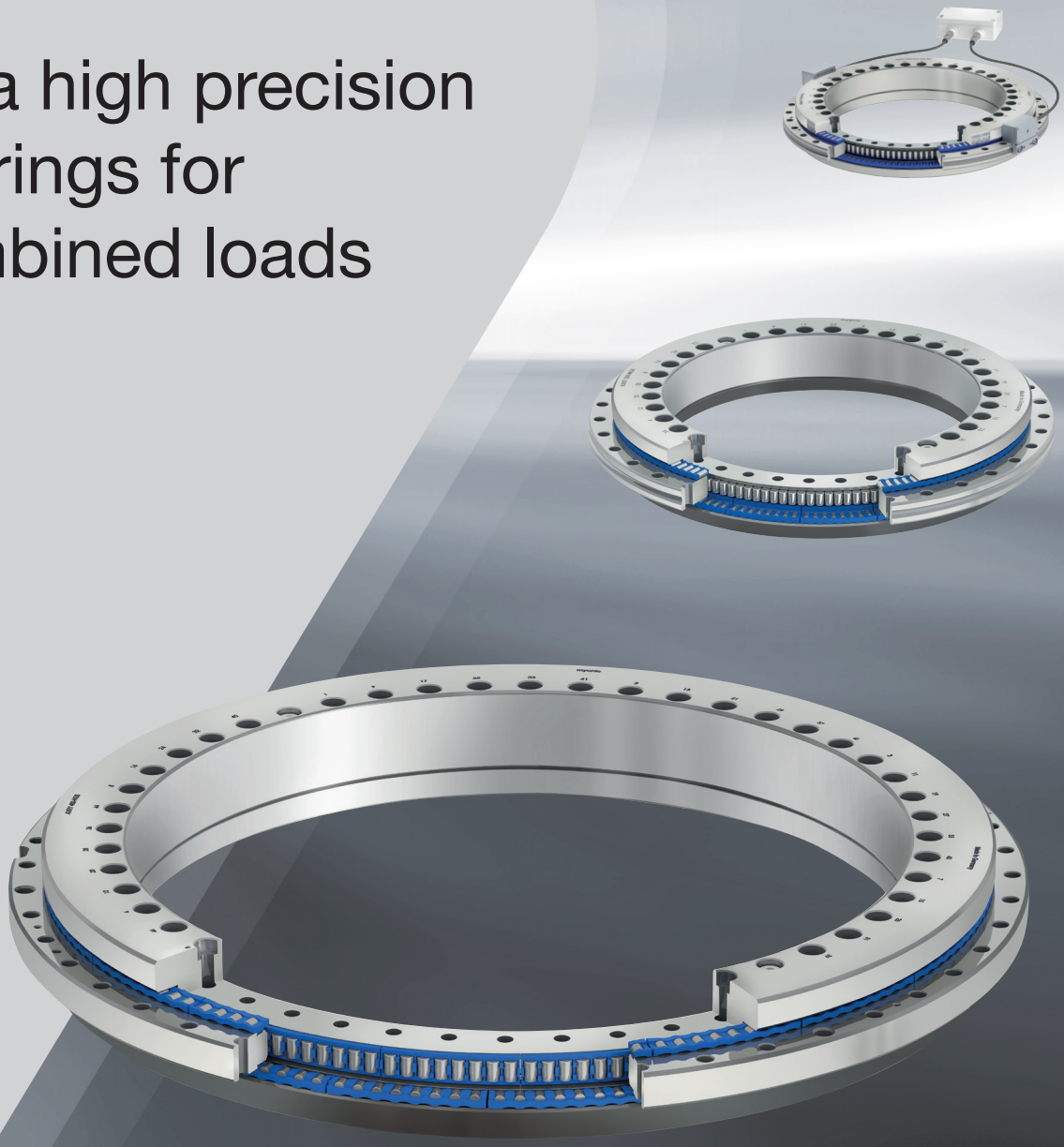
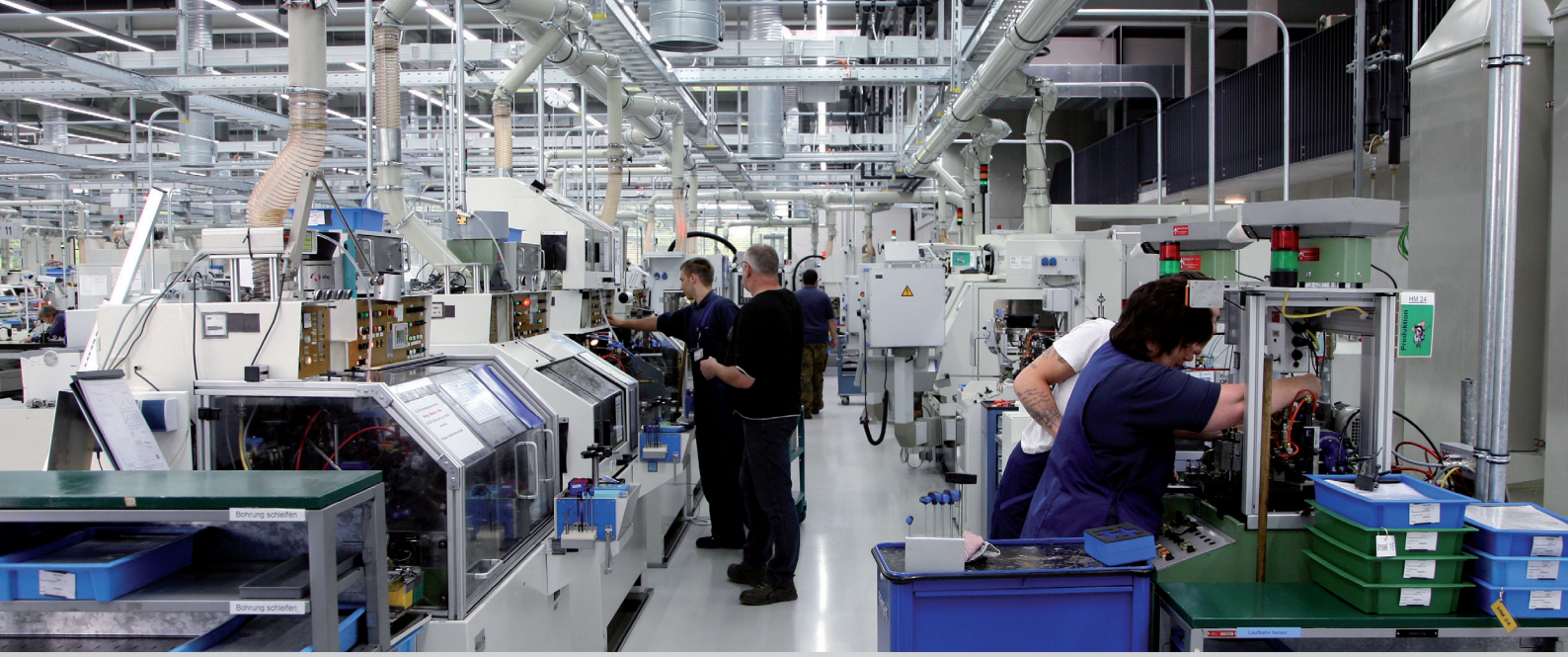
MinebeaMitsumi
Passion to Create Value through Difference

myonic

Ultra high precision bearings for combined loads





Technological leaders. A matter of tradition.

Bernhard Böck
Managing Director

Since the foundation of the company as RMB SA in 1936, we at myonic have searched every day for optimum solutions for our customers. Thanks to our force of innovation and our know-how, we have achieved international success.

Originally focussing on the challenges of the dental industry – high speeds, maximum precision and compact dimensions – we have continually expanded our product range competences. Today, myonic products can be found everywhere where intelligent solutions in the toughest of conditions are required.

These are, in addition to the machine tool industry, medical and fine tool technology, the automotive industry and aviation and aerospace applications.

Part of the MinebeaMitsumi Group

myonic is a company independently active within the MinebeaMitsumi Group.
MinebeaMitsumi is considered to be the world leader in the manufacture of high-precision components for the fields of telecommunications, aviation and aerospace as well as the automotive and electronic industries.

The MinebeaMitsumi Group comprises 99 subsidiaries worldwide, and employs more than 100,000 people.

Not only thanks to the worldwide network of different production sites, but also due to their consistent concentration on innovations as a result of high levels of investment in research and development, MinebeaMitsumi leads the competition with modern methods and technologies.

MinebeaMitsumi
Passion to Create Value through Difference

More than a bearing

The myonic principle focuses on the entire solution process.

We are not a supplier of roller bearings, but rather a process-orientated partner which finds and implements efficient and productive solutions in collegial and open working relationships.

For this reason, we ask questions; ask them again; want to know all the details, discuss plans and deal with advancements transparently and critically.
Our aim is your fullest satisfaction.
And this aim can only be achieved in trusting and close collaboration.

Our team familiarises themselves with you and your challenge.
We work together on the best solution, whether this is a modified standard bearing or a newly-developed ultra precision product.

Machine tool industry

The machine tool industry requires system partners to further increase the efficiency of high-performance machines and increase their own competitiveness.

myonic products are used in rotary table systems and rotary axes as well as in linear drive units. In close co-operation with the customers, both high speed solutions and highly rigid or friction-optimised applications are implemented.

The requirements for precision are met with state-of-the-art production technologies.

These processes enable optimised geometries and therefore ideal solutions for our customers.

myonic

Table of contents

Table of contents

Reprints, including extracts, are only permitted with the consent of myonic GmbH.

The information in this printed matter has been produced with the greatest of care and checked for correctness. In spite of this, we cannot bear any liability whatsoever for possible errors and incomplete information.

Technical changes reserved on all information provided.

myonic GmbH, Edition 09/2019

Overview of myonic bearings

General

myonic ultra high precision bearings are designed for use in machine tool axes, for example in rotary tables, milling heads or swiveling spindles. Any other use shall take place under your own responsibility.

Changes to the product are not permitted and shall lead to the exclusion of all warranties.

If not otherwise stated, all the data in the above printed matter refers to the bearing and not to the complete axis system.

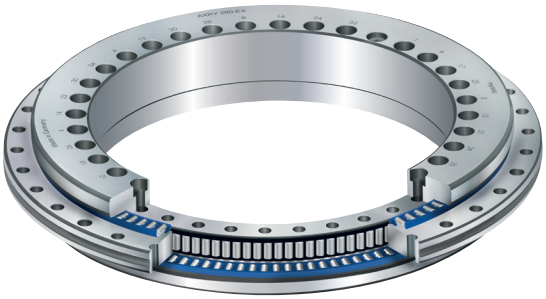
An appropriately accurate and rigid adjacent construction is required to utilise the performance capacity of the bearing. The assembly guidelines are to be followed carefully.

The information and results from test bench tests listed in this catalogue refer to the stated bearings and do not under any circumstances replace comprehensive testing of the complete rotary axis system in installed condition.

AXRY-EX axial-radial bearings for swivel applications

AXRY-EX bearings are double direction, screw-on precision bearing units ready for installation. They consist of two axial bearings and one radial bearing. These permit the simultaneous and backlash-free absorption of radial and axial forces and tilting moments.

The "EX" bearing type with optimised inner design, geometry and innovative cage design is designed for maximum rigidity with simultaneous low friction torque. The starting torque is only slightly higher than the running torque, and therefore the EX bearing type is ideal for applications with direct drives.



AXRY-EX-S axial-radial bearings for high speeds

The **EX-S** bearing type has been developed for the absorption of higher speeds, also in continuous operation. The rigidity and load rating have been reduced in favour of a higher speed endurance strength. All connection dimensions accord with the EX bearing type.

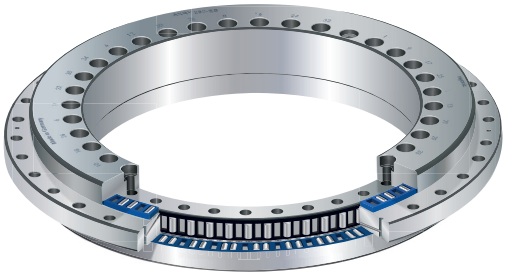
Overview of myonic bearings

AXRY-ES axial-radial bearings for high speeds

AXRY-ES bearings are similar in bearing type to the EX bearings, but are designed for maximum speeds and maximum running smoothness.

In combination with an adapted adjacent construction, ES bearings are used in high speed tables (e.g. milling/turning tables).

AXRY-ES bearings are equipped with optimised lubrication channels, optional seals and sensor bores for temperature measurement. In this design, AXRY-ES bearings are particularly suitable also in combination with minimum quantity lubrication systems.



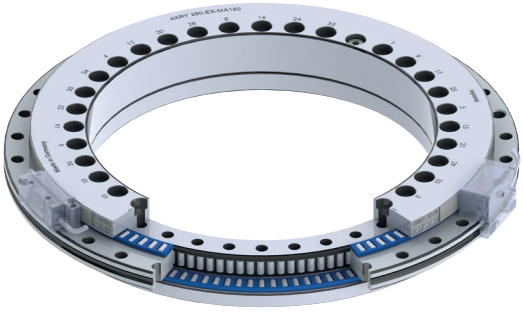
AXRY-EX-M/-S-M/-ES-M axial-radial bearings with angle measurement system

AXRY-EX (EX-S) and **AXRY-ES** bearings are available with integrated inductive measuring systems. Here we cooperate with AMO Austria, which provides direct support during the electronic integration.

All the systems have been designed so that interventions in the machine housing are kept as low as possible.
The required spare parts can be procured worldwide directly from AMO or their service subsidiaries.

The measuring systems are available as single and multi-head systems, using which positioning accuracies of less than 1 angular second can be achieved.

The absolute measuring system as the basis of the modular system can be screwed on either radially or axially. Due to the preadjustment of the measuring gap, the bearings can be installed without much effort.



General

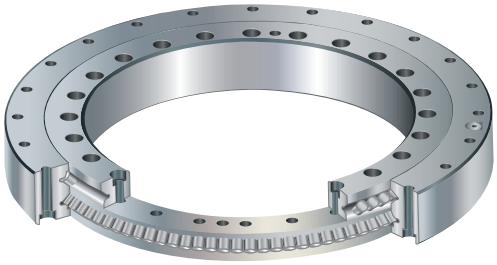
Overview of myonic bearings

AXDR double row angular contact roller bearings

AXDR double row angular contact roller bearings are double-row cylindrical roller bearings with two raceways offset by 90° in an O-arrangement.
This arrangement is highly suitable for the absorption of typical forces in machine tools.

In addition to a full complement design, AXDR bearings are also produced with spacers between the rollers.
This minimizes the friction in the bearings and facilitates substantially higher rotational speeds, in particular in combination with the optional oil/air lubrication.

With only two raceways, the achievable rigidities lie close to the AXRY-EX bearing values.
The accuracy requirements mainly accord with the accuracies of the AXRY-EX bearings.

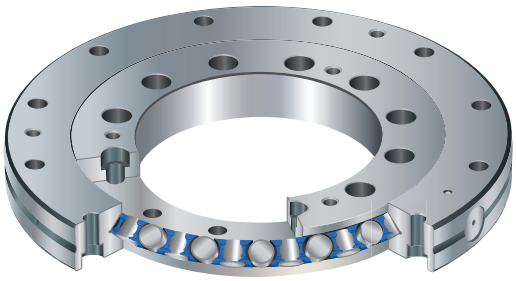


AXCR cross roller bearings

AXCR cross roller bearings are compact, highly durable cylindrical roller bearings featuring cylindrical rollers arranged crosswise offset by 90°. In this way, AXCR bearings can absorb loads from all directions.

myonic-AXCR bearings are manufactured on the same manufacturing machines as AXRY bearings, and therefore feature similar accuracy requirements.

myonic manufactures cross roller bearings in a multitude of variations. Customer-specific designs can be manufactured in smaller series.

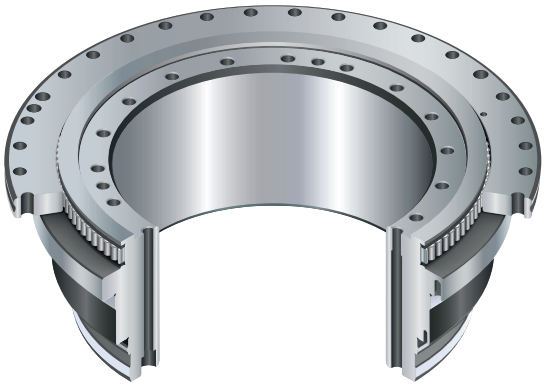


Overview of myonic bearings

Special bearings/non-locating bearings

Frequently, **special bearings** are an intelligent solution approach, on the one hand to increase the overall performance of axes, tables and milling heads and on the other to lower the overall costs.
Here drives, seals, clamps etc. can be integrated in the bearings to form a single unit which is easy to install.

myonic manufactures **non-locating bearings** for longer axes and/or those under very high levels of stress. These absorb radial loads backlash-free and additionally permit an axial displacement to avoid distortion.



General

Applications

Rotary tables/swivel rotary tables

Here the workpiece is either clamped in machining position or moved during machining. Rotary table bearings facilitate a precise, dynamic path movement between the tool and workpiece.
The accuracy and the surface quality of the workpiece are directly dependent on the precision and rigidity of the rotary table bearing.
Here swivel rotary tables can achieve almost any position. This generates high requirements on the bearing, both radially/axially and in the area of the necessary tilting rigidity.
Usually, **AXRY-EX** axial-radial bearings are used as the bearings, but in swivel applications **AXCR** cross roller bearings and **AXDR** double row angular contact roller bearings are also used.

Milling/turning tables

Milling/turning tables are a further development of "conventional" (swivel) rotary tables. In addition to the conventional requirements, rigidities and accuracies, an additional turning function is offered here in operation.
In case as low a temperature as possible is required in the table systems, measures for the discharge of the resulting friction heat are required.
myonic manufactures friction-optimised **AXRY-EX-S (ES)** bearings, which substantially reduce the friction with simultaneously high rigidities.

Milling heads

Additional axes are realised via the movement of the main spindle. In case of large and heavy components, machining is thus facilitated from all sides in the clamp using milling heads. The milling heads moved within the machining space should be as compact as possible. At the same time, increasing cutting forces demand high bearing rigidities.
AXCR cross roller bearings are frequently used as bearings. For higher rigidities, **AXRY-EX** axial-radial bearings **and AXDR** double row angular contact roller bearings are installed.

Axes in grinding machines

In high-performance grinding machines, both the workpiece and the spindle head are swivelled. Due to the high requirements on the surface quality and the precision of the workpieces, highly rigid axial-radial bearings are used.
The direct drives conventionally used require a low starting torque. myonic **AXRY-EX** bearings are used here, frequently with supported bearing rings and limited axial and radial runout (PRR50).
AXRY-EX-S (ES) speed bearings are used in the rotary table of rotary table grinding machines.

Other applications

Other applications include robotics, in printing machines, vertical turning machines and other axes which demand high precision, rigid positioning.

General basic principles for preloaded ultra high precision bearings

Preload

The bearings are preloaded so that it is possible to rotate and swivel backlash-free in all load situations during operation. Here it is necessary to support the bearing accurately. This means above all appropriately rigid and precise adjacent constructions on the part of the user.

Design strength

The bearings deform due to the application of the preload. The quality of the adjacent construction prevents negative effects on these normal settling and adaptation processes. All bearings are designed for the conventional applications described in the product chapters; it is essential that deviating installation cases are discussed with myonic.

Radial runout accuracy

The radial runout accuracy of the bearing can only be transferred onto the machine tool axis with appropriate backlash-free fits of the rotating connecting parts.
Clearance fits frequently lead to radial runout problems.

Axial runout accuracy

The axial runout accuracy for AXRY bearings is applied on both sides and on the axial washer as well as on the inner ring.
The installation position has no influence on the axial runout accuracy.

In the case of the construction series AXDR/AXCR, the axial runout accuracy is always applied to the face opposite the counterbores.

Axial and radial runout accuracy for AXRY-EX

Designation	Axial runout & radial runout	
	Standard	Restricted
	PL & RL [µm]	PL & RL [µm]
AXRY 50-EX	2	1
AXRY 80-EX	3	1.5
AXRY 100-EX	3	1.5
AXRY 120-EX	3	1.5
AXRY 150-EX	3	1.5
AXRY 180-EX	4	2
AXRY 200-EX	4	2
AXRY 260-EX	6	3
AXRY 325-EX	6	3
AXRY 395-EX	6	3
AXRY 460-EX	6	3
AXRY 580-EX	10	5
AXRY 650-EX	10	5

General principles preloaded ultra high precision bearings

Axial and radial runout accuracy for AXRY-EX-S (ES)

Designation	Axial runout & radial runout
	Standard
	PL & RL [µm]
AXRY 150-EX-S (ES)	1.5
AXRY 180-EX-S (ES)	2
AXRY 200-EX-S (ES)	2
AXRY 260-EX-S (ES)	3
AXRY 325-EX-S (ES)	3
AXRY 395-EX-S (ES)	3
AXRY 460-EX-S (ES)	3
AXRY 580-EX-S (ES)	5
AXRY 650-EX-S (ES)	5

Axial and radial runout accuracy for AXDR

Designation	Axial runout & radial runout			
	Inner ring		Outer ring	
	Standard	Restricted	Standard	Restricted
	PL & RL [µm]	PL & RL [µm]	PL & RL [µm]	PL & RL [µm]
AXDR 80	4	2	5	3
AXDR 100	4	2.5	7	4
AXDR 120	4	2.5	7	4
AXDR 150	5	2.5	7	4
AXDR 160	5	2.5	7	4
AXDR 180	5	2.5	7	4
AXDR 200	6	3	7	4
AXDR 210	6	3	8	5
AXDR 260	8	4	8	5
AXDR 325	8	4	9	5
AXDR 350	8	4	10	7
AXDR 395	8	4	10	7
AXDR 460	10	5	10	7
AXDR 580	12	6	15	8
AXDR 650	14	7	15	8

General principles preloaded ultra high precision bearing

Axial and radial runout accuracy for AXCR

AXCR-/RX-/SX accuracy requirements of inner ring				
Nominal size of the bearing bore d [mm]		Axial runout & radial runout PL & RL [µm]		
over	up to	Class P4	Class P2	Class UP
30	50	4	2.5	2
50	80	4	2.5	2
80	120	5	2.5	2
120	150	6	2.5	2
150	180	6	5	3
180	250	8	5	3
250	315	10	6	4
315	400	12	7	4
400	500	14	9	5
500	630	16	10	6
630	800	18	11	7
800	1000	20	12	9

Axial and radial runout accuracy for AXCR

AXCR-/RX-/SX accuracy requirements of the outer ring				
Nominal size of the outer diameter D [mm]		Axial runout & radial runout PL & RL [µm]		
over	up to	Class P4	Class P2	Class UP
30	50	5	2.5	2
50	80	5	4	3
80	120	6	5	3
120	150	7	5	3
150	180	8	5	3
180	250	10	7	4
250	315	11	7	4
315	400	13	8	5
400	500	14	9	6
500	630	17	10	7
630	800	20	15	9
800	1000	25	18	11

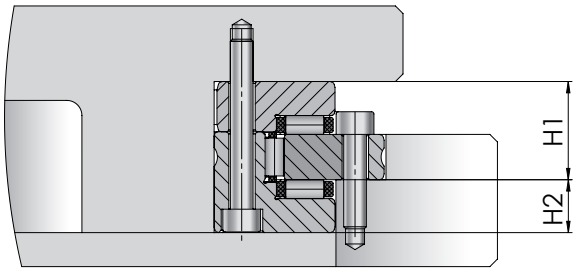
General principles preloaded ultra high precision bearing

Repeatability

Due to the extremely high manufacturing accuracy, the non-compensable repeat errors lie within a range of max. 1 µm. For most of the construction series, the repeatability is measured in assembly. These values can be queried from myonic using the serial number of the bearings.

Construction height tolerances

For the connection of drives, for example worm gears or for the production of defined sealing gaps, several bearing types feature limited tolerances in construction height. These are presented in the product table. You can receive further information or possibilities for tolerance limitation via myonic application engineering.



Operating temperature

All bearing types are suitable for operating temperatures from -30 °C to +120 °C.

The actual operating temperature of a machine tool axis is influenced by many factors.

The heat from the bearing friction (bearing and lubricant), tensions from assembly, grinding additional parts, the introduced forces (mass, cutting force) and external heat sources such as the drive are incorporated.
The heat can be discharged into the environment or onto additional cooling devices.

myonic-internal test results always refer to the bearing and the lubrication.

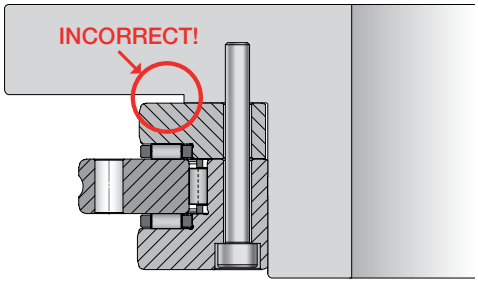
Further details on the operating temperature and influence factors are presented in the product chapter AXRY-EX-S (ES).

General construction notes

In order to guarantee proper function of the bearing, the tolerances and details of the form and positioning tolerances presented in the product chapter must be adhered to.
The bearings are to be supported with an appropriate construction. Non-adherence to these principles leads to severely reduced performance characteristics or to the complete loss of all bearing functions.

Based on the example of the AXRY bearing, the main design criteria are presented below.

Full-area support of at least one face and the bearing bore

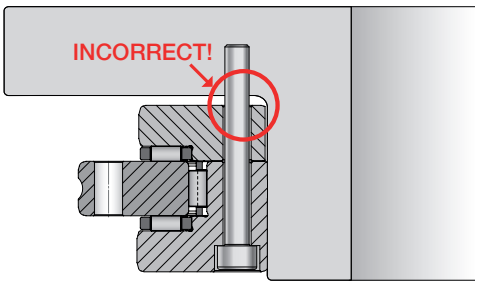


The preload in the bearing is generated through the inner ring screw connection. The rings deform due to the high preload forces. These deformations are reduced or avoided through the adjacent construction. After screwing it on, the bearing is placed under the planned preload.

All AXRY bearings have been designed and calculated on the basis of this principle. Deviating adjacent constructions can lead to a loss of rigidity and accuracy requirements or a severe increase in friction. More design-flexible bearing types such as the AXDR and AXCR-U help to reduce this issue.

In case of screw-on NE metal rings via which the preload is applied, please ensure that the preload forces are applied evenly to the bearing, for example via steel rings which are screwed on with the rings.

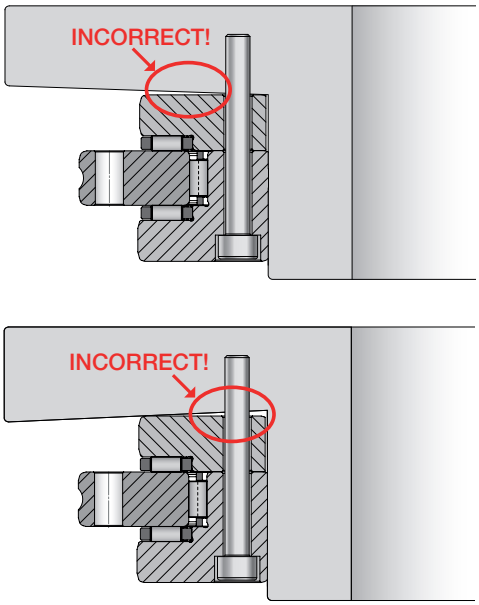
Edge rounding/radii



Excessively large radii in the connecting parts prevent the correct tightening of the bearing onto shafts or the correct application in the housing. The result is distortions in the bearing.

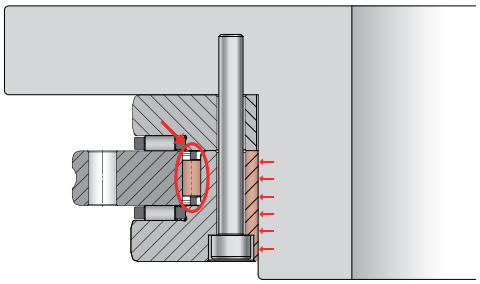
General construction notes

Perpendicularity/cylindrical shape and roundness of shaft



Incorrect form tolerances lead to undefined operating conditions. Both distortions and poor support of the bearings may occur.

Shaft press fit



Press fits lead to widening of the inner ring and thus to radial preload increases.

The higher the requirements on the accuracy and the detail are, the more precise the fits must be. In highly dynamic or high precision application cases, this leads to mating of the bearings with the connecting parts.

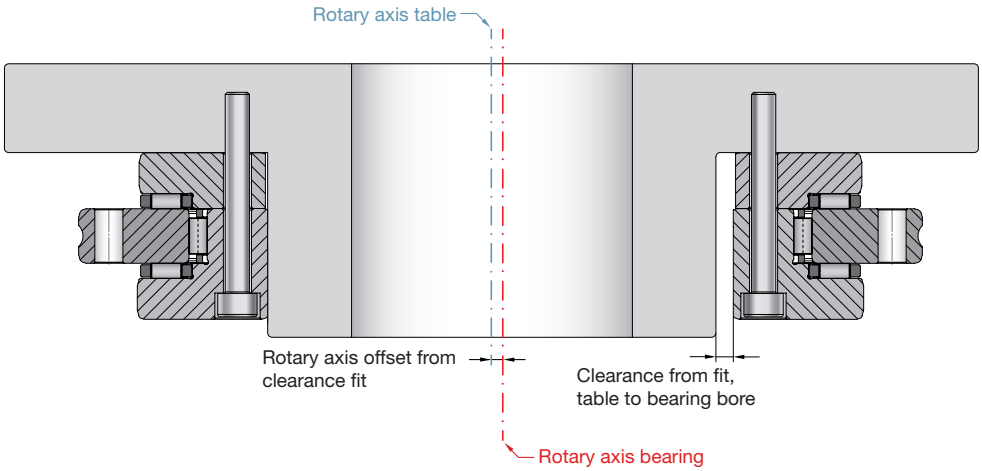
For this reason, the exact connection measurements are listed in the enclosed test protocol.

General construction notes

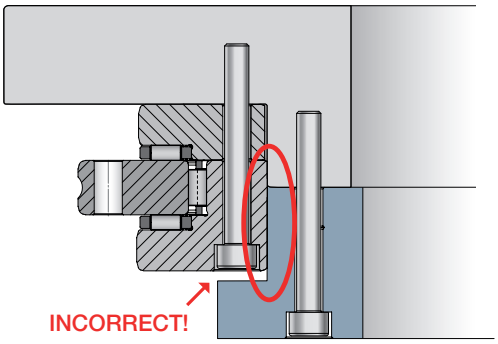
Clearance fit of shaft

If the rotating ring is not supported through a transition fit, displacement of the rotary axes table to bearing is possible. The clearance fit can add itself to the radial runout. The running accuracy of the bearing is not then reproducible on the table.

This applies in the same way for applications with rotating outer ring.



Avoid double centring



The bearings require support across the whole surface if possible in the area of the bearing bore. Further centring in the bearing bore should be avoided.

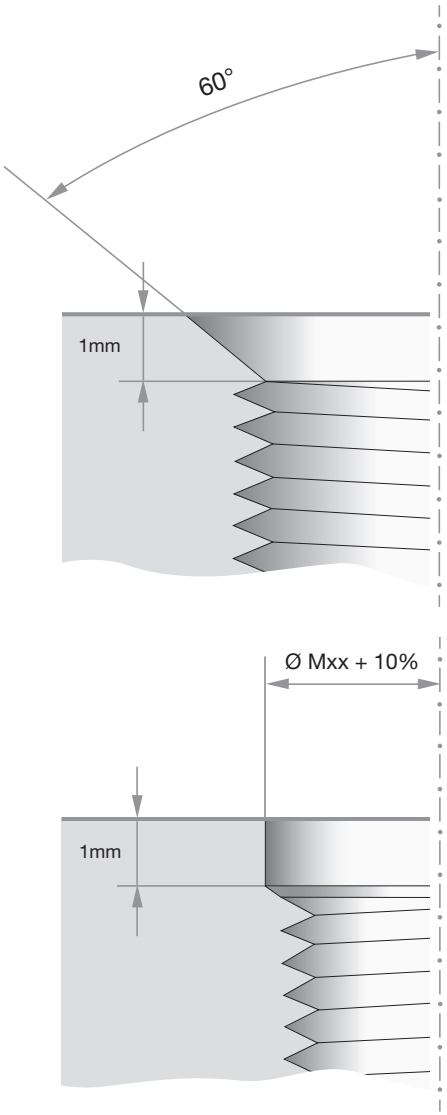
If this proves unavoidable in the design, the additional area to be centred must be as short as possible and have more clearance.

General construction notes

Fastening thread in the adjacent construction

In order to avoid a deformation of the screw-on surface when tightening the fixing screws, all fastening threads are to be bored accordingly. We either recommend 120° counterbores or cylindrical countersinks with a 10 % larger diameter than the nominal diameter of the thread. The counterbore depth should total at least 1 mm.

All counterbores must be clean and absolutely burr-free.



Ø Mxx = Thread nominal diameter

Friction

Friction torque

The bearing friction torque is mainly determined through:

- Bearing preload
- Viscosity of lubricant
- Quantity of lubricant

Preload

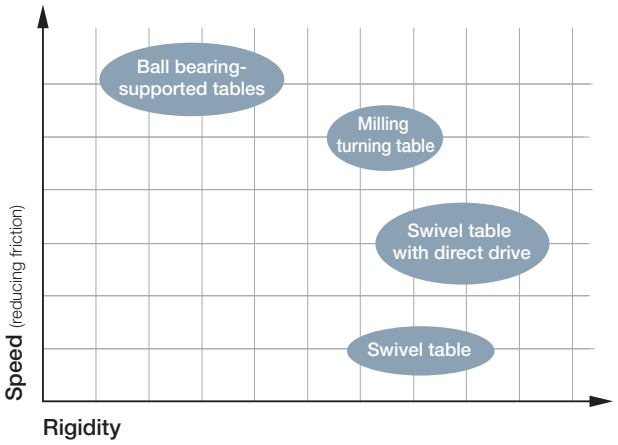
A lower bearing preload generates less friction and therefore lower temperatures, and is always better for high speed applications. Here it must be observed that the bearing preloads are always sufficient for backlash-free operation of the bearing under load.

A higher preload provides higher rigidity but at the same time also adds more friction to the bearing.

In particular in case of initially greased bearings for swivel applications (AXRY-EX/AXCR/AXDR-VX), the friction torque increases substantially as the speed increases.

myonic supplies axial-radial bearings in 2 basic alignments:

- **AXRY-EX** for swivel or slow-running applications.
- **AXRY-EX-S (ES)** for fast-running applications, e.g. milling turning tables.
- Adapted bearing preloads may be necessary in order to cover special requirements.



Friction

AXDR and **AXCR bearings** can be supplied with various preloads. Basically, we differentiate between three classes:

Bearing preloads – AXCR:

- Standard preload
- Slight preload
- Clearance

Bearing preloads – AXDR:

- Standard preload
- Bearing preload adapted for supported L-section ring
- Customer-specific bearing preload

In the standard series, AXDR and AXCR bearings are supplied with a standard preload and are suitable for swivel or slow-moving applications.

AXDR-SX bearings are friction-optimised in design and can, in combination with suitable lubrication, be used for high speed applications.

Viscosity lubricant

The viscosity is dependent on the operating temperature and of course on the selected lubricant. An excessively low viscosity leads to mixed friction, in particular in case of slow or intermittent operation. Excessively high viscosity, on the other hand, leads to high friction, in particular in high speed applications.

Lubricant quantity

Excessively high lubricant quantities substantially increase the bearing friction. myonic cages are designed to absorb as high a quantity of lubricant as possible and to add the lubricant directly onto the rollers during operation. During run-in or during relubrication, the appropriate run-in cycles must be adhered to.

The myonic standard greases are prealigned to the application areas AXRY-EX (Swivel) or AXRY-EX-S (Speed). The AXDR and AXCR are supplied with a high-performance grease for slow and/or intermittent operation or simply preserved for the realisation of oil/air lubrications.

Relubrication

An appropriate relubrication of the bearing is generally possible via the outer ring. The appropriate details are presented in the product chapter. Please enquire about deviating lubrication variations.

In addition to the usage duration of the bearing, the friction and thus the speed suitability is substantially influenced by the selected lubricant and the added quantity. Non-regulated relubrication frequently leads in practice to problems.

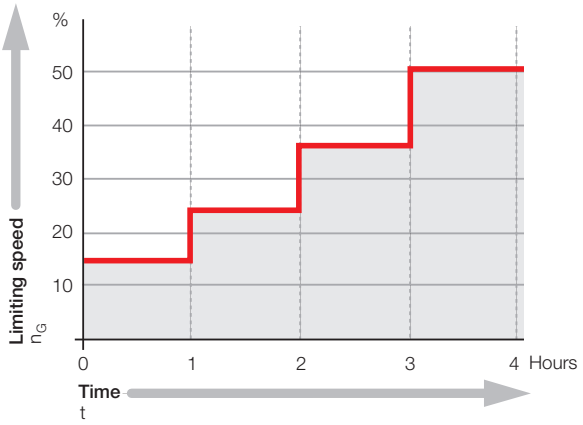
You can receive information on relubrication intervals and quantities from myonic application technology.

Friction

Commissioning

In case of grease lubrication, a run-in cycle is to be run during every initial commissioning and non-regulated relubrication in order to distribute the grease in the bearing. Only after complete distribution does the bearing achieve full functionality.

In case of incorrect execution of the run-in cycle, high friction torques may occur which overheat the bearing.



In case of existing temperature monitoring, the run-in cycles can be adapted. A maximum ring temperature of 60°C may not be exceeded. If you hear running noises, stop immediately and leave to cool down.

In case of slow-running swivel axes, the run-in cycle does not have to be conducted.

Friction torque in installed condition

In correctly-installed condition, the friction torque will increase slightly. The following is added to the bearing friction torque:

- Preload increase through interference fit
- Preload increase through form errors in the adjacent construction
- Preload increases through additional load

The reference values stated in the catalogues can only be achieved if all fits and form accuracies in the surrounding or additional parts are adhered to.

Assembly must take place in accordance with the myonic regulations.

Test bench/bearing dimensioning

myonic UP bearings are designed and dimensioned based on FEM calculations. The in-house test bench permits the static and dynamic inspection of the bearing. With the exception of the rigidity calculation, all information in the catalogue refers to the bearing and not to the entire machine axis. The specific influence factors of the applications must be tested in combination with the bearing.

General

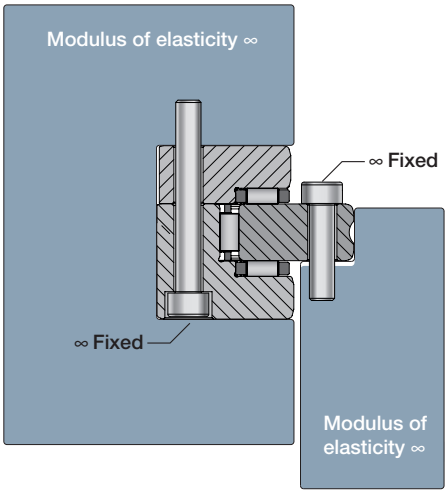
Rigidity/rigidity calculation

The rigidities stated in the different catalogues are not comparable with each other. In the following myonic product data, all rigidities are uniformly calculated; a cross-comparison over the individual product groups is therefore permitted.

myonic differentiates between the following rigidities:

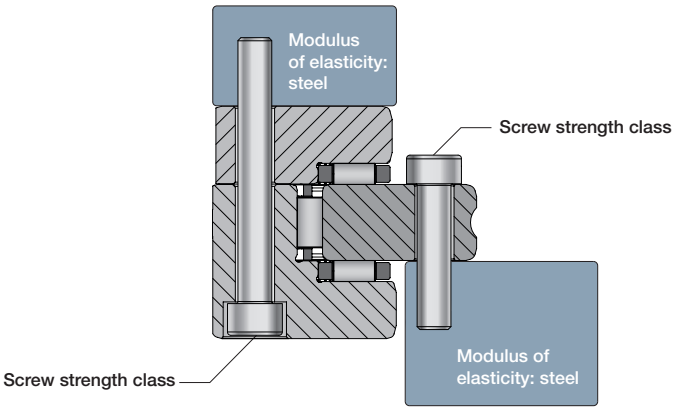
Dynamic rigidity or rigidity of the roller element set

The roller element set with infinitely rigid surroundings/screw connection is calculated here. The calculated values serve as a cross-comparison between the individual roller bearing types and say nothing about the expected rigidity of the axis. This data can be requested from myonic in case of own modelling or calculation through the machine manufacturer.



Static rigidity or rigidity of the bearing position

A frequently-used calculation procedure which takes into account the deformation of the rings and the screw connection. The results are only directly comparable in case of application of exactly the same measuring points.

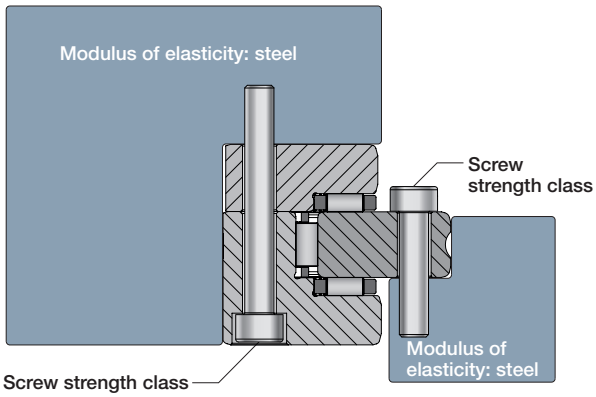


Rigidity/rigidity calculation

myonic calculation procedure

myonic procedure for the calculation of the probable axis rigidity, taking the following into account:

- Normal adjacent constructions and screw connections according to the information in the product chapter
- Normal preloads
- Operating loads applied for calculation



Identical FEM calculation procedures are conducted across all product groups with precisely-defined parameters. This means that all stated rigidity values for the individual product groups (AXRY/AXDR/AXCR) are directly comparable.

Under-dimensioned or poorly-executed adjacent constructions substantially reduce the rigidity of the axis. Seen vice versa, an improved construction support for the bearing can also increase the rigidity.

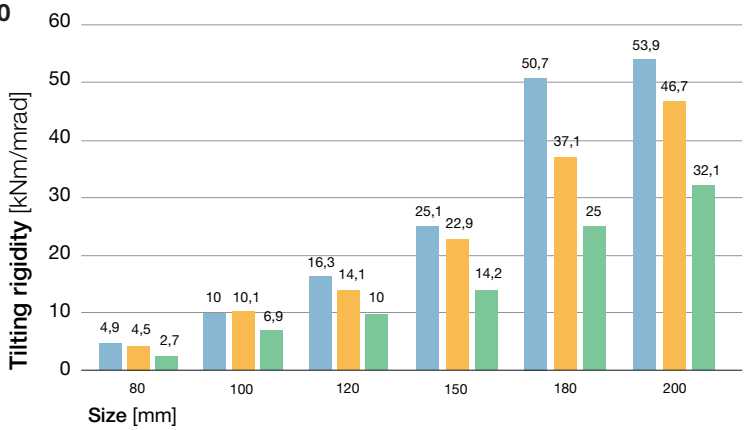
Dimensioning of the myonic bearings

All bearing modules are dimensioned so that they are rigidity-optimised, taking into account the usual installation situation in an axis.

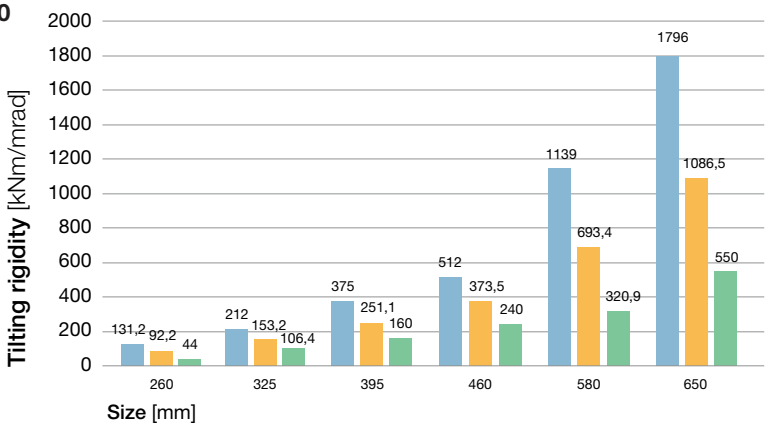
Rigidity comparison

Direct comparison of rigidity between AXRY-EX, AXDR___VX and AXCR-U

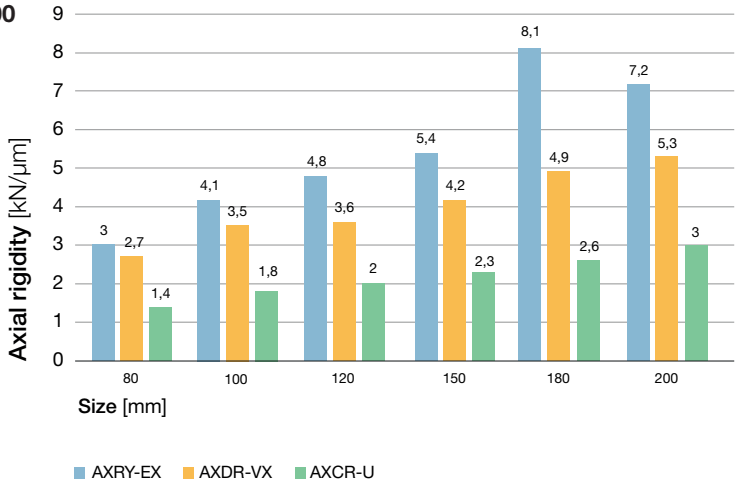
Tilting rigidity sizes 80 to 200



Tilting rigidity sizes 260 to 650



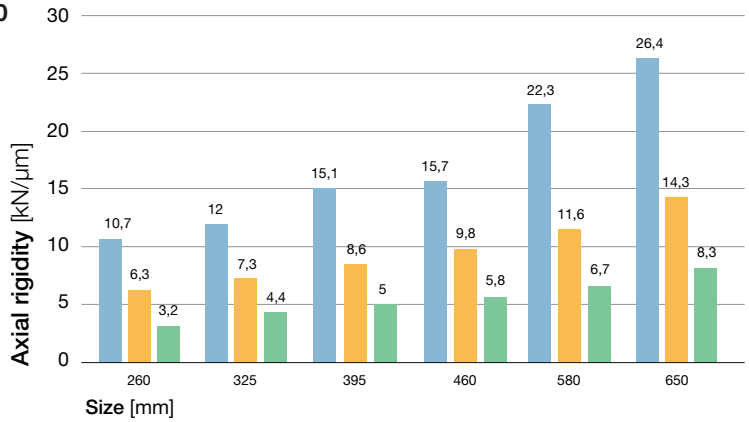
Axial rigidity sizes 80 to 200



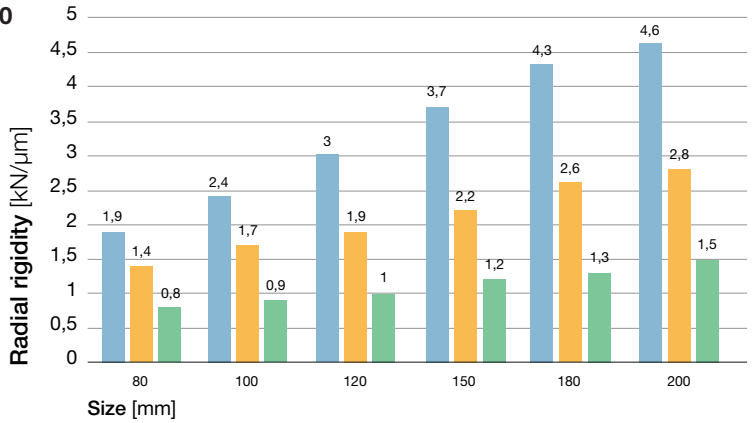
Rigidity comparison

Direct comparison of rigidity between AXRY-EX, AXDR___VX and AXCR-U

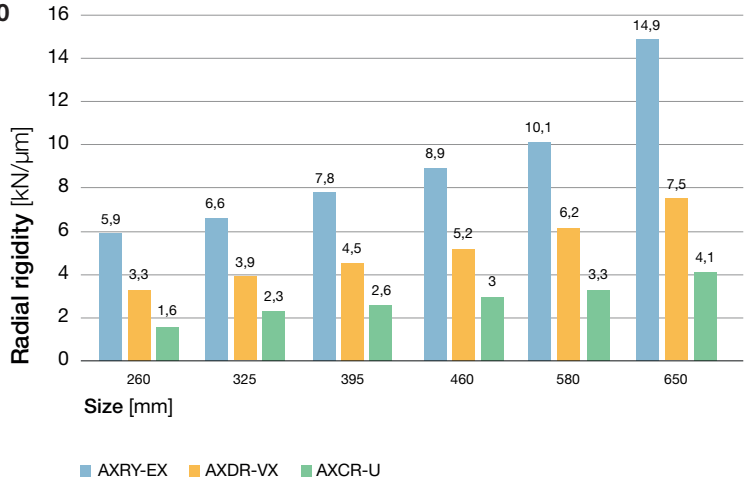
Axial rigidity sizes 260 to 650



Radial rigidity sizes 80 to 200



Radial rigidity sizes 260 to 650



General

Documentation

Serial number

myonic high-performance bearings for applications in machine tools are mainly serialised.
The serial number is both marked on the product and printed on the packaging and the enclosed inspection report.
State the serial number if making any queries on your product.

Inspection report

Every bearing is delivered with a detailed inspection report.
In addition to the function test results, the report contains the actual dimensions of the hole and the outer diameter.

In case of height-limited bearings, the actual dimensions of the unloaded bearing are stated.
In this way, customer additional parts can be optimally aligned to the bearing.

Traceability

Every bearing is 100 % traceable via the serial number. This includes all process steps, starting with the raw material, right up to the assembly of the bearing.

Screw connections

Fastening screws

The completely assembled bearing can be held together with fastening screws which are not normally removed.
However, if the fastening screws are removed, they may not be removed until after the bearing has been completely screwed on and must be replaced with normal screws.
Incorrect removal of the fastening screws can cause a decline in the axial/radial runout or the repeatability.

Strength class

All screw connections are to be executed with screws in strength class 10.9 (former designation 10K) acc. DIN 267-3 or DIN EN ISO 898-1.
All countersunk holes are designed for cylinder screws with internal hexagons acc. ISO 4762 (DIN 912).

Strength class 10.9

Tensile strength Rm = 1,000 MPa

0.2 % yield strength Rp 0.2 = 900 MPa

Screw connections with other strength classes lead to changed preload values on the AXRY axial/radial bearings, and can lead to unwanted clearance or increased friction.

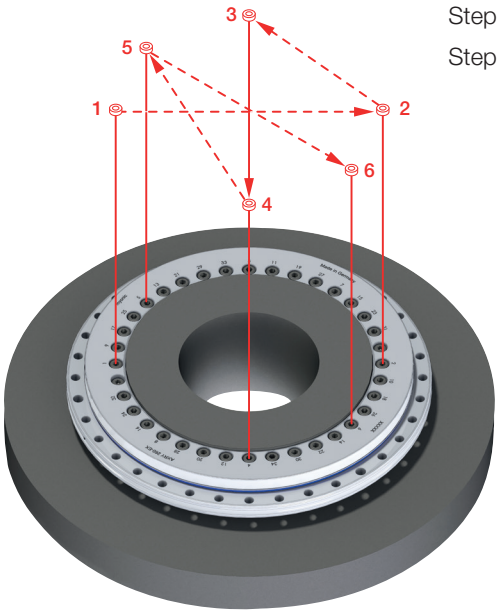
All calculations are executed with cylinder screws with internal hexagons acc. ISO 4762 (DIN 912) 10.9. In particular the static rigidities and the area pressures in the bearing, as the basis for the life time, change with the different strength classes.

Tightening torques

All bearings must be screwed on crosswise; the tightening sequence is partly marked on the bearings.

The tightening torque M_A is applied in 3 steps:

Step 1 – 40 % of M_A
Step 2 – 70 % of M_A
Step 3 – 100 % M_A



General

Screw connections

The bearing friction torque may increase during assembly. The bearing may not be unusually hard to move. If this is the case, loosen the screw connection and screw on again in 3 steps. Any remaining stiffness can also be caused through errors in the adjacent construction.

All myonic bearings are checked in assembly for the bearing friction torque.

Fastening screw	Tightening torque M_A		
	1st step 40 % M_A	**2nd step** 70 % M_A	**3rd step** 100 % M_A
M4	1.7	2.9	4.2
M5	3	6	8.5
M6	6	10	14
M8	14	24	34
M10	27	48	68
M12	46	81	116
M14	74	130	186
M16	114	199	284

AXDR/AXCR with single-part rings

The AXDR-/AXCR bearings with undivided (single-part) rings with countersunk holes can be tightened in 2 steps (step 1 and step 3).

Other strength classes/tightening torques

The preload and therefore the bearing friction torque, in particular for bearings in the AXRY construction series, are determined through the tightening torque of the screws.

A higher preload can also be achieved through the use of screws in strength class 12.9 and a higher tightening torque.

Conversely, the bearing friction can also be reduced through lower tightening torques.

If the screws are not tightened in accordance with the standardised tightening torques, these may lose the self-locking effect preventing the screw connection from loosening.

Provide appropriate screw locking measures.

Greases and preservatives

Standard grease

The standard grease used is a special grease by Klüber and can be procured worldwide directly from the manufacturer. Due to positive practical experience, this grease is used in all preloaded bearings (AXRY/AXDR/AXCR).

It features good pressure and wear stability and does not contain inorganic solid lubricants such as MoS_2 or graphite.

The high elastomer compatibility permits use with conventional sealants. If in doubt as to compatibility, sealant materials can be tested.

For relubrication purposes, we recommend metering systems or central lubrication systems in order to avoid over-greasing of the bearing. The grease is always easy to convey.
We are happy to assist in case of special system configurations.

Do not remove pre-greased bearings from the protective packaging until just before assembly. In order to avoid grease aging, we recommend that you install the bearing within one year after delivery.

The maximum storage duration may not exceed 3 years from delivery.

Temperature range	-40 to +150 °C
Base oil, kin. viscosity 40 °C (DIN 51562)	approx. 130 mm^2/s
Base oil, kin. viscosity 100 °C (DIN 51562)	approx. 14 mm^2/s
Colour	yellow
Consistency enhancer	Li special soap
Type of oil and mineral oil	Mix synth. hydrocarbon oil
Density:	approx. 0.88 g/cm^3
Flow pressure (DIN 51805)	< 1400 mbar
NLGI class (DIN 51818)	1
Maximum storage duration	36 months

In case of relubrication with other greases, check the miscibility. The use of non-miscible base oils or soaps will lead to premature bearing failure.

Greases and preservatives

Preservatives

The used corrosion protection oil is compatible und mixable with most of greases and oils produced on a mineral basis.

Check for compatibility when using synthetic lubricants and other consistency enhancers than lithium (complex) soaps.

In case of incompatibility, please consult myonic as to further procedures.

Miscibility of base oils

	Mineral oil	Synth. hydrocarbon	Ester oil	Polyglycol	Silicon oil (Methyl)	Perfluor-alkyl ether	Silicon oil (Phenyl)	Poly-phenyl-ether oil
Mineral oil	+	+	+	-	-	-	+/-	+
Synth. hydrocarbon	+	+	+	-	-	-	-	+
Ester oil	+	+	+	+	-	-	+	+
Polyglycol	-	-	+	+	-	-	-	-
Silicon oil (Methyl)	-	-	-	-	+	-	+/-	-
Perfluoralkyl ether	-	-	-	-	-	+	-	-
Silicon oil (Phenyl)	+/-	-	+	-	+/-	-	+	+
Polyphenyl ether oil	+	+	+	-	-	-	+	+

\+ miscible +/- miscible to a certain extent - non-miscible

Miscibility of thickener systems*)

		Metal-soap-greases				Complex-soap-greases					Greases		
		Al	Ca	Li	Na	Al	Ba	Ca	Li	Na	Bentonite	Polyurea	PTFE
Metal-soap-greases	**Al**	+	+/-	+	+/-	+	+/-	+	+	+/-	+	+	+
	Ca	+/-	+	+	+	+	+	+	+/-	+	+	+	+
	Li	+	+	+	-	+	+	+	+	-	+/-	+/-	+
	Na	+/-	+	-	+	+	+	+/-	+/-	+	-	+	+
Complex-soap greases	**Al**	+	+	+	+	+	+	+/-	+	+/-	+/-	+/-	+
	Ba	+/-	+	+	+	+	+	+/-	+/-	+	+	+/-	+
	Ca	+	+	+	+/-	+/-	+/-	+	+	+	+/-	+	+
	Li	+	+/-	+	+/-	+	+/-	+	+	+/-	+	+/-	+
	Na	+/-	+	-	+	+/-	+	+	+/-	+	-	+	+
Greases	**Bentonite**	+	+	+/-	-	+/-	+	+/-	+	-	+	+	+
	Polyurea	+	+	+/-	+	+/-	+/-	+	+/-	+	+	+	+
	PTFE	++	+	+	+	+	+	+	+	+	+	+	+

\+ miscible +/- miscible to a certain extent - non-miscible *) The miscibility of the base oils must be guaranteed.

Storage of bearings

Storage room

Closed rooms which are free of aggressive media (acids/lyes/exhaust gases/etc.) are suitable as storage rooms.
The temperature and the air humidity should be permanently monitored.

Temperature range: +5 to 40 °C – as constant as possible

Air humidity: max. 65 %

Avoid direct sunlight, in particular onto the packaging.

Variation in temperature and high humidity can lead to condensate!
Temperature and humidity have to be monitored continuously. Data logger could be used for this.
Time between measurements should not exceed more than two hours.

Storage periods

Roller bearings should never be stored longer than 3 years. Usually, bearings, if stored correctly, can still be used without problems even after this time period.

Pre-greased bearings should be installed as early as possible, at the most within a year, as grease properties reduce due to aging.
Therefore the grease operating period may be reduced.

General

Tolerance table

(based on DIN 620)

Diameter tolerance hole Δ dmp [µm]

Nominal size of the bearing bore [mm]	over	30	50	80	120	180	250	315	400	500	630	800
	up to	50	80	120	180	250	315	400	500	630	800	1000
Accuracy P0 (PN)	Δ dmp	0/-12	0/-15	0/-20	0/-25	0/-30	0/-35	0/-40	0/-45	0/-50	0/-75	0/-100
Accuracy P6	Δ dmp	0/-10	0/-12	0/-15	0/-18	0/-22	0/-25	0/-30	0/-35	0/-40	0/-55	0/-75
Accuracy P5*	**Δ dmp**	**0/-8**	**0/-9**	**0/-10**	**0/-13**	**0/-15**	**0/-18**	**0/-23**	**0/-27**	**0/-30**	**0/-40**	**0/-60**
Accuracy P4	Δ dmp	0/-6	0/-7	0/-8	0/-10	0/-12	0/-15	0/-19	0/-23	0/-26	0/-34	0/-54

Diameter tolerance outer diameter Δ Dmp [µm]

Nominal size of the outer diameter [mm]	over	30	50	80	120	150	180	250	315	400	500	630	800	1000
	up to	50	80	120	150	180	250	315	400	500	630	800	1000	1250
Accuracy P0 (PN)	Δ Dmp	0/-11	0/-13	0/-15	0/-18	0/-25	0/-30	0/-35	0/-40	0/-45	0/-50	0/-75	0/-100	0/-125
Accuracy P6	Δ Dmp	0/-9	0/-11	0/-13	0/-15	0/-18	0/-20	0/-25	0/-28	0/-33	0/-38	0/-45	0/-60	0/-75
Accuracy P5*	**Δ Dmp**	**0/-7**	**0/-9**	**0/-10**	**0/-11**	**0/-13**	**0/-15**	**0/-18**	**0/-20**	**0/-23**	**0/-28**	**0/-35**	**0/-40**	**0/-50**
Accuracy P4	Δ Dmp	0/-6	0/-7	0/-8	0/-10	0/-10	0/-11	0/-13	0/-15	0/-20	0/-25	0/-28	0/-35	0/-40

Axial and radial runout accuracy (inner ring) PL & RL [µm]

Nominal size of the bearing bore [mm]	over	30	50	80	120	180	250	315	400	500	630
	up to	50	80	120	180	250	315	400	500	630	800
Accuracy P5	PL & RL	5	5	6	8	10	13	15	18	20	22
Accuracy P4	PL & RL	4	4	5	6	8	10	12	14	16	18
Accuracy P2	PL & RL	3	3	3	5	6	8	8	11	13	15
Accuracy SP	PL & RL	3	3	3	3	4	6	6	8	10	12
Accuracy UP	PL & RL	2	2	2.5	2.5	3	4	4	5	6	7

Axial and radial runout accuracy (outer ring) PL & RL [µm]

Nominal size of the outer diameter [mm]	over	30	50	80	120	180	250	315	400	500	630	800
	up to	50	80	120	180	250	315	400	500	630	800	1000
Accuracy P5	PL & RL	7	8	10	13	15	18	20	23	25	30	35
Accuracy P4	PL & RL	5	5	6	8	10	11	13	15	16	20	24
Accuracy P2	PL & RL	2.5	4	5	5	7	7	8	9	10	15	20
Accuracy SP	PL & RL	2	3	4	4	5	5	6	7	8	11	15
Accuracy UP	PL & RL	2	2	3	3	4	4	5	5	7	8	10

*myonic standard

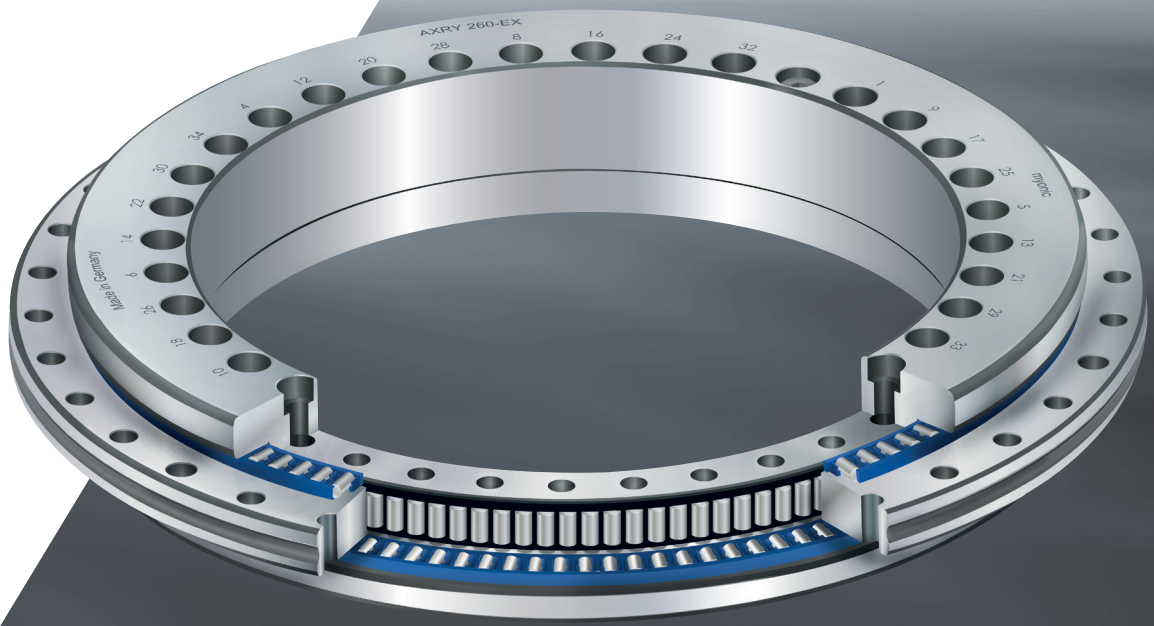
Fits table

Nominal size of the housing bore [mm]	over	**30**	50	80	120	180	250	315	400	500	630	800	1000
	up to	**50**	80	120	180	250	315	400	500	630	800	1000	1250
Tolerance Bearing outer diameter Accuracy P5	µm	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
	µm	**-7**	-9	-10	-11/-13	-15	-18	-20	-23	-28	-35	-50	-63
G7	µm	**34**	40	47	54	61	69	75	83	92	104	116	133
	µm	**9**	10	12	14	15	17	18	20	22	24	26	28
J6	µm	**10**	13	16	18	22	25	29	33	34	38	44	52
	µm	**-6**	-6	-6	-7	-7	-7	-7	-7	-10	-12	-12	-14
K5	µm	**2**	3	2	3	2	3	3	2	0	0	0	0
	µm	**-9**	-10	-13	-15	-18	-20	-22	-25	-32	-36	-40	-47
K6	µm	**3**	4	4	4	5	5	7	8	0	0	0	0
	µm	**-13**	-15	-18	-21	-24	-27	-29	-32	-44	-50	-56	-66

Nominal size of the shaft [mm]	over	**30**	50	80	120	180	250	315	400	500	630	800	
	up to	**50**	80	120	150	250	315	400	500	630	800	900	
Tolerance Bearing bore Accuracy P5	µm	**0**	0	0	0	0	0	0	0	0	0	0	
	µm	**-8**	-9	-10	-13	-15	-18	-23	-27	-30	-40	-50	
g5	µm	**-9**	-10	-12	-14	-15	-17	-18	-20	-22	-24	-26	
	µm	**-20**	-23	-27	-32	-35	-40	-43	-47	-51	-56	-62	
g6	µm	**-9**	-10	-12	-14	-15	-17	-18	-20	-22	-24	-26	
	µm	**-25**	-29	-34	-39	-44	-49	-54	-60	-66	-74	-82	
h5	µm	**0**	0	0	0	0	0	0	0	0	0	0	
	µm	**-11**	-13	-15	-18	-20	-23	-25	-27	-29	-32	-36	
h6	µm	**0**	0	0	0	0	0	0	0	0	0	0	
	µm	**-16**	-19	-22	-25	-29	-32	-36	-40	-44	-50	-56	

Product chapter

AXRY-EX



Product chapter AXRY-EX

General

General

AXRY-EX bearings are double direction, screw-on precision bearing units ready for installation and intended for highly-rigid applications, for example for rotary tables or milling heads. The bearing absorbs axial and radial forces as well as tilting moments backlash-free.

AXRY-EX bearings are suitable for grease and oil lubrication, and are designed for maximum rigidity. The friction torques of the bearing have been optimised, and the starting torque and running torque are almost identical.

In this way, myonic-AXRY-EX bearings fulfil all the requirements for modern highly-dynamic and direct-driven machine axes.

For high speed applications, we recommend the AXRY-EX-S and AXRY-ES designs.

Accuracy/designs

AXRY-EX bearings are supplied in the standard series with dimension tolerances P5 acc. DIN 620. The running tolerances (axial and radial runout) are available in 2 classes, normal and constricted.

For the EX bearings, all variations, such as limitation of the axial and radial runout, height tolerances H1/H2 and the design with supported L-section ring AC are available without limitations.
The inner ring and the axial washer have the same axial runout properties.

Measuring system

AXRY-EX bearings can be equipped with inductive angle measurement systems. These are available in incremental and absolute design (as single or multi-head systems in very different accuracies).

Mounting this system onto the bearing facilitates maximum accuracies through the exploitation of the precision on the bearing ring with minimal concentricity errors to the shaft (table).

See more in the chapter Measuring systems.

Specific bearing features

Bearing structure

AXRY-EX bearings consist of three rings:
- Inner ring
- Outer ring
- Axial washer

The hole inner ring features an appropriate fit. The axial washer is unsupported in the area of the hole.

Two axial roller sets and one radial roller set absorb radial and axial forces and tilting moments. All AXRY roller sets are radially and axially equipped with high-performance cages.

Fastening screws

The completely assembled bearing is held together with fastening screws which are not usually removed.
However, if the fastening screws are removed, they may not be removed until after the bearing has been completely screwed on and must be replaced with normal screws. Incorrect removal of the fastening screws can cause a decline in the axial/radial runout or the repeatability.

Lubrication

The bearing is first filled with a special grease (without suffix, Li-special soap with a mix of synthetic hydrocarbon oil and mineral oil). The grease is a special easy-running grease with appropriate additives for the operation of preloaded roller bearings.

Most commercially-available greases are not suitable for the operation of axial-radial bearings and generate too much friction in the bearing. For details see general chapter.

Run-in cycle

The run-in cycles during initial operation and after relubrication should in particular be observed. Overfilling of the bearing is to be avoided, as excessively high grease quantities generate higher friction heat levels and increasing running torques with faster speeds.
If the swivel axes run slowly, the run-in cycle no longer has to be conducted.

Relubrication

Relubrication takes place radially via lubrication channels in the outer ring or optionally via the inner ring. myonic application engineering is happy to assist with further details on relubrication quantities or cycles.

The bearings are only provided with preservation for oil-lubricated applications (suffix L-120).

Preservatives

The used corrosion protection oil is compatible und mixable with most of greases and oils produced on a mineral basis.

Check for compatibility when using synthetic lubricants and other consistency enhancers than lithium (complex) soaps.

In case of incompatibility, please consult myonic as to further procedures.

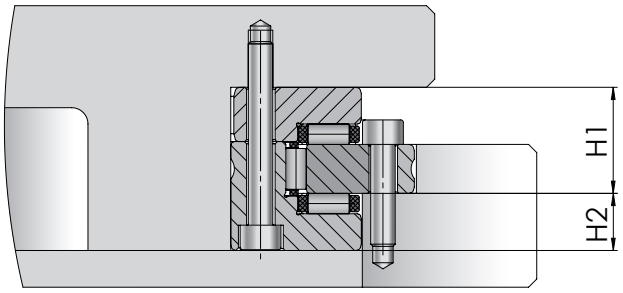
Specific bearing features

Height tolerances H1 and H2

Both height dimensions, seen from the normal axial contact area of the outer ring, can be substantially limited.

H1 refers to the position of the table in order for example to minimally adjust the labyrinth seal gap against the penetration of coolant from the machining area.

H2 refers to the adjacent construction under the bearing, for example for adjusting the clearance of a worm gear drive. The exact tolerances are located in the product tables.



Supported L-section ring AC

AXRY-EX bearings can be exposed or installed with whole surface support. If the L-section ring is supported across its whole surface by a support ring, the tilting rigidity of the bearing increases by approx. 15 to 20 %.

In order to prevent an increase in the bearing friction torque, the bearing preload is adapted (suffix AC). If normally-aligned bearings with supported L-section rings are used, the bearing friction torque increases by 10 – 20 %, and in part more. For further details, see bearing rigidity

Customer-specific design Jxxxx (J-number)

myonic produces customer-specific designs which are designated with J and a number.

Such J-numbers can, for example, include:

- Specific, application-related preload values
- Special directives for marking or packaging
- Special lubrication systems
- Changed dimensions/tolerances
- Outer ring rotation design

Specific bearing features

Limiting speeds/temperatures/friction

The limiting speed n_G stated in the dimensions table can be achieved for the selected axial-radial bearing in swivel operation or during short-term continuous operation.

In case of prolonged operation in the area of the limiting speed, the bearing increasingly heats up.
For high speed applications such as milling/turning tables, we recommend bearings in the AXRY-EX-S (ES) design.

Axial-radial bearings in the AXRY-EX series are equipped with cages both in the radial and in the axial part. In this way, the bearings run under full preload with very little friction. Here the starting friction torque is only slightly higher than the friction torque M_{RL} at 5 rpm, which is listed in the product chapter.

Therefore, AXRY-EX bearings are especially suitable for highly-dynamic, direct-driven, multi-axis applications.

The friction torque of the bearing is amongst other things also influenced through the viscosity and the quantity of the lubricant. The myonic standard grease can be used prealigned within a wide area of application.

Excessively high lubrication quantities substantially increase the bearing friction. Excessively low viscosities can lead to mixed friction.
myonic cages are designed to absorb as high a quantity of lubricant as possible to emit the lubricant during operation over a prolonged time period directly onto the rollers.

Please adhere to the appropriate run-in cycles during run-in or relubrication. The specifications for the adjacent construction and surrounding parts are to be adhered to!

Nominal life time

Nominal life time

The calculation of the nominal life time takes place via special calculation programs.
For this purpose, you are welcome to request our technical questionnaire. Our application engineering colleagues are then happy to execute the calculation itself for you.

Calculations at myonic

The following is required for calculation:

- Details on application (drawings, sketches, specifications)
- Workpiece dimensions and weight
- Details on the load cycle
  (cutting forces, speeds, operating durations)

Static load safety factor

The calculation of the static load safety factor must be executed separately for the radial and axial bearing parts.
For the machine tool application, the static load safety factor should total So > 4, in order to avoid lasting plastic deformations in the bearing.

$$S_o = \frac{C_{or}}{F_{or}} \quad \text{or} \quad S_o = \frac{C_{oa}}{F_{oa}}$$

S_o = Static load safety factor

C_{oa}/C_{or} [N] = Static load rating acc. dimensions table

F_{or}, F_{oa} [N] = Static load of radial or axial bearing part

Static limiting load diagrams

Static limiting load diagrams

The static limiting load diagrams serve to:

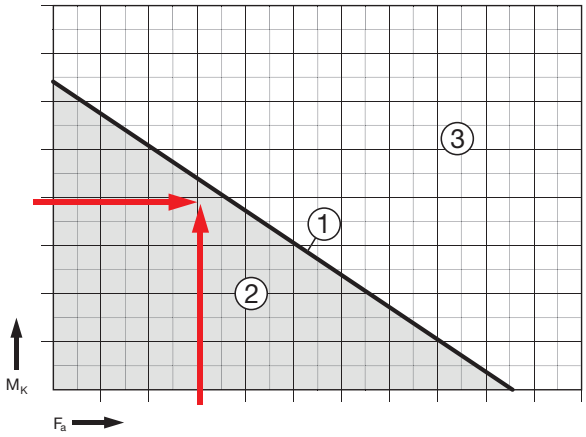
- Check the selected bearing size under mainly static load
- Determine the tilting moment Mk which the AXRY is able to absorb in addition to the axial load

The static limiting load diagrams take into account for the roller element set the static load safety factor $S_o \geq 4$ and the screw and bearing ring strength.

Example:

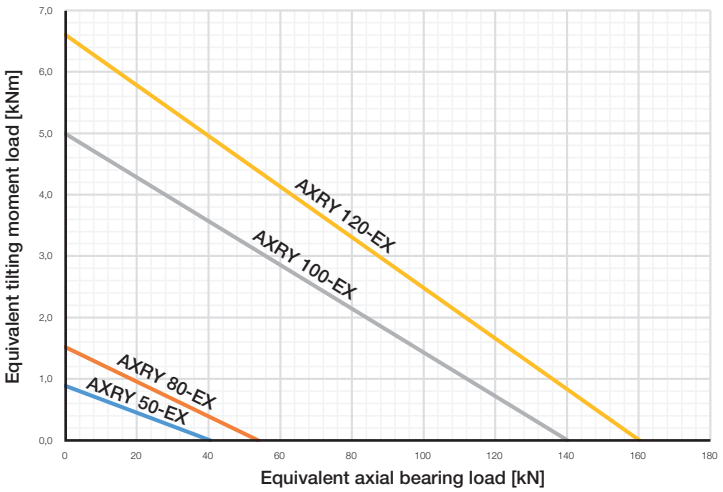
Static limiting load diagram for AXRY

1 Bearing/size
2 Permitted range
3 Unpermitted range
M_K Maximum tilting moment in [kNm]
F_a Axial load in [kN]

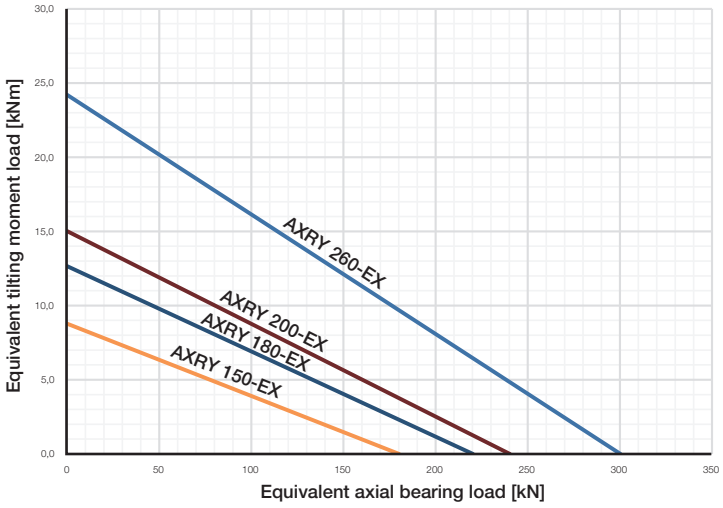


Static limiting load diagrams

Limiting load diagram axial-radial bearings AXRY 50-EX to AXRY 120-EX

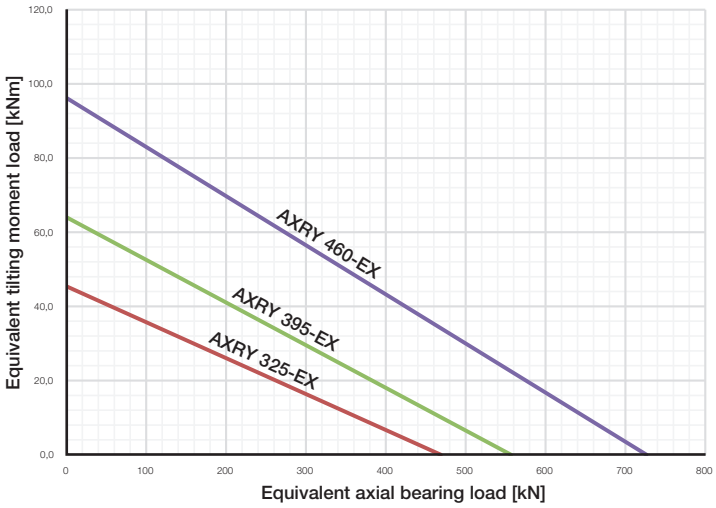


Limiting load diagram axial-radial bearings AXRY 150-EX to AXRY 260-EX

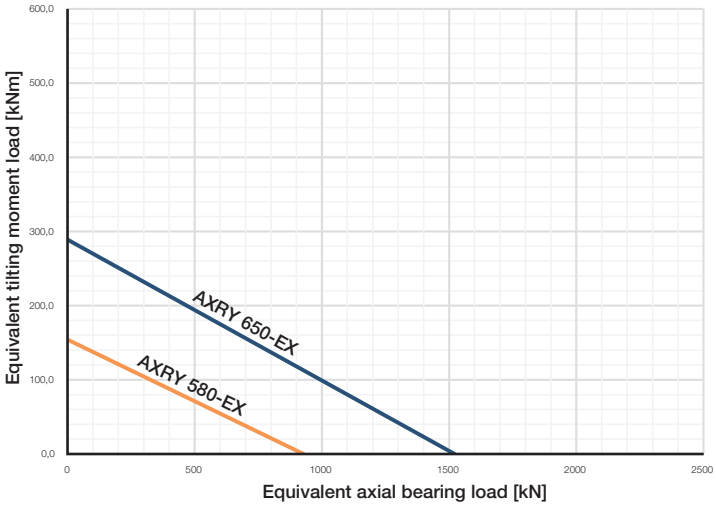


Static limiting load diagrams

Limiting load diagram axial-radial bearings
AXRY 325-EX to AXRY 460-EX



Limiting load diagram axial-radial bearings
AXRY 580-EX to AXRY 650-EX



Design of the adjacent construction

In the following sketches and tables, the design of the adjacent construction is described.
Pay particular attention to the connection surfaces, as any deviations will have an effect on the overall accuracy of the roller bearing.

In order to avoid a decline in bearing friction torque, accuracy requirements and running characteristics, the recommended tolerances may not be exceeded.

Press fits

In principle, when the fit is too constricted, the radial bearing preload increases, and thus…

…the following increases:

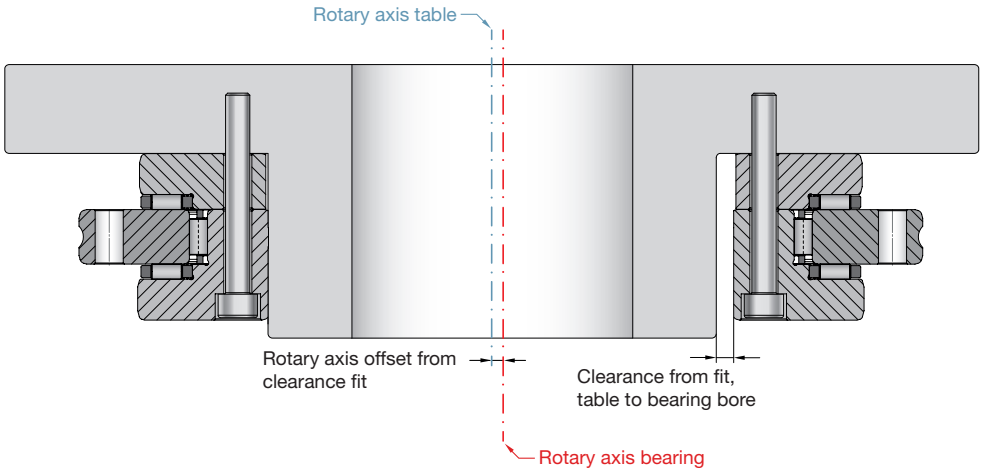
- The surface pressure in the raceway
- The bearing friction
- The bearing heat
- The amount of wear

…the following is reduced:

- The maximum speed
- The life time

Clearance fit

If the rotating ring is not supported by interference fits, displacement of the rotation axis raceway to table centre is probable. The clearance from the fit table to bearing bore (also applies for the clearance bearing outer diameter to table with rotating outer ring) can add to the radial runout.



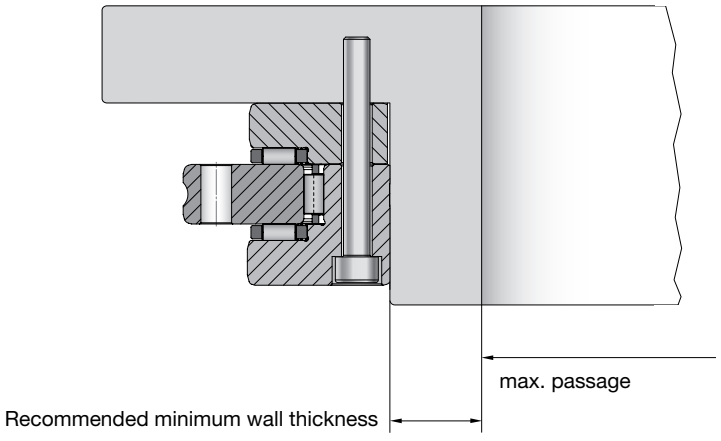
Design of the adjacent construction

No support or insufficient support of the inner ring leads to undefined operating conditions such as vibrations, radial runout errors and repeatability etc.

In order to achieve the rigidities offered in the product chapter, the following table dimensions must be adhered to.

Recommended minimum wall thickness of the table:

AXRY	Minimum wall thickness [mm]	Max. passage [mm]
50	12	26
80	12.5	55
100	15	70
120	16	88
150	16	118
180	16	148
200	18.5	163
260	21	218
325	23	279
395	23	349
460	25	410
580	30	520
650	37.5	575



Recommended fits, shaft

General

The accuracy of the fits and the geometrically-correct design of all adjacent parts have a direct effect on the accuracy requirements and the dynamic properties of the bearing and the table.
Please observe the construction notes in the general catalogue chapter.

Normal requirement

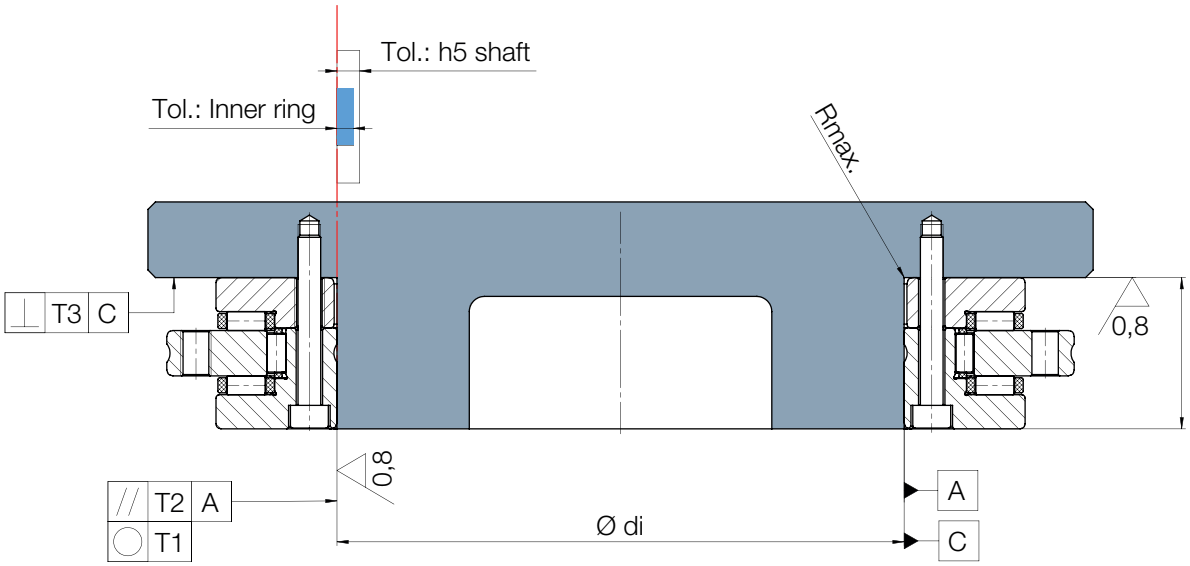
On rotating and stationary shafts, the bearing inner ring is to be supported across its whole surface and the shaft is to be designed with a fit acc. h5.
In this way, the bore tolerance of the bearing generates a transition fit with a slight tendency to a clearance fit.

Higher requirement

Max. accuracy requirements:
For the maximum accuracy requirement with rotating inner ring, a clearance fit 0 must be targeted; existing clearance fits can add to the radial runout.
The actual dimension of the bearing bore can be found in the inspection report enclosed with every bearing.

Higher dynamic properties:
In case of higher speeds (ndm > 35,000 mm/min) and prolonged operating durations (>10 %), do not exceed an interference fit of 5 µm.

Recommended fits, shaft



				Rotating and stationary inner ring					
Axial/ radial bearing	Shaft Ø	Tolerance zone Bearing inner Ø		Tolerance zone h5 of the shaft Ø		Roundness	Parallelism	Perpen-dicularity	Maximum corner radius
	di [mm]	d [mm]		di [mm]		T1 [µm]	T2 [µm]	T3 [µm]	Rmax. [mm]
AXRY 50-EX	50	0	-0.008	0	-0.011	3	1.5	3	0.1
AXRY 80-EX	80	0	-0.009	0	-0.013	3	1.5	3	0.1
AXRY 100-EX	100	0	-0.010	0	-0.015	4	2	4	0.1
AXRY120-EX	120	0	-0.010	0	-0.015	4	2	4	0.1
AXRY150-EX	150	0	-0.013	0	-0.018	5	2.5	5	0.1
AXRY180-EX	180	0	-0.013	0	-0.018	5	2.5	5	0.1
AXRY200-EX	200	0	-0.015	0	-0.020	7	3.5	5	0.1
AXRY260-EX	260	0	-0.018	0	-0.023	8	4	7	0.3
AXRY325-EX	325	0	-0.023	0	-0.025	9	4.5	7	0.3
AXRY395-EX	395	0	-0.023	0	-0.025	9	4.5	7	0.3
AXRY460-EX	460	0	-0.023	0	-0.027	10	5	7	0.3
AXRY580-EX	580	0	-0.025	0	-0.032	11	5.5	8	1
AXRY650-EX	650	0	-0.038	0	-0.036	13	6.5	10	1

Product chapter AXRY-EX

Recommended fits, housing

General

The accuracy of the fits and the geometrically-correct design of all adjacent parts have a direct effect on the accuracy requirements and the dynamic properties of the bearing and the table.

Please observe the construction notes in the general catalogue chapter.

Outer ring stationary

It is possible to do without a fit in the housing or alternatively to have a G7 fit design. Outer ring diameter clearance to the housing makes assembly easier.

In case of higher dynamic requirements on the rotating shaft, maintain a minimum clearance of 20 µm for the fit seat of the outer ring to the housing.

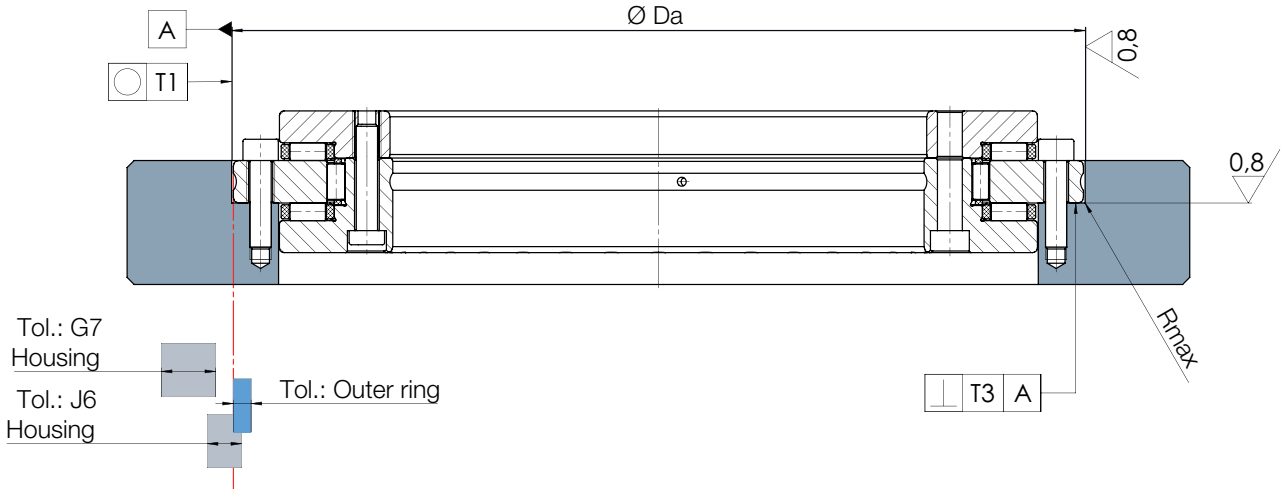
Outer ring rotates

Normal requirement:
Design the rotating housing with a J6 clearance; here a transition fit results with a tendency for clearance fit. Design the fit seat across the entire height of the outer ring.

Max. accuracy requirement:
A clearance fit of 0 is to be targeted; existing clearance fits can add to radial runout. The actual dimension of the bearing outer diameter can be found in the inspection report enclosed with all bearings.

Higher dynamic properties:
In case of higher speeds (ndm > 35,000 mm/min) and prolonged operation durations, do not exceed an interference fit of 5 µm.

Recommended fits, housing



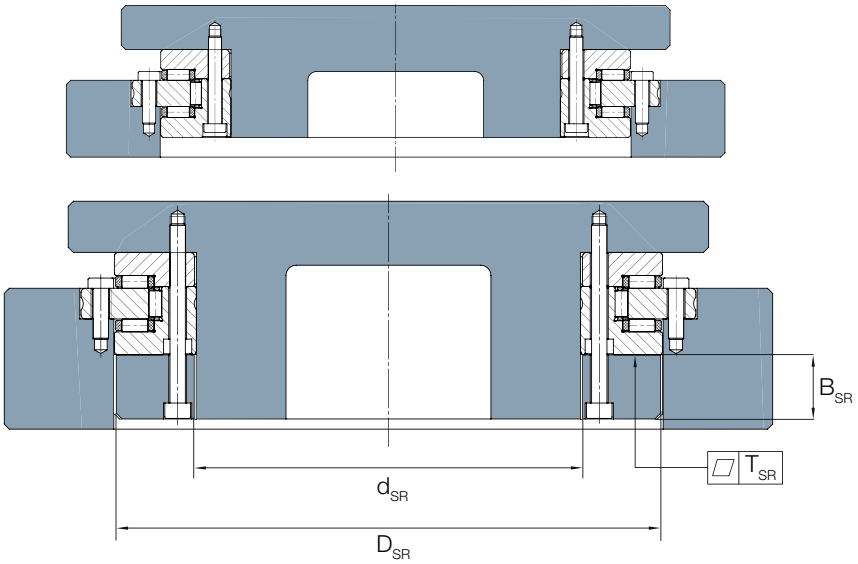
				Stationary outer ring			Rotating outer ring				
Axial/ radial bearing	Housing Ø Da [mm]	Tolerance zone Bearing outer Ø D [mm]		Tolerance zone G7 of the housing Ø Da [mm]		Round-ness, perpen-dicularity T1, T3 [µm]	Tolerance zone J6 of the housing Ø Da [mm]		Round-ness T1 [µm]	Perpen-dicularity T3 [µm]	Maximum corner radius Rmax. [mm]
AXRY 50-EX	126	0	-0.011	0.054	0.014	8	0.018	-0.007	5	5	0.1
AXRY 80-EX	146	0	-0.011	0.054	0.014	8	0.018	-0.007	5	5	0.1
AXRY 100-EX	185	0	-0.015	0.061	0.015	8	0.022	-0.007	7	7	0.1
AXRY120-EX	210	0	-0.015	0.061	0.015	10	0.022	-0.007	7	7	0.3
AXRY150-EX	240	0	-0.015	0.061	0.015	10	0.022	-0.007	7	7	0.3
AXRY180-EX	280	0	-0.018	0.069	0.017	12	0.025	-0.007	8	8	0.3
AXRY200-EX	300	0	-0.018	0.069	0.017	12	0.025	-0.007	8	8	0.3
AXRY260-EX	385	0	-0.020	0.075	0.018	13	0.029	-0.007	9	9	0.3
AXRY325-EX	450	0	-0.023	0.083	0.020	13	0.033	-0.007	10	10	0.3
AXRY395-EX	525	0	-0.028	0.092	0.022	16	0.034	-0.010	11	11	0.3
AXRY460-EX	600	0	-0.028	0.092	0.022	16	0.034	-0.010	11	11	1
AXRY580-EX	750	0	-0.035	0.104	0.024	18	0.038	-0.012	13	13	1
AXRY650-EX	870	0	-0.050	0.116	0.026	18	0.044	-0.012	15	15	1

Bearing rigidity

Supported L-section ring

AXRY bearings can be installed exposed or supported across their whole surface. If the L-section ring (bearing inner ring) is supported across its whole surface by a support ring (e.g. worm gear), the tilting rigidity of the bearing increases by approx. 15 to 20 %.

Depending on the installation situation, different preload alignments in the bearing are required. For this reason, it is important only to order bearings with the suffix AC for bearing situations with a supported L-section ring. Design the support ring at least twice as high as the axial washer of the bearing.



Recommendation: Support ring for maximum rigidity

Support ring for bearing size	Inner diameter d_{SR} [mm]	Outer diameter D_{SR} max. [mm]	Width B_{SR} [mm]	Evenness/ contact area T_{SR} [µm]
AXRY 50-EX	51	105	12	3
AXRY 80-EX	81	130	15	3
AXRY 100-EX	101	161	16	4
AXRY 120-EX	121.5	185	18	4
AXRY 150-EX	151.5	214	18	5
AXRY 180-EX	181.5	244	18	5
AXRY 200-EX	201.5	274	20	7
AXRY 260-EX	261.5	345	27	8
AXRY 325-EX	326.5	415	28	9
AXRY 395-EX	396.5	486	33	9
AXRY 460-EX	462	560	34	10
AXRY 580-EX	582	700	46	11
AXRY 650-EX	652	800	68	13

Order designation

Designation system — Bearing — Measuring system

AXRY 260 - EX - S - 2Z - PRR50 - H1 - H2 - AC - JXXXX - L120 - MI150 - A - 3 - 500 - K

Construction series

Bore
in mm

Bearing type
EX = Standard
ES = High-speed

Standard speed:
(only for EX)

Seal:
Without = No seal
AZ = Axial washer, sealed
IZ = Inner ring, sealed
2Z = Sealed on 2 sides

Accuracy requirements:
Without = Standard accuracy requirement
PRR50 = Axial and radial runout tolerances Restricted (for EX-S and ES standard series PRR50)

Connection dimension H1:
Without = Standard tolerance
H1= Restricted connection dimension H1

Connection dimension H2:
Without = Standard tolerance
H2 = Restricted connection dimension H2

Bearing preload:
Without = Standard alignment
AC = Alignment for supported L-section ring

Design:
Without = Catalogue design
JXXXX = Customer-specific design (number is issued by myonic)

Lubrication:
Without = Standard grease
L120 = Bearing ungreased, only preserved (e.g. for oil lubrication)
GXXX = Special grease (number is issued by myonic)

Reference marks:
K = Distance-coded (only possible for MI150 and MI160)
RI = 1 reference mark (only possible for MI150 and MI160)

Graduation period:
500 = 500 µm (only possible for MI150 and MI160)
1000 = 1000 µm
3000 = 3000 µm (only possible for MI150 and MI160)

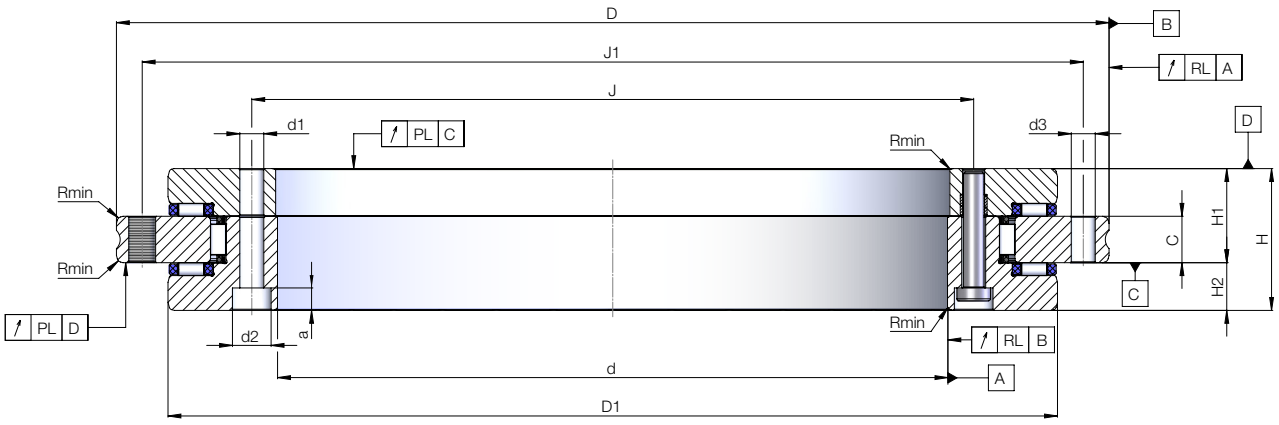
Graduation accuracy:
3 = ± 3 µm
5 = ± 5 µm
10 = ± 10 µm

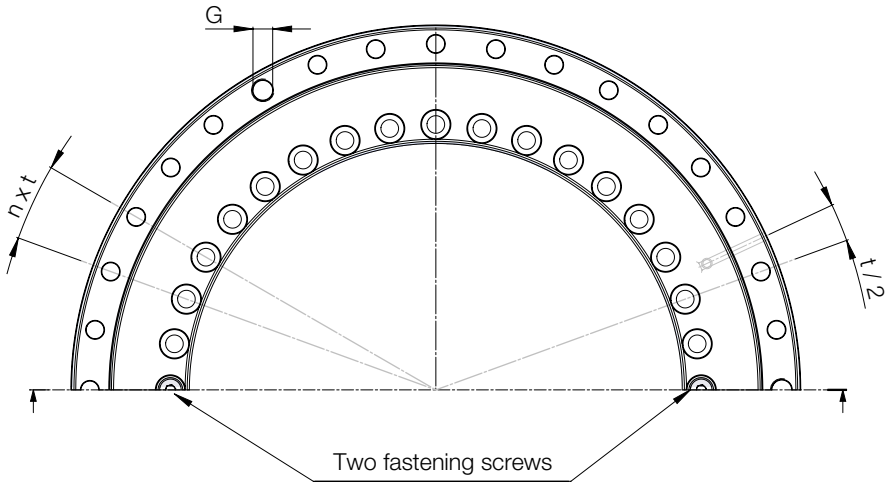
Position of the reference mark:
I = Reference mark inside (only possible for MI150 and MI160)
A = Reference mark outside (only possible for MI150 and MI160)

Design and mounting of measuring ring:
MI150 = Incremental on the inner ring
MI160 = Incremental on the axial washer
MA150 = Absolute on the inner ring
MA160 = Absolute on the axial washer

For further technical details or special designs, please contact myonic application engineering.

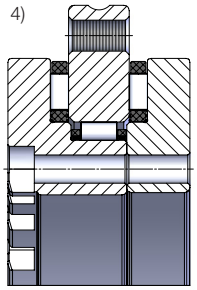
Dimensions table AXRY-EX (standard design)

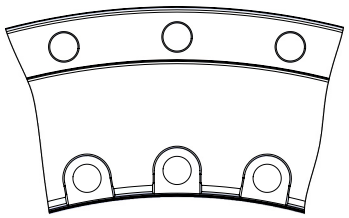




Designation	Weight	Dimensions [mm]													
	m [kg]	d	Δd	D	ΔD	H	H1	ΔH1	ΔH1 Restricted	H2	ΔH2 Restricted	C	D1 max	J	J1
AXRY 50-EX	1.6	50	-0.008	126	-0.011	30	20	±0.125	± 0.025	10	± 0.02	10	105	63	116
AXRY 80-EX[4)]	2.4	80	-0.009	146	-0.011	35	23.35	±0.150	± 0.025	11.65	± 0.02	12	130	92	138
AXRY 100-EX[4)]	4.1	100	-0.010	185	-0.015	38	25	±0.175	± 0.025	13	± 0.02	12	161	112	170
AXRY 120-EX	5.3	120	-0.010	210	-0.015	40	26	±0.175	± 0.025	14	± 0.02	12	185	135	195
AXRY 150-EX	6.2	150	-0.013	240	-0.015	40	26	±0.175	± 0.03	14	± 0.02	12	214	165	225
AXRY 180-EX	7.7	180	-0.013	280	-0.018	43	29	±0.175	± 0.03	14	± 0.025	15	244	194	260
AXRY 200-EX	9.7	200	-0.015	300	-0.018	45	30	±0.175	±0.03	15	± 0.025	15	274	215	285
AXRY 260-EX	18.3	260	-0.018	385	-0.020	55	36.5	±0.200	± 0.04	18.5	± 0.025	18	345	280	365
AXRY 325-EX[4)]	25	325	-0.023	450	-0.023	60	40	±0.200	± 0.05	20	± 0.025	20	415	342	430
AXRY 395-EX	33	395	-0.023	525	-0.028	65	42.5	±0.200	± 0.05	22.5	± 0.025	20	486	415	505
AXRY 460-EX	45	460	-0.023	600	-0.028	70	46	±0.225	± 0.06	24	± 0.03	22	560	482	580
AXRY 580-EX	89	580	-0.025	750	-0.035	90	60	±0.250	± 0.075	30	± 0.03	30	700	610	720
AXRY 650-EX	170	650	-0.038	870	-0.050	122	78	±0.250	± 0.1	44	± 0.03	34	800	680	830

4)





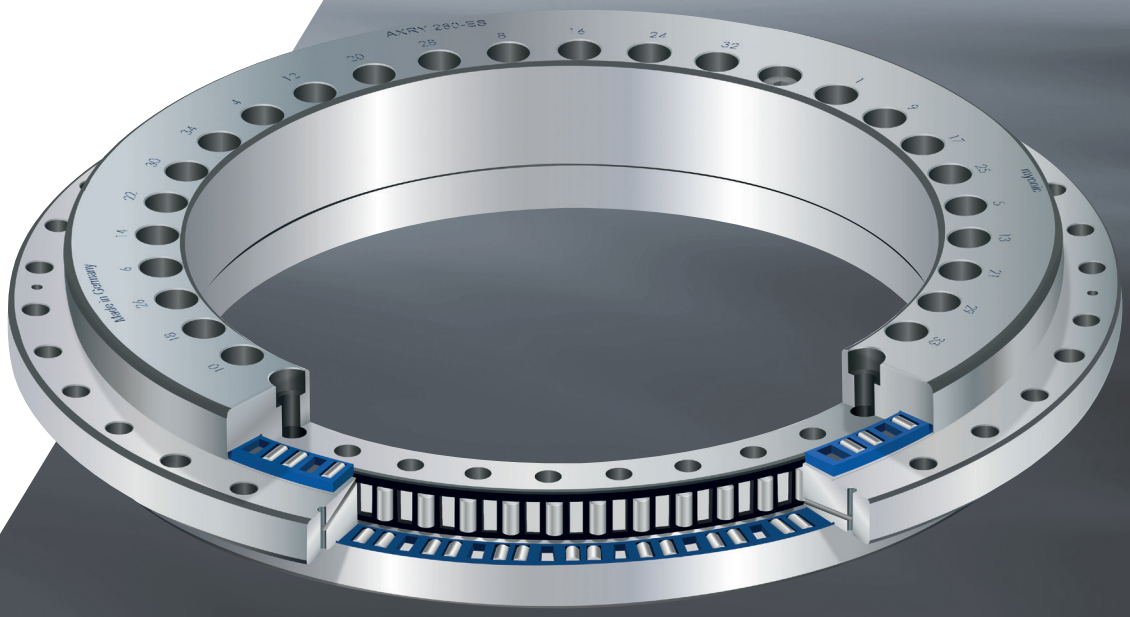
1) Including fastening screws or extraction thread.
2) Tightening torque for screws acc. DIN 912, strength class 10.9.
3) Attention! For fixing holes in the adjacent construction. Observe the pitch of the bearing bores.
4) Screw counterbores in large L-ring open to bearing bore. Bearing inside diameter is not supported in this area.
5) Please enquire in case of high speed applications.
6) Measurement speed n_{const} = 5 rpm
7) Measured on installed bearing with ideal adjacent construction.

Designation	Fixing holes									
	Inner ring				Outer ring				Number x Pitch	Screw tightening torque
							Extraction thread			
	d1	d2	a	Number[3]	d3	Number[3]	G	Number	nxt[1]	M_A[2] [Nm]
AXRY 50-EX	5.6	-	-	12	5.6	12	M5	2	12 x 30°	8.5
AXRY 80-EX[4]	5.6	10	4.4	12	4.6	12	M5	2	12 x 30°	8.5/4.5
AXRY 100-EX[4]	5.6	10	5.4	16	5.6	15	M6	3	18 x 20°	8.5
AXRY 120-EX	7	11	6.4	22	7	21	M8	3	24 x 15°	14
AXRY 150-EX	7	11	6.4	34	7	33	M8	3	36 x 10°	14
AXRY 180-EX	7	11	6.4	46	7	45	M8	3	48 x 7.5°	14
AXRY 200-EX	7	11	6.4	46	7	45	M8	3	48 x 7.5°	14
AXRY 260-EX	9.3	15	8.6	34	9.3	33	M12	3	36 x 10°	34
AXRY 325-EX[4]	9.3	15	8.6	34	9.3	33	M12	3	36 x 10°	34
AXRY 395-EX	9.3	15	8.6	46	9.3	45	M12	3	48 x 7.5°	34
AXRY 460-EX	9.3	15	8.6	46	9.3	45	M12	3	48 x 7.5°	34
AXRY 580-EX	11.4	18	10.6	46	11.4	42	M12	6	48 x 7.5°	68
AXRY 650-EX	14	20	12.6	46	14	42	M12	6	48 x 7.5°	116

Designation	Load ratings				Limiting speed	Bearing friction torque[6]	Axial runout & radial runout[7]		Rigidity of the bearing position			Min. corner radius
	Axial		Radial		Grease	Grease	Standard	Restricted	Axial	Radial	Tilting rigidity	
	dyn. C_a [kN]	stat. C_{0a} [kN]	dyn. C_r [kN]	stat. C_{0r} [kN]	n_G [rpm]	M_{RL} [Nm]	PL & RL [µm]	PL & RL [µm]	C_{al} [kN/µm]	C_{rl} [kN/µm]	C_{kl} [kNm/mrad]	R_{min} [mm]
AXRY 50-EX	33.5	161.6	22.7	39.2	2000	1.5	2	1	2.4	1.2	2.5	0.6
AXRY 80-EX[4]	39.5	215.4	51	104.9	1500	2.0	3	1.5	3	1.9	4.9	0.6
AXRY 100-EX[4]	89.2	560.6	56.3	126.9	1300	2.0	3	1.5	4.1	2.4	10	0.8
AXRY 120-EX	95.3	640.6	62.1	152.9	1150	4.5	3	1.5	4.8	3	16.3	0.8
AXRY 150-EX	100.4	720.7	68.4	185	1000	7.0	3	1.5	5.4	3.7	25.1	0.8
AXRY 180-EX	112.8	880.9	74	215	900	8.0	4	2	8.1	4.3	50.7	1
AXRY 200-EX	117.6	961	98.5	282.7	800	9.0	4	2	7.2	4.6	53.9	1
AXRY 260-EX	131.9	1201	112.8	367.7	650	13	6	3	10.7	5.9	131.2	1
AXRY 325-EX[4]	196.2	1875.5	123.9	441	520	20	6	3	12	6.6	212	1.2
AXRY 395-EX	215	2227.1	136.1	528.9	450	25	6	3	15.1	7.8	375	1.2
AXRY 460-EX	278.3	2905.1	146.5	608	400	37	6	3	15.7	8.9	512	1.2
AXRY 580-EX	317.8	3712	173.2	726.3	250	67	10	5	22.3	10.1	1139	2
AXRY 650-EX	548.3	6086.1	417.1	1830.2	180	100	10	5	26.4	14.9	1796	2

Product chapter

AXRY-EX-S
AXRY-ES
AXRY-OS



General

General

AXRY-EX-S (ES/OS) bearings are double direction, screw-on precision bearing units ready for installation and intended for highly-rigid and at the same time high speed applications, for example for milling turning tables.
The bearing absorbs axial and radial forces and tilting moments backlash-free.

AXRY-EX-S (ES/OS) bearings are suitable for oil, oil-air and grease lubrication and are optimised for the lowest friction torques. In this way, high speeds with low temperature increases are possible, with only minor limitations to the rigidities in comparison to the swivel bearing AXRY-EX.

Both grease and oil lubrications are suitable for high speed applications.

AXRY-EX-S (ES/OS) only function properly in the limit speed range with the appropriate surrounding construction.

Due to the maximum requirements placed upon them, these bearings have been produced with the maximum possible technical precision; all measuring tolerances have been produced acc. P5/DIN 620, and the axial and radial runout have been limited by 50 %.

Generation AXRY-ES

myonic bearings of the generation ES were developed from the consistent further development of the AXRY-EX-S series, and include numerous new features:

- Can be lubricated on both sides axially via the outer ring
- Particularly low-noise running
- Integrated temperature sensor bores
- Sealed design available
- Especially suitable for minimum quantity lubrication
- Specially developed lubrication channels in the outer ring
- Cooling channels can be guided directly on the inner ring and outer ring

The load ratings and the rigidities are identical to AXRY-EX-S.

Of course, all variations are available for unlimited selection for the EX-S (ES/OS) bearings such as limitation of the height tolerances H1/H2 or the supported L-section ring design.

General

Generation AXRY-OS

Generation OS myonic bearings accord in function with the ES construction series, but have been dimensioned for high speed outer ring rotation.

- Can be lubricated axially and radially via the inner ring
- Particularly low-noise operation
- Integrated temperature sensor bore
- Sealed design available
- Particularly suitable for minimum quantity lubrication
- Specially developed lubrication channels on the inner ring
- In case of axial lubrication, the cooling channels to the inner and outer ring can be directly guided on the bearing

For the AXRY-OS construction series, all variations such as limited height tolerances (H1/H2) or supported L-section ring AC are available without limits for selection.

Bearing structure

AXRY-EX-S (ES/OS) bearings consists of three rings: the inner ring, the outer ring and the axial washer.
The inner ring bore is produced for the manufacture of a fit to a tolerance.
The axial washer is unsupported in the area of the hole and is centred to the inner ring and fixed using fastening screws.

Fastening screws

The completely assembled bearing is held together using fastening screws. These may not be loosened or removed. However, if the fastening screws are removed, they may not be removed until after the bearing has been completely screwed on and must be replaced with normal screws.
Improper removal of the fastening screws causes a decline in the axial/radial runout and the repeatability and can generate vibrations.

Specific bearing features

Areas of application

AXRY-EX-S (ES/OS) bearings are suitable for applications which demand a high speed from highly durable, ultra-precision and backlash-free bearings, for example in machining centres with rotary tables, which have to fulfil a main spindle function (turning).

Only the installation of AXRY-EX-S (ES/OS) bearings generally does not bring about the required result. Rather more, the entire surrounding construction (cooling/correct thermal design, fits) and the application itself (compensation of thermal differences spindle/table/housing) are to be incorporated into the dimensioning.

Accuracy requirements

As a standard measure, the axial and radial runout are reduced by 50 % in comparison to the normal design.

The inner ring and the axial washer have the same axial runout properties.

Designation	**Axial runout & radial runout**
	Standard
	PL & RL [µm]
AXRY 150-EX-S (ES/OS)	1.5
AXRY 180-EX-S (ES/OS)	2
AXRY 200-EX-S (ES/OS)	2
AXRY 260-EX-S (ES/OS)	3
AXRY 325-EX-S (ES/OS)	3
AXRY 395-EX-S (ES/OS)	3
AXRY 460-EX-S (ES/OS)	3
AXRY 580-EX-S (ES/OS)	5
AXRY 650-EX-S (ES/OS)	5

Measuring systems

AXRY-EX-S (ES/OS) bearings can be equipped with inductive angle systems. These are available in incremental and absolute design as single or multi-head systems in very different accuracies.

The installation on the bearing permits maximum accuracies through the exploitation on the bearing ring with minimal concentricity errors to the shaft (table).

You can find out more in the chapter on Measuring systems.

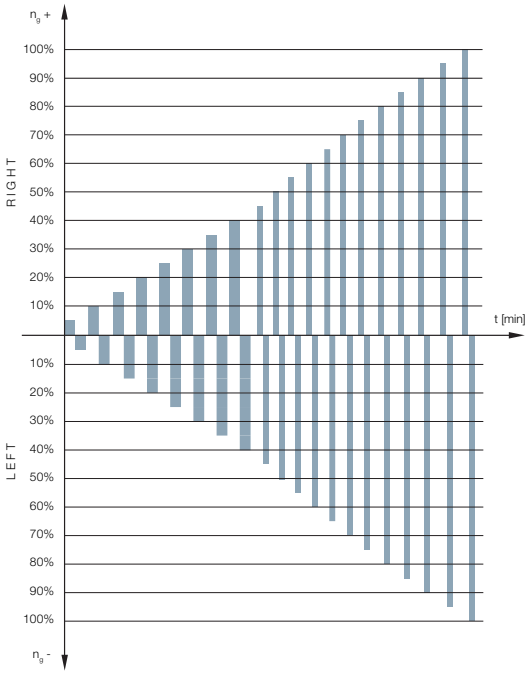
Specific bearing features

Lubrication/L120/Gxxx Run-in cycle

The run-in cycles for the AXRY-EX-S (ES/OS) are substantially longer than for normal EX bearings, and are adapted depending on the lubrication system, lubricant and lubrication plan. Complete distribution of the grease is absolutely essential for operation at higher speeds.
Common are run-in cycles with alternating clockwise/anti-clockwise rotation, differing duty-cycles and cooling breaks (example below).

Excess lubrication

Excess lubrication, whether with grease or oil, leads directly to an increase of the friction in the bearings and to strong increases in temperature. This may lead to premature bearing failure.



Lubrication variations

- **Life time lubrication**
  By introducing a high initial filling quantity, appropriate lubrication is ensured over a prolonged period of time.

  Due to the high level of friction because of the high grease filling quantity, the life time lubrication for fast-running rotation axes can only be used to a certain extent (in contrast to swivel axes).

- **Grease lubrication, relubrication**
  One excellent variation are controlled relubrication systems which regrease with low quantities of grease at defined intervals.

  The lower initial filling quantity reduces the run-in cycle and substantially reduces the friction in operation. The low relubrication quantities do not cause any new run-in cycles. Manual relubrication does not work well in practice.

Specific bearing features

- **Circulating oil lubrication**
  Is mainly used for larger bearings. Due to the larger, cooled oil quantities, cooling and lubrication take place simultaneously.

  Due to the large available lubricant quantity these systems also function with lower oil viscosities.

- **Oil minimum quantity lubrication**
  Via the non-rotating ring, oil is added radially or axially in small quantities. myonic bearings can be supplied with special lubrication bores/plugs.

  The disadvantage of this system is the formation of lubricant reserves in the supply lines and intermittent output of the lubricant.

- **Oil/air lubrication**
  In a similar way as for spindle bearings, an oil/air lubrication is injected directly into or next to the raceways; the lubrication takes place with minimal oil quantities. The lubrication takes place axially via 6 holes on the outer ring.

  myonic bearings can be supplied with all necessary holes, connection threads and seals for guidance of the oil/air lubrication.

  Due to the minimal oil quantities, frequently no or only minimal construction effort is required for return systems.

  The main xadvantage is the accurate, low friction lubrication of the bearing in accordance with the actual operating situation.

Lubrication bores/lubrication grooves/ cooling channels

The lubrication bores and lubrication grooves of the AXRY-EX-S bearings accord with the EX design.

The ES construction series has no radial lubrication bores on the outer and inner rings.

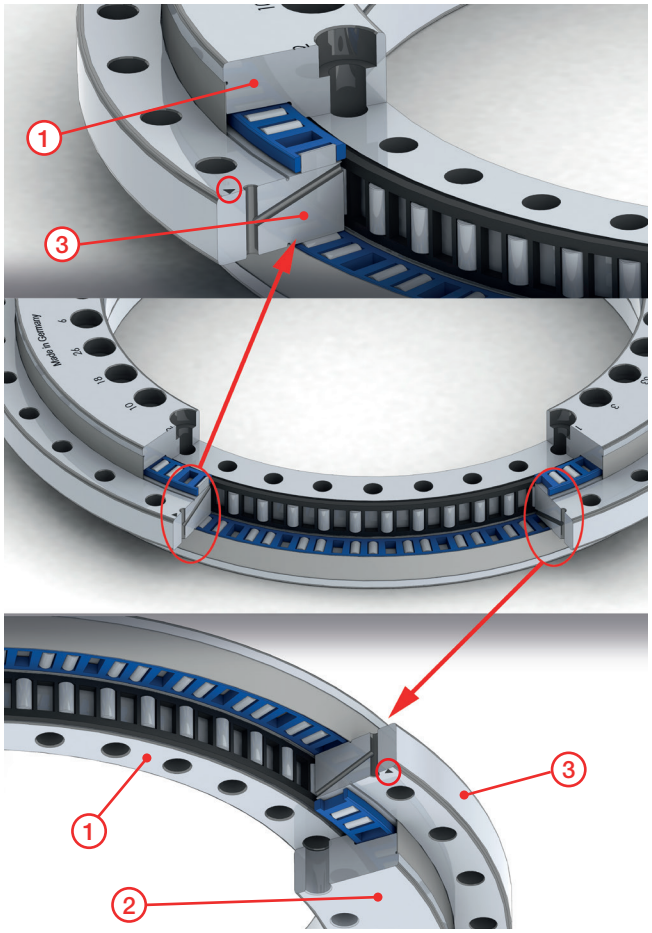
The OS construction series has no radial lubrication bore on the outer ring; during axial lubrication of the inner ring, the radial lubrication bores can simply be closed.

In case of both construction series, the cooling channels can be guided directly on the bearing. In this way, highly-efficient cooling is easily realisable via the surrounding construction.

Specific bearing features

Lubrication bores AXRY-ES

The AXRY-ES construction series has 6 evenly arranged lubrication bores on the outer ring.
The lubricant feed can take place axially on both sides. The bearing feed takes place 3 x in the direction of the inner ring and 3 x in the direction of the axial washer.
The exit side in the bearing is marked through the arrow marking on the outer ring.



1 Inner ring
2 Axial washer
3 Outer ring
▸ Arrow marking for outlet side

All lubrication bores are sealed in delivery condition with threaded pins.

Across all bearing sizes, the lubrication bores are designed as M4 threads.

The performance capacity of the oil/air lubrication can be increased via special nozzles.

Specific bearing features

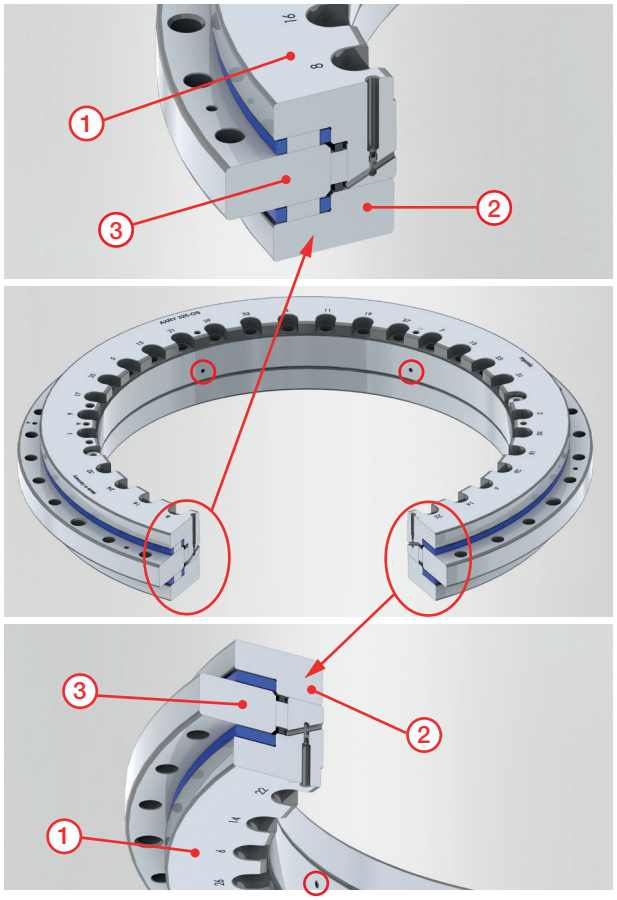
Lubrication bores AXRY-OS

The construction series AXRY-OS has 6 evenly arranged lubrication bores on the inner ring.

The lubrication feed can either take place radially or axially on one side via the inner ring (1). In case of non-use, the radial lubrication bores can remain sealed so that a cooling channel can be directly applied on the inner ring. Lubrication via the axial washer (2) is not possible.

The exit side in the bearing is marked with arrow markings on the inner ring.

The outer ring accords with the ES design.



1 Inner ring
2 Axial washer
3 Outer ring
▸ Arrow marking for outlet side

All lubrication bores are sealed in delivery condition with threaded pins.

Across all bearing sizes, the lubrication bores are designed as M4 threads.

The performance capacity of the oil/air lubrication can be increased via special nozzles.

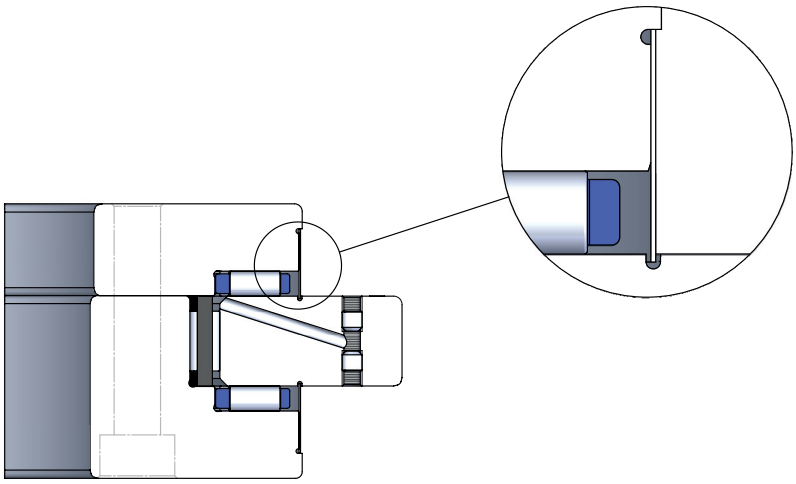
Specific bearing features

AXRY-ES/OS seals

Optionally, AXRY-ES/OS bearings can be supplied with integrated non-grinding seals. The seals are to be mounted so that the main dimensions of the bearing do not change. The seals form a narrow gap seal with the outer ring.

If the bearing is operated with an oil/air lubrication or with sealing air, an extremely effective seal is guaranteed against the penetration of dirt or cooling lubricant.

On mounted measurement systems, attachment on the axial side with the measuring head is not possible.



Sensors/bearing monitoring/Industry 4.0

AXRY-ES/OS bearings have one sensor bore on the outer ring, and OS bearing one additional in the inner ring as part of the standard series.
This leads to just under the raceways.

Equipped with a temperature sensor, the current temperatures in the bearing system can be used for control purposes, for example for the cooling system.

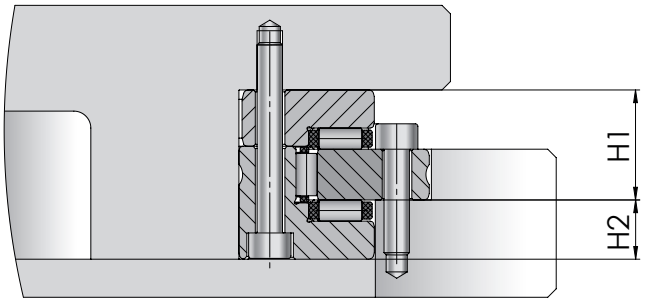
myonic application engineering is happy to provide you with data for diverse monitoring systems, for example defect frequencies, at any time.

As part of the MinebeaMitsumi Group, we can make use of a comprehensive electronic/mechatronic collection of know-how.
These areas are subject to rapid development. Please contact us for further details.

Specific bearing features

Height tolerances H1 and H2

Both height dimensions, seen from the normal axial support surface of the outer ring, can be substantially limited.
H1 refers to the position of the table in order for example to minimally adjust the labyrinth seal gap against the penetration of coolant from the machining area.
H2 refers to the adjacent construction under the bearing, for example for the adjustment of the clearance of a worm gear.
The exact tolerances are located in the product tables.



Supported L-section ring AC

AXRY-EX-S (ES/OS) bearings can be installed exposed or supported across their whole surface. If the L-section ring is supported across its whole surface by a support ring, the tilting rigidity of the bearing increases by approx. 15 to 20 %.

In order to prevent increases in the bearing friction torque, the bearing preload is adapted (suffix AC). If normally-aligned bearings with supported L-section rings are used, the bearing friction torque increases by 10 – 20 %, and in part more.
For further details, see bearing rigidity.

Customer-specific design Jxxxx (J-number)

myonic produces customer-specific designs which are designated with J and a number.

Such J-numbers can, for example, include:

- Specific application-related preload values
- Special directives for marking or packaging
- Special lubrication systems
- Changed dimensions/tolerances
- Outer ring rotation design

Specific bearing features

Limiting speed n_G

The limiting speeds stated in the dimensions table are reference values and refer to the lubrication with oil (minimum quantity or oil/air) or with grease (controlled relubrication).

In order to achieve these limiting speeds, the following must occur:

- It is essential that the regulations for the adjacent construction are adhered to
- The friction heat generated must be discharged
- A bearing alignment must be adjusted in accordance with the actual temperature difference inner ring to outer ring

Friction

Axial-radial bearings in the AXRY-EX-S (ES/OS) series are equipped with cages in both the radial and the axial parts. In this way, the bearings run under full preload with very little friction. In case of higher speeds, the friction torque only increases slightly, and therefore bearings in the AXRY-EX-S (ES/OS) series can be driven at high speeds in continuous operation.

The friction torque of the bearing in installed condition is primarily determined through:

- Bearing preload
- Viscosity of lubricant
- Quantity of lubricant
- Quality of the adjacent construction (dimensional precision/fits)

A reduced bearing preload generates less friction and therefore lower temperatures and is better suited for high speed applications. It must be ensured that the bearing preloads are always sufficient for backlash-free operation of the bearing under changing loads.

The viscosity is dependent on the operating temperature and the selected lubricant. Low viscosity lubricants may lead to mixed friction, in particular during slow or intermittent operation under high loads.

Excessively high viscosity, on the other hand, leads to high levels of friction and is hardly suitable for fast-running applications.
In case of strongly fluctuating loads, please contact myonic application engineering.

Excessively high lubricant quantities increase the bearing friction. myonic cages are designed to absorb as high a lubrication quantity as possible and to emit the lubrication directly onto the rollers during operation. During run-in or relubrication, adhere to the appropriate run-in cycles in order to ensure a clean distribution of grease in the bearing.

In case of incorrect execution of the adjacent construction, additional distortions are introduced onto the bearing. This leads to increased friction torques and higher temperatures during operation.

Specific bearing features

Operating temperature

In particular in case of high speed applications, the consideration of the friction and thermal action of the entire axis system, including all drives and the entire surroundings, is essential.

The diagram presents the main influences on the temperature increase of the axis to be expected.

Friction from bearings

Equals the bearing friction. This can mainly be influenced through the bearing preload. In case of precise knowledge of the thermal characteristics of the axis in operation under load, the bearing preloads can be adapted to the actual situation.

Friction from lubrication

In case of high speed applications, the lubrication and re-lubrication of the bearing must be precisely observed. Few greases are suitable for higher speeds.
High grease quantities lead to high operating temperatures. Controlled minimum grease quantity lubrications are ideal.

The friction from the bearing and the lubrication are the only two parameters which the roller bearing manufacturer can influence on the delivered bearing. All other parameters are directly influenced by the user.

We recommend rotating the bearing as the assembly progresses and measuring the running torque. In this way, serious errors can be discovered regarding the geometry of the adjacent construction, the screw connection or the additional parts.

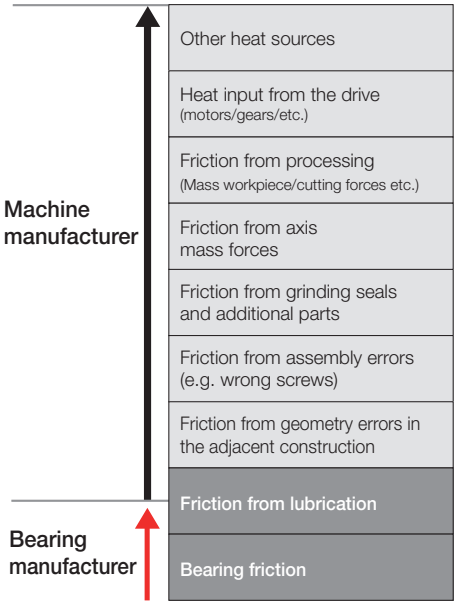
During operation, additional mass and machining forces generate further friction.
The introduction of heat via the motor or the gear is to be avoided in the design.

If asymmetrical housings heat up, these may deform asymmetrically and thus increase the bearing preload.

Only the consideration of the entire system generates a sufficient level of knowledge for the dimensioning of appropriate cooling or heating/cooling systems.

Test bench results show the basic performance capacities of the bearing and the lubrication, but only permit limited conclusions to be drawn on the actual operating temperature of a machine tool axis.

Influences on the temperature increase to be expected in the axis:



Nominal life time

Nominal life time

The calculation of the nominal life time takes place via special calculation programs.
Should you have questions, please contact myonic application engineering.

Calculations at myonic

The following is required for calculation purposes:

- Details on application (drawings, sketches, technical specifications)
- Workpiece dimensions and weight
- Details on the load cycle (cutting forces, speeds, operating durations)

Static load safety factor

The calculation of the static load safety factor must be executed separately for the radial and axial bearing parts. The static load safety factor for machine tool application should total So > 4 in order to avoid permanent plastic deformations in the bearing.

$$S_o = \frac{C_{or}}{F_{or}} \quad \text{or} \quad S_o = \frac{C_{oa}}{F_{oa}}$$

S_o = Static load safety factor

C_{oa}/C_{or} [N] = Static load rating acc. dimensions table

F_{or}, F_{oa} [N] = Static load of radial or axial bearing part

Static limiting load diagrams

Static limiting load diagrams

The static limiting load diagrams serve to:

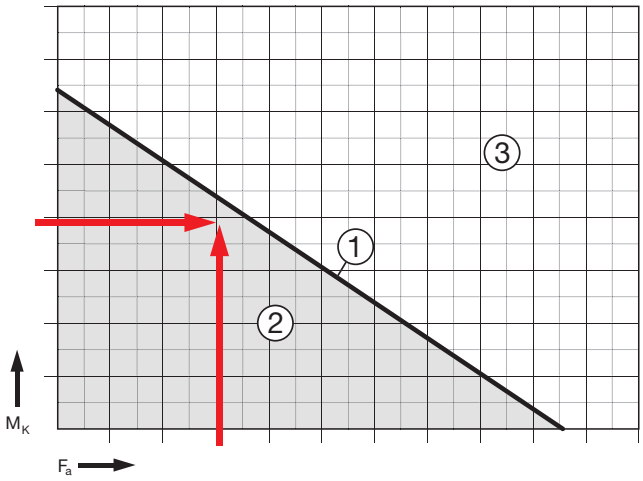
- Check the selected bearing size with mainly static load
- Determine the tilting moment Mk which the AXRY is able to absorb in addition to the axial load

The static limiting load diagrams take into account for the roller element set the static load safety factor $S_o \geq 4$ and the screw and bearing ring strength.

Example:

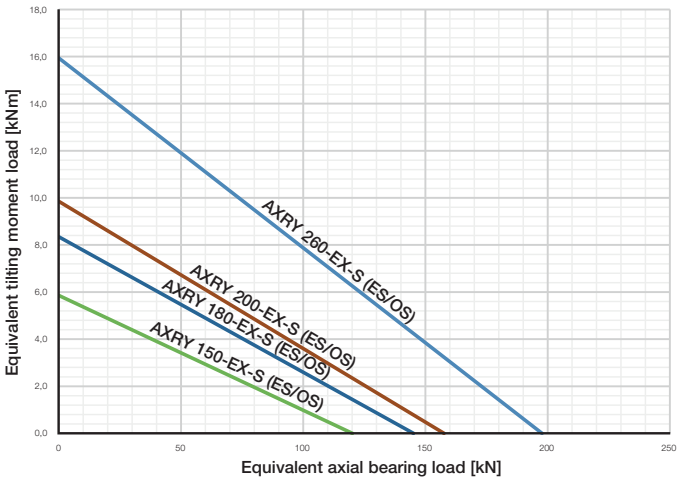
Static limiting load diagram for AXRY

1 Bearing/size
2 Permitted range
3 Unpermitted range
M_K Maximum tilting moment in [kNm]
F_a Axial load in [KN]

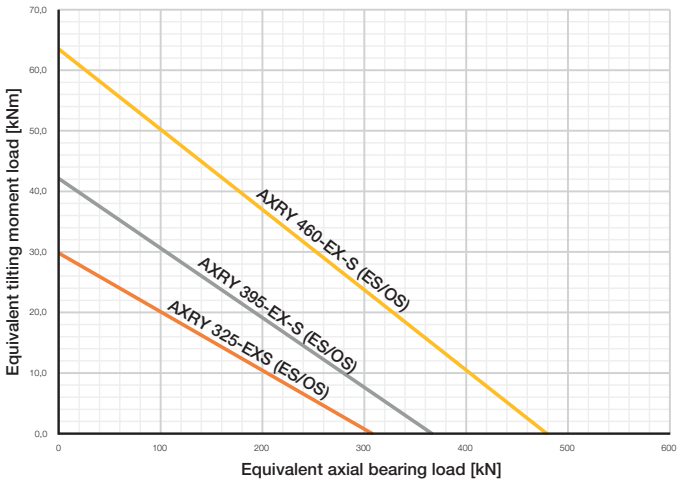


Static limiting load diagrams

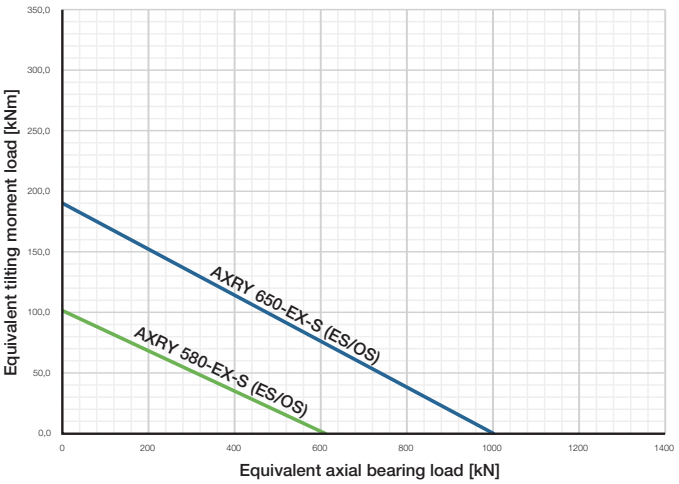
Limiting load diagram axial-radial bearing AXRY 150-EX-S (ES/OS) to AXRY 260-EX-S (ES/OS)



Limiting load diagram axial-radial bearing AXRY 325-EX-S (ES/OS) to AXRY 460-EX-S (ES/OS)



Limiting load diagram axial-radial bearing AXRY 580-EX-S (ES/OS) to AXRY 650-EX-S (ES/OS)



General construction notes

Rotary axis

Important during the design of high speed rotary axes is the consideration of the entire table around the rotation axis. AXRY-EX-S (ES/OS) bearings are guided in their rotation via the radial raceway, which thus forms the rotary axis. Around this axis, the eccentricities of all rotating parts are to be kept as low as possible, on the one hand to ensure radial runout, and on the other to avoid vibrations in operation.

Positive-locking centring of important connection parts such as for example the rotors on direct drives helps to substantially reduce this problem.

Conduct this centring process with the rotating inner ring via the table top or the shaft, and not via the bearing bore. Doubled centring in the hole can lead to distortions in the bearing.

Larger/heavier rotating parts such as the table should be dynamically balanced. Balancing devices for eccentrically-clamped workpieces reduce the problem during cutting.

Heat flow

The bearings heat up during operation through friction. How much heat an axis system can cope with is basically to be decided by the machine manufacturer.

Every temperature increase is transferred into the rotary table system, and generally leads to unwanted expansion and displacement of the axis. Because the compensations of bearing housing, table axis and spindle are complex, we recommend that you discharge generated temperatures immediately if possible.

For the bearing to function, it is necessary to keep it constantly under preload. For the optimum dimensioning of an AXRY-EX-S (ES/OS) bearing, knowledge of the temperature progression between the inner and outer ring is necessary.

There are several possibilities for the mounting of diverse sensors. myonic application engineering is available for questions at any time.

Avoid the generation of additional temperatures, for example via grinding seals. The thermal decoupling of other heat generators or cooling systems, for example the stator cooling system, can contribute towards fast thermal stabilisation of the high speed rotary axes.

General construction notes

Temperature difference shaft/housing

The difference in temperature between the shaft and the housing influence the preload in the radial part of the bearing. The temperature difference must be considered across all operating conditions.

The temperature difference is application-specific and can only be simulated on test benches to a certain extent.

In case of high shaft temperatures, the preload in the radial part increases. This leads to higher friction, area pressures in the bearing and to a lower life time.

In case of higher housing temperatures, the preload in the radial part is reduced and the radial rigidity is also reduced. In case of bearing backlash, wear is generated through slippage, and loud noises occur.

If the temperature difference across all operating conditions is known, the radial preload can be adapted at the factory (customer-specific suffix Jxxxx).

The compensation of shafts which expand through clearance fits to the bearing bore is only then useful if a positive-locking connection between the bearing and the shaft of the rotating axis is guaranteed for the targeted operating condition.

Cooling

An efficient cooling system permits the adjustment of an operating temperature with less fluctuations.

A separately-controllable cooling of the inner and outer rings is generally helpful. It is essential that the operating temperatures of the two bearing rings are known precisely over all operating conditions of the axis.

Unbalance/eccentric loads

Unbalanced tables/components generate high additional forces on the bearing. Please observe in particular the appropriate balancing of the axis, in particular when it is used at high speeds.

Eccentrically-applied operating loads have a similar effect.

We recommend the use of automatic unbalance compensation systems and a limiting of the residual unbalance of the workpiece in order to avoid premature bearing failures.

Design of the adjacent construction

In the following sketches and tables, the design of the adjacent construction is described.
Pay particular attention to the connection areas, as any deviations will have an effect on the overall accuracy of the roller bearing.

In order to avoid a decline in bearing friction torque, accuracy requirements and running characteristics, the recommended tolerances may not be exceeded.

Press fits

In principle, when the fit is too constricted, the radial bearing preload increases, and thus…

…the following increases:

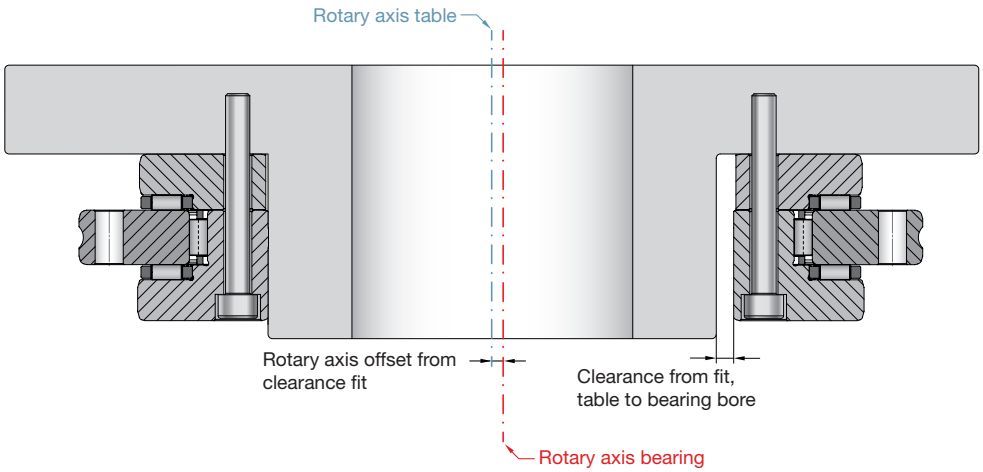
- The surface pressure in the raceway
- The bearing friction
- The bearing heat
- The amount of wear

…the following is reduced:

- The maximum speed
- The life time

Clearance fits

If the rotating ring is not supported by interference fits, displacement of the rotation axis raceway to table centre is probable. The clearance from the fit table to bearing bore (also applies for the clearance bearing outer diameter to table with rotating outer ring) can add to the radial runout.



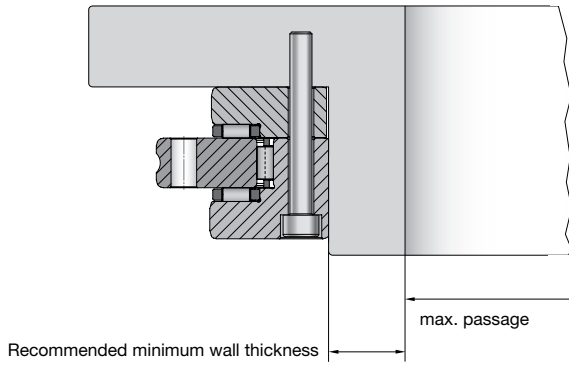
Design of the adjacent construction

Targeted clearance fits for compensation of the growth of individual roller bearing rings may be expedient, but demand exact knowledge and temperature control of the individual rings. The risk of axial runout errors or the loss of the rotation centre of the rotary axis is to be observed accurately over all operating conditions of the machine tool.

No support or insufficient support of the inner ring leads to undefined operating conditions such as vibrations, radial runout errors and repeatability etc.

Recommended minimum wall thickness of the table:

AXRY	Minimum wall thickness [mm]	Max. passage [mm]
150	16	118
180	16	148
200	18.5	163
260	21	218
325	23	279
395	23	349
460	25	410
580	30	520
650	37.5	575



Recommended fits, shaft

General

In particular in case of high speed bearings of the bearing types EX-S and ES/OS, the accuracies of the fits and the geometrically correct design of all adjacent parts are decisive for the function.

Errors in the adjacent construction can substantially increase the friction torque. Please observe the construction notes in the general catalogue chapter.

We recommend that you contact myonic application engineering in the draft phase.

Inner ring rotates

The bearing inner ring is to be supported across its whole surface for rotating shafts, and the shaft must be designed with a fit acc. h5. In this way, the bore tolerance of the bearing generates a transition fit with a slight tendency to a clearance fit.

Maximum interference fits:

- AXRY150 to AXRY325 – 3 µm
- AXRY460 to AXRY580 – 4 µm
- AXRY650 – 5 µm

The table part h5 limited accords with practice values which facilitate easier mating of shaft and bearing.

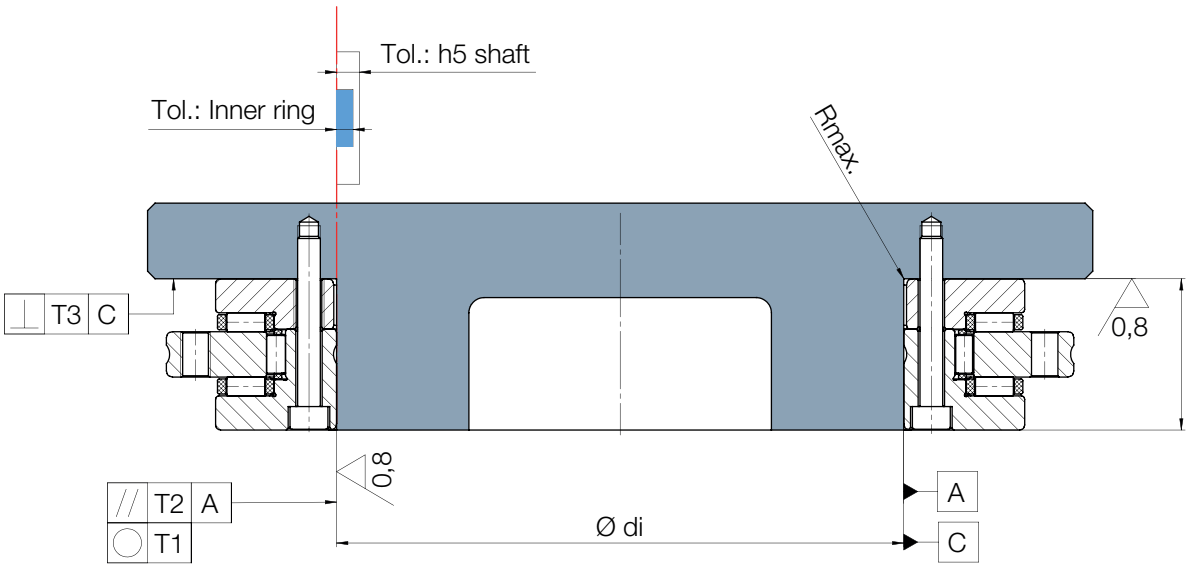
In case of precise knowledge of the axis thermals (temperature of bearing inner ring/bearing outer ring) and the power cycles and loads, deviating fits may be expedient. In individual application cases, the performance capability of the AXRY-EX-S (ES/OS) bearing can be substantially improved through factory adaptations of the preloads in the bearing.

Thermal ring expansions must always be observed in combination with the required accuracy requirements of the bearing across all operating conditions. For the maximum accuracy requirement with rotating inner ring, a clearance fit 0 must be targeted, as existing clearance fits can add to the radial runout.
The actual dimension of the bearing bore can be found in the inspection report enclosed with every bearing.

Outer ring rotates

On stationary shafts, the bearing inner ring is to be supported across its whole surface and the shaft is to be designed with a fit acc. h5.

Recommended fits, shaft



				Rotating and stationary inner ring							
Axial/radial bearing	Shaft Ø di [mm]	Tolerance zone Bearing inner Ø d [mm]		Tolerance zone h5 of the shaft Ø di [mm]		Tolerance zone h5 limited of the shaft Ø di [mm]		Roundness T1 [µm]	Parallelism T2 [µm]	Perpen-dicularity Even-ness T3 [µm]	Maximum corner radius Rmax. [mm]
AXRY150-EX-S (ES/OS)	150	0	-0.013	0	-0.018	-0.003	-0.018	4	2	4	0.1
AXRY180-EX-S (ES/OS)	180	0	-0.013	0	-0.018	-0.003	-0.018	4	2	4	0.1
AXRY200-EX-S (ES/OS)	200	0	-0.015	0	-0.020	-0.005	-0.020	5	2.5	5	0.1
AXRY260-EX-S (ES/OS)	260	0	-0.018	0	-0.023	-0.005	-0.023	6	3	6	0.3
AXRY325-EX-S (ES/OS)	325	0	-0.023	0	-0.025	-0.006	-0.025	6	3	6	0.3
AXRY395-EX-S (ES/OS)	395	0	-0.023	0	-0.025	-0.006	-0.025	7	3	7	0.3
AXRY460-EX-S (ES/OS)	460	0	-0.023	0	-0.027	-0.006	-0.027	7	3	7	0.3
AXRY580-EX-S (ES/OS)	580	0	-0.025	0	-0.032	-0.008	-0.032	8	4	8	1
AXRY650-EX-S (ES/OS)	650	0	-0.038	0	-0.036	-0.010	-0.036	8	4	8	1

Recommended fits, housing

General

In particular in case of high speed bearings of the bearing types EX-S and ES/OS, the accuracies of the fits and the geometrically correct design of all adjacent parts are decisive for the function.

Errors in the adjacent construction can substantially increase the friction torque. Please observe the construction notes in the general catalogue chapter.

We recommend that you contact myonic application engineering in the draft phase.

Outer ring rotates

Bearing outer ring heats up to the same extent or higher than the bearing inner ring
Design the rotating housing with a J6 clearance acc. the table. Design the fit seat across the entire height of the outer ring.

Bearing inner ring heats up more
If the inner ring (shaft) is warmer during operation than the outer ring, a clearance fit of at least 20 µm may be advantageous.
Here the preload increase in the radial part of the bearing is reduced, but there is a risk of outer ring screw connection overload in case of high temperature differences. This can lead to radial clearance and slippage of the radial bearing.

Centring/fit can also be produced via segments in the housing fit.
In case of more detailed knowledge of the axis thermals (temperature of bearing inner ring/bearing outer ring), the power cycles and loads, deviating fits may be expedient.

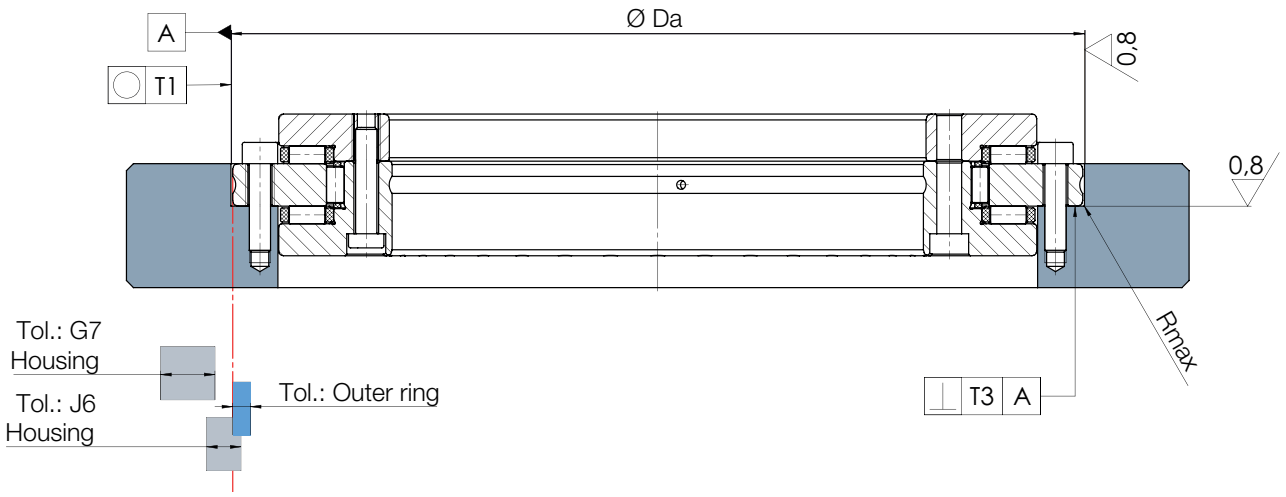
Inner ring rotates

It is possible to do without a fit in the housing or alternatively to have a G7 fit design.
The operating temperatures of the inner and outer rings must be observed, see notes on outer ring rotation or contact myonic application engineering.

Max. accuracy requirement

For the maximum accuracy requirement with rotating outer ring, a clearance fit 0 must be targeted; existing clearance fits can add to the radial runout.
The actual dimension of the bearing outer diameter can be found in the inspection report enclosed with all bearings.

Recommended fits, housing



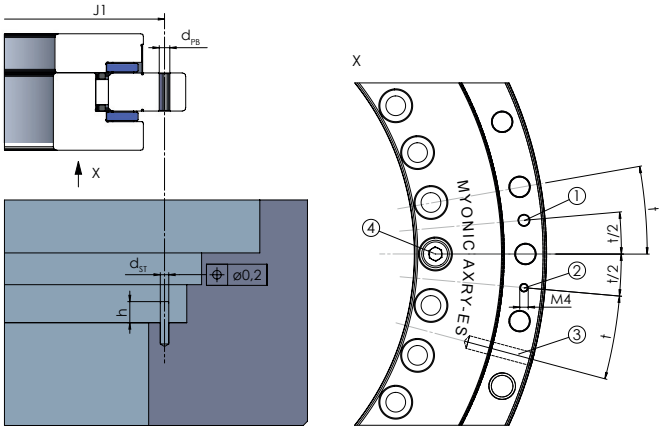
				Stationary outer ring			Rotating outer ring				
Axial/radial bearing	Housing Ø Da [mm]	Tolerance zone Bearing outer Ø D [mm]		Tolerance zone G7 of the housing Ø Da [mm]		Roundness, perpen-dicularity Evenness T1, T3 [µm]	Tolerance zone J6 of the housing Ø Da [mm]		Round-ness T1 [µm]	Perpen-dicularity Even-ness T3 [µm]	Maximum corner radius Rmax. [mm]
AXRY150-EX-S (ES/OS)	240	0	-0.015	0.061	0.015	10	0.009	-0.005	5	7	0.3
AXRY180-EX-S (ES/OS)	280	0	-0.018	0.069	0.017	12	0.011	-0.005	6	8	0.3
AXRY200-EX-S (ES/OS)	300	0	-0.018	0.069	0.017	12	0.011	-0.005	6	8	0.3
AXRY260-EX-S (ES/OS)	385	0	-0.020	0.075	0.018	13	0.014	-0.005	6	8	0.3
AXRY325-EX-S (ES/OS)	450	0	-0.023	0.083	0.020	13	0.015	-0.005	6	8	0.3
AXRY395-EX-S (ES/OS)	525	0	-0.028	0.092	0.022	16	0.017	-0.005	6	8	0.3
AXRY460-EX-S (ES/OS)	600	0	-0.028	0.092	0.022	16	0.017	-0.005	6	10	1
AXRY580-EX-S (ES/OS)	750	0	-0.035	0.104	0.024	18	0.019	-0.006	7	10	1
AXRY650-EX-S (ES/OS)	870	0	-0.050	0.116	0.026	18	0.022	-0.006	8	12	1

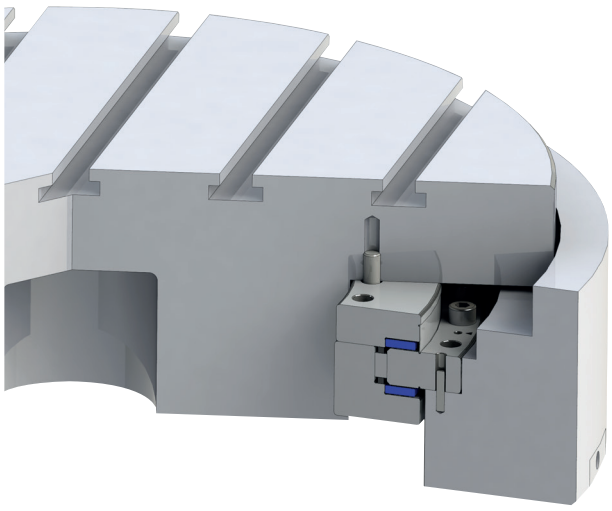
Positioning/lubrication bore

For simple alignment of the outer ring, a positioning hole (1) is offered for the AXRY-ES construction series.

Position of the positioning hole AXRY-ES

In the following sketch, the fastening screws (4) and the bearing marking are located at the top of the inner ring. The axial washer is installed on the table.
The positioning hole (1) is offset by half a pitch division to the fixing hole; one whole pitch division to the lubrication bore (2) and 2 pitch divisions to the temperature sensor bore (3).
The pitch divisions in the individual bearings are listed in the product data sheet in the table fixing holes.
The diameter d_{PB} of the positioning hole of the bearing outer ring is dimensioned somewhat larger than the recommended pin diameter d_{ST} (see table).





Positioning/lubrication bore

Positioning hole AXRY-ES design

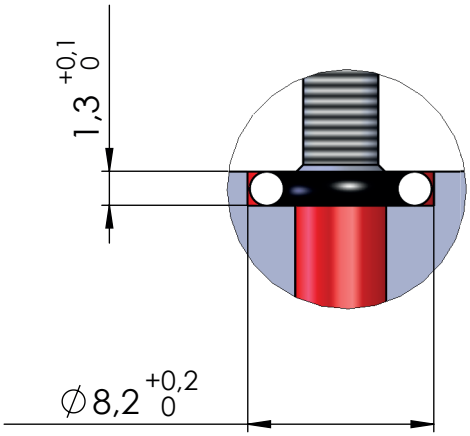
Secure the positioning pins during assembly or remove them after assembly (e.g. threaded rods). The pins must be reliably prevented from dropping out during operation. Dimension the positioning pins remaining in the table with at least 4 mm pin height, from size 580 with at least 6 mm pin height; do not dimension the maximum pin height (see table) over 50 % of the outer ring construction height.

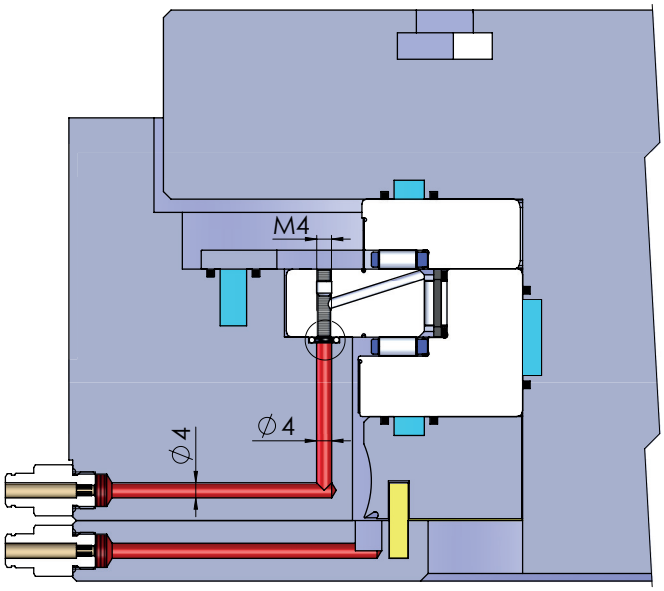
Positioning hole

AXRY	Pin height h max. [mm]	Pin diameter d_{ST} [mm]	Positioning hole d_{PB} min. [mm]
AXRY 150-ES	6	4	5
AXRY 180-ES	7.5	4	5
AXRY 200-ES	7.5	4	5
AXRY 260-ES	9	4	5
AXRY 325-ES	10	4	5
AXRY 395-ES	10	4	5
AXRY 460-ES	11	4	5
AXRY 580-ES	15	6	8
AXRY 650-ES	17	8	10

Lubrication bore AXRY-ES design

Dimension the connection of the lubrication bores in the outer ring as follows and seal with an O-ring d1=4mm x d2=2mm.





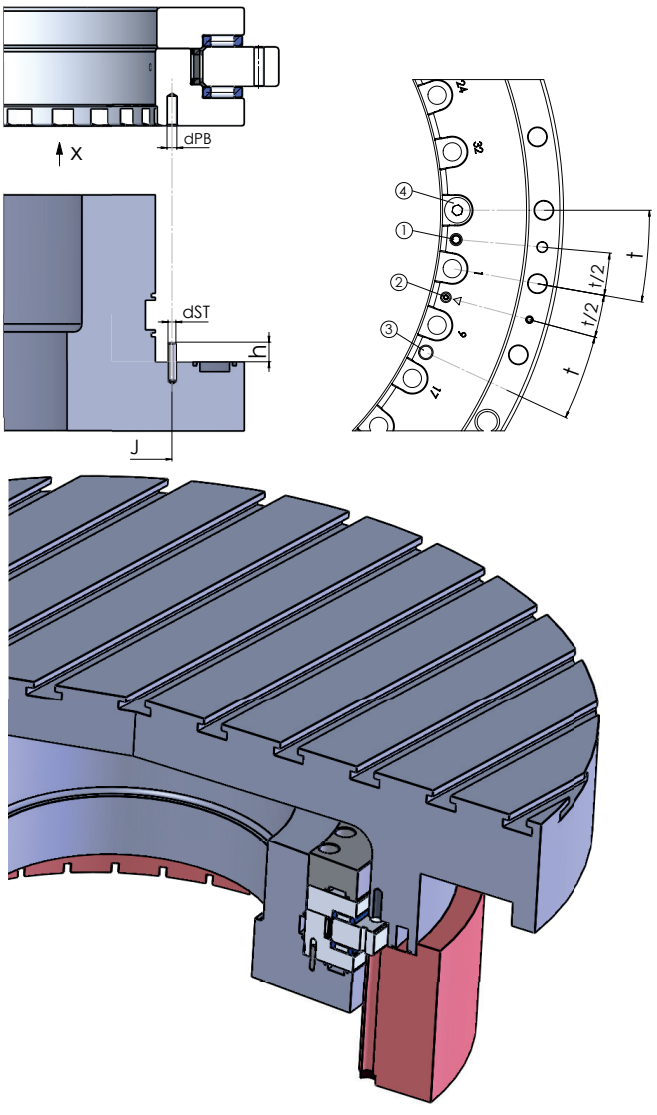
Positioning/lubrication bore

For easy alignment of the inner ring, a positioning hole (1) is offered for the AXRY-OS construction series.

Position of the positioning holes AXRY-OS

In the following sketch, the fastening screws (4) and the bearing marking/countersunk holes are located at the top of the inner ring. In case of installation the other way around, the information should also be followed the other way around.
The positioning hole (1) is offset by half a pitch division clockwise to the fastening screw. A lubrication bore (2) and the sensor bore (3) follow, offset by one whole pitch division.
The pitch divisions in the individual bearings are listed in the product data sheet in the table fixing holes.

The diameter d_{PB} of the positioning hole of the bearing outer ring is dimensioned somewhat larger than the recommended pin diameter d_{ST} (see table).



Positioning/lubrication bore

Positioning hole design for the AXRY-OS

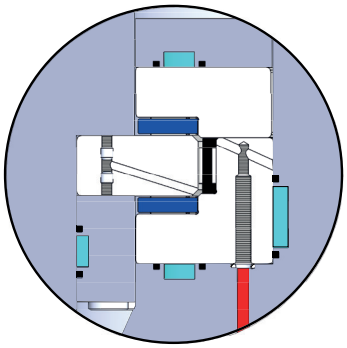
Secure the positioning pins during assembly or remove them after assembly (e.g. threaded rods). The pins must be reliably prevented from dropping out during operation. Dimension the positioning pins remaining in the table with at least 4 mm pin height, from size 580 with at least 6 mm pin height; do not dimension the maximum pin height (see table) over 50 % of the outer ring construction height.

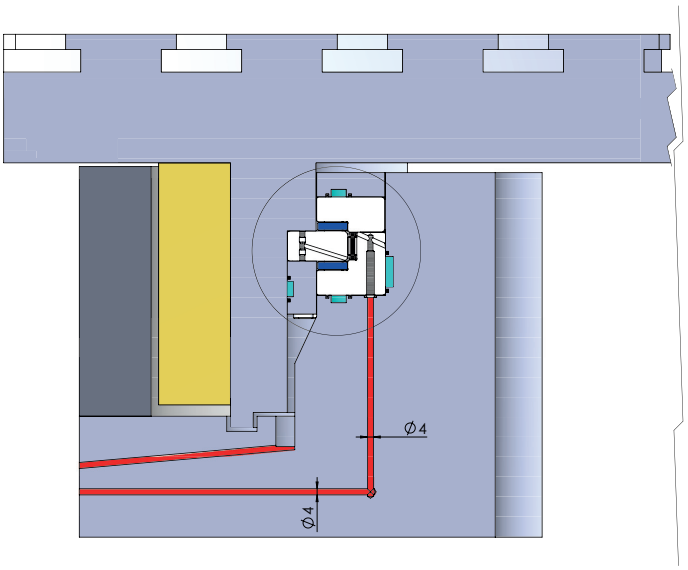
Positioning hole

AXRY	Pin height h max. [mm]	Pin diameter d_{ST} [mm]	Positioning hole d_{PB} min. [mm]
AXRY 150-OS	6	4	5
AXRY 180-OS	7.5	4	5
AXRY 200-OS	7.5	4	5
AXRY 260-OS	9	4	5
AXRY 325-OS	10	4	5
AXRY 395-OS	10	4	5
AXRY 460-OS	11	4	5
AXRY 580-OS	15	6	8
AXRY 650-OS	17	8	10

Lubrication bore design for the AXRY-OS

Conduct the connection of the lubrication bores in the inner ring as follows and seal with an O-ring d1=4mm x d2=2mm.



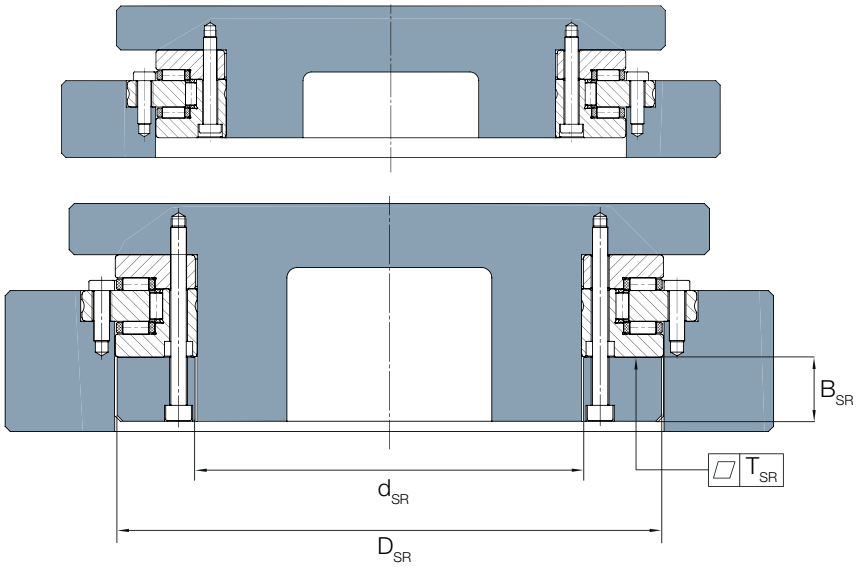


Bearing rigidity

Supported L-section ring

AXRY bearings can be installed exposed or supported across their whole surface.
If the bearing inner ring is supported across its whole surface by a support ring, the tilting rigidity of the bearing increases by approx. 15 to 20 %.

Depending on the installation situation, different preload alignments in the bearing are required. For this reason, it is important only to order bearings with the suffix AC for bearing situations with a supported L-section ring. Design the support ring at least twice as high as the bearing axial washer.



Recommendation: Support ring for maximum rigidity

Support ring for bearing size	Inner diameter d_{SR} [mm]	Outer diameter D_{SR} max. [mm]	Width B_{SR} [mm]	Evenness/ contact area T_{SR} [µm]
AXRY 150-EX-S (ES/OS)	151.5	214	18	5
AXRY 180-EX-S (ES/OS)	181.5	244	18	5
AXRY 200-EX-S (ES/OS)	201.5	274	20	7
AXRY 260-EX-S (ES/OS)	261.5	345	27	8
AXRY 325-EX-S (ES/OS)	326.5	415	28	9
AXRY 395-EX-S (ES/OS)	396.5	486	33	9
AXRY 460-EX-S (ES/OS)	462	560	34	10
AXRY 580-EX-S (ES/OS)	582	700	46	11
AXRY 650-EX-S (ES/OS)	652	800	68	13

Order designation

Designation system — Bearing — Measuring system

AXRY 260 - EX - S - 2Z - PRR50 - H1 - H2 - AC - JXXXX - L120 - MI150 - A - 3 - 500 - K

Construction series

Bore
in mm

Bearing type
EX = Standard design
ES = High speed inner ring rotation
OS = High speed outer ring rotation

Standard speed
(only for EX)

Seal:
Without = No seal
AZ = Axial washer, sealed
IZ = Inner ring, sealed
2Z = Sealed on 2 sides

Accuracy requirements:
Without = Standard accuracy requirement
PRR50 = Axial and radial runout tolerances restricted (with EX-S, ES and with OS standard series PRR50)

Connection dimension H1:
Without = Standard tolerance
H1 = Restricted connection dimension H1

Connection dimension H2:
Without = Standard tolerance
H2 = restricted connection dimension H2

Bearing preload:
Without = Standard alignment
AC = Alignment for supported L-section ring

Design:
Without = Catalogue design
JXXXX = Customer-specific design
(number is issued by myonic)

Lubrication:
Without = Standard grease
L120 = Bearing ungreased, only preserved
(e.g. for oil lubrication)
GXXX = Special grease
(number is issued by myonic)

Reference marks:
K = Distance-coded
(only possible for MI150 and MI160)
RI = 1 reference mark
(only possible for MI150 and MI160)

Graduation period:
500 = 500 µm
(only possible for MI150 and MI160)
1000 = 1000 µm
3000 = 3000 µm
(only possible for MI150 and MI160)

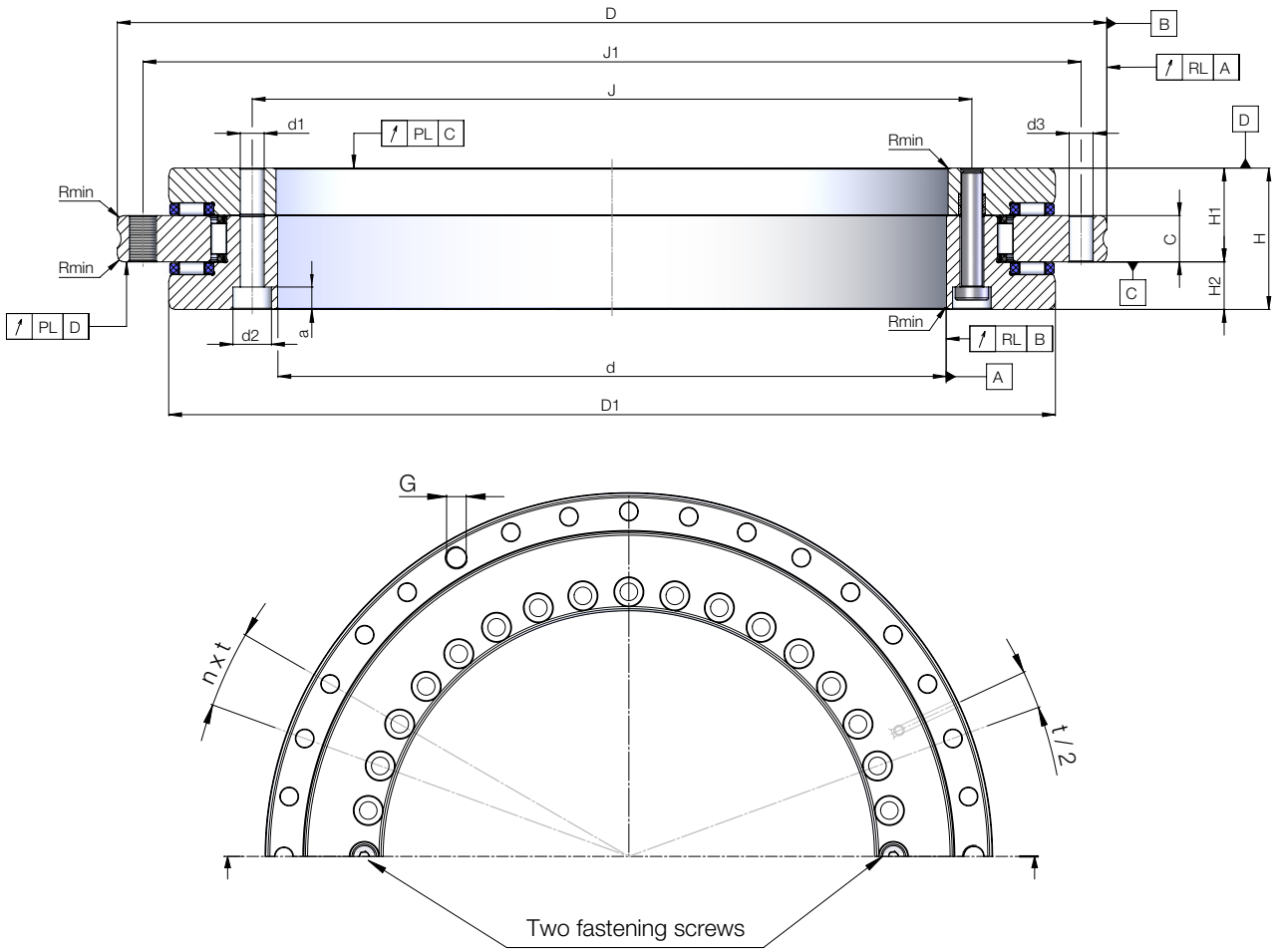
Graduation accuracy:
3 = ± 3 µm
5 = ± 5 µm
10 = ± 10 µm

Position of the reference mark:
I = Reference mark inside
(only possible for MI150 and MI160)
A = Reference mark outside
(only possible for MI150 and MI160)

Design and mounting of measuring ring:
MI150 = Incremental on the inner ring
MI160 = Incremental on the axial washer
MA150 = Absolute on the inner ring
MA160 = Absolute on the axial washer

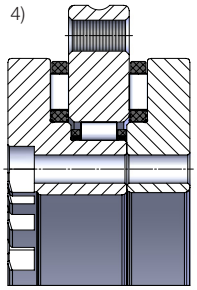
For further technical details or special designs, please contact myonic application engineering.

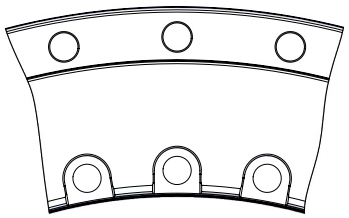
Dimensions table AXRY-EX-S (standard speed design)



Designation	Weight	Dimensions [mm]													
	m [kg]	d	Δd	D	ΔD	H	H1	ΔH1	ΔH1 restricted	H2	ΔH2 restricted	C	D1 max	J	J1
AXRY 150-EX-S	6.2	150	-0.013	240	-0.015	40	26	± 0.175	± 0.03	14	± 0.02	12	214	165	225
AXRY 180-EX-S	7.7	180	-0.013	280	-0.018	43	29	± 0.175	± 0.03	14	± 0.025	15	244	194	260
AXRY 200-EX-S	9.7	200	-0.015	300	-0.018	45	30	± 0.175	± 0.03	15	± 0.025	15	274	215	285
AXRY 260-EX-S	18.3	260	-0.018	385	-0.020	55	36.5	± 0.200	± 0.04	18.5	± 0.025	18	345	280	365
AXRY 325-EX-S[4)]	25	325	-0.023	450	-0.023	60	40	± 0.200	± 0.05	20	± 0.025	20	415	342	430
AXRY 395-EX-S	33	395	-0.023	525	-0.028	65	42.5	± 0.200	± 0.05	22.5	± 0.025	20	486	415	505
AXRY 460-EX-S	45	460	-0.023	600	-0.028	70	46	± 0.225	± 0.06	24	± 0.03	22	560	482	580
AXRY 580-EX-S	89	580	-0.025	750	-0.035	90	60	± 0.250	± 0.075	30	± 0.03	30	700	610	720
AXRY 650-EX-S	170	650	-0.038	870	-0.050	122	78	± 0.250	± 0.1	44	± 0.03	34	800	680	830

4)



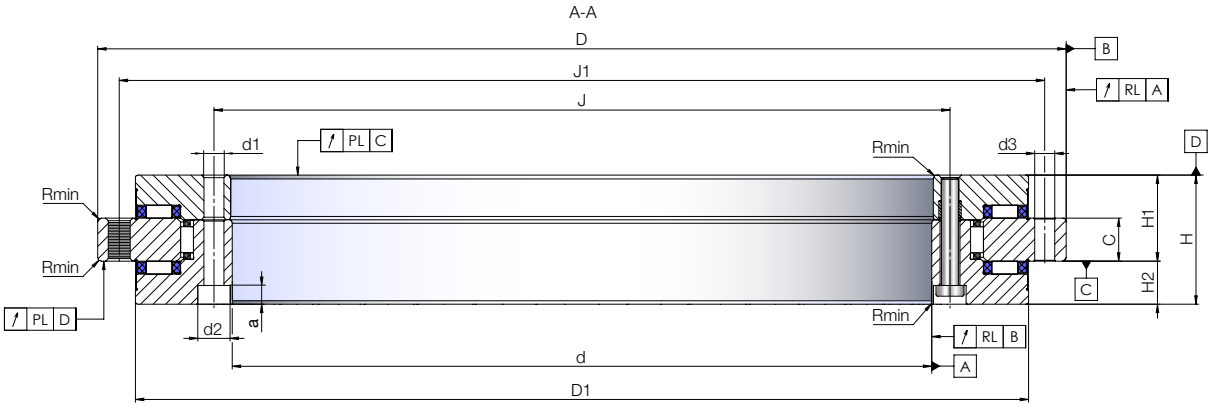


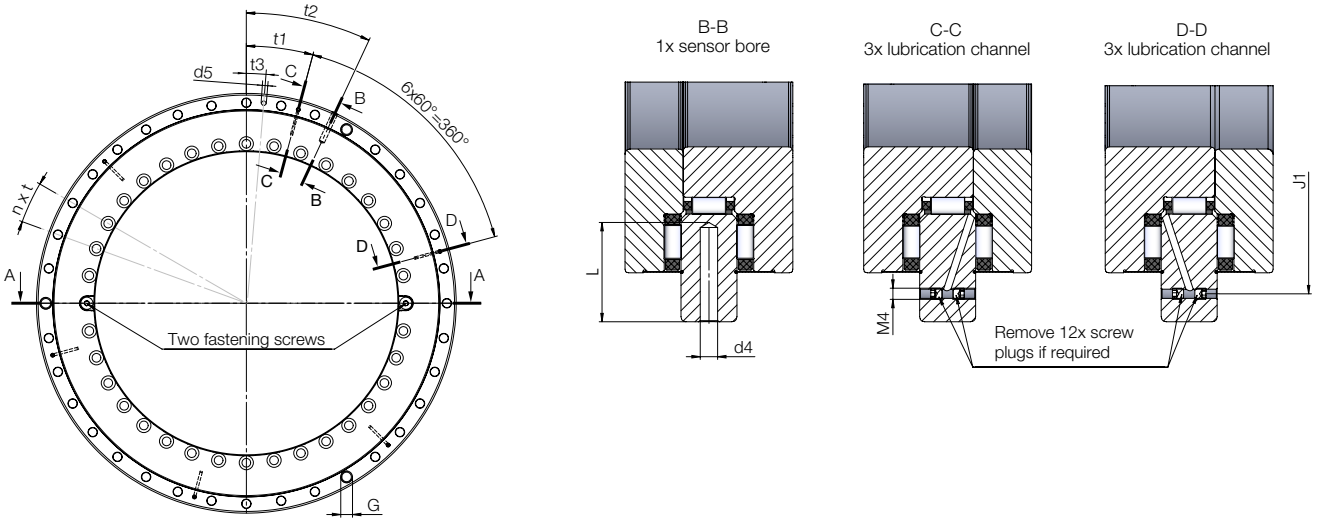
1) Including fastening screws or extraction thread.
2) Tightening torque for screws acc. DIN 912, strength class 10.9.
3) Attention! For fixing holes in the adjacent construction. Observe the pitch of the bearing bores.
4) Screw counterbores in large L-ring open to bearing bore. Bearing inside diameter is not supported in this area.
5) Measurement speed n_{const} = 5 rpm
6) Measured on the installed bearing with ideal adjacent construction.

Designation	Fixing holes									
	Inner ring				Outer ring				Number x Pitch	Screw tightening torque
							Extraction thread			
	d1	d2	a	Number[3]	d3	Number[3]	G	Number	nxt[1]	M_A[2] [Nm]
AXRY 150-EX-S	7	11	6.4	34	7	33	M8	3	36 x 10°	14
AXRY 180-EX-S	7	11	6.4	46	7	45	M8	3	48 x 7.5°	14
AXRY 200-EX-S	7	11	6.4	46	7	45	M8	3	48 x 7.5°	14
AXRY 260-EX-S	9.3	15	8.6	34	9.3	33	M12	3	36 x 10°	34
AXRY 325-EX-S[4]	9.3	15	8.6	34	9.3	33	M12	3	36 x 10°	34
AXRY 395-EX-S	9.3	15	8.6	46	9.3	45	M12	3	48 x 7.5°	34
AXRY 460-EX-S	9.3	15	8.6	46	9.3	45	M12	3	48 x 7.5°	34
AXRY 580-EX-S	11.4	18	10.6	46	11.4	42	M12	6	48 x 7.5°	68
AXRY 650-EX-S	14	20	12.6	46	14	42	M12	6	48 x 7.5°	116

Designation	Load ratings				Limiting speed		Bearing friction torque[5]	Axial & radial runout[6]	Rigidity of the bearing position			Min. corner radius
	Axial		Radial		Oil	Grease	Grease	Standard	Axial	Radial	Tilting rigidity	
	dyn. C_a [kN]	stat. C_{0a} [kN]	dyn. C_r [kN]	stat. C_{0r} [kN]	n_G [rpm]	n_G [rpm]	M_{RL} [Nm]	PL & RL [µm]	C_{al} [kN/µm]	C_{rl} [kN/µm]	C_{kl} [kNm/mrad]	R_{min} [mm]
AXRY 150-EX-S	74.1	480.5	41	93.5	1800	1600	4.2	1.5	4.6	2.3	21.8	0.8
AXRY 180-EX-S	82.5	580.6	44	107.5	1600	1400	4.8	2	6.8	2.7	42.8	1
AXRY 200-EX-S	85.7	630.6	59	143.8	1400	1200	5.4	2	6	2.8	46.3	1
AXRY 260-EX-S	96.4	790.8	67.1	183.9	1200	1000	7.8	3	8.9	3.7	111.2	1
AXRY 325-EX-S[4]	143.1	1230.8	74	222	1000	800	12	3	10	4.2	181	1.2
AXRY 395-EX-S	157.1	1465.2	81.3	265.9	800	680	15	3	12.7	5	324	1.2
AXRY 460-EX-S	203.7	1916.5	87.1	304	700	600	22	3	13.4	5.9	446	1.2
AXRY 580-EX-S	232.1	2441.1	103	363.2	450	350	40	5	18.7	6.4	982	2
AXRY 650-EX-S	400.5	4004	249	920.3	350	250	60	5	21.8	9.7	1517	2

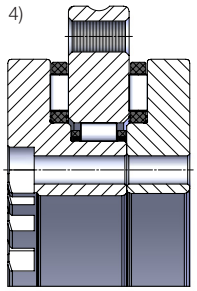
Dimensions table AXRY-ES (extended speed design)

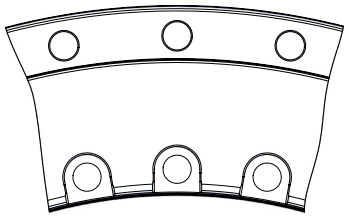




Designation	Dimensions [mm]																				
	m	d	Δd	D	ΔD	H	H1	ΔH1	ΔH1	H2	ΔH2	C	D1	J	J1	t1	t2	t3	d4	d5	L
	[kg]								restricted		restricted		max						~		
AXRY 150-ES	6.2	150	-0.013	240	-0.015	40	26	± 0.175	± 0.03	14	± 0.02	12	214	165	225	15°	25°	5°	4.2	5	24
AXRY 180-ES	7.7	180	-0.013	280	-0.018	43	29	± 0.175	± 0.03	14	± 0.025	15	244	194	260	18.75°	26.25°	11.25°	6.2	5	29.5
AXRY 200-ES	9.7	200	-0.015	300	-0.018	45	30	± 0.175	± 0.03	15	± 0.025	15	274	215	285	18.75°	26.25°	11.25	6.2	5	26
AXRY 260-ES	18.3	260	-0.018	385	-0.020	55	36.5	± 0.200	± 0.04	18.5	± 0.025	18	345	280	365	15°	25°	5°	6.2	5	33.5
AXRY 325-ES[4]	25	325	-0.023	450	-0.023	60	40	± 0.200	± 0.05	20	± 0.025	20	415	342	430	15°	25°	5°	6.2	5	35.5
AXRY 395-ES	33	395	-0.023	525	-0.028	65	42.5	± 0.200	± 0.05	22.5	± 0.025	20	486	415	505	18.75°	26.25°	11.25°	6.2	5	37
AXRY 460-ES	45	460	-0.023	600	-0.028	70	46	± 0.225	± 0.06	24	± 0.03	22	560	482	580	18.75°	26.25°	11.25°	6.2	5	43
AXRY 580-ES	89	580	-0.025	750	-0.035	90	60	± 0.250	± 0.075	30	± 0.03	30	700	610	720	41.25°	48.75°	33.75°	12.2	8	48
AXRY 650-ES	170	650	-0.038	870	-0.050	122	78	± 0.250	± 0.1	44	± 0.03	34	800	680	830	41.25°	48.75°	33.75°	12.2	10	61.5

4)



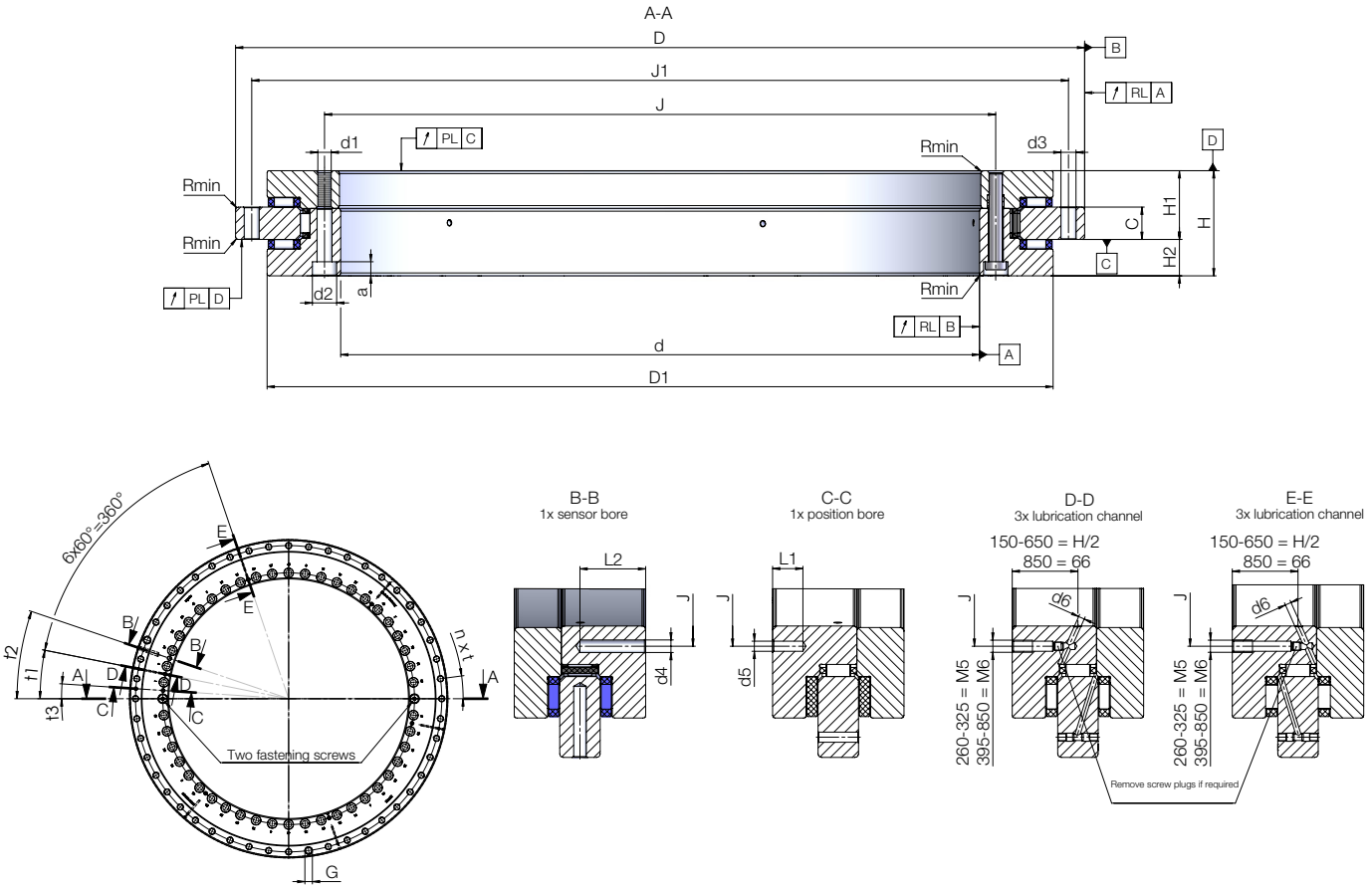


1) Including fastening screws or extraction thread.
2) Tightening torque for screws acc. DIN 912, strength class 10.9.
3) Attention! For fixing holes in the adjacent construction. Observe the pitch of the bearing bores.
4) Screw counterbores in large L-ring open to bearing bore. Bearing inside diameter is not supported in this area.
5) Measurement speed n_{const} = 5 rpm
6) Measured on the installed bearing with ideal adjacent construction.

Designation	Fixing holes									
	Inner ring				Outer ring				Number x Pitch	Screw tightening torque
							Extraction thread			
	d1	d2	a	Number[3]	d3	Number[3]	G	Number	nxt[1]	M_A[2] [Nm]
AXRY 150-ES	7	11	6.4	34	7	33	M8	3	36 x 10°	14
AXRY 180-ES	7	11	6.4	46	7	45	M8	3	48 x 7.5°	14
AXRY 200-ES	7	11	6.4	46	7	45	M8	3	48 x 7.5°	14
AXRY 260-ES	9.3	15	8.6	34	9.3	33	M12	3	36 x 10°	34
AXRY 325-ES[4]	9.3	15	8.6	34	9.3	33	M12	3	36 x 10°	34
AXRY 395-ES	9.3	15	8.6	46	9.3	45	M12	3	48 x 7.5°	34
AXRY 460-ES	9.3	15	8.6	46	9.3	45	M12	3	48 x 7.5°	34
AXRY 580-ES	11.4	18	10.6	46	11.4	42	M12	6	48 x 7.5°	68
AXRY 650-ES	14	20	12.6	46	14	42	M12	6	48 x 7.5°	116

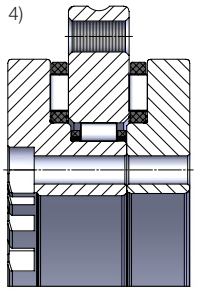
Designation	Load ratings				Limiting speed		Bearing friction torque[5]	Axial & radial runout[6]	Rigidity of the bearing position			Min. corner radius
	Axial		Radial		Oil	Grease	Grease	Standard	Axial	Radial	Tilting rigidity	
	dyn. C_a [kN]	stat. C_{0a} [kN]	dyn. C_r [kN]	stat. C_{0r} [kN]	n_G [rpm]	n_G [rpm]	M_{RL} [Nm]	PL & RL [µm]	C_{al} [kN/µm]	C_{rl} [kN/µm]	C_{kl} [kNm/mrad]	R_{min} [mm]
AXRY 150-ES	74.1	480.5	41	93.5	1800	1600	4.2	1.5	4.6	2.3	21.8	0.8
AXRY 180-ES	82.5	580.6	44	107.5	1600	1400	4.8	2	6.8	2.7	42.8	1
AXRY 200-ES	85.7	630.6	59	143.8	1400	1200	5.4	2	6	2.8	46.3	1
AXRY 260-ES	96.4	790.8	67.1	183.9	1200	1000	7.8	3	8.9	3.7	111.2	1
AXRY 325-ES[4]	143.1	1230.8	74	222	1000	800	12	3	10	4.2	181	1.2
AXRY 395-ES	157.1	1465.2	81.3	265.9	800	680	15	3	12.7	5	324	1.2
AXRY 460-ES	203.7	1916.5	87.1	304	700	600	22	3	13.4	5.9	446	1.2
AXRY 580-ES	232.1	2441.1	103	363.2	450	350	40	5	18.7	6.4	982	2
AXRY 650-ES	400.5	4004	249	920.3	350	250	60	5	21.8	9.7	1517	2

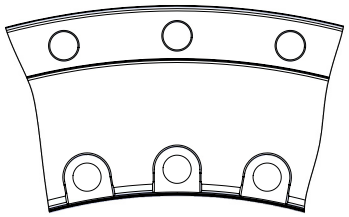
Dimensions table AXRY-OS



Designation	Dimensions [mm]																						
	m	d	Δd	D	ΔD	H	H1	ΔH1	ΔH1	H2	ΔH2	C	D1	J	J1	t1	t2	t3	d4	d5	d6	L1	L2
	[kg]								restricted		restricted		max							~			
AXRY 150-OS	6.2	150	-0.013	240	-0.015	40	26	± 0.175	± 0.03	14	± 0.02	12	214	165	225	15°	-	-	-	-	2.5	-	-
AXRY 180-OS	7.7	180	-0.013	280	-0.018	43	29	± 0.175	± 0.03	14	± 0.025	15	244	194	260	11.25°	-	-	-	-	2.5	-	-
AXRY 200-OS	9.7	200	-0.015	300	-0.018	45	30	± 0.175	± 0.03	15	± 0.025	15	274	215	285	11.25°	-	-	-	-	2.5	-	-
AXRY 260-OS	18.3	260	-0.018	385	-0.020	55	36.5	± 0.200	± 0.04	18.5	± 0.025	18	345	280	365	15°	25°	5°	6.2	5	2.5	15	27.5
AXRY 325-OS[4]	25	325	-0.023	450	-0.023	60	40	± 0.200	± 0.05	20	± 0.025	20	415	342	430	15°	25°	5°	6.2	5	2.5	15	30
AXRY 395-OS	33	395	-0.023	525	-0.028	65	42.5	± 0.200	± 0.05	22.5	± 0.025	20	486	415	505	11.25°	18.75°	3.75°	6.2	5	3	15	32.5
AXRY 460-OS	45	460	-0.023	600	-0.028	70	46	± 0.225	± 0.06	24	± 0.03	22	560	482	580	11.25°	18.75°	3.75°	6.2	5	3	15	35
AXRY 580-OS	89	580	-0.025	750	-0.035	90	60	± 0.250	± 0.075	30	± 0.03	30	700	610	720	11.25°	18.75°	3.75°	12.2	8	3	20	45
AXRY 650-OS	170	650	-0.038	870	-0.050	122	78	± 0.250	± 0.1	44	± 0.03	34	800	680	830	11.25°	18.75°	3.75°	12.2	10	3	25	61

4)





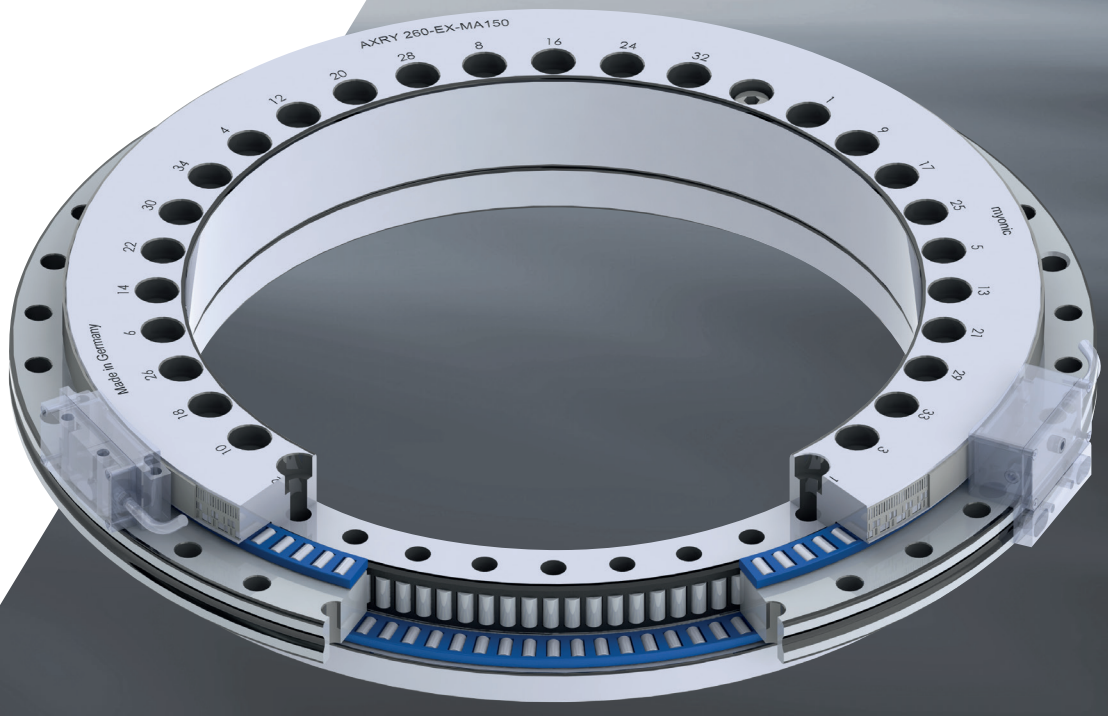
1) Including fastening screws or extraction thread.
2) Tightening torque for screws acc. DIN 912, strength class 10.9.
3) Attention! For fixing holes in the adjacent construction. Observe the pitch of the bearing bores.
4) Screw counterbores in large L-ring open to bearing bore. Bearing inside diameter is not supported in this area.
5) Measurement speed n_{const} = 5 rpm
6) Measured on the installed bearing with ideal adjacent construction.

Designation	Fixing holes									
	Inner ring				Outer ring				Number x Pitch	Screw tightening torque
							Extraction thread			
	d1	d2	a	Number[3]	d3	Number[3]	G	Number	nxt[1]	M_A[2] [Nm]
AXRY 150-OS	7	11	6.4	34	7	33	M8	3	36 x 10°	14
AXRY 180-OS	7	11	6.4	46	7	45	M8	3	48 x 7.5°	14
AXRY 200-OS	7	11	6.4	46	7	45	M8	3	48 x 7.5°	14
AXRY 260-OS	9.3	15	8.6	34	9.3	33	M12	3	36 x 10°	34
AXRY 325-OS[4]	9.3	15	8.6	34	9.3	33	M12	3	36 x 10°	34
AXRY 395-OS	9.3	15	8.6	46	9.3	45	M12	3	48 x 7.5°	34
AXRY 460-OS	9.3	15	8.6	46	9.3	45	M12	3	48 x 7.5°	34
AXRY 580-OS	11.4	18	10.6	46	11.4	42	M12	6	48 x 7.5°	68
AXRY 650-OS	14	20	12.6	46	14	42	M12	6	48 x 7.5°	116

Designation	Load ratings				Limiting speed		Bearing friction torque[5]	Axial & radial runout[6]	Rigidity of the bearing position			Min. corner radius
	Axial		Radial		Oil	Grease	Grease	Standard	Axial	Radial	Tilting rigidity	
	dyn. C_a [kN]	stat. C_{0a} [kN]	dyn. C_r [kN]	stat. C_{0r} [kN]	n_G [rpm]	n_G [rpm]	M_{RL} [Nm]	PL & RL [µm]	C_{al} [kN/µm]	C_{rl} [kN/µm]	C_{kl} [kNm/mrad]	R_{min} [mm]
AXRY 150-OS	74.1	480.5	41	93.5	1800	1600	4.2	1.5	4.6	2.3	21.8	0.8
AXRY 180-OS	82.5	580.6	44	107.5	1600	1400	4.8	2	6.8	2.7	42.8	1
AXRY 200-OS	85.7	630.6	59	143.8	1400	1200	5.4	2	6	2.8	46.3	1
AXRY 260-OS	96.4	790.8	67.1	183.9	1200	1000	7.8	3	8.9	3.7	111.2	1
AXRY 325-OS[4]	143.1	1230.8	74	222	1000	800	12	3	10	4.2	181	1.2
AXRY 395-OS	157.1	1465.2	81.3	265.9	800	680	15	3	12.7	5	324	1.2
AXRY 460-OS	203.7	1916.5	87.1	304	700	600	22	3	13.4	5.9	446	1.2
AXRY 580-OS	232.1	2441.1	103	363.2	450	350	40	5	18.7	6.4	982	2
AXRY 650-OS	400.5	4004	249	920.3	350	250	60	5	21.8	9.7	1517	2

Product chapter

AXRY-EX-M
AXRY-EX-S-M
AXRY-ES-M



General

General & advantages

myonic supplies bearing-integrated absolute and incremental angle measurement systems in cooperation with AMO. Here the measuring ring is directly mounted onto the bearing. Normally on the inner ring as this has a fit to the shaft.
The shell surface on which the measuring ring is mounted runs almost concentrically to the table centre due to exceptionally accurate myonic production tolerances. This increases the system accuracy and thus the overall accuracy of the axis. Because these measurements take place close to the workpiece, deviations through torsion are almost completely avoided.

AMO measuring systems are inductive systems, i.e. no magnetic or optical components are used. AMO systems have the advantage of a high accuracy/speed, direct mounting without own bearing (no additional friction/heating and largest hollow shaft) and no encapsulation (IP67 standard) is required. The measuring unit is not magnetic and therefore completely resistant to electromagnetic interference fields.

Open system

myonic has developed the new generation of absolute measuring heads and has consciously openly designed this development. All manufacturers and users are able to procure these systems directly from AMO.
This guarantees that all users can access the systems without limitations; no ties to an individual roller bearing manufacturer are made when deciding on a measuring head.

Measuring accuracy

System accuracy:

Accuracy of the completely assembled angle measuring device only on the AXRY bearing.

Mainly influenced through:

- The pitch accuracy of the measuring ring (±3 µm or ±5 µm)
- Eccentricity error of the measuring ring (1/2 radial runout inner ring)
- Interpolation error of the measuring head (IPF-AMO)

Total accuracy:

Accuracy of the completely assembly angle measuring device in the machine axis.

Mainly influenced through:

- Deformation of the axis (tilting etc.)
- Form and dimension deviations in the customer shaft and adjacent construction
- Installation error

The larger the bearings are, the more easily can high system accuracies be realised. Using multi-head solutions, accuracies of less than +/- 1 arcsec have been realised in practical applications.
The heads are available with different input frequencies so that ultra precision applications and high speed applications can be covered.

General

Available systems

Measuring systems can be mounted on most axial-radial bearings of the construction series AXRY-EX/AXRY-EX-S and AXRY-ES.

The following systems are available:

- Incremental systems (MI) as single and multi-head solution, as miniature head with external electronics or with heads with integrated electronics.
- Absolute systems (MA) as single and multi-head solution as modular head. This can be mounted axially or radially. In case of radial assembly, it is mounted on the shell surface on the bearing outer ring.
  This means that the complex adjustment of the air gap between the head and measuring ring are no longer required.

Due to the height of the measuring ring of 10 mm incremental or 14 mm absolute, the construction heights increase for the smaller bearings.
Details are specified in the product areas.

Function, incremental vs. absolute systems

The measuring ring permanently mounted on the bearing contains a measuring track and a reference track. The measuring track represents the measuring embodiment, into which a high precision periodic pitch is photolithographically etched. These graduation marks or increments are counted by the head as they pass by, whereby the absolute position is unclear.
On incremental systems, these are obtained through a distance code on the reference track. By driving over 2 neighbouring reference tracks, the system is able to determine the absolute position. The necessary angle is dependent on size; generally less than 30°.
On absolute systems, a second absolute pitch division runs in parallel next to the incremental pitch division, which constantly supplies the control system with a constant, absolute position.

Connection to control system/electronics

myonic cooperates closely with AMO regarding all measuring system electronics. In this way, the connection to very different control systems, cable outlets, cable lengths, feedthroughs etc. can be efficiently fixed.
Prototype solutions are realised short-term.
The best know-how bearers for mechanics and electronics are available from a single source.

Delivery condition

myonic supplies bearings with mounted measuring rings; the measuring heads can be directly procured via AMO. If required, just the bearings can be supplied, appropriately prepared to hold measuring rings.

Product chapter AXRY-EX-M/EX-S-M/-ES-M

Bearing with incremental angular measurement system MI

Through the purely inductive measuring system, maximum system accuracies smaller than +/- 2 µm discharge length can be realised.

The measuring system consists of a solid measure with incremental code as well as a measuring head with a sensor and the analogue-digital evaluation electronics.

Depending on the requirements, a single or multi-head scanner can be used, whereby the measuring ring is mounted directly on the bearing inner ring (MI150) or on the axial washer (MI160).

The integrated measuring systems are available for sizes 150 to 650. In the size range 200 to 650, the bearing main dimensions accord with the AXRY-EX standard design, in the case of the sizes 150 and 180, the construction height is higher (Details in the product data sheet).

Here the measuring head is integrated in the adjacent construction or the central distance plate directly on the outer ring.

Characteristics:

- Can be mounted on an inner ring or axial washer (on request)
- Bearing main dimensions mainly accord with the AXRY standard
- Available from size 150 to 650 mm
- Incremental coding
- Minimal installation dimensions through miniature measuring head
- Special solutions for smaller types available on request
- Single and multi-head scanner for maximum accuracies
- Elimination of eccentricity and radial runout errors during multi-head scanning
- Resistant to dirt IP67
- Resistant to magnetic interference fields
- High accuracy and resolution
- Working temperature -10 °C to +100 °C
- Integrated reference pulse, also distance-coded
- Analogue starting signals (1 VSS) with subdivided signal period up to 15 µm
- Digital output RS-422/TTL with resolution up to 0.125 µm discharge length

The bearings are prepared for mounting up to 2 measuring heads (axially or radially mountable on the outer ring).

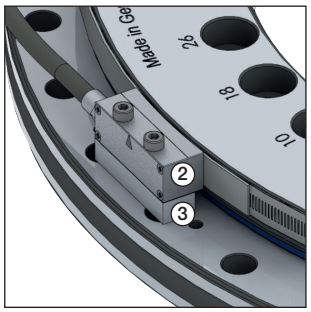
The required threads for assembly are located in the outer ring (axial and radial 2x each).

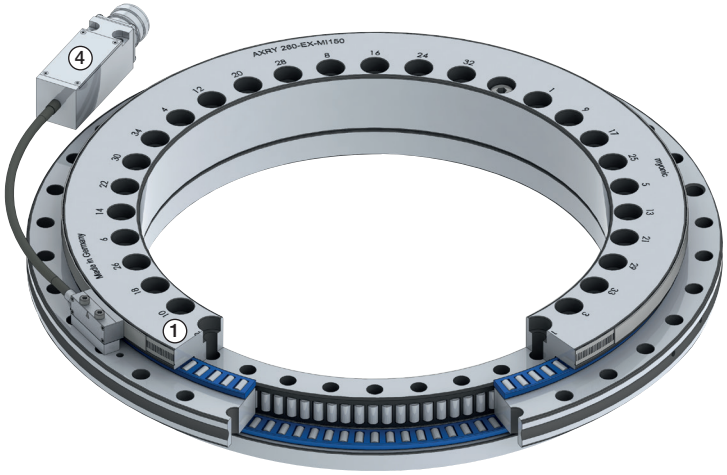
The distance plates can be ordered separately from AMO or myonic.

Bearing with incremental angular measurement system MI

Single head measurement (axial):

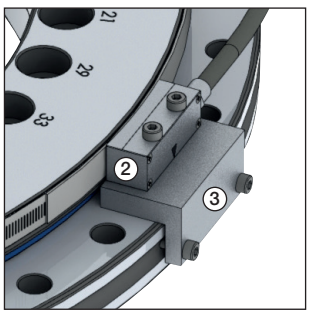
1 AXRY-EX-MI150
2 Measuring head
3 Distance plate
4 External evaluation electronics

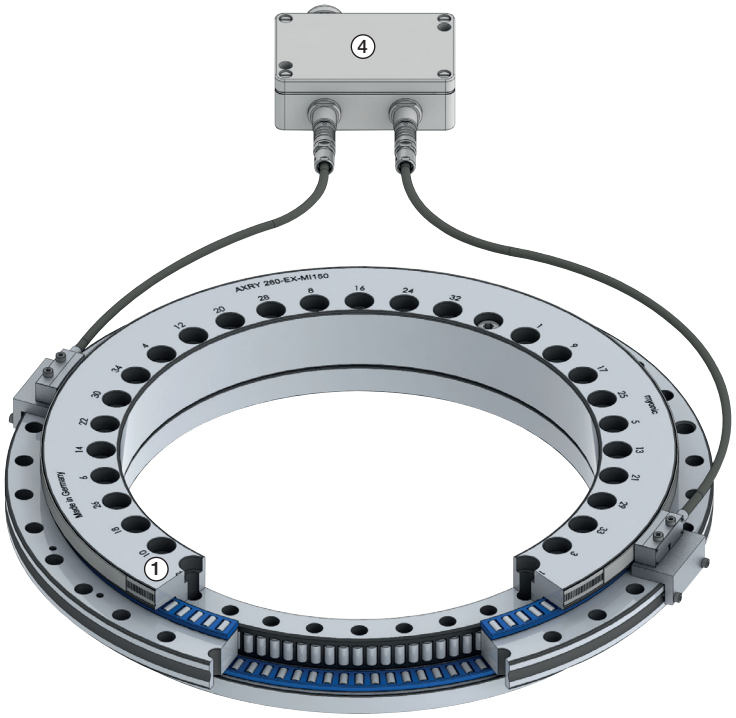




Double head measurement (radial):

1 AXRY-EX-MI150
2 Measuring head
3 Radial plate
4 MHS evaluation electronics





Product chapter AXRY-EX-M/EX-S-M/-ES-M

Bearing with absolute angular measurement system MA

With the purely inductive measuring system, maximum system accuracies up to +/- 1 µm discharge length can be realised.

The measuring system consists of a solid measure with incremental code as well as a measuring head with a sensor and the evaluation electronics.

Depending on the requirements, a single or multi-head scanner can be used, whereby the measuring ring is mounted directly on the bearing inner ring (MA150) or on the axial washer (MA160).

The integrated measuring systems are available for the sizes 150 to 650. In the size range 395 to 650, the bearing main dimensions accord with the standard design AXRY-EX, for the sizes 150 and 325, the construction height is larger (details in the product data sheet).

The measuring head is mounted directly on the outer ring; the fastening can take place radially or axially. During radial assembly, the clearance adjustment takes place via the shell diameter of the outer ring; complex setup of the measuring gap is no longer required.

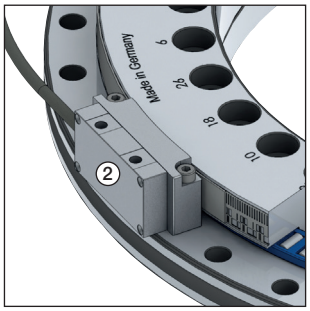
Characteristics:

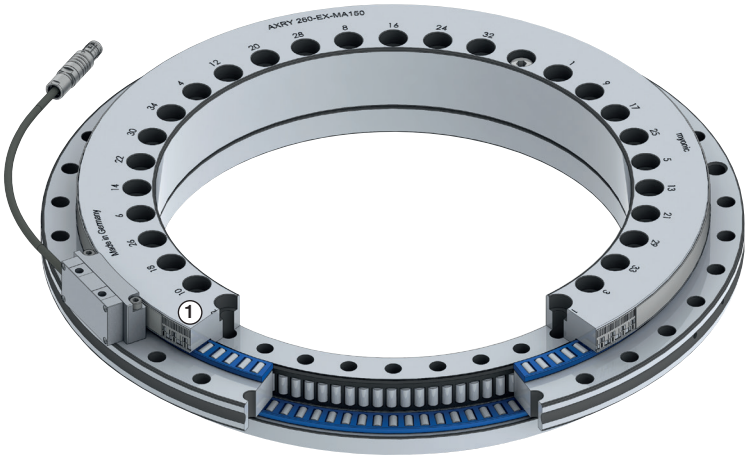
- Can be mounted on the inner ring or axial washer (on request)
- Bearing main measurements mainly accord with the AXRY standard
- Available from size 150 to 650 mm
- Absolute coding
- Special solutions for smaller types available on request
- Single and multi-head scanner for maximum accuracies
- Elimination of eccentricity and radial runout errors during multi-head scanning
- Resistant to dirt IP67
- Resistant to magnetic interference fields
- High accuracy and resolution
- Working temperature -10 °C to +100 °C
- Interfaces to most CNC control systems, direct cooperation with AMO for a fast connection

Bearing with absolute angular measurement system MA

Single head measurement (axial):

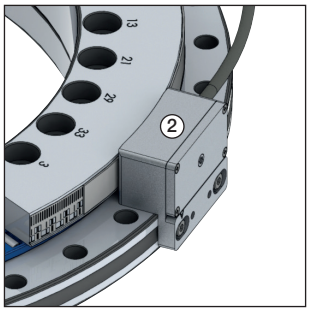
1 AXRY-EX-MA150
2 Measuring head (axial)

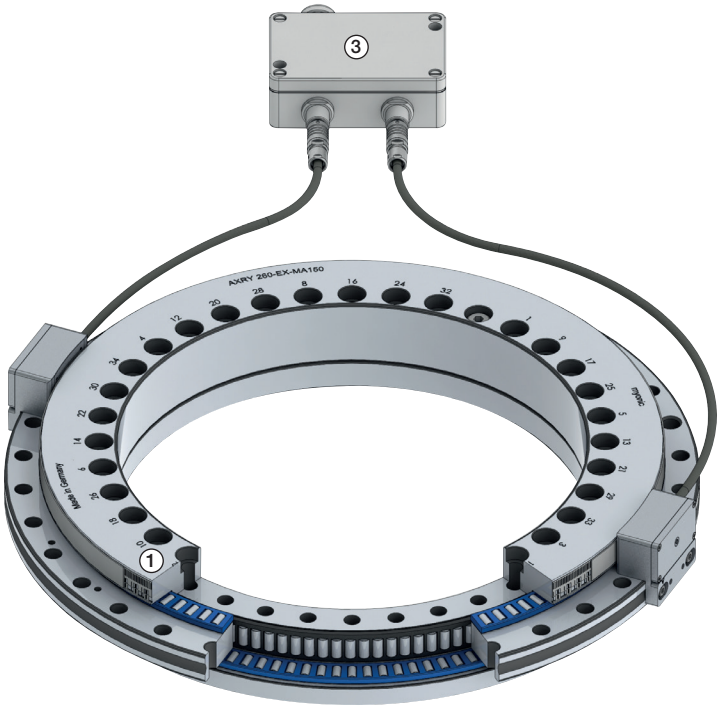




Double head measurement (radial):

1 AXRY-EX-MA150
2 Measuring head (radial)
3 MHSA evaluation electronics





Order designation

Designation system — Bearing — Measuring system

AXRY 260 - EX - S - 2Z - PRR50 - H1 - H2 - AC - JXXXX - L120 - MI150 - A - 3 - 500 - K

Construc-tion series

Bore
in mm

Bearing type
EX = Standard
ES = High-speed

Standard speed:
(only for EX)

Seal:
Without = No seal
AZ = Axial washer, sealed
IZ = Inner ring, sealed
2Z = Sealed on 2 sides

Accuracy requirements:
Without = Standard accuracy requirement
PRR50 = Axial and radial runout tolerances Restricted (for EX-S and ES standard series PRR50)

Connection dimension H1:
Without = Standard tolerance
H1= Restricted connection dimension H1

Connection dimension H2:
Without = Standard tolerance
H2 = Restricted connection dimension H2

Bearing preload:
Without = Standard alignment
AC = Alignment for supported L-section ring

Design:
Without = Catalogue design
JXXXX = Customer-specific design
(number is issued by myonic)

Lubrication:
Without = Standard grease
L120 = Bearing ungreased, only preserved
(e.g. for oil lubrication)
GXXX = Special grease
(number is issued by myonic)

Reference marks:
K = Distance-coded
(only possible for MI150 and MI160)
RI = 1 reference mark
(only possible for MI150 and MI160)

Graduation period:
500 = 500 µm
(only possible for MI150 and MI160)
1000 = 1000 µm
3000 = 3000 µm
(only possible for MI150 and MI160)

Graduation accuracy:
3 = ± 3 µm
5 = ± 5 µm
10 = ± 10 µm

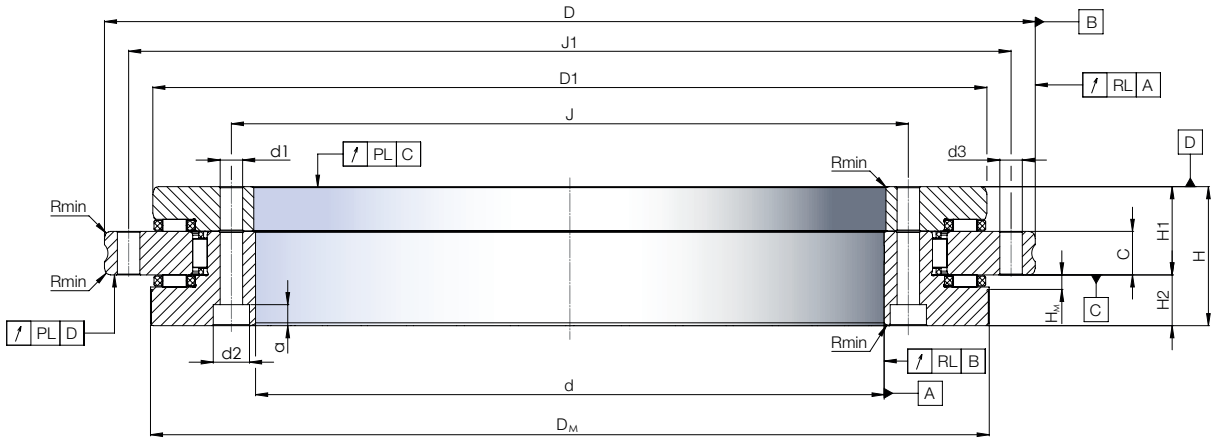
Position of the reference mark:
I = Reference mark inside
(only possible for MI150 and MI160)
A = Reference mark outside
(only possible for MI150 and MI160)

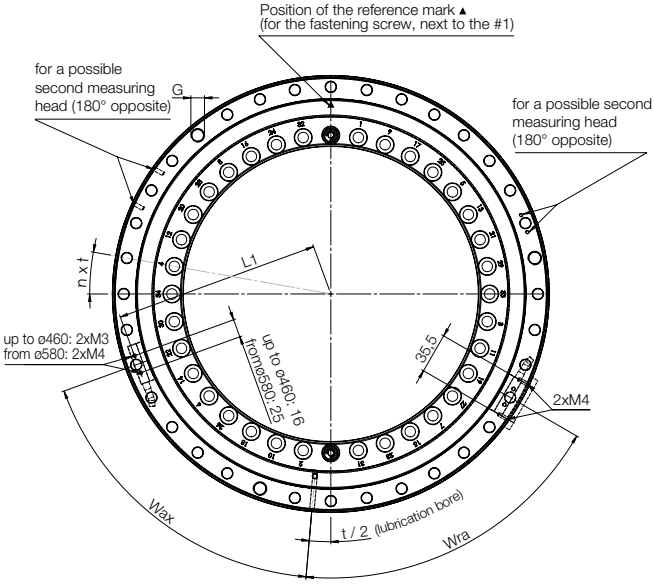
Design and mounting of measuring ring:
MI150 = Incremental on the inner ring
MI160 = Incremental on the axial washer
MA150 = Absolute on the inner ring
MA160 = Absolute on the axial washer

For further technical details or special designs, please contact myonic application engineering.

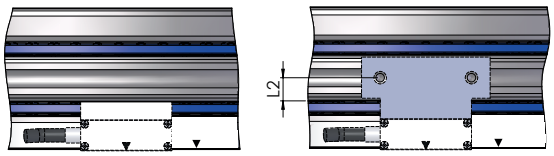
Dimensions table AXRY-EX-MI150

(Standard design with incremental measuring ring on the inner ring)

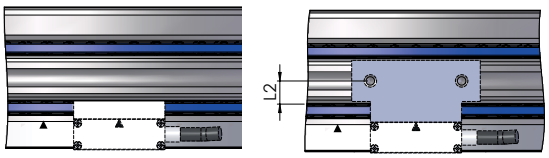




Reference mark ▾ outside (suffix -A)



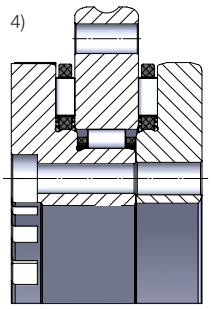
Reference mark ▲ inside (suffix -I)

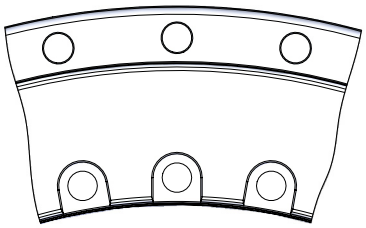


Measuring heads and support plates only represented symbolically (not included in scope delivery)

Designation	Weight	Dimensions [mm]															
	m [kg]	d	Δd	D	ΔD	H	H1	ΔH1	ΔH1 restricted	H2	ΔH2 restricted	C	D1 max	J	J1	D_M	H_M
AXRY 150-EX-MI150	7.1	150	-0.013	240	-0.015	47[8]	26	± 0.175	± 0.03	21[8]	± 0.02	12	214	165	225	214.4	6
AXRY 180-EX-MI150	8.5	180	-0.013	280	-0.018	50[8]	29	± 0.175	± 0.03	21[8]	± 0.025	15	244	194	260	245.0	6
AXRY 200-EX-MI150	10.4	200	-0.015	300	-0.018	45	30	± 0.175	± 0.03	15	± 0.025	15	274	215	285	274.2	5
AXRY 260-EX-MI150	18.9	260	-0.018	385	-0.020	55	36.5	± 0.200	± 0.04	18.5	± 0.025	18	345	280	365	344.3	8
AXRY 325-EX-MI150[4]	25	325	-0.023	450	-0.023	60	40	± 0.200	± 0.05	20	± 0.025	20	415	342	430	415.0	8
AXRY 395-EX-MI150	33	395	-0.023	525	-0.028	65	42.5	± 0.200	± 0.05	22.5	± 0.025	20	486	415	505	484.4	8
AXRY 460-EX-MI150	45	460	-0.023	600	-0.028	70	46	± 0.225	± 0.06	24	± 0.03	22	560	482	580	558.2	10
AXRY 580-EX-MI150	89	580	-0.025	750	-0.035	90	60	± 0.250	± 0.075	30	± 0.03	30	700	610	720	700.9	15
AXRY 650-EX-MI150	170	650	-0.038	870	-0.050	122	78	± 0.250	± 0.1	44	± 0.03	34	800	680	830	796.4	21

4)





1) Including fastening screws or extraction thread.

2) Tightening torque for screws acc. DIN 912, strength class 10.9.

3) Attention! For fixing holes in the adjacent construction. Observe the pitch of the bearing bores.

4) Screw counterbores in large L-ring open to bearing bore. Bearing inside diameter is not supported in this area.

5) Please enquire in case of high speed applications.

6) Measurement speed n_{const} = 5 rpm

7) Measured on installed bearing with ideal adjacent construction.

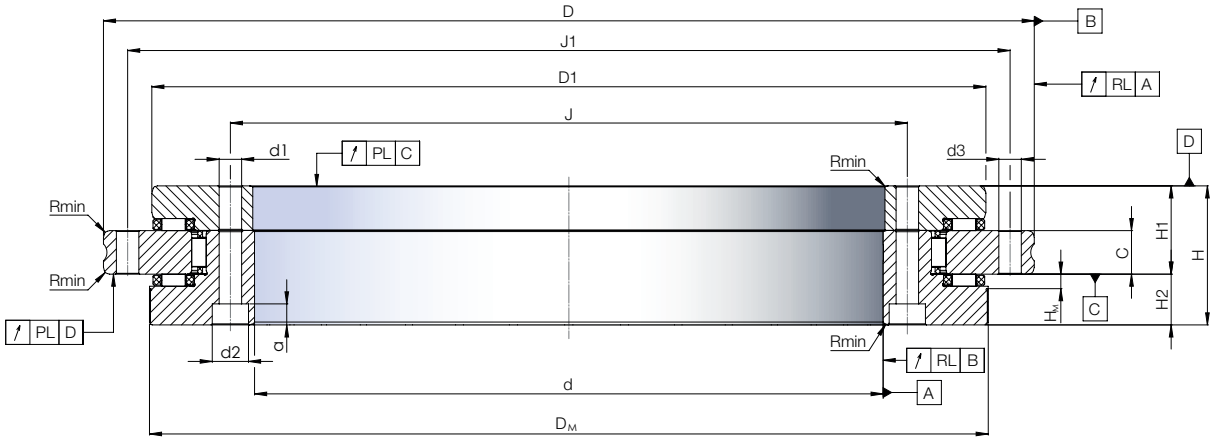
8) Dimensions deviating from the AXRY-EX.

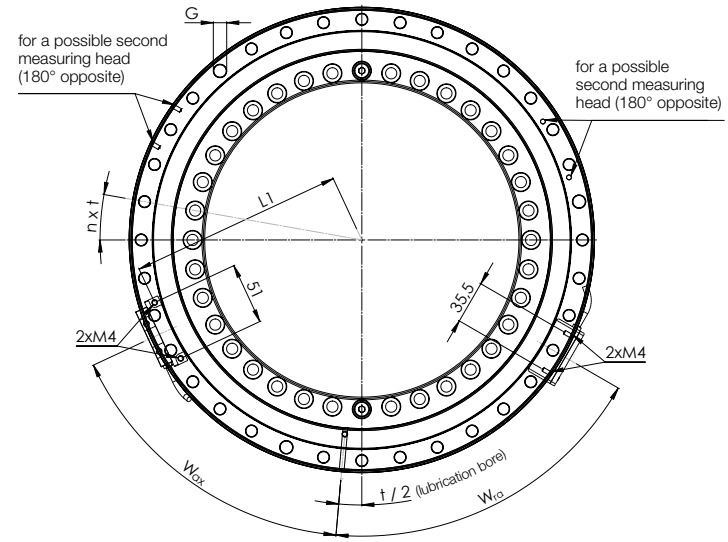
Designation	Fixing holes													
	Inner ring				Outer ring								Number x Pitch	Screw tightening torque
							Extraction thread		Fastening thread for measuring head					
	d1	d2	a	Number[3]	d3	Number[3]	G	Number	L1	W_{ax}	L2	W_{ra}	nxt[1]	M_A[2] [Nm]
AXRY 150-EX-MI150	7	11	6.4	34	7	33	M8	3	116.3	55°	6	65°	36 x 10°	14
AXRY 180-EX-MI150	7	11	6.4	46	7	45	M8	3	131.6	56.25°	7.5	63.75°	48 x 7.5°	14
AXRY 200-EX-MI150	7	11	6.4	46	7	45	M8	3	146.2	56.25°	7.5	63.75°	48 x 7.5°	14
AXRY 260-EX-MI150	9.3	15	8.6	34	9.3	33	M12	3	181.3	60°	9	65°	36 x 10°	34
AXRY 325-EX-MI150[4]	9.3	15	8.1	34	9.3	33	M12	3	216.6	55°	10	65°	36 x 10°	34
AXRY 395-EX-MI150	9.3	15	8.6	46	9.3	45	M12	3	251.3	60°	10	63.75°	48 x 7.5°	34
AXRY 460-EX-MI150	9.3	15	8.6	46	9.3	45	M12	3	288.2	56.25°	11	63.75°	48 x 7.5°	34
AXRY 580-EX-MI150	11.4	18	10.6	46	11.4	42	M12	6	367.3	56.25°	15	63.75°	48 x 7.5°	68
AXRY 650-EX-MI150	14	20	12.6	46	14	42	M12	6	420.0	56.25°	17	63.75°	48 x 7.5°	116

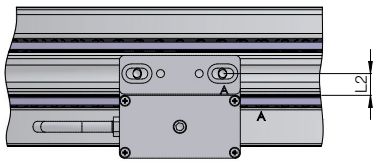
Designation	Load ratings				Limiting speed [5]	Bearing friction torque[6]	Axial runout & radial runout[7]		Rigidity of the bearing position			Min. corner radius	Measuring ring		
	Axial		Radial		Grease	Grease	Standard	Restricted	Axial	Radial	Tilting rigidity		Grad.mark./ 360°	Pitch accuracy	
	dyn. C_a [kN]	stat. C_{0a} [kN]	dyn. C_r [kN]	stat. C_{0r} [kN]	n_G [rpm]	M_{RL} [Nm]	PL & RL [µm]	PL & RL [µm]	C_{al} [kN/µm]	C_{rl} [kN/µm]	C_{kl} [kNm/mrad]	R_{min} [mm]	with 500 µm pitch	wih ±3µm	with ±5µm
AXRY 150-EX-MI150	100.4	720.7	68.4	185	1000	7	3	1.5	6.1	3.7	28.4	0.8	1344	5.8"	9.6"
AXRY 180-EX-MI150	112.8	880.9	74	215	900	8	4	2	9.3	4.3	58	1	1536	5.1"	8.4"
AXRY 200-EX-MI150	117.6	961	98.5	282.7	800	9	4	2	7.2	4.6	53.9	1	1720	4.5"	7.5"
AXRY 260-EX-MI150	131.9	1201	112.8	367.7	650	13	6	3	10.7	5.9	131.2	1	2160	3.6"	6.0"
AXRY 325-EX-MI150[4]	196.2	1875.5	123.9	441	520	20	6	3	12	6.6	212	1.2	2604	3.0"	5.0"
AXRY 395-EX-MI150	215	2227.1	136.1	528.9	450	25	6	3	15.1	7.8	375	1.2	3040	2.5"	4.2"
AXRY 460-EX-MI150	278.3	2905.1	146.5	608	400	37	6	3	15.7	8.9	512	1.2	3504	2.2"	3.7"
AXRY 580-EX-MI150	317.8	3712	173.2	726.3	250	67	10	5	22.3	10.1	1139	2	4400	1.8"	3.0"
AXRY 650-EX-MI150	548.3	6086.1	417.1	1830.2	180	100	10	5	26.4	14.8	1796	2	5000	1.6"	2.6"

Dimensions table AXRY-EX-MA150

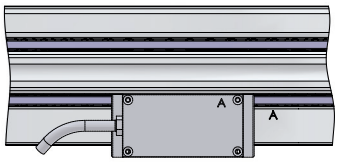
(Standard design with absolute measuring ring on the inner ring)





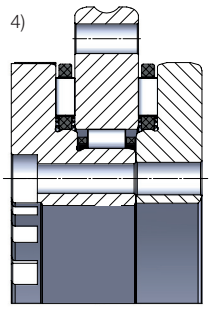


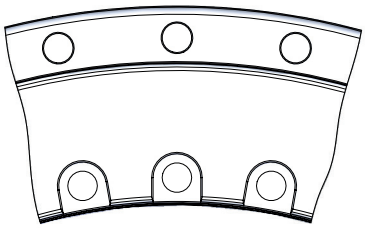
Measuring head only represented symbolically (not included in scope of delivery)



Designation	Weight	Dimensions [mm]															
	m [kg]	d	Δd	D	ΔD	H	H1	ΔH1	ΔH1 restricted	H2	ΔH2 restricted	C	D1 max	J	J1	D_M	H_M
AXRY 150-EX-MA150	7.1	150	-0.013	240	-0.015	47[8]	26	± 0.175	± 0.03	21[9]	± 0.02	12	214	165	225	214.5	6
AXRY 180-EX-MA150	8.5	180	-0.013	280	-0.018	50[8]	29	± 0.175	± 0.03	21[8]	± 0.025	15	244	194	260	245.1	6
AXRY 200-EX-MA150	10.4	200	-0.015	300	-0.018	51[8]	30	± 0.175	± 0.03	21[9]	± 0.025	15	274	215	285	274.3	6
AXRY 260-EX-MA150	18.9	260	-0.018	385	-0.020	57.5[8]	36.5	± 0.200	± 0.04	21[9]	± 0.025	18	345	280	365	346.9	6
AXRY 325-EX-MA150[4]	25	325	-0.023	450	-0.023	61[8]	40	± 0.200	± 0.05	21[9]	± 0.025	20	415	342	430	415.1	6
AXRY 395-EX-MA150	33	395	-0.023	525	-0.028	65	42.5	± 0.200	± 0.05	22.5	± 0.025	20	486	415	505	487.7	6
AXRY 460-EX-MA150	45	460	-0.023	600	-0.028	70	46	± 0.225	± 0.06	24	± 0.03	22	560	482	580	560.9	9
AXRY 580-EX-MA150	89	580	-0.025	750	-0.035	90	60	± 0.250	± 0.075	30	± 0.03	30	700	610	720	699.7	9
AXRY 650-EX-MA150	170	650	-0.038	870	-0.050	122	78	± 0.250	± 0.1	44	± 0.03	34	800	680	830	799.0	21

4)





1) Including fastening screws or extraction thread.

2) Tightening torque for screws acc. DIN 912, strength class 10.9.

3) Attention! For fixing holes in the adjacent construction. Observe the pitch of the bearing bores.

4) Screw counterbores in large L-ring open to bearing bore. Bearing inside diameter is not supported in this area.

5) Please enquire in case of high speed applications.

6) Measurement speed n_{const} = 5 rpm

7) Measured on installed bearing with ideal adjacent construction.

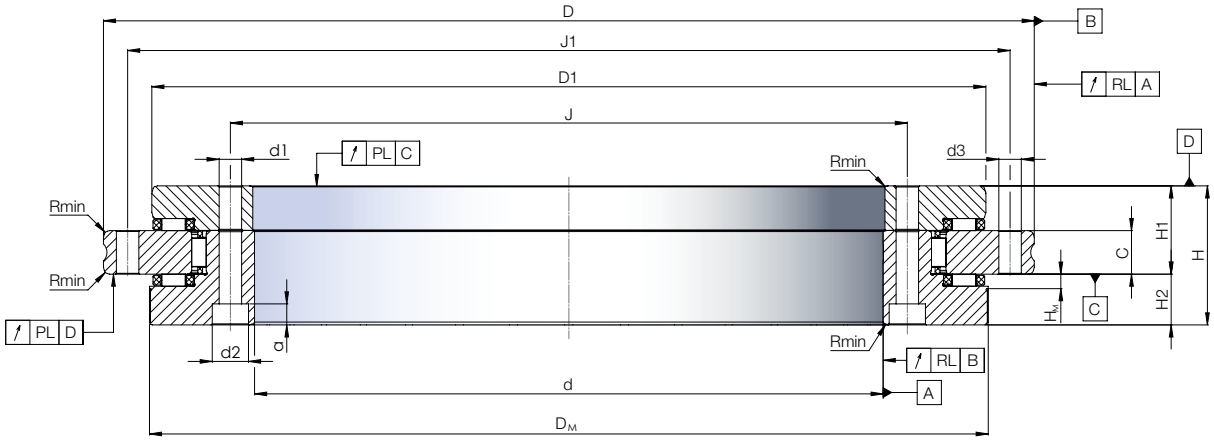
8) Dimensions deviating from the AXRY-EX.

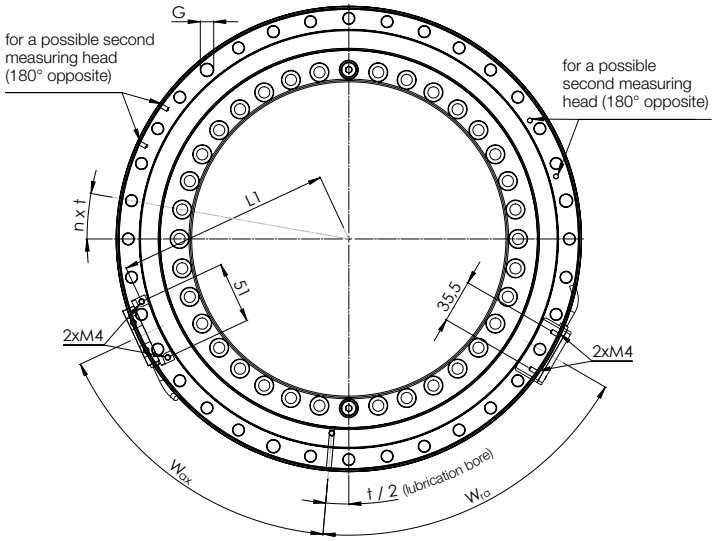
Designation	Fixing holes													
	Inner ring				Outer ring								Number x Pitch	Screw tightening torque
							Extraction thread		Fastening thread for measuring head					
	d1	d2	a	Number[3]	d3	Number[3]	G	Number	L1	W_{ax}	L2	W_{ra}	nxt[1]	M_A[2] [Nm]
AXRY 150-EX-MA150	7	11	6.4	34	7	33	M8	3	111.7	55°	6	65°	36 x 10°	14
AXRY 180-EX-MA150	7	11	6.4	46	7	45	M8	3	127.0	56.25°	7.5	63.75°	48 x 7.5°	14
AXRY 200-EX-MA150	7	11	6.4	46	7	45	M8	3	141.6	56.25°	7.5	63.75°	48 x 7.5°	14
AXRY 260-EX-MA150	9.3	15	8.6	34	9.3	33	M12	3	177.2	60°	9	65°	36 x 10°	34
AXRY 325-EX-MA150[4]	9.3	15	8.6	34	9.3	33	M12	3	212.5	55°	10	65°	36 x 10°	34
AXRY 395-EX-MA150	9.3	15	8.6	46	9.3	45	M12	3	249.0	60°	10	63.75°	48 x 7.5°	34
AXRY 460-EX-MA150	9.3	15	8.6	46	9.3	45	M12	3	285.6	56.25°	11	63.75°	48 x 7.5°	34
AXRY 580-EX-MA150	11.4	18	10.6	46	11.4	42	M12	6	355.0	56.25°	15	63.75°	48 x 7.5°	68
AXRY 650-EX-MA150	14	20	12.6	46	14	42	M12	6	404.7	56.25°	17	63.75°	48 x 7.5°	116

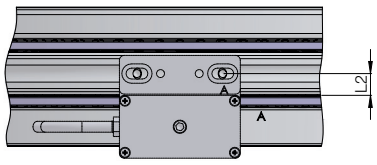
Designation	Load ratings				Limiting speed [5]	Bearing friction torque[6]	Axial runout & radial runout[7]		Rigidity of the bearing position			Min. corner radius	Measuring ring		
	Axial		Radial		Grease	Grease	Standard	Restricted	Axial	Radial	Tilting rigidity		Grad.mark./ 360°	Pitch accuracy	
	dyn. C_a [kN]	stat. C_{0a} [kN]	dyn. C_r [kN]	stat. C_{0r} [kN]	n_G [rpm]	M_{RL} [Nm]	PL & RL [µm]	PL & RL [µm]	C_{al} [kN/µm]	C_{rl} [kN/µm]	C_{kl} [kNm/mrad]	R_{min} [mm]	with 1000 µm-pitch	with ±3µm	with ±5µm
AXRY 150-EX-MA150	100.4	720.7	68.4	185	1000	7	3	1.5	6.1	3.7	28.4	0.8	672	5.8"	9.6"
AXRY 180-EX-MA150	112.8	880.9	74	215	900	8	4	2	9.3	4.3	58	1	768	5.1"	8.4"
AXRY 200-EX-MA150	117.6	961	98.5	282.7	800	9	4	2	7.9	4.6	59.6	1	860	4.5"	7.5"
AXRY 260-EX-MA150	131.9	1201	112.8	367.7	650	13	6	3	11	5.9	135	1	1088	3.6"	6.0"
AXRY 325-EX-MA150[4]	196.2	1875.5	123.9	441	520	20	6	3	12.1	6.6	215	1.2	1302	3.0"	5.0"
AXRY 395-EX-MA150	215	2227.1	136.1	528.9	450	25	6	3	15.1	7.8	375	1.2	1530	2.5"	4.2"
AXRY 460-EX-MA150	278.3	2905.1	146.5	608	400	37	6	3	15.7	8.9	512	1.2	1760	2.2"	3.7"
AXRY 580-EX-MA150	317.8	3712	173.2	726.3	250	67	10	5	22.3	10.1	1139	2	2196	1.8"	3.0"
AXRY 650-EX-MA150	548.3	6086.1	417.1	1830.2	180	100	10	5	26.4	14.9	1796	2	2508	1.6"	2.6"

Dimensions table AXRY-EX-S-MA150

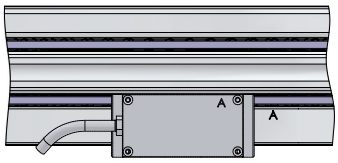
(Standard speed design with absolute measuring ring on inner ring)





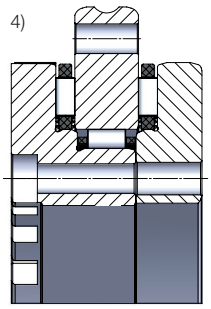


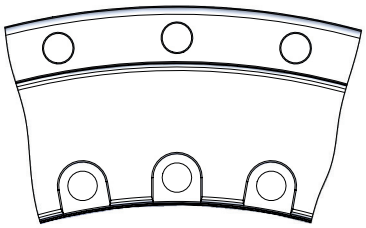
Measuring head only represented symbolically (not included in scope of delivery)



Designation	Weight	Dimensions [mm]															
	m [kg]	d	Δd	D	ΔD	H	H1	ΔH1	ΔH1 restricted	H2	ΔH2 restricted	C	D1 max	J	J1	D_M	H_M
AXRY 150-EX-S-MA150	7.1	150	-0.013	240	-0.015	47[7]	26	± 0.175	± 0.03	21[7]	± 0.02	12	214	165	225	214.5	6
AXRY 180-EX-S-MA150	8.5	180	-0.013	280	-0.018	50[7]	29	± 0.175	± 0.03	21[7]	± 0.025	15	244	194	260	245.1	6
AXRY 200-EX-S-MA150	10.4	200	-0.015	300	-0.018	51[7]	30	± 0.175	± 0.03	21[7]	± 0.025	15	274	215	285	274.3	6
AXRY 260-EX-S-MA150	18.9	260	-0.018	385	-0.020	57.5[7]	36.5	± 0.200	± 0.04	21[7]	± 0.025	18	345	280	365	346.9	6
AXRY 325-EX-S-MA150[4]	25	325	-0.023	450	-0.023	61[7]	40	± 0.200	± 0.05	21[7]	± 0.025	20	415	342	430	415.1	6
AXRY 395-EX-S-MA150	33	395	-0.023	525	-0.028	65	42.5	± 0.200	± 0.05	22.5	± 0.025	20	486	415	505	487.7	6
AXRY 460-EX-S-MA150	45	460	-0.023	600	-0.028	70	46	± 0.225	± 0.06	24	± 0.03	22	560	482	580	560.9	9
AXRY 580-EX-S-MA150	89	580	-0.025	750	-0.035	90	60	± 0.250	± 0.075	30	± 0.03	30	700	610	720	699.7	9
AXRY 650-EX-S-MA150	170	650	-0.038	870	-0.050	122	78	± 0.250	± 0.1	44	± 0.03	34	800	680	830	799.0	21

4)





1) Including fastening screws or extraction thread.

2) Tightening torque for screws acc. DIN 912, strength class 10.9.

3) Attention! For fixing holes in the adjacent construction. Observe the pitch of the bearing bores.

4) Screw counterbores in large L-ring open to bearing bore. Bearing inside diameter is not supported in this area.

5) Measurement speed n_{const} = 5 rpm

6) Measured on the installed bearing with ideal adjacent construction.

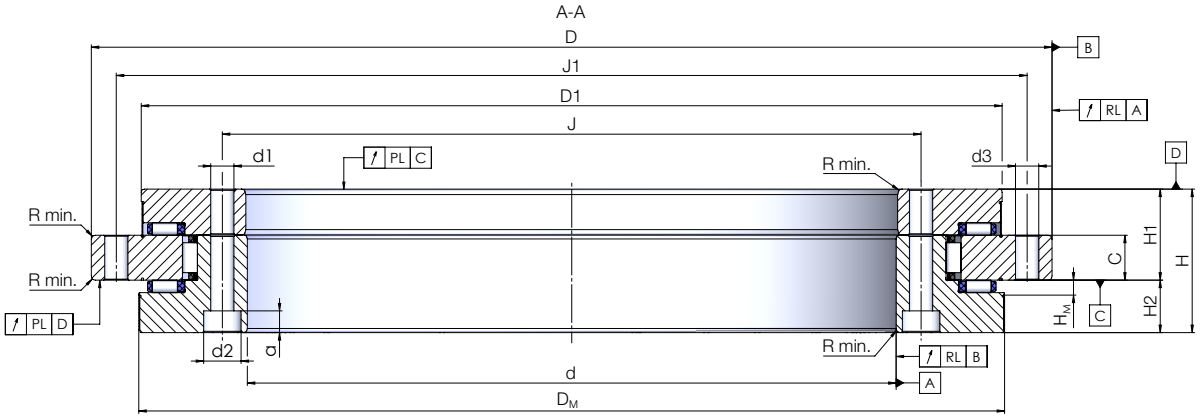
7) Dimension deviating from AXRY-EX-S.

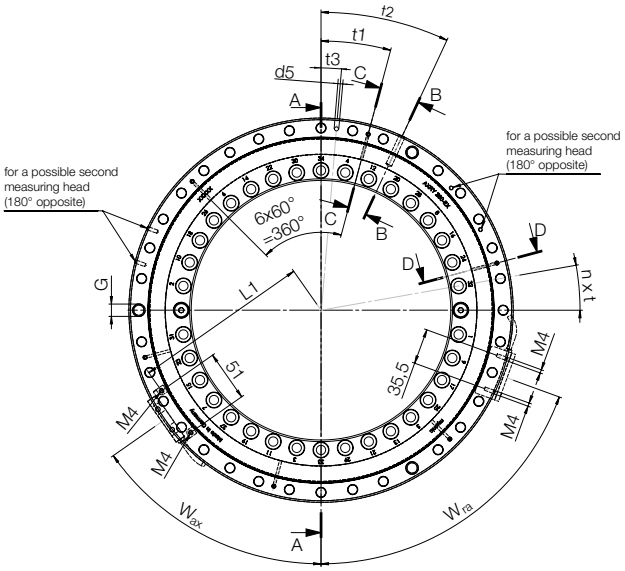
Designation	Fixing holes													
	Inner ring				Outer ring								Number x Pitch	Screw tightening torque
							Extraction thread		Fastening thread for measuring head					
	d1	d2	a	Number[3]	d3	Number[3]	G	Number	L1	W_{ax}	L2	W_{ra}	nxt[1]	M_A[2] [Nm]
AXRY 150-EX-S-MA150	7	11	6.4	34	7	33	M8	3	111.7	55°	6	65°	36 x 10°	14
AXRY 180-EX-S-MA150	7	11	6.4	46	7	45	M8	3	127.0	56.25°	7.5	63.75°	48 x 7.5°	14
AXRY 200-EX-S-MA150	7	11	6.4	46	7	45	M8	3	141.6	56.25°	7.5	63.75°	48 x 7.5°	14
AXRY 260-EX-S-MA150	9.3	15	8.6	34	9.3	33	M12	3	177.2	60°	9	65°	36 x 10°	34
AXRY 325-EX-S-MA150[4]	9.3	15	8.6	34	9.3	33	M12	3	212.5	55°	10	65°	36 x 10°	34
AXRY 395-EX-S-MA150	9.3	15	8.6	46	9.3	45	M12	3	249.0	60°	10	63.75°	48 x 7.5°	34
AXRY 460-EX-S-MA150	9.3	15	8.6	46	9.3	45	M12	3	285.6	56.25°	11	63.75°	48 x 7.5°	34
AXRY 580-EX-S-MA150	11.4	18	10.6	46	11.4	42	M12	6	355.0	56.25°	15	63.75°	48 x 7.5°	68
AXRY 650-EX-S-MA150	14	20	12.6	46	14	42	M12	6	404.7	56.25°	17	63.75°	48 x 7.5°	116

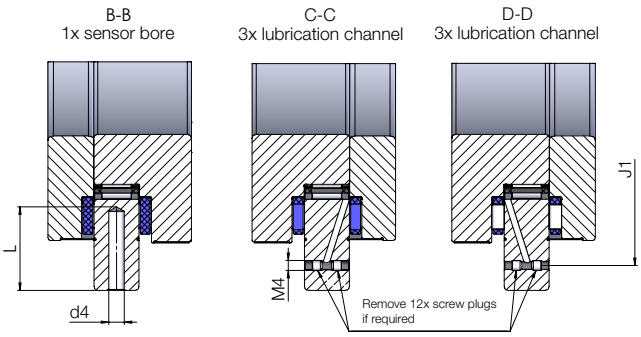
Designation	Load ratings				Limiting speed		Bearing-friction torque[5]	Axial & radial runout[6]	Rigidity of the bearing position			Min. corner radius	Measuring ring		
	Axial		Radial		Oil	Grease	Grease	Standard	Axial	Radial	Tilting rigidity		Grad.mark./ 360°	Pitch accuracy	
	dyn. C_a [kN]	stat. C_{0a} [kN]	dyn. C_r [kN]	stat. C_{0r} [kN]	n_G [rpm]	n_G [rpm]	M_{RL} [Nm]	PL & RL [µm]	C_{al} [kN/µm]	C_{rl} [kN/µm]	C_{kl} [kNm/mrad]	R_{min} [mm]	with 1000 µm pitch	with ±3µm	with ±5µm
AXRY 150-EX-S-MA150	74.1	480.5	41	93.5	1800	1600	4.2	1.5	5.6	2.5	25.2	0.8	672	5.8"	9.6"
AXRY 180-EX-S-MA150	82.5	580.6	44	107.5	1600	1400	4.8	2	7.7	2.6	48.7	1	768	5.1"	8.4"
AXRY 200-EX-S-MA150	85.7	630.6	59	143.8	1400	1200	5.4	2	7	3	54.1	1	860	4.5"	7.5"
AXRY 260-EX-S-MA150	96.4	790.8	67.1	183.9	1200	1000	7.8	3	9.2	3.7	121.2	1	1088	3.6"	6.0"
AXRY 325-EX-S-MA150[4]	143.1	1230.8	74	222	1000	800	12	3	10.1	4.2	184	1.2	1302	3.0"	5.0"
AXRY 395-EX-S-MA150	157.1	1465.2	81.3	265.9	800	680	15	3	12.7	5	324	1.2	1530	2.5"	4.2"
AXRY 460-EX-S-MA150	203.7	1916.5	87.1	304	700	600	22	3	13.4	5.9	446	1.2	1760	2.2"	3.7"
AXRY 580-EX-S-MA150	232.1	2441.1	103	363.2	450	350	40	5	18.7	6.4	982	2	2196	1.8"	3.0"
AXRY 650-EX-S-MA150	400.5	4004	249	920.3	350	250	60	5	21.8	9.7	1517	2	2508	1.6"	2.6"

Dimensions table AXRY-ES-MA150

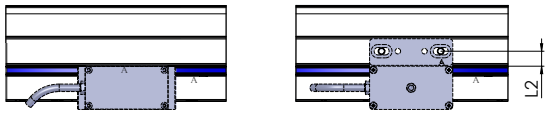
(extended speed design with absolute measuring ring on the inner ring)





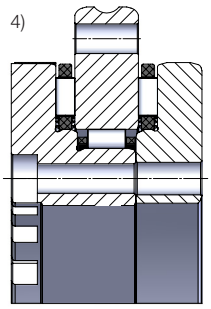


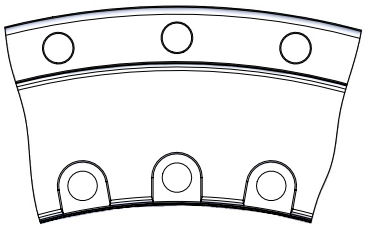
Measuring head only represented symbolically (not included in scope of delivery)



Designation	Weight	Dimensions [mm]																					
	m	d	Δd	D	ΔD	H	H1	ΔH1	ΔH1	H2	ΔH2	C	D1	J	J1	t1	t2	t3	d4	d5	L	D_M	H_M
	[kg]								restricted		restricted		max								~		
AXRY 150-ES-MA150	7.1	150	-0.013	240	-0.015	47[7]	26	± 0.175	± 0.03	21[7]	± 0.02	12	214	165	225	15°	25°	5°	4.2	5	24	214.5	6
AXRY 180-ES-MA150	8.5	180	-0.013	280	-0.018	50[7]	29	± 0.175	± 0.03	21[7]	± 0.025	15	244	194	260	18.75°	26.25°	11.25°	6.2	5	29.5	245.1	6
AXRY 200-ES-MA150	10.4	200	-0.015	300	-0.018	51[7]	30	± 0.175	± 0.03	21[7]	± 0.025	15	274	215	285	18.75°	26.25°	11.25°	6.2	5	26	274.3	6
AXRY 260-ES-MA150	18.9	260	-0.018	385	-0.020	57.5[7]	36.5	± 0.200	± 0.04	21[7]	± 0.025	18	345	280	365	15°	25°	5°	6.2	5	33.5	346.9	6
AXRY 325-ES-MA150[4]	25	325	-0.023	450	-0.023	61[7]	40	± 0.200	± 0.05	21[7]	± 0.025	20	415	342	430	15°	25°	5°	6.2	5	35.5	415.1	6
AXRY 395-ES-MA150	33	395	-0.023	525	-0.028	65	42.5	± 0.200	± 0.05	22.5	± 0.025	20	486	415	505	18.75°	26.25°	11.25°	6.2	5	37	487.7	6
AXRY 460-ES-MA150	45	460	-0.023	600	-0.028	70	46	± 0.225	± 0.06	24	± 0.03	22	560	482	580	18.75°	26.25°	11.25°	6.2	5	43	560.9	9
AXRY 580-ES-MA150	89	580	-0.025	750	-0.035	90	60	± 0.250	± 0.075	30	± 0.03	30	700	610	720	41.25°	48.75°	33.75°	12.2	8	48	699.7	9
AXRY 650-ES-MA150	170	650	-0.038	870	-0.050	122	78	± 0.250	± 0.1	44	± 0.03	34	800	680	830	41.25°	48.75°	33.75°	12.2	10	61.5	799.0	21

4)





1) Including fastening screws or extraction thread.

2) Tightening torque for screws acc. DIN 912, strength class 10.9.

3) Attention! For fixing holes in the adjacent construction. Observe the pitch of the bearing bores.

4) Screw counterbores in large L-ring open to bearing bore. Bearing inside diameter is not supported in this area.

5) Measurement speed n_{const} = 5 rpm

6) Measured on the installed bearing with ideal adjacent construction.

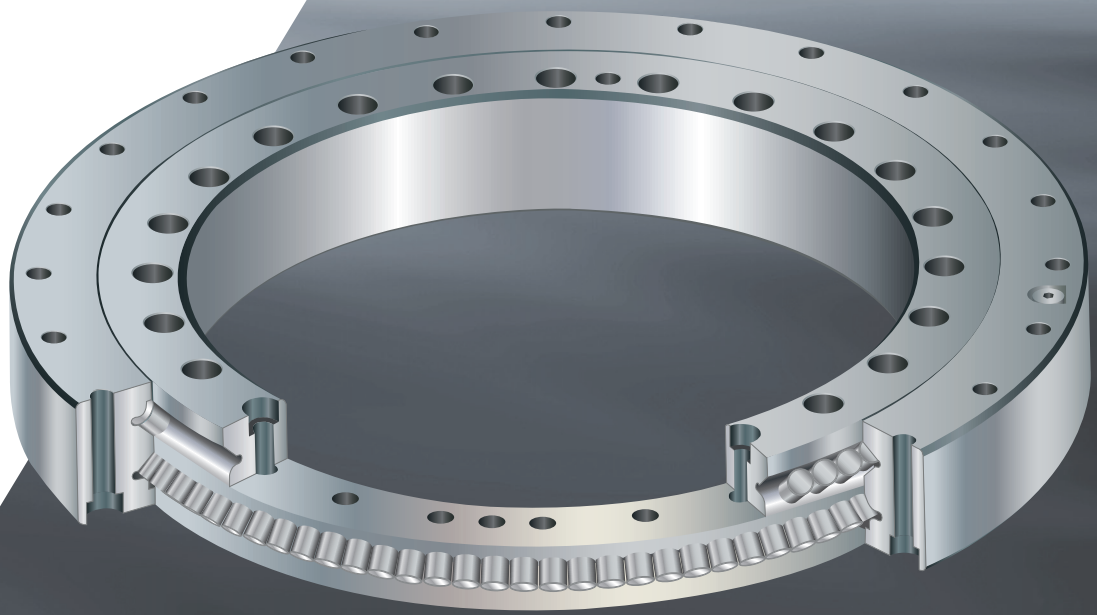
7) Dimension deviating from AXRY-ES.

Designation	Fixing holes													
	Inner ring				Outer ring								Number x Pitch	Screw tightening torque
							Extraction thread		Fastening thread for measuring head					
	d1	d2	a	Number[3]	d3	Number[3]	G	Number	L1	W_{ax}	L2	W_{ra}	nxt[1]	M_A[2] [Nm]
AXRY 150-ES-MA150	7	11	6.4	34	7	33	M8	3	111.7	50°	6	70°	36 x 10°	14
AXRY 180-ES-MA150	7	11	6.4	46	7	45	M8	3	127.0	52.5°	7.5	67.5°	48 x 7.5°	14
AXRY 200-ES-MA150	7	11	6.4	46	7	45	M8	3	141.6	52.5°	7.5	67.5°	48 x 7.5°	14
AXRY 260-ES-MA150	9.3	15	8.6	34	9.3	33	M12	3	177.2	55°	9	70°	36 x 10°	34
AXRY 325-ES-MA150[4]	9.3	15	8.6	34	9.3	33	M12	3	212.5	50°	10	70°	36 x 10°	34
AXRY 395-ES-MA150	9.3	15	8.6	46	9.3	45	M12	3	249.0	56.25°	10	67.5°	48 x 7.5°	34
AXRY 460-ES-MA150	9.3	15	8.6	46	9.3	45	M12	3	285.6	52.5°	11	67.5°	48 x 7.5°	34
AXRY 580-ES-MA150	11.4	18	10.6	46	11.4	42	M12	6	355.0	52.5°	15	67.5°	48 x 7.5°	68
AXRY 650-ES-MA150	14	20	12.6	46	14	42	M12	6	404.7	52.5°	17	67.5°	48 x 7.5°	116

Designation	Load ratings				Limiting speed		Bearing friction torque[5]	Axial & radial runout[6]	Rigidity of the bearing position			Min. corner radius	Measuring ring		
	Axial		Radial		Oil	Grease	Grease	Standard	Axial	Radial	Tilting rigidity		Grad.mark./ 360°	Pitch accuracy	
	dyn. C_a [kN]	stat. C_{0a} [kN]	dyn. C_r [kN]	stat. C_{0r} [kN]	n_G [rpm]	n_G [rpm]	M_{RL} [Nm]	PL & RL [µm]	C_{al} [kN/µm]	C_{rl} [kN/µm]	C_{kl} [kNm/mrad]	R_{min} [mm]	with 1000 µm pitch	with ±3µm	with ±5µm
AXRY 150-ES-MA150	74.1	480.5	41	93.5	1800	1600	4.2	1.5	5.6	2.5	25.2	0.8	672	5.8"	9.6"
AXRY 180-ES-MA150	82.5	580.6	44	107.5	1600	1400	4.8	2	7.7	2.6	48.7	1	768	5.1"	8.4"
AXRY 200-ES-MA150	85.7	630.6	59	143.8	1400	1200	5.4	2	7	3	54.1	1	860	4.5"	7.5"
AXRY 260-ES-MA150	96.4	790.8	67.1	183.9	1200	1000	7.8	3	9.2	3.7	121.2	1	1088	3.6"	6.0"
AXRY 325-ES-MA150[4]	143.1	1230.8	74	222	1000	800	12	3	10.1	4.2	184	1.2	1302	3.0"	5.0"
AXRY 395-ES-MA150	157.1	1465.2	81.3	265.9	800	680	15	3	12.7	5	324	1.2	1530	2.5"	4.2"
AXRY 460-ES-MA150	203.7	1916.5	87.1	304	700	600	22	3	13.4	5.9	446	1.2	1760	2.2"	3.7"
AXRY 580-ES-MA150	232.1	2441.1	103	363.2	450	350	40	5	18.7	6.4	982	2	2196	1.8"	3.0"
AXRY 650-ES-MA150	400.5	4004	249	920.3	350	250	60	5	21.8	9.7	1517	2	2508	1.6"	2.6"

Product chapter

AXDR



Product chapter AXDR

General

General

AXDR double row angular contact roller bearings are double direction, screw-on precision bearing units ready for installation for applications with high rigidity requirements such as rotary tables or milling heads. The bearing absorbs both axial and radial torques and tilting moments backlash-free.

AXDR bearings feature two raceways with tilted cylindrical rollers laid out in an O-arrangement. The pressure angle of 45° is ideal in order to absorb all the forces occurring in machine tools.

Bearing structure

AXDR bearings consist of 2 rings

- Inner ring
- Outer ring

The rollers are introduced via special axial filling openings in the bearing; these are sealed with a plug.
In contrast to radial filling holes, the raceway is not interrupted. This leads to accurate and smooth running of the bearings.

AXDR are filled with full complement (bearing type VX) or with spacers (bearing types SX/ES).

Applications

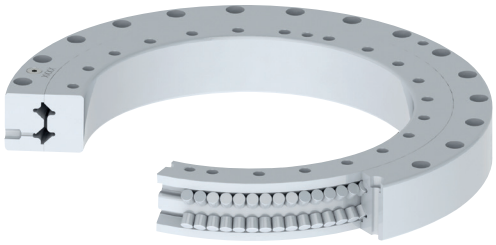
myonic AXDR double row angular contact roller bearings feature substantially higher performance capacities than most axial/radial bearings available on the market. Due to the high design strength, AXDR bearings are less sensitive to the surrounding construction; the bearings can be installed more easily.

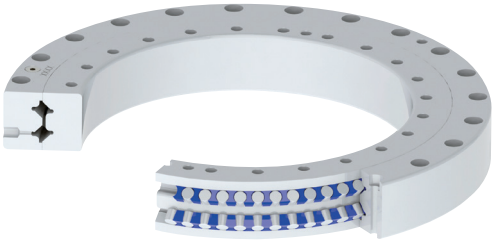
AXDR double row angular contact roller bearings are frequently used as an alternative to axial/radial bearings in rotary axes and milling heads.
A cross-comparison of the individual bearing construction series is presented in the general catalogue chapter.

Available designs

Bearing types

AXDR double row angular contact roller bearings have been designed for three different application areas, and are divided into the following bearing types:





- **VX:** Full-complement roller element sets achieve maximum rigidities.
  Due to the optimally-dimensioned end clearance between the individual cylindrical rollers, the friction torque remains low.

  The bearings are delivered pre-greased.

  The positions of the lubrication bores for relubrication are of a conventional design.

- **SX:** Special spacers are mounted between the rollers. These prevent the rollers rubbing against each other and reduce the bearing friction torque. In this way, the bearings of the construction series AXDR-SX increase speed endurance strength with an acceptable reduction of the load ratings and rigidities.

  The bearings are delivered pre-greased.
  Due to the low grease quantity required, controlled relubrication systems should be provided.

  The positions of the relubrication bores are of a conventional design.

Available designs

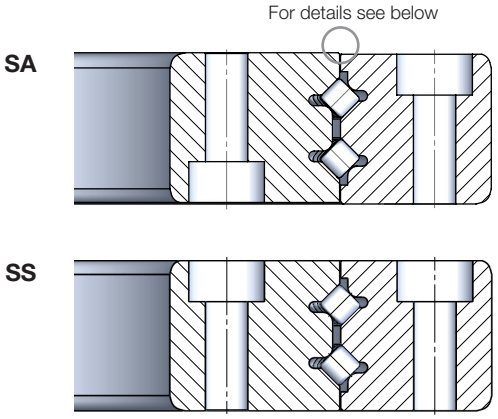
Fastening possibilities

The three main bearing types can be further configured within a modular system: due to their compact form with integrated assembly holes, AXDR double row angular contact roller bearings are particularly easy to assemble.
The drilling pattern shown and the countersunk hole design accord with the most common variations.

Standard fastening designs:

- SA: Counterbores opposite
- SS: Counterbores identical

Variations with through or threaded bores are available on request.

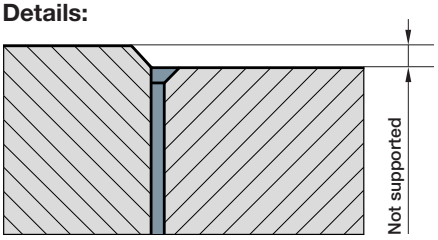


Construction height/clearance

The individual rings are always unsupported on the side of the cylinder counterbore by 0.2 mm, meaning that collisions in the fastening possibility "SA" are excluded.

If, on the other hand, the ring arrangement "SS" is selected, a total height of 0.2 mm less results as both the recessed cylinder counterbores are located on the same side.

Details:



SA

Specific bearing features

Seals

Double row angular contact roller bearings are delivered with a non-grinding gap seal. These seal reliably in normal environments and do not increase the friction torque.

Grinding seals are available on request as NBR or Viton seals which increase on the one hand the sealing effect, and on the other hand generate additional friction in the area of the seal contact surface.

For oil or oil/air lubrications, the seals can be adapted for controlled feed/discharge or distribution of the lubricant in the bearing.

Accuracies

AXDR bearings are supplied in the standard series with dimension tolerances P5 acc. DIN 620. The highly accurate hole and outer diameter designs permit the production of accurate fits and guides which are a great advantage in machine tools.

The running tolerances (axial and radial runout) are available in two classes: standard and constricted (PRR50).
These accord approximately with the tolerances P2 and UP.

Other tolerance limitations are available on request. For example, height tolerances and offset tolerances can be defined in the same way as accurate running torques.

Specific bearing features

Lubrication/excess lubrication

The initial filling takes place using a high-performance grease from a Li-special soap with a mixture of synthetic hydrocarbon oil and mineral oil.

The grease is a special easy-running grease with appropriate additives for the operation of preloaded roller bearings. Most conventional greases are not suitable for the operation of double row angular contact roller bearings, and generate excessively high friction in the bearings!

The run-in cycles during initial operation and after relubrication must be observed in particular. Overfilling of the bearing must be avoided; excessively high grease quantities generate higher levels of friction heat and increasing running torques, in particular at higher speeds.

Relubrication takes place radially via several lubrication channels in the outer ring. Lubrication channels in the inner ring are available as a special design. myonic application engineering is happy to help regarding further details on relubrication quantities or cycles, but also special lubrication procedures such as oil/air lubrication.

The bearings are only supplied with preservation for oil-lubricated applications (suffix L120). Fuchs Anticorit 5F is used as a preservative oil. This can easily be mixed with most oils and greases.

Surface treatment

myonic double row angular contact roller bearings are offered in the standard series without surface treatment.

Measuring system

AXDR bearings cannot be offered with mounted measuring systems.
For applications with measuring systems, we recommend bearings from the AXRY-EX or AXRY-EX-S (ES) series.
These are available with incremental and absolute angle measurement systems.

Specific bearing features

Dimensions/fixing holes

All main dimensions such as the inner diameter, outer diameter, bearing height and the fixing screws are identical with those of other manufacturers.
myonic AXDR double row angular contact roller bearings feature further limited standard tolerances for the alignment of ultra high precision bearing seats.

The main dimensions and fixing holes represent the most common dimensions and define the standard.
Our application engineers are happy to provide further dimensions on request.

Calculation of rigidity

The rigidity calculation takes place under the following parameters:

- With application of a radial and axial load and a tilting torque
- With slight preloads
- With normal adjacent construction and screw connections acc. the information in the production chapter
- Identical FEM calculation procedures with precisely defined parameters were used across all product groups → The stated rigidity values in the product tables are directly comparable (AXRY vs. AXDR vs. AXCR)

An under-dimensioned, inaccurate adjacent construction reduces the rigidity of the bearing position substantially; on the other hand rigidities can also be increased through constructional support of the additional parts.

myonic application engineering is happy to assist in case of further enquiries or optimisations of your axes.

For further details, see the chapter "General calculation of rigidity".

Specific bearing features

Limiting speed/bearing friction torque

The limiting speed n_G stated in the dimensions table can be achieved for the selected taper roller bearing in swivel operation or in case of short-term continuous operation.
In case of prolonged operation in the area of the limiting speed, the bearing increasingly heats up. For thermally stable axes, a cooling system should discharge any friction heat generated.

We recommend oil/air lubrication for high speed applications. myonic application engineering is happy to assist with further details and possible limiting speeds.

The friction torque of double row angular contact roller bearings is influenced in particular through the selected preload. Higher preloads result in higher rigidities with simultaneously higher levels of friction.

The selected lubricants, in particular the viscosity and the filling quantity, have a direct influence on the friction. Standard pre-greased bearings are suitable for swivel operation and short continuous operation up to the limiting speed.

Metering systems are most suitable for relubrication purposes. In case of manual relubrication, there is a risk of overgreasing and thus an increase in the bearing friction torque.

During run-in or during relubrication, the appropriate run-in cycles must be adhered to. The specifications for the adjacent construction and surrounding parts must be adhered to!

Axial and radial runout

The undivided individual rings facilitate maximum radial runout and running accuracy. The narrow standard tolerances can be further constricted (suffix "PRR50").

Life time and load safety factor

Nominal life time

The calculation of the nominal life time takes place via special calculation programs. You are welcome to request our technical questionnaire for the purpose. The calculation itself is conducted by our employees in application engineering.

Calculations at myonic

The following is required for calculation:

- Details on application (drawings, sketches, technical specifications)
- Workpiece dimensions and weight
- Details on the load cycle (cutting forces, speeds, operating durations)

Static load safety factor

The static load safety factor S_0 describes the safety prior to unpermitted plastic deformations of the bearing components in the roller area.
In case of purely axial or radial forces, the static load safety can be inspected separately via the following formulas:

$$S_0 = \frac{C_{0r}}{F_{0r}} \quad \text{or} \quad S_0 = \frac{C_{0a}}{F_{0a}}$$

S_0 = Static load safety
(should be for machine tools >4!)
C_{0r} = Static load rating radial acc. dimensions tables [N]
C_{0a} = Static load rating axial acc. dimensions tables [N]
F_{0r} = Maximum static load of radial bearing [N]
F_{0a} = Maximum static load of axial bearing [N]

Static limiting load diagrams

Static limiting load diagrams

In most applications, tilting moments are added to the radial or axial forces.
With the aid of the following static limiting load diagrams, the correct bearing size can be rapidly selected. Here the required load safety factor S0 = 4 is already taken into account in the diagrams for the roller element set and the screw and bearing ring strength.

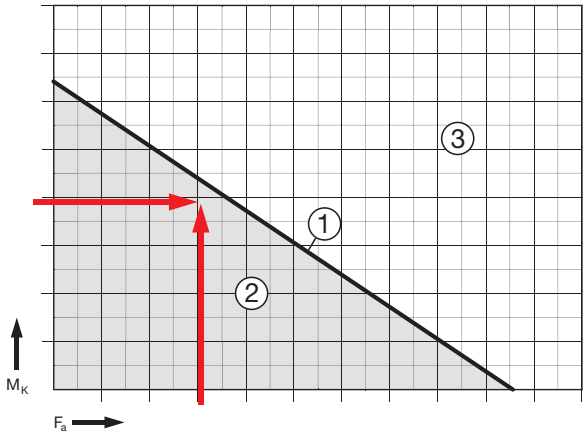
Advantages:

- Easy selection of the bearing size with mainly static load
- Determination of the possible tilting moment MK, which can be absorbed in addition to the axial load

Note:
AXDR double row angular contact roller bearings and AXRY axial-radial bearings have been calculated under the same framework conditions so that both bearing types are directly comparable with each other as long as the adjacent construction is designed acc. the myonic catalogue data.

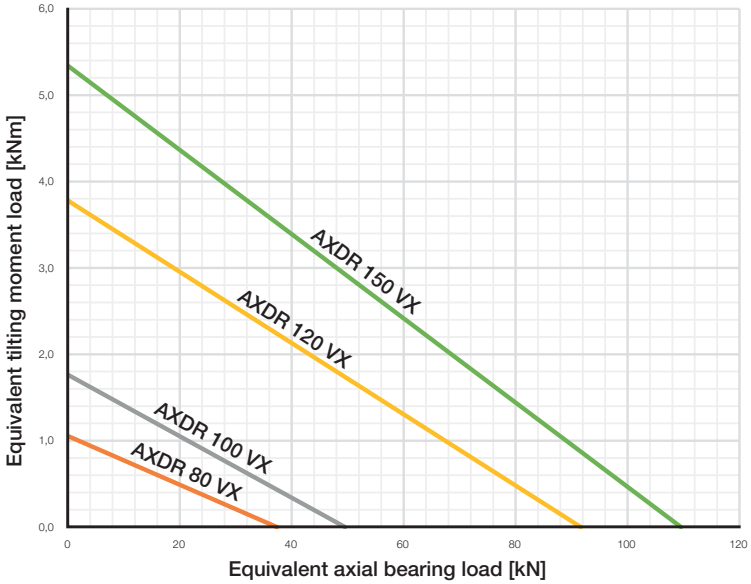
Example:
Static limiting load diagram for AXDR

1 Bearing/size
2 Permitted range
3 Unpermitted range
M_K Maximum tilting torque [kNm]
F_a Axial load [kN]

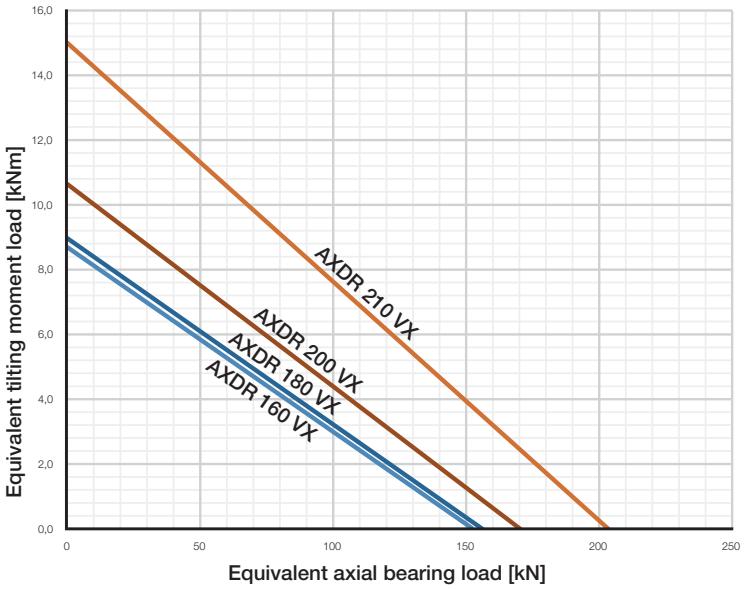


Static limiting load diagrams

Limiting load diagram double row angular contact roller bearing AXDR 80 VX to AXDR 150 VX

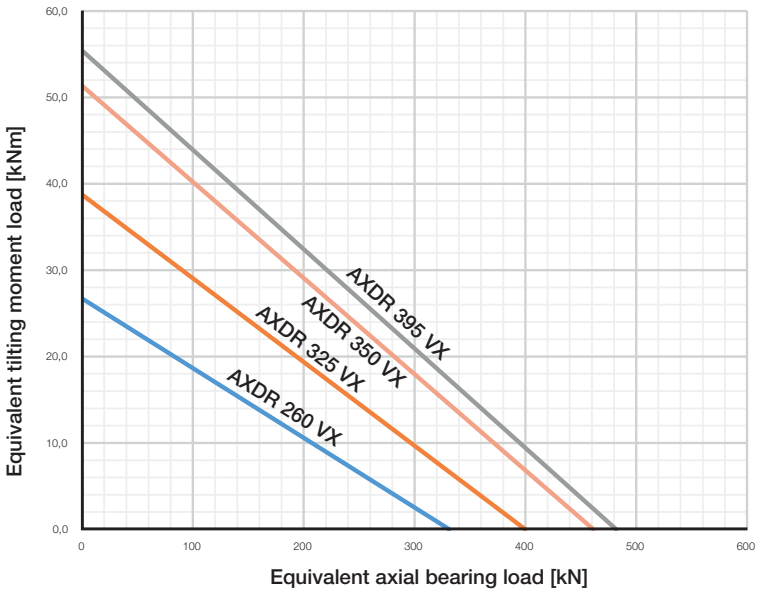


Limiting load diagram double row angular contact roller bearing AXDR 160 VX to AXDR 210 VX

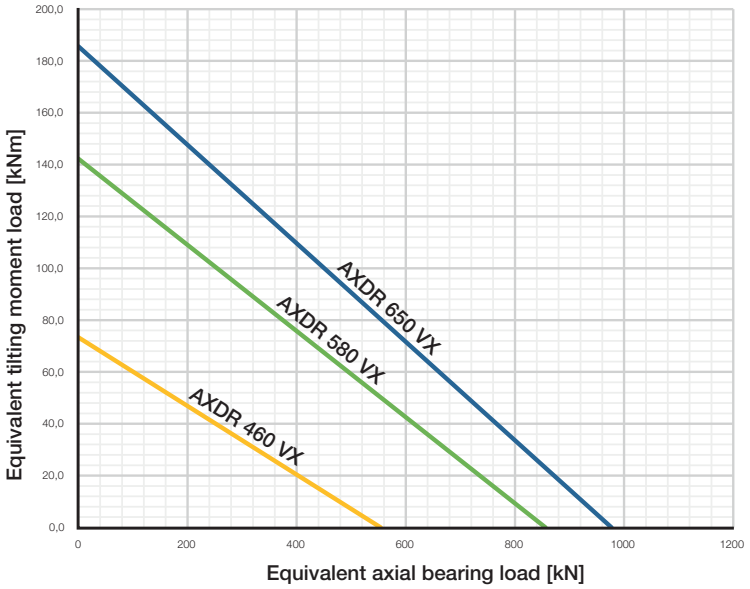


Static limiting load diagrams

Limiting load diagram double row angular contact roller bearing AXDR 260 VX to AXDR 395 VX



Limiting load diagram double row angular contact roller bearing AXDR 460 VX to AXDR 650 VX



Design of the adjacent construction

In the following sketches and tables, the design of the adjacent construction is described.
Pay particular attention to the connection areas, as any deviations will have an effect on the overall accuracy and the rigidities of the roller bearing.

In order to avoid a decline in bearing friction torque, accuracy requirements and running characteristics, the recommended tolerances may not be exceeded.

Press fit

If the fit is too constricted, the bearing preload increases, and thus…

…the following increases:

- The surface pressure in the raceway
- The bearing friction
- The bearing heat
- The amount of wear

…the following is reduced:

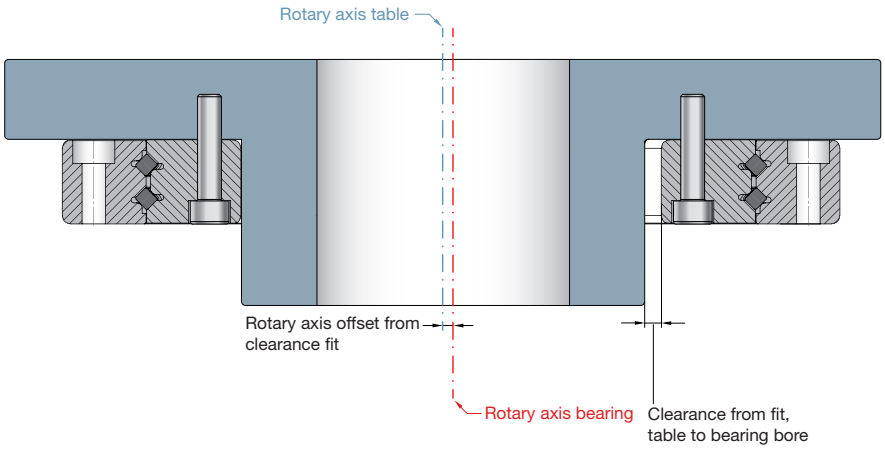
- The maximum speed
- The life time

Design of the adjacent construction

Clearance fit

If the rotating ring is not supported by interference fits, displacement of the rotation axes raceway to table centre is probable. The clearance from the fit table to bearing bore (also applies for the clearance bearing outer diameter to table with rotating outer ring) can add to the radial runout.

myonic-AXDR bearings are produced both in the hole and on the outer diameter with severely limited tolerances (acc. P5/ DIN 620). This facilitates the generation of accurate fits; the accuracy of the bearing is transferred onto the table.



In case of applications with subordinate accuracy requirements, rings can also be screwed in clearance fits.

Centred shafts/tables

Execution via a shaft clearance fit with centring of the rotary axis is possible.
Due to the solid rings, AXDR bearings are less sensitive to non-positive locking shafts than AXRY bearings.
A reduction in the rigidity of the axis and possible radial runout problems or a displacement of the rotation axis on overload must be accepted.

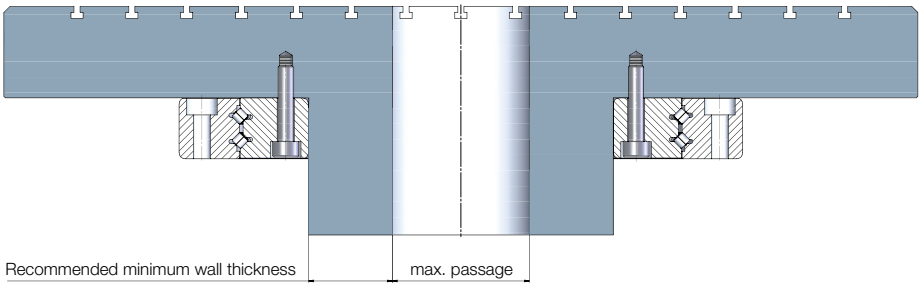
A radial runout measurement with centred tabletop and mounted measuring ball does not accord with the following catalogue values. During this accurately centred measurement, exclusively the radial runout of the raceways and the form errors of the measuring construction are measured.
If the measuring construction is executed precisely, the measured values are lower than the stated myonic radial runout values.

The myonic radial runout values include the radial runout errors of the raceway and the roundness of the bore.

Design of the adjacent construction

Minimum wall thicknesses

The wall thickness of the table adapter in the bearing bore (or on the outer diameter) must be appropriately large to exclude the risk of undefined operating conditions such as vibrations, errors in radial runout and repeatability etc.



Recommended minimum wall thicknesses

AXDR	Minimum wall thickness	Max. passage
50	12	26
80	12.5	55
100	15	70
120	16	88
150	16	118
160	24	112
180	16	148
200	18.5	163
210	30	150
260	21	218
325	23	279
350	33	284
395	23	349
460	25	410
580	30	520
650	37.5	575

Recommended fits, shaft

General

The accuracy of the fits and the geometrically-correct design of all adjacent parts have a direct effect on the accuracy requirements and the dynamic properties of the bearing and the table.
In case of maximum demands, limit the tolerances and fits accordingly.

Please observe the construction notes in the general catalogue chapter.

Rotating inner ring

On rotating shafts, the bearing inner ring is to be supported radially across its whole surface and the shaft is to be designed with a fit acc. h5.
In this way, the bore tolerance of the bearing generates a transition fit with a slight tendency to a clearance fit. In case of designs with clearance fits, see the notes in the chapter adjacent construction.

Higher requirement

Max. accuracy requirements:

For the maximum accuracy requirement with rotating inner ring, a clearance fit 0 must be targeted; existing clearance fits can add to the radial runout.

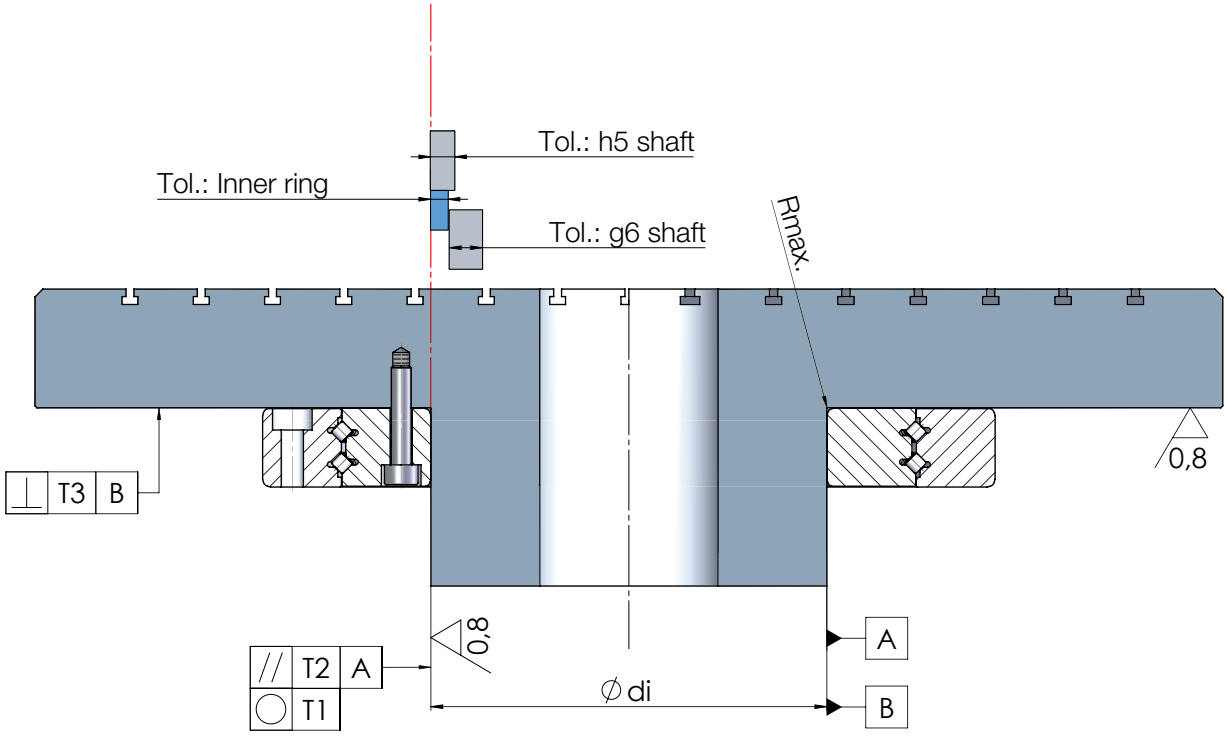
Higher dynamic characteristics:

In case of higher speeds (ndm > 35,000 mm/min) and prolonged operating durations (>10 %), an interference fit of 5 µm is not to be exceeded.

Stationary inner ring

Stationary, screwed inner rings do not require a special fit and can also be mounted with clearance to the shaft.
If the inner ring is centred, then please execute with shaft tolerance g6 and as fit h5 under maximum requirements.
Press fits are to be avoided due to the risk of an increase in bearing preload.

Recommended fits, shaft



				Stationary inner ring			Rotating inner ring					
double row angular contact roller bearings	Shaft Ø di [mm]	Tolerance zone Bearing inner Ø d [mm]		Tolerance zone g6 of the shaft Ø di [mm]		Roundness, parallelism, perpen-dicularity T1, T2, T3 [µm]	Tolerance zone h5 of the shaft Ø di [mm]		Roundness T1 [µm]	Parallelism T2 [µm]	Perpen-dicularity T3 [µm]	Maximum corner radius Rmax. [mm]
AXDR 80	80	0	-0.009	-0.010	-0.029	5	0	-0.013	3	1.5	3	0.1
AXDR 100	100	0	-0.010	-0.012	-0.034	6	0	-0.015	4	2	4	0.1
AXDR 120	120	0	-0.010	-0.012	-0.034	6	0	-0.015	4	2	4	0.1
AXDR 150	150	0	-0.013	-0.014	-0.039	8	0	-0.018	5	2.5	5	0.1
AXDR 160	160	0	-0.013	-0.014	-0.039	8	0	-0.018	5	2.5	5	0.1
AXDR 180	180	0	-0.013	-0.014	-0.039	8	0	-0.018	5	2.5	5	0.1
AXDR 200	200	0	-0.015	-0.015	-0.044	10	0	-0.020	7	3.5	5	0.1
AXDR 210	210	0	-0.015	-0.015	-0.044	10	0	-0.020	7	3.5	7	0.3
AXDR 260	260	0	-0.018	-0.017	-0.049	12	0	-0.023	8	4	7	0.3
AXDR 325	325	0	-0.023	-0.018	-0.054	13	0	-0.025	9	4.5	7	0.3
AXDR 350	350	0	-0.023	-0.018	-0.054	13	0	-0.025	9	4.5	7	0.3
AXDR 395	395	0	-0.023	-0.018	-0.054	13	0	-0.025	9	4.5	7	0.3
AXDR 460	460	0	-0.023	-0.020	-0.060	15	0	-0.027	10	5	7	0.3
AXDR 580	580	0	-0.025	-0.022	-0.066	17	0	-0.032	11	5.5	8	1
AXDR 650	650	0	-0.038	-0.024	-0.074	19	0	-0.036	13	6.5	10	1

Recommended fits, housing

General

The accuracy of the fits and the geometrically-correct design of all adjacent parts have a direct effect on the accuracy requirements and the dynamic properties of the bearing and the table. In case of maximum demands, limit the tolerances and fits accordingly.

Please observe the construction notes in the general catalogue chapter.

Outer ring stationary

It is possible to do without a fit in the housing or alternatively to have a G7 fit design. An outer ring diameter clearance fit to the housing makes assembly easier.

In case of higher dynamic requirements (ndm > 35,000 mm/min, prolonged operating duration) on the rotating shaft, maintain a minimum clearance of 20 µm for the fit seat of the outer ring to the housing.

Outer ring rotates

Normal requirement:

Execute the rotating housing with a J6 clearance; here a transition fit results with a slight tendency for clearance fit. Execute the fit seat across the entire height of the outer ring.

Higher requirement:

Max. accuracy requirement

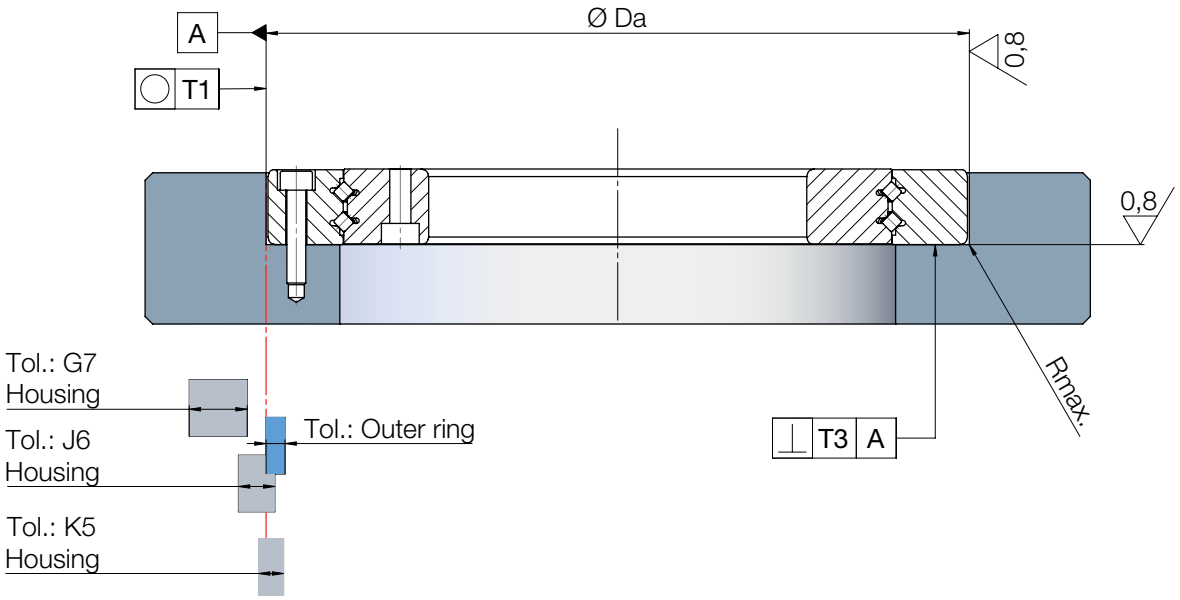
Execute the rotating housing with a J6 clearance. Alternatively, the housing can be designed with a G5 fit for a narrower fit.

This can more easily be mated with the tolerance zone of the bearing outer diameter in case of high requirements. This may make assembly more complex.
For maximum accuracy requirements, adjust the clearance fit to 0.

Higher dynamic characteristics:

In case of higher speeds (ndm > 35,000 mm/min) and prolonged operating durations, do not exceed an interference fit of 5 µm.

Recommended fits, housing



				Stationary outer ring			Rotating outer ring						
double row angular contact roller bearings	Housing Ø Da [mm]	Tolerance zone Bearing outer Ø D [mm]		Tolerance zone G7 of the housing Ø Da [mm]		Round-ness, perpendic-ularity T1, T3 [µm]	Tolerance zone J6 of the housing Ø Da [mm]		Tolerance zone K5 of the housing Ø Da [mm]		Round-ness T1 [µm]	Perpen-dicularity T3 [µm]	Maximum corner radius Rmax. [mm]
AXDR 80	146	0	-0.011	0.054	0.014	8	0.018	-0.007	0.003	-0.015	5	5	0.1
AXDR 100	185	0	-0.015	0.061	0.015	8	0.022	-0.007	0.002	-0.018	7	7	0.1
AXDR 120	210	0	-0.015	0.061	0.015	8	0.022	-0.007	0.002	-0.018	7	7	0.1
AXDR 150	240	0	-0.015	0.061	0.015	10	0.022	-0.007	0.002	-0.018	7	7	0.1
AXDR 160	295	0	-0.018	0.069	0.017	12	0.025	-0.007	0.003	-0.020	8	8	0.1
AXDR 180	280	0	-0.018	0.069	0.017	12	0.025	-0.007	0.003	-0.020	8	8	0.1
AXDR 200	300	0	-0.018	0.069	0.017	12	0.025	-0.007	0.003	-0.020	8	8	0.1
AXDR 210	380	0	-0.020	0.075	0.018	13	0.029	-0.007	0.003	-0.022	9	9	0.3
AXDR 260	385	0	-0.020	0.075	0.018	13	0.029	-0.007	0.003	-0.022	9	9	0.3
AXDR 325	450	0	-0.023	0.083	0.020	13	0.033	-0.007	0.002	-0.025	10	10	0.3
AXDR 350	540	0	-0.028	0.092	0.022	16	0.034	-0.010	0.000	-0.032	11	11	0.3
AXDR 395	525	0	-0.028	0.092	0.022	16	0.034	-0.010	0.000	-0.032	11	11	0.3
AXDR 460	600	0	-0.028	0.092	0.022	16	0.034	-0.010	0.000	-0.032	11	11	0.3
AXDR 580	750	0	-0.035	0.104	0.024	18	0.038	-0.012	0.000	-0.036	13	13	0.3
AXDR 650	870	0	-0.050	0.116	0.026	20	0.044	-0.012	0.000	-0.040	15	15	1

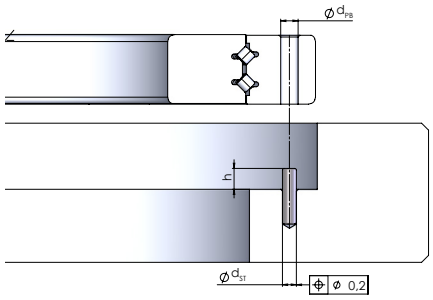
Positioning hole

For easy alignment of the outer ring, a positioning hole is offered for the construction series AXDR-ES.

Position of the positioning hole

In the following sketch, the cylinder counterbores lie at the top of the outer ring.

The pitches of the individual bearings are listed in the product data sheet in the table under Positioning hole.



Positioning hole design

Secure the positioning pins appropriately during assembly or remove them after assembly (e.g. threaded rods).

The pins must be reliably prevented from dropping out during operation.

Dimension the positioning pins remaining in the table with at least 4 mm pin height, from size 580 with at least 6 mm pin height. Maximum pin heights acc. table:

Positioning hole:

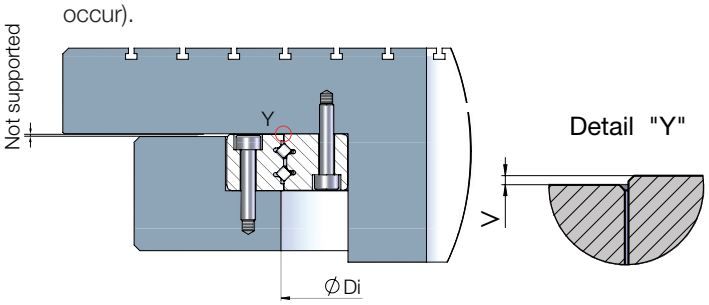
AXDR	Pin height h max. [mm]	Pin-Ø d_{ST} [mm]	Positioning hole d_{PB} min. [mm]
AXDR 50	-	-	-
AXDR 80	10	4	5
AXDR 100	10	4	5
AXDR 120	15	4	5
AXDR 150	15	4	5
AXDR 160	17.5	4	5
AXDR 180	20	4	5
AXDR 200	20	4	5
AXDR 210	20	4	5
AXDR 260	25	4	5
AXDR 325	25	4	5
AXDR 350	25	4	5
AXDR 395	25	4	5
AXDR 460	25	4	5
AXDR 580	30	6	8
AXDR 650	30	8	10

Recommended connection dimensions

For the connection dimensions, two cases must be considered:

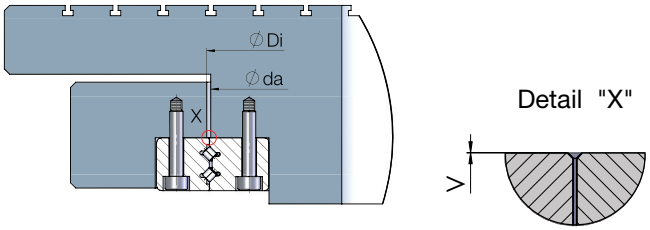
Fastening possibility SA

For the fastening possibility SA; there are no specified connection dimensions (as, due to the offset of the two rings to each other, no collision with the adjacent construction can occur).



Fastening possibility SS

For the fastening possibility SS, there is no offset between the inner and outer ring and therefore the specified table values apply here.
The diameter value Øda is a maximum value, and the diameter value ØDi is a minimum value.



double row angular contact roller bearings	Connection dimensions Øda Max. [mm]	Connection dimensions ØDi Min. [mm]
AXDR 80	106.5	114.5
AXDR 100	141.0	149.0
AXDR 120	160.4	168.4
AXDR 150	191.0	199.0
AXDR 160	223.7	231.7
AXDR 180	225.9	233.9
AXDR 200	246.0	254.0
AXDR 210	292.7	300.7
AXDR 260	318.4	326.4
AXDR 325	381.7	389.7
AXDR 350	439.4	447.4
AXDR 395	458.5	466.5
AXDR 460	525.3	533.3
AXDR 580	661.6	669.6
AXDR 650	753.3	761.3

Bearing rigidity

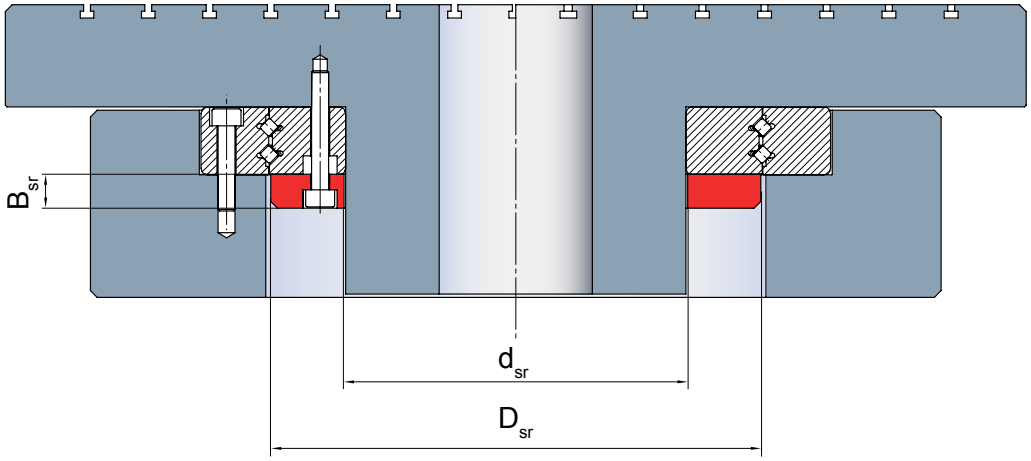
Supported rings/bearing preload

AXDR double row angular contact roller bearings are normally screwed on directly; the bearing rings are only supported on one side.

For higher static rigidities, the bearing ring can be supported on the opposite side.
In this way, the ring rigidity and the total rigidity of the bearing is increased.

If the bearing inner ring is supported across its whole surface by a support ring, the tilting rigidity of the bearing increases by approx. 10 to 15 %.
Depending on the installation situation, different preload alignments in the bearing are required.

Therefore it is very important for bearings with support ring to order with the suffix "AC".



Recommended dimensions of the support ring:

		AXDR														
Size:		80	100	120	150	160	180	200	210	260	325	350	395	460	580	650
Support ring	Inner Ø d_{sr} [mm]	82	102	122	152	162	182	202	212	262	327	352	397	462	582	652
	Outer Ø D_{sr} [mm]	109	143	163	193	226	228	248	295	320	383	441	460	527	663	755
	Width B_{sr} [mm]	15	15	23	23	26	30	30	30	38	38	38	38	38	45	45
	Flatness [µm]	3	4	4	5	5	5	7	8	8	9	9	9	10	11	13
	Surface	Ra 0.8														

Order designation

Designation system

AXDR 200VX - SA - PRR50 - AC - JXXXX - L120

Construc-tion series

Bore
in mm

Bearing type:
VX = Full complement
SX = Spacer
ES = Spacer + oil/air special holes

Fastening possibility:
SA = Grooves opposite
SS = Grooves identical
Others available on request

Lubrication:
Without = Standard grease
L120 = Bearing ungreased, only preserved (e.g. for oil lubrication)
Gxxx = Special grease (number is issued by myonic)

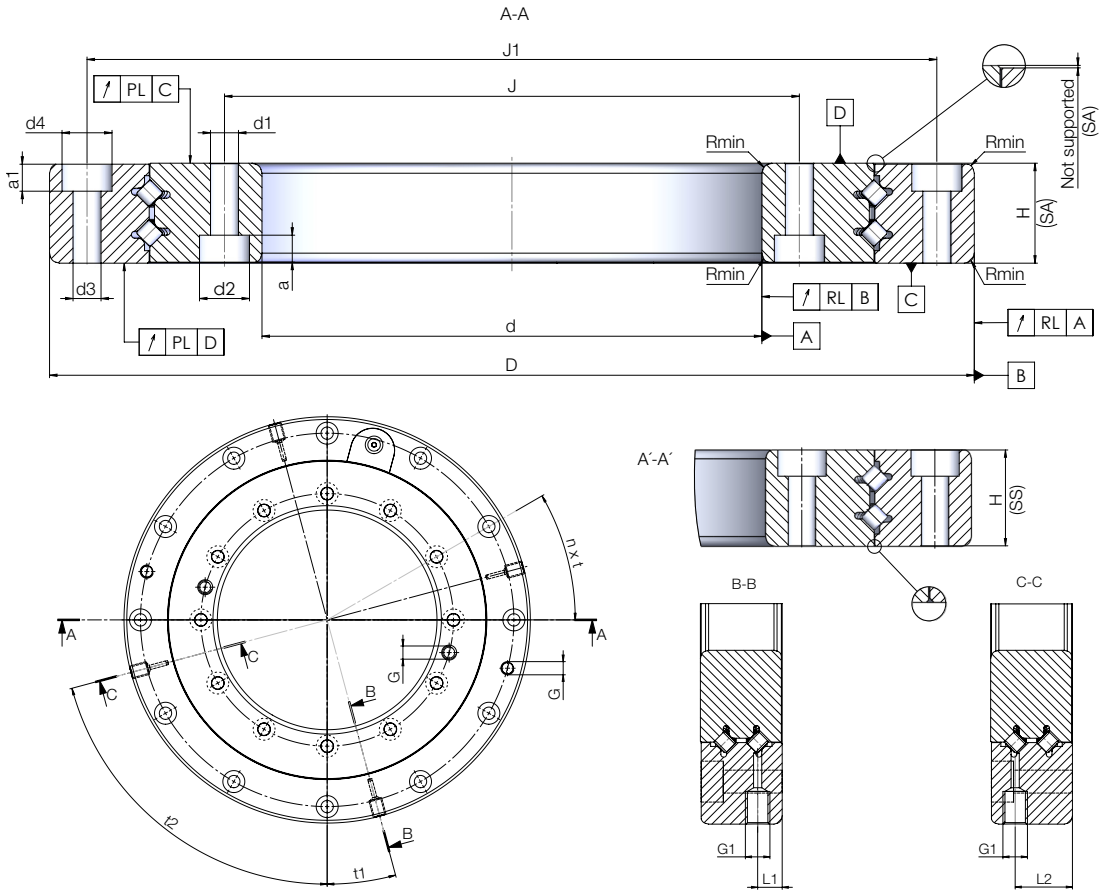
Design:
Without = Catalogue design
JXXXX= Customer-specific design (number is issued by myonic)

Bearing preload:
Without = Standard preload
AC = Bearing preload adapted for supported L-section ring
CC = Customer-specific bearing preload

Accuracy requirements:
Without = Standard accuracy requirement
PRR50 = Axial and radial runout tolerances restricted

Please contact myonic application engineering should you require further technical details or special designs.

Dimensions table AXDR___VX (full complement)



Designation	Weight	Dimensions [mm]													
	m	d	Δd	D	ΔD	H		ΔH	J	J1	t1	t2	G1	L1	L2
	[kg]					VX-SA	VX-SS								
AXDR 80VX	1.6	80	-0.009	146	-0.011	20	19.8	-0.075	93	133	22.5°	67.5°	M6	6	14
AXDR 100VX	2.7	100	-0.010	185	-0.015	20	19.8	-0.075	115	170	15°	75°	M6	6	14
AXDR 120VX	4.9	120	-0.010	210	-0.015	30	29.8	-0.075	138	192	15°	75°	M6	8	22
AXDR 150VX	5.8	150	-0.013	240	-0.015	30	29.8	-0.1	168	222	11.25°	78.75°	M6	8	22
AXDR 160VX	11.8	160	-0.013	295	-0.018	35	34.8	-0.1	184	270	15°	75°	M6	10.5	24.5
AXDR 180VX	10.3	180	-0.013	280	-0.018	40	39.8	-0.1	200	260	10°	70°	M6	12	28
AXDR 200VX	11.2	200	-0.015	300	-0.018	40	39.8	-0.1	220	280	9°	81°	G1/8	12	28
AXDR 210VX	21.9	210	-0.015	380	-0.020	40	39.8	-0.1	240	350	11.25°	78.75°	G1/8	12	28
AXDR 260VX	22	260	-0.018	385	-0.020	50	49.8	-0.12	282	363	7.5°	82.5°	G1/8	15	35
AXDR 325VX	26.4	325	-0.023	450	-0.023	50	49.8	-0.15	347	428	42°	54°	G1/8	15	35
AXDR 350VX	46.8	350	-0.023	540	-0.028	50	49.8	-0.15	385	505	7.5°	82.5°	G1/8	15	35
AXDR 395VX	32.7	395	-0.023	525	-0.028	50	49.8	-0.15	418	502	5°	85°	G1/8	15	35
AXDR 460VX	41.1	460	-0.023	600	-0.028	50	49.8	-0.15	486	574	130.5°	139.5°	G1/8	15	35
AXDR 580VX	76.4	580	-0.025	750	-0.035	60	59.8	-0.15	610	720	5.625°	84.375°	G1/8	18	42
AXDR 650VX	114.2	650	-0.038	870	-0.050	60	59.8	-0.15	690	830	5.625°	84.375°	G1/8	18	42

1) Tightening torque for screws acc. DIN 912, strength class 10.9.

2) Please enquire in case of high speed applications.

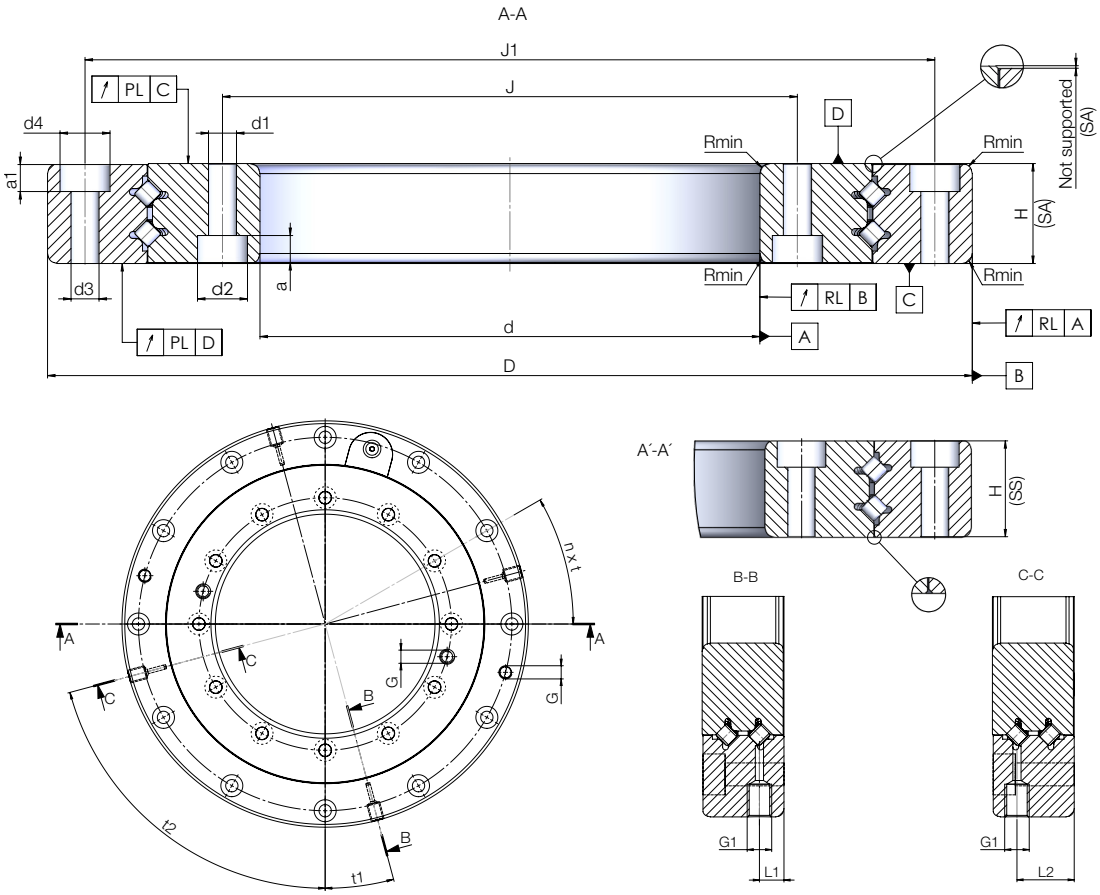
3) Measuring speed n_{const} = 5 rpm
Dependent on the selected preload and lubrication

4) Measured on the installed bearing with ideal adjacent construction.

Designation	Fixing holes											
	Inner ring				Outer ring				Extraction thread on the inner ring and outer ring		Number x Pitch	Screw tightening torque
	d1	d2	a	Number	d3	d4	a1	Number	G	Number	n x t	M_A [1] [Nm]
AXDR 80VX	5.6	10	5.4	8	5.6	10	5.4	8	M6	2	8 x 45°	8.5
AXDR 100VX	5.6	10	5.4	12	5.6	10	5.4	12	M6	2	12 x 30°	8.5
AXDR 120VX	7	11	6.4	12	7	11	6.4	12	M8	2	12 x 30°	14
AXDR 150VX	7	11	6.4	16	7	11	6.4	16	M8	2	16 x 22.5°	14
AXDR 160VX	11.4	18	10.6	12	11.4	18	10.6	12	M8	2	12 x 30°	68
AXDR 180VX	7	11	6.4	18	7	11	6.4	18	M8	2	18 x 20°	14
AXDR 200VX	7	11	6.4	20	7	11	6.4	20	M8	2	20 x 18°	14
AXDR 210VX	14	20	12.6	16	14	20	12.6	16	M10	2	16 x 22.5°	116
AXDR 260VX	9.3	15	8.6	24	9.3	15	8.6	24	M10	2	24 x 15°	34
AXDR 325VX	9.3	15	8.6	30	9.3	15	8.6	30	M10	2	30 x12°	34
AXDR 350VX	14	20	12.6	24	14	20	12.6	24	M10	2	24 x 15°	116
AXDR 395VX	9.3	15	8.6	36	9.3	15	8.6	36	M10	2	36 x 10°	34
AXDR 460VX	9.3	15	8.6	40	9.3	15	8.6	40	M10	2	40 x 9°	34
AXDR 580VX	11.4	18	10.6	32	11.4	18	10.6	32	M12	2	32 x 11.25°	68
AXDR 650VX	14	20	12.6	32	14	20	12.6	32	M12	2	32 x 11.25°	116

Designation	Load ratings				Limiting speed [2]	Bearing friction torque [3]	Axial runout & radial runout [4]				Rigidity of the bearing position			Min. corner radius
	Axial		Radial		Grease	Grease	Inner ring		Outer ring		Axial	Radial	Tilting rigidity	
							Standard	Restricted	Standard	Restricted				
	dyn. C_a [kN]	stat. C_{0a} [kN]	dyn. C_r [kN]	stat. C_{0r} [kN]	n_G [rpm]	$M_{RL\,max}$ [Nm]	PL & RL [µm]	PL & RL [µm]	PL & RL [µm]	PL & RL [µm]	C_{al} [kN/µm]	C_{rl} [kN/µm]	C_{kl} [kNm/mrad]	R_{min} [mm]
AXDR 80VX	29.5	149.5	26.2	59.8	900	2.8	4	2	5	3	2.7	1.4	4.5	1.5
AXDR 100VX	34.2	198.2	30.4	79.3	700	2.8	4	2.5	7	4	3.5	1.7	10.1	1.5
AXDR 120VX	67.1	366.6	59.6	146.6	600	4.2	4	2.5	7	4	3.6	1.9	14.1	2
AXDR 150VX	73.7	438.3	65.4	175.3	500	5.6	5	2.5	7	4	4.2	2.2	22.9	2
AXDR 160VX	100.7	617.9	89.4	247.2	450	5.6	5	2.5	7	4	5.3	2.6	38.6	2.5
AXDR 180VX	101.2	624.2	89.9	249.7	450	7	5	2.5	7	4	4.9	2.6	37.1	2.5
AXDR 200VX	106.0	681.0	94.1	272.4	400	8.4	6	3	7	4	5.3	2.8	46.7	2.5
AXDR 210VX	116.3	813.6	103.3	325.4	350	9	6	3	8	5	7.7	3.8	96.1	2.5
AXDR 260VX	203.0	1325.6	180.4	530.2	300	11	8	4	8	5	6.3	3.3	92.2	3
AXDR 325VX	223.9	1599.4	198.8	639.7	250	15	8	4	9	5	7.3	3.9	153.2	3
AXDR 350VX	241.5	1845.7	214.4	738.3	230	17	8	4	10	7	9.2	4.9	255.8	3
AXDR 395VX	247.2	1927.7	219.4	771.1	210	20	8	4	10	7	8.6	4.5	251.1	3
AXDR 460VX	265.9	2215.1	236.0	886.1	190	28	10	5	10	7	9.8	5.2	373.5	3
AXDR 580VX	389.3	3423.4	345.4	1369.4	150	50	12	6	15	8	11.6	6.2	693.4	4
AXDR 650VX	416.8	3907.4	369.8	1563.0	130	70	14	7	15	8	14.3	7.5	1086.5	4

Dimensions table AXDR___SX (Spacer)



Designation	Weight	Dimensions [mm]													
	m [kg]	d	Δd	D	ΔD	H SX-SA	H SX-SS	ΔH	J	J1	t1	t2	G1	L1	L2
AXDR 80SX	1.6	80	-0.009	146	-0.011	20	19.8	-0.075	93	133	22.5°	67.5°	M6	6	14
AXDR 100SX	2.7	100	-0.010	185	-0.015	20	19.8	-0.075	115	170	15°	75°	M6	6	14
AXDR 120SX	4.9	120	-0.010	210	-0.015	30	29.8	-0.075	138	192	15°	75°	M6	8	22
AXDR 150SX	5.8	150	-0.013	240	-0.015	30	29.8	-0.1	168	222	11.25°	78.75°	M6	8	22
AXDR 160SX	11.8	160	-0.013	295	-0.018	35	34.8	-0.1	184	270	15°	75°	M6	10.5	24.5
AXDR 180SX	10.3	180	-0.013	280	-0.018	40	39.8	-0.1	200	260	10°	70°	M6	12	28
AXDR 200SX	11.2	200	-0.015	300	-0.018	40	39.8	-0.1	220	280	9°	81°	G1/8	12	28
AXDR 210SX	21.9	210	-0.015	380	-0.020	40	39.8	-0.1	240	350	11.25°	78.75°	G1/8	12	28
AXDR 260SX	22	260	-0.018	385	-0.020	50	49.8	-0.12	282	363	7.5°	82.5°	G1/8	15	35
AXDR 325SX	26.4	325	-0.023	450	-0.023	50	49.8	-0.15	347	428	42°	54°	G1/8	15	35
AXDR 350SX	46.8	350	-0.023	540	-0.028	50	49.8	-0.15	385	505	7.5°	82.5°	G1/8	15	35
AXDR 395SX	32.7	395	-0.023	525	-0.028	50	49.8	-0.15	418	502	5°	85°	G1/8	15	35
AXDR 460SX	41.1	460	-0.023	600	-0.028	50	49.8	-0.15	486	574	130.5°	139.5°	G1/8	15	35
AXDR 580SX	76.4	580	-0.025	750	-0.035	60	59.8	-0.15	610	720	5.625°	84.375°	G1/8	18	42
AXDR 650SX	114.2	650	-0.038	870	-0.050	60	59.8	-0.15	690	830	5.625°	84.375°	G1/8	18	42

1) Tightening torque for screws acc. DIN 912, strength class 10.9.

2) Please enquire in case of high speed applications.

3) Measuring speed n_{const} = 5 rpm
Dependent on the selected preload and lubrication

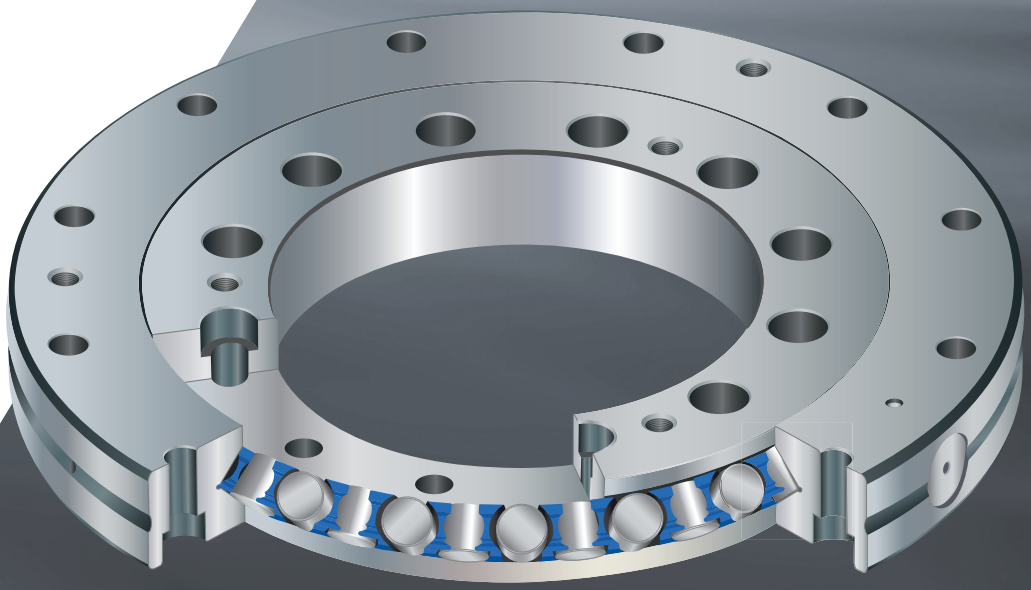
4) Measured on the installed bearing with ideal adjacent construction.

Designation	Fixing holes											
	Inner ring				Outer ring				Extraction thread on the inner ring and outer ring		Number x Pitch	Screw tightening torque
	d1	d2	a	Number	d3	d4	a1	Number	G	Number	n x t	M_A [1] [Nm]
AXDR 80SX	5.6	10	5.4	8	5.6	10	5.4	8	M6	2	8 x 45°	8.5
AXDR 100SX	5.6	10	5.4	12	5.6	10	5.4	12	M6	2	12 x 30°	8.5
AXDR 120SX	7	11	6.4	12	7	11	6.4	12	M8	2	12 x 30°	14
AXDR 150SX	7	11	6.4	16	7	11	6.4	16	M8	2	16 x 22.5°	14
AXDR 160SX	11.4	18	10.6	12	11.4	18	10.6	12	M8	2	12 x 30°	68
AXDR 180SX	7	11	6.4	18	7	11	6.4	18	M8	2	18 x 20°	14
AXDR 200SX	7	11	6.4	20	7	11	6.4	20	M8	2	20 x 18°	14
AXDR 210SX	14	20	12.6	16	14	20	12.6	16	M10	2	16 x 22.5°	116
AXDR 260SX	9.3	15	8.6	24	9.3	15	8.6	24	M10	2	24 x 15°	34
AXDR 325SX	9.3	15	8.6	30	9.3	15	8.6	30	M10	2	30 x12°	34
AXDR 350SX	14	20	12.6	24	14	20	12.6	24	M10	2	24 x 15°	116
AXDR 395SX	9.3	15	8.6	36	9.3	15	8.6	36	M10	2	36 x 10°	34
AXDR 460SX	9.3	15	8.6	40	9.3	15	8.6	40	M10	2	40 x 9°	34
AXDR 580SX	11.4	18	10.6	32	11.4	18	10.6	32	M12	2	32 x 11.25°	68
AXDR 650SX	14	20	12.6	32	14	20	12.6	32	M12	2	32 x 11.25°	116

Designation	Load ratings				Limiting speed [2]	Bearing friction torque [3]	Axial runout & radial runout [4]				Rigidity of the bearing position			Min. corner radius
	Axial		Radial		Grease	Grease	Inner ring		Outer ring		Axial	Radial	Tilting rigidity	
							Standard	Restricted	Standard	Restricted				
	dyn. C_a [kN]	stat. C_{0a} [kN]	dyn. C_r [kN]	stat. C_{0r} [kN]	n_G [rpm]	$M_{RL\,max}$ [Nm]	PL & RL [µm]	PL & RL [µm]	PL & RL [µm]	PL & RL [µm]	C_{al} [kN/µm]	C_{rl} [kN/µm]	C_{kl} [kNm/mrad]	R_{min} [mm]
AXDR 80SX	23.8	112.5	21.2	45.0	2250	2	4	2	5	3	2.2	1.1	3.7	1.5
AXDR 100SX	27.6	148.6	24.5	59.5	1750	2	4	2.5	7	4	2.9	1.4	8.2	1.5
AXDR 120SX	54.1	275.0	48.1	110.0	1550	2.7	4	2.5	7	4	2.9	1.5	11.4	2
AXDR 150SX	59.4	328.7	52.7	131.5	1300	3.5	5	2.5	7	4	3.4	1.8	18.6	2
AXDR 160SX	81.1	463.4	72.1	185.4	1100	3.7	5	2.5	7	4	4.3	2.1	31.1	2.5
AXDR 180SX	81.8	469.7	72.6	187.9	1100	4	5	2.5	7	4	4	2.1	30.1	2.5
AXDR 200SX	85.8	513.8	76.2	205.5	1000	4.5	6	3	7	4	4.3	2.3	38.1	2.5
AXDR 210SX	93.6	608.6	83.1	243.5	850	5	6	3	8	5	6.2	3	77.5	2.5
AXDR 260SX	163.2	990.9	145.0	396.3	800	7	8	4	8	5	5.2	2.7	75	3
AXDR 325SX	180.1	1196.2	159.9	478.5	650	10	8	4	9	5	6	3.2	125.3	3
AXDR 350SX	193.6	1374.2	171.8	549.7	600	11.5	8	4	10	7	7.5	4	205.9	3
AXDR 395SX	198.9	1442.4	176.5	577.0	540	13	8	4	10	7	7	3.7	204	3
AXDR 460SX	213.0	1647.8	189.0	659.1	480	18	10	5	10	7	8.1	4.3	307.9	3
AXDR 580SX	313.7	2567.6	278.4	1027.0	380	34	12	6	15	8	9.7	5.1	579.9	4
AXDR 650SX	335.9	2930.6	298.0	1172.2	330	50	14	7	15	8	11.6	6.1	889.8	4

Product chapter

AXCR



General/available designs

General

AXCR bearings consist of an inner and outer ring, cylindrical rollers and spacers. Due to their compact size, these are frequently used as axis and swivel bearings. Typical applications are milling heads, swivel axes or robots, but also industrial applications with increased accuracy requirements.

In cross roller bearings, the cylindrical rollers are arranged cross-wise in a raceway offset by 90° so that loads and torques can be evenly absorbed in all directions.

Cross roller bearings offer relatively high axial and radial rigidities and tilting rigidity in highly compact constructions.

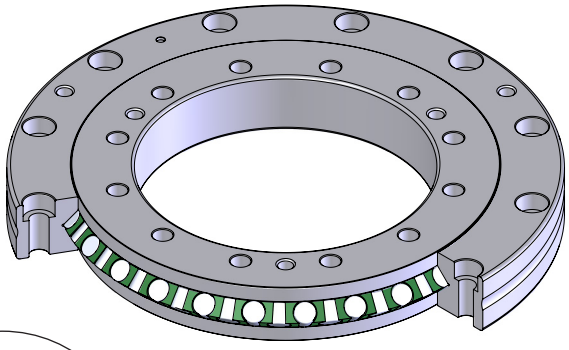
Bearing types

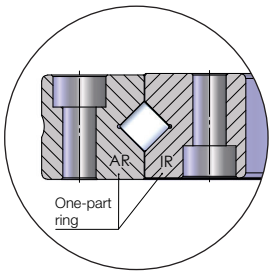
Cross roller bearings are available in a multitude of bearing types and designs. Besically, we differentiate between these as follows:

- Single-part rings with radial filling plugs for filling with rollers and distance pieces (spacers)
- Two-part, non-rotating ring, single-part rotating ring
- Screw-on rings/non screw-on rings
- Special bearings with special ring dimensions, fastening possibilities or toothings

AXCR-U

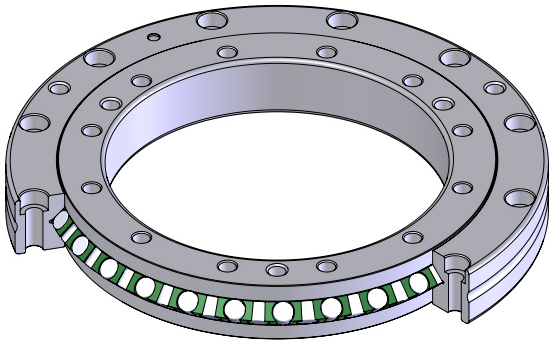
Design with single-part rings, both rings can be screwed on, standard program available (see product tables).

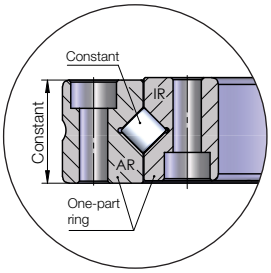




Available designs

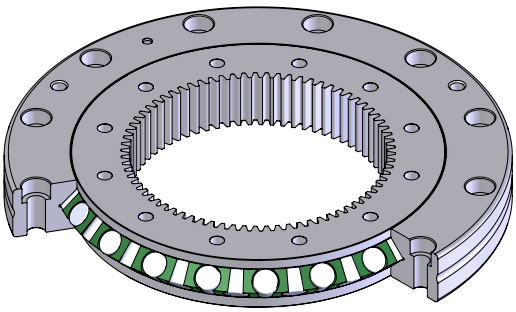
AXCR-S Design with single-part rings at constant construction height, both rings can be screwed on, standard program available (see product tables).

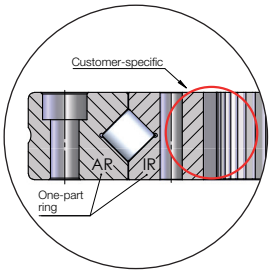




Available designs

AXCR-M Customer-specific design with single-part rings.
The roller elements and the spacers are filled via a radial filling plug. The ring designs are designed with countersunk holes, through or threaded bores or without holes.
All features of the bearing are adapted to the customer requirements.





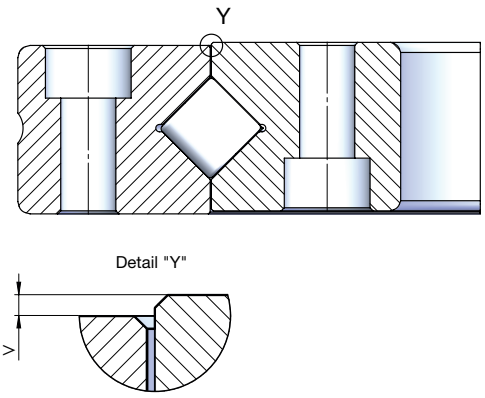
Specific bearing features

Fastening possibilities AXCR-U/AXCR-S

myonic offers the following fixing possibilities in the standard series.

Standard fastening designs:

- SA = Grooves opposite



Further details can be found in the chapter Recommended connection dimensions.

- SS = Groove identical

Further details can be found in the chapter Recommended connection dimensions.

Special features

These two standard designs contain the completely identical individual rings. Only one inner ring each is installed in mirror opposition, depending on which fastening possibility is desired.

The individual rings are always unsupported on the side of the cylinder counterbore, meaning that collisions in the fastening possibility "SA" are excluded.

If, on the other hand, the ring arrangement "SS" is selected, a lower total height results, as both the recessed cylinder counterbores are located on the same side.
For details see chapter Adjacent construction.

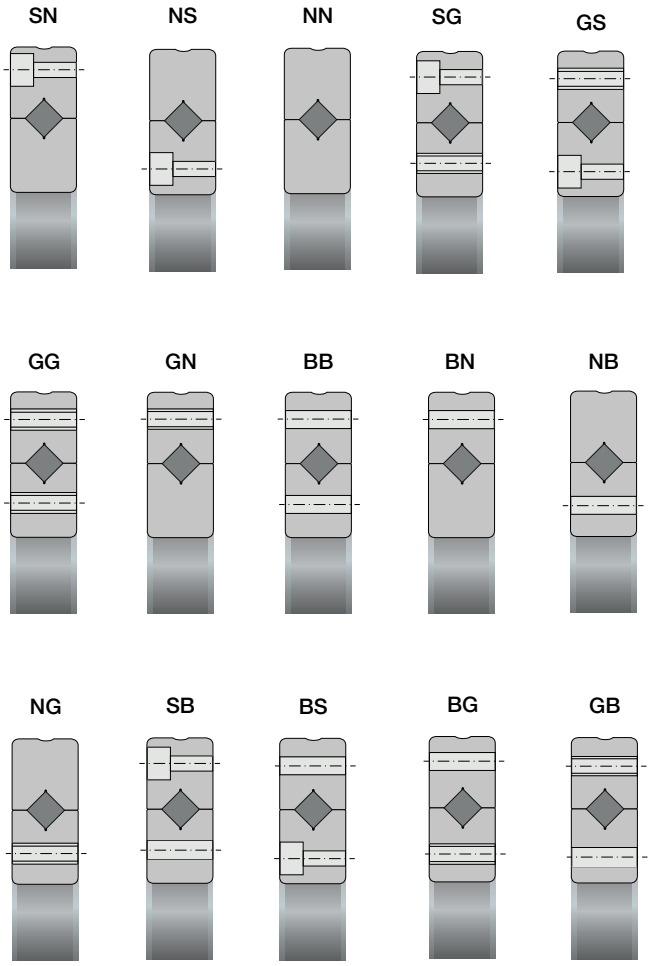
Specific bearing features

Further ring designs (on request)

Designation system for the ring designs:

- S = Countersunk hole
- N = No holes
- G = Threaded bore
- B = Through bore

Designation sequence: first position outer ring design, second position ring inner ring design



Example

Fastening possibility SG

- Position one: Other ring design with countersunk hole
- Position two: Inner ring design with threaded bore

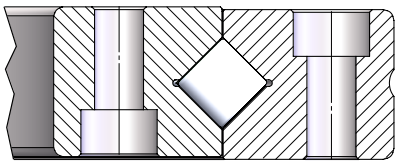
Specific bearing features

Seals

myonic cross roller bearings are supplied with a non-grinding gap or labyrinth seal.
Through the gap formation, the penetration of dirt particles is efficiently prevented without causing additional friction (temperature).

For special applications, grinding seals made from very different materials can also be used.

- Gap seal



Accuracy

The production at myonic takes place on the same production systems as for all other ultra precision bearings. In this way, myonic-AXCR cross roller bearings run with similar accuracies as AXRY or AXDR bearings.

The measuring accuracy P5 with the hole and the outer diameter permit the manufacture of high precision fits and thus the accurate guidance of rotary axes.
The axial and radial runouts accord with the classes P4, P2 and UP.

Specific bearing features

Accuracy requirements of the inner ring				
Nominal dimension of the bearing bore d [mm]		Axial runout & running accuracy PL & RL [µm]		
Over	Up to	Class P4	Class P2	Class UP
30	50	4	2.5	2
50	80	4	2.5	2
80	120	5	2.5	2
120	150	6	2.5	2
150	180	6	5	3
180	250	8	5	3
250	315	10	6	4
315	400	12	7	4
400	500	14	9	5
500	630	16	10	6
630	800	18	11	7
800	1000	20	12	9

Accuracy requirements of the outer ring				
Nominal dimension of the outer diameter D [mm]		Axial runout & running accuracy PL & RL [µm]		
Over	Up to	Class P4	Class P2	Class UP
30	50	5	2.5	2
50	80	5	4	3
80	120	6	5	3
120	150	7	5	3
150	180	8	5	3
180	250	10	7	4
250	315	11	7	4
315	400	13	8	5
400	500	14	9	6
500	630	17	10	7
630	800	20	15	9
800	1000	25	18	11

Specific bearing features

Preload

myonic cross roller bearings are available with bearing clearance, more lightweight and with standard preload.
In case of higher preload, the rigidity increases; at the same time however the bearing friction torque increases.
Usually, most AXCR are assembled with standard preload.

Customer-specific designs Jxxxx (J-numbers)

myonic produces customer-specific designs which are designated with J and a number.

Such J-numbers can for example contain:

- Specific application-related preload values or friction torques
- Special directives for marking or packaging
- Special lubrication systems
- Changed tolerances

Lubrication

Cross roller bearings are pre-greased with a high-performance grease (Li-special soap with a mix of synthetic hydrocarbon oil and mineral oil), but can be supplied ungreased (suffix L120).

Preservatives

The used corrosion protection oil is compatible und mixable with most of greases and oils produced on a mineral basis.

Check for compatibility when using synthetic lubricants and other consistency enhancers than lithium (complex) soaps.

Surface treatment

In case of incompatibility, please consult myonic as to further procedures.

myonic cross roller bearings are offered in the standard series without surface treatment.

Product chapter AXCR

Specific bearing features

Limiting speeds/temperatures/friction

The limiting speed nG stated in the dimensions table can be achieved for the selected cross roller bearing in swivel operation or during short-term continuous operation.
In case of prolonged operation in the area of the limiting speed, the bearing increasingly heats up.

The friction torque of cross roller bearings is in particular influenced through the selected preload.
Higher preloads result in higher rigidities with simultaneously higher levels of friction.

Relubrication

The selected lubricant, in particular the viscosity and the filling quantity, have a direct influence on the friction. Standard pregreased bearings are suitable for swivel operation and short continuous operation up to the limiting speed.

Metering systems are most suitable for relubrication purposes. In case of manual relubrication, there is a risk of over-greasing and thus an increase in the bearing friction torque.
During run-in or during relubrication, the appropriate run-in cycles must be adhered to.

Calculation of rigidity

The rigidity calculation takes place under the following parameters:

- With the application of a radial and axial load and a tilting moment
- With slight preloads
- With normal adjacent construction and screw connections acc. the information in this myonic catalogue
- Across all product groups, identical FEM calculation procedures were defined with precisely-defined parameters. The stated rigidity values in the product tables are directly comparable (AXRY vs. AXDR vs. AXCR)

An under-dimensioned, inaccurate adjacent construction reduces the rigidity of the bearing position substantially; on the other hand rigidities can also be increased through constructional support of the additional parts.

myonic application engineering is happy to assist in case of further enquiries or optimisations of your axes.

For further details, see chapter "General".

Life time and load safety factor

General notes

The following calculation is generally used and represents a good approximately for simple application cases.

Calculations at myonic

An accurate calculation of the nominal life time is possible via special calculation programs at myonic.

The following is required for calculation:

- Details on application (drawings, sketches, technical specifications)
- Workpiece dimensions and weight
- Details on the load cycle (cutting forces, speeds, operating durations)

Dynamically equivalent load

In case of applications with radial and axial loads and speeds which have an effect on the bearing, all loads can be collected to form a single equivalent load. This "dynamically equivalent load" can be calculated acc. the following formula:

$$P = X \cdot \left(F_r + \frac{2M}{D_{pw}} \right) + Y \cdot F_a$$

$$X=1\ ; \qquad Y=0{,}45\ ; \qquad \frac{F_a}{F_r + \frac{2M}{D_{pw}}} \leq 1{,}5$$

$$X=0{,}67\ ; \qquad Y=0{,}67\ ; \qquad \frac{F_a}{F_r + \frac{2M}{D_{pw}}} > 1{,}5$$

P = Dynamically equivalent load [N]

F_r = Radial load [N]

F_a = Axial load [N]

M = Torque [Nmm]

D_{pw} = Roller centre diameter [mm]

X = Radial load coefficient

Y = Axial load coefficient

Life time and load safety factor

Nominal life time

The nominal life time can be estimated with the following equation. The nominal life time designated the rotations of a bearing with the same load and speed in millions, which 90 % of all bearings of the same type achieve before material fatigue occurs.

$$L = \left(\frac{C}{P}\right)^{\frac{10}{3}}$$

L = Nominal life time of the bearing [10^6 rotations]

C = Dynamic load rating [N]

For mainly radial loads on the bearing, please use C_r, and for mainly axial loads use C_a.

P = Dynamic equivalent load [N]

Equivalent static load

The static equivalent load collects all loads incurred during static application into one single load. This puts load on the bearing in the same way as the actual effective loads.

$$P_0 = \left(F_r + \frac{2M}{D_{pw}}\right) + 0{,}44 \cdot F_a$$

P_0 = Equivalent static load [N]

F_r = Radial load [N]

F_a = Axial load [N]

M = Torque [Nmm]

D_{pw} = Roller centre diameter [mm]

Static limiting load diagrams

Static load safety factor

The static load safety factor describes the relationship from the static load rating C_0 (depending on the application case, C_{0r} or C_{0a} must be drawn upon) and the equivalent static load P_0. Depending on the respective operating case, different static load safety factors are to be strived for.
For more accurate information, please contact our Technical Support.

$$S_0 = \frac{C_0}{P_0}$$

S_0 = Static load safety factor
C_0 = Static load rating [N]
P_0 = Equivalent static load [N]

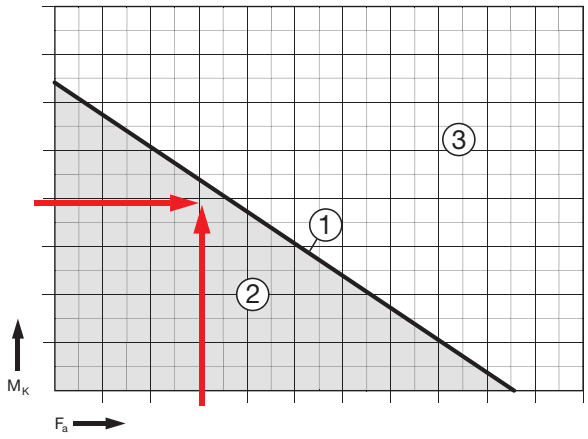
Limiting load diagram

The static limiting load diagrams serve to:

- Check the selected bearing size with mainly static load
- Determine the tilting moment Mk which the AXCR is able to absorb in addition to the axial load

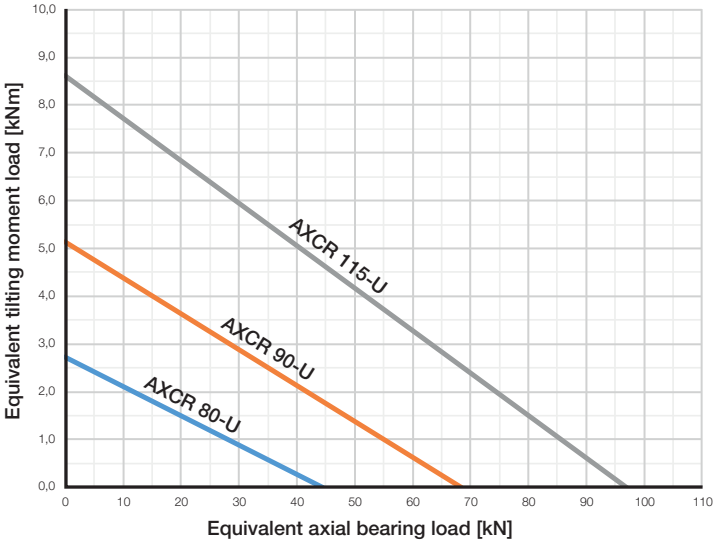
The static limiting load diagrams take into account for the roller element set the static load safety factor $S_o \geq 4$ and the screw and bearing ring strength.

Example:
Static limiting load diagram for AXCR
1 Bearing/size
2 Permitted range
3 Unpermitted range
M_K Maximum tilting moment in [kNm]
F_a Axial load [kN]

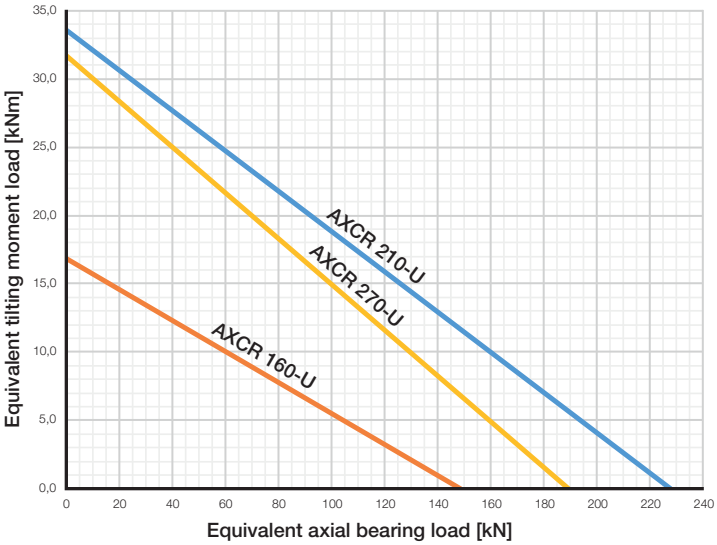


Static limiting load diagrams

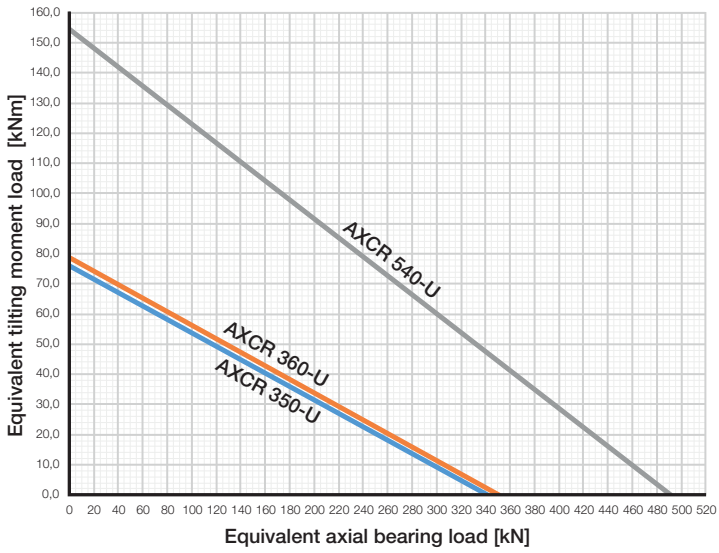
Limiting load diagram cross roller bearing AXCR 80-U to AXCR 115-U



Limiting load diagram cross roller bearing AXCR 160-U to AXCR 270-U

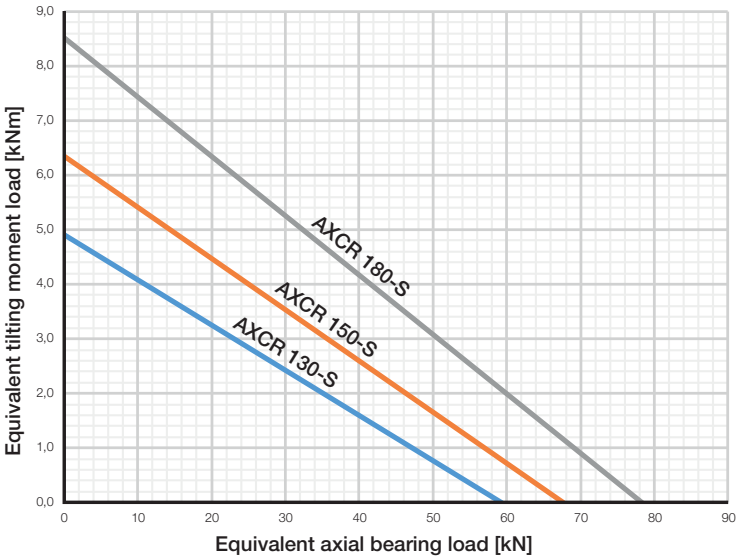


Limiting load diagram cross roller bearing AXCR 350-U to AXCR 540-U

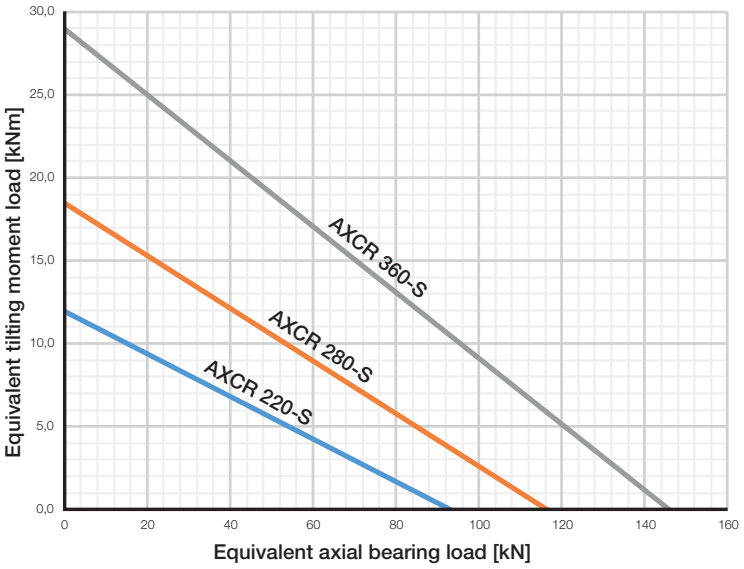


Static limiting load diagrams

Limiting load diagram cross roller bearing AXCR 130-S to AXCR 180-S



Limiting load diagram cross roller bearing AXCR 220-S to AXCR 360-S



Design of the adjacent construction

In the following sketches and tables, the design of the adjacent construction is described.
Pay particular attention to the connection areas, as any deviations will have an effect on the overall accuracy and the rigidities of the roller bearing.
In order to avoid a decline in bearing friction torque, accuracy requirements and running characteristics, the recommended tolerances may not be exceeded.

Press fit

In principle, when the fit is too constricted the radial bearing preload increases, and thus…

…the following increases:

- The surface pressure in the raceway
- The bearing friction
- The bearing heat
- The amount of wear

…the following is reduced:

- The maximum speed
- The life time

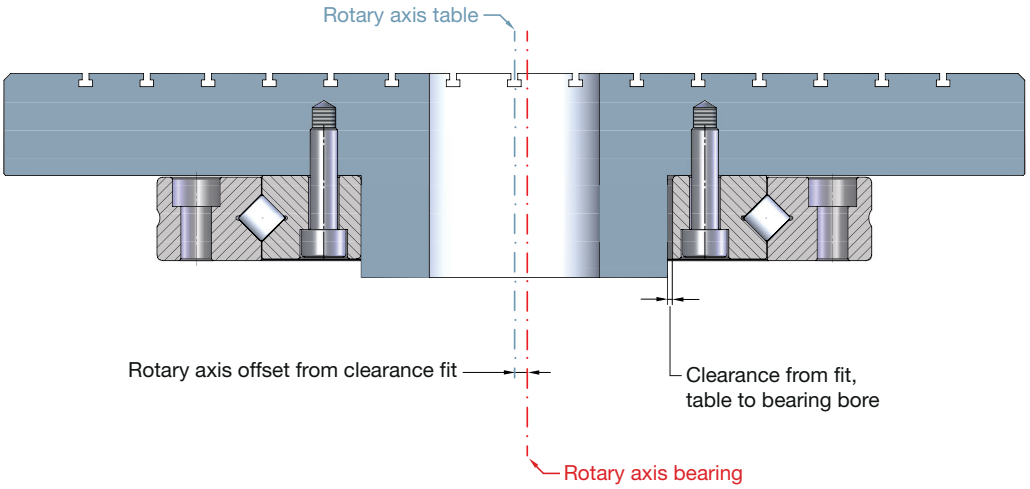
Clearance fit

If the rotating ring is not supported during clearance fits, displacement of the rotation axes raceway to table centre is probable. The clearance from the fit table to bearing bore (also applies for the clearance bearing outer diameter to table with rotating outer ring) can add to the radial runout.

myonic-AXCR bearings are produced both in the hole and on the outer diameter with severely limited tolerances (acc. P5/ DIN 620). This facilitates the generation of accurate fits; the accuracy of the bearing is transferred onto the table.

In case of applications with subordinate accuracy requirements, rings can also be screwed in clearance fits.
The wall thickness of the table adapter in the bearing bore (or on the outer diameter) must be appropriately large to exclude the risk of undefined operating conditions such as vibrations, errors in radial runout and repeatability etc.

Design of the adjacent construction



Centred shafts/tables

Execution via a shaft clearance fit with centring of the rotary axis is possible. Due to the solid rings, AXCR bearings are less sensitive to non-positive locking shafts than AXRY bearings. A reduction in the rigidity of the axis and possible radial runout problems or a displacement of the rotation axis on overload must be accepted.

A radial runout measurement with centred tabletop and mounted measuring ball does not accord with the following catalogue values. During this accurately centred measurement, exclusively the radial runout of the raceways and the form errors of the measuring construction are measured. If the measuring construction is executed precisely, the measured values are lower than the stated myonic radial runout values.

The myonic radial runout values include the radial runout errors of the raceway and the roundness of the hole.

Recommended fits, shaft

General

The accuracy of the fits and the geometrically-correct design of all adjacent parts have a direct effect on the accuracy requirements and the dynamic properties of the bearing and the axis.

Please observe the construction notes in the general catalogue section.

Rotating inner ring AXCR-U with the usual bore tolerance (0/minus)

On rotating shafts, the bearing inner ring is to be supported across its whole surface and the shaft is to be designed with a fit acc. h5. In this way, the bore tolerance of the bearing generates a transition fit with a slight tendency to a clearance fit.

Rotating inner ring AXCR-S with bore tolerance (0/plus)

On rotating shafts, the bearing inner ring is to be supported across its whole surface and the shaft is to be designed with a fit acc. h5. In this way, the bore tolerance of the bearing generates a transition fit with a slight tendency to a clearance fit.

In case of designs with clearance fits, see guidelines in the chapter Adjacent construction.

Higher requirement

Max. accuracy requirements:

For the maximum accuracy requirement with rotating inner ring, a clearance fit 0 must be targeted; existing clearance fits can add to the radial runout.

Higher dynamic characteristics:

In case of high speeds (ndm > 35,000 mm/min) and slower operating durations (>10 %), do not exceed an interference fit of 5 µm.

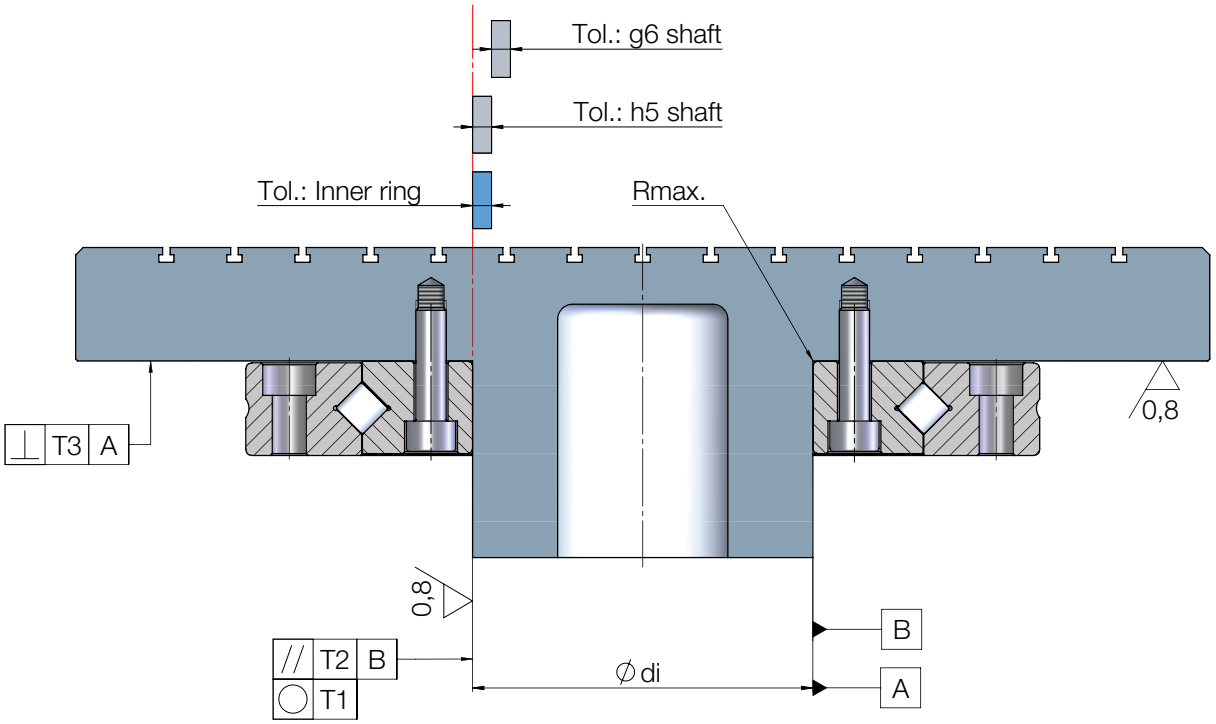
Stationary inner ring

Stationary, screw connection inner rings do not require a special fit, and can also be mounted with clearance to the shaft. If the inner ring is centred, then design

- For inner ring AXCR-U with the usual bore tolerance (0/minus) as g6 or similar or for
- Inner ring AXCR-S with bore tolerance (0/plus) as j6 or similar

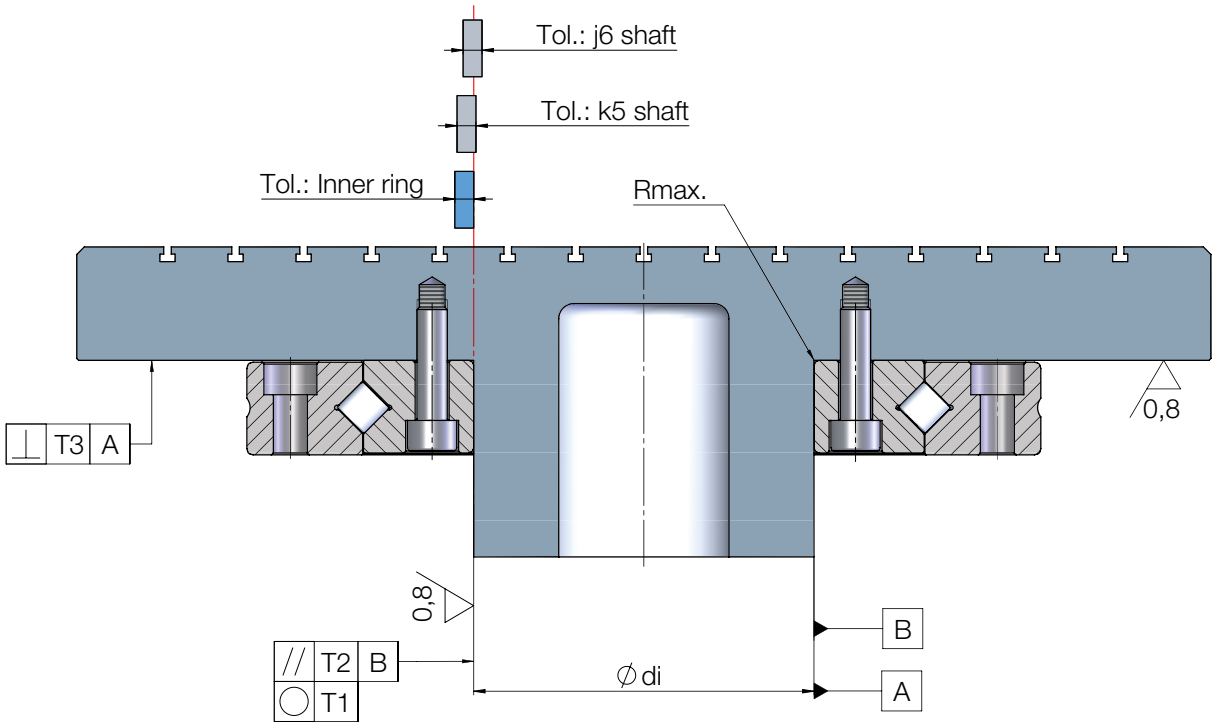
Press fits are to be avoided due to the risk of an increase in bearing preload.

Recommended fits, shaft



Application case			With stationary inner ring		With rotating inner ring				
Cross roller bearing	Shaft Ø di [mm]	Tolerance zone bearing inner Ø [mm]	Tolerance zone g6 of the shaft Ø di [mm]	Roundness, parallelism, perpendicularity T1, T2, T3 [µm]	Tolerance zone h5 of the shaft Ø di [mm]	Roundness T1 [µm]	Parallelism T2 [µm]	Perpendicularity T3 [µm]	Maximum corner radius Rmax. [mm]
AXCR 80-U	80	0 -0.009	-0.010 -0.029	5	0 -0.013	3	1.5	3	0.1
AXCR 90-U	90	0 -0.010	-0.012 -0.034	6	0 -0.015	4	2	4	0.1
AXCR 115-U	115	0 -0.010	-0.012 -0.034	6	0 -0.015	4	2	4	0.1
AXCR 160-U	160	0 -0.013	-0.014 -0.039	8	0 -0.018	5	2.5	5	0.1
AXCR 210-U	210	0 -0.015	-0.015 -0.044	10	0 -0.020	7	3.5	7	0.3
AXCR 270-U	270	0 -0.018	-0.017 -0.049	12	0 -0.023	8	4	8	0.3
AXCR 350-U	350	0 -0.023	-0.018 -0.054	13	0 -0.025	9	4.5	9	0.3
AXCR 360-U	360	0 -0.023	-0.018 -0.054	13	0 -0.025	9	4.5	9	0.3
AXCR 540-U	540	0 -0.030	-0.022 -0.066	16	0 -0.032	11	5.5	11	0.3

Recommended fits, shaft



Application case			With stationary inner ring		With rotating inner ring				
Cross roller bearing	Shaft Ø di [mm]	Tolerance zone bearing inner Ø [mm]	Tolerance zone j6 of the shaft Ø di [mm]	Roundness, parallelism, perpendicularity T1, T2, T3 [µm]	Tolerance zone k5 of the shaft Ø di [mm]	Roundness T1 [µm]	Parallelism T2 [µm]	Perpendicularity T3 [µm]	Maximum corner radius Rmax. [mm]
AXCR 130-S	130	0 0.025	0.014 -0.011	8	0.021 0.003	5	2.5	5	0.1
AXCR 150-S	150	0 0.025	0.014 -0.011	8	0.021 0.003	5	2.5	5	0.1
AXCR 180-S	180	0 0.025	0.014 -0.011	8	0.021 0.003	5	2.5	5	0.1
AXCR 220-S	220	0 0.029	0.016 -0.013	10	0.024 0.004	7	3.5	7	0.3
AXCR 280-S	280	0 0.032	0.016 -0.016	12	0.027 0.004	8	4	8	0.3
AXCR 360-S	360	0 0.036	0.018 -0.018	13	0.029 0.004	9	4.5	9	0.3

Recommended fits, housing

General

The accuracy of the fits and the geometrically-correct design of all adjacent parts have a direct effect on the accuracy requirements and the dynamic properties of the bearing and the table.
In case of maximum demands, limit the tolerances and fits accordingly.

Please observe the construction notes in the general catalogue chapter.

Outer ring stationary

It is possible to do without a fit in the housing or alternatively to have a G7 fit design.
Outer ring diameter clearance to the housing makes assembly easier.

In case of higher dynamic requirements (ndm > 35,000 mm/min, prolonged operating duration) on the rotating shaft, maintain a minimum clearance of 20 µm for the fit seat of the outer ring to the housing.

Outer ring rotates

Normal requirement:
Design the rotating housing with a J6 clearance; here a transition fit results with a tendency for clearance fit. Design the fit seat across the entire height of the outer ring.

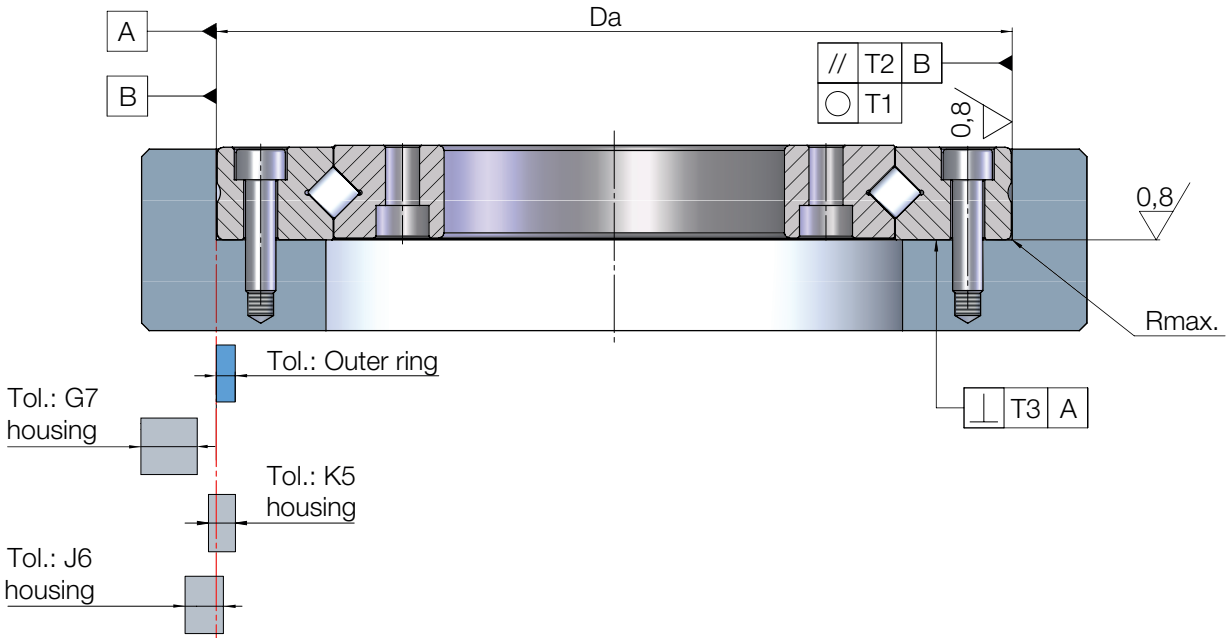
Alternatively, the housing can also be designed with a K5 fit for a narrower fit.
This can more easily be mated with the tolerance zone of the bearing outer diameter in case of high requirements; the assembly may prove more complex.

Higher requirement

Max. accuracy requirement:
For the maximum accuracy requirement with rotating outer ring, a clearance fit 0 must be targeted; existing clearance fits can add to the radial runout. The actual dimension of the bearing outer diameter can be found in the inspection report enclosed with all bearings.

Higher dynamic characteristics:
In case of higher speeds (ndm > 35,000 mm/min) and prolonged operating durations) do not exceed an interference fit of 5 µm.

Recommended fits, housing



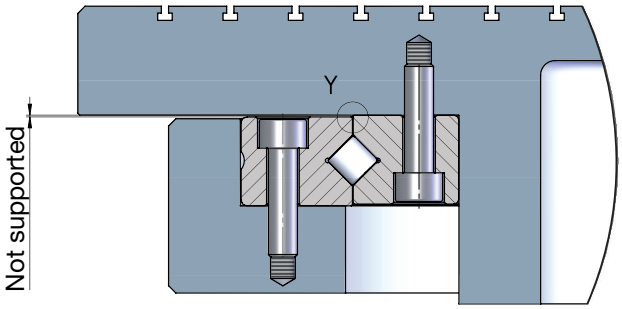
			Stationary outer ring		Rotating outer ring					
Cross roller bearing	Housing Ø Da [mm]	Tolerance zone Bearing outer Ø [mm]	Tolerance zone G7 of the housing Ø Da [mm]	Roundness, perpen-dicularity T1, T3 [µm]	Tolerance zone J6 of the housing Ø Da [mm]	Tolerance zone K5 of the housing Ø Da [mm]	Round-ness T1 [µm]	Paralle-lism T2 [µm]	Perpen-dicularity T3 [µm]	Maximum corner radius Rmax. [mm]
AXCR 80-U	165	0 -0.013	0.054 0.014	8	0.018 -0.007	0.003 -0.015	5	2.5	5	0.1
AXCR 90-U	210	0 -0.015	0.061 0.015	10	0.022 -0.007	0.002 -0.018	7	3.5	7	0.3
AXCR 115-U	240	0 -0.015	0.061 0.015	10	0.022 -0.007	0.002 -0.018	7	3.5	7	0.3
AXCR 160-U	295	0 -0.018	0.069 0.017	12	0.025 -0.007	0.003 -0.020	8	4	8	0.3
AXCR 210-U	380	0 -0.020	0.075 0.018	13	0.029 -0.007	0.003 -0.022	9	4.5	9	0.3
AXCR 270-U	400	0 -0.020	0.075 0.018	13	0.029 -0.007	0.003 -0.022	9	4.5	9	0.3
AXCR 350-U	540	0 -0.028	0.092 0.022	16	0.034 -0.010	0.000 -0.032	11	5.5	11	0.3
AXCR 360-U	540	0 -0.028	0.092 0.022	16	0.034 -0.010	0.000 -0.032	11	5.5	11	0.3
AXCR 540-U	718	0 -0.035	0.104 0.024	18	0.038 -0.012	0.000 -0.036	13	6.5	13	1
AXCR 130-S	205	0 -0.029	0.061 0.015	10	0.022 -0.007	0.002 -0.018	7	3.5	7	0.3
AXCR 150-S	225	0 -0.029	0.061 0.015	10	0.022 -0.007	0.002 -0.018	7	3.5	7	0.3
AXCR 180-S	255	0 -0.032	0.069 0.017	12	0.025 -0.007	0.003 -0.020	8	4	8	0.3
AXCR 220-S	295	0 -0.032	0.069 0.017	12	0.025 -0.007	0.003 -0.020	8	4	8	0.3
AXCR 280-S	355	0 -0.036	0.075 0.018	13	0.029 -0.007	0.003 -0.022	9	4.5	9	0.3
AXCR 360-S	435	0 -0.040	0.083 0.020	15	0.033 -0.007	0.002 -0.025	10	5	10	0.3

Recommended connection dimensions

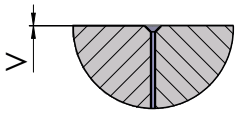
Fastening possibility SA

For the connection dimensions, two cases must be considered:

For the fastening possibilities SA; there are no specific connection dimensions (as may happen due to the offset of the two rings to each other, no collision with the adjacent construction can occur).



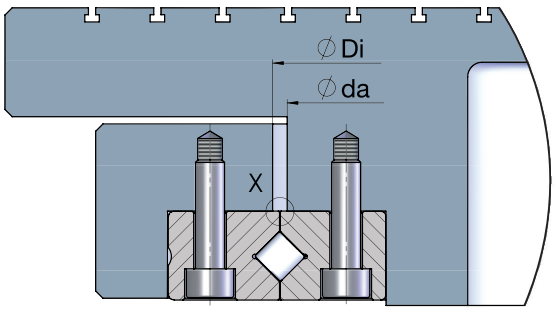
Detail "X"



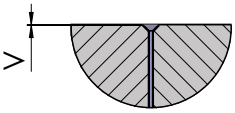
Fastening possibility SS

For the fastening possibility SS, there is no offset between the inner and outer ring and therefore the specified table values apply here.

The diameter value da is a maximum value, and the diameter value Di is a minimum value.



Detail "X"



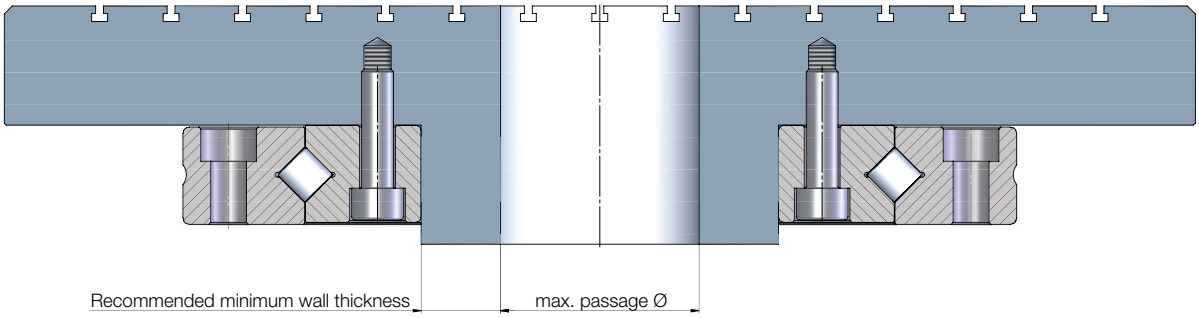
Recommended connection dimensions

The offset "V", as shown in detail "X", can be produced with high precision on customer request; a tolerance of a few µm is possible.

This means that complex shim rings and high assembly costs are no longer required.

Cross roller bearing	Connection dimension Ø da MAX. [mm]	Connection dimension Ø Di MIN. [mm]
AXCR 80-U	122.0	130.0
AXCR 90-U	144.5	152.5
AXCR 115-U	173.0	181.0
AXCR 160-U	223.0	231.0
AXCR 210-U	295.0	303.0
AXCR 270-U	331.0	339.0
AXCR 350-U	439.0	447.0
AXCR 360-U	450.0	458.0
AXCR 540-U	626.0	634.0
AXCR 130-S	162.0	170.0
AXCR 150-S	184.5	192.5
AXCR 180-S	213.0	221.0
AXCR 220-S	253.0	261.0
AXCR 280-S	315.0	323.0
AXCR 360-S	394.5	402.5

Design of the adjacent construction



Recommended minimum wall thicknesses

Cross roller bearing	Min. wall thickness [mm]	Max. passage [mm]
AXCR 80-U	15	50
AXCR 90-U	21	48
AXCR 115-U	22	71
AXCR 160-U	24	113
AXCR 210-U	30	150
AXCR 270-U	23	224
AXCR 350-U	34	283
AXCR 360-U	32	297
AXCR 540-U	31	478
AXCR 130-S	13	104
AXCR 150-S	13	124
AXCR 180-S	13	154
AXCR 220-S	13	194
AXCR 280-S	13	254
AXCR 360-S	13	334

Order designation

Designation system

AXCR 210 - USA - P2 - CL - JXXXX - L120

Construction series

Bore
in mm

Bearing type:

U = Standard design with single-part rings

S = Standard design with single-part rings and constant construction height

M = Customer-specific design with single-part rings

Fastening possibility:

SA = Counterbores opposite
SS = Counterbores identical

Others available on request

Lubrication:
Without = Standard grease
L120 = Bearing ungreased, only preserved (e.g. for oil lubrication)
GXXX= Special grease (number is issued by myonic)

Design:
Without = Catalogue design
JXXXX = Customer-specific design (number is issued by myonic)

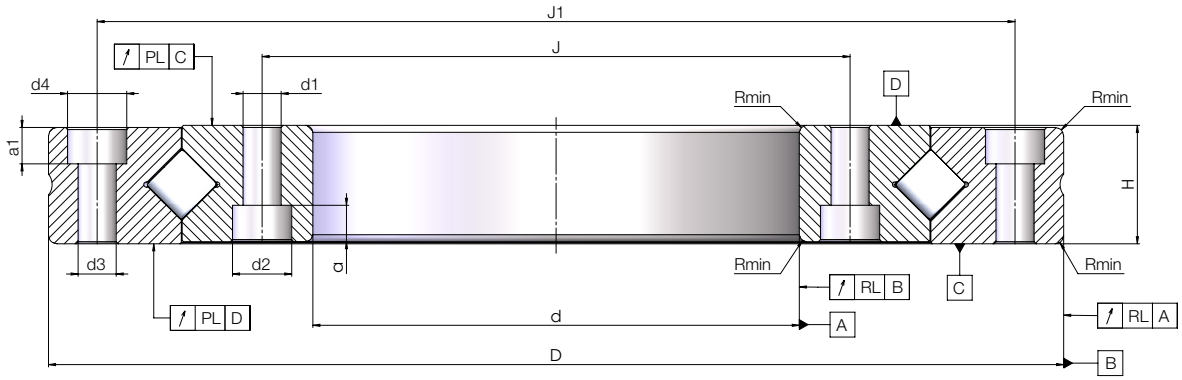
Preload:
Without = Standard preload
CL = Slight preload
CP = Clearance

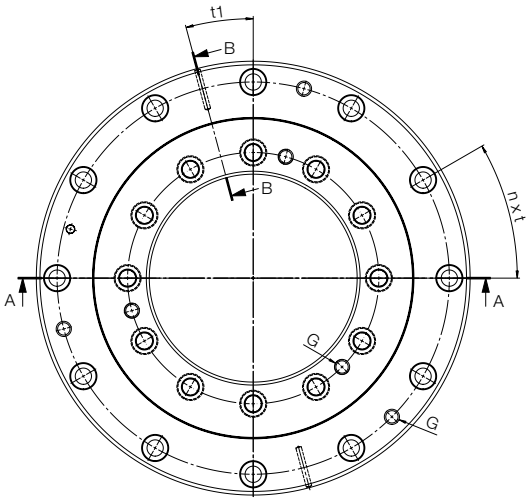
Accuracy requirements:
Without = Standard accuracy requirement P4
P2 = Constricted accuracy requirement
UP = Ultra high precision accuracy requirement

For further technical details or special designs, please contact myonic application engineering.

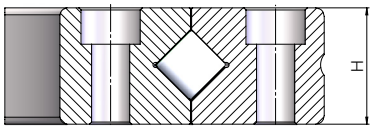
Dimensions table AXCR-U

A-A (Design: USA)

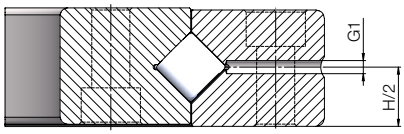




(Design: USS)



B-B



Designation	Weight	Dimensions [mm]										
	m	d	Δd	D	ΔD	H		ΔH	J	J1	t1	G1	Number
	[kg]					USA	USS						
AXCR 80-U	2.6	80	-0.009	165	-0.013	22	21.5	+/- 0.150	97	148	18°	3.1	2
AXCR 90-U	4.9	90	-0.010	210	-0.015	25	24.5	+/- 0.150	112	187	15°	3.1	2
AXCR 115-U	6.9	115	-0.010	240	-0.015	28	27.5	+/- 0.150	139	217	15°	3.1	2
AXCR 160-U	11.8	160	-0.013	295	-0.018	35	34.5	+/- 0.200	184	270	15°	6	2
AXCR 210-U	22.0	210	-0.015	380	-0.020	40	39.5	+/- 0.200	240	350	11.25°	6	2
AXCR 270-U	14.9	270	-0.018	400	-0.020	30	29.5	+/- 0.250	298	376	11.25°	6	2
AXCR 350-U	42.6	350	-0.023	540	-0.028	45	44.5	+/- 0.300	385	505	7.5°	6	2
AXCR 360-U	35.8	360	-0.023	540	-0.028	40	39.5	+/- 0.300	395	510	7.5°	6	2
AXCR 540-U	62.1	540	-0.030	718	-0.035	50	49.5	+/- 0.300	574	684	5°	6	2

1) Tightening torque for screws acc. DIN 912, strength class 10.9.

2) Please enquire in case of high speed applications.

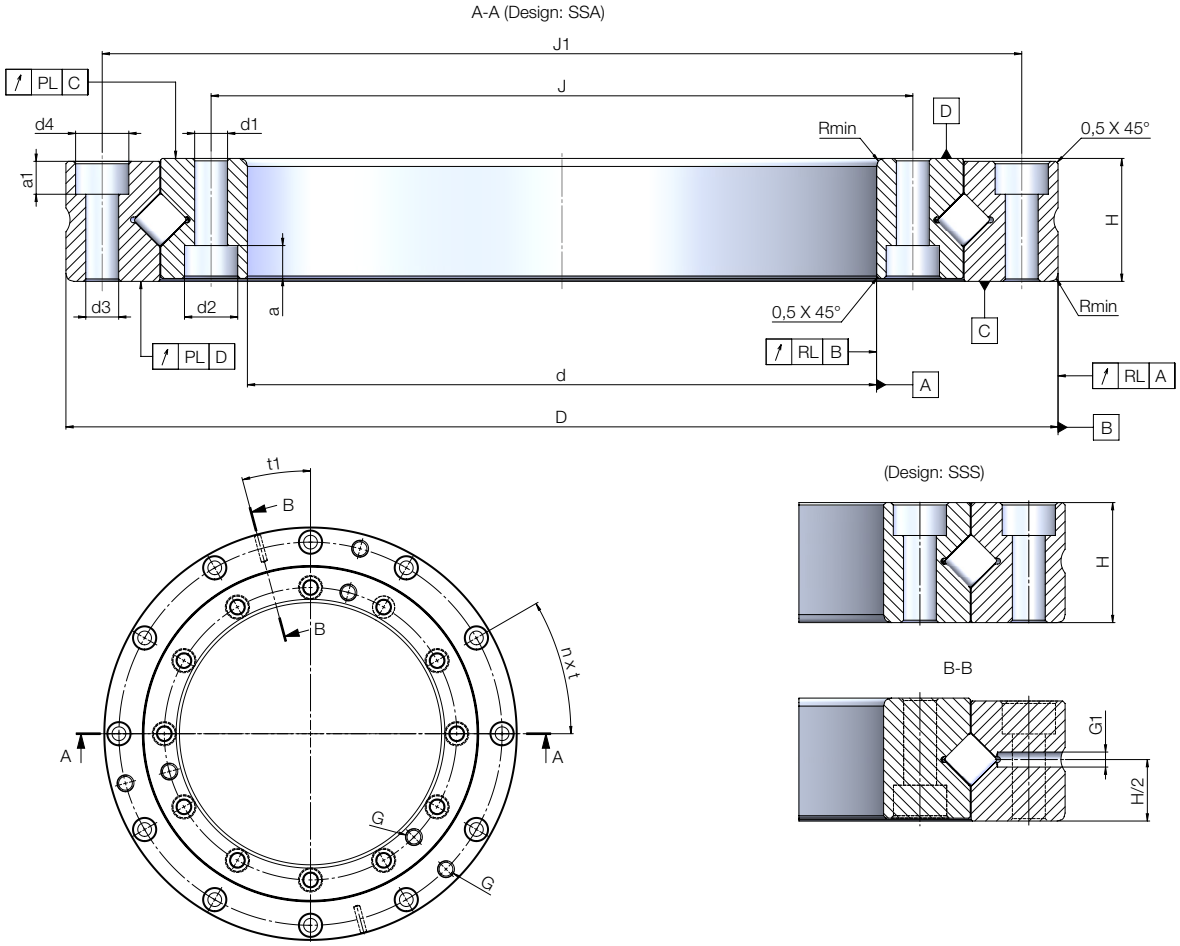
3) Measuring speed n_{const} = 5 rpm

4) Measured on the installed bearing with ideal adjacent construction.

Designation	Fixing holes										Extraction thread	
	Inner ring				Outer ring				Number x Pitch	Screw tightening torque	Inner ring/ outer ring	
	d1	d2	a	Number	d3	d4	a1	Number	nxt	M_A [1] [Nm]	G	Number
AXCR 80-U	5.5	9.5	5.4	10	5.5	9.5	5.4	10	10 x 36°	8.5	M8	2
AXCR 90-U	9	14	8.6	12	9	14	8.6	12	12 x 30°	34	M8	3
AXCR 115-U	9	14	8.6	12	9	14	8.6	12	12 x 30°	34	M8	3
AXCR 160-U	11	17.5	10.6	12	11	17.5	10.6	12	12 x 30°	68	M10	3
AXCR 210-U	13.5	20	12.6	16	13.5	20	12.6	16	16 x 22.5°	116	M10	2
AXCR 270-U	9	14	8.6	16	9	14	8.6	16	16 x 22.5°	34	M10	2
AXCR 350-U	13.5	20	12.6	24	13.5	20	12.6	24	24 x 15°	116	M10	3
AXCR 360-U	13.5	20	12.6	24	13.5	20	12.6	24	24 x 15°	116	M10	3
AXCR 540-U	13.5	20	12.6	36	13.5	20	12.6	36	36 x 10°	116	M10	3

Designation	Load rating				Limiting speed [2]	Bearing friction torque [3]	Axial runout & radial runout [4]						Rigidity of the bearing position			Min. corner radius
	Axial		Radial		Grease	Grease	Inner ring			Outer ring			Axial	Radial	Tilting rigidity	
							Class P4	Class P2	Class UP	Class P4	Class P2	Class UP				
	dyn. C_a [kN]	stat. C_{0a} [kN]	dyn. C_r [kN]	stat. C_{0r} [kN]	n_G [rpm]	$M_{RL\,max}$ [Nm]	PL & RL [µm]	PL & RL [µm]	PL & RL [µm]	PL & RL [µm]	PL & RL [µm]	PL & RL [µm]	C_{al} [kN/µm]	C_{rl} [kN/µm]	C_{kl} [kNm/mrad]	R_{min} [mm]
AXCR 80-U	49.4	177.8	44.0	71.1	320	5	4	2.5	2	8	5	3	1.4	0.8	2.7	1
AXCR 90-U	74.9	273.7	66.7	109.5	270	6	5	2.5	2	10	7	4	1.7	0.9	4.5	1.5
AXCR 115-U	103.8	388.2	92.5	155.3	225	10	5	2.5	2	10	7	4	1.8	0.9	6.9	1.5
AXCR 160-U	147.5	594.0	131.3	237.6	180	12	6	5	3	11	7	4	2.3	1.2	14.2	2
AXCR 210-U	206.2	911.6	183.5	364.6	140	18	8	5	3	13	8	5	3.0	1.5	32.1	2.5
AXCR 270-U	147.0	757.0	130.6	302.8	120	25	10	6	4	13	8	5	3.2	1.6	44.0	3
AXCR 350-U	254.2	1368.0	225.9	547.2	90	40	12	7	4	17	10	7	4.4	2.3	106.4	2.5
AXCR 360-U	258.0	1402.9	229.2	561.2	90	50	12	7	4	17	10	7	4.3	2.2	106.8	3.5
AXCR 540-U	307.3	1964.4	272.9	785.8	65	100	16	10	6	20	15	9	6.7	3.3	320.9	4

Dimensions table AXCR-S



Designation	Weight	Dimensions [mm]										
	m	d	Δd	D	ΔD	H		ΔH	J	J1	t1	G1	Number
	[kg]					SSA	SSS						
AXCR 130-S	3.3	130	0.025	205	-0.029	25.4	24.8	± 0.200	145	190	15°	3.1	2
AXCR 150-S	3.7	150	0.025	225	-0.029	25.4	24.8	± 0.200	165	210	11.25°	3.1	2
AXCR 180-S	4.3	180	0.025	255	-0.032	25.4	24.8	± 0.200	195	240	9°	3.1	2
AXCR 220-S	5.1	220	0.029	295	-0.032	25.4	24.8	± 0.200	235	280	7.5°	3.1	2
AXCR 280-S	6.3	280	0.032	355	-0.036	25.4	24.8	± 0.250	295	340	6.43°	3.1	2
AXCR 360-S	7.8	360	0.036	435	-0.040	25.4	24.8	± 0.300	375	420	5°	3.1	2

1) Tightening torque for screws acc. DIN 912, strength class 10.9.

2) Please enquire in case of high speed applications.

3) Measuring speed n_{const} = 5 rpm

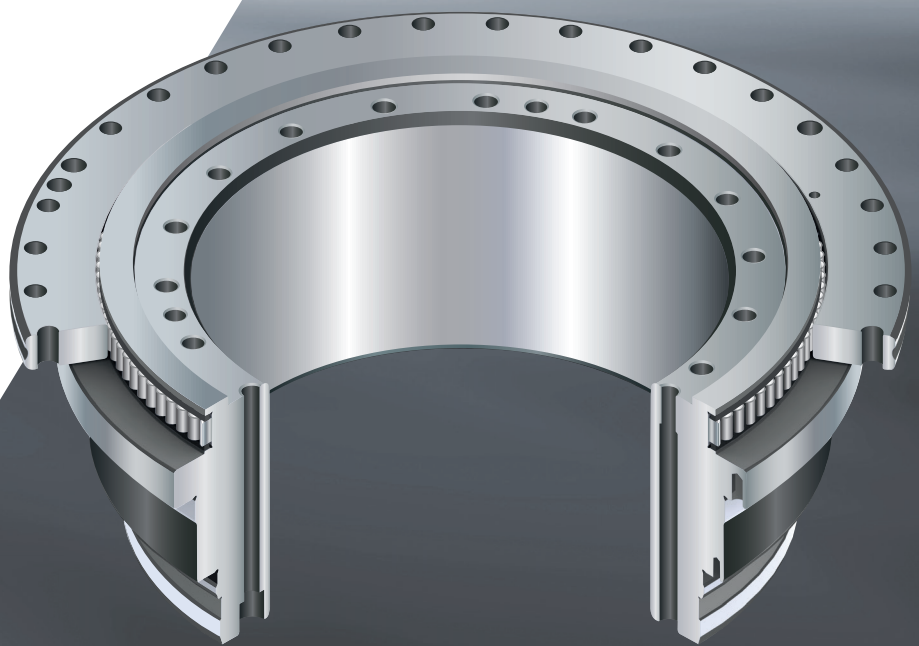
4) Measured on the installed bearing with ideal adjacent construction.

Designation	Fixing bores										Extraction thread	
	Inner ring				Outer ring				Number x Pitch	Screw tightening torque	Inner ring/ outer ring	
	d1	d2	a	Number	d3	d4	a1	Number	nxt	M_A [1] [Nm]	G	Number
AXCR 130-S	6.6	11	6.4	12	6.6	11	6.4	12	12 x 30°	14	M8	3
AXCR 150-S	6.6	11	6.4	16	6.6	11	6.4	16	16 x 22.5°	14	M8	2
AXCR 180-S	6.6	11	6.4	20	6.6	11	6.4	20	20 x 18°	14	M8	2
AXCR 220-S	6.6	11	6.4	24	6.6	11	6.4	24	24 x 15°	14	M8	3
AXCR 280-S	6.6	11	6.4	28	6.6	11	6.4	28	28 x 12.857°	14	M8	2
AXCR 360-S	6.6	11	6.4	36	6.6	11	6.4	36	36 x 10°	14	M8	3

Designation	Load ratings				Limiting speed[2]	Bearing friction torque[3]	Axial runout & radial runout[4]		Rigidity of the bearing position			Min. corner radius
	Axial		Radial		Grease	Grease	Inner ring	Outer ring	Axial	Radial	Tilting rigidity	
							Standard	Standard				
	dyn. C_a [kN]	stat. C_{0a} [kN]	dyn. C_r [kN]	stat. C_{0r} [kN]	n_G [rpm]	$M_{RL\,max}$ [Nm]	PL & RL [µm]	PL & RL [µm]	C_{al} [kN/µm]	C_{rl} [kN/µm]	C_{kl} [kNm/mrad]	R_{min} [mm]
AXCR 130-S	57.3	237.1	50.9	94.8	240	10	10	10	1.9	1.0	6.2	2
AXCR 150-S	61.5	270.8	54.7	108.3	215	12	10	10	2.1	1.1	9.1	2
AXCR 180-S	66.2	313.2	58.8	125.3	185	16	10	10	2.5	1.3	14.2	2
AXCR 220-S	72.4	372.5	64.3	149.0	155	18	10	10	2.9	1.5	23.5	2
AXCR 280-S	81.5	465.5	72.4	186.2	130	25	10	10	3.6	1.7	43.3	2
AXCR 360-S	91.7	584.0	81.4	233.6	100	50	10	10	4.4	2.0	83.9	2

Product chapter

Special bearings



General

General

The production of myonic ultra precision bearings takes place on ultra modern machine tools in one clamping position.

This permits form accuracies to be achieved which cannot be achieved using conventional methods.
In the area of special bearing construction, the transmission of this accuracy onto the surrounding construction is a decisive criterion.

myonic features an extremely flexible set-up in the area of production for ultra high precision rotary axis bearings.
This permits the production of special bearings in smaller batch sizes.

Preloaded non-locating bearings/integration

General

For long axes or axes with high applications of pressure through tilting moments, a counter bearing can substantially increase the performance capacity.

The bearings are preloaded via the radial part and therefore run backlash-free, but can balance out via length expansions.

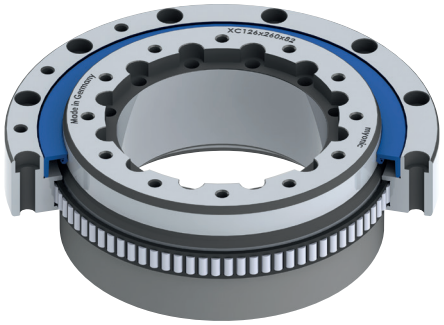
Integration

Further functions can be integrated into these bearing types:

- Fit seats for additional parts such as toothed wheels or measuring flanges
- Counter faces for shaft sealing rings
- Seals
- Toothings

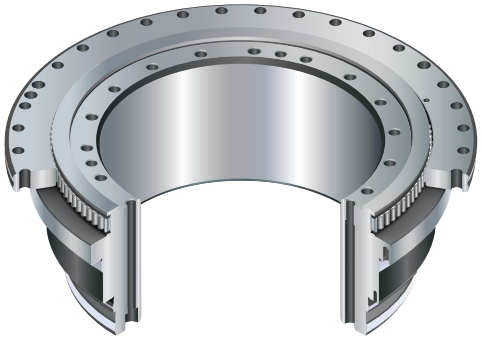
Advantages

The defined fixed/non-locating bearing setup avoids distortions in the rotary axis system. The assembly costs are lowered; the parts merely have to be centred once.



Example – non-locating bearing in a swing bridge

In addition to the non-locating bearing function, the bearing seals against the outside. The integrated high precision centring attachment in the bearing bore simplifies assembly.



Example – non-locating bearing in the machining axis of a transfer centre

In addition to the non-locating bearing function, mating surfaces for a toothed wheel and the measuring flange and a hardened, twist-free counter surface are designed for the shaft sealing ring.

Integrated axial/radial bearings

General

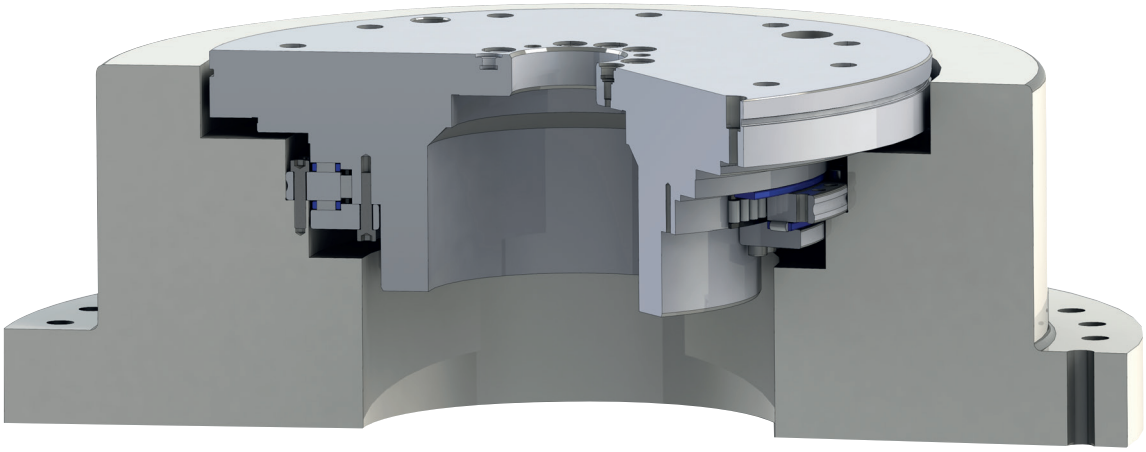
The manufacture of a suitable adjacent construction for ultra high precision bearings is complex; form irregularities worsen the radial and axial runout.

With the functional integration of the axial/radial bearings in the surrounding construction, better and less expensive solutions can be realised.

Advantages

The integration generates numerous advantages:

- Reduction of components
- Compact solution, ready to install
- Reduction in assembly effort
- Improved accuracy requirements
- Higher rigidities
- Seals
- Reduction of total costs



Example of table integration as inner ring

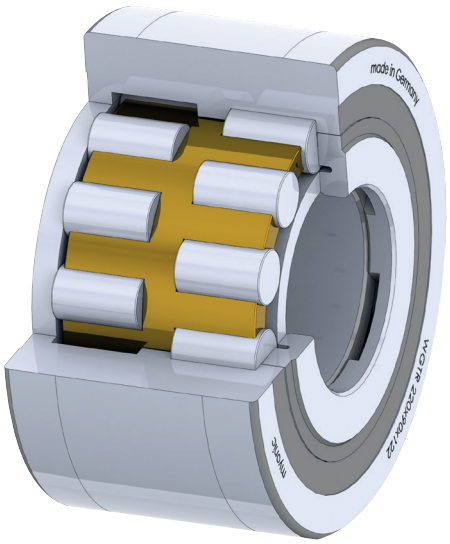
The machining table replaces the inner ring of the axial-radial bearings. The entire solution is more compact, rigid and accurate in axial and radial runout than the conventional solution with simultaneously lower total costs of the axis.

Support bearings

General

Support bearings from the roller mill sector are frequently used as accompanying support bearings for heavy workpieces.

Due to the extremely high production precision, these bearings can be supplied with minimum construction heights and lowest radial runout tolerances.



Further bearings for machine tools/ Accessories

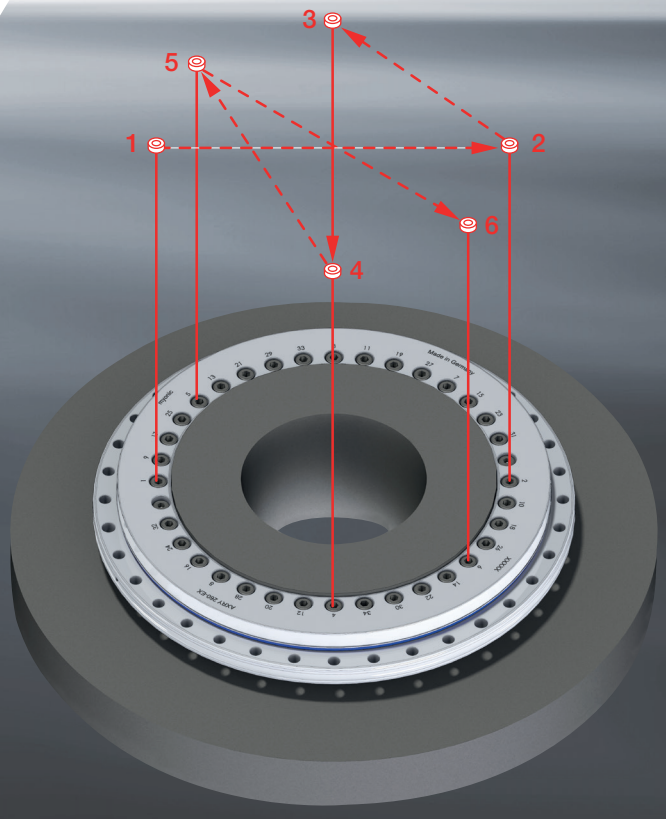
Bearings for ball screw drives

myonic produces a complete program of needle axial cylindrical roller bearings, construction series AXZN and AXZF.
Please request these catalogues separately.

Spindle bearings

myonic produces ultra high precision spindle bearings in the smaller diameter range, suitable for maximum speeds.
Please request these catalogues separately.

Installation and maintenance AXRY-EX/ EX-S/ES/ AXDR/AXCR



General

General guidelines on installation

Roller bearings for machine tools are precision machine elements.
These high precision roller bearings only achieve their maximum duration of use and functionality if they are correctly assembled and maintained.

Because it is not possible to present all variations of the adjacent construction or deviating fits, these installation and maintenance instructions refer to the most frequent installation case of the rotating inner ring and an adjacent construction in accordance with the recommendations of the myonic catalogue.

In case of deviating installation or application cases, the bearings are to be installed appropriately. We are happy to assist in case of queries.

General cleanliness

Roller bearings for machine tools must be treated with great care. Handle the bearing carefully and impact-free, and do not remove it from the packaging until directly prior to assembly.

The workplace and all connecting parts must be clean and dust-free. Only use lint-free cloths for cleaning purposes.

Tools and measuring equipment

Only use calibrated tools and measuring equipment.

Design of the assembly station

It is essential that you keep the assembly station of the bearing clean and dust-free.

During on-site repairs, cover the machine in order to avoid contamination from the surroundings.

Any contamination will influence the bearing function.

Bearing delivery

All bearings are preserved, wrapped in anti-rust paper and supplied individually shrink-wrapped in foil.

Do not unpack the bearings until directly prior to assembly.

In case of contamination of the bearing prior to assembly, return it to myonic for inspection and, if applicable, for cleaning and regreasing.

General

Initial greasing

As standard grease, a special grease acc. DIN 51825-KPHC1N-30 is used. The quantity of lubrication used depends on the intended purpose.

AXRY-EX/AXDR-V and AXCR are supplied with higher grease filling quantities and are suitable for swivel operation and short, high speeds.

AXRY-EX-S/AXRY-ES are supplied with lower grease filling quantities and must be relubricated during operation.

Bearings with the suffix L120 are delivered ungreased; only corrosion protection oil is added to the bearings.

ATTENTION!

The friction torque of the bearing is highly dependent on the grease quantity and the quality of the grease.

All the catalogue information refers to the original condition after run-in of the bearing.

In particular for high speed applications, most conventional greases cannot or can only be used under certain circumstances.

Preservatives

The used corrosion protection oil is compatible und mixable with most of greases and oils produced on a mineral basis.

Check for compatibility when using synthetic lubricants and other consistency enhancers than lithium (complex) soaps.

In case of incompatibility, please consult myonic as to further procedures.

Cleaning the bearings

When cleaning the bearing, only use lint-free cloths!
Only the outer areas of the bearing may be cleaned!
The following agents can be used:
Organic cleaning agents, e.g. benzine or thin, clean oil for warm cleaning.

ATTENTION!

Keep hands clean and dry, as hand perspiration leads to corrosion.

Always use gloves.

General

Transportation of the bearings

Only store and transport large bearings in prone position. Do not store bearings vertically!

Only transport heavy bearings with lifting gear on eyebolts or`with textile straps. Never wrap the bearings in a chain!

ATTENTION!

Do not unpack the bearing until just prior to assembly from the packaging and protect against contamination.

Storage

Storage capacity up to 3 years is guaranteed under the following conditions:

- Closed storage room
- Room temperatures between 0 °C and +40 °C (dry and clean)
- Relative air humidity under 65 %
- Clean atmosphere, no influence from aggressive chemicals
- Install greased bearing within at most 1 year

ATTENTION!

Treat the bearing very carefully prior to and after the assembly and only assembly these according to the installation and maintenance instructions.

Only mount the bearing with the specified tools and assembly aids.

Handling of bearings with measuring system

All myonic measuring systems function inductively.
For this reason, the bearings are resistant to magnetism.

The measuring rings mounted on the bearing are to be protected against mechanical damage.

Lubrication

General information regarding lubricants:

Greases can be mixed under the following prerequisites:

- Same base oil basis
- Consistent thickener type
- Similar base oil viscosities (not further apart than one ISO-VG class)
- Consistent NLGI class

The standard grease used is a special grease by Klüber and can be procured worldwide directly from the manufacturer. Due to positive practical experience with this grease, it is used in all preloaded bearings (AXRY/AXDR/AXCR).

It features good pressure and wear stability and does not contain inorganic solid lubricants such as MoS_2 or graphite.

The high elastomer compatibility permits use with conventional sealants. If in doubt as to compatibility, sealant materials can be tested.

For relubrication, we recommend dosing systems or central lubrication systems in order to exclude over-greasing of the bearing.

The grease is always easy to convey; we are happy to assist in case of special system constructions.

Do not remove pre-greased bearings from the protective packaging until just before assembly. In order to avoid aging of the grease, we recommend that you install the bearings within one year after delivery.

ATTENTION!

The friction torque is heavily dependent on the bearing greasing.

The friction torques stated in the measurement tables only apply for original greasing.

Do not mix the original grease with barium complex soap.

ATTENTION!

In case of relubrication with other greases, check the miscibility.

The use of non-miscible base oils or soaps leads to premature bearing failure.

Lubrication

Grease properties		
	Temperature range	- 40 to +150 °C
	Base oil, kin. viscosity 40 °C (DIN 51562)	approx. 130 mm²/s
	Base oil, kin. viscosity 100 °C (DIN 51562)	approx. 14 mm²/s
	Colour	Yellow
	Consistency enhancer	Li special soap
	Type of oil and mineral oil	Mix synth. hydrocarbon oil
	Density	approx. 0.88 g/cm³
	Flow pressure (DIN 51805)	< 1400 mbar
	NLGI class (DIN 51818)	1
	Minimum storage duration	36 months

Miscibility of base oils

	Mineral oil	Synth. hydrocarbon	Ester oil	Polyglycol	Silicon oil (Methyl)	Perfluor-alkyl-ether	Silicon oil (Phenyl)	Poly-phenyl-ether oil
Mineral oil	+	+	+	-	-	-	+/-	+
Synth. hydrocarbon	+	+	+	-	-	-	-	+
Ester oil	+	+	+	+	-	-	+	+
Polyglycol	-	-	+	+	-	-	-	-
Silicon oil (Methyl)	-	-	-	-	+	-	+/-	-
Perfluoralkyl ether	-	-	-	-	-	+	-	-
Silicon oil (Phenyl)	+/-	-	+	-	+/-	-	+	+
Polyphenyl ether oil	+	+	+	-	-	-	+	+

\+ miscible +/- miscible to a certain extent - not miscible

Miscibility of thickener systems*)

		Metal-soap-greases				Complex-soap-greases					Greases		
		Al	Ca	Li	Na	Al	Ba	Ca	Li	Na	Bentonite	Polyurea	PTFE
Metal-soap greases	Al	+	+/-	+	+/-	+	+/-	+	+	+/-	+	+	+
	Ca	+/-	+	+	+	+	+	+	+/-	+	+	+	+
	Li	+	+	+	-	+	+	+	+	-	+/-	+/-	+
	Na	+/-	+	-	+	+	+	+/-	+/-	+	-	+	+
Complex soap greases	Al	+	+	+	+	+	+	+/-	+	+/-	+/-	+/-	+
	Ba	+/-	+	+	+	+	+	+/-	+/-	+	+	+/-	+
	Ca	+	+	+	+/-	+/-	+/-	+	+	+	+/-	+	+
	Li	+	+/-	+	+/-	+	+/-	+	+	+/-	+	+/-	+
	Na	+/-	+	-	+	+/-	+	+	+/-	+	-	+	+
Greases	Bentonite	+	+	+/-	-	+/-	+	+/-	+	-	+	+	+
	Polyurea	+	+	+/-	+	+/-	+/-	+	+/-	+	+	+	+
	PTFE	++	+	+	+	+	+	+	+	+	+	+	+

\+ miscible +/- miscible to a certain extent - not miscible *) The miscibility of the base oils must be guaranteed

Lubrication

During manual relubrication, use the original grease if possible. The bearings are greased on delivery with a lithium complex soap grease acc. DIN 51825-KPHC2N-30L, and can be lubricated via the outer ring.

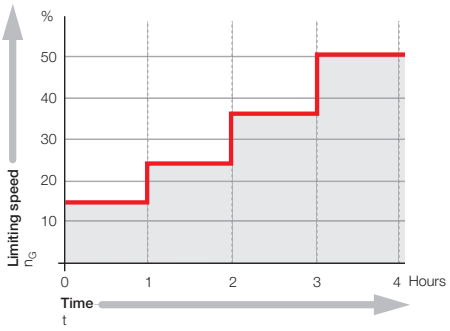
The following is to be observed:

- Clean or replace the lubricating nipples and filters.
- Press grease evenly into all lubricating nipples, until the relubrication quantity is reached.
- During the relubrication process, rotate the bearing ring and ensure unhindered exit of the old grease.

  Prior to commissioning, ensure that all lubricant lines to the bearing are filled with lubricant.

Grease distribution run/excess lubrication

In order to evenly distribute the grease in the bearing, conduct at least one grease distribution run. Repeat this multiple times for high speed bearings. You can obtain alternative grease distribution runs over longer periods of time from myonic application engineering.
In case of excess lubrication, the friction torque and therefore the bearing temperature increases substantially. In order to achieve the original friction values again, conduct one or several grease distribution runs.



No grease distribution run is required for slow-running swivel applications.

ATTENTION!

During the grease distribution run, do not exceed a roller bearing ring temperature of 60 °C.

Relubrication deadlines and quantities

Relubrication deadlines and quantities can be calculated by stating the load spectrum (speed, load, operating duration) and the ambient conditions (temperature, dirt, dust, water etc.). Please enquire at myonic.

ATTENTION!

Always relubricate the bearing prior to and after a prolonged standstill, in case of high levels of humidity and within the defined lubrication intervals.

Preparing the adjacent construction for installation

Prepare connecting parts

The connecting parts for the bearing rings must be clean and burr-free. Please proceed as follows:
Treat the surfaces and burrs with an oil stone.
Apply cleaning agent with a brush or suitable cloth onto system and bearing seat surfaces.
Clean surfaces and dry them.

ATTENTION!

All connection components and lubrication bores must be free of cleaning agents, solvents, wash emulsions and dissolving particles.

Select the assembly screws

Only fasten the bearing using the specified screws.
The information in the product catalogues is decisive for this purpose.

ATTENTION!

For all versions of AXRY, only use fixing screws in the strength class 10.9 acc. DIN 912.

Check the tolerances of the adjacent construction

All tolerances must lie within the stated values for the adjacent construction in the product catalogues.
Deviating tolerances lead to functional problems on the installed bearing; severely increased friction values may occur, or problems with the preload.

Check the bearing tolerances

The information on the bearing diameter are mean values.
The accuracy requirements for the bearing can only be measured on an installed, screwed and fully supported bearing!

ATTENTION!

Do not loosen the fastening screws.

Documentation of the values during assembly

Over the course of assembly, the friction values should be continuously recorded. Severely increased friction values during assembly indicate an adjacent construction of poor quality.
We recommend that you archive the actual dimensions of the adjacent construction in addition to the friction values, and the myonic measuring log with the serial number enclosed with the bearing.

Interrupted assembly

If the assembly source is interrupted, cover the bearing to avoid it becoming dirty.
Use plastic foil or lint-free cloths; in case of prolonged interruptions, use cover material with rust protection inhibitors (e.g. VCI paper).

Component temperature

Only screw together components with the same temperature.
Give cold or heated components time to adapt to the ambient temperature.

Bearing assembly

Fastening the bearing inner ring:

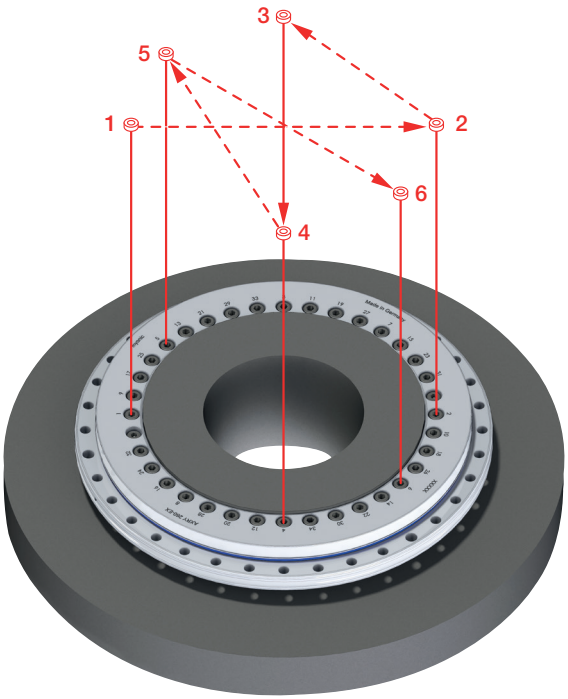
- Slightly oil the seat areas for the bearing inner ring to the adjacent construction.
- Prior to pushing on the bearing, align the bearing drilling pattern acc. the drilling pattern of the adjacent construction.
  Threaded rods cut to size are highly suitable for this purpose.
- Push the bearing onto the shaft without tilting the bearing.
- To facilitate assembly, the bearings can be heated up slightly; 20 °K over room temperature is generally sufficient; prior to screwing on, allow the bearing to cool down.

The extraction thread can be used to align the bearing. To do this, insert the appropriate screws and screw in up to the bearing construction height. Insert longer fixing screws into 4-6 holes and screw them tight.

Loosen the screws in the extraction threads bit by bit and retighten the fixing screws. Repeat the process until the bearing sits tightly on the shaft.

- Insert fixing screws into the holes and tighten slightly by hand.
- Tighten the fixing screws with a torque wrench crosswise in three stages to the specified tightening torque M_A:
  - 1st stage 40 % of MA
  - 2nd stage 70 % of MA
  - 3rd stage 100 % MA

  Tightening torque for the fixing screws, see table on tightening torques.



Bearing assembly

Tighten the AXDR and undivided AXCR bearings to stages 1 and 3. Tighten the AXCR bearings with divided rings in 3 stages.

- During the assembly process, rotate the unscrewed ring several times.
- After completion of the assembly, check the friction torque and record it.

ATTENTION!

Only apply the assembly forces to the ring to be installed; never guide the assembly forces via the roller element.

Do not hit the bearing.

Do not loosen the fastening screws.

All screws must have clearance in the holes; in case they are hard to move, re-align the bearing to the drilling pattern of the cadjacent construction.

In case of NE connection parts which are screwed with the bearing, observe the flow of force.
Steel washers also screwed onto NE parts produce more even flow of force.

Fasten the bearing outer ring

- Oil the seat area slightly for the bearing outer ring in the housing.
- Adjust and assemble the outer ring of the bearing in the housing hole.
- Align the AXRY-ES bearing over the positioning hole.
- Insert all fixing screws into the holes and tighten them slightly by hand.
- Tighten the fixing screws with torque wrench crosswise to the specified tightening torque MA.

  Tightening torque for the fixing screws, see table on tightening torques.

ATTENTION!

Screw the outer ring on completely; missing screws reduce the bearing capacity and rigidity of the bearing, and the running characteristics may deteriorate.

Secure the positioning pins against falling out.

Tightening torques for fixing screws 10.9

Fixing screw	Tightening torque MA Nm		
	1st stage 40 % from M_A	2nd stage 70 % from M_A	3rd stage 100 % from M_A
M5	3	6	8.5
M4	2	3	4.5
M5	3	6	8.5
M5	3	6	8.5
M6	6	10	14
M6	6	10	14
M6	6	10	14
M6	6	10	14
M8	14	24	34
M8	14	24	34
M8	14	24	34
M8	14	24	34
M10	27	48	68
M12	46	81	116
M16	114	199	284

Deviating strength classes/ tightening torques

The bearing preload and therefore the friction torque are determined through the tightening torque of the screws.

Higher and lower preload values can be adjusted via the screw tightening torque.

In case of lower tightening torques of screws in strength class 10.9 or the use of screws in strength class 12.9 with specified tightening torque, the screws must be secured accordingly acc. Table 10.9.

ATTENTION!

Lower screw tightening torques may lead to loosening of the screw connection.

Bearing inspection

Functional inspection

After correct screwing on, the bearing must rotate evenly and jerk-free. The friction torque does not adjust until after it has been completely screwed on.

Measuring the AXRY-EX (EX-S, ES) in unscrewed condition is not permitted.

The friction torque is influenced by:

- Additional loads
- The screw tightening torque
- The form errors of the mating, contact and screw-on surfaces
- The lubricant (quantity/vicosity/general suitability)
- The fits
- The difference in the bearing ring temperature inner ring to the outer ring
- The operating temperature

A slight increase in the friction torque after assembly is normal; in case of unusually high values, loosen the bearing screw connection, check for the abovementioned influence factors, correct if necessary and screw on again.

The adjusted actual running torque after assembly is noted in the report included in delivery. Fits can be optimised with the actual dimensions of the bearing bore or the bearing outer diameter.

Inspection of accuracy requirements

An inspection of the accuracy requirements is only permitted in installed condition.

Every myonic precision bearing is checked prior to delivery for roundness and axial runout. The absolute values are supplied with the inspection report.

Further information, for example regarding repeatability, is available via the bearing serial number directly at myonic.

Causes of incorrect accuracy requirements after assembly:

- Adjacent construction inaccuracies
- Clearance fit of rotating ring to adjacent construction, eccentricity of the raceway to the axis centre
- Fixing screws incorrectly tightened
- Fixing screws incorrectly aligned
- Fastening screws loosened prior to assembly

Bearing inspection

Safety inspection

The fixing screws must be regularly inspected.

High, alternating loads may trigger settling symptoms.

- After initial commissioning, check the tightening torques
- Check during the service intervals
- Only use the fixing screws once; on installation of a replacement bearing, use new screws.
  If necessary, tighten the fixing screws crosswise to the specified values.

notes:

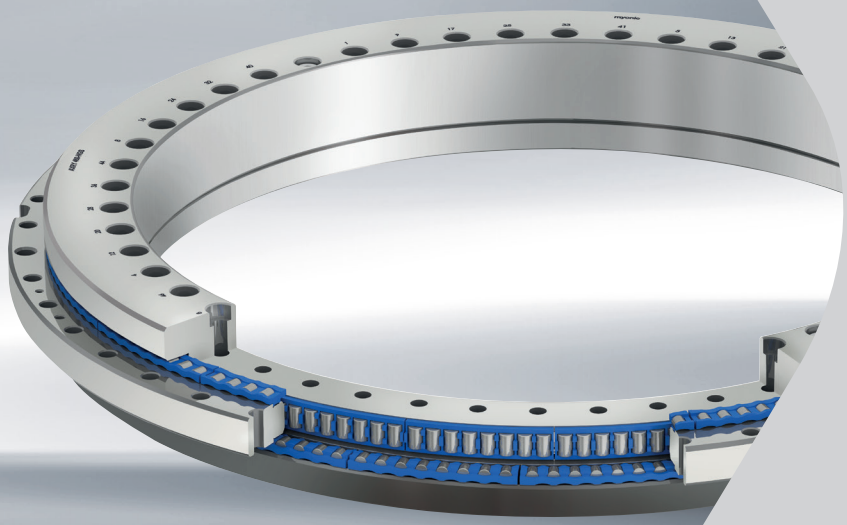
notes:

notes:

notes:

MinebeaMitsumi
Passion to Create Value through Difference

myonic



Your local contact:

Germany/Switzerland/Rest of Europe

myonic GmbH
Tel. +49 7561 978 0
mtc@myonic.com
www.myonic.com

Japan

MinebeaMitsumi Inc.
Tel. +81-(0)3-6758-6772
smachida.ne@minebeamitsumi.com
www.minebeamitsumi.com

ASIA

myonic
Representation Office
Taipei
Tel. +886 909 150 281
gerd.nehuis@myonic.com

USA

myonic USA
A Division of New Hampshire
Ball Bearings, Inc.
Tel. +1 818 701 4833
info@nhbb.com
www.nhbb.com