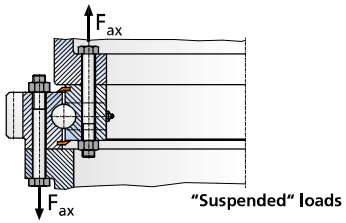
- Axial loads can be either "compressive" or "suspended".
- "Suspended" axial loads and the load on a rising segment in tilting moments must be adequately resisted by mounting bolts (Fig. 3). **Note: Catalog bolt data is not valid in this case!**

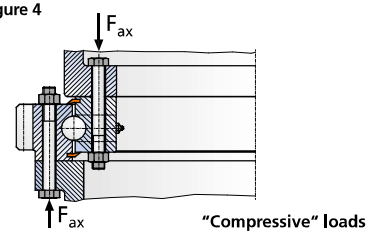
Figure 3



- Radial loads must be transmitted by means of frictional contact between Slewing Ring and the attached mounting structure.
- A good bolt connection is vital for satisfactory function of the Slewing Ring.
- The bolt connection and tilting clearance of the Slewing Ring must be checked regularly.

All catalog bolt data is valid only for "compressive" loads as shown in Figure 4

Figure 4



Gear
Our standard Slewing Rings are designed with spur gears. Permissible torques are specified in the Slewing Ring tables.

Sealing
Polymer seals protect the Slewing Rings from normal dirt penetration, dust and light sprayed water. For very dirty and wet environments, the seals shall be protected by pre-mounted labyrinth or additional seals on the mounting structure. Performance and service life of the Slewing Ring depends strongly on preventing ingress of contaminents into the Slewing Ring.

Pressure washing must not be used to clean Slewing Rings.

Operating temperature
Standard IMO Slewing Rings can be used in ambient temperatures from -25 up to +70°C. Please contact us in the case of higher or lower operating temperatures.

Selection criteria

The following criteria must be considered for the correct selection of a Slewing Ring.

Direction of rotational axis
Vertical: Slewing Rings of all series can be used.

Horizontal and alternating: A horizontal rotational axis is generally possible for ball Slewing Rings with limitited rotational speed, but has to be verified by IMO application engineering.

Loads
External forces such as axial loads, radial loads and tilting moment must lie below the static limiting load curve, as regards their operating load point. For this, please refer to the chapters "Static capacity of raceway" and "Mounting bolts".

Shocks, vibrations
To account for the peculiarities of the different applications the shock factors for gears and the raceway system should be considered.

Torque / tooth forces
The required torque must not exceed the maximum permissible torques and tooth forces given in the Technical Information section. Explanations of the different torque specifications can be found in the gear section.

Rotational speed
The following is a list of the maximum permissible rotational speeds n_{perm} for the different series:

Series 116 Slewing Rings: $n_{perm} = \frac{80000}{D_L}$

Series 120, 125, 150, 920, 932, 840 and 850 Slewing Rings: $n_{perm} = \frac{40000}{D_L}$

Series 320, 325, 332, 340, 350, 532 and 540 Slewing Rings: $n_{perm} = \frac{20000}{D_L}$

Lower permissible values apply for Slewing Rings in precision designs or those with reduced clearance. Please contact our Engineering Department for assistance.

Duty

For continuous running or high duty applications it is essential to check the service life of the Slewing Ring and, if necessary, the gearing. Please contact our Engineering Department for assistance.

Static load capacity of raceway

Static load capacity of the Slewing Ring is determined by:

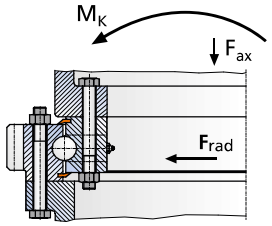
- Hardening depth of the raceway
- Number and size of the rolling elements
- Slewing Ring design
- Raceway geometry

The limiting load diagram shows the permissible axial and tilting moment loads for the respective size unit. Each loading case including the required or recommended safety must lie below the limiting load line for the selected Slewing Ring.

Limiting load diagrams are valid under the following condition:

- Static loading
- Limiting load line with safety 1
- Bolt clamping length between 5 and 10 times the bolt diameter
- Continuous threads up to bolt head are not permissible
- Strength of bolts according to grade 10.9
- All mounting holes used
- "Compressive" axial load (load applied according to fig. 5)
- Adequately stiff and level mounting structure (see Installation & Operating Manual)
- Minimum strength of mounting structure 500 N/mm2
- Radial loading considered as specified
- Compliance with "Installation & Operating Manual"

Figure 5



To address the peculiarities of different applications, the following application service factors are to be considered with respect to the operating conditions: (Note, these factors may be superseded by customer specification, FEM classifications, calculation or design regulations by certifying authorities.)

Application	Application service factor f_a	Bemerkung
Construction machinery	1.25	Normal Operation
Forestry machinery	1.50	Rough Operation
Foundries	1.75	Rough Operation
Manlift platforms	1.30	Normal Operation
Mech. engineering, general	1.25	Normal Operation
Mech. engineering, general	1.50	Heavy Operation
Measuring technique	2.00	Genauigkeit
Robots / mech. handling sys.	1.50	Genauigkeit
Rail vehicles	1.50	Rough Operation
Special vehicles	1.50	Rough Operation
Deep mining	1.75	Rough Operation
Shipboard cranes	1.10	Normal Operation
Cranes	1.25	Average Operation
Cranes	1.45	Heavy Operation
Stackers & attachments	1.10	Light shocks
Wind power turbines	2.00	Risk of false brinelling
Machine tools	1.50	Precision required

Table 1: Application service factors

In the case of applications with higher duty factors or continuous running it is recommended that a calculation of service life is carried out. Please contact our Engineering Department for assistance.

The application service factors and the required static safety S0 for the existing loads are to be taken account of in the following equations:

Equivalent axial load for limited load diagram:

$$F_{axD} = F_{ax} \bullet f_a \bullet S_0$$

To account for the prevailing radial load the tilting moment is increased correspondingly, at the same time the radial components from the gearing are also to be taken into account.

Radial load of toothing:

$$F_{radZ} = \frac{F_z}{\cos 20°}$$

Equivalent radial load:

$$F_{radD} = (F_{rad} + F_{radz}) \bullet f_a \bullet S_0$$

Equivalent tilting moment for limited load diagram:

$$M_{kD} = M_k \bullet f_a \bullet S_0 + 1.73 \bullet F_{radD} \bullet \frac{D_L}{1000}$$

(Series 116, 120, 125, 150, 920, 932)

This calculation is only valid if:

$$(F_{rad} + F_{radZ}) \leq 200 \bullet \frac{M_k}{D_L} + 0.05 \bullet F_{ax}$$

Should the value be exceeded, the limiting load diagram no longer applies.
Please contact our Engineering Department for assistance.

For Triple Row Slewing Rings (Series 320 to 350) the radial load is calculated with respect to the static radial load rating and does not have to be taken into account in M_{kD}.

$$M_{kD} = M_k \bullet f_a \bullet S_0 \quad \text{(Series 320 bis 350)}$$

$$S_{0rad} = \frac{C_{0rad}}{F_{rad} \bullet f_a \bullet S_0} \quad \text{(Series 320 bis 350)}$$

Calculation example:

Application: Slewing equipment for a construction machine under normal operation, no additional safety factor S_0 ($S_0 = 1$) is required.

Load:

Axial load	160	kN
Radial load	6	kN
Tilting moment load	120	kNm

Slewing Ring: pre-selected series 120
Type 10-20 0941 / 0-02062

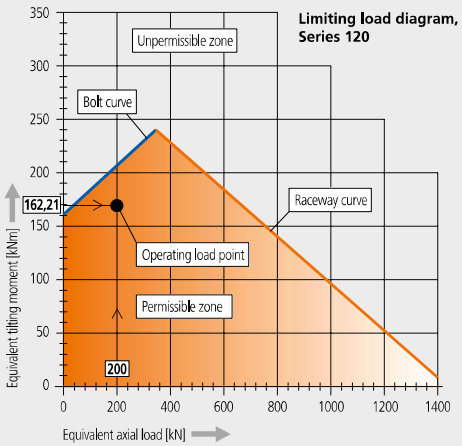
The following values are achieved with an application service factor of 1.25:

$$F_{axD} = 160 \bullet 1.25 = 200 \text{ kN}$$

$$F_{axdD} = 6 \bullet 1.25 = 7.5 \text{ kN}$$

$$M_{kD} = 120 \bullet 1.25 + 1.75 \bullet 7.5 \bullet \frac{941}{1000} = 162.21 \text{ kNm}$$

At this point it can be verified in the limiting load diagram, whether or not the pre-selected Slewing Ring is statically adequate.



Limiting load diagram, Series 120

If the operating load point lies below the limiting load line then the Slewing Ring is statically adequately dimensioned. If loads frequently occur during the slewing process, the selected type should be re-evaluated dynamically for service life. Please contact our Engineering Department for assistance.

Mounting bolts

Prevailing loads must be safely transmitted. To ensure this, mounting bolts should be sized to handle the raceway loading. The bolt curve is depicted in the static limiting load diagram subject to the following conditions:

- Quote the fulfillment of the conditions in the case of considering the static load capacity of the raceway.
- The limiting load diagram is applicable for "compressive" loads (see Fig. 4).
- In the case of "suspended" loads, the bolts are subject to additional tensional forces. Please contact our Engineering Department for assistance.
- The bolts of strength grade 10.9 are tightened according to specification with a torque wrench (aA = 1.6). You can find the tightening torques in our Installation & Operating Manual. If there are other conditions please talk to our Engineering Department.
- Bolts above M30 should be tightened with an hydraulic tightening device to 90% of the yield point. Details on this can be found in our Installation & Operating Manual.
- For Slewing Rings with through holes, use the largest possible metric bolts with regular threads.

Static load carrying capacity of the mounting bolts

Determining the operation load level, both with and without radial load, occurs along with the verification of the static load carrying capacity of the raceway.

If the prevailing load case lies below the limiting load line in the static limiting load diagram then the bolted connection is statically adequately dimensioned.

Dynamic load carrying capacity of the mounting bolts

Mostly, static dimensioning of a mounting bolt is sufficient.
In cases where very high numbers of stress reversals act on the Slewing Ring, dynamic verification is necessary. Please contact our Engineering Department for assistance.

Frictional capability of bolt connection

When radial loads act on the Slewing Ring, it must be ensured that these loads can be transmitted without shearing forces occurring in the bolts. Therefore, it must be determined whether the radial load can be transmitted via frictional contact between the mounting structure and the Slewing Ring.

$$F_{rad\ max} = \frac{n_b \bullet F_{sp}}{18.8}$$

If the prevailing radial load exceeds the limit value, please contact our Engineering Department for assistance.

Adequate measures to increase the radial load:

- centering
- fitting depth
- bonding
- more possibilities are to be inquired at IMO Application Engineering

For Slewing Rings with a different number or size of the bolts in the inner and outer ring, the permissible radial load is to be determined for both rings. The smaller value is the limiting value.

Friction contact prevails if Frad max is greater than the prevailing radial load.

Securing the mounting bolts

An adequately pre-loaded bolted connection does not need a safeguard. (compare VDI-guidelines 2230 edition 2003)

Friction torque

The friction torque of Slewing Rings depends upon many influence factors, such as:

- Rigidity and flatness of the mounting structure
- Load and loading combination
- Rotational speed and operating temperature
- Design of raceway system
- Number and frictional torque of seals
- Lubrication grease and filling level
- Manufacturing tolerances
- Other factors

The friction torque of an unloaded Slewing Ring can be determined approximately with the following equations:

Slewing Rings in the Series 116, 120, 125, 150, 920 and 932 with minimum clearance greater than zero

$$M_{wA} = 0.2 \bullet \frac{D_L^2}{2000}$$

Slewing Rings in the Series 116, 120, 125, 150, 920 and 932 with a minimum clearance of zero

$$M_{wA} = 0.3 \bullet \frac{D_L^2}{2000}$$

Slewing Rings in the Series 116, 120, 125, 150, 920 and 932 with preloaded raceways

$$M_{wA} = 2.0 \bullet \frac{D_L^2}{2000}$$

Slewing Rings in the Series 320, 325, 332, 340 and 350 with minimum raceway clearance greater than zero

$$M_{wA} = 0.8 \bullet \frac{D_L^2}{2000}$$

Slewing Rings in the Series 532 and 540 with minimum raceway clearance greater than zero

$$M_{wA} = 0.4 \bullet \frac{D_L^2}{2000}$$

Slewing Rings in the Series 840 and 850 with minimum raceway clearance greater than zero

$$M_{wA} = 0.3 \bullet \frac{D_L^2}{2000}$$

The friction torque for a Slewing Ring under load can be determined with the following equation, approximately:

$$M_w = 0.005 \bullet (4400 \bullet M_k + 4 \bullet D_L \bullet F_{rad} + D_L \bullet F_{ax}) + M_{wA}$$

Gear

Gearing design
Slewing Rings can optionally be selected with spur gears conforming with DIN 3960, DIN 3962 and DIN 3967. The toothing is either normalized or quenched and tempered according to the Slewing Ring series. If higher torques or longer service lives are required toothing is available in the quenched and tempered or hardened condition.

Permissible tooth forces $f_{z\ norm}$ and $f_{z\ max}$
The data is available in the Technical Information section and defined as the gearing circumferential force and refer to the tooth base. The values for fz max are calculated with a safety factor against fracture of 2, the values for fz norm are calculated with SF=1 with respect to the tooth base fatigue. The pinion is thereby taken into account as hardened and grounded with z1=17 and x1=0,5.
In the Series 120 and 920 the safety factor against fracture is 1.5 and the values for fz norm are determined with SF=0.85 and are therefore in the fatigue strength range.
In the case of standard single-sided pinion bearings the static safety factor should not be less than1.5. If a pinion with fewer teeth and with addendum modification coefficient is used, please contact our Engineering Department for assistance.

The required gearing circumferential force can be determined from the existing or the required torque:

$$F_z = \frac{2000 \bullet M_d}{m \bullet z}$$

According to whether Fz is calculated from the torque at the Slewing Ring or the pinion, the corresponding number of teeth and the corresponding friction torque must be used.

If more detailed calculations such as service life etc. are needed please contact our Engineering Department for assistance.

Drive pinion

The permissible tooth forces (gearing circumferential force) have been determined with a pinion with z_1=17 and x_1=0.5. If no special requirements exist with respect to the gear ratio the drive pinion can be designed with this gear data. The width of the pinion teeth should also be more than the teeth on the Slewing Ring. The difference between teeth widths should be approximately equal to the module.

If less than 17 teeth are used for the pinion, the gearing should be checked by calculations. The recommended gear quality for the pinion is 8e26 or better. In the case of very high tooth forces we recommend a pinion tip relief and a wide crown design, please contact our Engineering Department for assistance. The recommended toothing quality for the pinion is 8e26 or higher.

Tooth backlash

The tooth backlash is set at the highest point of the gear. It depends on the module of the gear and is calculated according to the following equation:

Tooth backlash to be set

$$\delta_f = 0.03 \text{ to } 0.04 \cdot m$$

For setting the circumferential backlash, the tooth zone with the run-out ‚high point' is marked with green. The backlash is to be set at this point.

Shock coefficient

As for the applications in which impact is expected, the appropriate impact coefficients must be considered when determining the Slewing Rings`maximum torque rating.

Service life

The service life of the gear depends on the operating conditions. The following factors are key:

- Torque
- Output speed
- Duty factor
- Ambient temperature
- Lubrication etc.

Drive power

In principle the drive should be dimensioned conservatively. The friction torque of a Slewing Ring can have a wide spread due to the load combination and magnitude, the design of the mounting structure, the raceway clearance and many other factors.

If the required drive torque is determined from the friction torque of the Slewing Ring it is necessary to start with twice the calculated value for the design of the drive power. Similarly additions should be made for the accelerating and decelerating of the moved masses and for any further power requirements according to the application.

Lubrication

To ensure flawless operation and a long usable life, adequate and regular lubrication is necessary. The grease fulfills the following functions:

For the raceway:

- Reduction of friction and wear in the rolling contacts
- Corrosion protection
- Lubrication of seals
- Additional sealing effect of grease collar
- Low friction torque

For the gears:

- Smoother running
- Lower wear
- Reduced operating noise
- Longer useful life
- Lower heat development

Initial greasing

IMO Slewing Rings are supplied pre-lubricated. High-quality lithium-complex grease, based on mineral oil, with EP - additives according to DIN 51825, KP2P-20 is the standard lubricant.

Regreasing intervals

Regreasing must be done at regular intervals, depending on frequency of use and ambient operating conditions. General attention must be payed to ensure that the grease used during the greasing is compatible with the sealing material. Special attention should be paid to ensure that lubricating grease types originally specified are used throughout the life of the unit.
Should you wish to use other types of grease, it must be verified whether the grease is compatible with that used for initial greasing. Please contact your grease manufacturer.
Please observe also the data in the"Installation and Maintenance Instruction " chapter.

Beside regular regreasing during operation, it is also necessary to grease the Slewing Rings before and after long inactive periods. Equally important is to regrease the equipment after cleaning.

Attention:
Slewing Rings must not be cleaned with pressure washing equipment. During pressure washing, large amounts of pressurized water can penetrate into the Slewing Ring through the sealing gap and cannot be removed, even by massive regreasing. This will strongly reduce the usable service life of a Slewing Ring.

Mixing greases

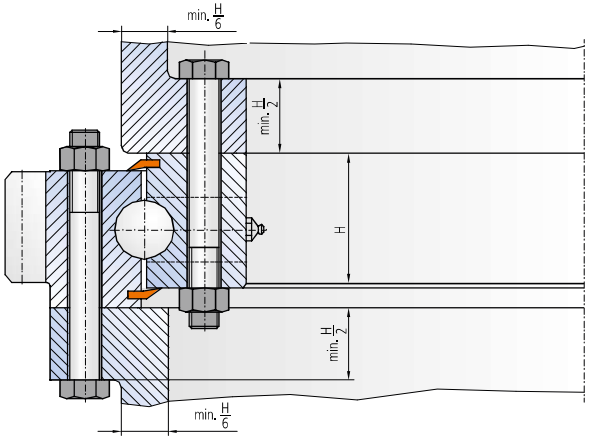
Greases with different thickeners and / or base oils should generally not be mixed. The manufacturer should always confirm if different grease types can be mixed.

Shelf life of lubricants

Lubricants are subject to ageing even if unused. If after about 3 years grease is not yet used, it should be replaced.

Design of mounting structure

Safe transmission of application loads and reliable operation of Slewing Rings is achieved, along with other factors, through using adequately designed mounting structures. To ensure safe operation of Slewing Rings, there are certain minimum requirements to the mounting structure:



- Sufficient rigidity (see Installation & Operating Manual)
- Maintain flatness according to Installation & Operating Manual
- No hard points (e.g. through cross beams)
- Bolting surfaces must be machined flat
- A hollow mounting structure is preferred
- Use all mounting bolts
- Bolts of recommended strength should be used
- Minimum strength of attached structure 500 N/mm^2

Very different mounting structure solutions can be used, depending upon maximum load and application. If a hollow mounting structure is intended flange thickness should be at least 50% of the overall Slewing Ring height. The thickness of the hollow mounting structure should be about 1/3 of the flange thickness. For weight-critical applications, flange thickness can only be reduced if appropriate stiffening ribs are provided and specifications on permissible flatness, perpendicularity deviations and deformation under load are achieved. Values on this are specified in the "Installation & Operating Manual".

A few simple steps for selecting a Slewing Ring

You will find a detailed procedure on the following pages!

Start

- Load data determined
- Rotational speed known
- Tooth forces calculated
- Application factors selected

Selecting a design

Selection list for optimum series	Series															
Requirement	**920**	**932**	**120**	**116**	**125**	**150**	**320**	**325**	**332**	**340**	**350**	**840**	**850**	**532**	**540**	**Special design**
Robust design	++	++	++	++	++	++	O	O	O	O	O	+	+	+	+	++2)
Rough mounting structure	++	++	++	+	+	+	–	–	–	–	–	O	O	O	O	++2)
Vibrations	+	+	++	++	++	++	+	+	+	+	+	++	++	+	+	++2)
High load capacity	—	—	–	–	–	O	++	++	++	++	++	+	+	++	++	++2)
High service life	—	—	—	—	–	–	++	++	++	++	++	O	O	+	+	++2)
Reduced clearance	+1)	+1)	O	O	O	O	+	+	+	+	+	O	O	+	+	++2)
Low friction torque under load	—	—	–	–	–	–	+	+	+	+	+	O	O	+	+	++2)
Uniform friction torque under load	—	—	–	–	–	–	++	++	++	++	++	+	+	+	+	++2)
High rotational speed	O	O	O	++	+	+	–	–	–	–	–	O	O	–	–	++2)
Small diameter	++	O	++	++	+	O	O	–	–	–	–	O	+	++	++	++2)
Large diameter	–	–	–	—	O	O	O	O	+	++	++	+	+	++	++	++2)
High axial load	–	O	O	–	O	+	++	++	++	++	++	+	+	++	++	
High tilting moment load	–	O	O	–	O	+	++	++	++	++	++	+	+	+	+	
High precision	—	—	–	–	O	O	++	++	++	++	++	O	O	+	+	++2)
High rigidity	—	—	–	–	O	O	++	++	++	++	++	O	O	+	+	++2)

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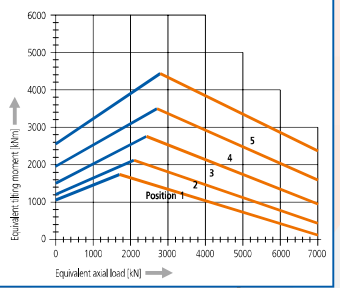
Checking of the raceway and bolt connection



Checking of gearing

Zeichnungsnummer	Position	Abmessungen und Gewicht: Außendurchmesser Außenring D_a [mm]	Innendurchmesser Innenring d_i [mm]	Innendurchmesser Außenring D_i [mm]	Außendurchmesser Innenring d_a [mm]	Gewicht [kg]	Befestigungsbohrungen: Lochkreisdurchmesser außen L_a [mm]	Lochkreisdurchmesser innen L_i [mm]	Bohrungsanzahl je Lochkreis n [-]	Verzahnung und Zahnkräfte: Tellerraddurchmesser d_0 [mm]	Modul [mm]	Zähnezahl z2 [-]	Profilverschiebung x [-]	zulässige Zahnkraft $F_{z\,norm}$ [kN]	maximal zulässige Zahnkraft $F_{z\,max}$ [kN]	Tragzahlen: statisch $C_{0\,rad}$ [kN]	$C_{0\,ax\,T}$ [kN]	$C_{0\,ax\,H}$ [kN]	dynamisch C_{rad} [kN]	$C_{ax\,T}$ [kN]	$C_{ax\,H}$ [kN]
31-20 1250/2-06700	1	1461,6	1103	1282	1280	542	1355	1155	36	1428	12	119	+0,50	107	187	587	7383	4423	410	1464	1080
31-20 1400/2-06710	2	1635,2	1253	1432	1430	646	1505	1305	36	1596	14	114	+0,50	136	236	660	8269	4956	436	1558	1143
31-20 1600/2-06720	3	1831,2	1453	1632	1630	731	1705	1505	40	1792	14	128	+0,50	136	236	757	9450	5666	469	1674	1229
31-20 1800/2-06730	4	2044,8	1653	1832	1830	844	1905	1705	46	2000	16	125	+0,50	163	285	854	10631	6376	500	1789	1307
31-20 2000/2-06740	5	2236,8	1853	2032	2030	912	2105	1905	54	2192	16	137	+0,50	163	285	951	11812	7086	529	1886	1384

No

Are all values in the permissible range

Yes

Selection completed

We recommend that the Slewing Ring selection is checked at IMO. Please fill in the Application Data sheet on page 148 and provide a sketch of the application.

The correct Slewing Ring in 5 steps

Step 1: Determining the load

The first step is to determine the loads and rotational speeds. Here it is necessary to consider both axial as well as radial loads and tilting moment loads. It is also important to take account of those loads which can result from extreme situations such as high wind loads, loads during assembly, possible tilting etc.

Please note: This dimensioning is only calculated with static loads. Dynamic loads have to be checked with IMO Application Engineering.

Furthermore shock factors and the necessary safety factors must also be taken into account.

Step 4: Checking of bolt connection

In the same limiting load diagram a check should also be made whether the load point is below the bolt curve. The load must include the shock factors, the necessary safety factors and the calculated radial load. If the load is above the curve then the next size up or a stronger series must be selected. In addition an examination should be carried out with the equation on Page 62 to check whether frictional contact is present.

Selection list for optimum series																
	Series															
Requirement	920	932	120	116	125	150	320	325	332	340	350	840	850	532	540	Special design
Robust design	++	++	++	++	++	++	○	○	○	○	○	+	+	+	+	++2)
Rough mounting structure	++	++	++	+	+	+	–	–	–	–	–	○	○	○	○	++2)
Vibrations	+	+	++	++	++	++	+	+	+	+	+	++	++	+	+	++2)
High load capacity	—	—	–	–	–	○	++	++	++	++	++	+	+	++	++	++2)
High service life	—	—	—	—	–	–	++	++	++	++	++	○	○	+	+	++2)
Reduced clearance	+1)	+1)	○	○	○	○	+	+	+	+	+	○	○	+	+	++2)
Low friction torque under load	—	—	–	–	–	–	+	+	+	+	+	○	○	+	+	++2)
Uniform friction torque under load	—	—	–	–	–	–	++	++	++	++	++	+	+	+	+	++2)
High rotational speed	○	○	○	++	+	+	–	–	–	–	–	○	○	–	–	++2)
Small diameter	++	○	++	++	+	○	○	–	–	–	–	○	+	++	++	++2)
Large diameter	–	–	–	—	○	○	○	○	+	++	++	+	+	++	++	++2)
High axial load	–	○	○	–	○	+	++	++	++	++	++	+	+	++	++	
High tilting moment load	–	○	○	–	○	+	++	++	++	++	++	+	+	+	+	
High precision	—	—	–	–	○	○	++	++	++	++	++	○	○	+	+	++2)
High rigidity	—	—	–	–	○	○	++	++	++	++	++	○	○	+	+	++2)

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Evaluation code
— Less suitable / adaptable
– Suitable / adaptable under certain conditions
○ Medium
\+ Good
++ Very good

Remarks
1) See Technical Data
2) According to the respective requirement

Step 2: Determining the Size

One or the other series is better suited according to the application. To make the optimum choice the following table shall be used to determine the suitable / adaptable size.

Step 3: Static checking of raceway

Using the static limiting load diagram a check must be made on whether the existing forces including the safety factors to be used do not exceed the permissible loads for the raceway.

The load, including the shock factors, the necessary safety factors and the calculated radial load must be in the permissible zone of the raceway curve and the expected rotational speeds must be below the limit. If the load is above the curve then the next size up or a stronger series must be selected. If the expected rotational speed is above the limit then the next smaller size or another series with higher limits must be selected.

Step 5: Static checking of gearing

A check should be made using the maximum expected tooth force to see whether the gearing has been adequately dimensioned. If the existing maximum tooth force has been determined from the friction torque under the maximum load, then this value must be doubled before comparison with the value in the table. If the corresponding masses are accelerated or decelerated the respective torques must also be taken into account.

If all the values for the selected Slewing Ring are in the permissible zone the Slewing Ring can be used. Finally, we would strongly recommend that your choice is confirmed by our Engineering Department.

In the case of high duty cycles or continuous running we recommend that a service life calculation is carried out by our Engineering Department.

Example with static loads:
Application: Crane operating in medium conditions
Load data:

Axial load	F_{ax}	= 268 kN
Radial load	F_{rad}	= 47 kN
Tilting moment	M_k	= 670 kNm
Tooth force	F_z	= 63 kN
Max. rotational speed	n	= 1.3 1/min

Special requirements:
Internal toothed design, no special precision required.
Maximum outer diameter 1550 mm
Additional safety factor $S_0 = 1.1$

From the table of f_a values, $f_a = 1.25$ for medium duty cranes, from this you get:
Pre-selection - Series 125, Item 10 12-25 1355/1-03260
with $D_L = 1355$ mm $D_A = 1455$ mm

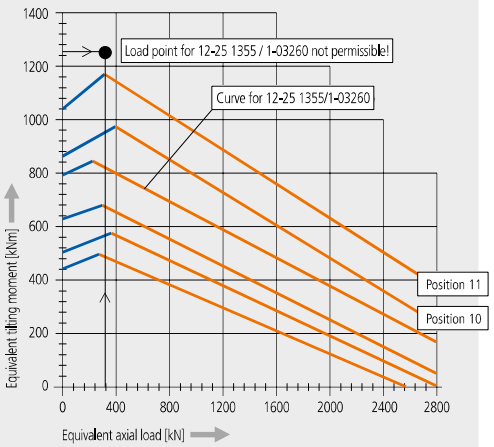
$$F_{axD} = 268 \bullet 1.25 \bullet 1.1 = 368.50 \text{ kN}$$

$$F_{radD} = \left(47 + \frac{63}{\cos 20°}\right) \bullet 1.25 \bullet 1.1 = 156.8 \text{ kN}$$

$$M_{kD} = 670 \bullet 1.25 \bullet 1.1 + 1.73 \bullet 156.8 \bullet \frac{1355}{1000} = 1289 \text{ kNm}$$

Reading off the load point on the limiting load diagram.

Limiting load diagram, Series 125



According to the limiting load diagram the pre-selected type cannot be used. There is also no other usable Slewing Ring in this series.
The new pre-selection for the maximum outer diameter of 1550 mm is the 3-row roller slewing ring type 32-20 1250/2-06700 with $D_A = 1461$mm.

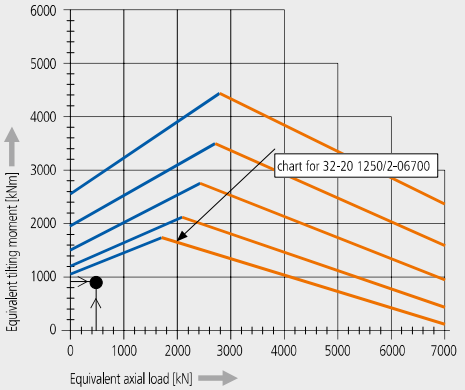
$$F_{axD} = 268 \bullet 1.25 \bullet 1.1 = 368.50 \text{ kN}$$

$$F_{radD} = \left(47 + \frac{63}{\cos 20°}\right) \bullet 1.25 \bullet 1.1 = 156.8 \text{ kN}$$

$M_{kD} = 670 \bullet 1.25 \bullet 1.1 = 921.3$ kNm without radial load!

In the Series 320 the radial load is not taken into account in M_{kD}, instead it is calculated against the radial load rating.

Limiting load diagram, Series 320



The selected Slewing Ring 32-20 1250 / 2-06700 is in the permissible zone.

Static safety factor for the radial series ($C_{0rad} = 587$ kN) under radial load and the radial components of the tooth force:

$$S_{0rad} = \frac{587}{\left(47 + \frac{63}{\cos 20°}\right) \bullet 1.1 \bullet 1.25} = 3.7$$

The permissible tooth force $f_{z\,max}$ is 187 kN and is therefore significantly above the existing tooth force F_z of 63 kN.

The permissible rotational speed for this type is:
$n_{perm} = 20000 / 1250 = 16$ 1/rpm

and is significantly over the existing rotational speed of 1.3 rpm.

This concludes the examination and the selection should be confirmed by IMO together with details of the loads.

Please follow our Installation & Operating Manual.

Following the Installation & Operating Manual is important for the reliability and safety of our product and has considerable influence on its expected service-life. The latest edition of the Installation & Operating Manual is to be found at **www.imo.de.**
Contact us to receive a paper copy.