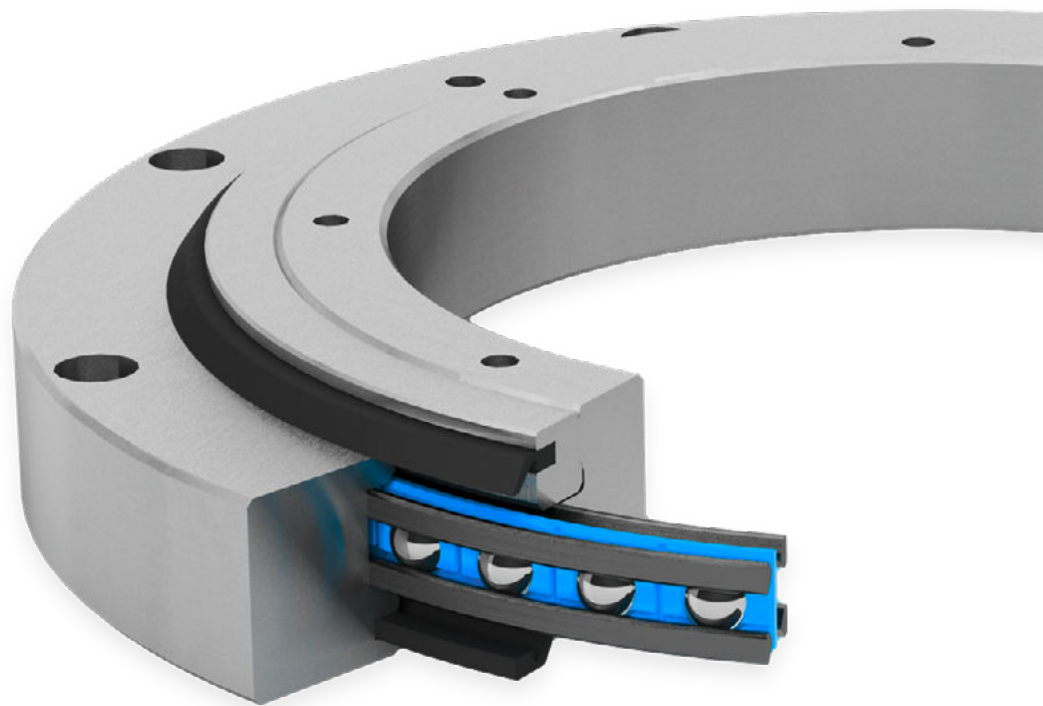


Technical documentation

Bearing assemblies with integrated wire race bearing



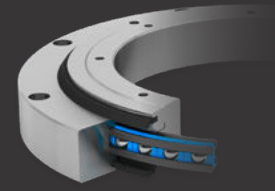
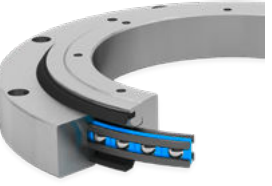

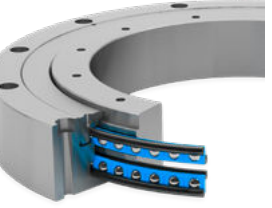
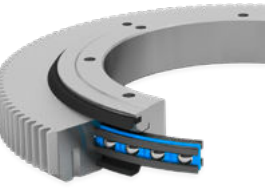




Table of contents

page		page	
	1. Bearing assemblies		3. Rotational resistance and concentricity 6
1.1 Overview	3		4. Maintenance
	2. Calculation basis		4.1 Safety instructions for maintenance
2.1 Terms, unit of measurement	4		4.2 Maintenance work
2.2 Static calculation	4		4.2.1 Relubrication
2.2.1 Axial and radial factors			5. Tools and accessoires
2.2.2 Recommended static safety S_{st}			5.1 Tools needed
2.3 Dynamic calculation.....	5		5.2 Accessoires
2.3.1 Nominal lifetime			6. Imprint
2.3.2 Axial and radial loads			11
2.3.3 Axial and moment load and axial load with $F_r = 0, M_k = 0$			
2.3.4 Radial and moment load and radial load with $F_a = 0, M_k = 0$			

1. Bearing assemblies

1.1 Overview

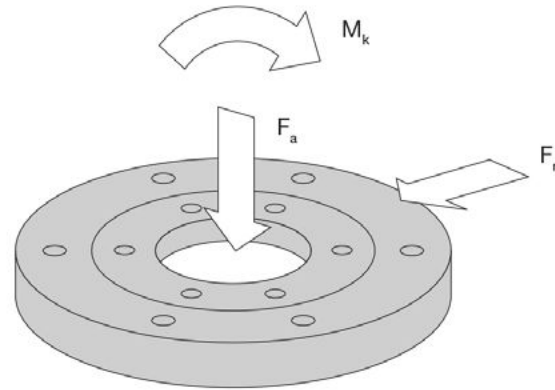
Product	KK-Diameter	Material	Gear teeth	Illustration
LVA	100 - 1800 mm	C45N	without	
LVB	100 - 1800 mm	Aluminium	without	
LVC	100 - 1800 mm	C45N	without	
LVD	100 - 1800 mm	C45N/42CrMo4V	straight gearing	
LVE	100 - 1800 mm	Aluminium	AT10 Belt toothing	
LVG	200 - 400 mm	Aluminium	without	

2. Calculation basis

All forces and moments acting on the bearing are to be summarized by vectorial addition into centrally acting forces F_a and F_r as well as resulting moments M_k . For complex load cases and load collectives with variable load and speed, we will be pleased to perform the calculation for you.

2.1 Terms, unit of measurement

C	dynamic load rating	(N)
C_0	static load rating	(N)
F_a	centrally acting axial force	(N)
F_r	centrally acting radial force	(N)
KKØ	Ball race diameter = (D + d)/2	(M)
L_n	nominal life	(h)
M_k	tilting moment	(Nm)
n	rotational speed	(min - 1)
P	dynamic equivalent load	(N)
P_0	statically equivalent load	(N)
S_{st}	static safety	
X	Radial factor	
Y	Axial factor	
Z	Moment faktor	



2.2 Static calculation

A static calculation is sufficient if the bearing is loaded at standstill. A bearing with sufficient load carrying capacity has been selected if the recommended static safety is achieved.

$$S_{st} = \frac{1}{\frac{F_a}{C_{oa}} + \frac{F_r}{C_{or}} + \frac{M}{C_{om}}}$$

2.2.1 Axial and radial factors

	X_0	Y_0
All bearing types	1.0	0.47

2.2.2 Recommended static safety S_{st}

Ball diameter > 6	S_{st}
With quiet, vibration-free operation	> 1.8
During normal operation	> 2.5
With pronounced shock loads and high requirements on running accuracy	> 8.0

2.3 Dynamic calculation

For a circulating speed of $v > 0.1$ m/s, a static and dynamic calculation is required, whereby the static safety S_{st} must reach at least the recommended value of the respective load (Table 2.2.2).

2.3.1 Nominal life

$$L_n = \left(\frac{C}{P}\right)^3 \cdot \frac{10^6}{60 \cdot n} \quad (h)$$

2.3.2 Axial and radial loads

$$P = X \cdot F_r + Y \cdot F_a \quad (N)$$

	$\frac{F_a}{F_r} \geq 1$		$\frac{F_a}{F_r} < 1$	
	X	Y	X	Y
All bearing types	1.26	0.45	0.86	0.86

2.3.3 Axial and moment load and axial load with $F_r = 0, M_k = 0$

$$P = Y \cdot F_a + Z \cdot \frac{M_k}{KKØ} \quad (N)$$

	$0 < \frac{M_k}{F_a \cdot KKØ} \leq 0,5$		$\frac{M_k}{F_a \cdot KKØ} \geq 0,5$	
	Y	Z	Y	Z
All bearing types	0.86	1.72	0.45	2.54

2.3.4 Radial and moment load and radial load with $F_a = 0, M_k = 0$

$$P = X \cdot F_r + Z \cdot \frac{M_k}{KKØ} \quad (N)$$

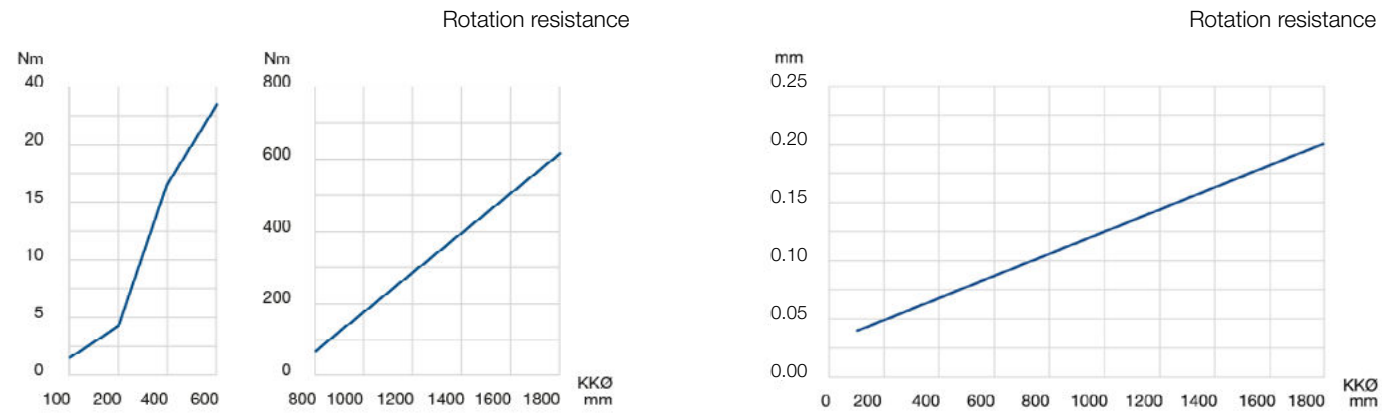
	$0 \leq \frac{M_k}{F_r \cdot KKØ} \leq 0,5$		$\frac{M_k}{F_r \cdot KKØ} \geq 0,5$	
	X	Z	X	Z
All bearing types	1.0	1.68	0.86	1.96

We will be pleased to perform the calculation for you for the load case radial, axial and moment load.

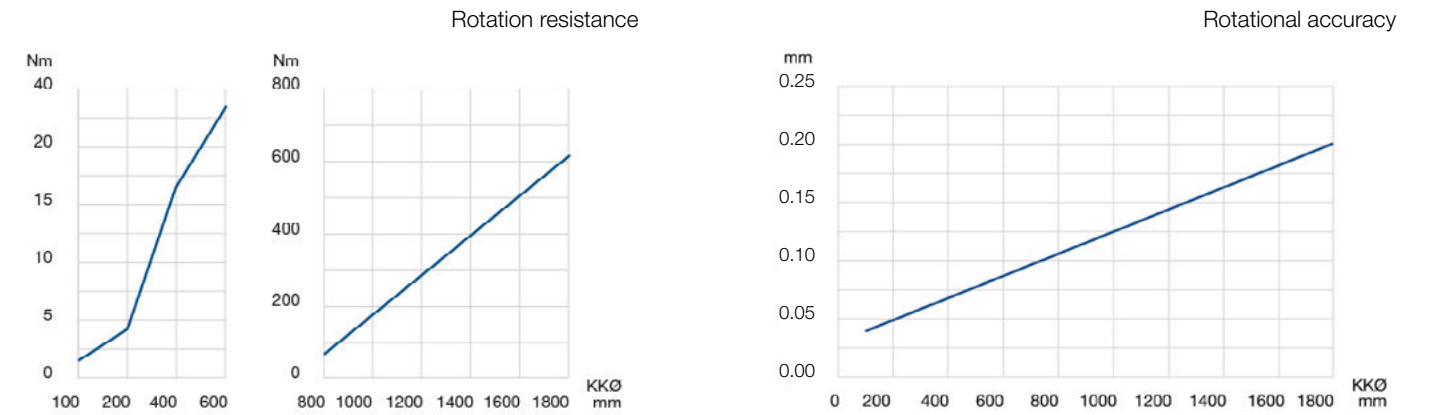
3. Rotational resistance and concentricity

The following data are recommendations of the rotational resistance to be set. Depending on the manufacturing tolerances, the concentricity accuracies shown can be achieved.

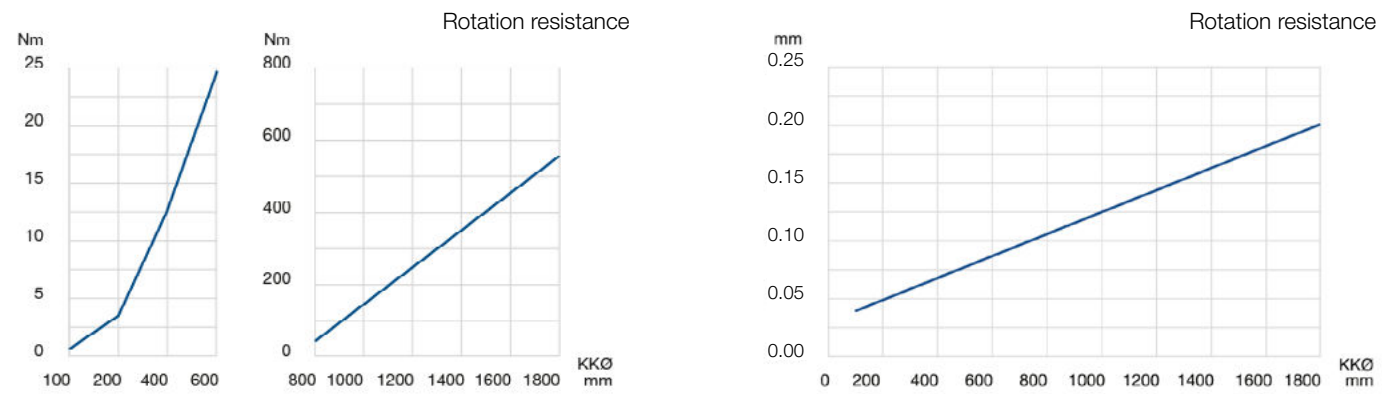
LVA



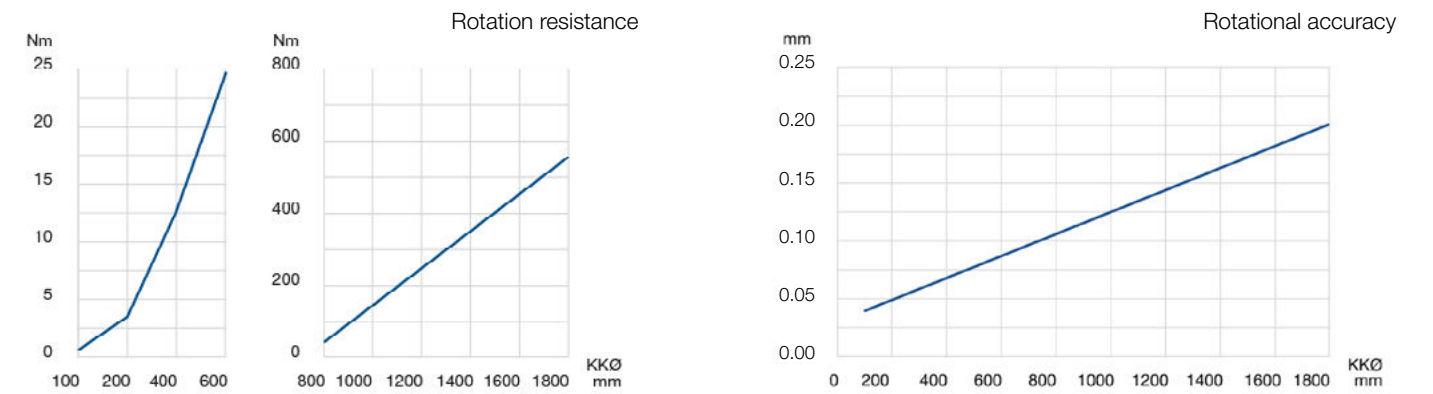
LVD



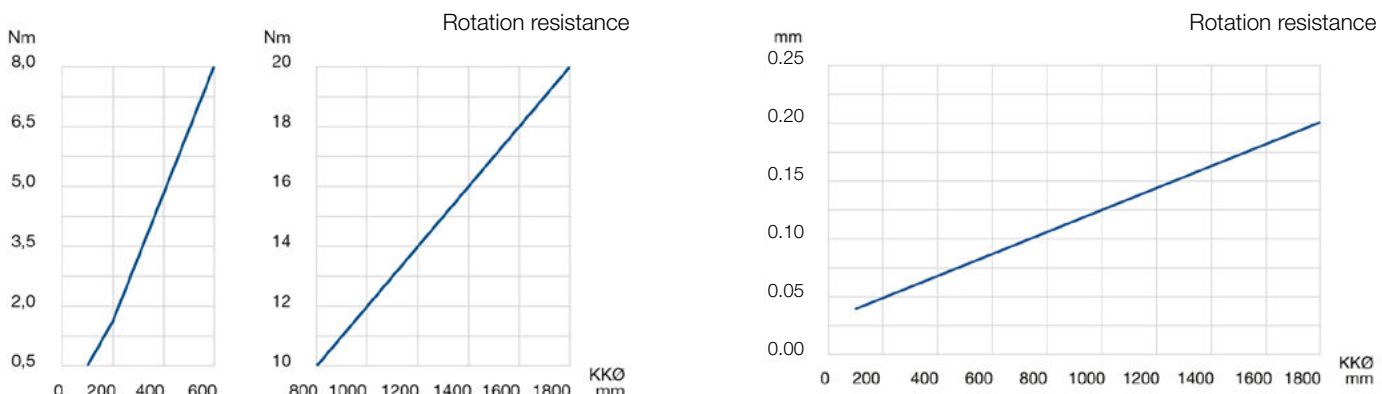
LVB



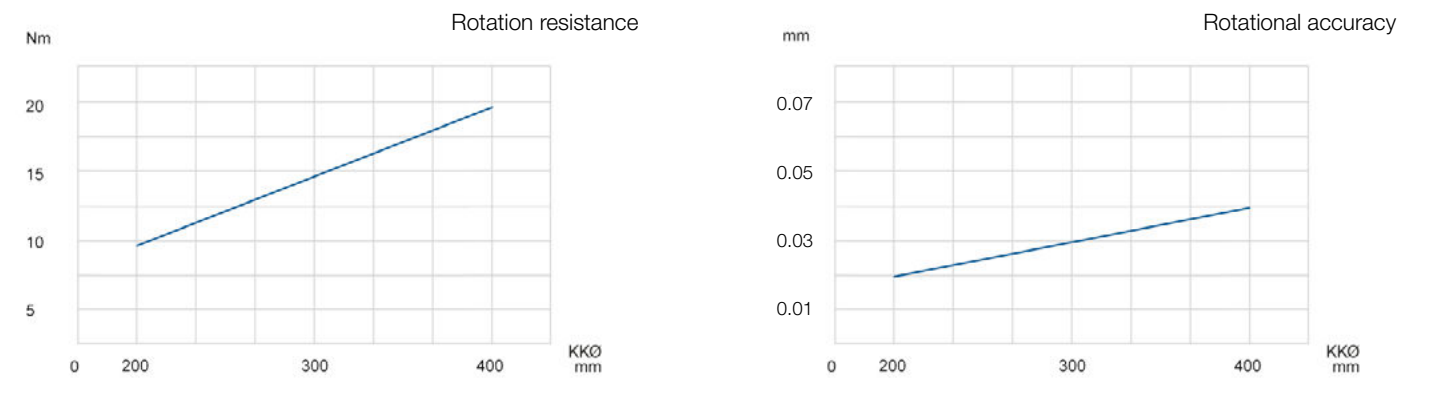
LVE



LVC



LVG



7. Maintenance

7.1 Safety instructions for maintenance

Improper
Maintenance work

WARNING!

Risk of injury due to improperly performed maintenance work!

- Ensure sufficient assembly clearance before starting work.
- Ensure tidiness and cleanliness at the assembly site!
- If components have been removed, ensure correct assembly, reinstall all fasteners and observe screw tightening torques.
- When cleaning the bearing, use suitable cleaning agents that are compatible with the seal. For this purpose, follow the instructions of the cleaning agent manufacturer.

Observe the following before recommissioning:

- Ensure that all maintenance work has been carried out and completed in accordance with the information and notes in this manual.
- Ensure that there are no persons in the danger zone.
- Ensure that all covers and safety devices are installed and functioning properly.

Incorrect maintenance

NOTE!

Material damage due to faulty maintenance

- Inspect slewing ring for corrosion every six months.
- Depending on the application (e.g. influence of vibrations), retighten the screw connections at regular intervals.
- If the bearing makes running noises, switch off the machine and determine the cause of the fault.
- Check the seals of the bearing at regular intervals.

Incorrect lubrication

NOTE!

Material damage to the bearing due to improper lubrication!

- Only use greases approved by the manufacturer (→ chapter 5.1 "Approved lubricants").
- Observe relubrication quantity and relubrication intervals (→ chapter 8.2.1 "Relubrication").
- Relubricate the bearing only at operating temperature.

Environmental protection

At all lubrication points supplied with lubricant, remove the escaping, used or excess grease and dispose of it in accordance with the applicable local regulations..

7.2 Maintenance work

7.2.1 Relubrication

Lubricants



For long-term lubrication, use high-performance bearing lubricants due to their higher ageing resistance. Franke recommends the special lubricating grease „SHELL Gadus S3 V220 C2“ or comparable.

NOTE!

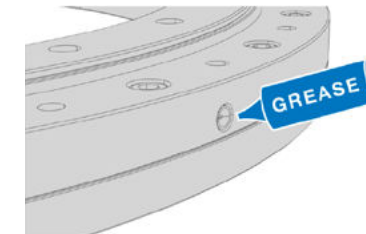
Material damage due to improper lubrication!

- Ensure that the lubricants are suitable for the respective application and for the materials used (e.g. rolling bearing cage or seal).
- When mixing lubricants, consider the compatibility of the lubricant types. In particular, note the base oil type, thickener, base oil viscosity and NGLI class. These questions must be clarified in advance with the lubricant manufacturer, especially if the bearing is used under extreme operating conditions.

Relubrication of the bearing

Relubrication takes place via the gap between the inner and outer ring.

- 1 Perform relubrication below the operating temperature of the bearing.
- 2 When relubricating, rotate the bearing.



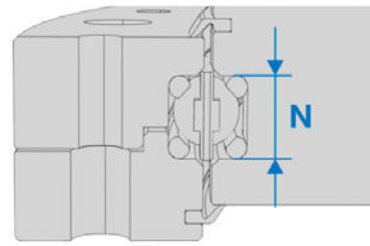
Relubrication



The relubrication period is application-specific. The following table shows reference values.

For recommended lubricants, see page 11.

Peripheral speed in m/s	Relubrication interval in h
0 bis < 3	5000
3 bis < 5	1000
5 bis < 8	600
8 bis < 10	200



Wire bed height

- 3 Once the relubrication frequency has been determined, calculate the relubrication quantity using the following formula.

Relubrication quantity for bearing elements:

$$m = KK\varnothing \cdot (N \cdot 2) / 3 \cdot x$$

m = relubrication quantity in grams

ØKK = ball ring diameter

M = wire bed height in millimeters

x = factor x in mm⁻¹ according to table for relubrication quantity

Wire bed height N for LV series:

KK100 - 350mm:	13 mm
KK400 - 1000mm:	17.5 mm
KK1200 - 1800mm:	20.9 mm

Relubrication	x in mm ⁻¹
Weekly	0.002
Monthly	0.003
Yearly	0.004
Every 2 - 3 years	0.005



When lubricating toothed bearings, automatic gear lubrication is recommended. In the case of manual lubrication, lubricate the gearing and pinions before commissioning.

Always contact customer service in the event of any uncertainties.

Lubricants standard:

Application area	Manufacturer	Description	Usage	Container	Order no.
Universal applicable	Shell	Gadus	ex factory in all slewing rings of the standard series LVA, LVB, LVC, LVD, LVE, LVG	400g	45176

Special lubricants for special applications are available on request. We will be pleased to advise you on this.

5. Tools and accessoires

5.1 Tools needed

- Torque wrench
- Dial gauge
- Allen wrench
- Screwdriver
- Surface cylindrical grinding machine (for massive tuning)
- Feeler gauge
- Spring scale (or similar)
- Lever for measuring the torque

5.2 Accessoires

The following accessories are optionally available:

- Reconciliation supplements
- Seals
- Spare balls (G25 according to DIN 5401) for bearing elements
- Retaining screws

6. Impressum

© Franke GmbH
 Obere Bahnstr. 64
 73431 Aalen
 Tel. +49 7361 920-0
 info@franke-gmbh.com
 www.franke-gmbh.com

All rights reserved.
 No liability for errors or
 printing mistakes.

This manual is also as a
 download (PDF) on our website.
www.franke-gmbh.com/downloads