Angular-Contact Ball Bearing Assemblies

Series ZKLR...2RS, ZKLR...2Z

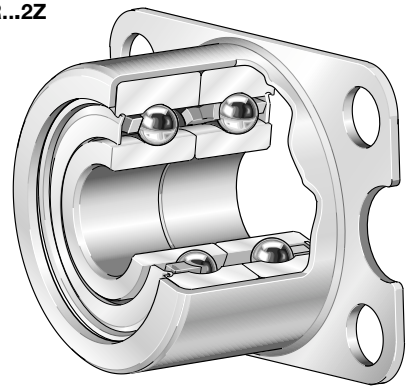
Low Cost
Angular-Contact Ball Bearing Assemblies

Angular-Contact Ball Bearing Assemblies

- Consist of a deep-drawn steel flange housing and two radial or angular-contact ball bearings in an “X” arrangement with:
  - optional lip or gap seals on both sides of the bearings
  - axially and radially preloaded bearing arrangement
- Provide ready-to-mount economical systems solutions
- Support radial loads and axial loads in either direction
- Are protected against contamination through integrated seals
- Have low frictional torque:
  - frictional torque is slightly higher in bearings with **.**2RS seals
- Include lifetime lubrication for most applications due to large grease reservoir
- Come with a corrosion-resistant housing protected by INA’s Corrotect® plating
- Have a simplified mounting procedure with the following advantages:
  - direct mating of the unit, for example to the milled face of the mounting structure, eliminates the need for costly precision fitting and additional parts for seating and axial location of the bearings (Table 2, p. 3)
  - additional components are not required to retain the bearings in the housing
  - the smaller number of parts minimizes assembly defects or errors compared with conventional solutions (Table 2, p. 3)
  - the bearing arrangement self-adjusts through the screw drive nut during assembly, so that warping due to bearing seat misalignment is virtually impossible
  - a set preload is present in the bearing arrangement, eliminating the need for adjustment during assembly that is normally required for lead screw bearings
  - the location of the bearing only requires a shaft locknut for clearance-free axial location
- Are well-suited, based on their dimensions and design, for use as simple, space-saving arrangements in highly dynamic ball or roller screw drive systems for:
  - gauging and measuring equipment
  - small machine tools
  - applications involving semiconductors and precision mechanics
  - any bearing arrangements that can be simplified by using complete assemblies

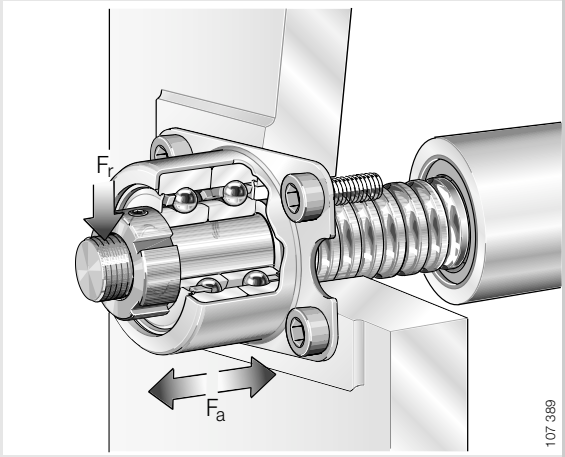
Angular-Contact Ball Bearing Assemblies

ZKLR...2RS
ZKLR...2Z



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- Housing of deep-drawn steel with Corrotect® plating
- Radial or angular-contact ball bearings arranged in pairs, peloaded both axially and radially, with **.**2RS or **.**2Z-seals on both sides
- For operating temperatures from –20 °C to +120 °C, limited by the lubricating grease
- For shafts of 6 mm, 8 mm, 10 mm, 12 mm, 15 mm and 20 mm



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- Axial load F_a and radial load F_r
- Clearance-free axial location of the bearing assembly by the locknut

Angular-Contact Ball Bearing Assemblies

Bearing Size

The selection of the suitable bearing size depends on the following:

- Basic rating life L or L_h
- Static limiting load diagrams (Figures 1 and 2)

Basic Rating Life

The basic rating life is calculated as follows:

$$L_h = \frac{16666}{n} \cdot \left(\frac{C}{P}\right)^p$$

L_h h
Basic rating life in operating hours

n min^{-1}
Operating speed

C N
Basic dynamic load rating according to the *Dimension Table*

P N
Equivalent dynamic bearing load according to Table 1

p –
Life exponent for ball bearings: p = 3

F_a N
Axial operating load

F_r N
Radial operating load

Table 1 · Factors for calculating the equivalent bearing load P

Bearing Assembly Designation	Equivalent Dynamic Load Factor Calculation
ZKLR 0624.2Z	$P = 140 + 0{,}13\ F_a^{1,4} + 0{,}003\ F_r^{1,9}$
ZKLR 0828.2Z	$P = 210 + 0{,}28\ F_a^{1,27} + 0{,}002\ F_r^{1,9}$
ZKLR 1035.2Z	$P = 240 + 0{,}47\ F_a^{1,17} + 0{,}0015\ F_r^{1,9}$
ZKLR 1244.2RS	$P = 580 + 0{,}046\ F_a^{1,3} + 0{,}076\ F_r^{1,28}$
ZKLR 1547.2RS	$P = 540 + 0{,}011\ F_a^{1,5} + 0{,}022\ F_r^{1,45}$
ZKLR 2060.2RS	$P = 960 + 0{,}0082\ F_a^{1,5} + 0{,}017\ F_r^{1,45}$

Static Limiting Load Diagrams

The easy-to-use diagrams for the static limiting load (Figures 1 and 2) allow quick verification of the correct bearing size – regardless of the axial and radial operating loads. The deciding factor is that the intersection of axial load and radial load must lie below the curve for the selected bearing.

Example:

- If the operating loads F_a and F_r are below the curve, then the bearing size is suitable for the application (Figure 3):
  – operating load F_a = 300 N, operating load F_r = 600 N

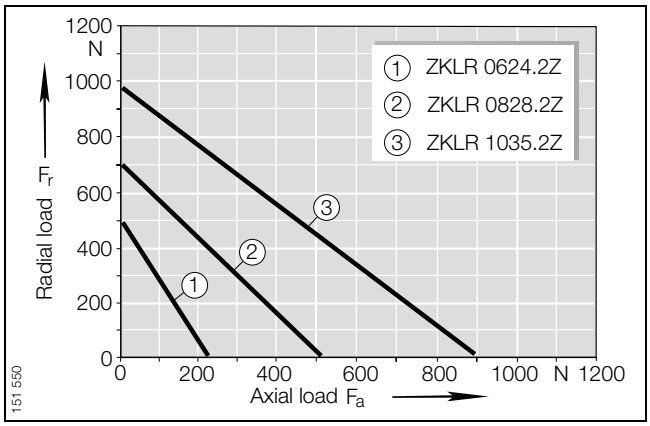


Figure 1 · Static limiting load diagram for ZKLR 0624.2Z, ZKLR 0828.2Z, ZKLR 1035.2Z

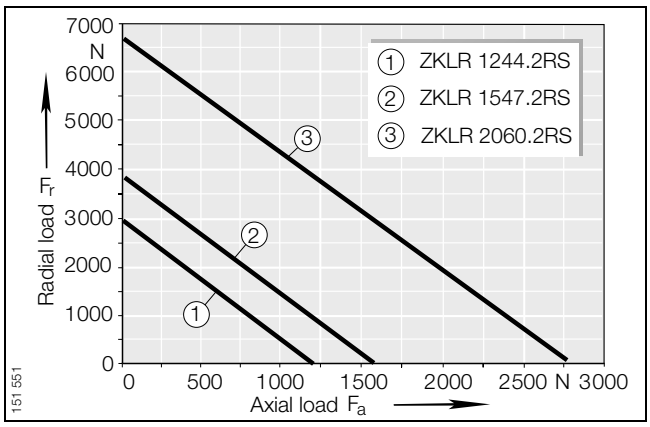


Figure 2 · Static limiting load diagram for ZKLR 1244.2RS, ZKLR 1547.2RS, ZKLR 2060.2RS

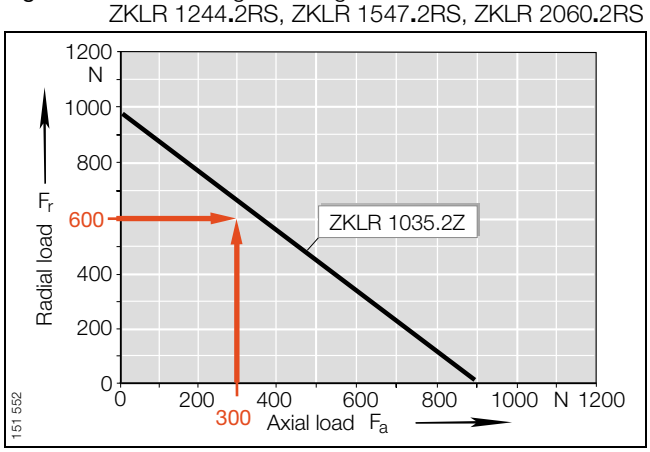


Figure 3 · Sample application of the static limiting load diagram for ZKLR 1035.2Z

Accuracy

Series ZKLR...2RS and ZKLR...2Z angular-contact ball bearing assemblies have lateral and radial runout accuracy on the inner ring of P5 to DIN 620.

Locating the Bearing Assembly on the Screw/Installation

ZKLR angular-contact ball bearing assemblies are particularly easy to install, as these bearing arrangements:

- Are bolted directly onto the supporting structure
- No longer require preloading after installation

Thus the bearing arrangement can usually be fixed on the screw simply by means of clearance-free clamping – however, the type of axial location required depends on the load to be supported.

A milled, or if necessary even an unmachined flat surface without additional radial location suffices as a supporting structure (see *Dimension Table*).

Table 2 lists the advantages of the INA ZKLR bearing assemblies over conventional solutions.

Installation (Figure 4)

- Locate the bearing assembly on the screw ② with locknut ① or clearance-free clamping device
- Bolt the bearing assembly onto the supporting structure ③:
  – bolts should be only hand-tightened
- Move the screw nut ④ to the end positions (the position of the screw is the reference for the linear guidance system; the movable screw nut serves as a functional element for positioning the flanged unit):
  – the bearing adjusts automatically into the optimum radial position (as a result of the constraining forces exerted by the reference)
- Bolt the bearing assembly down on the supporting structure using the tightening torque specified in the assembly drawing ⑤

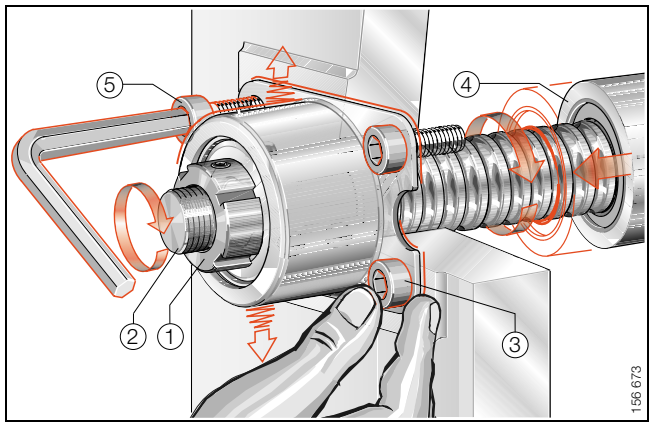
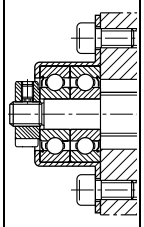
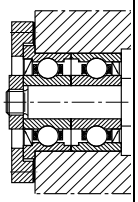
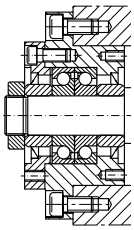


Figure 4 · Installation of a ZKLR bearing assembly on the screw/machine wall

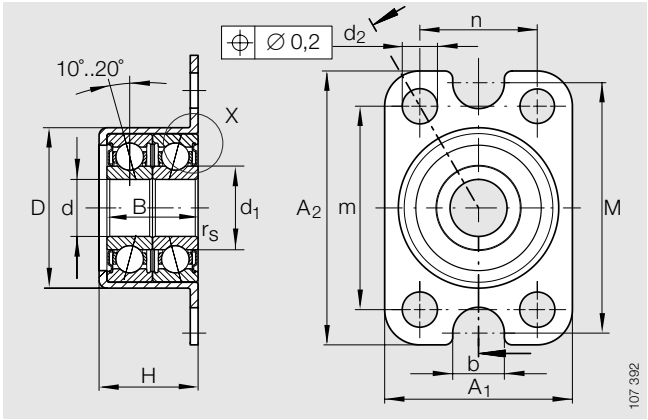
Table 2 · Comparison of requirements on mounting structure and assembly effort

Evaluation Criteria	INA ZKLR	Conventional Solutions	
+ = good ❍ = satisfactory – = not satisfactory			
No additional housing components required (flange, shield)	++	–	++
No additional seals or seal races required	++	++	++
Low space requirement	++	❍	– –
Low demands on surrounding structure	++	– –	❍
Assembly errors/ defects virtually eliminated	++	–	+
Reduction of overall costs	++	–	– –

Angular-Contact Ball Bearing Assemblies

Double direction, suitable for flange mounting

Series ZKLR...2RS
ZKLR...2Z



ZKLR 0624.2Z
ZKLR 0828.2Z

Dimension Table · Dimensions in mm

Shaft diameter	Designation	Weight	Dimensions												
			d	A_1	A_2	D +0,03 –0,01	B –0,25	d_1	r_s min	d_2	b	m	n	M	H –0,5
		≈ g													
6	**ZKLR 0624.2Z**	23	6	24	35	20,5	12	10,4	0,3	4,5	6,6	26	15	32	13
8	**ZKLR 0828.2Z**	30	8	28	35	23,9	14	11,8	0,3	4,5	6,6	26	20	35	15,5
10	**ZKLR 1035.2Z**	50	10	35	35	28,14	16	14,7	0,3	4,5	–	26	26	–	17,5
12	**ZKLR 1244.2RS**	120	12	44	50	35,45	20	16,6	0,3	6,6	–	38	32	–	22
15	**ZKLR 1547.2RS**	140	15	47	51	38,45	22	18	0,3	6,6	–	39	35	–	24
20	**ZKLR 2060.2RS**	300	20	60	60	50,45	28	24,4	0,3	6,6	–	47	47	–	30

Permissible operating temperature: –20 °C to +120 °C for continuous operation, limited by the lubricating grease

Due to constant development of the product range, we reserve the right to make modifications

1) Tightening torque of the mounting bolts to manufacturer recommendations; bolts must be ordered separately

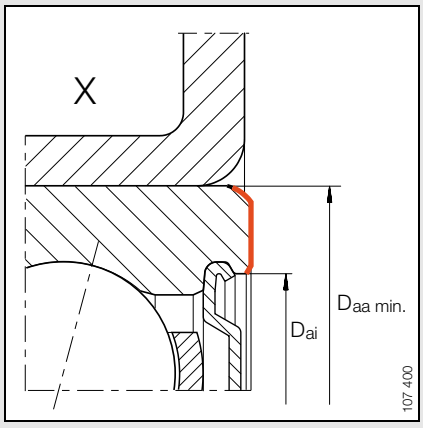
2) Moment of inertia for rotating inner ring

3) Locknuts must be ordered separately

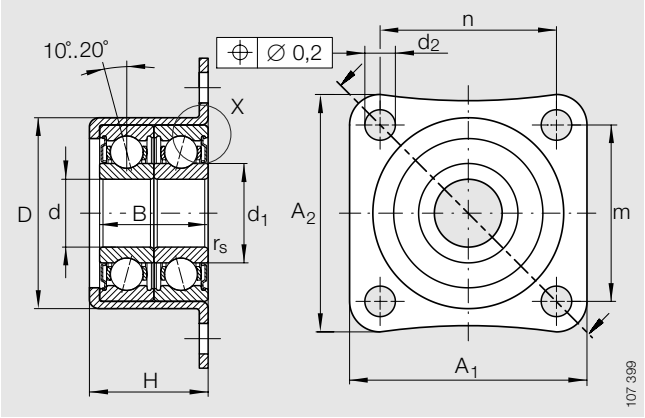
4) Recommended minimum abutment diameters; if these values are not used, the actual bearing shoulder dimension d_1 must be observed

5) Locknuts serve only in the axial location of the bearing assembly and have no influence on the bearing preload; to install the locknuts refer to instructions in *INA publication "ZAE"*

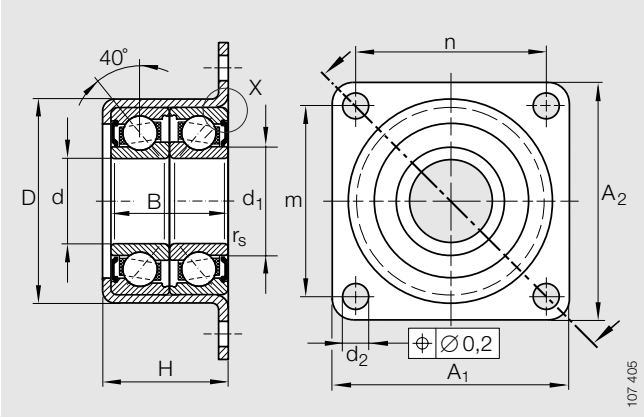
6) The stated geometric tolerance is required only for diameters ranging from D_{ai} to D_{aa}



Axial support area for the outer ring

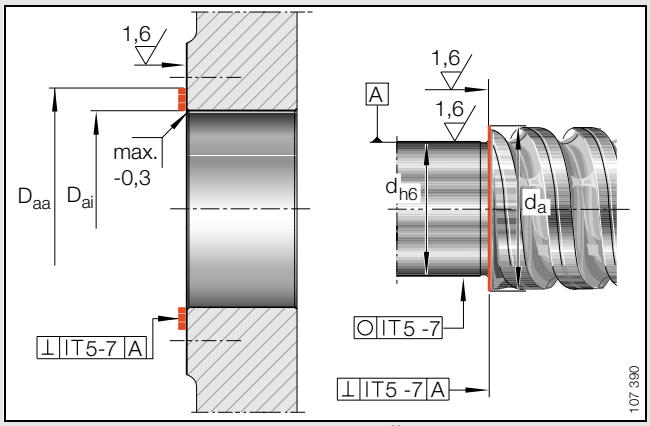


ZKLR 1035.2Z



ZKLR 1547.2RS
ZKLR 2060.2RS

			Basic load ratings				Mounting bolts DIN 912[1]	Moment of inertia[2]	Recommended INA locknut[3][5]		Shaft diameter
			radial		axial				Designation	Tightening torque	
d_a[4]	D_{ai}[4]	D_{aa}[4] min	dyn. C N	stat. C_0 N	dyn. C_a N	stat. C_{0a} N		M_M kg · cm²		M_A Nm	
8	16	19	3 850	1 870	1 340	1 250	4×M4 or 2×M6	0,0014	ZM 06	2	***6***
10,4	18	22	4 900	2 280	1 810	1 520	4×M4 or 2×M6	0,0028	ZM 08	4	***8***
12,4	22	26	7 400	3 600	2 550	2 420	4×M4	0,0075	ZM 10	6	***10***
14	27	32	13 600	8 500	13 200	17 900	4×M6	0,0102	ZM 12	8	***12***
17,5	29	35	16 700	10 700	16 400	22 400	4×M6	0,0178	ZM 15	10	***15***
24	39	47	28 000	19 100	27 500	40 000	4×M6	0,263	ZM 20	18	***20***



Tolerances for the mounting structure[6]

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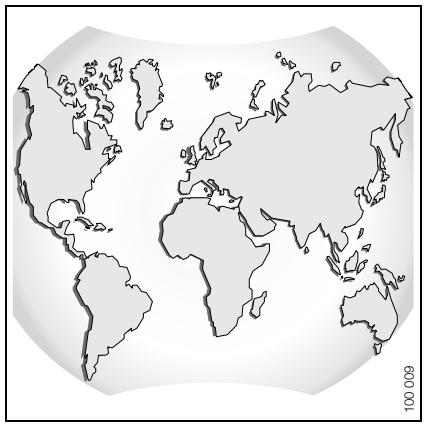
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