



Technical documentation

Aluminum roller guide type FD



Technical documentation FD / EN / Art. no. 612223



Technical documentation

FD



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1. Linear guides type FD

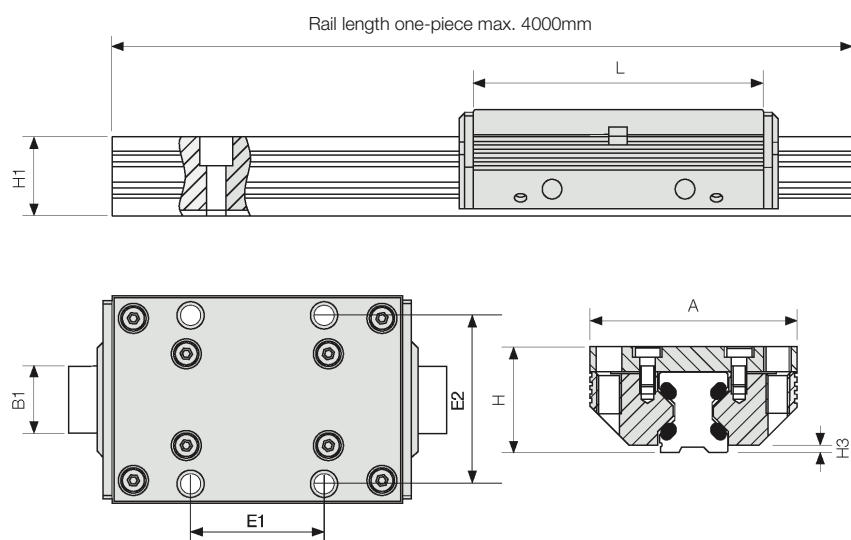
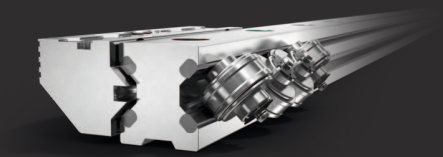
1.1 Available series

Name	Characteristics	Size	Application possibilities
FDA	<ul style="list-style-type: none">aluminum roller guides in standard designinlaid steel racewaysrollers with needle bearings for easy and quiet running	12, 15, 20, 25, 35, 45	Suitable for linear motion applications in virtually all industries. Sealed track rollers for maintenance-free operation over the entire service life. Smooth, clean running.
FDB	<ul style="list-style-type: none">aluminum roller guides in LowCost designinlaid steel racewaysball bearing mounted rollers	12, 15, 20, 25, 35, 45	Suitable for linear motion applications in virtually all industries. Particularly suitable for cost-sensitive applications with reduced load and noise requirements.
FDC	<ul style="list-style-type: none">aluminum roller guides in NIRO designInserted raceways made of corrosion-free steelStainless steel track rollers with needle bearings for smooth and quiet running	12, 15, 20, 25, 35, 45	Suitable for linear motion applications in virtually all industries. Insensitive to environmental influences as well as moisture or cleaning agents.
FDD	<ul style="list-style-type: none">aluminum roller guides in amagnetic designinlaid raceways made of amagnetic steelrollers with needle bearings for easy and quiet running	25	Suitable for linear motion applications in virtually all industries. Amagnetic raceways without influence on prevailing magnetic fields (e.g. in medical technology or electronics manufacturing).
FDE	<ul style="list-style-type: none">aluminum roller guides in lubricant-free designinlaid raceways made of steellubricant-free rollers for easy and quiet running	12, 15, 20, 25, 35, 45	Suitable for linear motion applications in virtually all industries. Special track rollers without lubricants.
FDG	<ul style="list-style-type: none">Aluminum roller guides in NIRO-LowCost DesignInserted raceways made of corrosion-free steelball-bearing track rollers made of corrosion-free steel	12, 15, 20, 25, 35, 45	Suitable for linear motion applications in virtually all industries. Especially suitable for cost-sensitive applications in harsh environments or when using cleaning agents.
FDH	<ul style="list-style-type: none">Aluminum roller guides in highly dynamic designInserted raceways made of steeltrack rollers with sealed angular contact ball bearings	25, 35, 45	Suitable for linear motion applications in virtually all industries. Track rollers with angular contact ball bearings for maximum acceleration and speed values, for example when using linear motors as a drive source.
FDI	<ul style="list-style-type: none">Aluminum roller guides in vacuum-compatible designInserted raceways made of corrosion-free steelRollers in full-needle, corrosion-free design	12, 15, 20, 25, 35, 45	For linear motion tasks in the vacuum range for low loads and dynamics. The cassettes are equipped with a lubricant suitable for vacuum and without plastic parts.



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Dimensions

Size	Dimensions (mm)								Available series
	A	B1	H	H1	H3	L	E1	E2	
12	37	12.0	19	14.7	1.4	64	25	30	FDA, FDB, FDC, - , FDE, FDG, - , FDI
15	47	15.5	24	18.7	2.0	78	30	38	FDA, FDB, FDC, - , FDE, FDG, - , FDI
20	63	21.0	30	22.6	2.0	92	40	53	FDA, FDB, FDC, - , FDE, FDG, - , FDI
25	70	23.0	36	27.0	2.5	98	45	57	FDA, FDB, FDC, FDD, FDE, FDG, FDH, FDI
35	100	32.0	48	37.0	3.5	135	62	82	FDA, FDB, FDC, - , FDE, FDG, FDH, FDI
45	120	45.0	60	46.0	4.0	165	80	100	FDA, FDB, FDC, - , FDE, FDG, FDH, FDI

Characteristic

Franke linear systems are the best solution when it comes to speed and lightweight construction. Due to their design principle, Franke linear systems are highly dynamic, quiet and maintenance-free. Thanks to a modular design, Franke linear systems can be individually adapted to customer requirements. By using different rail profiles and roller shoes, special cassettes, variable track widths, you always get a solution optimized for your application. The sliding resistance is individually adjustable. The guide rails are available in one piece up to 4000mm and can be coupled endlessly.

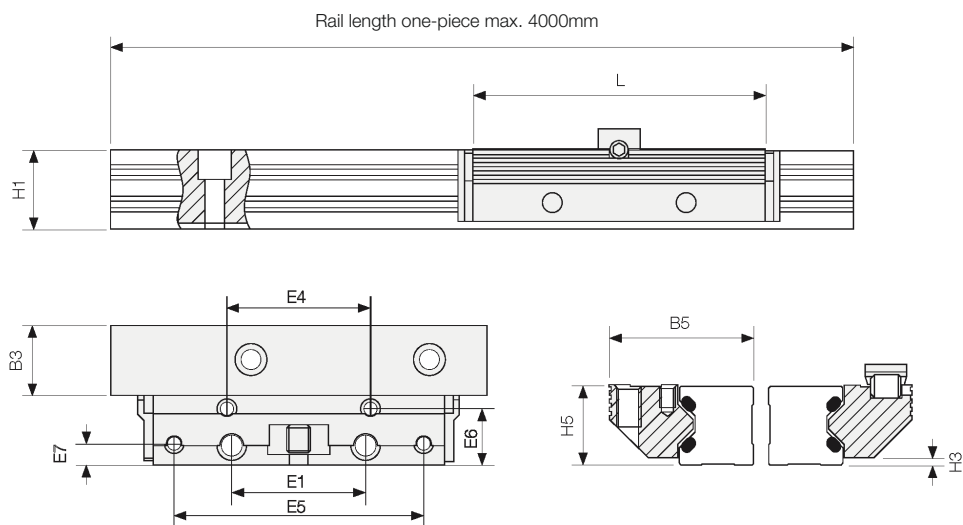
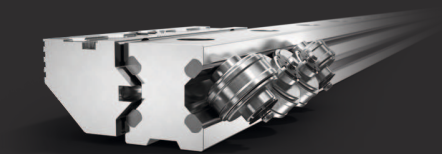
Technical data

Material	Cassette plate, roller shoes and rail body: aluminum; track rollers and track rods depending on series: steel, stainless steel, amagn. steel
Operating temperature	-20 °C to +80 °C
Vmax	10 m/s
Installation position	any
Lubrication	lubricated for life, maintenance-free



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Dimensions

Size	Dimensions (mm)											Available series
	B3	B5	H1	H3	H5	L	E1	E4	E5	E6	E7	
12	12.00	24.4	14.7	1.4	15.0	64	25	29	57	9.7	3.4	FDA, FDB, FDC, - , FDE, FDG, - , FDI
15	15.25	30.9	18.7	2.0	19.0	78	30	34	68	12.4	4.9	FDA, FDB, FDC, - , FDE, FDG, - , FDI
20	20.00	40.9	22.6	2.0	23.0	92	40	42	80	16.9	5.9	FDA, FDB, FDC, - , FDE, FDG, - , FDI
25	25.00	48.4	27.0	2.5	27.5	98	45	48	84	19.4	7.4	FDA, FDB, FDC, FDD, FDE, FDG, FDH, FDI
35	35.00	68.9	37.0	3.5	37.5	135	62	67	117	28.4	8.9	FDA, FDB, FDC, - , FDE, FDG, FDH, FDI
45	45.00	82.4	46.0	4.0	46.5	165	80	83	146	30.9	9.9	FDA, FDB, FDC, - , FDE, FDG, FDH, FDI

Characteristic

Franke linear systems are the best solution when it comes to speed and lightweight construction. Due to their design principle, Franke linear systems are highly dynamic, quiet and maintenance-free. Thanks to a modular design, Franke linear systems can be individually adapted to customer requirements. By using different rail profiles and roller shoes, special cassettes, variable track widths or an integrated direct drive, you always get a solution optimized for your application. The sliding resistance is individually adjustable. The guide rails are available in one piece up to 4000mm and can be coupled endlessly.

Technical data

Material	Roller shoes and rail bodies: aluminum; track rollers and track rods depending on series: steel, stainless steel, amagn. steel
Operating temperature	-20 °C to +80 °C
Vmax	10 m/s
Installation position	any
Lubrication	lubricated for life, maintenance-free



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Franke aluminum linear systems have base bodies made of high-strength, anodized aluminum. Depending on the type, the rollers with needle or ball bearings are made of rolling bearing steel. Plastic end plates house felt wipers that keep the guide system clean.

2. Type FD - Franke Dynamic

2.1 Versions and system description

Franke aluminum roller guides are available as a double rail with cassette or as a single rail pair with a pair of roller shoes.

Double rail with cassette (Figure 1)

The double rail with cassette version is a ready-adjusted linear guide as standard. Cassette and rail have standard connection holes.

Single rail pair with roller shoe pair (Figure 2)

Single rails with roller shoes are part of the design with the advantage of variable guide width. The connecting plate is specified by the customer. The cassette or the pair of roller shoes of the standard type FDA runs over four crosswise arranged rollers with needle bearings on raceways made of tough spring steel. For applications with special requirements, other types are available, e.g. with stainless steel raceways or customer-specific special designs.

The aluminum roller guides are lubricated for life. Travel speeds of 10 m/s and accelerations of 40 m/s² can be implemented. The operating temperature of the guides is between -20 °C and +100 °C. Franke will be pleased to advise if solutions are required that are suitable for temperatures outside the range mentioned.

Rail-mounted cassettes are set backlash-free at the factory. It is possible to subsequently adjust the aluminum roller guides to the respective load situation via an integrated clearance adjustment. The clearance setting is best determined by measuring the sliding resistance in the unloaded state (see Figure 3).

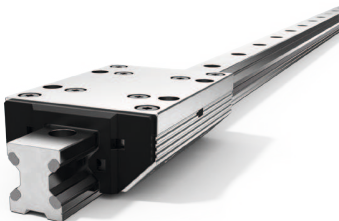


Figure 1: Double rail with cassette



Figure 2: Single rail pair and roller shoe pair

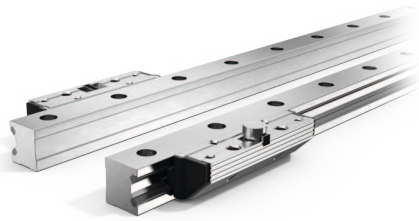


Figure 3: Measure slide resistance

For adjustment, the screw connection of the cassette plate on the adjustment side is loosened slightly. Then the threaded pin integrated in the longitudinal side of the cassette is readjusted. Turning the grub screw produces a displacement of the roller shoe and thus an increase or reduction of the preload.

The setting values of the individual types can be taken from Table 1.4.6 Sliding resistors. More detailed information on the assembly and adjustment of the guide is given in the assembly instructions for the aluminum roller guides.



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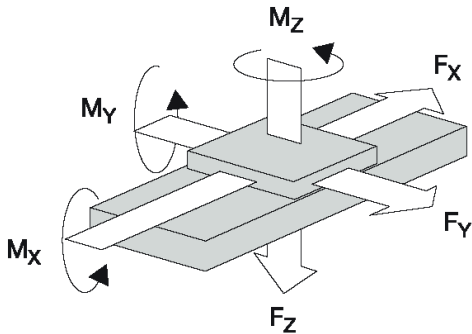


2.2 Design of the guides

The following parameters are required for a correct design of the guide:

- selection of the arrangement
- all forces/moments applied or generated (dynamic/static), (see Figure 4)
- type of load (static, pulsating, alternating)
- environmental influences (e.g. temperature, humidity) or special operating conditions (e.g. clean room, vacuum)
- travel speed and acceleration
- stroke length
- target service life in km

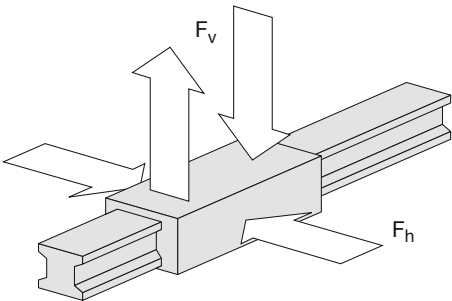
All forces and torques occurring must be within the permissible limits.
The relevant data can be found on the pages for the types.



2.3 Calculation linear systems

2.3.1 Terms, dimensions

- C = dynamic load rating
- C₀ = static load rating
- D_a = diameter roller
- F = dynamic equivalent load
- F_a = off-center load
- F₀ = equivalent static load
- F₁, F₂, F_n = individual loads
- F_h, F_v = horizontal force/vertical force



- L = life time (km)
- M_{0cx}, O_{cy}, O_{cz} = perm. stat. Moment load ratingl (Nm)
- M_{cx}, C_y, C_z = perm. static or dynamic torsional moment (Nm)
- q₁, q₂ = time share for F₁, F₂ (%)
- S = safety

2.3.2 Static calculation

A static calculation is sufficient for stationary load or minimum linear motion up to v ≤ 0.1 m/s. A sufficiently load bearing linear guide has been selected if the recommended static safety S is achieved.

static safety: $S = \frac{C_0}{F_0}$

The equivalent load is made up of the addition of the individual external loads F_v and F_h.

stat. equivalent load: $F_0 = F_v + F_h$

Under an off-center load F_a with a torsional moment M₀, the following relationship results:

$$F_0 = F_0 + C_0 \cdot \frac{M_x}{M_{0cx}} + C_0 \cdot \frac{M_{yz}}{M_{0cy,0cz}}$$



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2.3.4.2 Life time

$$L = \left(\frac{C}{F}\right)^p \cdot \pi \cdot D_a = \left(\frac{9000}{2400}\right)^{\frac{10}{3}} \cdot 3.14 \cdot 19 = 4890$$

The life time is 4890 kilometers.

2.4 Notes for adjacent construction

2.4.1 Subplate for type FD

When using single rails and roller shoes, a connecting plate (continuing construction) must also be provided. The roller shoes and the connecting plate together form the carriage.

Note on the design of the carriage connecting plate: For better alignment during assembly, the roller shoes have centering grooves. For this purpose, a centering bar is attached to the connecting plate (Figure 4). The dimensions for the manufacture of the centering bar are shown in Table 1. All other dimensions, tolerances and accuracies of the guides are given on the respective pages.

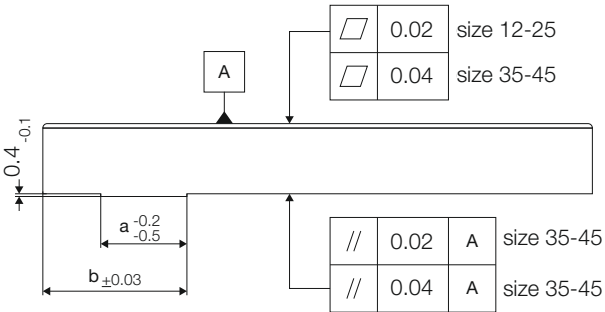


Figure 4: Centering bar

Size	a (mm)	b (mm)
12	4.5	9.6
15	5.0	12.6
20	7.5	16.1
25	10.5	17.6
35	12.5	26.1
45	15.5	31.1

Table 1: Dimensions centering bar

2.4.2 Multilane arrangements

For multilane arrangements, it is advisable to define a locating and a non-locating bearing side on the carriage plate. This is the best way to compensate for tolerances between the rails. For example, the non-locating bearing side can be designed with a driver and an anti-lift device. The locating bearing side performs the guiding function, while the non-locating bearing side compensates for parallelism and height tolerances. It is advisable to install the drive in the immediate vicinity of the guide side, as this is where the drive torques are absorbed.

2.4.3 Assembly area

The contact and contact surfaces have a decisive influence on the function and accuracy of the guideway. Inaccuracies can add up to the running accuracy of the guideway system. In double-track arrangements, for example, exact parallelism and height alignment is required. The accuracies for screw mounting and contact surfaces of the rails from Table 2 must be observed to ensure the running accuracy of the guidance:

Size	Size 12 - 20 (mm)	Size 25 - 45 (mm)
Max. tolerance for parallelism	0.03/m	0.05/m
Max. flatness screw-on area	0.05/m	0.10/m

Table 2: Accuracies of support and contact surfaces

Please note the recommendation of flatness for the adjacent construction:

Size 12 - 15: 0.03 mm
Size 20 - 45: 0.05 mm



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2.4.4 Mounting the rails

The alignment of the rails should be done by means of a ruler or a contact shoulder. Depending on the type of load, the guide rails should be either

- 1. be screwed together or
- 2. be screwed and pinned together or
- 3. be placed against a asset shoulder and screwed together (Figure 5).

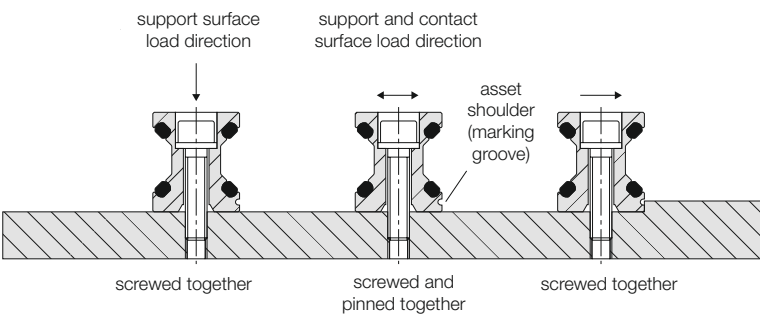


Figure 5: Mounting rail

The load-carrying capacity of the guidance is influenced by the connections between the guiding elements and the adjacent construction. Fastening to the adjacent construction is done using quality 8.8 screws with DIN 433 washers.

2.4.5 Assembly instructions for coupled rails

Rails over a length of 4000 mm are coupled according to Franke standard. The division according to Franke standard ensures a continuous, uniform hole pattern and optimum utilization of the rail length. Partitioning according to customer requirements is also possible.

Coupled rails are specially matched to each other. For correct assembly, the rails therefore have a consecutive production number (e.g. A/1-1/1-2/2/E).

The rails are additionally marked with a marking groove on the lower edge of the rail, which must always be on the same side. The rails must be aligned without gaps. Appropriate auxiliary cylinders are used for this purpose (Figure 6). Dimensions for the design of the auxiliary cylinders can be found in Table 3. The cylinders are inserted into the raceway at the separation points of the rails and tensioned by means of a fixture. The appropriate tightening moments for the respective screw connections are given in Table 4.



Figure 6: Coupled rails/auxiliary cylinder

Size	Auxiliary cylinder (mm)
12	11
15	11
20	14
25	16
35	27
45	35

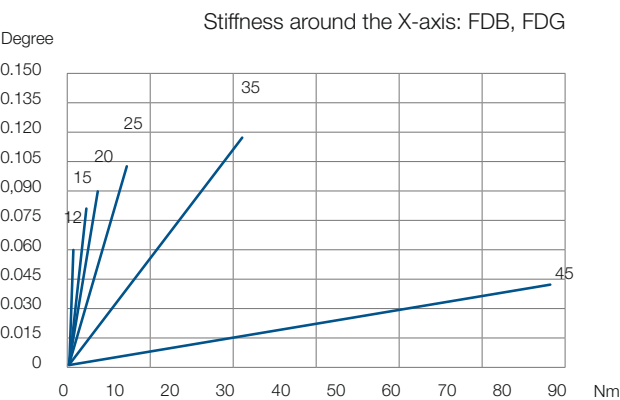
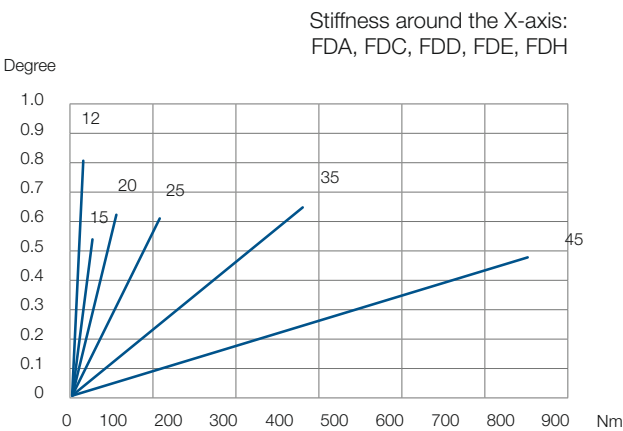
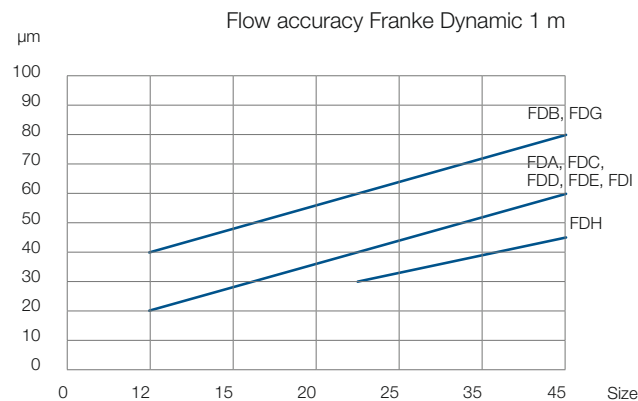
Table 3: Dimenstions auxiliary cylinder

Screw	Tightening moment
M3	1.1
M4	2.5
M5	5.0
M6	8.5
M8	21.0
M10	41.0
M12	71.0

Table 4: Tightening moments for screw connections



2.4.6 Flow accuracy and stiffness



3. Linear tables/modules

3.1 Version

Franke linear systems are suitable, for example, for automation tasks in measuring and testing or for rationalization in handling and assembly. The selection ranges from strokes from 100 mm up to 7000 mm, the drive is via a spindle or belt drive. The lightweight aluminum construction combined with the integrated Franke guide system allows high load capacities and moment loads. For detailed technical data, please refer to the respective catalog pages.

3.2 Application area

For simple loads without acceleration and moment loads, we recommend using Franke linear systems with safety $S \geq 3$. For dynamically occurring moments, a safety of $S \geq 6$ should be used. The installation position is arbitrary, for vertical operation we recommend a stop or a brake.

The positioning accuracy of the linear systems of type FTB is $\pm 0.052 / 300$ mm (IT7) according to the spindle pitch accuracy. Other accuracies are possible on request. The repeatability is ≤ 0.01 mm. The running accuracy of the linear tables FTB is $0.03/300$ mm. Franke linear tables can be used in a temperature range from -20 °C to $+80$ °C. The linear systems FTD 15 - 35 are suitable for continuous operation at temperatures from -30 °C to $+80$ °C. Please contact us for use in other temperature ranges.

3.3 Limit switch and reference switch

- Reference switch: Franke linear systems of the FTB series have inductive proximity switches that are set to stroke end position. Optionally, another proximity switch can be provided as a reference switch. In the case of linear modules of type FTC and FTD, it is possible to mount freely adjustable limit switches on the outside. Franke linear systems are equipped with PNP-nc 10-30VDC inductive limit and reference switches as standard. PNP-nc, NPN-nc and NPN-nc switches are available on request. Mounting or installation of a length measuring system with sine or square wave signal is possible on request. Rotary encoders can be mounted on the motor.
- Multi-axis units: Franke linear systems can be combined to form multi-axis units. The required angles and adapter plates are selected according to your needs. We supply completely assembled units, ready to use.



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4. Assembly

4.1 General information

4.1.1 Symbols and signs used

1. Describes a sequence of actions step by step



Notes and recommendations (e.g. on tightening moments of screws)



There is a risk of property damage or the function of the roller guide will be impaired if the handling instructions are not followed.

4.1.2 Intended use

Franke aluminum roller guides are intended for precise linear movement of loads, e.g. in mechanical engineering, packaging and food processing machinery, handling, robotics and transport. Franke aluminum roller guides should be used exclusively in the intended temperature range of -20°C to +100°C.

Franke GmbH accepts no liability for damage caused by modifications to the linear guides that are not described in the documentation.

4.1.3 Protection and maintenance measures

Store Franke aluminum roller guides in the original packaging until assembly to protect them from moisture and damage. Use only Franke parts for assembly and repairs.

The aluminum roller guides are maintenance-free. The cassettes and roller shoes are lubricated for life.

4.1.4 Preparation for assembly, tools and aids

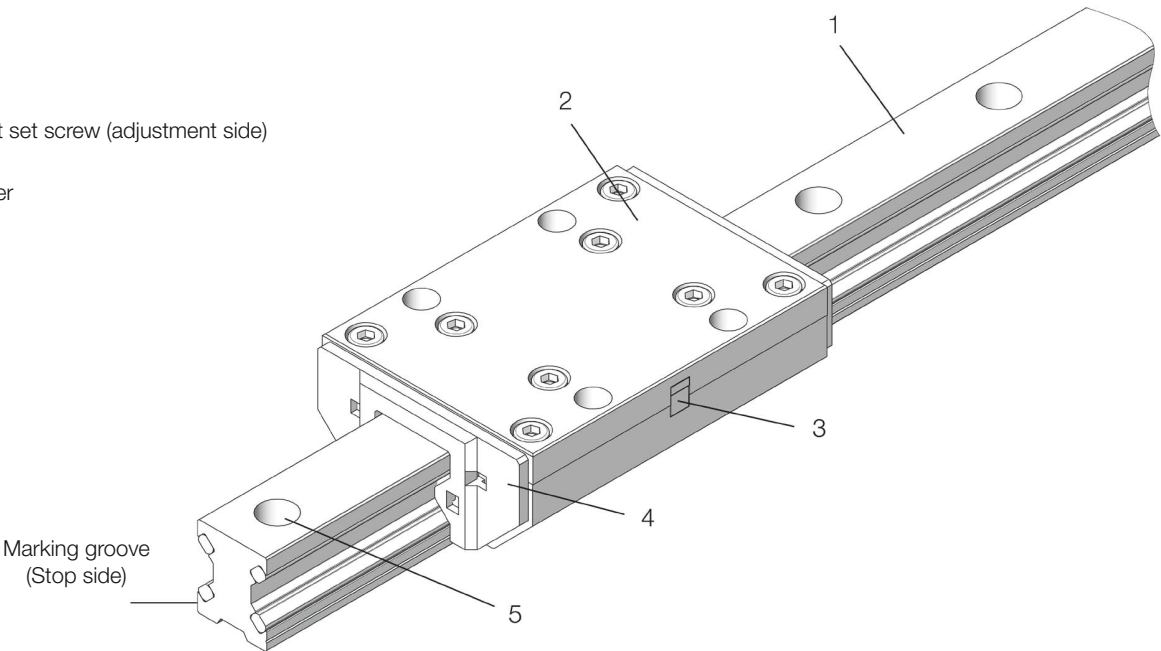
- Torque wrench
- Fastening screws
- Allen wrench
- Dial gauge
- Screwdriver
- Auxiliary cylinder for coupled rails
- Plastic hammer and plastic plate for screw covers



4.1.5 Overview guide varaints

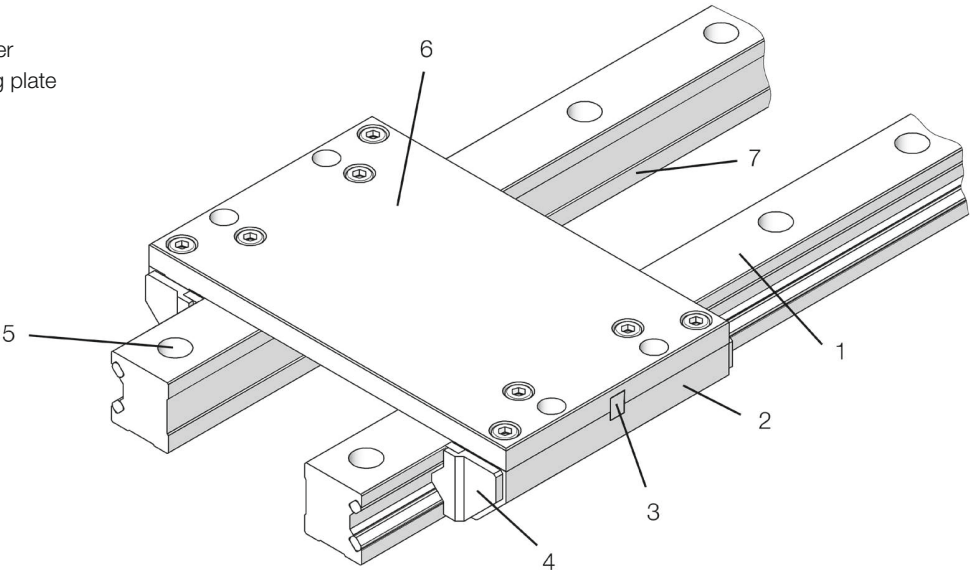
Double rail with cassette (Assembly see chapter 2)

1. Double rail
2. Cassette
3. Adjustment set screw (adjustment side)
4. Wiper
5. Screw cover



Single rails with pair of roller shoes (Assembly see chapter 3)

1. Single rail
2. Roller shoe
3. Adjustment set screw (adjustment side)
4. Wiper
5. Screw cover
6. Connecting plate
7. Stop side





4.2 Assembly of double rail with cassette

The rails are fastened with screws. If possible, screw the double rails against a plant shoulder and use washers.

1. If necessary, pull the cassette off the rail. Check the contact surfaces for dirt and damage.
2. Place the rail with the stop side (marked with marking groove) against the contact shoulder.
3. Tighten the screws slightly, check the linearity of the rail.
The values for this can be found in Table1: „Linearity double rail/single rail“.

Rail size	max. tolerance linearity (mm/m)
12 - 20	0.5
25 - 45	0.3

Table 1: Linearity double rail/single rail

4. Screw the rail from the center outwards alternately.



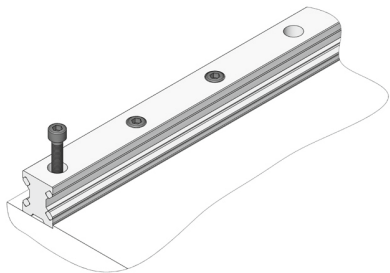
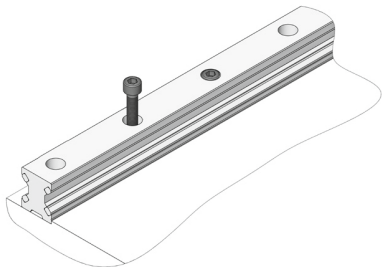
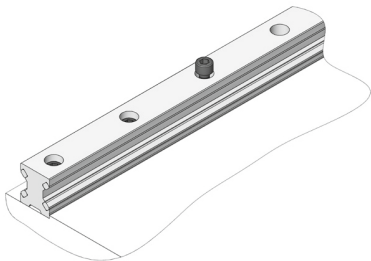
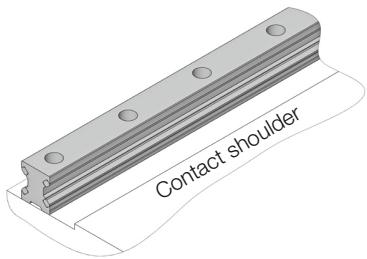
Observe the specified screw torques (chapter 9).

- a. Slide the cassette on the double rail.



Observe the correct arrangement of the fixed and adjustment sides of the cassette. The marking groove of the rail must be on the opposite side of the setting set screw.

- b. Travel the stroke distance with the cassette.
The cassette must run smoothly over the entire distance, otherwise check the assembly process.

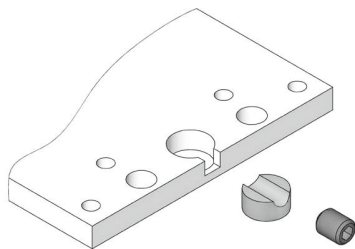




4.3 Assembly of single rails with pair of roller shoes

4.3.1 Assembly of the roller shoes (carriage)

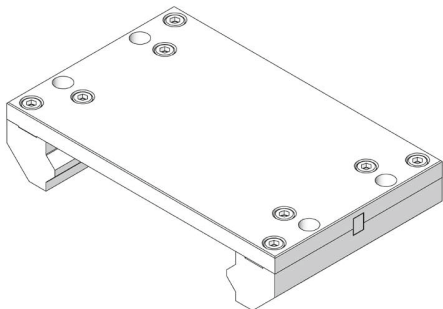
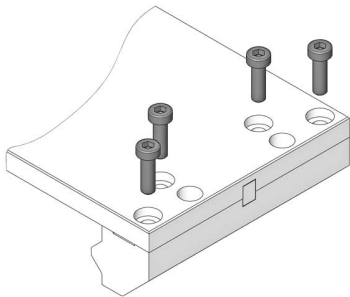
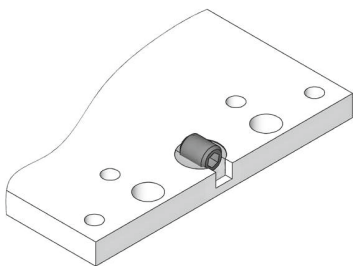
The roller shoes are supplied paired to each other.
Assemble only the two roller shoes that you have taken from the same packaging onto one connection plate at a time.
The roller shoes have a centering groove for better fixing on the fixed side.
The connecting plate has a centering bar for this purpose.



1. To mount the roller shoes, you first need the connecting plate with the adapter piece and the adjusting screw.
2. Place the adapter piece and the adjusting screw in the bore of the connecting plate.
3. Place the roller shoes on the connecting plate and screw them together. Press the fixed side (with centering groove) outward against the centering bar.
4. Screw all four fastening screws, as well as the two connection screws.



Observe the specified tightening torques (chapter 9).





4.3.2 Assembly of the single rails

The rails are fastened with screws.

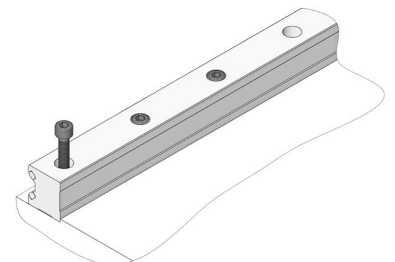
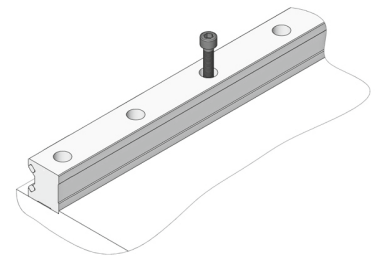
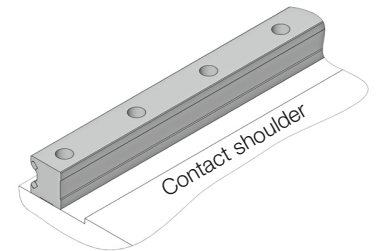
If possible, screw the individual rails against a contact shoulder and use washers.

Assemble the first rail (fixed side):

1. Check the contact surfaces for dirt and damage.
2. Place the rail with the stop side against the contact shoulder.
3. Tighten the screws lightly and check the linearity of the rail.
4. (for tolerance values, see Table 1, page 5).
5. Screw the rail from the center outwards alternately.



Observe the specified tightening torques (chapter 9).



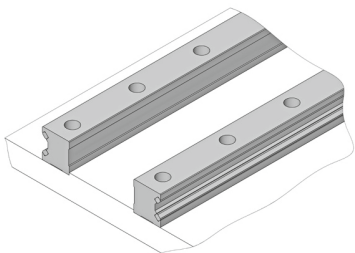
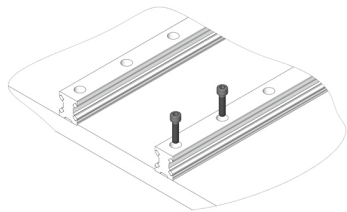


Mounting the second rail (setting side):

1. Place the second rail in its position. Align it parallel to the first rail. Tighten the screws slightly here as well.
2. Check the parallelism of the two rails. The tolerance limits can be found in Table 2 „Parallelism of single rail“. Screw the rail alternately from the center to the outside.

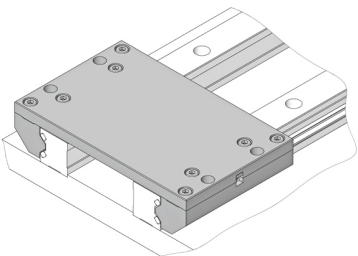


Observe the specified tightening torques (chapter 9).

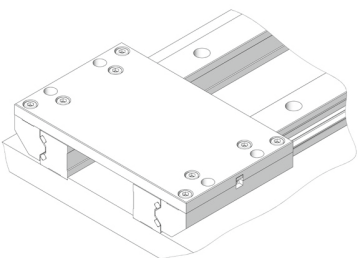


Rail size	max. tolerance parallelism (mm/m)
12 - 20	0.03
25 - 45	0.05

Table 2: Parallelism single rail



3. Slide the carriage onto the rails and set approximately the correct sliding resistance via the adjusting set screw. The exact setting is made later.
4. Run the carriage on the lifting section with the carriage. It must run evenly over the entire distance, otherwise check the assembly process.





4.4 Assembly of coupled double or single rails

The rails of the aluminum roller guide can also be built up from several individual rails. Rails over a length of 4000 mm are coupled.

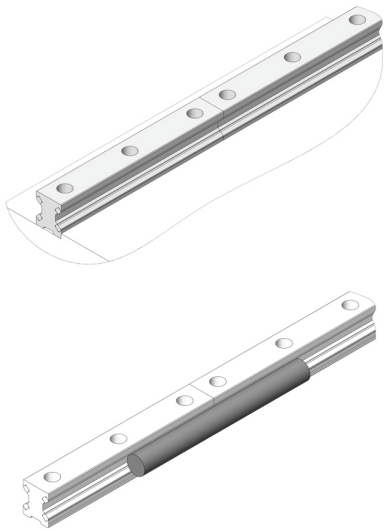
1. Check the contact surfaces for dirt and damage.



Coupled rails are specially matched to each other. Place the rails with consecutive production number (e.g. A/1-1/2-2/3-3/E) one after the other.

Random coupling is not possible. The marking groove must be on the same side throughout for double rails.

2. Align the rails without any gaps and tighten the screws lightly.
3. Then use auxiliary cylinders to align the transition exactly (see Table 3).



Rail size	12	15	20	25	35	45
Auxiliary cylinder Ø [mm]	11	11	14	16	27	35
Length [mm]	60	60	60	60	100	100

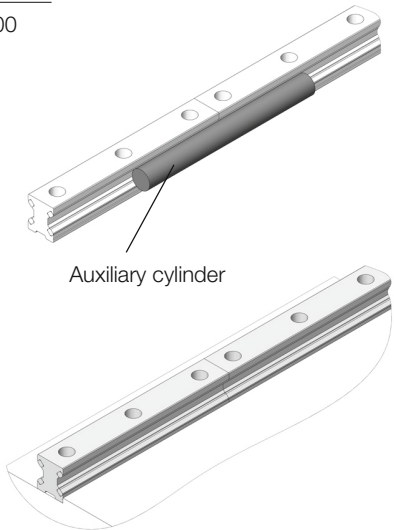
Table 3: Cylinder diameter

- a. Insert the cylinders into the raceway at the point where the rails separate.
b. Clamp cylinder with the help of a device.
4. Check the linearity (tolerances Table 1, page 5) and, in the case of single rails, also the parallelism of the rails (tolerances Table 2, page 8)
a. Now screw the rails together.



Observe the specified tightening torques (chapter 9).

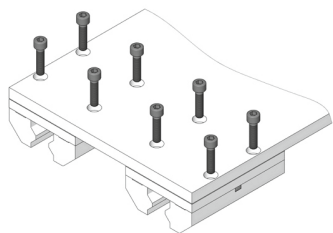
- b. Slide the cassette or carriage onto the rails and adjust the sliding resistance as described in chapter 7.





4.5 Assembly of multilane arrangements

Cassettes that are mounted on the rail on delivery are already set to the correct sliding resistance.

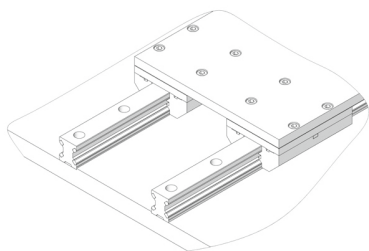
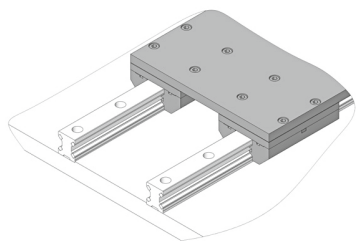
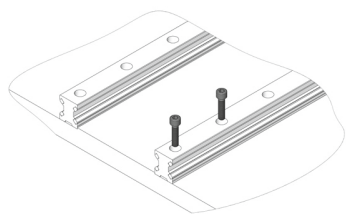


Do not exchange cassettes and rails at random here. You must adjust individually supplied, loose cassettes to the respective rails.

1. Screw the cassettes on the connecting plate.
2. Mount one of the double rails (guide rail) as described in chapter 2.
 - a. Place the second rail on your position. Roughly align it and lightly tighten the screws.
 - b. Slide the cassettes with the connecting plate (carriage) onto the rails.
3. To align the second rail in parallel, travel the entire rail section with the carriage. The permissible tolerances for parallelism can be found in Table 2, page 8.
4. Now screw the second rail.



Observe the specified tightening torques (chapter 9).

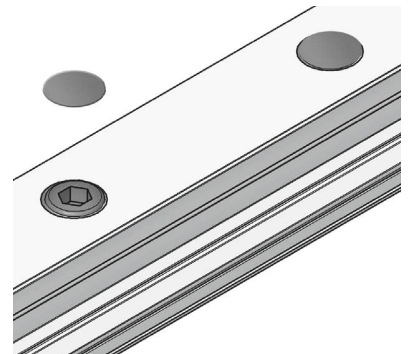
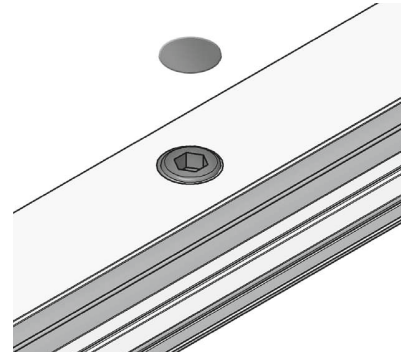




4.6 Assembly of screw covers

Use the covers provided to protect the wipers of the cassette and carriage.

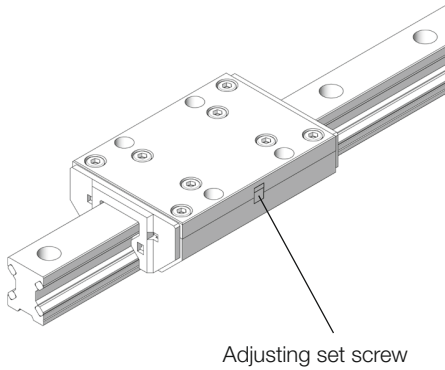
1. Place the covers in the holes of the rail.
2. Cover the rail with a plastic plate and then tap the covers flat into the rail with a hammer.
3. Remove the burr if necessary.





4.7 Adjusting cassette or carriage

Cassettes that are mounted on a rail on delivery already have the correct sliding resistance. Do not exchange cassettes and rails at random here. You must adjust individually delivered, loose cassettes to the respective rails:



Adjusting set screw

1. Remove the wipers from the cassette or roller blocks (see chapter 8.2). Slide the cassette or roller carriage on the rail.



Observe the correct arrangement of the fixed and adjustment sides of the cassette. In the case of double rails, the marking groove of the rail must be on the opposite side of the setting set screw.

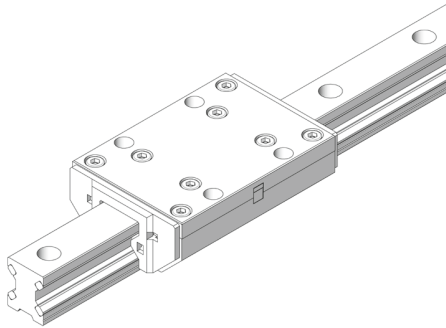
2. Loosen the four fixing screws on the adjustment side and tighten them slightly again.
3. Adjust the sliding resistance via the adjusting set screw. Turning the set screw produces a displacement of the roller shoe and thus an increase or reduction of the preload.
4. Tighten the four screws on the adjustment side again.



1. Check the slide resistance with a spring balance. Take the values from Table 4: „Guide values for slide resistances [N]“.

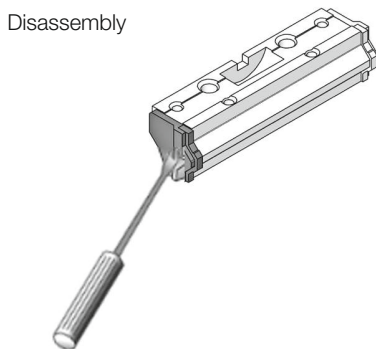
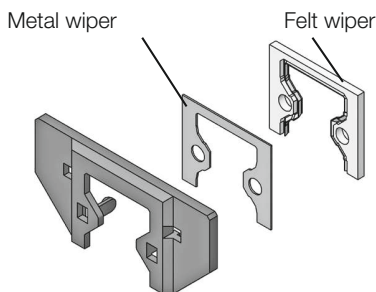
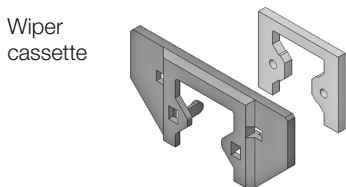
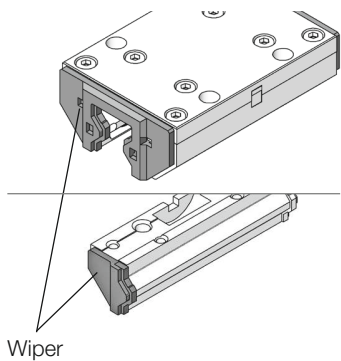


Repeat steps 2 to 4 until the correct slide resistance is set. Then tighten all fastening screws to the specified tightening torque (chapter 9).



Series		FDA	FDB	FDG	FDC	FDD	FDE	FDH
12	Min.	0.7	0.2	0.2	0.5	-	0.5	-
	Max.	1.0	0.3	0.3	1.0	-	2.0	-
15	Min.	0.5	0.2	0.2	0.5	-	0.8	-
	Max.	2.0	0.3	0.3	2.0	-	2.0	-
20	Min.	1.5	0.5	0.5	1.5	-	1.0	-
	Max.	2.5	0.9	0.9	2.5	-	2.5	-
25	Min.	1.5	1.0	1.0	1.5	1.5	1.5	2.5
	Max.	3.0	1.5	1.5	3.0	3.0	3.0	5.0
35	Min.	2.0	1.0	3.0	2.0	-	2.0	4.0
	Max.	4.0	1.5	4.0	4.0	-	4.0	6.0
45	Min.	5.0	2.0	3.0	5.0	-	5.0	5.0
	Max.	8.0	3.0	4.0	8.0	-	8.0	8.0

Table 4: Guide values for slide resistors [N]



4.8 Wiper

If the wipers are supplied loose, they must be mounted on the cassette or roller shoes.

4.8.1 Assembly of wiper

1. Pull the cassette off the guide rail.
 - a. Soak the felt scraper with oil if necessary.
 - b. Place the felt wiper in the wiper plate and guide the snap lugs of the plate through the slot on the wiper. If you are using a metal wiper, insert it into the wiper plate before the felt wiper.
 - c. Now clip the wipers with the locks onto the roller shoes or cassette.

Make sure that you do not damage the wipers. You should replace the felt wipers after 6000 km at the latest.



The felt wipers are impregnated with „Mobil DTE26“ at the factory.
The service life of the felt wipers can be extended by regular re-oiling.

4.8.2 Disassembly of wiper

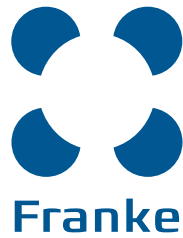
1. Pull the cassette or carriage off the guide rail.
2. Insert a screwdriver on the same stripper side first into the inner and then into the outer recess and use it to disengage the snap lugs.
 - a. Repeat the process on the other side of the wiper.
 - b. Pull off the wiper.



4.9 Tightening moments for screw fittings

Screw size	Tightening moment
M3	1.1
M4	2.5
M5	5.0
M6	8.5
M8	21.0
M10	41.0
M12	71.0

Table 5: Tightening moments for screw fittings [Nm]



For further information please contact our service team
will be pleased to assist you.

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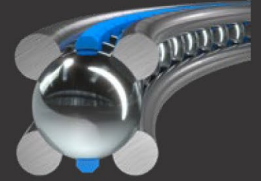
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Technical Information on Wire Race Bearings



Bearings Elements and Slim Bearings | Bearing Assemblies | Rotary Tables and Direct Drive

1 Wire race bearing selection

An optimum selection or dimensioning of the bearing should be made before the design work is started. The individual series offer the following advantages:

- Bearing elements (Type LEL, LER):
 - highest possible degree of integration
 - cost-sensitive series applications
 - greatest possible flexibility with regard to preload, running properties and diameter ranges
- Slim bearings (Type LSA):
 - simple, space-saving integration into your construction
 - Low-cost alternative to conventional slim bearings
 - non-preloaded bearings
 - rather subordinate quality requirements regarding accuracy and play
- Bearing assemblies (Type LVA, LVB, LVD, LVE):
 - ready-to-install standard bearings with a wide selection range
 - backlash-free preloaded (optimized with regard to stiffness, speed and service life)
 - short-term availability (partly from stock)
- Bearing assemblies (Type LVC, LVG):
 - ready-to-install standard bearing for high rotational speeds (LVC)
 - ready-to-install standard bearing for high loads (LVG)
- Rotary tables (Type LTA, LTB):
 - robust rotary table with worm drive for fast moving handling and positioning tasks (LTA)
 - rotary table with worm drive for high-precision measuring and positioning tasks (LTB)

- Bearing assemblies with direct drive (Type LTD):
 - Rotary joint with integrated torque motor for energy-efficient, highly dynamic movements

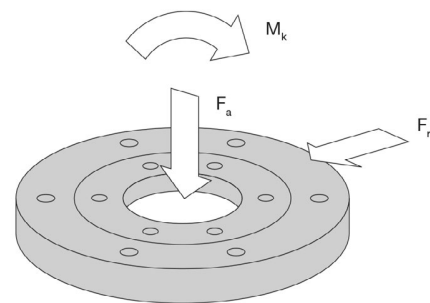
1.1 Parameters for bearing selection

- permissible dimensions and material information of the bearing
- loads with load spectra and associated time shares in %
- speed/number of swivel movements and angles per time unit
- peripheral forces to be transmitted by the gearing
- operating conditions (temperature, vacuum, clean room, humidity)
- required bearing life in revolutions or operating hours

1.2 Static and dynamic load capacity - Calculation

The basic static and dynamic load ratings stated in the catalogue are only sufficient for preliminary design. The basic load ratings shown correspond to the radial load ratings. The static axial and radial load carrying capacities or the dynamic axial and radial load carrying capacities are required for an optimum design. For more complex loads, please contact our technical sales department.

2 Calculation



All forces and moments acting on the bearing are to be combined by vectorial addition into centrally acting forces F_a and F_r and resulting moments M_a . For complex load cases and load spectra with variable loads and speeds, we will be pleased to calculate the values for you.



2.1 Terms, unit of measurement

C	dynamic load rating	(N)
C ₀	static load rating	(N)
F _a	centrically acting axial force	(N)
F _r	centrically acting radial force	(N)
KKØ	ball and cage diameter = (D + d)/2	(M)
L _n	nominal lifetime	(h)
M _k	tilting moment	(Nm)
n	rotational speed	(min – 1)
P	equivalent dynamic load	(N)
P ₀	equivalent static load	(N)
S _{st}	static safety	
X	radial factor	
Y	axial factor	
Z	moment factor	

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}
For quiet, vibration-free operation	> 1,8
For normal operation	> 2,5
For heavy impact loads and high demands on running accuracy	> 8,0

2.3 Dynamic calculation

At a circulation speed of v > 0.1 m/s, a static and dynamic calculation is required, whereby the static safety factor S_{st} must at least reach the recommended value of the respective load.

2.3.1 Nominal lifetime

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

2.3.2 Axial and radial loads

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

	$\frac{F_a}{F_r} \geq 1$	$\frac{F_a}{F_r} > 1$
	X	Y
All bearing types	1,26	0,45

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

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

	$0 < \frac{M_k}{F_a \cdot KKØ} \leq 0,5$	$\frac{M_k}{F_a \cdot KKØ} \leq 0,5$
	Y	Z
All bearing types	0,86	1,72

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

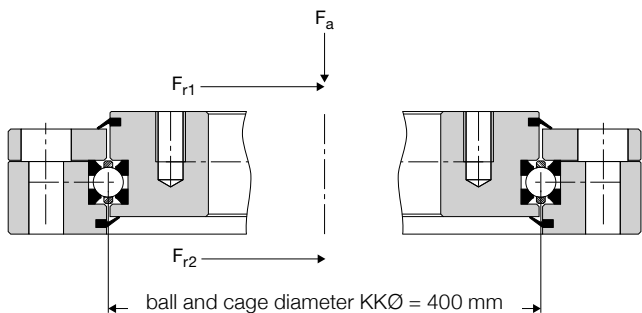
$$P = X \cdot F_r + Z \cdot \frac{M_k}{KKØ}$$
 (N)

	$0 \geq \frac{M_k}{F_r \cdot KKØ} \leq 0,5$	$\frac{M_k}{F_r \cdot KKØ} \geq 0,5$
	X	Z
All bearing types	1,0	1,68

For radial, axial and moment loads, we will be pleased to carry out the calculation for you.



3 Calculation example bearing elements



3.1 Load details:

Load case A (static stress)

Centric axial force from

Tare weight + load

Radial force from working pressure

$$F_a = 22 \text{ kN}$$

$$F_{r1} = 4,2 \text{ kN}$$

Load case B (dynamic stress)

Centric axial force from

Tare weight + load

Radial force from drive

Average operating speed

$$F_a = 22 \text{ kN}$$

$$F_{r2} = 1,5 \text{ kN}$$

$$n = 9,5 \text{ 1/min}$$

Calculation for bearing element LER5 with KKØ 400 mm.

Details: $C0_a = 419 \text{ kN}$ und $C0_r = 197 \text{ kN}$

3.2 Calculation:

Load case A (static stress)

$$S_{st} = \frac{1}{\frac{F_a}{C_{0a}} + \frac{F_r}{C_{0r}} + \frac{M}{C_{0m}}} = \frac{1}{\frac{22}{419} + \frac{4,2}{197} + \frac{-}{-}} = 13,5$$

Safety $S_{st} = 13,5$ (sufficient for normal operation)

Load case B (dynamic stress)

$$S_{st} = \frac{1}{\frac{F_a}{C_{0a}} + \frac{F_r}{C_{0r}} + \frac{M}{C_{0m}}} = \frac{1}{\frac{22}{419} + \frac{1,5}{197} + \frac{-}{-}} = 16,6$$

Safety $S = 9,5$ (above the minimum security level specified in 2.2.2)

$$\text{Lifetime } L_h = \left(\frac{44}{20,2} \right)^3 \cdot \frac{10^6}{60 \cdot 9,5} = 18.100 \text{ h}$$

$$(P = 0,86 \cdot 1,5 \text{ kN} + 0,86 \cdot 22 \text{ kN} = 20,2 \text{ kN})$$

4 Design and manufacture of the bearing bed

Bearing elements consist of two inner and outer raceways and a multi-piece segmented cage with balls. The races are open and can therefore be changed elastically in diameter for installation.

The balls correspond to class G20 (DIN 5401:2002-08). Only the balls included in the delivery may be used. If balls are lost, all balls must be replaced in order not to impair the running characteristics of the bearing.

The design and technically optimum production as well as the correct setting of the preload are important prerequisites for a long service life. This guarantees that all raceways are involved in load carrying and that the balls roll optimally in the predetermined position.

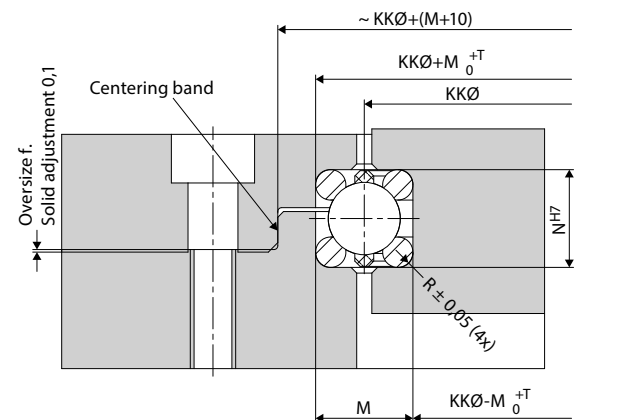
Design and manufacture of the wire bed differ for the individual bearing elements and slim bearings and are described below for these.

4.1 Wire bed design for bearing elements Type LEL

The bearing elements LEL offer the highest running culture and running accuracy. They also place the highest demands on the design of the wire bed. Two dimensional sketches illustrate the most important parameters here:

4.4.1 Tuning by grinding (Massive tuning)

When designing the enclosing parts, care must be taken that the two housing parts to be joined are manufactured with oversize in order to achieve the desired preload in the bearing by grinding the cover.

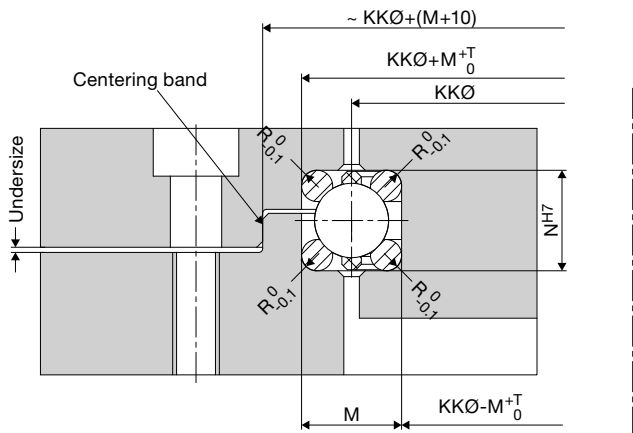


Technical Information on Wire Race Bearings



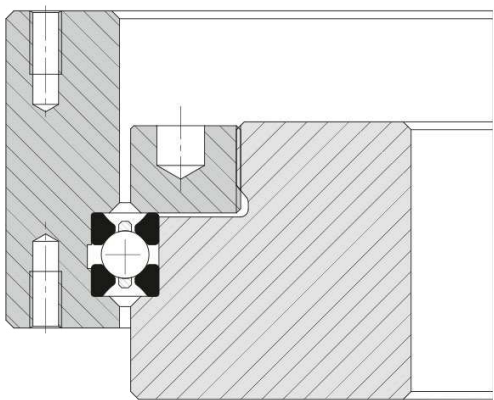
4.1.2 Adjustment with shims

When designing the enclosing parts, it must be ensured that the two housing parts to be joined are undersized so that the desired preload in the bearing can be achieved by enclosing shims.



4.1.3 Adjustment with threaded ring

In this case the use of LER bearing elements is recommended. The wire bed diameters can be manufactured in one piece, then the bearing setting is adjusted by screwing in the threaded ring. This must be secured by means of a set screw after correct bearing adjustment.
With LEL bearing elements, the threaded ring must be fitted with a race to ensure sufficient concentricity.



4.1.4 Dimensions and tolerances

The dimensions and tolerances are calculated as follows:

$$R = \frac{\lambda}{2} - 0,1$$

$$T = KKØ / 10.000 \text{ (dimensions in mm)}$$

Grinding oversize or undersize for shims: 0.1 mm

Fitting tolerance centering fit

- bore: lower tolerance: +0,05;
upper tolerance: +0,05 + IT6
shaft: upper tolerance: -0,05;
lower tolerance: -0,05 - IT6

It is advisable to design the stator of the bearing in a split design. The rotor should be made in one piece. The accuracy to be achieved is influenced by the individual accuracies, therefore it applies that split rings 2/3 receive the runout/ axial runout tolerances, the one-piece ring receives half of the runout/axial runout tolerances.

Half the diameter tolerance applies to the roundness of the wire bed. The screw mounting surface of the adjacent construction is the basis for the axial runout of the wire bed. The basis for radial runout is the wire bed centre line. Flatness and parallelism of the individual parts are designed with half the total tolerance.

When designing the enclosing parts, it must be ensured that parallel surfaces that are not joined (e.g. surface above the centring collar) are designed with sufficient clearance so that they still have clearance after the bearing has been adjusted. Chamfers and radii at the fit must be designed in such a way that the joining surfaces can be screwed together without causing collisions in the area of the cylinder edges.

Basically, it can be said that the accuracy of the bearing assembly can be improved if the wire bed of the split ring is manufactured when both rings are bolted and additionally pinned. In general, the locating fit of the bearing together with the wire bed can also be machined in one clamping. It is sufficient to manufacture the wire bed by turning or milling, in this case surface qualities of < Ra 3.2 should be aimed for, since the setting behaviour of the bearing is positively influenced by high surface quality.

The wire bed should always be machined in one setting with the contours that are related to the centering or running accuracy, thus achieving optimum accuracy and bearing life.

For soft materials such as aluminum, we recommend protecting the wire bed against wear (e.g. by anodizing, chemical nickel plating, etc.). The layer thickness should not be less than 20µm.

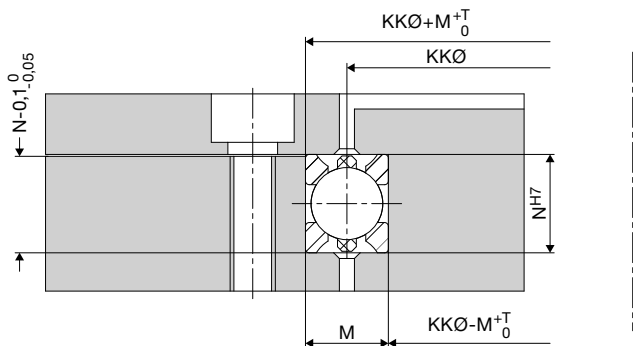


Technical Information on Wire Race Bearings

4.2 Wire bed design for bearing elements Type LER

The bearing elements LER offer a significant simplification compared to the LEL series with regard to the production of the enclosing turned parts. Here it is possible to adjust the bearing using a simple cover plate and shims. The wire bed does not have to be split - as with the LEL - no centering on the split ring is required.

Even in the case of the design with cover, care must be taken when designing the enclosing parts to ensure that the wire bed, which is provided with cover, is manufactured with undersize in order to be able to achieve the desired preload in the bearing by enclosing shims.



The statements made in the section for LEL apply to the constructive design. The wire bed has no radii to accommodate the race, but the tool radii must not exceed 0.2 mm.

$T = KKØ/10.000$ (dimensions in mm)
Undersize for shims: 0,1 mm

It makes sense to design the stator of the bearing divided, the rotor should be one piece. The accuracy to be achieved is influenced by the individual accuracies. However, since the wire bed of the split ring also has no offset in concentricity, the concentricity and axial runout tolerances are divided equally between the two rings.

Half the diameter tolerance applies for the roundness of the wire bed, the screw mounting surface of the adjacent construction is the basis for the axial runout of the wire bed. The basis for radial runout is generally the wire bed centre line.

Flatness and parallelism of the individual parts are designed with half the total tolerance. The locating fit of the bearing is to be machined together with the wire bed in one clamping.

It is sufficient to produce the wire bed by turning or milling. Surface qualities of $< Ra\ 3.2$ should be aimed for here, since the setting behaviour of the bearing arrangement is positively influenced by high surface quality.

4.3 Wire bed design for bearing elements Type LEW

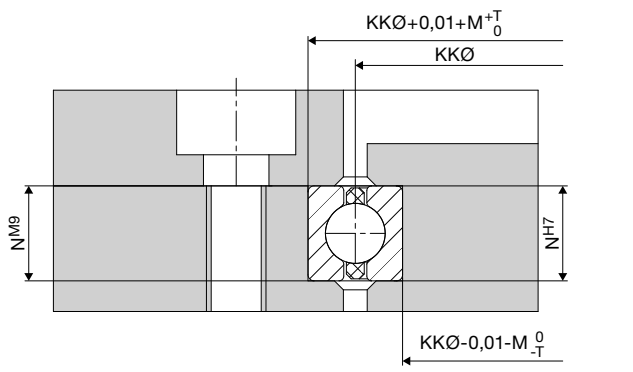
For the design of wire rod beds of bearing element series LEW, the same guidelines apply accordingly as for bearing elements of series LEL.

When ordering the bearing elements, it is absolutely necessary to specify which bearing ring will be manufactured split.

4.4 Wire bed design for slim bearing Type LSA

In contrast to the bearing elements described above, the bearing elements LSA are not adjustable and are always subject to play. According to the following specifications, the resulting bearing arrangements have play between 0.02 and 0.12 mm. As with the LER, the wire bed is undivided, and adjustment of the play is not possible.

When designing, it makes sense to integrate the outer ring into the split element of the surrounding structure, as this makes it easier to insert the ring into the surrounding structure.



The wire bed has no radii to accommodate the race, but the tool radii must not exceed 0.2 mm. $T = 0.03\text{ mm}$ for KK up to 300 | 0.04 mm for KK greater than 300 (mm).

Half the diameter tolerance applies for the roundness of the wire bed, the screw mounting surface of the adjacent construction is the basis for the axial runout of the wire bed. The basis for radial runout is generally the wire bed centre line.

The locating fit of the bearing must be machined together with the wire bed in one clamping. It is sufficient to produce the wire bed by turning or milling, in this case surface qualities of $< Ra\ 3.2$ should be aimed for, since the setting behaviour of the bearing arrangement is positively influenced by high surface quality.

Technical Information on Wire Race Bearings



5 Assembly

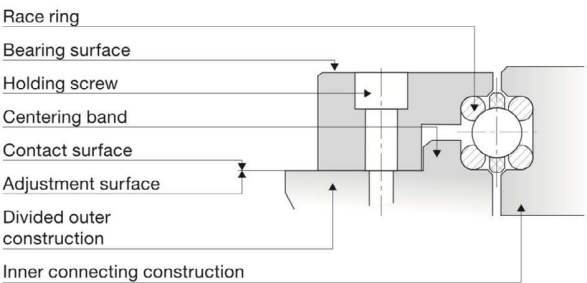
5.1 Installation and adjustment of bearing elements

5.1.1 Adjustment with shims

Adjustment with shims is the most economical and flexible procedure, since subsequent changes to the rotational resistance are also possible. Shims are available in different thicknesses depending on the screw diameter.

Requirements:

- Division of the inner or outer construction.
- The height of the raceway bed is 0,3 to 0,5 mm smaller on the side of the split adjacent construction. This gap is required to accommodate the shims.
- The split side of the adjacent construction should be fixed using a centring collar. This is the only way to guarantee the concentricity of the two raceways.



Installation and adjustment:

Before installation, both the raceways and the wire bed must be cleaned. The races are inserted in the adjacent construction. In order to hold the races in position during fitting, the race beds can be coated with grease. The joints of the opposing race rings in the same part are each fitted at an angle of approx. 180°. The split side of the adjacent construction is then brought into the intended position.

Then insert the cage segments with the balls and grease the bearing element (see 6.1 Lubrication and maintenance). Before the adjacent construction of the split side is closed, the shims must be distributed over the screw holes of the retaining screws. The thickness depends on the designed gap (see above).

After the screws (see 6.5 Screw connections) have been tightened and the rotary joint has been turned through 360° approx. 2 to 3 times, check the rotational resistance. If the measured value deviates more than 5 to 10 %, the thickness of all shims must be changed and the procedure repeated.

5.1.2 Adjustment by massive tuning

When using solid tuning, the tuning surface is brought to the required dimension by grinding over it. This method achieves the best accuracy since the interface between the split side of the adjacent construction is interlocking and no tension can build up.

Requirements:

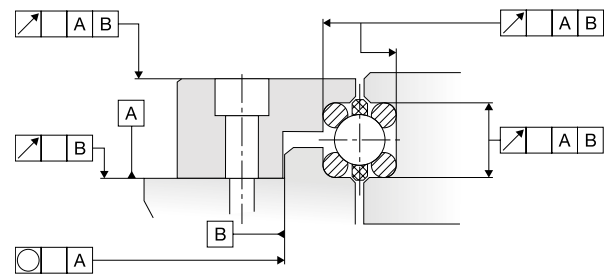
- Division of the inner or outer construction.
- Surface grinding machine of suitable size.
- The height of the raceway bed on the side of the split adjacent construction is 0.1 mm greater. This allowance is required for the adjustment.
- The split side of the adjacent construction should be fixed using a centring collar. This determines the concentricity of the two raceways.

Installation and adjustment:

The cage segments with the balls are inserted and the bearing assembly is sealed with the second split side of the adjacent construction (shim ring). After the screws have been tightened as specified (see 6.5 Screw connections) and the bearing assembly has been turned through 360° approx. 2 or 3 times, the clearance between the inner and outer ring is measured using a dial gauge. The tuning ring is then dismantled again and the measured value determined plus 0.02 to 0.03 mm is ground off with the surface grinding machine.

To ensure that this surface remains parallel to the raceway support, a suitable mounting surface must be provided at the design stage.

After the grinding dust has been thoroughly removed, the ring is remounted as described above and the bearing is moved. Then check the rotational resistance. If this measured value deviates more than 5 to 10 %, the procedure must be repeated. Finally the bearing assembly is greased via the lubrication holes provided (see 6.1



Lubrication and maintenance).

The bearings are suitable for continuous operation at temperatures between -10 °C and +70 °C - for short periods up to +120 °C.

Technical Information on Wire Race Bearings



Peripheral speeds of 10 m/s with grease lubrication and 12 m/s with oil lubrication can be achieved. The setting of the preload is an important prerequisite for a long service life of the bearing element. The preload ensures that all raceways are involved in load carrying and that the balls run optimally at their predetermined position. The preload is correctly adjusted when the rotational resistance without seal corresponds to the values in the diagram under point 6.

Note: It is advisable to adjust the preload, because even with optimum production there are tolerances which must be compensated.

5.2 Installation and adjustment of slim bearings

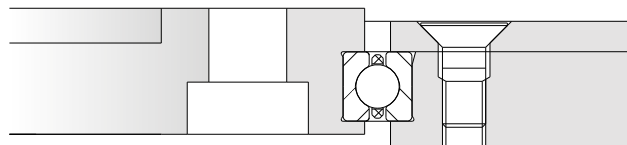
In the LSA, two running wires are combined into a single wire.

The special profile of the raceways maintains the 4-point principle. This makes installation just as easy as with conventional slim bearings.

The assembly is carried out in the following steps:

1. Clean components with a clean, lint-free cloth.
2. Grease the raceways (rear side).
3. Insert the race ring inner ring in the inner ring of the adjacent construction. Ensure that the raceway ends are separated by a gap.
4. Place the cage and outer race onto the inner race. Hold the raceway ends of the outer race together so that the ball cage cannot slip out.
5. Position the outer ring and push it in axially.
6. Replace the cover and screw it on.

Installation suggestion:



6 Installation and adjustment of bearing assemblies

Franke bearing assemblies are ready-to-install complete bearings.

The specified or defined running accuracy, rotational resistance, rigidity and general characteristics depend both on the adjacent construction and on the correctness or completeness of the data transmitted. They must therefore be given particular attention.

6.1 Lubrication and maintenance

In order to keep friction low and to protect the bearing arrangement permanently against corrosion, sufficient lubrication should be ensured. All lubricants are subject to an ageing process that limits the operating life. The best resistance to ageing is achieved with fully synthetic lubricants. The grease SHELL GADUS S3 V 2200C for Franke bearing assemblies is used for initial greasing. The ageing resistance of this lubricant is approx. three years. This lubricant is also recommended for the use of bearing elements.

As an alternative, high-quality lithium soap greases based on synthetic oils or mineral oil or according to DIN 51825-K2 K-40. Questions regarding the lubricant, such as miscibility, aggressiveness, extreme temperatures, disposal, areas of application, etc. must be clarified with the respective manufacturer of the lubricant.

6.2 Initial lubrication and relubrication

The amount of lubricant required by a wire-race bearing for lubrication is relatively small and is self-adjusting depending on the speed. If the quantity of lubricant is too large, the rolling action will cause increased temperatures which will limit or suspend the lubricity. The service life of the bearing is considerably reduced by the increased wear. The lubricant quantity depends on the calculated clearance inside the bearing assembly. The calculated volume must be filled with 20 to 30 % lubricant. For swivel bearings, 30 to 40 % is recommended.

Technical Information on Wire Race Bearings



Franke bearing assemblies are ready-to-install complete bearings. Bearing elements and slim bearings are treated with corrosion protection oil for transport and must be greased during assembly.

6.3 Relubrication and lubrication intervals

The lubricity decreases as a result of mechanical stress and signs of ageing. It is therefore necessary to supplement the existing lubricant quantity or to renew it completely (e.g. in case of heavy contamination). The bearing must be rotated during relubrication. Relubrication should be carried out at below operating temperature if possible.

6.3.2 Relubrication and lubrication intervals for bearing elements LV

The relubrication quantity is calculated as follows:

- m = KKØ x H1 / 3 x X
- H1 = Bearing ring height in mm
- KKØ = Ball and cage diameter in mm
- m = Relubrication quantity in g
- X = Factor according to Table 1 in mm-1

Relubrication intervals:

An exact determination of the intervals is specific to the application and can therefore only be determined correctly by tests (for reference values see Table 1). To determine the factor X (Table 2), the time value read off is set in relation to the duty cycle of the application.

Note: For standard bearings, it is sufficient to fit a relubrication facility, since the lubricant is distributed evenly by the bearing movement. In the case of swivel bearings, at least three relubrication possibilities must be provided (3 x 120°).

Vu m/s	Intervall h
0 bis < 3	5000
3 bis < 5	1000
5 bis < 8	600
3 bis < 10	200

Table 1: Relubrication time limits

intervall	weekly	monthly	annually	2-3 years
X	0,002	0,003	0,004	0,005

Table 2: Relubrication intervals

Circulating oil lubrication is basically possible and should be agreed with the respective manufacturer of the lubricant. Lubricant-free bearings are available for special applications (e.g. clean room or ultra high vacuum).

Calculation example:

Bearing assembly type LVA, KKØ 500 mm,
Peripheral speed 3 m/s
Duty cycle approx. 16 h/day
Relubrication period for 3 m/s is 1000 h (see Table 1) = 1000 (h)/16 (h/day) = 63 days ~ 3 months for 16 h/day duty cycle

Relubrication should be carried out quarterly. Accordingly, the factor X (Table 2) is rounded and amounts to 0.003. Dimension H1 is 42 mm (see www.franke-gmbh.de).

m = 500 mm x 42 / 3 mm-1 x 0.003 g = 21 g
The relubrication quantity is 21 g SHELL GADUS every three months. The shelf life of the lubricant is three years.

6.4 Lubrication and lubrication intervals for the gearing

Automatic gear lubrication is recommended. In the case of manual lubrication, the gear teeth and pinion must be adequately lubricated before commissioning. The lubrication interval depends on the design and the peripheral speed and must therefore be considered individually.

6.5 Screw connections

The number and diameter of the screws for mounting on the adjacent construction should always be checked. The distance X from retaining screw to retaining screw should not exceed 125 mm to avoid bridging. The fixing screws are tightened crosswise with a torque wrench in relation to the screw quality - according to the specifications in Table 3.

	Quality Nm	
	8.8	12.9
M 6	10	17
M 8	25	41
M10	49	83
M12	86	145
M16	210	355

Table 3: Tightening torques

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To compensate for settlement effects, the screws must be retightened to the specified tightening torque. This procedure should be carried out if possible when the screws are free of additional forces.

The checks must be carried out after approximately 100 and then every 600 operating hours. For special operating conditions (e.g. due to strong vibrations) this period can be considerably shorter.

6.6 Gearing

As standard Franke supplies a straight gearing without hardening (material 42CrMo4V) and special gearing on request. The material, the design and the quality can also be changed on request.

6.7 Tolerances and accuracies

All tolerances and accuracies are stated on the respective catalogue pages. The greatest possible accuracies are achieved if the design of the enclosing parts is such that all diameters and surfaces in relation to each other can be machined in one clamping. The running accuracies in the catalogue are average values and can be further improved by limiting the tolerances. The tolerance specification T = IT6 or T = IT7 refers to the diameter-dependent basic tolerances according to DIN ISO 286.

Nominal dimension range		Basic tolerances	
mm		µm	
starting from ...	up to	IT6	IT7
80...	120	22	35
120...	180	25	40
180...	250	29	46
250...	315	32	52
315...	400	36	57
400...	500	40	63
500...	630	44	70
630...	800	50	80
800...	1000	56	90
1000...	1250	66	105
1250...	1600	78	125

Table 4: Tolerance specifications DIN ISO 286 T1 (11.90)

7 Rotary tables and direct drives

Franke rotary tables are highly resilient and particularly suitable for assembly, measuring and testing tasks. All rotary tables have a compact aluminum housing with integrated Franke components. A worm gear guarantees high accuracy even under continuous load. The rotary tables are extremely tilt resistant at a low tare weight.

Bearing assemblies with direct drive are suitable for applications where high performance and low space requirements are important criteria. The integration of the drive into the bearing housing means that wear-prone components for transmitting drive power such as toothed belts, shafts or chains are no longer needed. This reduces the required drive energy and also benefits more precise positioning.

7.1 Load capacity

The recommended safety for Franke turntables is $Sst \geq 3$ for simple load ratios and $Sst \geq 6$ for dynamically changing load and lever ratios. Franke will calculate the load and service life if required.

7.2 Temperature range

The rotary tables can be operated at an operating temperature of -10 °C to +80 °C.Extended temperature ranges are possible on request.

7.3 Lubrication

In general, all standard rotary tables are provided ex works with long-term lubrication with the wire-race bearing grease ISOFLEX TOPAS NCA52. It is recommended to relubricate Franke rotary tables - depending on the application - every six months to annually.

Lubrication point	Lubrication quantity		
	g	left	right
LTA100	1		1
LTA200	1		1
LTB125	2		
LTB175	3		
LTB265	3		
LTB400	4		
LTD100			
LTD205			
LTD320			
LTD385			

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7.4 Options

- One or two integrated inductive proximity switches
- Freely positionable trip cams
- Mounting kits for motors according to customer requirements
- Motorization depending on the application with stepper or servo motors
- Encoder mounting on the second shaft end of the worm shaft
- Complete automation solutions

For all technical information, please also refer to our assembly and maintenance instructions for the respective products.



Technical Information on Wire Race Bearings
We reserve the right for errors and alterations.

Updated: March 2020

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El estado del contenido corresponde a la fecha de impresión.
Sujeto a cambios y errores.

Creado: 30.03.2022

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