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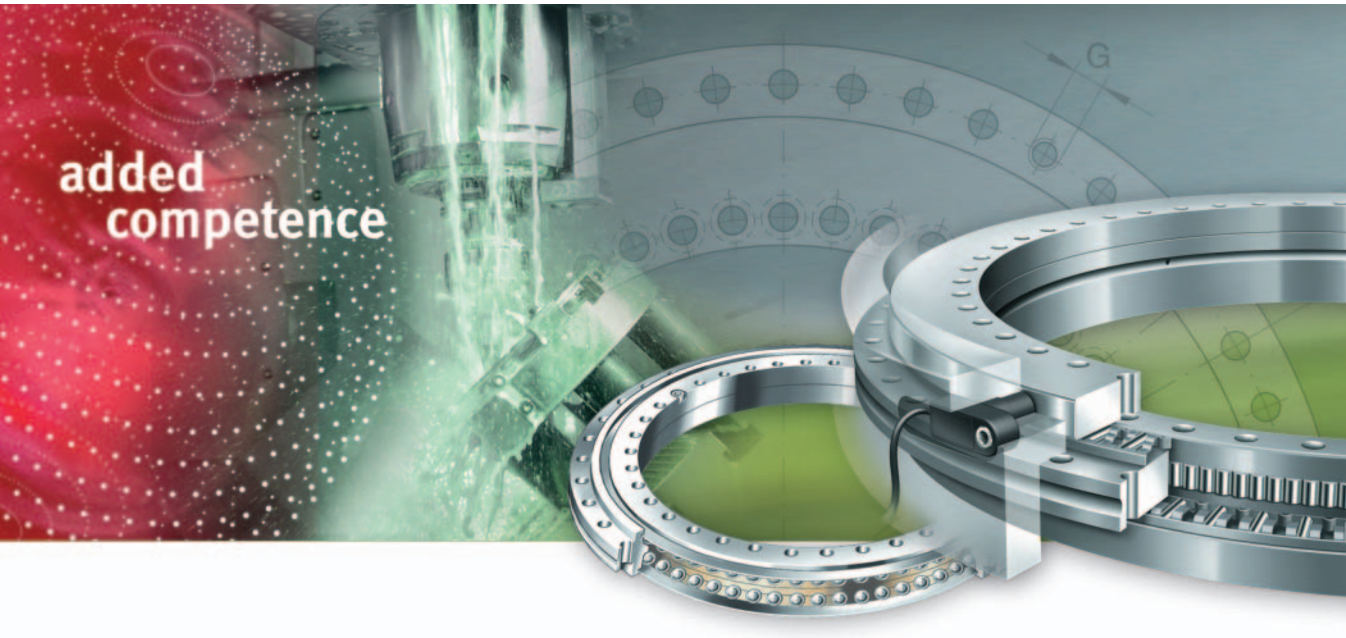

High precision bearings for combined loads

Axial/radial bearings
Axial angular contact ball bearings
Axial/radial bearings with integral angular measuring system

SCHAEFFLER GROUP
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The right product for every application

=

Optimum benefit for you

With their forward-looking bearing arrangement solutions for feed spindles, main spindles, rotary tables and linear guidance units, INA and FAG have been at the forefront of the world market for decades. The bearing components alone, however, are often no longer the decisive factor for these machine subsystems.

Our customers have of course benefitted directly from significant performance improvements and unique selling propositions thanks to our "ready-to-fit" products; these compact, ready-to-fit bearings are used in accordance with the simple principle: unpack, screw mount, use. In order to optimise the entire machine tool system, however, it is becoming ever more important not simply to support the subsystems but to integrate important functions such as measurement, sealing, lubrication, braking etc. in the components themselves. This intellectual approach is fulfilled comprehensively by the new concept **added competence** in the Production Machinery Sector since it attaches central importance to systems solution thinking for the bearing, bearing position and entire system.
This means that you can now access a product range that gives optimum coverage to all your applications in the machine tool.

Since direct drives and mechatronic solutions are used ever more frequently in machine tools, we have incorporated a further strong partner in the form of IDAM – INA Drives & Mechatronics – in our spectrum of capabilities. In this way, we can now supply you from a single source with bearing elements and the appropriate drive system to give complete systems that are precisely matched to each other. This opens up completely new technical and economic design possibilities for your requirements as well as significant advantages in the time and process chain.

In terms of products, we offer you a comprehensive, precisely balanced range, precision technology and top product quality.
In order to match the pulse of your developments as closely as possible, furthermore, we have a worldwide network of engineers, service and sales technicians working for you and ensuring that we maintain close contact with you in your own location.

In conclusion, we are convinced that we will always have the right product for your application. Just contact us to see what we can do for you.

added
competence

High precision bearings for combined loads

Axial/radial bearings are double direction axial bearings for screw mounting, with a radial guidance bearing. These ready-to-fit, pregreased units are very rigid, have high load carrying capacity and run with particularly high accuracy. They can support radial forces, axial forces from both directions and tilting moments free from clearance. The bearings are available in several series.

For applications with low speeds and small operating durations – such as indexing tables and swivel type milling heads – series YRT is generally the best suited.

Where comparatively lower friction and higher speeds are required, RTC bearings can be used. For higher requirements in accuracy, these bearings are also available with restricted axial runout accuracy.

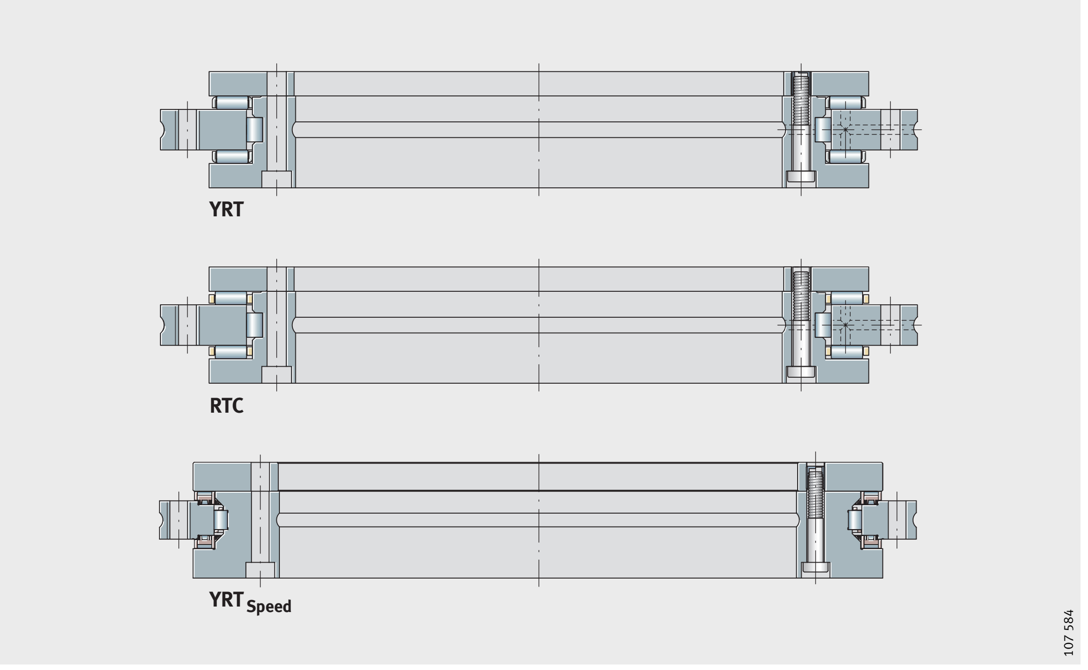
For the bearing arrangements of direct drive axes, there is the series $\text{YRT}_{\text{Speed}}$. Due to their high limiting speeds and very low, uniform frictional torque across the whole speed range, these bearings are particularly suitable for combination with torque motors.

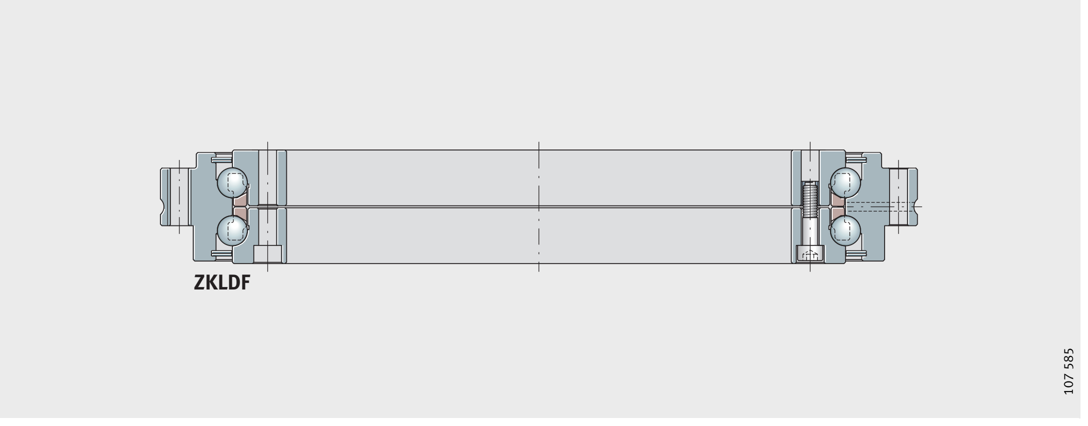
Axial angular contact ball bearings ZKLDF are low-friction, ready-to-fit, greased bearing units with high accuracy for very high speeds, high axial and radial loads and high demands on tilting rigidity.

Axial angular contact ball bearings are particularly suitable for precision applications involving combined loads. Their preferred areas of use are bearing arrangements in rotary tables, milling, grinding and honing heads as well as measurement and testing equipment.

Axial/radial bearings with integral angular measuring system YRTM correspond in mechanical terms to series YRT but are additionally equipped with an angular measuring system. The measuring system can measure angles to an accuracy of a few angular seconds by non-contact, magneto-resistive means.

The unit comprises an axial/radial bearing with a dimensional scale and a MEKO/U electronic measuring system. The electronic measuring system consists of two measuring heads and an electronic evaluation system.


YRT
RTC
YRT Speed
107 584


ZKLDF
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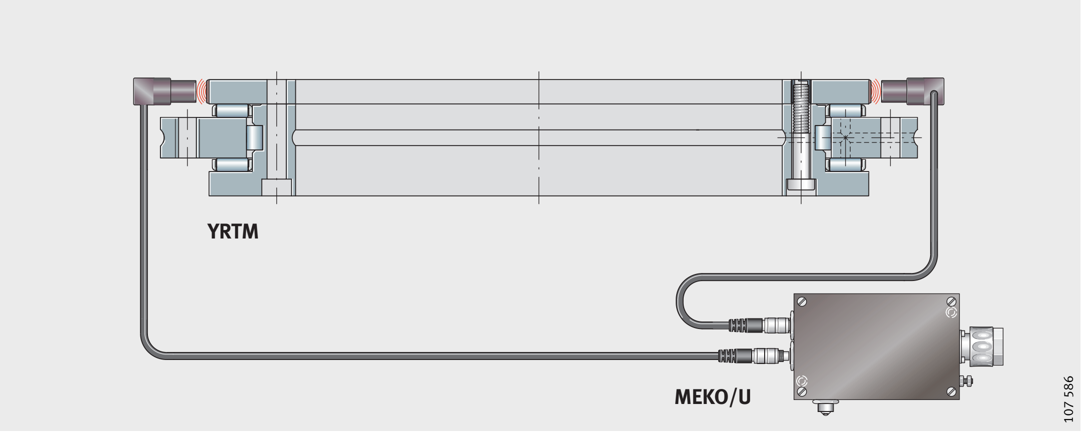
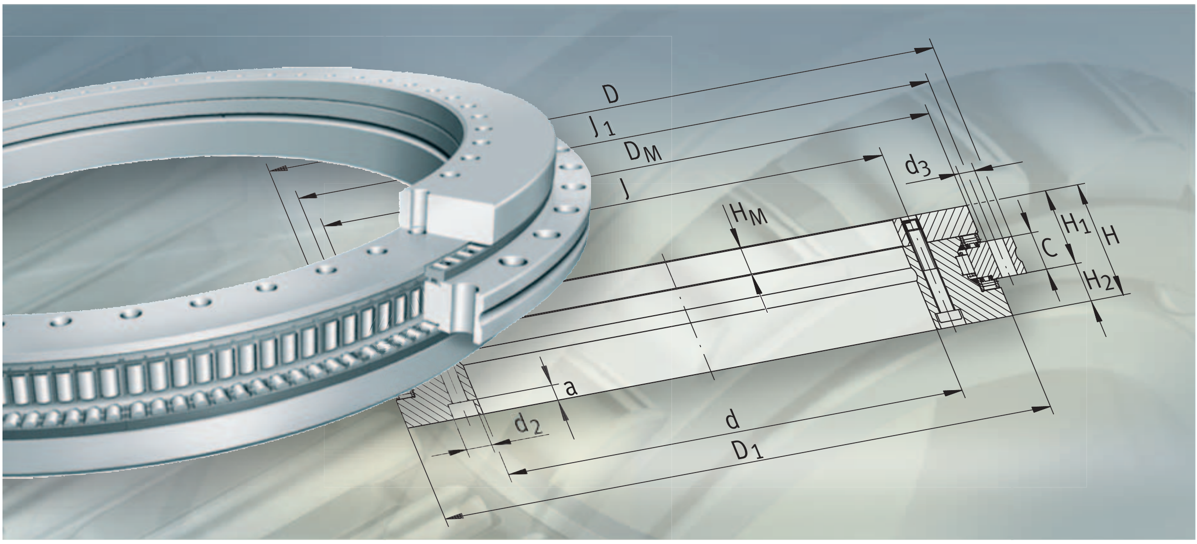
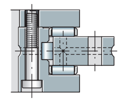
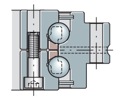

YRTM
MEKO/U
107 586



Axial/radial bearings
Axial angular contact ball bearings

Axial/radial bearings
Axial angular contact ball bearings

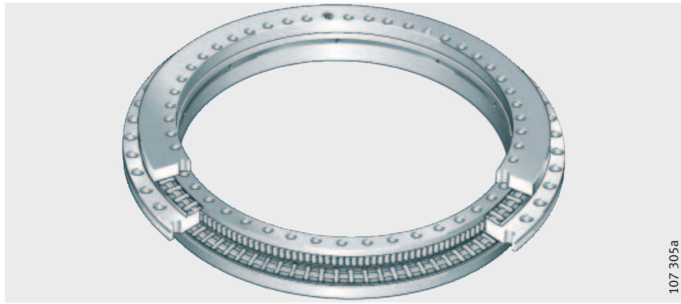




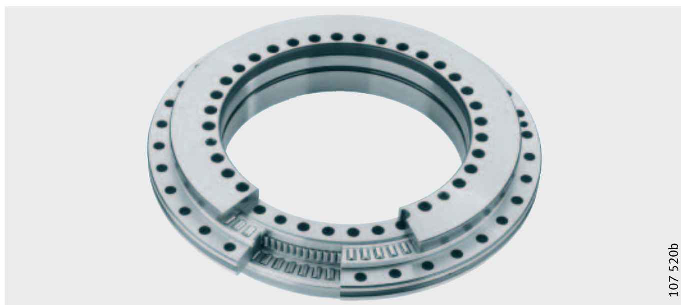
Product overview – Axial/radial bearings, axial angular contact ball bearings

Axial/radial bearings

YRT



RTC

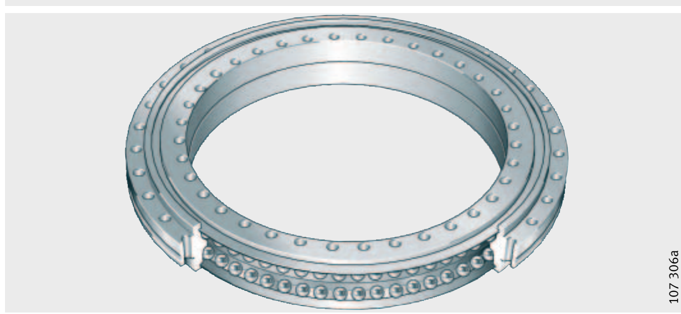


For higher speeds

YRT_{Speed}

Axial angular contact ball bearings

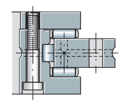
ZKLDF



Axial/radial bearings
Axial angular contact ball bearings

Features

Axial/radial bearings YRT, RTC and YRT_{Speed} and axial angular contact ball bearings ZKLDF are ready-to-fit high precision bearings for high precision applications with combined loads. They can support radial loads, axial loads from both sides and tilting moments without clearance and are particularly suitable for bearing arrangements with high requirements for running accuracy, such as rotary tables, face plates, milling heads and reversible clamps.

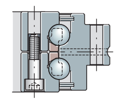


Due to the fixing holes in the bearing rings, the units are very easy to fit. The bearing is radially and axially preloaded after fitting.

The mounting dimensions of all series are identical.

With angular measuring system

Axial/radial bearings are also available with an angular measuring system. The measuring system can measure angles to an accuracy of a few angular seconds by non-contact, magneto-resistive means, see page 32.



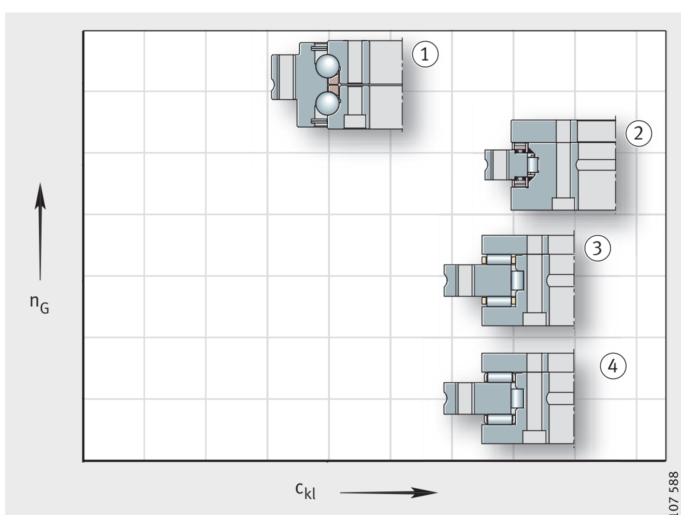
Areas of application

For standard applications with low speeds and small operating durations – such as indexing tables and swivel type milling heads – series YRT is generally the best suited, *Figure 1*. These bearings are available in two axial and radial runout accuracies.

Where comparatively lower friction and higher speeds are required, RTC bearings can be used, *Figure 1*. For higher requirements in accuracy, these bearings are also available with restricted axial runout accuracy.

For the bearing arrangements of direct drive axes, there is the series YRT_{Speed}. Due to their high limiting speeds and very low, uniform frictional torque across the whole speed range, these bearings are particularly suitable for combination with torque motors, *Figure 1*.

Axial angular contact ball bearings ZKLDF are particularly suitable for high speed applications with long operating duration, *Figure 1*. They are characterised by high tilting rigidity, low friction and low lubricant consumption.



(1) ZKLDF
(2) YRT_{Speed}
(3) RTC
(4) YRT

n_G = limiting speed
c_{kl} = tilting rigidity

Figure 1

Speed and tilting rigidity – comparison

Axial/radial bearings
Axial angular contact ball bearings

Axial/radial bearings

Axial/radial bearings YRT, RTC and YRT_{Speed} have an axial component and a radial component.

The axial component comprises an axial needle roller or cylindrical roller and cage assembly, an outer ring, L-section ring and shaft locating washer and is axially preloaded after fitting.

The radial component is a full complement (YRT, RTC) or cage-guided, preloaded cylindrical roller set. The outer ring, L-section ring and shaft locating washer have fixing holes.

The unit is located by means of retaining screws for transport and safe handling.

Sealing/lubricant

Axial/radial bearings are supplied without seals.

Bearings of series YRT and YRT_{Speed} are greased using a lithium complex soap grease to GA08 and can be lubricated via the outer ring and L-section ring (for information on GA08, see page 15).

Bearings of series RTC are greased with Arcanol MULTITOP.

Axial angular contact ball bearings

Axial angular contact ball bearings ZKLDF comprise a single-piece outer ring, a two-piece inner ring and two ball and cage assemblies with a 60° contact angle. The outer ring and inner ring have fixing holes for screw mounting of the bearing on the adjacent construction.

The unit is located by means of retaining screws for transport and safe handling.

Sealing/lubricant

Axial angular contact ball bearings have sealing shields on both sides. They are greased with a barium complex soap grease to DIN 51825–KPE2K–30 and can be lubricated via the outer ring.

Operating temperature

Axial/radial bearings and axial angular contact ball bearings are suitable for operating temperatures from –30 °C to +120 °C.

Suffixes

Suffixes and additional text for the available designs: see table.

Available designs

Suffix	Description	Design
H_1 ...	Reduced tolerance on mounting dimension H_1 (postscript: H_1 with tolerance ± ...) Restricted tolerance value according to table, page 22	Special design[1]
H_2 ...	Reduced tolerance on mounting dimension H_2 (postscript: H_2 with tolerance ± ...) Restricted tolerance value according to table, page 22	Special design[1]
–	Axial and radial runout tolerances reduced by 50% (additional text: axial/radial runout 50%)	Special design[1]

[1] Available by agreement.

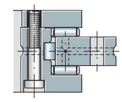
Design and safety guidelines

Basic rating life

The load carrying capacity and life must be checked for the radial and axial bearing component.

For checking of the basic rating life, please contact INA/FAG. The speed, load and operating duration must be given.

Static load safety factor



The static load safety factor S_0 indicates the security against permissible permanent deformations in the bearing.

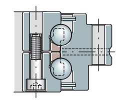
It is determined as follows:

$$S_0 = \frac{C_0}{F_0}$$

S_0 –
Static load safety factor

C_0 N
Basic static load rating according to dimension tables

F_0 N
Maximum static load P on the radial or axial bearing.



Caution! For machine tools and similar areas of application, the static load safety factor should not be less than $S_0 = 4$.

Static limiting load diagrams

The static limiting load diagrams can be used:

- for rapid checking of the selected bearing size under predominantly static load
- for calculation of the tilting moment M_k that can be supported by the bearing in addition to the axial load.

The limiting load diagrams take account of the static load safety factor $S_0 \geqq 4$ for the rolling element set as well as the screw and bearing ring strength.

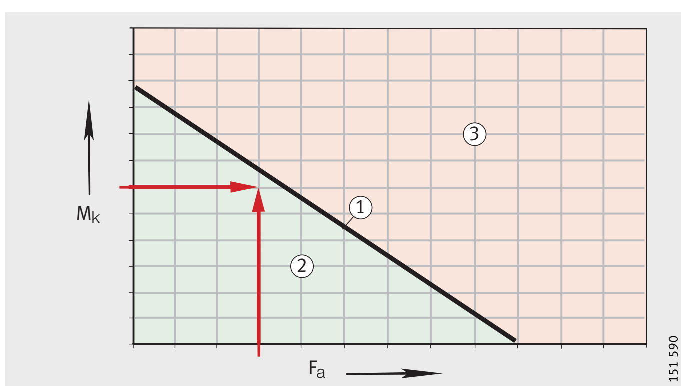
Caution! The static limiting load must not be exceeded when dimensioning the bearing. Example: see *Figure 2*.

Axial/radial bearings

The static limiting load diagrams for YRT, YRTS and RTC are shown in *Figure 3* to *Figure 9*.

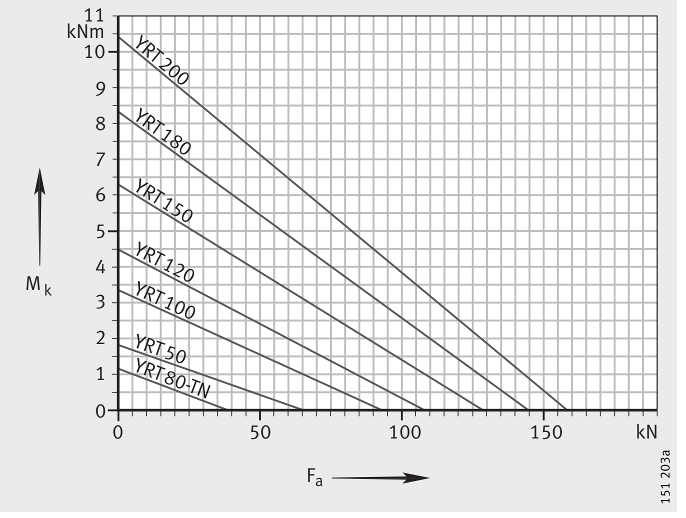
Axial angular contact ball bearings

The static limiting load diagrams for series ZKLDF are shown in *Figure 10* and *Figure 11*.



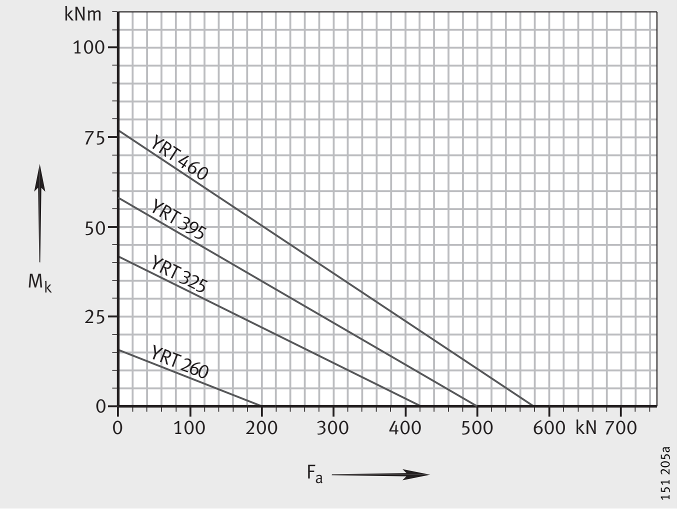
① Bearing/size
② Permissible range
③ Impermissible range
M_k = max. tilting moment
F_a = axial load

Figure 2
Static limiting load diagram – example



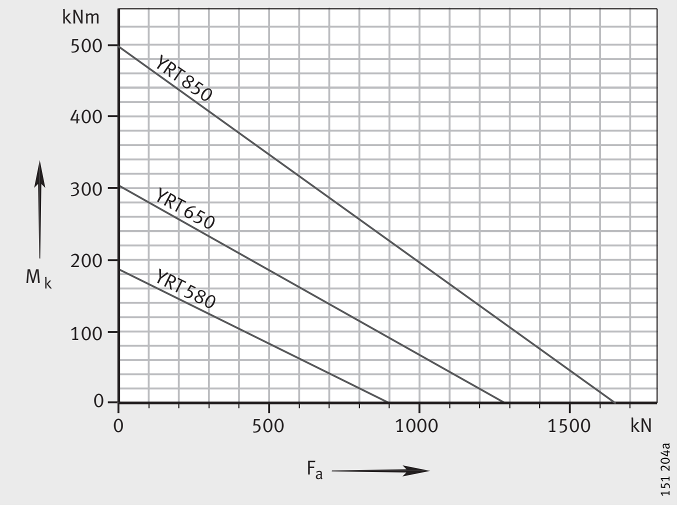
M_k = max. tilting moment
F_a = axial load

Figure 3
Static limiting load diagram – YRT50 to YRT200



M_k = max. tilting moment
F_a = axial load

Figure 4
Static limiting load diagram – YRT260 to YRT460



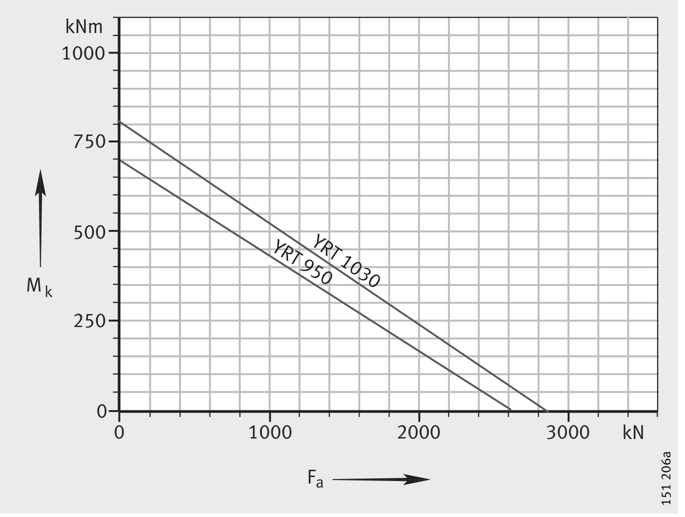
M_k = max. tilting moment
F_a = axial load

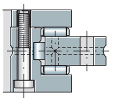
Figure 5
Static limiting load diagram – YRT580 to YRT850

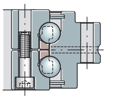
M_k = max. tilting moment
F_a = axial load

Figure 6

Static limiting load diagram – YRT950 and YRT1030



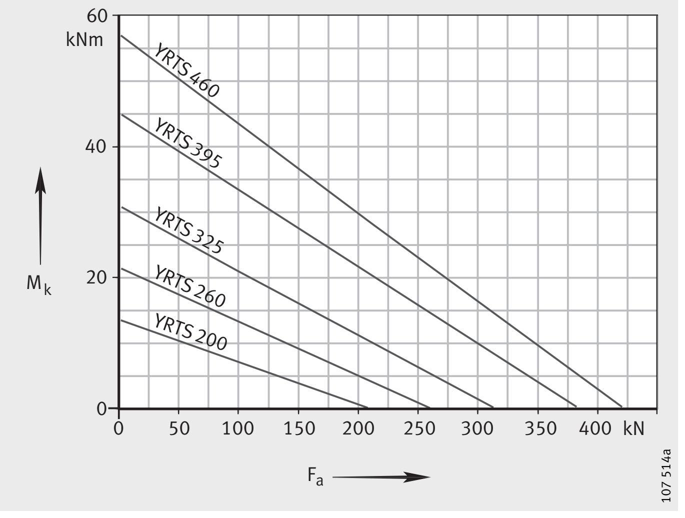




M_k = max. tilting moment
F_a = axial load

Figure 7

Static limiting load diagram – YRT_{Speed}200 to YRT_{Speed}460



M_k = max. tilting moment
F_a = axial load

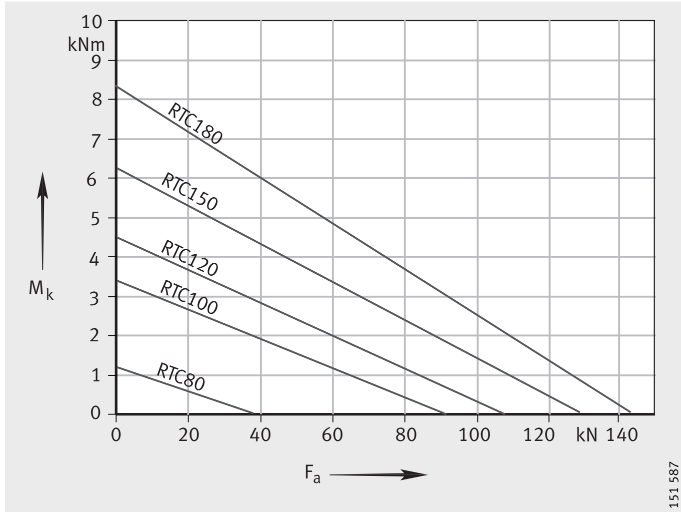


Figure 8
Static limiting load diagram – RTC80 to RTC180

M_k = max. tilting moment
F_a = axial load

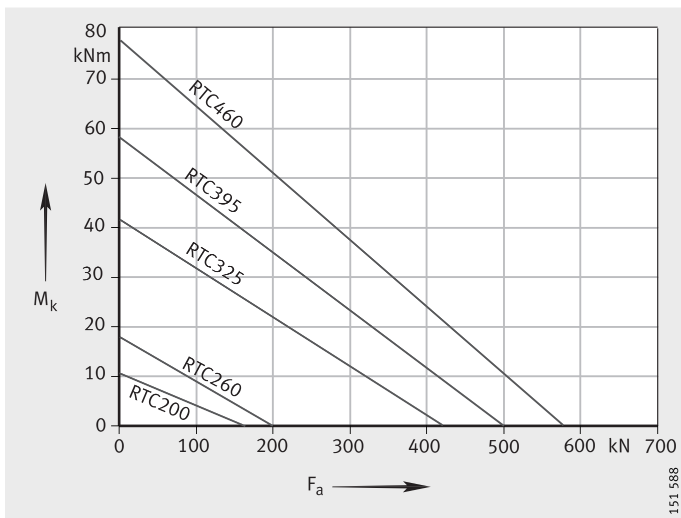
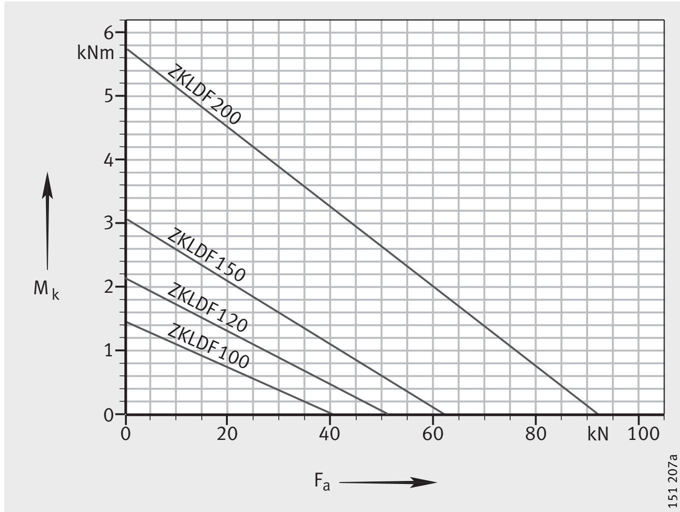


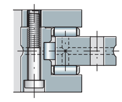
Figure 9
Static limiting load diagram – RTC200 to RTC460

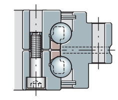
M_k = max. tilting moment
F_a = axial load

Figure 10

Static limiting load diagram – ZKLDF100 to ZKLDF200



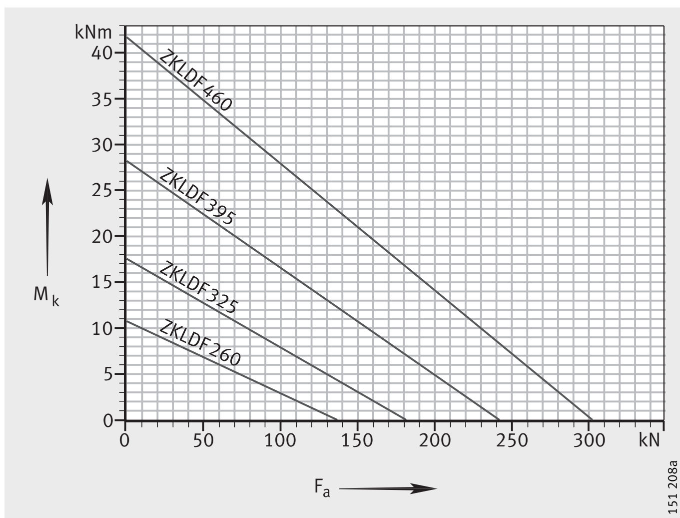




M_k = max. tilting moment
F_a = axial load

Figure 11

Static limiting load diagram – ZKLDF260 to ZKLDF460



Limiting speeds

The bearings allow the limiting speeds n_G given in the dimension tables. The operating temperatures occurring are heavily dependent on the environmental conditions. Calculation is possible by means of a thermal balance analysis based on frictional torque data.

Caution! If the environmental conditions differ from the specifications in relation to, for example, adjacent construction tolerances, lubrication, ambient temperature/heat dissipation or from operating conditions normal for machine tools, checking must be carried out again. Please contact INA/FAG in this case.

Bearing preload

Once the bearings have been fitted and fully screw mounted, they are radially and axially clearance-free and preloaded.

Temperature differences

Temperature differences between the shaft and housing influence the radial bearing preload and thus the operating behaviour of the bearing arrangement.

If the shaft temperature is higher than the housing temperature, the radial preload will increase proportionally, so there will be an increase in the rolling element load, bearing friction and bearing temperature.

If the shaft temperature is lower than the housing temperature, the radial preload will decrease proportionally, so the rigidity will decrease to bearing clearance and wear will increase.

Frictional torque

The bearing frictional torque M_{RL} is influenced primarily by the viscosity and quantity of the lubricant and the bearing preload.

The lubricant viscosity and quantity are dependent on the lubricant grade and operating temperature.

The bearing preload is dependent on the the mounting fits, the geometrical accuracy of the adjacent parts, the temperature difference between the inner and outer ring, the screw tightening torque and mounting situation (bearing inner ring axially supported on one or both sides).

The frictional torques M_{RL} in the dimension tables are statistically determined guide values for bearings with grease lubrication (measurement speed $n_{const} = 5\ min^{-1}$). *Figure 12* shows measured frictional torques for mounting with an unsupported L-section ring for YRT_{Speed}.

Caution! Deviations from the tightening torque of the fixing screws will have a detrimental effect on the preload and the frictional torque.

M_{RL} = frictional torque
n = speed

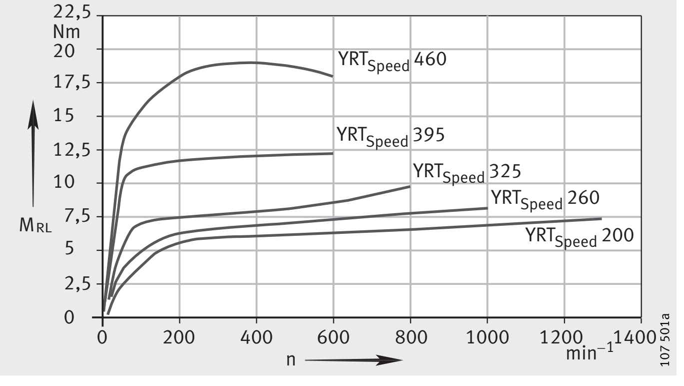


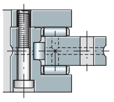
Figure 12
Frictional torques as guide values for YRT_{Speed} – statistically determined values from series of measurements

Frictional energy and dimensioning of the drive

Caution!

For YRT and RTC bearings, it must be taken into consideration that the frictional torque can increase by a factor of between 2 and 2,5 with increasing speed.

For ZKLDF bearings, it must be taken into consideration that the starting frictional torque can be 1,5 times as high as the values M_{RL} in the dimension tables.



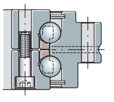
Lubrication

Axial/radial bearings YRT, RTC and YRT_{Speed} can be relubricated via the L-section ring and outer ring.

Axial angular contact ball bearings ZKLDF can be relubricated via the outer ring.

The initial greasing is compatible with lubricating oils having a mineral oil base.

For calculation of the relubrication quantities and intervals based on a stated load spectrum (speed, load, operating duration) and the environmental conditions, please contact INA/FAG.



Overlubrication

If the bearing is inadvertently overlubricated, the bearing frictional torque and temperature will increase.

In order to achieve the original frictional torque again, the running-in cycle in accordance with *Figure 13* should be carried out.

n_G = limiting speed
t = time
h = hours

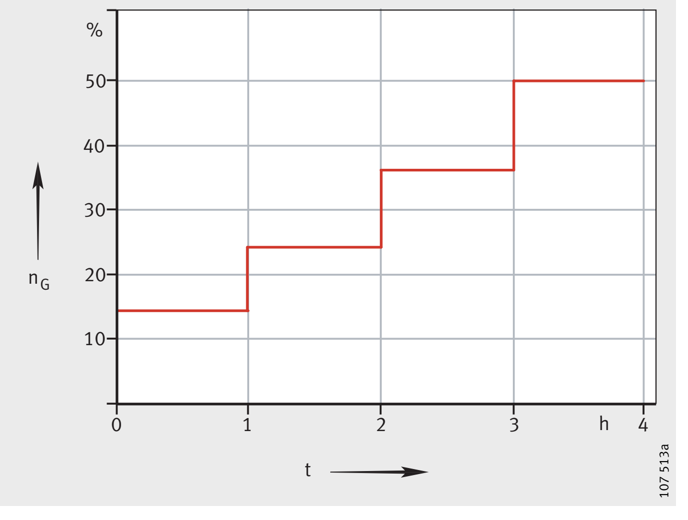


Figure 13
Running-in cycle after overlubrication

Grease Application Group GA08

Desig-nation	Classi-fication	Type of grease	Operating temperature range °C	NLGI class	Speed parameter $n \cdot d_M$ $min^{-1} \cdot mm$	ISO VG class (base oil)[1]
GA08	Grease for line contact	Lithium complex soap, mineral oil	–30 to +140	2 to 3	500 000	150 to 320

[1] Dependent on bearing type.

Design of adjacent construction

YRT, RTC, YRT_{Speed} and ZKLDF have the same mounting dimensions.

Caution!

Geometrical defects in the screw mounting surfaces and fits will influence the running accuracy, preload and running characteristics of the bearing arrangement. The accuracy of the adjacent surfaces must therefore be matched to the overall accuracy requirement of the subassembly.

The adjacent construction should be produced in accordance with *Figure 14* and the tolerances in the tables on page 18 and page 19 should be adhered to. Any deviations will influence the bearing frictional torque, running accuracy and running characteristics.

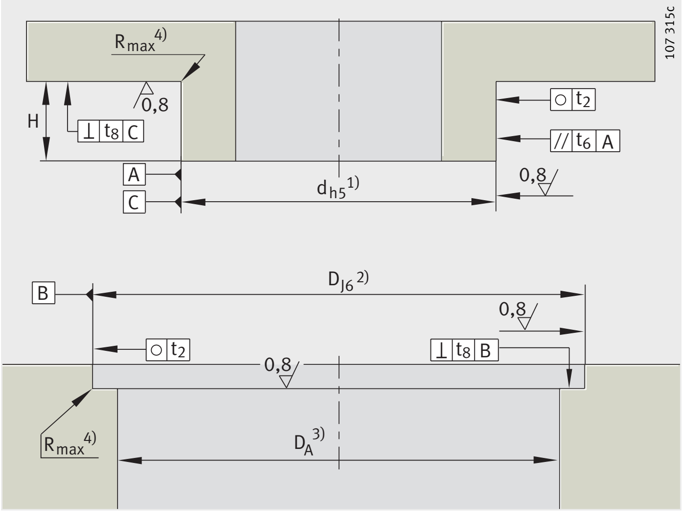


Figure 14
Requirements for the adjacent construction – YRT, RTC, YRT_{Speed}, ZKLDF

Legend to *Figure 14*

1) Support over whole bearing height.
It must be ensured that the means of support has adequate rigidity.

2) A precise fit is only necessary if radial support due to the load or a precise bearing position is required.

3) Note the bearing diameter D_1 according to the dimension tables.
Ensure that there is sufficient distance between the rotating bearing rings and the adjacent construction.

4) For values, see the tables on maximum corner radii of fit surfaces, page 19.

Fits

The selection of fits leads to transition fits, i.e. depending on the actual dimensional position of the bearing diameter and the mounting dimensions, clearance fits or interference fits can arise.

Caution!

The fit influences, for example, the running accuracy of the bearing and its dynamic characteristics.

An excessively tight fit will increase the radial bearing preload. This means that:

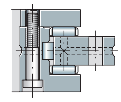
- there will be an increase in bearing friction and heat generation in the bearing as well as the loading on the raceway system and wear
- there will be a reduction in the achievable speed and the bearing operating life.

In order to achieve a very high running accuracy, the fit clearance should be as close as possible to zero.

For easier matching of the adjacent construction to the actual bearing dimensions, each bearing of series RTC and YRT$_{Speed}$ is supplied with a measurement record (this is supplied by agreement for other series).

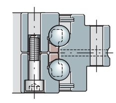
Recommended fits for shafts

The shaft should be produced to tolerance zone h5 and for series YRT$_{Speed}$ to the table, page 19.



If there are special requirements, the fit clearance must be further restricted within tolerance zone h5:

- Running accuracy:
  For maximum running accuracy and a rotating bearing inner ring, the fit clearance should be as close as possible to zero.
  The fit clearance may otherwise increase the bearing runout.
  With normal requirements for running accuracy or a stationary bearing inner ring, the shaft should be produced to h5.
- Dynamic characteristics:
  - For swivel type operation ($n \times d < 35\,000$, operating duration ED $<$ 10%) the shaft should be produced to h5.
  - For higher speeds and longer operating durations, the fit oversize should not exceed 0,01 mm. For series YRT$_{Speed}$, the fit oversize should not exceed 0,005 mm.



For series ZKLDF, the fit dimension should be based on the inner ring with the smallest bore dimension.

Recommended fits for housings

The housing should be designed to tolerance zone J6, for series YRT$_{Speed}$ to the table Recommended fits, page 19.

If there are special requirements, the fit clearance must be further restricted within tolerance zone J6:

- Running accuracy:
  For maximum running accuracy and a rotating bearing outer ring, the fit clearance should be as close as possible to zero.
  With a static bearing outer ring, a clearance fit or a design without radial centring should be selected.
- Dynamic characteristics
  - For predominantly swivel type operation ($n \times d < 35\,000$, operating duration ED $<$ 10%) and a rotating bearing outer ring, the housing fit should be produced to tolerance zone J6.
  - For higher speed and operating duration, the bearing outer ring should not be radially centred or the housing fit should be produced as a clearance fit with at least 0,02 mm clearance. This reduces the increase in preload when heat is generated in the bearing position.

Fit selection depending on the screw connection of the bearing rings

If the bearing outer ring is screw mounted on the static component, a fit seating is not required or a fit seating in accordance with the table Recommended fits for adjacent construction, page 19, can be used. If the values in the table are used, this will give a transition fit with a tendency towards clearance fit. This generally allows easy fitting.

If the bearing inner ring is screw mounted on the static component, it should nevertheless for functional reasons be supported by the shaft over the whole bearing height. The shaft dimensions should then be selected in accordance with the tables on page 18 and page 19. If these values in the table are used, this will give a transition fit with a tendency towards clearance fit.

Axial/radial bearings
Axial angular contact ball bearings

Geometrical and positional accuracy of the adjacent construction

The values given in the following tables for geometrical and positional accuracy of the adjacent construction have proved effective in practice and are adequate for the majority of applications.

Caution!

The geometrical tolerances influence the axial and radial runout accuracy of the subassembly as well as the bearing frictional torque and the running characteristics.

Geometrical and positional accuracy for shafts – YRT, RTC, ZKLDF

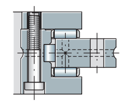
Nominal shaft diameter d mm		Deviation d for tolerance zone h5 µm		Roundness Parallelism Perpendicularity t_2, t_6, t_8 µm
over	incl.			
50	80	0	−13	3
80	120	0	−15	4
120	150	0	−18	5
150	180	0	−18	5
180	250	0	−20	7
250	315	0	−23	8
315	400	0	−25	9
400	500	0	−27	10
500	630	0	−28	11
630	800	0	−32	12
800	1 000	0	−36	14

Geometrical and positional accuracy for housings – YRT, RTC, ZKLDF

Nominal housing bore diameter D mm		Deviation D for tolerance zone J6 µm		Roundness Perpendicularity t_2, t_8 µm
over	incl.			
120	150	+18	−7	5
150	180	+18	−7	5
180	250	+22	−7	7
250	315	+25	−7	8
315	400	+29	−7	9
400	500	+33	−7	10
500	630	+34	−10	11
630	800	+38	−12	12
800	1 000	+44	−12	14
1 000	1 250	+52	−14	16

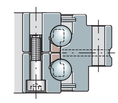
Recommended fits for shaft and housing – YRT_{Speed}

Axial/radial bearing	Shaft diameter d	Housing bore D
YRT_{Speed}200	$200^{-0,01}_{-0,024}$	$300^{+0,011}_{-0,005}$
YRT_{Speed}260	$260^{-0,013}_{-0,029}$	$385^{+0,013}_{-0,005}$
YRT_{Speed}325	$325^{-0,018}_{-0,036}$	$450^{+0,015}_{-0,005}$
YRT_{Speed}395	$395^{-0,018}_{-0,036}$	$525^{+0,017}_{-0,005}$
YRT_{Speed}460	$460^{-0,018}_{-0,038}$	$600^{+0,017}_{-0,005}$



Geometrical and positional accuracy for shafts – YRT_{Speed}

Axial/radial bearing	Roundness t_2 μm	Parallelism t_6 μm	Perpendicularity t_8 μm
YRT_{Speed}200	6	5	5
YRT_{Speed}260 to YRT_{Speed}460	8	5	7



Geometrical and positional accuracy for housings – YRT_{Speed}

Axial/radial bearing	Roundness t_2 μm	Perpendicularity t_8 μm
YRT_{Speed}200 to YRT_{Speed}460	6	8

Maximum corner radii of fit surfaces – YRT, RTC, YRT_{Speed}, ZKLDF

Bore diameter d	Max. corner radius R_{max} mm
50 incl. 150	0,1
over 150 incl. 460	0,3
over 460 incl. 950	1

Mounting dimensions H_1, H_2

Caution!

If a height fluctuation as small as possible is required, the H_1 dimensional tolerance according to the table Dimensional tolerance, mounting dimensions, axial and radial runout, page 22, page 23 and *Figure 15*, must be observed.

The mounting dimension H_2 defines the position of any worm wheel used, *Figure 15*.

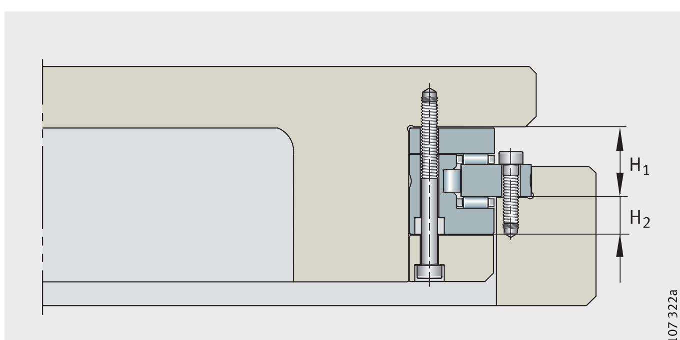


Figure 15
Mounting dimension H_1, H_2

L-section ring without support ring/ with support ring

The L-section ring of bearings YRT and RTC can be fitted unsupported or supported over its whole surface, *Figure 16*. The support ring (e.g. a worm wheel) must be ordered separately. If the L-section ring is supported, the tilting rigidity is higher.

Depending on the application, bearings with different preload adjustment are required in the case of series YRT and RTC in order to achieve the same preload forces in the axial bearing when fitted.

For series YRT_{Speed} and ZKLDF, there is only one preload adjustment. The increase in rigidity and frictional torque in YRT_{Speed} bearings is slight and can normally be ignored.

In bearings of series ZKLDF, the rigidity and frictional torque are not influenced by the support ring.

L-section ring without support ring

For the case L-section ring without support ring, the bearing designation is:

- YRT <bore diameter> or
  RTC <bore diameter>.

L-section ring with support ring

For the case L-section ring with support ring, the bearing designation is:

- YRT <bore diameter> **VSP**
- RTC <bore diameter> **EB**.

For RTC with additionally restricted axial and radial runout, the bearing designation is:

- RTC <bore diameter> **T52EA**.

Caution!

For bearing arrangements with a supported L-section ring, only bearings with the suffix VSP, EB or T52EA should be ordered.

If the normal design is mounted with a supported L-section ring, there will be a considerable increase in the bearing frictional torque.

YRT
RTC

YRT..VSP
RTC..EB
RTC..TS2EA

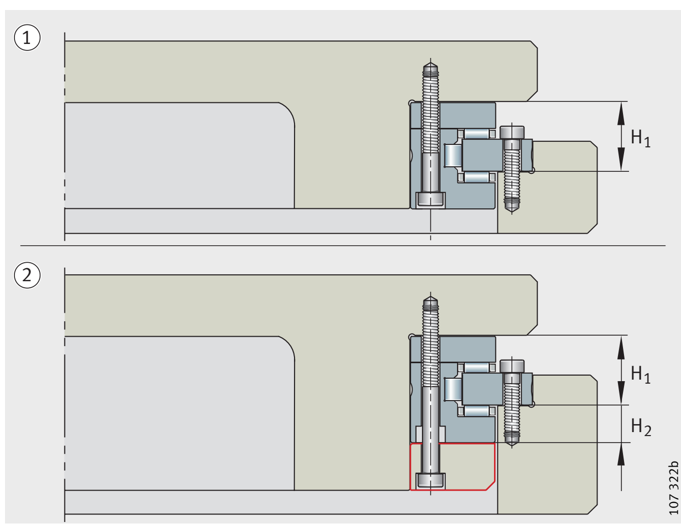
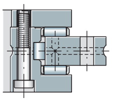


Figure 16
① Unsupported L-section ring,
② Supported L-section ring/
for YRT, RTC

Fitting Retaining screws secure the bearing components during transport. For easier centring of the bearing, the screws should be loosened before fitting and either secured again or removed after fitting.

Tighten the fixing screws in crosswise sequence using a torque wrench in three stages to the specified tightening torque M_A, rotating the bearing ZKLDF, *Figure 17*:

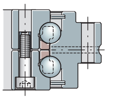


- Stage 1 40% of M_A
- Stage 2 70% of M_A
- Stage 3 100% of M_A.

Note the grade of the fixing screws.

Caution! Assembly forces must only be applied to the bearing ring to be fitted, never through the rolling elements.

Bearing components must not be separated or interchanged during fitting and dismantling.



If the bearing is unusually difficult to move, loosen the fixing screws and tighten them again in stages in a crosswise sequence. This will eliminate any distortion.

Bearings should only be fitted in accordance with TPI 103, Fitting and Maintenance Manual.

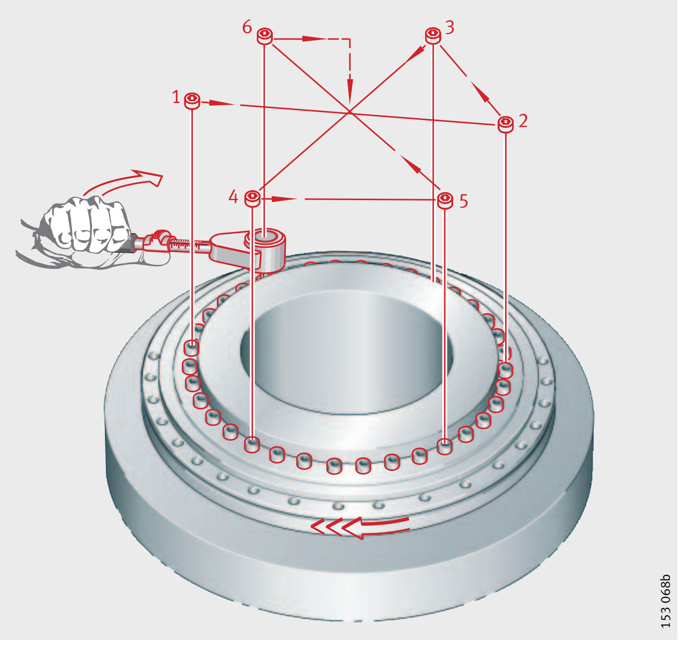


Figure 17
Tightening of fixing screws

Accuracy

The dimensional tolerances are derived from tolerance class P5.

The geometrical tolerances correspond to P4 in accordance with DIN 620, see table Dimensional tolerances, mounting dimensions, axial and radial runout.

The axial and radial runout accuracy is influenced by:

- the running accuracy of the bearing
- the geometrical accuracy of the adjacent surfaces
- the fit between the rotating bearing ring and adjacent component.

Caution! In order to achieve a very high running accuracy, the fit clearance should be as close as possible to zero.

The bearing bore of series YRT, RTC and YRT_{Speed} may be slightly conical when delivered. This is typical of the bearing design and is a result of the radial bearing preload forces. The bearing will regain its ideal geometry when fitted.

Dimensional tolerances, mounting dimensions, axial and radial runout – YRT, ZKLDF

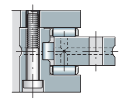
Dimensional tolerances				Mounting dimension					Axial and radial runout[1]	
Bore		Outside diameter				Restricted[2]		Restricted[2]	Normal	Restricted[2]
d	Δ_{ds}	D	Δ_{Ds}	H_1	Δ_{H1s} ±	Δ_{H1s} ±	H_2	Δ_{H2s} ±		
mm	mm	mm	mm	mm	mm	mm	mm	mm	µm	µm
50	−0,008	126	−0,011	20	0,125	0,025	10	0,02	2	1
80	−0,009	146	−0,011	23,35	0,15	0,025	11,7	0,02	3	1,5
100	−0,01	185	−0,015	25	0,175	0,025	13	0,02	3	1,5
120	−0,01	210	−0,015	26	0,175	0,025	14	0,02	3	1,5
150	−0,013	240	−0,015	26	0,175	0,03	14	0,02	3	1,5
180	−0,013	280	−0,018	29	0,175	0,03	14	0,025	4	2
200	−0,015	300	−0,018	30	0,175	0,03	15	0,025	4	2
260	−0,018	385	−0,02	36,5	0,2	0,04	18,5	0,025	6	3
325	−0,023	450	−0,023	40	0,2	0,05	20	0,025	6	3
395	−0,023	525	−0,028	42,5	0,2	0,05	22,5	0,025	6	3
460	−0,023	600	−0,028	46	0,225	0,06	24	0,03	6	3
580	−0,025	750	−0,035	60	0,25	0,075	30	0,03	10	5[3]
650	−0,038	870	−0,05	78	0,25	0,1	44	0,03	10	5[3]
850	−0,05	1095	−0,063	80,5	0,3	0,12	43,5	0,03	12	6[3]
950	−0,05	1200	−0,063	86	0,3	0,12	46	0,03	12	6[3]

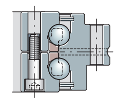
[1] For rotating inner and outer ring, measured on fitted bearing, with ideal adjacent construction.

[2] Special design, YRT only.

[3] By agreement only for rotating outer ring.

Dimensional tolerances, mounting dimensions, axial and radial runout – RTC





Dimensional tolerances						Mounting dimension		Axial and radial runout[1)]	
Bore		Outside diameter		Bearing height				Nor-mal	Res-tricted
d	Δ_{ds}	D	Δ_{Ds}	H	Δ_{Hs}	H_1	Δ_{H1s} ±		
mm	mm	mm	mm	mm	mm	mm	mm	µm	µm
80	−0,009	146	−0,011	35	+0,025 −0,15	23,35	0,25	3	1,5
100	−0,01	185	−0,015	38	+0,025 −0,15	25	0,25	3	1,5
120	−0,01	210	−0,015	40	+0,03 −0,175	26	0,25	3	1,5
150	−0,013	240	−0,015	40	+0,03 −0,175	26	0,3	3	1,5
180	−0,013	280	−0,018	43	+0,03 −0,175	29	0,3	4	2
200	−0,015	300	−0,018	45	+0,03 −0,2	30	0,3	4	2
260	−0,018	385	−0,020	55	+0,04 −0,25	36	0,4	5	3
325	−0,023	450	−0,023	60	+0,05 −0,3	40	0,5	5	3
395	−0,023	525	−0,028	65	+0,05 −0,3	42,5	0,5	5	3
460	−0,027	600	−0,028	70	+0,06 −0,35	46	0,6	6	3

1) For rotating inner and outer ring, measured on fitted bearing, with ideal adjacent construction.

Dimensional tolerances, mounting dimensions, axial and radial runout – YRT_{Speed}

Dimensional tolerances				Mounting dimension			Axial and radial runout[1)]
Bore		Outside diameter					
d	Δ_{ds}	D	Δ_{Ds}	H_1	Δ_{H1s}	H_2	
mm	mm	mm	mm	mm	mm	mm	µm
200	–0,015	300	–0,018	30	+0,04 −0,06	15	4
260	–0,018	385	–0,02	36,5	+0,05 −0,07	18,5	6
325	–0,023	450	–0,023	40	+0,06 −0,07	20	6
395	–0,023	525	–0,028	42,5	+0,06 −0,07	22,5	6
460	–0,023	600	–0,028	46	+0,07 −0,08	24	6

1) For rotating inner and outer ring, measured on fitted bearing, with ideal adjacent construction.

Special designs

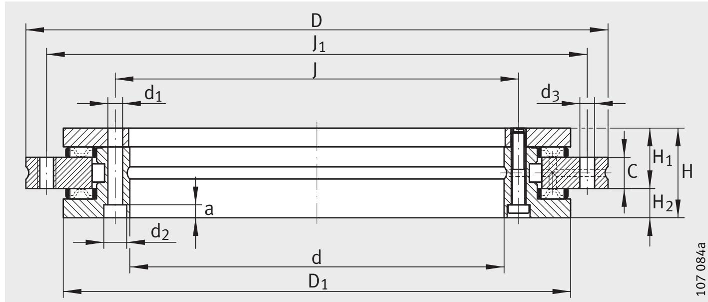
The following are available by agreement:
For YRT, axial and radial runout tolerances reduced by 50%.
Additional text: axial/radial runout 50%.

For RTC, axial runout tolerance reduced by 50%.
Additional text: axial runout 50%.

For YRT, closer tolerance on mounting dimensions H_1 and H_2.
Additional text: H_1 with tolerance ± ..., H_2 with tolerance ± ...
For restricted tolerance value, see table, page 22.

Axial/ radial bearings

Double direction



YRT

Dimension table · Dimensions in mm

Designation	Mass	Dimensions									Fixing holes					
											inner ring				outer ring	
	≈kg	d	D	H	H_1	H_2	C	D_1 max.	J	J_1	d_1	d_2	a	Quantity[4]	d_3	Quantity[4]
YRT50	1,6	**50**	126	30	20	10	10	105	63	116	5,6	–	–	10	5,6	12
YRT80-TN[5]	2,4	**80**	146	35	23,35	11,65	12	130	92	138	5,6	10	4	10	4,6	12
YRT100[5]	4,1	**100**	185	38	25	13	12	160	112	170	5,6	10	5,4	16	5,6	15
YRT120	5,3	**120**	210	40	26	14	12	184	135	195	7	11	6,2	22	7	21
YRT150	6,2	**150**	240	40	26	14	12	214	165	225	7	11	6,2	34	7	33
YRT180	7,7	**180**	280	43	29	14	15	244	194	260	7	11	6,2	46	7	45
YRT200	9,7	**200**	300	45	30	15	15	274	215	285	7	11	6,2	46	7	45
YRT260	18,3	**260**	385	55	36,5	18,5	18	345	280	365	9,3	15	8,2	34	9,3	33
YRT325[5]	25	**325**	450	60	40	20	20	415	342	430	9,3	15	8,2	34	9,3	33
YRT395	33	**395**	525	65	42,5	22,5	20	486	415	505	9,3	15	8,2	46	9,3	45
YRT460	45	**460**	600	70	46	24	22	560	482	580	9,3	15	8,2	46	9,3	45
YRT580	89	**580**	750	90	60	30	30	700	610	720	11,4	18	11	46	11,4	42
YRT650	170	**650**	870	122	78	44	34	800	680	830	14	20	13	46	14	42
YRT850	253	**850**	1095	124	80,5	43,5	37	1018	890	1055	18	26	17	58	18	54
YRT950[7]	312	950	1200	132	86	46	40	1130	990	1160	18	26	17	58	18	54
YRT1030	375	**1030**	1300	145	92,5	–	40	1215	1075	1255	18	26	17	60	18	66

1) Including retaining screws and threaded extraction holes.

2) Tightening torque for screws to DIN 912, grade 10.9.

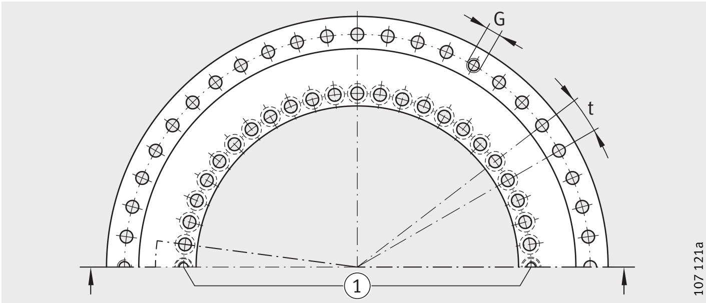
3) Rigidity values taking account of the rolling element set, deformation of the bearing rings and the screw connections.

4) Caution!
For fixing holes in the adjacent construction.
Pay attention to the pitch of the bearing holes.

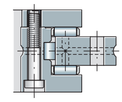
5) Screw counterbores in the L-section ring open to the bearing bore, see figure, page 25. Bearing inside diameter is unsupported in this area ②.

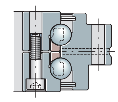
6) For high operating durations or continuous operation, please contact us.

7) Available only by agreement.

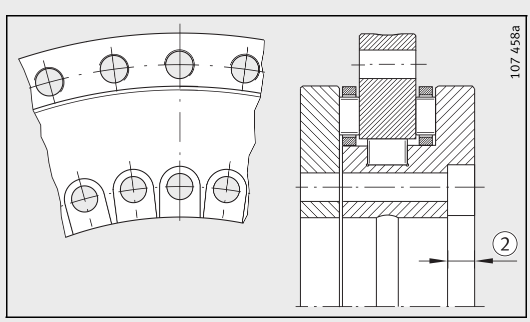


Hole pattern
① Retaining screws





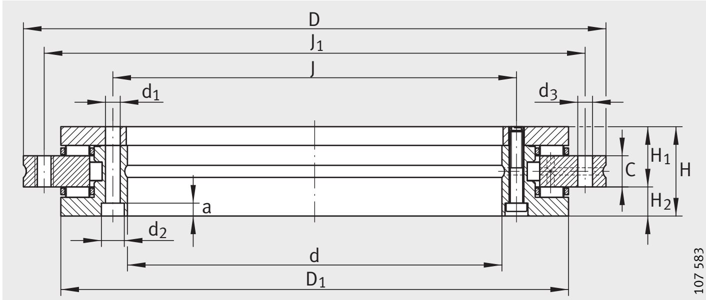
Pitch t[1] Quantity Xt	Retaining screws Quantity	Threaded extraction holes G	Threaded extraction holes Quantity	Screw tightening torque M_A[2] Nm	Basic load ratings axial dyn. C kN	axial stat. C_0 kN	radial dyn. C kN	radial stat. C_0 kN	Limiting speed[6] n_G min^{-1}	Bearing frictional torque M_{RL} Nm	Axial rigidity[3] c_{aL} kN/μm	Radial rigidity[3] c_{rL} kN/μm	Tilting rigidity[3] c_{kL} kNm/mrad
12X30°	2	–	–	8,5	56	280	28,5	49,5	440	2,5	1,3	1,1	1,25
12X30°	2	–	–	8,5/4,5	38	158	44	98	350	3	1,6	1,8	2,5
18X20°	2	M5	3	8,5	73	370	52	108	280	3	2	2	5
24X15°	2	M8	3	14	80	445	70	148	230	7	2,1	2,2	7
36X10°	2	M8	3	14	85	510	77	179	210	13	2,3	2,6	11
48X 7,5°	2	M8	3	14	92	580	83	209	190	14	2,6	3	17
48X 7,5°	2	M8	3	14	98	650	89	236	170	15	3	3,5	23
36X10°	2	M12	3	34	109	810	102	310	130	25	3,5	4,5	45
36X10°	2	M12	3	34	186	1 710	134	415	110	48	4,3	5	80
48X 7,5°	2	M12	3	34	202	2 010	133	435	90	55	4,9	6	130
48X 7,5°	2	M12	3	34	217	2 300	187	650	80	70	5,7	7	200
48X 7,5°	2	M12	6	68	390	3 600	211	820	60	140	6,9	9	380
48X 7,5°	2	M12	6	116	495	5 200	415	1 500	55	200	7,6	10	550
60X 6°	2	M12	6	284	560	6 600	475	1 970	40	300	9,3	13	1 100
60X 6°	2	M12	6	284	1 040	10 300	600	2 450	40	600	10,4	14	1 500
72X 5°	12	M16	6	284	1 080	11 000	620	2 650	35	800	11,2	16	1 900



Screw counterbore open
Bearing inside diameter unsupported in area ②

Axial/ radial bearings

Double direction



RTC

Dimension table · Dimensions in mm

Designation	Mass	Dimensions								Fixing holes					
										inner ring				outer ring	
		d	D	H	H_1	C	D_1	J	J_1	d_1	d_2	a	Quan-tity[4]	d_3	Quan-tity[4]
	≈kg						max.								
RTC80[5]	2	**80**	146	35	23,35	12	130	92	138	5,6	10	5,7	12	4,6	12
RTC100[5]	4	**100**	185	38	25	12	160	112	170	5,6	10	5,7	15	5,6	18
RTC120	5	**120**	210	40	26	12	184	135	195	7	11	7	21	7	24
RTC150	5,8	**150**	240	40	26	12	212	165	225	7	11	7	33	7	36
RTC180	8	**180**	280	43	29	15	242	194	260	7	11	7	45	7	48
RTC200	9,3	**200**	300	45	30	15	272	215	285	7	11	7	45	4	48
RTC260	18	**260**	385	55	36,5	18	343	280	365	9,3	15	9,3	33	9,3	36
RTC325[5]	25	**325**	450	60	40	20	413	342	430	9,3	15	9,3	33	9,3	36
RTC395	33	**395**	525	65	42,5	20	484	415	505	9,3	15	9,3	45	9,3	48
RTC460	48	**460**	600	70	46	22	558	482	580	9,3	15	9,3	45	9,3	48

1) Including retaining screws and threaded extraction holes.

2) Tightening torque for screws to DIN 912, grade 10.9.

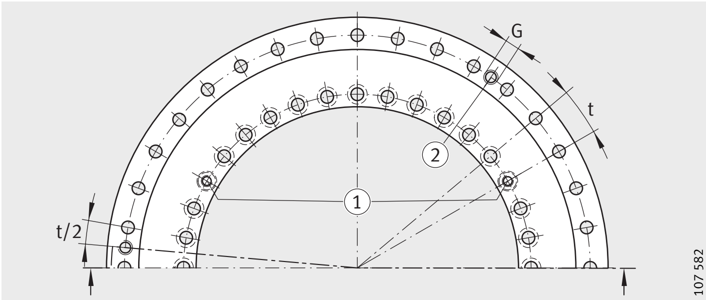
3) Rigidity values taking account of the rolling element set, deformation of the bearing rings and the screw connections.

4) Caution! For fixing holes in the adjacent construction. Note the pitch of the bearing holes.

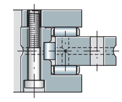
5) Screw counterbores in the L-section ring open to the bearing bore, see figure, page 27. Bearing inside diameter is unsupported in this area ③.

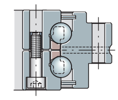
6) For high operating durations or continuous operation, please contact us.

7) Sizes > 1 030 mm available by agreement.

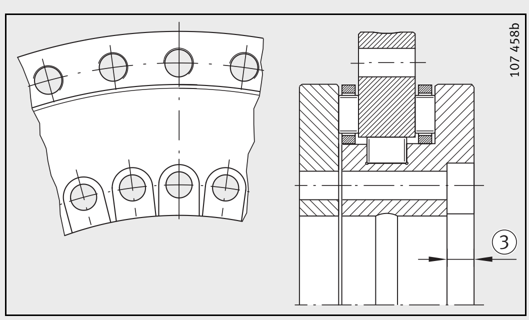


Hole pattern
① Retaining screws 3X120°
② Threaded extraction holes





Pitch t[1] QuantityXt	Retaining screws Quantity	Threaded extraction holes G	Threaded extraction holes Quantity	Screw tightening torque M_A[2]	Basic load ratings axial dyn. C	axial stat. C_0	radial dyn. C	radial stat. C_0	Limiting speed[6] n_G	Bearing frictional torque M_{RL}	Axial rigidity[3] c_{aL}	Radial rigidity[3] c_{rL}	Tilting rigidity[3] c_{kL}
				Nm	kN	kN	kN	kN	min^{-1}	Nm	kN/μm	kN/μm	kNm/mrad
12X30°	3	–	–	8,5	56	255	42,5	100	530	1	0,71	1,8	1,6
18X20°	3	M5	3	8,5	76,5	415	47,5	120	430	4	1,2	2	5
24X15°	3	M6	3	14	102	540	52	143	340	5	1,3	2,2	7
36X10°	3	M6	3	14	112	630	56	170	320	7	1,5	2,6	11
48X 7,5°	3	M6	3	14	118	710	69,5	200	280	9	1,7	3	17
48X 7,5°	3	M6	3	14	120	765	81,5	220	260	11	1,8	3,5	23
36X10°	3	M8	3	34	160	1 060	93	290	200	16	2,1	4,5	45
36X10°	3	M8	3	34	275	1 930	120	345	170	27	2,8	5	80
48X 7,5°	3	M8	3	34	300	2 280	186	655	140	42	3,4	6	130
48X 7,5°	3	M8	3	34	355	2 800	200	765	120	55	3,9	7	200



Screw counterbore open
Bearing inside diameter unsupported in area ③

Axial/ radial bearings

Double direction

YRT$_{\text{Speed}}$

Dimension table · Dimensions in mm

Designation	Mass	Dimensions									Fixing holes						Retaining screws
		d	D	H	H_1	H_2	C	D_1	J	J_1	inner ring				outer ring		Quantity
	≈kg										d_1	d_2	a	Quantity[3]	d_3	Quantity[3]	
YRTS200	9,7	**200**$_{-0,015}$	300$_{-0,018}$	45	30	15	15	274	215	285	7	11	6,2	46	7	45	2
YRTS260	18,3	**260**$_{-0,018}$	385$_{-0,02}$	55	36,5	18,5	18	345	280	365	9,3	15	8,2	34	9,3	33	2
YRTS325[5]	25	**325**$_{-0,023}$	450$_{-0,023}$	60	40	20	20	415	342	430	9,3	15	8,2	34	9,3	33	2
YRTS395	33	**395**$_{-0,023}$	525$_{-0,028}$	65	42,5	22,5	20	486	415	505	9,3	15	8,2	46	9,3	45	2
YRTS460	45	**460**$_{-0,023}$	600$_{-0,023}$	70	46	24	22	560	482	580	9,3	15	8,2	46	9,3	45	2

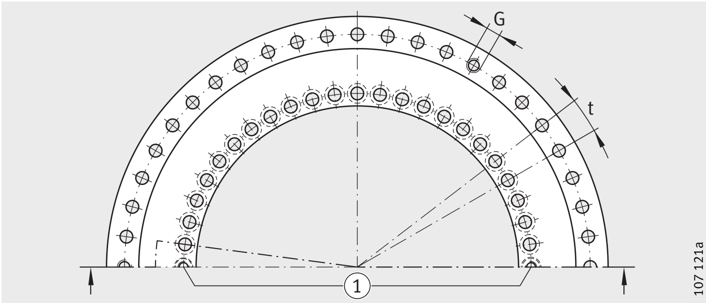
1) Including retaining screws and threaded extraction holes.

2) For screws to DIN 912, grade 10.9.

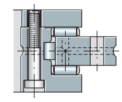
3) Caution!
For fixing holes in the adjacent construction.
Note the pitch of the bearing holes.

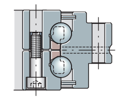
4) Rigidity values taking account of the rolling element set, deformation of the bearing rings and the screw connections.

5) Screw counterbores in the L-section ring open to the bearing bore, see figure, page 29.
Bearing inside diameter is unsupported in this area ②.

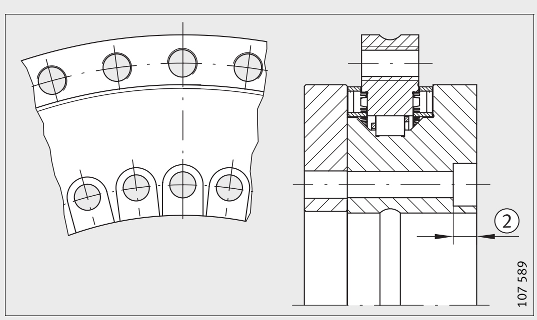


Hole pattern
① Retaining screws





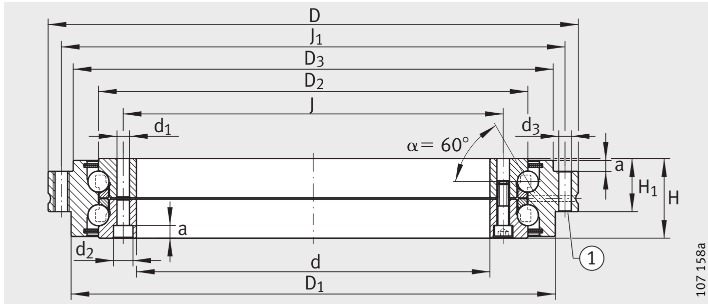
Pitch $t^{1)}$	Threaded extraction holes		Screw tightening torque	Basic load ratings				Limiting speed	Axial rigidity$^{4)}$	Radial rigidity$^{4)}$	Tilting rigidity$^{4)}$	Mass moment of inertia for rotating	
QuantityXt	G	Quantity		axial		radial						inner ring IR	outer ring AU
			$M_A{}^{2)}$	dyn. C	stat. C_0	dyn. C	stat. C_0	n_G	c_{aL}	c_{rL}	c_{kL}	M_M	
			Nm	kN	kN	kN	kN	min^{-1}	kN/μm	kN/μm	kNm/mrad	kg · cm²	kg · cm²
48X 7,5°	M8	3	14	155	840	94	226	1 160	4	1,2	29	667	435
36X10°	M12	3	34	173	1 050	110	305	910	5,4	1,6	67	2 074	1 422
36X10°	M12	3	34	191	1 260	109	320	760	6,6	1,8	115	4 506	2 489
48X 7,5°	M12	3	34	214	1 540	121	390	650	7,8	2	195	8 352	4 254
48X 7,5°	M12	3	34	221	1 690	168	570	560	8,9	1,8	280	15 738	7 379



Screw counterbore open
Bearing inside diameter unsupported in area ②

Axial angular contact ball bearings

Double direction



ZKLDF
① Contact surface/centring diameter

Dimension table · Dimensions in mm

Designation	Mass	Dimensions										inner ring			
		d	D	H	H_1	D_1	D_2	D_3	J	J_1	a	Fixing holes			Retaining screws
	≈kg											d_1	d_2	Quantity[4]	Quantity
ZKLDF100[5]	4,5	**100**	185	38	25	160	136	158	112	170	5,4	5,6	10	16	2
ZKLDF120	6	**120**	210	40	26	184	159	181	135	195	6,2	7	11	22	2
ZKLDF150	7,5	**150**	240	40	26	214	188	211	165	225	6,2	7	11	34	2
ZKLDF200	11	**200**	300	45	30	274	243	271	215	285	6,2	7	11	46	2
ZKLDF260	22	**260**	385	55	36,5	345	313	348	280	365	8,2	9,3	15	34	2
ZKLDF325[5]	28	**325**	450	60	40	415	380	413	342	430	8,2	9,3	15	34	2
ZKLDF395	39	**395**	525	65	42,5	486	450	488	415	505	8,2	9,3	15	46	2
ZKLDF460[6]	50	**460**	600	70	46	560	520	563	482	580	8,2	9,3	15	46	2

1) Including retaining screws and threaded extraction holes.

2) Tightening torque for screws to DIN 912, grade 10.9.

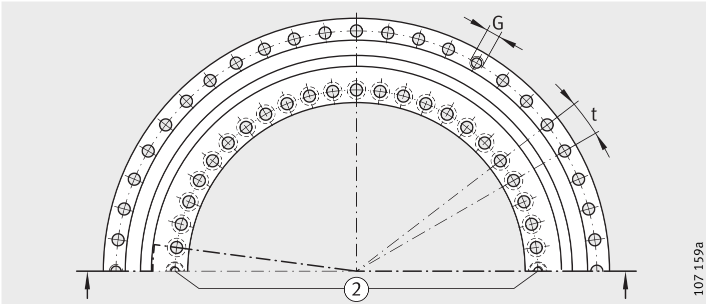
3) Rigidity values taking account of the rolling element set, deformation of the bearing rings and the screw connections.

4) Caution!
For fixing holes in the adjacent construction.
Note the pitch of the bearing holes.

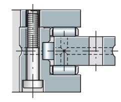
5) Screw counterbores in the L-section ring open to the bearing bore, see figure, page 31.
Bearing inside diameter is unsupported in this area ③.

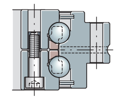
6) Sizes > d = 460 mm available by agreement.

7) Valid for adapted adjacent construction.

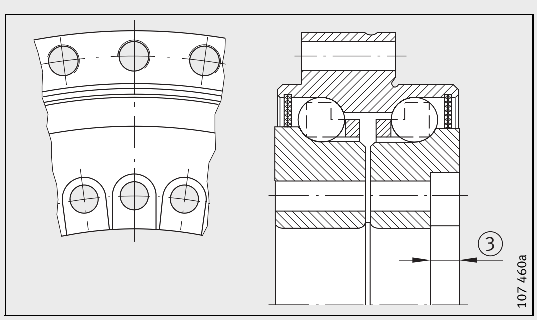


Hole pattern
② Retaining screws

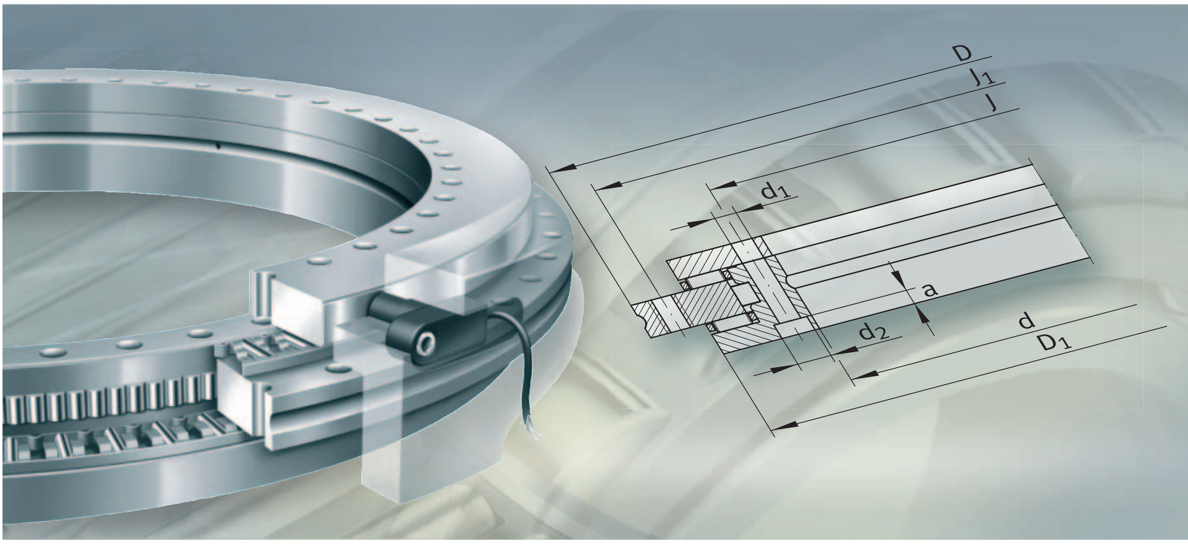




Outer ring				Pitch t[1]	Screw tightening torque	Basic load ratings		Limiting speed[7]	Bearing frictional torque	Axial rigidity[3]	Radial rigidity[3]	Tilting rigidity[3]
Fixing holes		Threaded extraction holes				axial						
d_3	Quantity[4]	G	Quantity	QuantityXt	M_A[2]	dyn. C	stat. C_0	n_G	M_{RL}	c_{aL}	c_{rL}	c_{kL}
					Nm	kN	kN	min^{-1}	Nm	kN/μm	kN/μm	kNm/mrad
5,6	15	M5	3	18X20°	8,5	71	265	2 800	1,6	1,2	0,35	3,6
7	21	M8	3	24X15°	14	76	315	2 400	2	1,5	0,4	5,5
7	33	M8	3	36X10°	14	81	380	2 000	3	1,7	0,5	7,8
7	45	M8	3	48X 7,5°	14	121	610	1 600	4,5	2,5	0,7	17,5
9,3	33	M12	3	36X10°	34	162	920	1 200	7,5	3,2	0,9	40
9,3	33	M12	3	36X10°	34	172	1 110	1 000	11	4	1	60
9,3	45	M12	3	48X 7,5°	34	241	1 580	800	16	4,5	1,3	100
9,3	45	M12	3	48X 7,5°	34	255	1 860	700	21	5,3	1,6	175

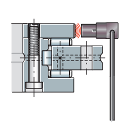


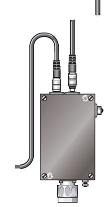
Screw counterbore open
Bearing inside diameter unsupported in area ③



Axial/radial bearings with integral measuring system

Axial/radial bearings with integral measuring system

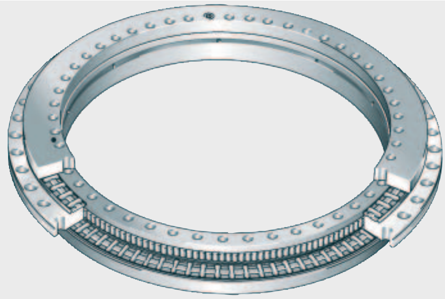




Product overview – Axial/radial bearings with integral measuring system

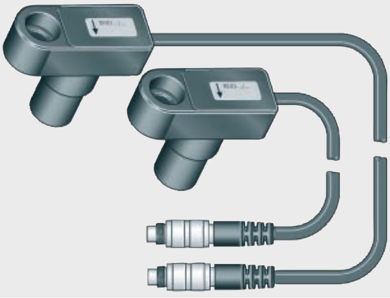
Axial/radial bearings
with magnetic dimensional scale

YRTM

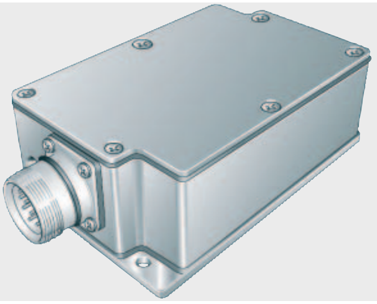


MEKO/U
electronic measuring system
Measuring heads

MEKO/U



Electronic evaluation system



Axial/radial bearings with integral measuring system

Features

Axial/radial bearings with integral measuring system comprise:

- an axial/radial bearing YRTM with a dimensional scale and a MEKO/U electronic measuring system. The electronic measuring system comprises two measuring heads, a set of shims and an electronic evaluation system.

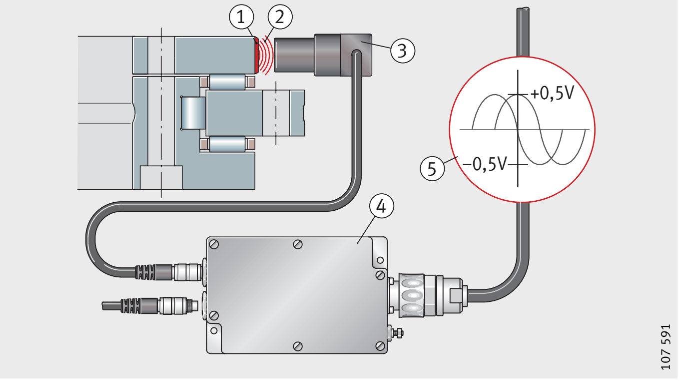
Bearings of series YRTM correspond in mechanical terms to axial bearings YRT but are additionally fitted with a magnetic dimensional scale. The measuring system can measure angles to an accuracy of a few angular seconds by non-contact, magneto-resistive means.

For the mechanical part of axial/radial bearings YRTM, please refer to the information on page 7 to page 23.

Advantages of the angular measuring system

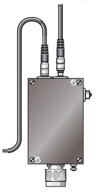
The measuring system, *Figure 1*:

- operates by non-contact means and is therefore not subject to wear
- carries out measurement irrespective of tilting and position
- has automatically self-adjusting electronics
- has a self-centring function
- is unaffected by lubricants
- is easy to fit, the measuring heads are easily adjustable, there is no need for alignment of the bearing and a separate measuring system
- requires no additional parts
  - the dimensional scale and measuring heads are integrated in the bearing and adjacent construction respectively
  - the resulting space saved can be used for the machining area of the machine
- does not give any problems relating to supply cables. The cables can be laid within the adjacent construction directly through the large bearing bore
- gives savings on design envelope size and costs due to the compact, integrated design requiring fewer components.



① Magnetic scale
② Magnetic field lines
③ Measuring head with magnetoresistive sensor
④ Electronic evaluation system
⑤ Analogue signals at output

Figure 1
Measurement principle



Axial/radial bearings with integral measuring system

Axial/radial bearings with integral measuring system

Dimensional scale

The dimensional scale is applied without seams or joins to the outside diameter of the shaft locating washer.
Magnetic poles are present as angle references on the magnetisable, electroplated coating at a spacing of 250 µm, *Figure 2*.

The angular position is measured incrementally, i.e by counting the individual increments. In order to ensure a fixed datum point for the angular position after the machine is switched on, an additional reference mark track is also required.

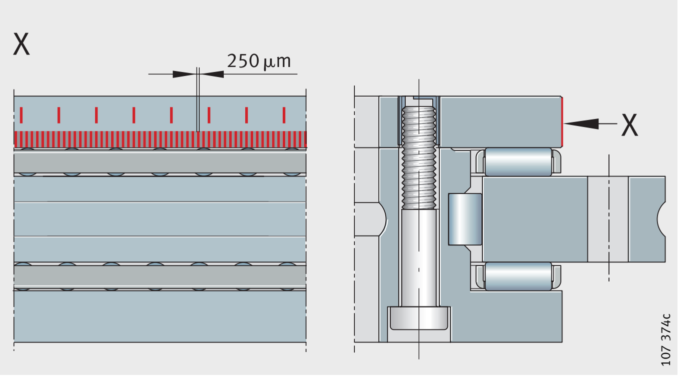


Figure 2
Dimensional scale

Reference marks

The system has pitch-coded reference marks in order to quickly create the absolute datum point. Reference marks with different defined spacings are applied every 15°, so that the absolute datum point is achieved by passing over two adjacent reference marks (maximum 30°).

MEKO/U electronic measuring system

Measuring heads with magneto-resistive sensors

The two measuring heads are designed for optimum use of space. They are fixed in a slot in the adjacent construction by means of a fixing screw.

The small magnetic fields are detected as a result of the magneto-resistive effect (MR effect). Compared with magnetic heads, the MR sensors allow static measurement of magnetic fields, i.e. electrical signals are derived without movement, in contrast to magnetic heads.

The resistance layer of the MR sensors is designed such that the resistance changes when a magnetic field is perpendicular to the current flow.

When the magnetic pitch moves past the MR sensor, two sine wave signals are generated at a 90° phase offset with a period length of 500 µm.

Electronic evaluation system

The electronic evaluation system operates with the aid of a digital signal processor (DSP).

The input signals are digitised by an analogue/digital converter. The high performance processor (DSP) automatically compares the sensor signals and calculates the effective angular value from the sensor signals by means of vector addition. Correction is carried out, for example, on the offset of the analogue signals.
A digital/analogue converter generates synthetic analogue signals as a 1 V_{SS} value.

The electronic evaluation system can be positioned at any location or within the adjacent construction. It is connected to the controller by means of a conventional 12-pin extension cable.

Cables up to 100 m long can be used for transmitting the voltage signals from the electronic evaluation system to the electronic post-processor.

Cable for signal transmission

Each measuring head is fitted with a 2 m, 2,5 m or 3 m cable and plug.

The cables for the measuring system components are made from polyurethane (PUR) and are resistant to oil, hydrolysis and microbes in accordance with VDO 0672.

The cables are suitable for fixed laying free from forces or torsion. A minimum bending radius $R \geqq 40$ mm must be observed.
For other requirements, please contact us.

Plug connectors

INA plug connectors are robust and designed for use in industrial environments. When connected, they conform to protection grade IP 65 (EN 60 529).

The large sheathed areas of the plugs ensure effective shielding.

Measurement accuracy

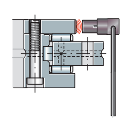
The more accurate the angular measurement, the more accurately a rotary axis can be positioned. The accuracy of angular measurement is essentially determined by:

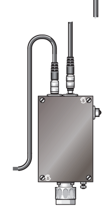
① the quality of the dimensional scale
② the quality of scanning
③ the quality of the electronic evaluation system
④ the eccentricity of the dimensional scale to the bearing raceway system
⑤ the runout deviation of the bearing arrangement
⑥ the elasticity of the measurement system shaft and its linkage to the shaft to be measured
⑦ the elasticity of the stator shaft and shaft coupling.

For the measuring system YRTM, only points ① to ③ are relevant.

The eccentricity in point ④ is completely eliminated by the diametrically opposed arrangement of the MR sensors.

Points ⑤ to ⑦ play only a very minor role in the INA/FAG measuring system.





Positional deviations

Positional deviations within a revolution are the absolute measurement errors over one revolution of the system (measured at +20 °C ambient temperature)

- YRTM150 ≦ ±6″
- YRTM180 ≦ ±5″
- YRTM200, YRTM260, YRTM325, YRTM395, YRTM460 ≦ ±3″.

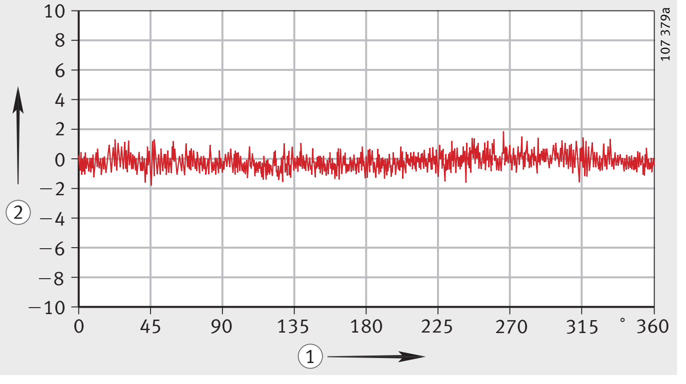
Since the dimensional scale is directly connected, i.e. without any compensation elements, with the rolling bearing, deflections in the bearing raceway system due to machining forces could affect the measurement result. This effect is eliminated by the diametrically opposed arrangement of the measuring heads in the electronic evaluation system.

Measurement record

Each INA measuring system is supplied with an accuracy measurement record, *Figure 3*.

The accuracy is measured on the coded washer of the YRTM bearing when the coding is applied and is documented.

The measurement trace shows the pitch error of the coding.



① Measurement travel in degrees
② Deviation in angular seconds

Figure 3
Excerpt from a measurement trace – example YRTM 395 – S.Nr. 03/09/004

Error-free signal transmission

If the INA measuring system is fitted and operated as specified, it fulfils the requirements of Guidelines 89/336/EWG and 92/031/EWG for electromagnetic compatibility (EMC).

Adherence to the EMC guideline in accordance with the following standards is demonstrated:

- EN 61 000-6-2 Immunity
  - ESD:
    EN 61 000-4-2
  - Radiated electromagnetic fields:
    EN 61 000-4-3
  - Burst:
    EN 61 000-4-4
  - Surge:
    EN 61 000-4-5
  - Conducted immunity:
    EN 61 000-4-6
  - Magnetic field:
    EN 61 000-4-8.
- EN 55 011-B Emission
  - Interference voltage:
    EN 55 011-B
  - Perturbing radiation:
    EN 55 011-B.

Possible sources of electrical interference in the transmission of measurement signals

Disruptive voltage is mainly generated and transmitted by capacitive or inductive interference. Interference can occur through lines and equipment inputs and outputs.

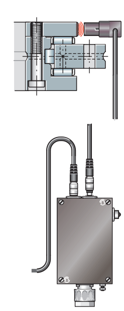
Sources of interference include:

- strong magnetic fields due to transformers and electric motors
- relays, contactors and solenoid valves
- high frequency equipment, pulse devices and magnetic stray fields due to switched-mode power supply units
- supply mains and leads to the equipment mentioned above.

Caution!

Interference in initial operation can generally be attributed to absent or inadequate shielding of the measurement leads or insufficient spacing between the signal and power cables.

The overall design should be such that the function of the measuring system is not influenced by sources of electrical or mechanical interference.

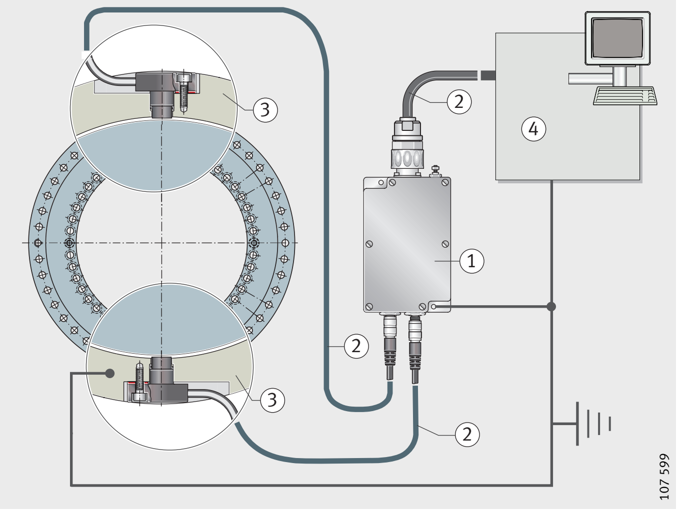


Measures to protect against interference

Caution!

Screw the electronic evaluation system firmly to the earthed machine frame, *Figure 4*. If screw mounting surfaces are non-conductive, one of the fixing screws should be connected by electronically conductive means over the largest possible cross-section and a short route with the machine frame (all measuring system components must have the same potential).

For signal connections, only shielded plug connectors and cables should be used.



① Electronic evaluation system
② Shielded plug connectors and cable
③ Adjacent construction
④ CNC

Figure 4
Shielding and post-processor

Protection against magnetic fields

Magnetic fields will damage or erase the dimensional scale. This will lead to partial mismeasurement by the system.

Magnetic sources must be kept away from the magnetic scale on the outside diameter of the shaft locating washer. A field strength of approx. 70 mT or higher immediately on the coding carries the risk of damage to the magnetic increments.

Caution!

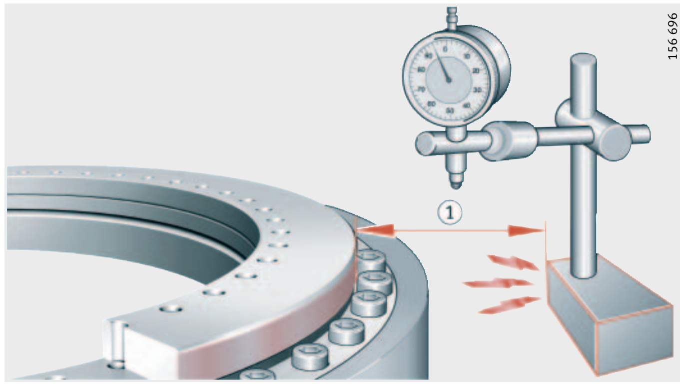
Do not place magnetic dial gauge holders directly on the coded washer (guide value: at least 100 mm distance in air or 10 mm unalloyed steel), *Figure 5* and *Figure 6*.

Never touch the coding with magnetisable objects (e.g. knives, screwdrivers, dial gauge feelers).

Prevent contact with magnetisable contaminants. These could otherwise be deposited on the coding and lead to impaired functioning.

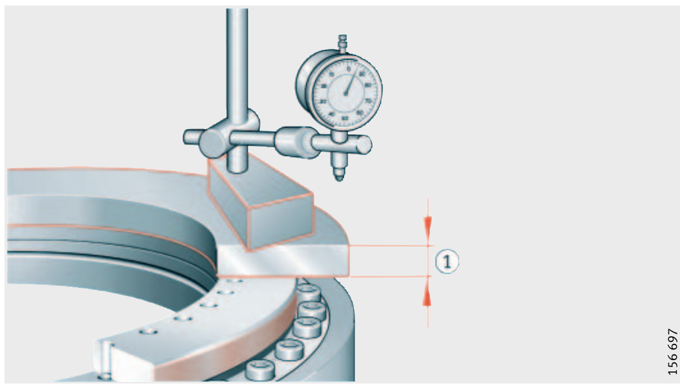
This could be due to:

- contamination of the lubricant (e.g. oil bath)
- contamination washed off by condensation (e.g. in conjunction with cooling devices)
- wear debris from gears.



① Minimum distance > 100 mm

Figure 5
Minimum distance between magnetic measurement stand and shaft locating washer



① Shielding > 10 mm

Figure 6
Shielding by unalloyed steel

Protection against mechanical damage

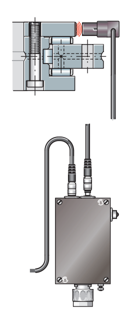
In order to protect the sensor chip against damage, the measuring head can only be pressed against the dimensional scale by hand. Forces > 50 N can lead to sensor damage.

Caution!

- The measurement gap should only be preset by pressing the measuring head by hand.
- Tighten the fixing screw carefully. Note the amplitude display on the software MEKOEDS. Do not exceed a display value of 80% during setting.

Special designs

The MEKO electronic measuring system is also available as a single reference mark system. Please state this in the order text.



Laying of signal cables

Spatial separation

Laying of disruptive and and suppressed or non-disruptive cables in parallel and in spatial vicinity should be avoided. Separation in air of > 100 mm is recommended. If adequate spacing cannot be achieved, additional shielding or earthed metallic partition walls between the cables should be provided. The requirement for spatial separation of cables also applies to typical sources of interference such as servo drives, frequency converters, contactors, solenoid valves and choking coils.

Crossings

If cables must be crossed, this should be carried out at a 90° angle if possible.

Overlong cables

Overlong cables that must be located for safety reasons in the switch cabinet should be cut to the required length. Otherwise, these will act as antennae and cause unnecessary interference.

Shielding

If shield separations are necessary, these should be reconnected over as large an area as possible. The free lead ends to the connector terminal should be as short as possible.

Shield separations are a functional risk and should therefore be avoided.

Ends not required

Non-assigned ends should be connected on both sides with PE potential.

Motor connectors

No other cables for data cabling should be fed within shielded motor cables or terminal boxes for motor connectors.
Spatial separation is also recommended here, for example by sheet metal partitions.

Radio interference suppression filters

Connections between radio interference suppression filters and the emission source should be kept as short as possible and should be shielded.

Caution!

The precision bearing and measuring system must be handled with care. The dimensional scale and sensor surface of the measuring heads are unprotected once the protective covers have been removed.

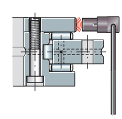
Operating conditions

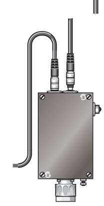
The measuring system design has been tested in relation to environmental conditions in accordance with the following standards:

Climatic tests		
Cold	According to standard	IEC 68-2-1
	Storage temperature	–10 °C, ±3 °C
	Dwell time	72 h
Dry heat	According to standard	IEC 68-2-2
	Storage temperature	+70 °C, ±2 °C
	Dwell time	72 h
Thermal cycling	According to standard	IEC 68-2-14
	Lower storage temperature	–20 °C, ±3 °C
	Upper storage temperature	+60 °C, ±3 °C
	Change gradient	1 °C/min
	Dwell time	3 h at each limit temperature
	Number of cycles	5
Thermal shock	According to standard	IEC 68-2-14
	Lower storage temperature	–5 °C, ±3 °C
	Upper storage temperature	+55 °C, ±3 °C
	Change duration	≦ 8 sec
	Dwell time	20 min at each limit temperature
	Number of cycles	10
Humid heat, cyclic	According to standard	IEC 68-2-30
	Lower storage temperature	+25 °C, ±3 °C
	Upper storage temperature	+55 °C, ±3 °C
	Change duration	3 h to 6 h
	Cycle duration	24 h
	Number of cycles	6

Mechanical tests		
DIN EN 60 086-2-6 MIL-STD-202, 204 C		Condition B
Vibration, sine wave (measuring heads)	According to standard	IEC 68-2-6
	Frequency range	10 Hz to 2 kHz
	Vibration amplitude	±0,76 mm (10 Hz to 60 Hz)
		100 m/sec^2 (60 Hz to 2 kHz)
	Rate	1 octave/min
	Load duration	240 min per axis
	Number of frequency cycles	16 per axis
	Load directions	All three main axes

Cable relieved of tension and compression by cable holders





Axial/radial bearings with integral measuring system

Shocks (measuring heads)	According to standard	IEC 68-2-27
	Acceleration	30 g
	Shock duration	18 m/sec
	Shock type	Semisine wave
	Number of shock cycles	6 per axis
	Load directions	All three main axes (i. e. total of 18 cycles)
	Cable relieved of tension and compression by cable holders	
IP protection type, protection against ingress of water	According to standard	DIN 40 050-9
	Protection type	IP 65

Caution! Protection type testing is carried out with water as a medium and over a limited time period. The measuring system should therefore be fitted with protection against cooling lubricants.

Chemical resistance (measuring heads)

Resistance to oils	Test media	Mineral oil Aral Degol BG150 PAO Mobilgear SHC XMP150 Ester Shell Omala EPB150 PG Klüber Klübersynth GH6-150
	Storage temperature	+60 °C
	Storage duration	168 h
Resistance to cooling lubricants KSS	Test media	Unitech Hosmac SL145 ZG Zubora 92F MR Oemeta Hycut ET46 Unitech Hosmac S558
	Storage temperature	+35 °C
	Storage duration	168 h
	Concentration	5% in water

Caution! For different operating conditions, please contact INA/FAG.

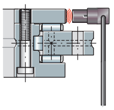
Technical data

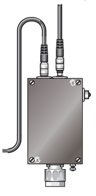
The technical data of the MEKO/U electronic measurement system are summarised in the following table.

Data

Data	Specification	Comments
Voltage supply	DC +5 V ±10%	–
Current consumption	120 mA typical/ max. 200 mA	Box with measuring heads YE, WH
Scale	Magnetically hard electroplated coating with periodic North-South pitch	–
Incremental signals Line count/ accuracy (at +20 °C) Reference marks	$1\ V_{SS}$ YRTM150: 2 688/±6″ YRTM180: 3 072/±5″ YRTM200: 3 408/±3″ YRTM260: 4 320/±3″ YRTM325: 5 184/±3″ YRTM395: 6 096/±3″ YRTM460: 7 008/±3″ 24 , pitch-coded approx. each 15°	–
Fixed reference mark pitch	30°	–
Differential pitch between two reference marks	2 signal periods	–
Data interface	RS 232 C	–
Recommended measurement step	0,0001°	–
Operating temperature	from 0 °C to +70 °C	–
Protection type (EN 60 529)	IP 65	–
Masses Measuring heads Electronic evaluation system	 each approx. 130 g 520 g	–
Electrical connections Measuring heads Post-processor (not included in delivery)	 with: 2 m PUR cable ∅ 5,5 mm[1)] with: plug ∅ 12 mm with: 12 pin flanged plug, ∅ 28 mm	–

1) Other lengths available by agreement.





Data
continued

Data	Specification	Comments
Permissible cable length for electronic post-processor	Max. 100 m	–
Humidity	Max. 70% relative humidity/non-condensing	–
Output signal load	100 Ω to 120 Ω	Recommended CNC input resistance
Output signal ①, ②	0,9 V_{SS} typical/ 0,8 V to 1 V max.	120 Ω load resistance, f = 100 Hz
Signal difference ①, ②	< 1% typical	Difference in output signal amplitude between signal ① and ②, f = 100 Hz
Output constant voltage	2,4 V ±10%	Output signals ①+, ①–, ②+, ②–
Output offset voltage ①, ②	±10 mV typical/ ±50 mV max.	Constant current offset between ①+ and ①–, ②+ and ②–
Reference signal Z	Width: 230° typical/ 180° to 270° max. Centre position: see *Figure 7*	From output signal period ①, ② at recommended reference movement speed
Reference signal centre voltage	2,4 V ±10%	–
Reference signal level	0,8 Vs-s typical/ 0,6 V to 1 V max. Inactive: –0,4 V Active: +0,4 V	120 Ω load resistance
Output frequency ①, ②	DC up to 8 kHz max.	–
System resolution	Max. 2 500 steps per sine wave	–

Detection of zero position/functional principle, *Figure 7*:

- The CNC checks whether the signals ①, ② and ③ are all positive, see cross-hatched quadrants in *Figure 7*.
  The zero position is then reached where
  ① = MAX (90°), ② = ZERO (0°).
- The reference signal type has no influence (it is important to emphasise rather more than this one quadrant, but not more than one signal period).

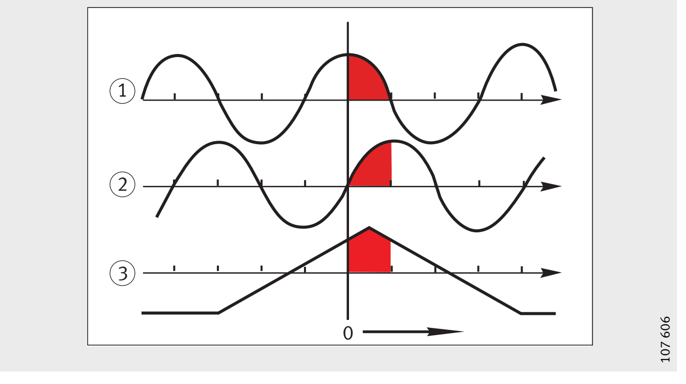


Figure 7
Reference signal position

Compatibility

The analogue output signals $1V_{SS}$ of the incremental track can be processed by all conventional CNC controllers.

For new applications, it should be checked whether the CNC controller can be parametrised in accordance with the technical data of the YRTM.

For most controllers, the input parameters can be requested from INA/FAG.

Input of line count

For many controllers, the line count can be entered directly from the table Technical data, page 45. In isolated cases, however, this is carried out via a whole number multiplication and division value. In these cases, the line count cannot be entered exactly for sizes YRTM200 and YRTM395 and must be corrected using other parameters.

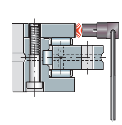
Pitch-coded reference marks

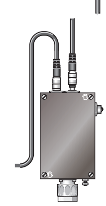
Some controllers cannot record signals from pitch-coded measuring systems. For these cases, the electronic measuring system can be supplied as a single reference mark system; please indicate this in the order text.

The differential pitch between two adjacent reference marks is two signal periods. In the zero transition area, the system design of the encoder leads to a large difference. The controller must be capable of processing this.

In swivel type axes, the measuring system zero point (marked on the bearing by a drill bit) can be placed outside the scanning range of the yellow measuring head (recording, for example, the reference marks).

With continuous monitoring of the pitch-coded reference marks, the limiting speed for the reference travel must not be exceeded. For reference speeds, see dimension table, page 54.





Ordering example

One unit always comprises the following, *Figure 8* and *Figure 9*:

- the INA axial/radial bearing YRTM with a dimensional scale
  – Ordering designation: **YRTM** >Bearing size<
- the MEKO/U electronic measuring system comprising:
  – 2 measuring heads with cable ① and shims
  – 1 electronic evaluation system ②
  – Ordering designation: **MEKO/U** >Measuring head size< and >Cable length< (cable lengths: see page 57).

The following are also required:

- the setting and diagnosis software (diskette with 5 m long interface cable, can be used as often as required)
  – Ordering designation: **SRMC5-RS232**
  (MEKOEDS for systems supplied before 1 January 2005)
- the Fitting and Maintenance Manual TPI 103 for the axial/radial bearing
- the Initial Operation and Diagnosis Manual MON 18 for the measuring system

The manuals TPI 103 and MON 18 are available upon request.

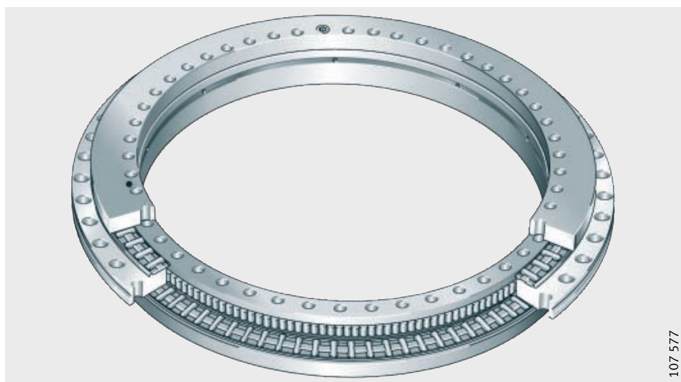
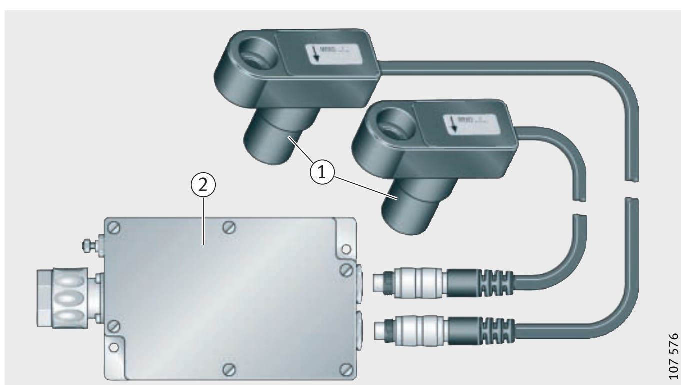


Figure 8
Axial/radial bearing YRTM



① Measuring heads
② Electronic evaluation system

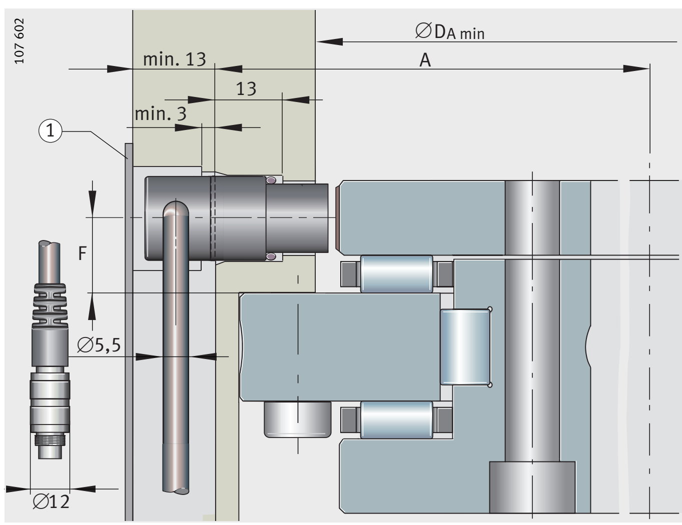
Figure 9
MEKO/U
electronic measuring system

Design and safety guidelines
Design of adjacent construction

Design of adjacent construction for measuring heads, see *Figure 10* to *Figure 13*. The measuring heads must be sealed against contamination and moisture after fitting ①, *Figure 10*.

The slot depth for the measuring heads must be produced to dimension A, *Figure 10* and the table Recess diameter $D_{A\,min}$.
If the slot is produced slightly too deep, this can be compensated by means of additional shims (ordering designation for shims = MEKOABL). If the specified data are exceeded in the other direction, the adjacent construction must be reworked.

For fitting of the bearing and reliable function of the measuring system, the functional diameter $D_{A\,min}$ must be incorporated in the adjacent construction, *Figure 10* and the table Recess diameter $D_{A\,min}$. The distance F must be observed, *Figure 10* and the table Recess diameter $D_{A\,min}$.



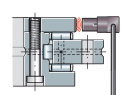
① Cover for measuring heads, sealed

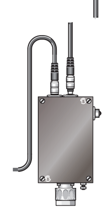
Figure 10
Design of adjacent construction

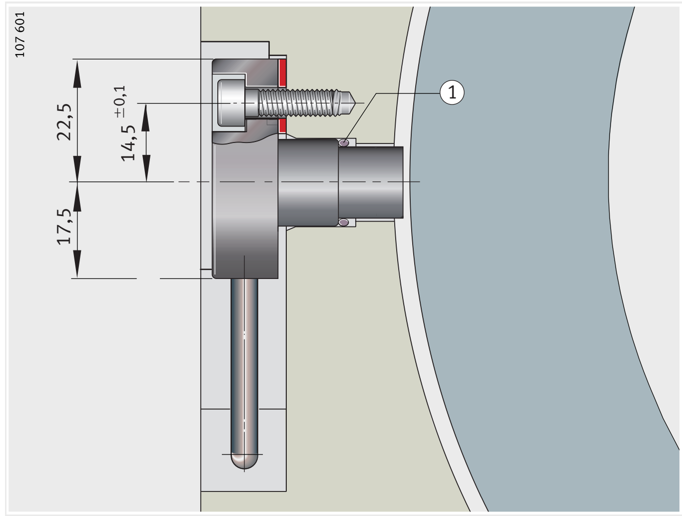
Recess diameter $D_{A\,min}$, distance F and A

Axial/radial bearing	Distance between screw mounting face of sensor and centre of bearing[1] $A_{-0,4}$ mm			Recess diameter $D_{A\,min}$ mm	Spacing F mm
Designation	MEKO/U 200	MEKO/U 150	MEKO/U 260		±
YRTM150	–	129,5	132	215	10
YRTM180	–	144,7	147,2	245,5	10
YRTM200	155,6	–	160,6	274,5	10
YRTM260	–	–	196,9	345,5	11,8
YRTM325	–	228,8	231,3	415,5	12,5
YRTM395	–	–	267,5	486,5	13,8
YRTM460	–	–	303,8	560,5	14,5

[1] The electronic evaluation system is identical for all bearing sizes.
The measuring heads differ in length "B", figure and table, page 57,
i.e. the longest measuring head MEKO 260/395/460 can be used for all sizes.
Note the mounting dimension "A".

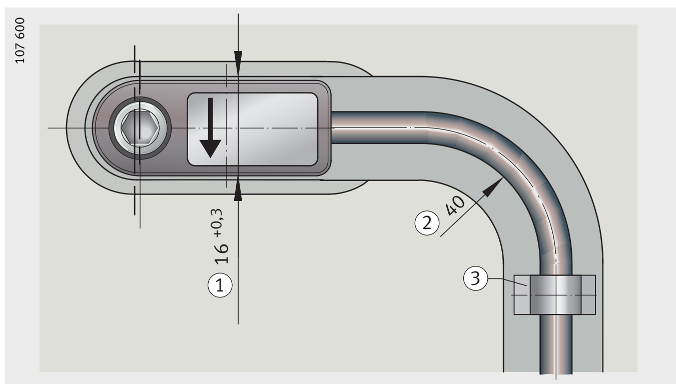






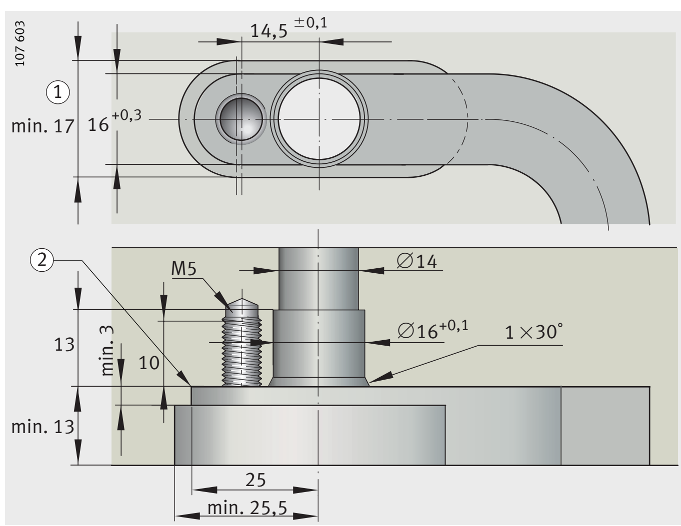
① O ring 12,5×1,8

Figure 11
Design of adjacent construction



① Slot width
② $R_{min} \geqq 40$ mm
③ Cable holder

Figure 12
Design of adjacent construction



① For deep slots, slots must be free in upper area (for easier fitting in setting of the measurement gap)
② r_{max} 0,2 mm

Figure 13
Dimensioning of the fitting space for the measuring heads

Caution!

The measuring heads must be centred with the shaft locating washer height when fitted, *Figure 10* and table Recess diameter $D_{A\ min}$, Seite 49.

The screw mounting faces for the measuring heads must be free from burrs and flat. If the measuring heads are located deep in the housing, sufficient accessibility for setting the spacing must be ensured.

The measuring heads and cable must be protected by a suitable cover against mechanical damage and long term heavy contact with fluids.

The positional orientation of the measuring heads is determined by the locating slot. Positional orientation solely by the fixing screw is not sufficient.

Observe the minimum bending radii for signal cables.

Fluids must not be allowed to build up in the measuring head pocket (IP65).

Fitting

Due to the compact arrangement of the dimensional scale and the small measuring heads designed for optimum use of available space, the measuring system is very easy to install.

Fitting guidelines for axial/radial bearings

During fitting, the coded shaft locating washer is centred precisely by means of the shaft journal manufactured precisely over the whole bearing height.

Before fitting, the retaining screws on the inner ring should be loosened so that the bearing inner ring and shaft locating washer with the dimensional scale can align and centre themselves to each other without any force.

Caution!

Do not use magnetised tools.

The magnetic dimensional scale has a protective strip for transport and fitting. Do not remove the protective strip until after the bearing is fitted.

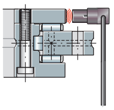
Follow the further information on the fitting of axial/radial bearings YRTM in TPI 103.

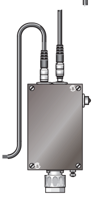
Fitting guidelines for measuring heads

The mounting position of the measuring heads is indicated by an arrow, *Figure 12*, page 50.

Caution!

The heads should be fitted such that the arrow points towards the screw mounting surface of the bearing outer ring.





Axial/radial bearings with integral measuring system

Arrangement of measuring heads

The arrangement of the measuring heads should not be smaller or greater than a diametrically opposed arrangement of 180° ±1°, otherwise eccentricities of the shaft locating washer will affect the measurement accuracy, *Figure 14*.

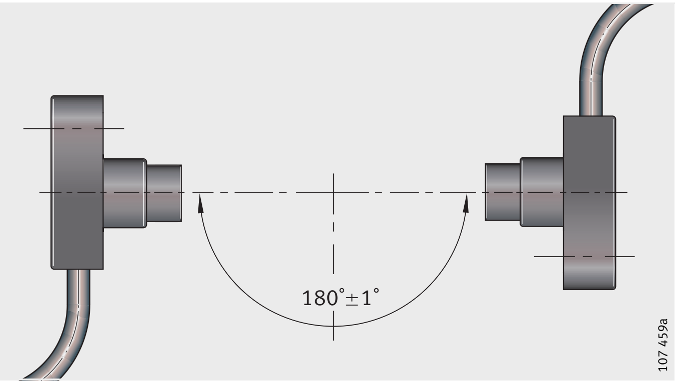


Figure 14
Diametrically opposed arrangement of measuring heads

Fitting of measuring heads

Set the measuring heads using the MEKOEDS software and the shims ① supplied to the correct distance from the outside diameter of the shaft locating washer, *Figure 15*. For setting see the Initial Operation and Diagnosis Manual MON 18. The software is then used to carry out a teaching process that matches the measuring heads to the electronic evaluation system.

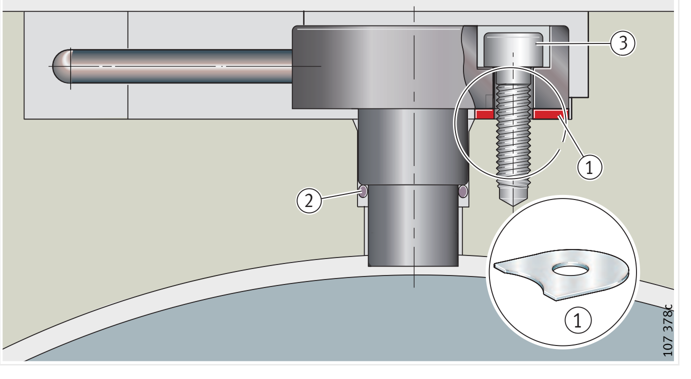
For sealing, a sealing ring ② is integrated in the adjacent construction, for example an O ring 12,5×1,8 with radial sealing, *Figure 15*. This prevents the egress of oil and the ingress of fluids such as cooling lubricants.

Caution!

Tighten the fixing screw carefully. Do not exceed the 80% amplitude display (MEKOEDS software) during setting. The sensor surface of the measuring head must only be subjected to load by hand pressure. Forces > 50 N may damage the sensor surface.

When laying the cable, ensure that the measuring head never impacts on it.

The fixing screws ③ for the measuring heads should be secured using Loctite (detachable), *Figure 15*. Max. screw tightening torque M_A = 6 Nm.



① Shim
② Sealing ring
③ Fixing screws

Figure 15
Fitting of measuring head

Cables and plugs for signal transmission

The input signal plugs for the electronic evaluation system are 7-pin or 8-pin and colour coded (white and yellow respectively). The 7-pin and 8-pin plugs should only be connected to the appropriate socket on the electronic evaluation system.

Caution!

The measuring heads, plugs and cables must be protected from mechanical damage.

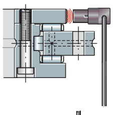
Setting and diagnosis program

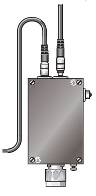
The setting and diagnosis program must be used to set the distance between the measuring heads and the outside diameter of the shaft locating washer, see page 51 and page 52, Fitting guidelines for measuring heads as well as MON 18, Initial Operation and Diagnosis Manual.

The program is also used to:

- check the function of the fitted measuring system
- detect errors in the measuring system.

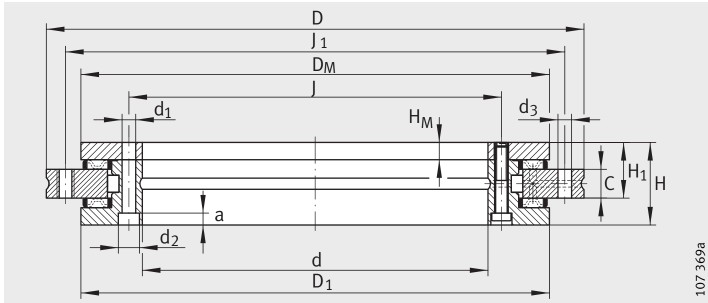
Measuring system data can be recorded, displayed in diagram form, printed out and sent by e-mail to the INA/FAG service department for evaluation.





Axial/ radial bearings with integral measuring system

Double direction



YRTM

Dimension table · Dimensions in mm

Designation	Mass	Dimensions										Fixing holes					
												Inner ring				Outer ring	
	≈kg	d	D	H	H_1	H_M	C	D_M	D_1	J	J_1	d_1	d_2	a	Quantity[6]	d_3	Quantity[6]
YRTM150[4]	6,4	**150**	240	41[5]	27	10	12	214	214	165	225	7	11	6,2	34	7	33
YRTM180[4]	7,7	**180**	280	44[5]	30	10	15	244,5	244	194	260	7	11	6,2	46	7	45
YRTM200[4]	9,7	**200**	300	45	30	10	15	271,2	274	215	285	7	11	6,2	46	7	45
YRTM260	18,3	**260**	385	55	36,5	13,5	18	343,8	345	280	365	9,3	15	8,2	34	9,3	33
YRTM325[7]	25	**325**	450	60	40	15	20	412,6	415	342	430	9,3	15	8,2	34	9,3	33
YRTM395	33	**395**	525	65	42,5	17,5	20	485,5	486	415	505	9,3	15	8,2	46	9,3	45
YRTM460	45	**460**	600	70	46	19	22	557,7	560	482	580	9,3	15	8,2	46	9,3	45

1) Including retaining screws and threaded extraction holes.

2) Tightening torque for screws to DIN 912, grade 10.9.

3) Rigidity values taking account of the rolling element set, deformation of the bearing rings and the screw connections.

4) The measuring head cannot be mounted between the fixing holes or the heads of the fixing screws. Two holes for fixing screws therefore remain unused in the bearing outer ring.

5) Caution! H is 1 mm higher than the standard bearing YRT.

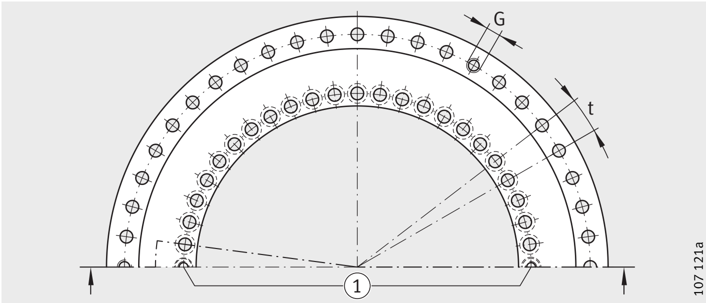
6) Caution! For fixing holes in the adjacent construction. Note the pitch of the bearing holes.

7) Screw counterbores in the L-section ring open to the bearing bore (see figure, page 55). Bearing inside diameter is unsupported in this area ②.

Limiting speeds for MEKO/U measuring system[1]

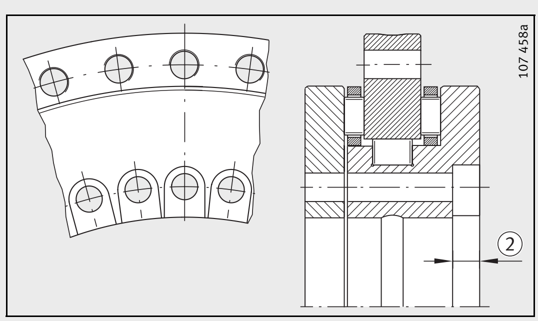
Axial/ radial bearing	Limiting speeds	
	Electronic evaluation system n_G min^{-1}	Reference travel n_{REF} min^{-1}
YRTM150	175	5
YRTM180	155	4
YRTM200	140	4
YRTM260	110	3
YRTM325	90	3
YRTM395	75	2 to 3
YRTM460	65	2 to 3

1) Firmware 2.× and higher.

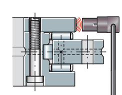


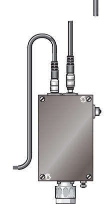
Hole pattern
① Retaining screws

Pitch t[1]	Retaining screws	Threaded extraction holes		Screw tightening torque	Basic load ratings				Bearing frictional torque	Axial rigidity[3]	Radial rigidity[3]	Tilting rigidity[3]
QuantityXt	Quantity	G	Quantity		axial		radial					
				M_A[2]	dyn. C	stat. C_0	dyn. C	stat. C_0	M_{RL}	c_{aL}	c_{rL}	c_{kL}
					kN	kN	kN	kN	Nm	kN/μm	kN/μm	kNm/mrad
36X10°	2	M8	3	14	85	510	77	179	13	2,3	2,6	11
48X 7,5°	2	M8	3	14	92	580	83	209	14	2,6	3	17
48X 7,5°	2	M8	3	14	98	650	89	236	15	3	3,5	23
36X10°	2	M12	3	34	109	810	102	310	25	3,5	4,5	45
36X10°	2	M12	3	34	186	1 710	134	415	48	4,3	5	80
48X 7,5°	2	M12	3	34	202	2 010	133	435	55	4,9	6	130
48X 7,5°	2	M12	3	34	217	2 300	187	650	70	5,7	7	200



Screw counterbore open
Bearing inside diameter unsupported in area ②





MEKO/U electronic evaluation system

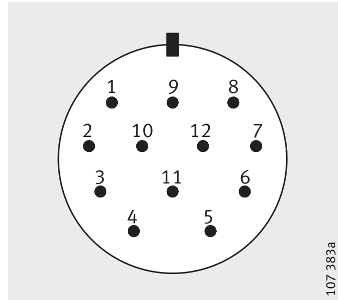
Electronic components

Caution!

The electronic evaluation system is identical for all bearing sizes.

The measuring heads differ in length B (table, page 57), i. e. the longest measuring head MEKO/U 260/395/460 can be used for all sizes.

Note the installation dimension A, see page 49.



Plug configuration of 12-pin flanged plug

Plug configuration of 12-pin flanged plug

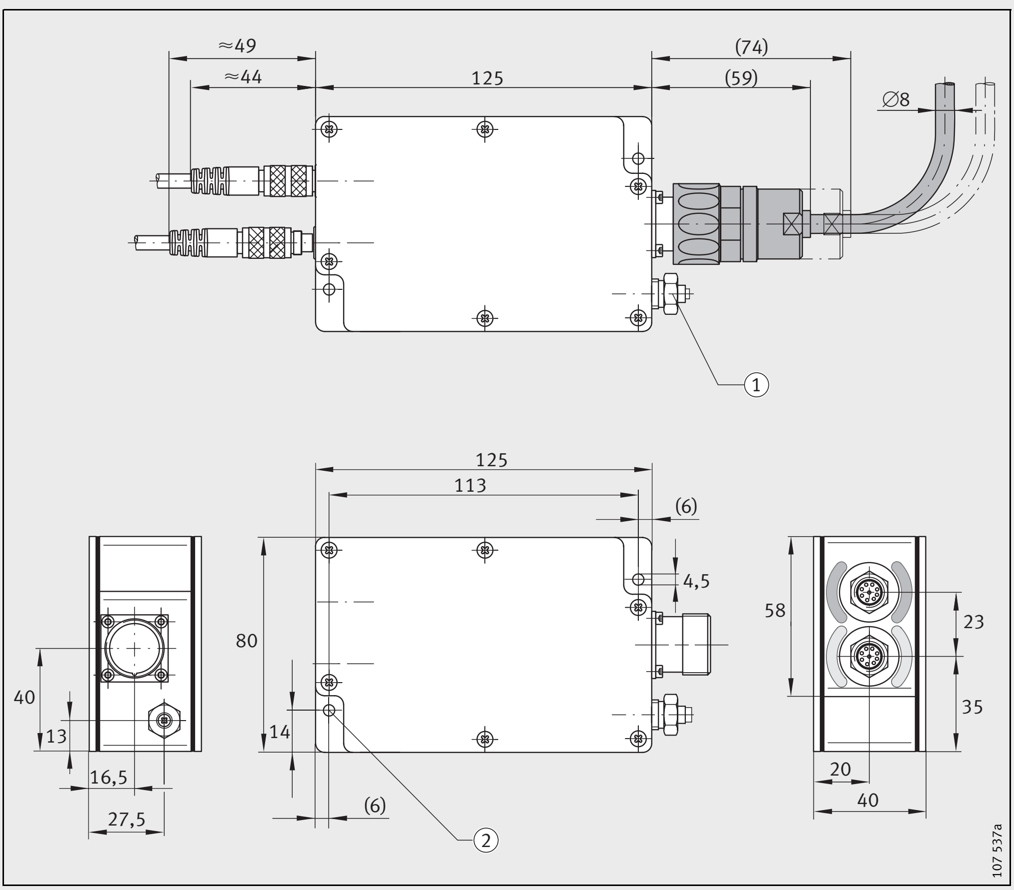
5	6	8	1	3	4	12	10	2	11	9	7	/
A		B		R		5 V (U_P)	0 V (U_N)	5 V (Feeler)	0 V (Feeler)	free	/	free
+	–	+	–	+	–	–	–	–	–	–	–	–
–	–	–	–	–	–	IEC 747 EN 50 178		–	–	–	–	–

The sensor leads are linked internally with the supply cables (2 with 12 and 11 with 10).
They are used by the motor controller as a measurement cable in order to compensate the voltage drop on the supply cable (four-wire principle). If this function is not supported by the controller used, the two 5 V cables and the two 0 V cables are wired in parallel in order to reduce the voltage drop on the supply lead.
The housing is shielded.

Electronic evaluation system (protection class IP65):

① Connector for RS232

② Holes (2×) for fixing screw to DIN 912-M4×10.



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