IMO

DV 105 E

Slewing Ring
Product Catalog

www.goimo.com

Strong Partnership

Strong Partnership

The strong partnership IMO has with Brück GmbH in Saarbrücken for seamless rolled rings and Brück AM in Zámrsk in the Czech Republic for CNC pre-machining, enables IMO to present a line of high performance, high quality Slewing Rings and Slew Drives.

Since at the same time the shareholders of Brück GmbH hold half the equity capital in IMO, an efficient manufacturing and commercial partnership is created with direct and secure access to all the central elements of the added value chain. For you this is a guarantee of fast, flexible and reliable order handling!

Brück is running five rolling mills with a monthly capacity of up to 3,500 tons (7,7000,000 lbs)!

Preface and Imprint

IMO has developed, designed, manufactured and sold large diameter anti-friction bearings globally for many years. Our current range of products up to a diameter of 5,200 mm (204 in) is presented in this catalog. Special designs are also available, please contact our Engineering Department for assistance (the contact details are on the back of the catalog).

In this catalog we provide you with comprehensive information about our standard range of Ball and Roller Slewing Rings. The catalog has a reference number on the front cover. Please always check this is the latest edition before using the information contained within it.

You will find the "Application Data Sheet" on pages 134/135 in this catalog. If you require assistance with any Slewing Ring application, please fill in this form. This gives us an overview of the application and represents a record of your requirements.

Slewing Rings are safety critical products. They have to meet your requirements exactly and perform in the environmental conditions of your application. Therefore, it is important to fill in the form completely, with as much detail as possible and send it to us. You will then receive our recommendation for the right IMO product for your application and gain the benefit of years of experience meeting challenging customer requirements and operating conditions! If the application data sheet has already been removed we will be pleased to send you another one. The application data sheet can also be downloaded from our homepage www.goimo.com.

You can find information on our Slew Drive product line in the Slew Drive catalog ST105E and ST205US, which we will send you on request. Further details of our company, products, their application and utilization can be found in our detailed company brochure IM104E.

IMO terms and conditions shall apply to all quotations and purchase orders. Further we would like to ask you to follow closely our Installation and Maintenance Instructions which contain important data. You can find these on pages 50 to 55 of this catalog, or on our homepage which has the latest revision.

The observance of our Installation and Maintenance Instructions is important for the reliability and safety of our product and has a great influence on the service life. The Installation and Maintenance Instructions contain practical information to help you with the design of your mounting structure.

The Installation and Maintenance Instructions are also available in other languages. Please contact us or visit our homepage if you require these instructions in a different language.

Our product range and designs are being continually updated and revised. Please check with us for the latest information.

All the information in this catalog has been carefully evaluated and checked.
We cannot accept responsibility for omissions and errors in this publication.

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The innovative business group IMO, with headquarters in Gremsdorf, Germany, has been designing, manufacturing and supplying Slewing Rings and self-contained Slew Drives for more than 16 years. IMO currently holds EN ISO 9001:2000 approval and has been certified since 1995.

IMO, with its modern manufacturing facilities, manufactures and delivers over 10,000 Ball and Roller Slewing Rings and Slew Drives each year, with diameters up to 5,200 mm (204 in). IMO is a globally recognized supplier of Slewing Rings and patented worm and pinion driven Slew Drives.

IMO is proud to have been recently named one of Bavaria's Top 50 companies by the State Minister of Economy. IMO has also earned several technical awards at international exhibitions for new and innovative product introductions.

BRÜCK® Rolling Mill, Ensheim/Saarbrücken

Nomenclature

1 2 – 60 5012 / 2 – 01234

Drawing reference number

Gearing heat treatment
1: Normalized
2: Quenched and tempered
3: Tooth flanks surface hardened
4: Tooth flanks and roots surface hardened
5-9: Identification for special designs
0: Untoothed

For Slewing Rings: Raceway diameter [mm]
For gear rims and pinions: Pitch circle diameter [mm]
For rings: Outside diameter [mm]

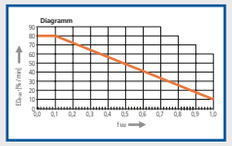
For Slewing Rings: Rolling element diameter [mm]
For gear rims and pinions: Module [mm]

Gear type:
1: External toothed
2: Internal toothed
3-9: Identification for special designs
0: Untoothed

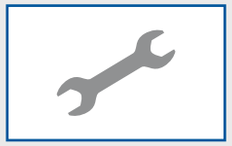
Slewing Ring design
1: Single Row Ball Slewing Ring
2: Cross Roller Slewing Ring
3: Triple Row Roller Slewing Ring
4: Double Row Ball Slewing Ring
5: Roller / Ball Combination Slewing Ring
6: Gear rim / pinion / ring
7: Wire race bearing / fitting element
8: Double Axial Slewing Ring
9: Ball Slewing Rings with flange rings
0: Special Slewing Ring

Table of Contents

Product Information P. 4 - 37



Technical Information P. 38 - 49



Installation and Maintenance Instructions P. 50 - 55

Ball Slewing Rings with flange rings
Series **920, 932** P. 56 - 63

Single Row Ball Slewing Rings
Series **116, 120, 125, 150** P. 64 - 77

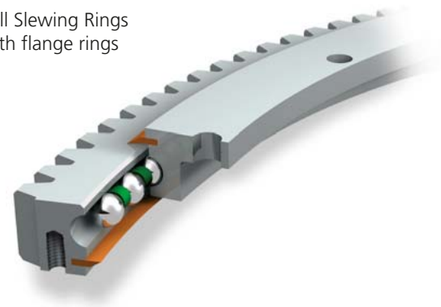
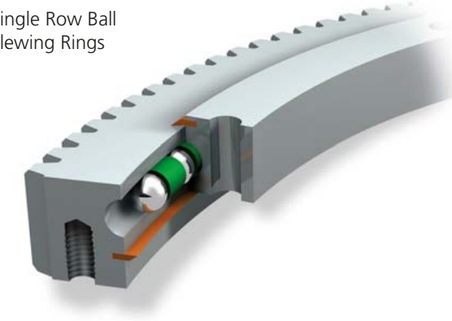
Double Axial Slewing Rings
Series **840, 850** P. 78 - 83

Roller / Ball Combination Slewing Rings
Series **532, 540** P. 84 - 89

Triple Row Roller Slewing Rings
Series **320, 325, 332, 340, 350** P. 90 - 101

Other Standard Ball Slewing Rings P. 102 - 133

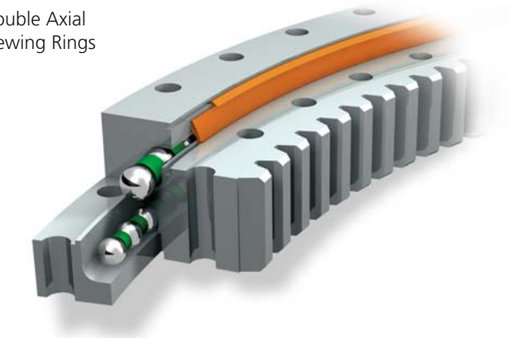
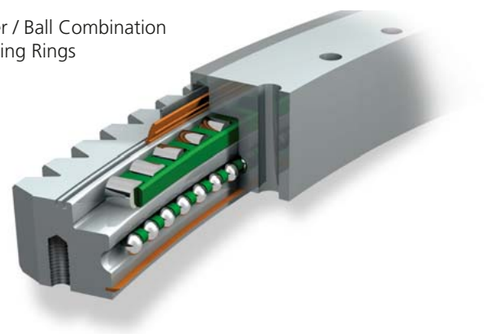
Product Line Overview / Comparison

Design types	Series	Raceway diameters D_L [mm]	Maximum tangential tooth force [1] $f_{z\,max}$ [Nm]	Maximum tilting moment [1] [2] $M_{k\,max}$ [kNm]	Load carrying capacity [1]: Static axial load rating $C_{0\,ax}$ [kN]	Load carrying capacity [1]: Static radial load rating $C_{0\,rad}$ [kN]	Weight [1] G [kg]	Clearance
Ball Slewing Rings with flange rings 	Series **920**	from 311 to 1091	from 22.7 to 50.5	from 16 to 151	from 208 to 730	from 89 to 312	from 19 to 87	Radial clearance 0 - 0.3 mm Axial tilting clearance 0 - 0.5 mm Precision version up to max. 0.06 mm
	Series **932**	from 955 to 1455	from 65 to 86	from 441 to 1036	from 2754 to 4196	from 1029 to 1568	from 131 to 250	Radial clearance 0 - 0.2 mm Axial tilting clearance 0 - 0.4 mm
Single Row Ball Slewing Rings 	Series **116**	from 100 to 500	from 16 to 18.5	from 3 to 50	from 103 to 517	from 51 to 253	from 5 to 24	Radial clearance 0 - 0.2 mm Axial tilting clearance 0 - 0.4 mm Precision version up to max. 0.03 mm
	Series **120**	from 311 to 1091	from 22.7 to 50.5	from 35 to 311	from 448 to 1572	from 191 to 673	from 21 to 91	Radial clearance 0 - 0.2 mm Axial tilting clearance 0 - 0.4 mm Precision version up to max. 0.06 mm
	Series **125**	from 455 to 1455	from 52 to 86	from 121 to 1154	from 1213 to 3879	from 453 to 1450	from 53 to 233	Radial clearance 0 - 0.25 mm Axial tilting clearance 0 - 0.4 mm
	Series **150**	from 1800 to 2800	from 229 to 290	from 2861 to 7008	from 8423 to 13102	from 3148 to 4896	from 762 to 1205	Radial clearance 0 - 0.4 mm Axial tilting clearance 0 - 0.75 mm

1) The data refers to the minimum and maximum diameter per series

2) The tilting moment capacity for each unit should be confirmed by referring to the limiting load diagram for each individual model

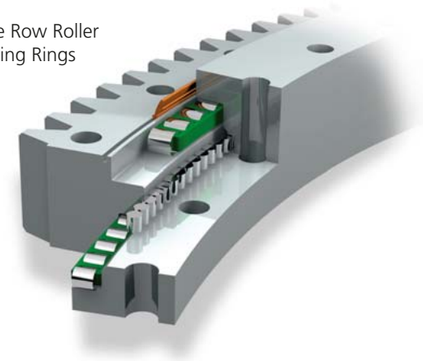
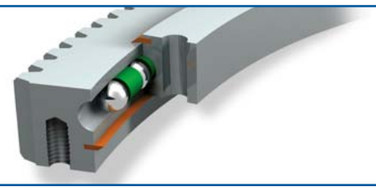
Product Line Overview / Comparison

Design types	Series	Raceway diameters D_L [mm]	Maximum tangential tooth force [1] $f_{z\,max}$ [kN]	Maximum tilting moment [1] [2] $M_{k\,max}$ [kNm]	Load carrying capacity [1]: Static axial load rating $C_{0\,ax}$ [kN]	Load carrying capacity [1]: Static radial load rating $C_{0\,rad}$ [kN]	Weight [1] G [kg]	Clearance
Double Axial Slewing Rings 	Series **840**	from 2199 to 3300	from 307 to 408	from 4383 to 9236	from 10387 to 15587	from 2078 to 3115	from 1238 to 1969	Radial clearance 0 - 0.4 mm Axial clearance 0 - 0.4 mm
	Series **850**	from 2559 to 4140	from 403 to 495	from 6661 to 16170	from 14580 to 23588	from 2955 to 4750	from 1892 to 3282	Radial clearance 0 - 0.5 mm Axial clearance 0 - 0.5 mm
Roller / Ball Combination Slewing Rings 	Series **532**	from 3550 to 4250	from 294 to 294	from 16633 to 23716	from 32008 to 38320	from 1083 to 1300	from 2028 to 2455	Radial clearance 0 - 0.32 mm Axial clearance 0 - 0.32 mm
	Series **540**	from 4250 to 4900	from 450 to 450	from 27652 to 36769	from 44728 to 51569	from 1403 to 1620	from 3469 to 4000	Radial clearance 0 - 0.4 mm Axial clearance 0 - 0.4 mm

1) The data refers to the minimum and maximum diameter per series

2) The tilting moment capacity for each unit should be confirmed by referring to the limiting load diagram for each individual model

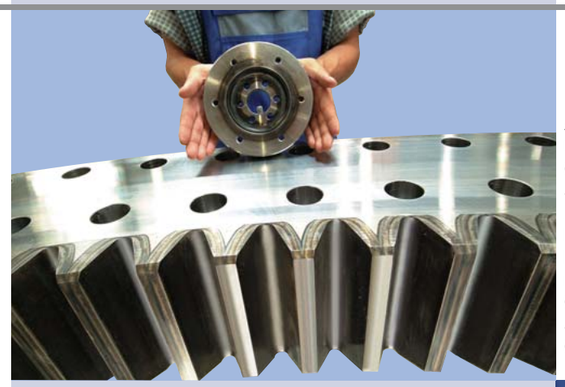
Product Line Overview / Comparison

Design types	Series	Raceway diameters D_L [mm]	Maximum tangential tooth force [1] $f_{z\,max}$ [Nm]	Maximum tilting moment [1] [2] $M_{k\,max}$ [kNm]	Load carrying capacity [1] Static axial load rating $C_{0\,ax}$ [kN]	Load carrying capacity [1] Static radial load rating $C_{0\,rad}$ [kN]	Weight [1] G [kg]	Clearance
Triple Row Roller Slewing Rings 	Series **320**	from 1250 to 2000	from 187 to 319	from 1735 to 4416	from 7383 to 11812	from 587 to 989	from 539 to 912	Radial clearance max. 0.25 mm Axial clearance max. 0.08 mm
	Series **325**	from 1800 to 2800	from 306 to 449	from 4274 to 10542	from 13006 to 20232	from 1348 to 2194	from 1101 to 1785	Radial clearance max. 0.40 mm Axial clearance max. 0.13 mm
	Series **332**	from 2240 to 4000	from 401 to 559	from 8108 to 25869	from 19352 to 34558	from 1862 to 3471	from 1975 to 3752	Radial clearance max. 0.50 mm Axial clearance max. 0.17 mm
	Series **340**	from 2800 to 4500	from 525 to 740	from 13500 to 37340	from 27973 to 44956	from 2334 to 3905	from 3213 to 5410	Radial clearance max. 0.60 mm Axial clearance max. 0.20 mm
	Series **350**	from 3150 to 4750	from 760 to 820	from 21074 to 48351	from 36813 to 55512	from 3894 to 6143	from 5128 to 7870	Radial clearance max. 0.60 mm Axial clearance max. 0.20 mm
Other Standard Ball Slewing Rings 		de 120 to 1845	de 11 to 204	from 2 to 2130	from 78 to 6456	from 29 to 2413	from 4 to 479	Radial clearance acc. to version Axial clearance acc. to version

1) The data refers to the minimum and maximum diameter per series

2) The tilting moment capacity for each unit should be confirmed by referring to the limiting load diagram for each individual model

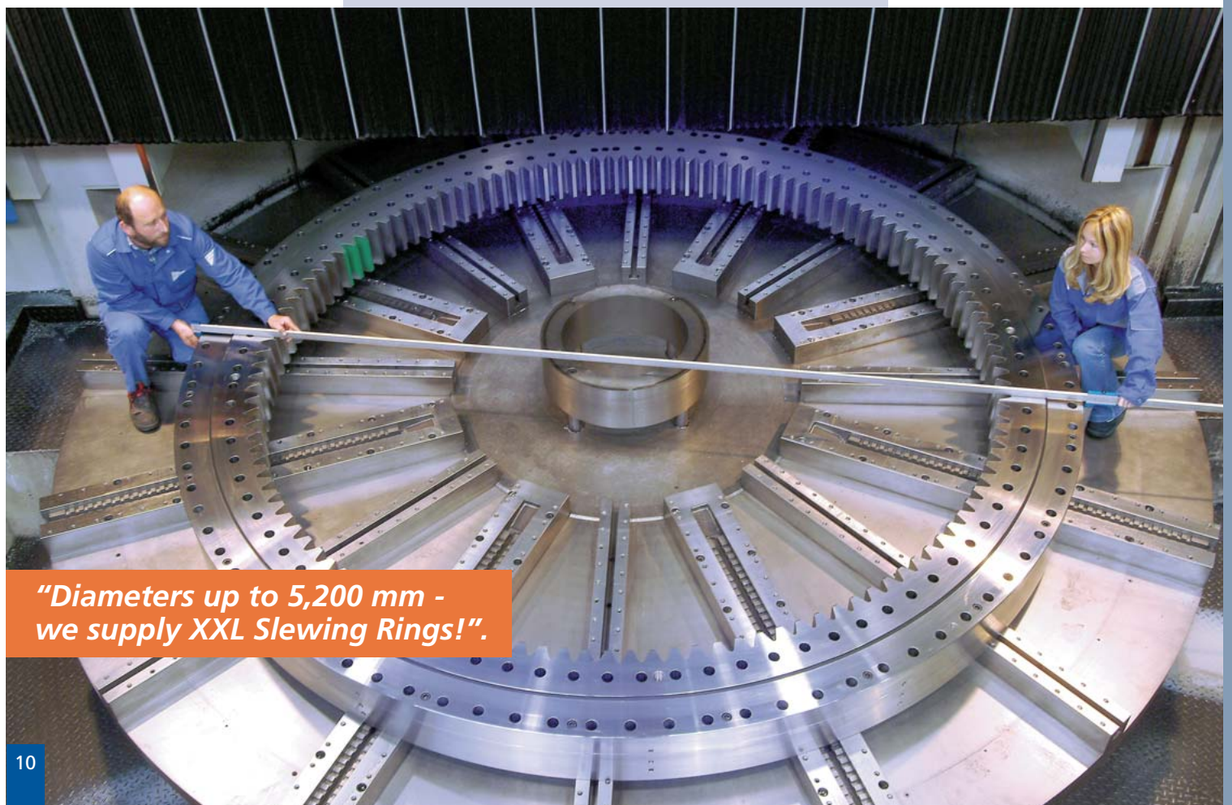
Product Line
Slewing Rings



A comparison of the Slewing Rings: On the left are the smallest (internal diameter 40 mm / 1 5/8 in) and the largest (outside diameter 5,200 mm / 204 in) IMO Slewing Rings.
Below is the smallest raceway roller which we use (diameter 12 mm / 1/2 in) and the largest ball (diameter 70 mm / 2 3/4 in).

Large-diameter anti-friction Slewing Rings designed to handle simultaneously occuring axial, radial and moment loads.

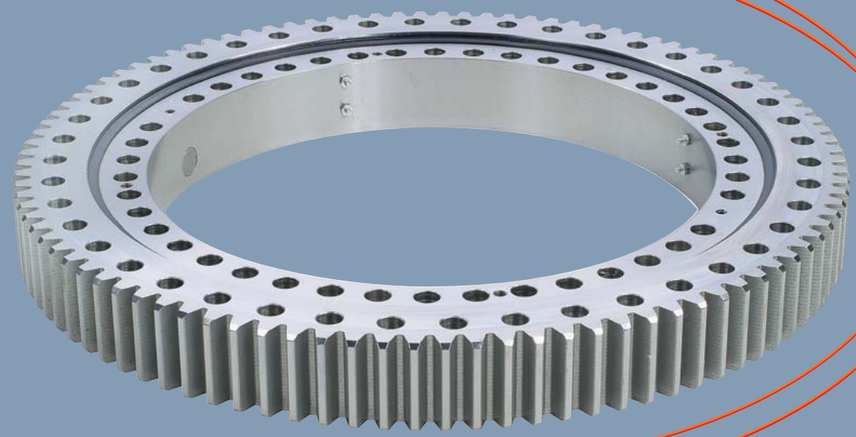
- Replaces traditional systems using fixed and floating bearings as well as king pins
- Ball and Roller Type Slewing Ring configurations
- Available in diameters from 100 to 5,200 mm (4 to 204 in)
- Integrated mounting holes
- Available with integral internal or external gearing of bearing rings (modules 1 to 30 mm)
- Sealed raceway system with grease lubrication
- Standard series and special designs
- Certified to meet EN 10204 requirements for materials, dimensions and operating specifications



"Diameters up to 5,200 mm - we supply XXL Slewing Rings!".

Services
Express Service

"IMO cannot perform miracles, but we will do our utmost to meet what others describe as 'impossible' delivery requirements. IMO"s Express Service has already met the emergency needs of many customers. Try us!"

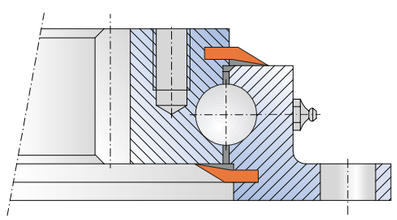


in only a few weeks!

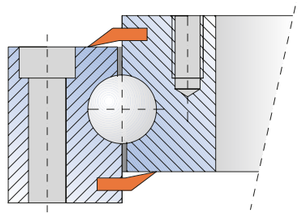
IMO is able to offer you a unique service on the market: Dependent on the size and features of the Slewing Ring we are able to manufacture and deliver urgently needed spare parts or prototypes in only 2 to 8 weeks whether standard or special designs.

Slewing Rings
Standard Designs

Ball Slewing Rings with flange rings

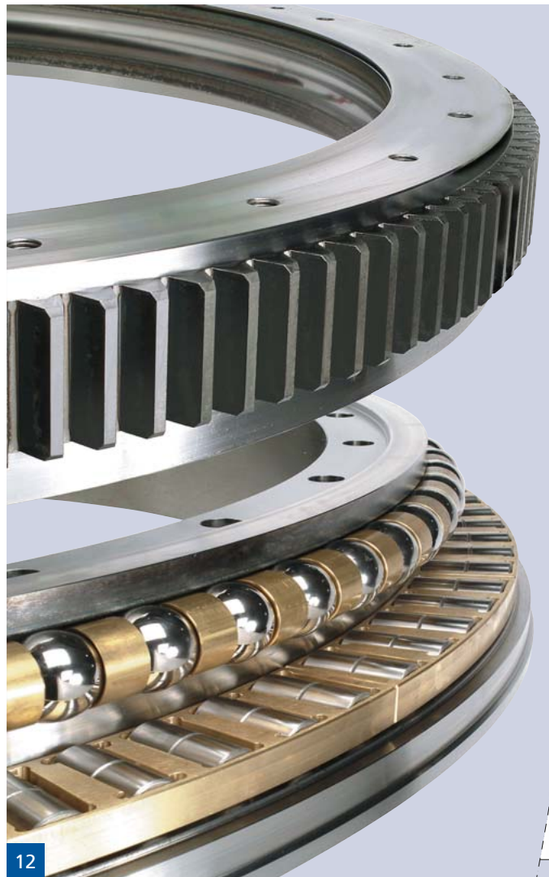


- Single row design with four-point raceway geometry
- Untoothed rings with flange thicknesses of 12 and 21 mm
- Ball diameters 20 and 32 mm
- Available ex stock or with a short delivery time as standard series in 14 sizes
- Raceway diameters of 311 to 1,091 mm or 955 to 1,455 mm
- For applications with light loads
- Enables lightweight structures in spite of large bearing diameters
- Applications: Handling technology, manlift platforms, turntables



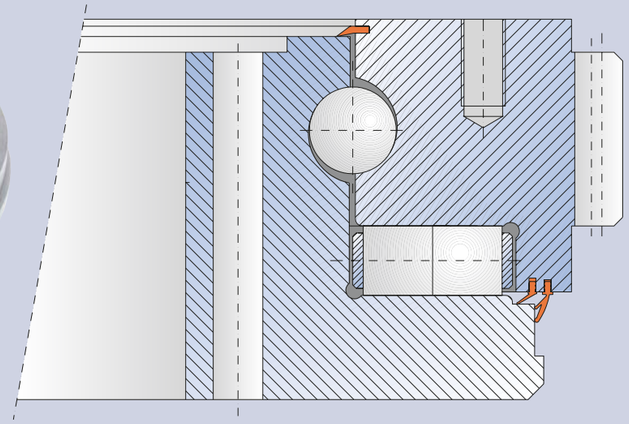
Ball Slewing Rings

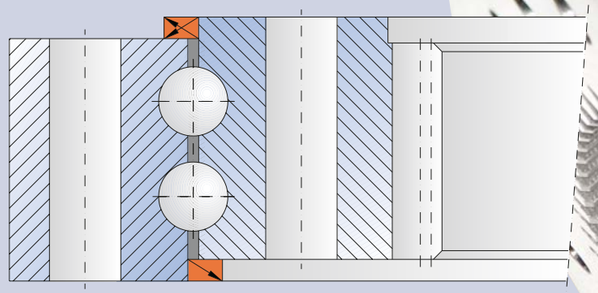
- Single row (picture above) and double row (picture below) designs
- Ball diameters 12 to 70 mm
- Four-point raceway geometry
- Optional preloaded raceway system and centerings
- Enables robust designs for arduous application conditions
- High resistance to 'false brinelling' in heavy vibration conditions
- Reduced sensitivity to shape deformations in the mounting structure
- Higher static load capacity than similar design Cross Roller Slewing Rings
- Catalog series with outside diameters from 180 to 2,971 mm
- Often designed as special versions according to customer requirements (outside diameters up to 5,200 mm)
- Frequently used in wind energy turbines, cranes, construction machinery, mechanical engineering and special purpose machinery



Roller / Ball Combination Slewing Rings

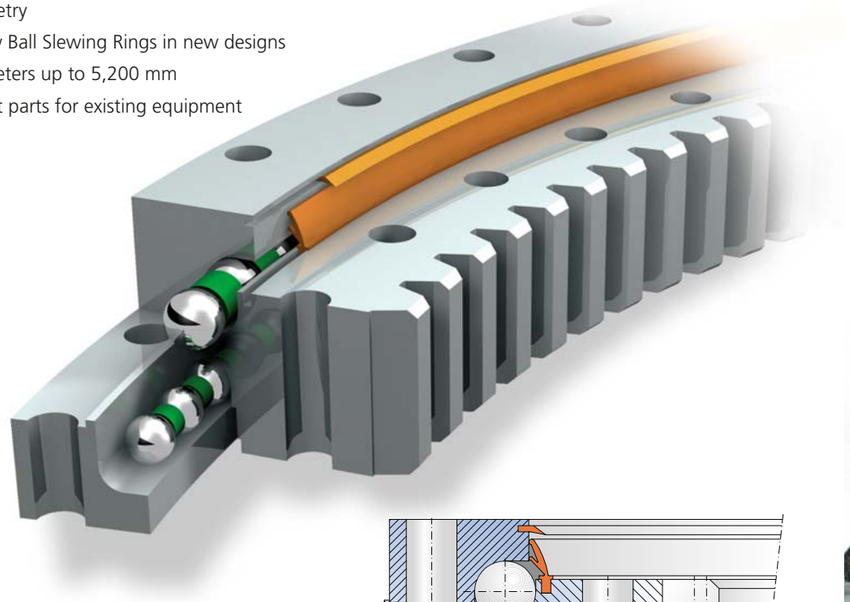
- Roller raceway to take up the axial loads
- Ball raceway provides support for radial loads. All parts are retained together as a unit during fitting
- Ball diameters 25 to 70 mm, roller diameters up to 100 mm
- Used in application with a dominant axial force and low radial load / tilting moments
- Standard series with outside diameters up to 5,176 mm
- Frequently produced as special designs according to customer requirements
- Typical applications: Bulk materials handling, stacker reclaimers, bucket wheel excavators, machine tools

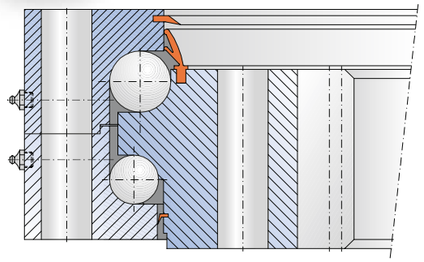




Double Axial Slewing Rings

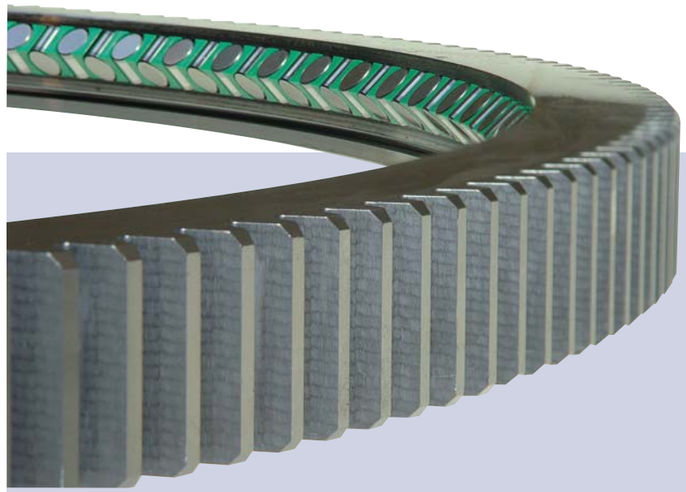
- Double row design with large supporting balls and smaller retaining balls
- Ball diameters 20 to 70 mm
- Both raceways in two point geometry
- Frequently replaced by double row Ball Slewing Rings in new designs
- Standard series with outside diameters up to 5,200 mm
- Used in cranes and as replacement parts for existing equipment
- Special designs can be supplied

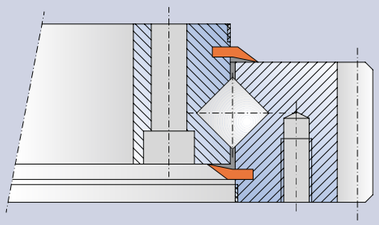




Cross Roller Slewing Rings

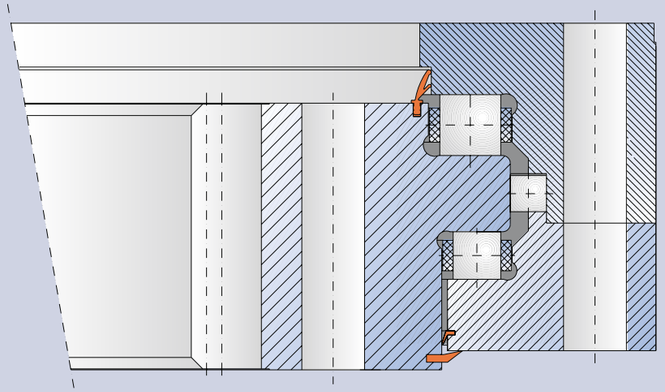
- Single row roller raceway under 45 degrees
- Roller diameters 12 to 60 mm
- Alternately arranged rolling elements
- Constant friction torque with different loads
- Higher dynamic service life than similar Ball Slewing Ring designs
- Higher demands on the rigidity and precision of the mounting structure in comparison with Ball Slewing Rings
- Applications: Robots, antennas, medical technology, positioning devices, machine tools
- Can be supplied to special customer requirements





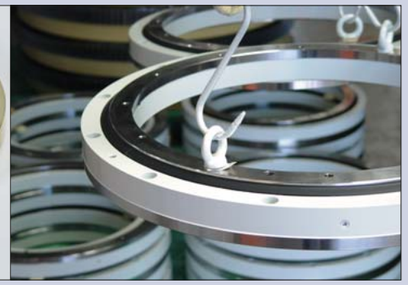
Roller Slewing Rings

- Triple Row Roller Slewing Rings
- Roller diameters 10 to 100 mm
- Plastic, steel or brass cage segments according to loads (can also be supplied with closed cage)
- Designed to provide the combination of the highest capacity in the smallest configuration
- Greater static and dynamic load capacity, higher rigidity and constant friction torque compared with all other Slewing Ring designs (with the same raceway diameter)
- High requirements on the rigidity and precision of the mounting structure
- Standard series with outside diameters from 1,462 to 5,179 mm
- Mostly supplied as customer specific designs



ZnFeCo coating, dark-coloured, according to MIL specification

ZnFe coating



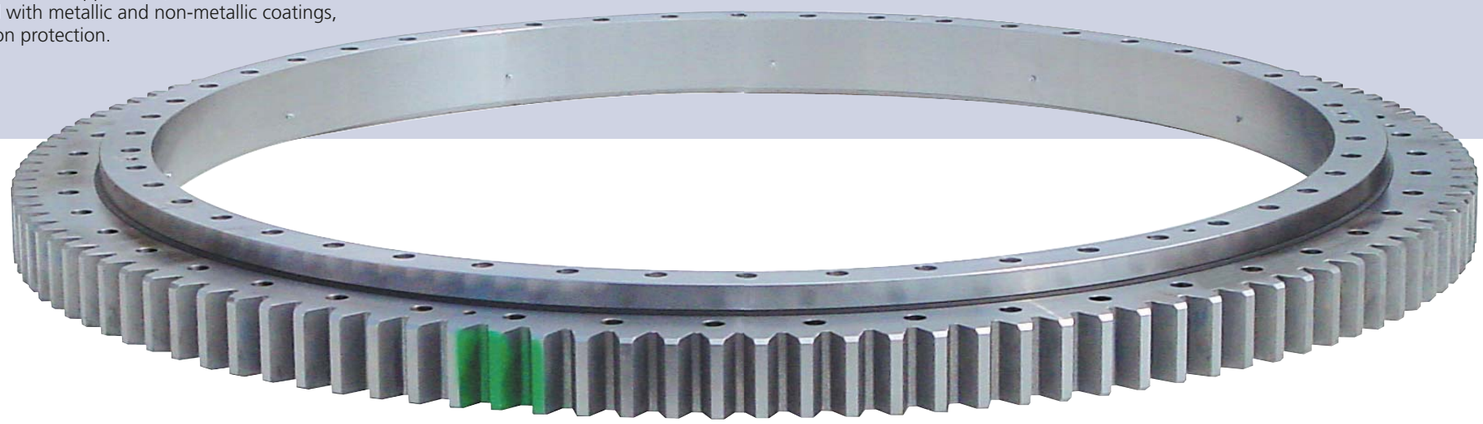
Priming and multi-coat painting

Zinc-coated surface (flame-sprayed)

Metal zinc spraying (flame spraying) on sand-blasted surface

Surface coating

Depending on the requirements of the application, the surfaces of our Slewing Rings can be provided with metallic and non-metallic coatings, which ensure effective corrosion protection.

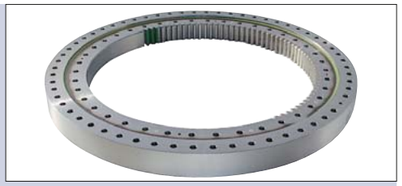


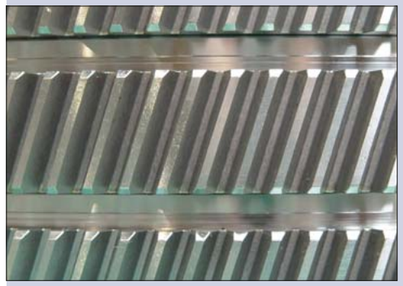
External toothed Slewing Ring, quenched and tempered rings, raceway 3,000 mm, module 20 mm

Gearing

We supply Slewing Rings with internal, external, straight and helical gears, (in various heat treated conditions) as well as untoothed Slewing Rings. The point of maximum runout of the gearing at which the circumferential backlash of the pinion should be adjusted, is marked in green.

Teeth in only one segment

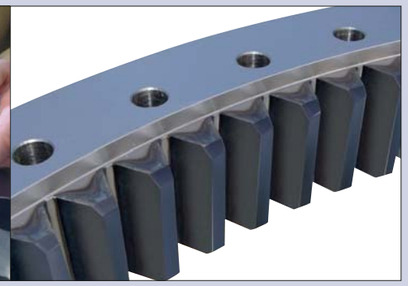




External helical gear, normalized

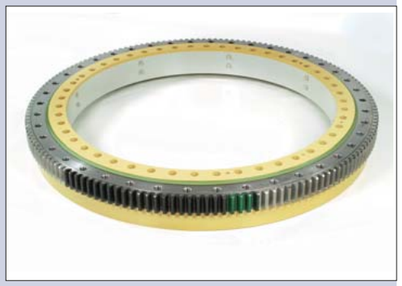
External straight gear, quenched and tempered

We supply modules from 1 to 30 mm (pictured: 3 mm and 20 mm modules)

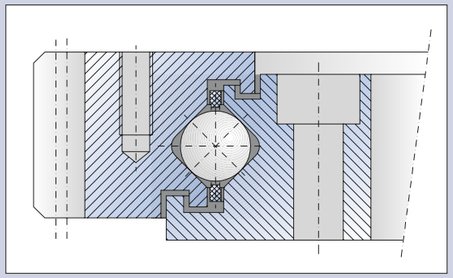


Quenched and tempered ring, induction hardened wear resistant tooth flanks

Hardened tooth flanks and roots



Hardened tooth flanks and roots in only one segment



Special materials

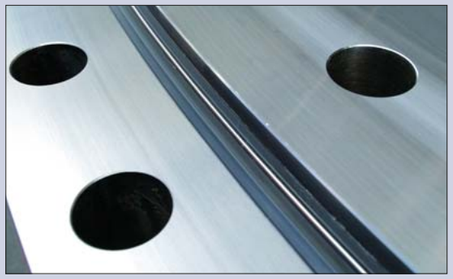
Special Slewing Rings with ceramic balls (dry running), stainless steel rings, square-sectioned raceway (low friction torque) and labyrinth seal.

Ceramic and steel balls

Series 920 Slewing Rings, but with stainless steel rings and rollers

Untoothed Roller / Ball Combination Slewing Ring, outside diameter 4,300 mm

Seals



NBR70 seal fixed with stainless steel wire

Steel plate as primary seal

Rolling element separation

Steel cage segments for a crane Slewing Ring

Brass cage for Ball Slewing Ring with longer service life and higher rotational speed requirements

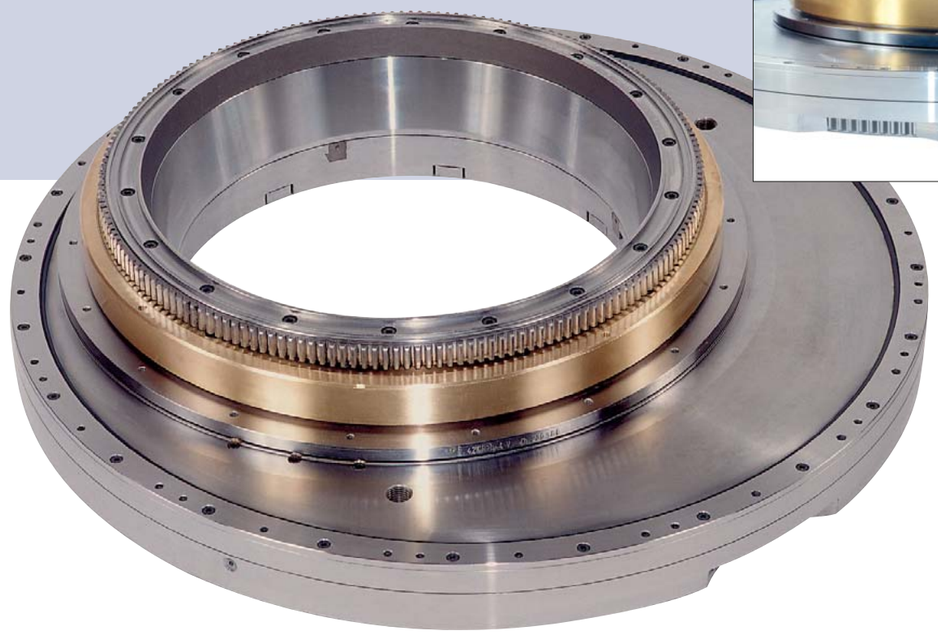
Plastic cage for high circumferential speeds

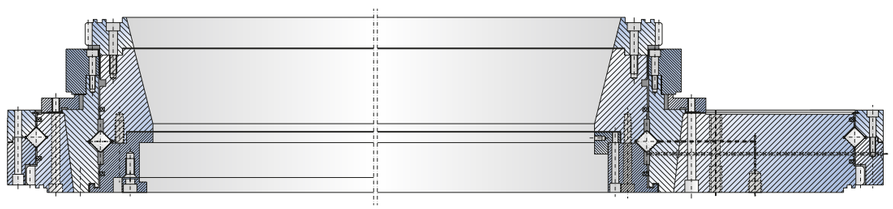
Plastic spacers for low circumferential speeds

Rolling element guided brass roller cage made for horizontal axis rotation

Slewing Rings
Special Designs

"We show what is possible!"

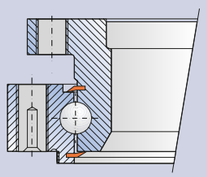


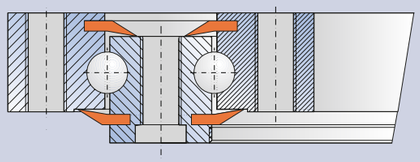


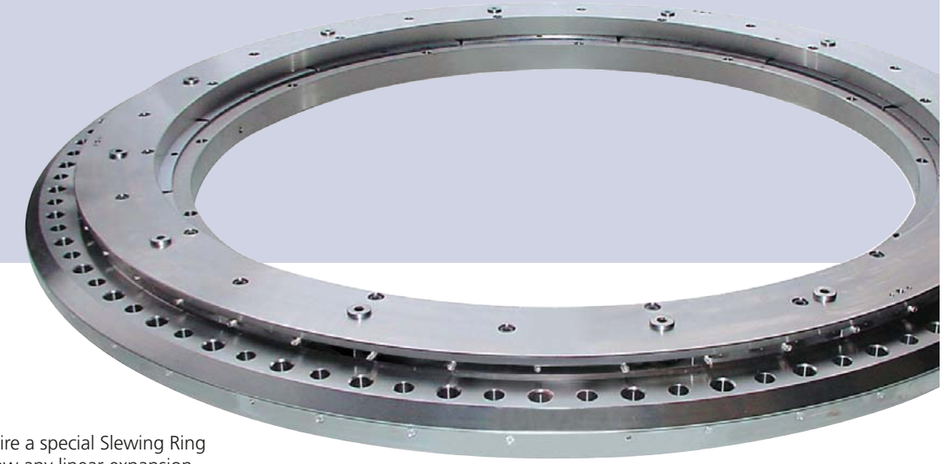
Eccentric bearing unit from a machine tool used for diesel engine crankshaft machining. The bearing unit contains two high precision Cross Roller raceways and one slide bearing. The integrated toothing makes it possible to adjust the eccentricity allowing machining of all crankshaft bearing surfaces in just one operation. The unit has an external diameter of around 1,200 mm (47 in). Completely manufactured by IMO!

Other special designs

- Slewing Rings matched to customer requirements, e.g. custom mounting hole patterns or prototype designs
- Geometry of the Slewing Ring adapted to the installation conditions
- Suitable for extreme temperatures and vacuums
- Special cages for high circumferential speeds
- Special sealing systems for specific applications
- Special lubrication according to customer requirements
- Rings made of special materials

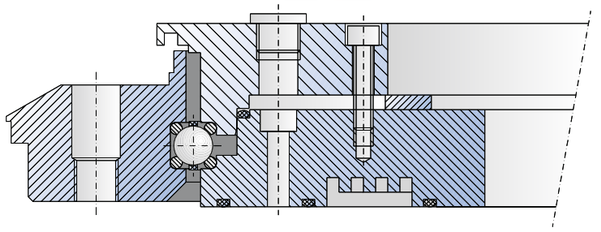






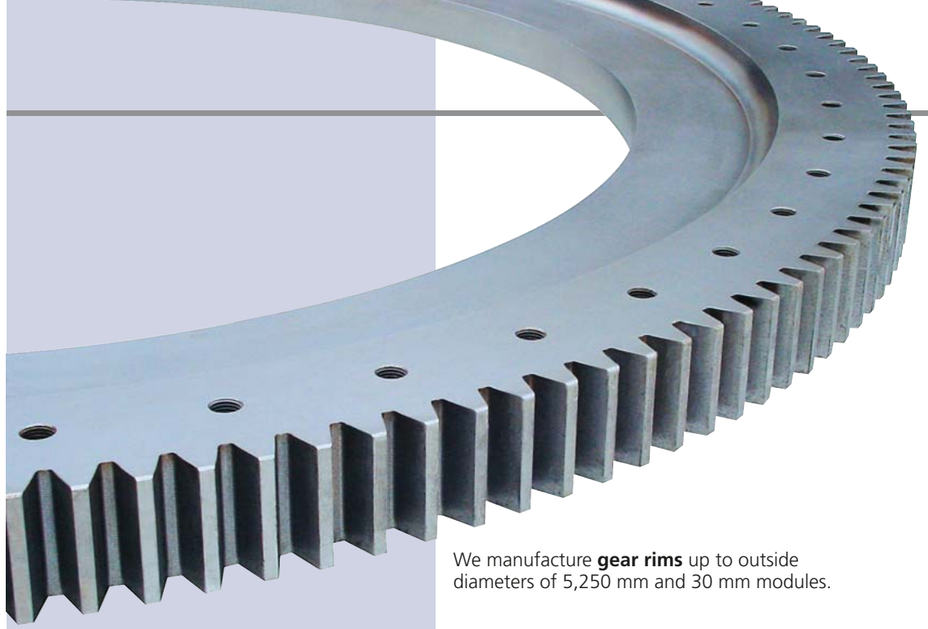
Imagine you require a special Slewing Ring that does not show any linear expansion with temperature increase and no shrinkage as it cools. Do you think this is impossible? Are you sure?

Customer specific **wire race bearing** with rings manufacured from a high nickel rich material with a thermal expansion coefficient of practically zero. Such a bearing was developed and manufactured by IMO!



IMO: "Engineering at its best!"

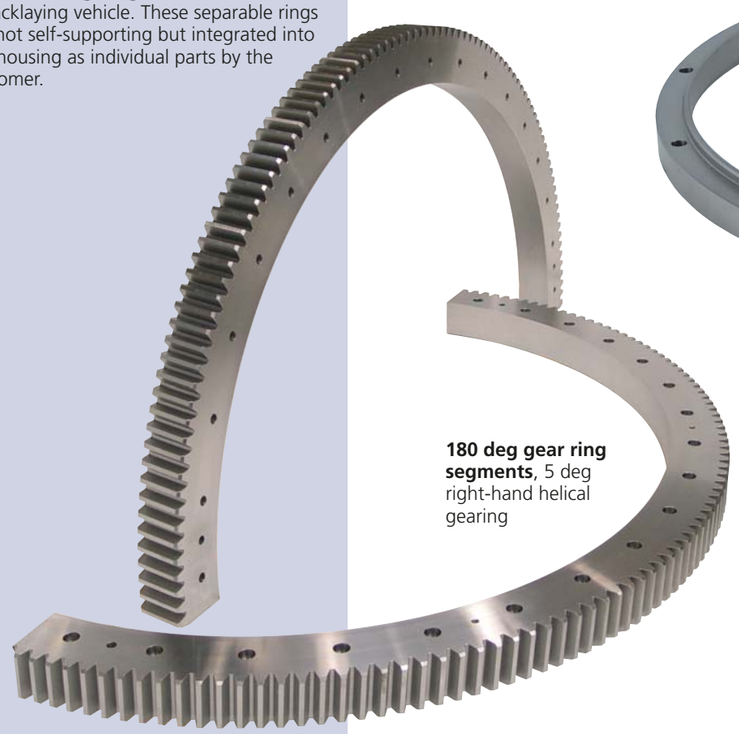
Split Slewing Rings are ideal for situations where a bearing has to be fitted around an existing structure, or where complete dismantling of a machine would be uneconomic. Typical applications are stone compactors, tool magazines and yaw bearings of clarification plants.



We manufacture **gear rims** up to outside diameters of 5,250 mm and 30 mm modules.

Double Row Angular Contact Cylindrical Roller Slewing Ring for the chain wheel of a tracklaying vehicle. These separable rings are not self-supporting but integrated into the housing as individual parts by the customer.

We supply customer specific **pinions** from 12 mm module.



180 deg gear ring segments, 5 deg right-hand helical gearing

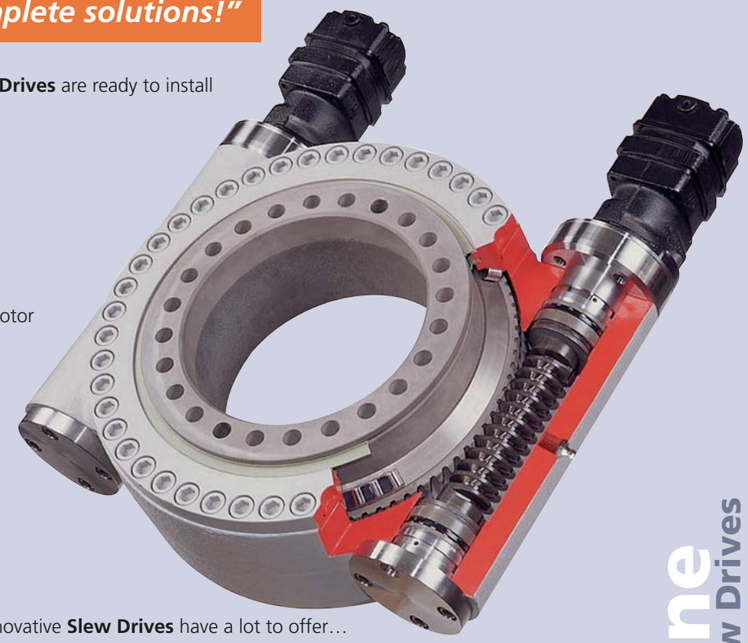
Finish turned and bored **mounting flanges** and **supporting rings** complete our production lines.

"We also supply complete solutions!"

Our **pinion and worm driven Slew Drives** are ready to install system modules consisting of:

- A Ball or Roller Slewing Ring
- Hydraulic or electric motors (direct drive or with gearbox)
- A totally enclosed housing
- Attachments on request (brakes, position feedback sensors)

Bolt on the Slew Drive, connect the motor and start slewing - as simple as that!



IMO's innovative **Slew Drives** have a lot to offer…

- No adjusting of components
- Complete system instead of many single parts
- Compact design
- High output torques thanks to the high gear ratio

… and are used in many applications such as steering gear in special vehicles, hinges in manlift platforms, in cranes and in attachments for stackers and excavators.

You can find our complete standard lines in our **Product Catalog ST104E**. We also supply customized designs. Request a copy of the catalog straight away by E-mail: **PrintedMaterial@goimo.com.**

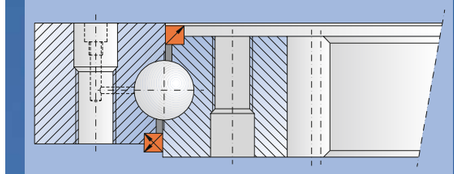
Applications
Wind Energy Turbines

IMO Slewing Rings - approved for use in arctic conditions (operation down to -30°C, proof of structural integrity under load at -40°C)

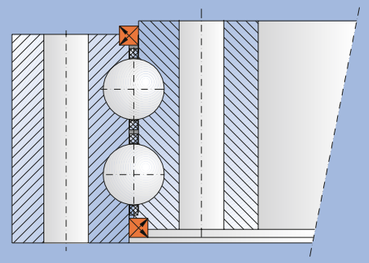
Offshore - the future!

Assembly of a Blade Bearing on the hub.

The nacelle with Yaw Bearing already attached, is lowered onto the turbine tower.

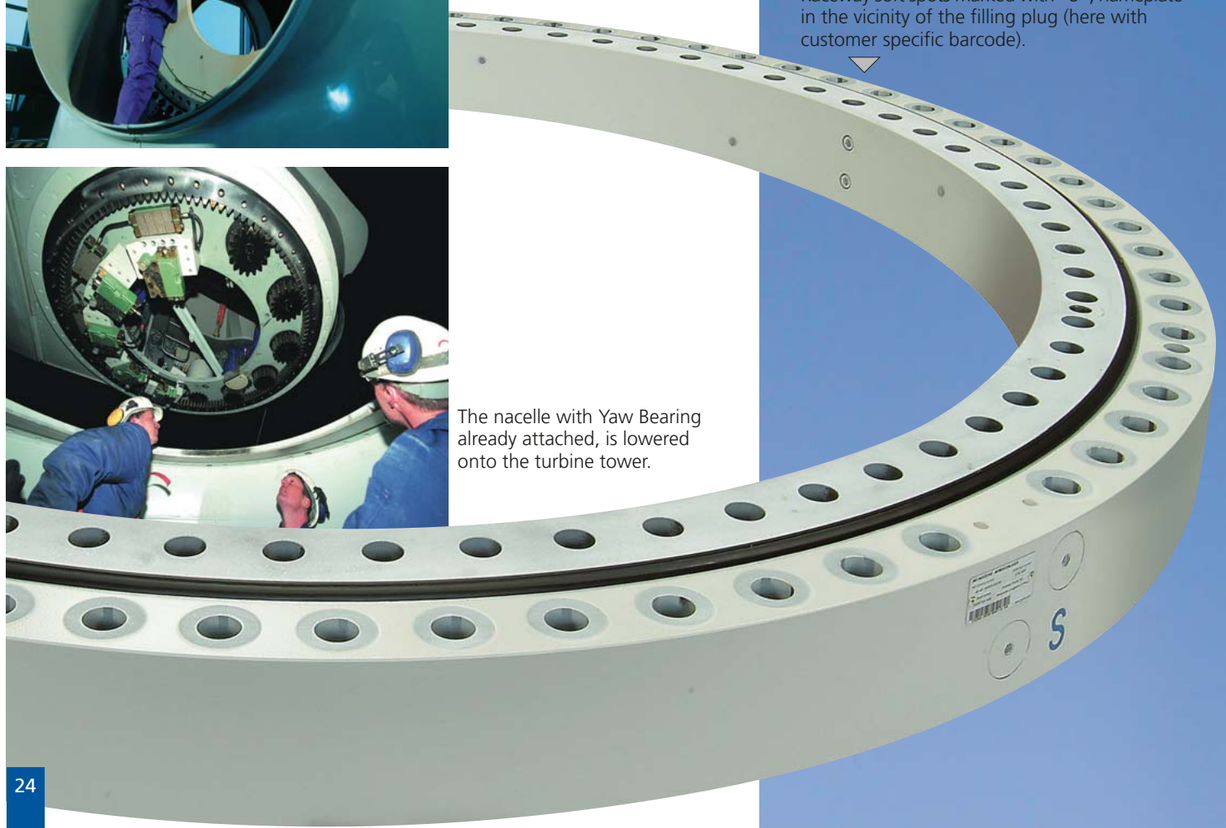


Single Row Ball Slewing Ring, with internal teeth, zinc coated surface (flame-sprayed) and painted. Used on top of the turbine tower as a Yaw Bearing to allow the nacelle and rotor to orientate into wind.



Double Row untoothed Ball Slewing Ring, with cage and special seals, zinc- coated surfaces (flame-sprayed) and painted. Such Slewing Rings are used to adjust the rotor blades (three per wind turbine).

Slewing Ring in delivery condition, unpacked: Raceway soft spots marked with “S”, nameplate in the vicinity of the filling plug (here with customer specific barcode).



A wind energy turbine with a rotor diameter of 82 m and a power of 1.65 MW. This turbine can provide electric power for 1,200 homes. IMO develops Slewing Rings for such wind energy turbines with the latest equipment according to recognized procedures. The calculation is carried out according to the relevant regulations from Germanischer Lloyd, the DNV and other well-known certifying authorities.

Applications
Cranes And Manlift Platforms

Shipboard cranes

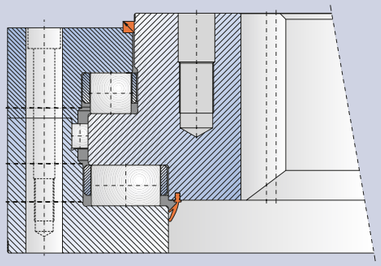
Harbour cranes, mobile harbour cranes

Railway slewing cranes

Manlift platforms, mobile cranes

Specifications:

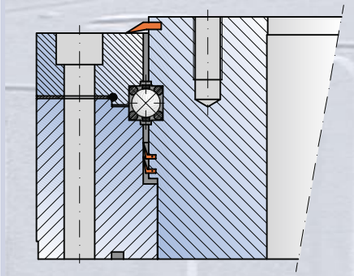
- Outside diameter 5,000 mm
- Support roller diameter 50 mm
- Maximum permissible tilting moment 65,000 kNm
- Module 24 mm
- Weight 8,500 kg



Triple Row Roller Slewing Ring with an outside diameter of about 5,000 mm and root and flank hardened internal toothing. This Slewing Rings for an Indonesian harbour pontoon crane was manufactured and shipped by IMO in only 8 weeks.

Applications
Offshore And FPSOs

FPSOs (Floating Production Storage Offloading) are oil processing ships which pump crude oil from the bottom of the sea by injecting high-pressure media. The ship 'weather vanes' around a swivel incorporating a Triple Row Roller Slewing Ring.



Special Slewing Rings (wire race bearing) with stainless steel rings for a slip ring assembly on an FPSO. A highly accurate and very narrow bearing gap ensures the necessary EExd - explosion pressure protection. In the case of an explosion on the upper side of the wire race bearing there must be no possibility of ignition sparks penetrating through the bearing and causing a secondary detonation on the lower side.

Ball Slewing Ring with root and flank hardened external toothing for a ship`s thruster on a vessel. The stamp by Lloyd's Register of Shipping can be clearly seen. Together with BRÜCK we are able to fulfill the specifications of all the leading certifying authorities.

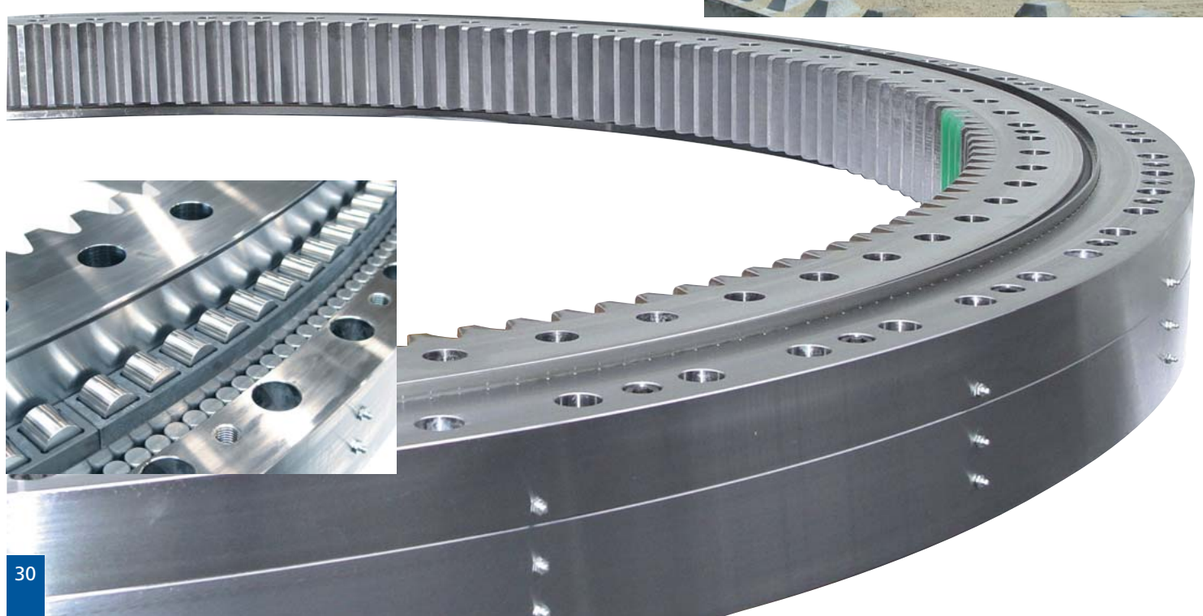
Slewing Rings for offshore applications are always subject to special approval requirements from the respective certifying authority. The rolled rings must demonstrate a notched bar impact strength of an average of 42 J at -20°C.

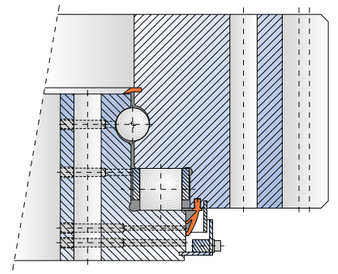
The picture below shows the final assembly of a Triple Row, internal toothed Roller Slewing Ring for a large offshore crane.

This stacker on board of a ship is swivelled by means of an internal toothed, Triple Row Roller Slewing Ring.

Specification:
- Outside diameter 3,250 mm
- Maximum tilting moment 13,000 kNm

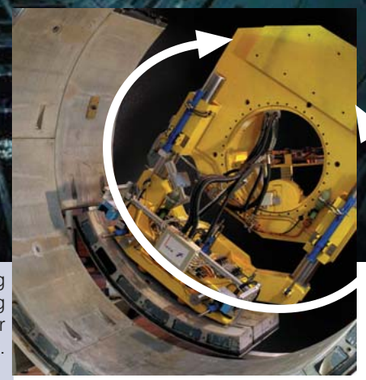
Bulk materials handling in the harbour is carried out by stackers and reclaimers, which are equipped with external toothed, Roller / Ball Combination Slewing Rings with raceways in a diameter range of 4 to 5 m.



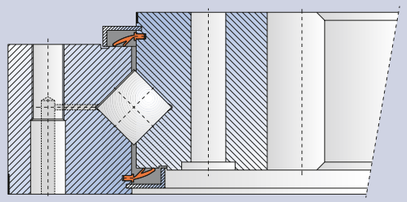


Specification:
- Stacker reclaimer with 80 m boom
- Outside diameter 4,300 mm
- Roller diameter 40 mm, ball diameter 32 mm
- Maximum axial force 4,000 kN
- Maximum swivelling moment 6,000 kNm

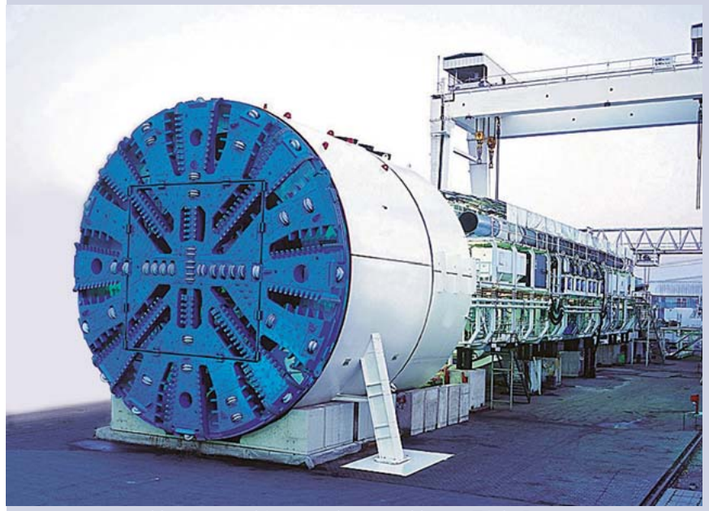
Applications
Tunnel Boring Machine (TBM)



The erector uses a Cross Roller Slewing Ring for lifting and positioning the concrete lining segments (Tubbing) which are used for strengthening the tunnel walls.



Specification:
- Raceway diameter 4,500 mm
- Outside diameter 4,700 mm
- Roller diameter 40 mm
- Double lip seals with primary labyrinth



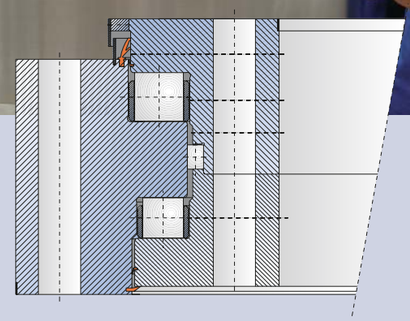
Tunnel boring machines use large and heavy Triple Row Roller Slewing Rings in cutting heads.

Triple Row Roller Slewing Ring for a micro tunnel boring machine.

IMO

Applications
Foundries And Steelworks

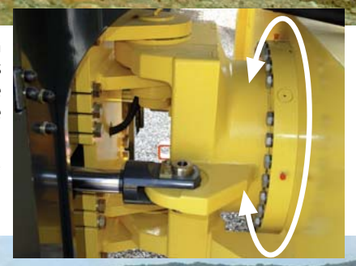
We manufacture Triple Row Roller Slewing Rings for cover swing gears of electric arc furnaces (so-called EAFs, picture above) as well as Triple Row Roller Slewing Rings for ladle turrets (picture below).



Applications
Construction Machinery

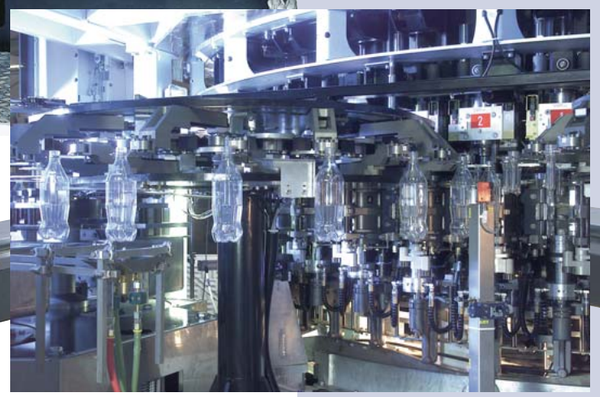
Tandem asphalt compaction rollers use untoothed Slewing Rings as steering bearings, which are coated to prevent corrosion.

Ball Slewing Rings with a horizontal rotating axis are used in the knuckle joint of the refuse compactor.

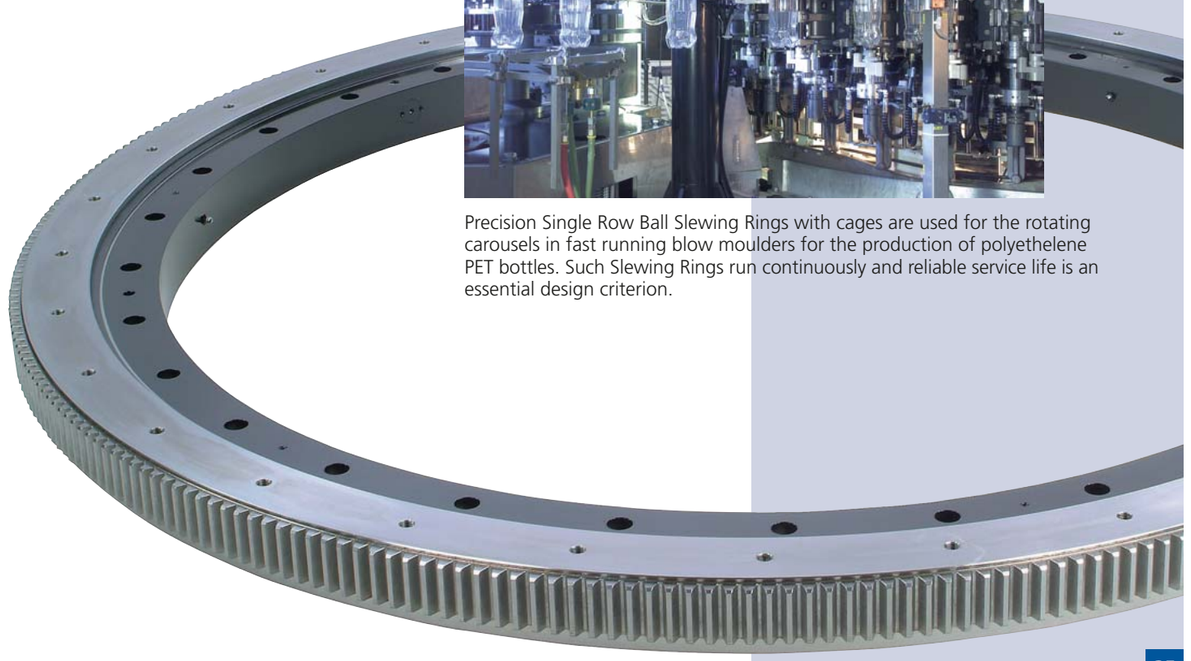


The Ball Slewing Ring shown has special seals and compensates for the relative rotational movements of the split rollers (the actual rollers).

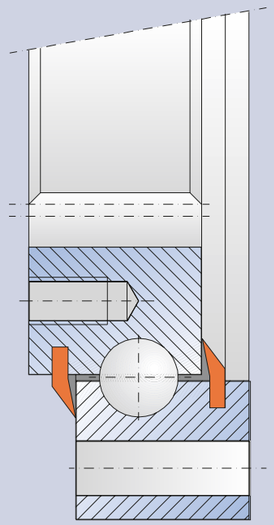
Applications
Special Purpose Machinery



Precision Single Row Ball Slewing Rings with cages are used for the rotating carousels in fast running blow moulders for the production of polyethelene PET bottles. Such Slewing Rings run continuously and reliable service life is an essential design criterion.

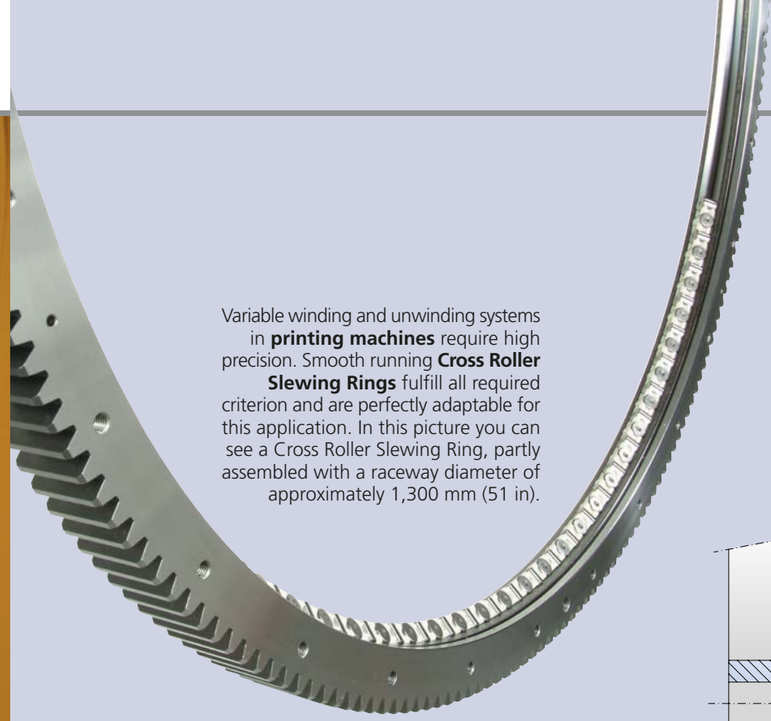


Applications
Medical Technology

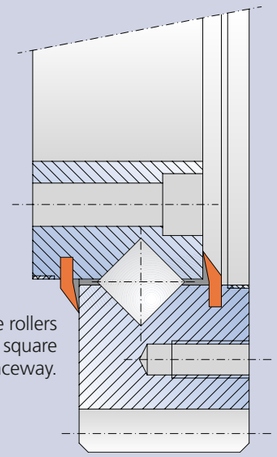


Linear accelerators are used in oncology for radiation therapies. The Ball Slewing Rings with horizontal rotational axes have to be highly precise with a minimum of running noise and friction torque.

Applications
Special Mechanical Engineering



Variable winding and unwinding systems in **printing machines** require high precision. Smooth running **Cross Roller Slewing Rings** fulfill all required criterion and are perfectly adaptable for this application. In this picture you can see a Cross Roller Slewing Ring, partly assembled with a raceway diameter of approximately 1,300 mm (51 in).



In **Cross Roller Slewing Rings**, the rollers are arranged crosswise and run in a square sectioned raceway.

Technical Information

Symbols and units

C_{ax}	kN	Basic axial dynamic load rating
C_{axT}	kN	Basic axial dynamic load rating, supporting raceway
C_{axH}	kN	Basic axial dynamic load rating, retaining raceway
C_{rad}	kN	Basic radial dynamic load rating
C_{0ax}	kN	Basic axial static load rating
C_{0axT}	kN	Basic axial static load rating, supporting raceway
C_{0axH}	kN	Basic axial static load rating, retaining raceway
C_{0rad}	kN	Basic radial static load rating
D_L	mm	Raceway diameter of rolling elements (see Product Overview)
D_W	mm	Diameter of rolling elements
f_a	—	Application service factor
F_{ax}	kN	Axial load including all occurring shock loads and required safety factors, calculated from all axial forces
F_{axD}	kN	Equivalent axial load including application service factor for determining the load point in the limiting load diagram
F_{rad}	kN	Radial load including all occurring shock loads and required safety factors, calculated from all radial forces
F_{radD}	kN	Equivalent radial load including application service factor for determining the load point in the limiting load diagram
F_{radZ}	kN	Radial load from gearing circumferential force
$F_{rad\ max}$	kN	Limit value for checking frictional contact
F_{sp}	kN	Initial preload on bolt
F_z	kN	Available tooth force
$f_{z\ norm}$	kN	Permissible gearing circumferential force for tooth base fatigue strength
$f_{z\ max}$	kN	Maximum permissible gearing circumferential force against overload fracture
G	kg	Mass (weight)
H	mm	Overall height of Slewing Ring
i	—	Gear ratio
m	mm	Module
M_k	kNm	Tilting moment, including all occurring impact loads and required safety factors, calculated from all axial and radial forces that cause the tilting effect
M_{kD}	kNm	Equivalent tilting moment including application service factor for determining the load point in the limiting load diagram
M_W	Nm	Friction torque of the Slewing Ring under operating load in the installed state
M_{WA}	Nm	Friction torque of the Slewing Ring, unloaded
n	rpm	Rotational speed of Slewing Ring
n_b	—	Number of mounting holes per bearing ring
n_{max}	rpm	Maximum rotational speed of Slewing Ring
n_{perm}	rpm	Permissible rotational speed of Slewing Ring
S_0	—	Required static raceway safety
S_{0rad}	—	Existing static safety of radial raceway
SF	—	Safety factor against tooth base fracture
x_1	—	Pinion addendum modification coefficient
x_2	—	Slewing Ring addendum modification coefficient
z_1	—	Number of pinion teeth
z_2	—	Number of Slewing Ring teeth (wheel)
α_A	—	Bolt tightening factor
δ_f	mm	Circumferential backlash of gearing
δ_k	mm	Tilting clearance increase
$\delta_{k\ perm}$	mm	Maximum permissible tilting clearance increase
δ_p	mm	Maximum permissible flatness deviation
δ_v	mm	Maximum permissible deformation of mounting structure
δ_w	mm	Maximum permissible perpendicularity deviation

Function

Construction and function of a Slewing Ring

Slewing Rings consist of an internal and external ring (1) and (2) with an integrated raceway system and optional internal or external toothing (3). A functional seal (4) protects the raceway system on the upper and lower sides. Slewing Rings are designed for grease lubrication which is carried out via grease nipples (5).

In Slewing Rings, the rolling elements (6) carry the loads between the inner and outer ring. The load capacity of the raceway system is determined predominantly by the raceway design, the hardening depth, and the number and size of the rolling elements. Spacers (7) separate the rolling elements and minimise friction and wear. The rolling elements are inserted during manufacture through the filling plug hole (8), retained by the filling plug which is then secured by a pin (9). The force is transmitted to the mounting structure by bolts. Through holes or threaded holes (10) can be provided in the inner and outer rings for these bolts.

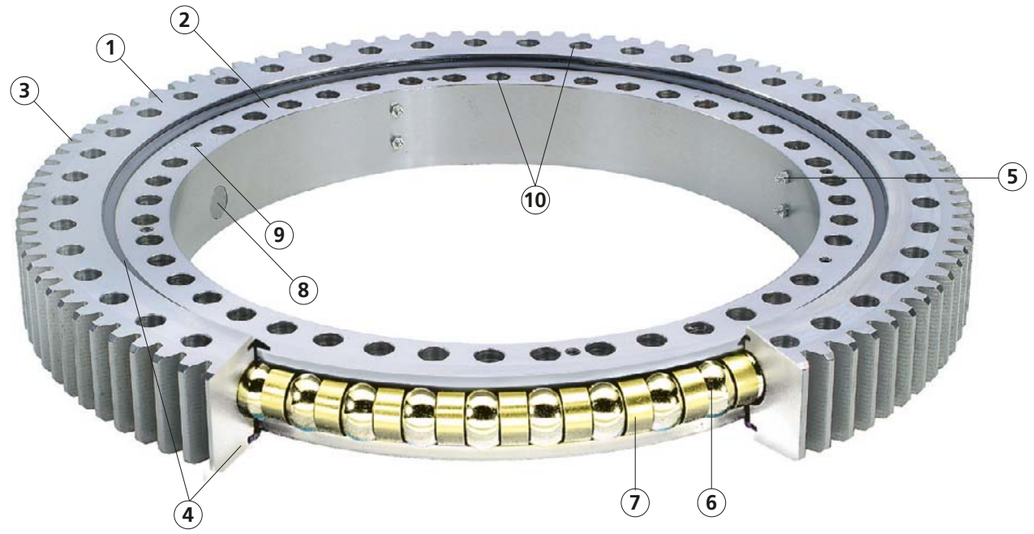


Figure 1

Load distribution

Depending on external load, the load distribution and the contact angle around the rolling elements will vary.

- In the case of axial load, all rolling elements are loaded in the same direction
- In the case of radial load, a segment of the rolling elements carries the load
- In the case of tilting moment load, a segment on one side and a segment on the opposite side of the raceway carry the load
- Mostly, a combination of axial, radial and tilting moment loads occur (Fig. 2).

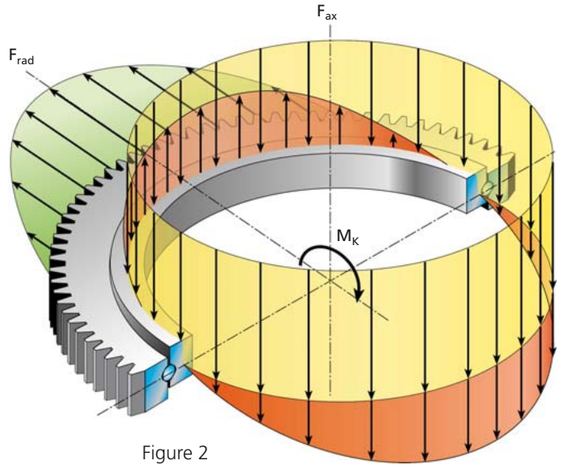
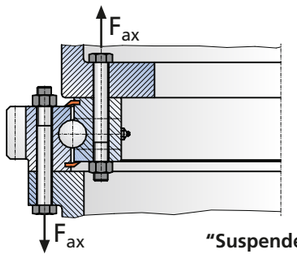


Figure 2

- 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



"Suspended" loads

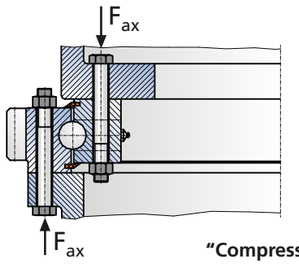
- Radial loads must be transmitted by means of frictional contact between Slewing Ring and the attached mounting structure.

- 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



"Compressive" loads

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: Slewing Rings of all series can be used with exception of series 120, 920 and 932. It is important to note that for above series the permissible rotational speed is limited to half the permissible value for the rotational speed of the vertical rotational axis.

Alternating: Here the same conditions apply as for a horizontal rotational axis.

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 on page 43.

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, 920 and 932 Slewing Rings: $n_{perm} = \frac{40000}{D_L}$

With horizontal axis of rotation: $n_{perm} = \frac{20000}{D_L}$

Series 125 and150 Slewing Rings: $n_{perm} = \frac{40000}{D_L}$

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

Series 532 and 540 Slewing Rings: $n_{perm} = \frac{40000}{D_L}$

Series 840 and 850 Slewing Rings: $n_{perm} = \frac{40000}{D_L}$

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:

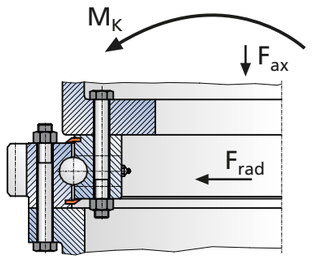
- Hardening depth of the raceway
- Number and size of the rolling elements
- Slewing Ring design
- Raceway geometry

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
- Minimum strength of mounting structure 500 N/mm²
- Radial loading considered as specified
- Compliance with " Installation and Maintenance Instructions", p. 50

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	Remarks
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	Precision required
Robots / mech. handling sys.	1.50	Precision required
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 S_0 for the existing loads are to be taken account of in the following equations:

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

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.

$$F_{radZ} = \frac{F_z}{\cos 20°}$$

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

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

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

This equation applies only if:

$$(F_{rad} + F_{radZ}) \leq 220 \bullet \frac{M_k}{1000} + 0.5 \bullet F_{ax}$$

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

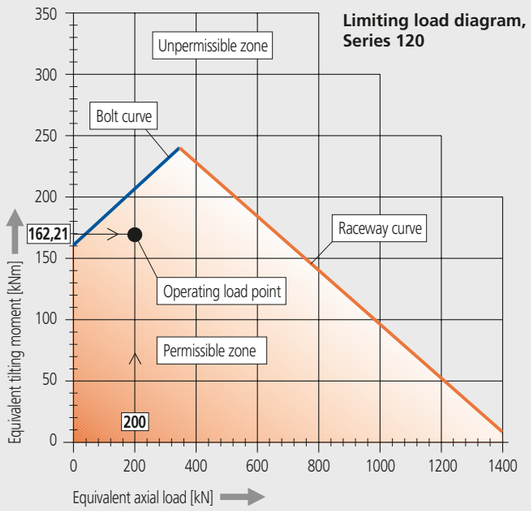
The following values are achieved with an application service factor of 1.25:

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

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

$$M_{kD} = 120 \bullet 1.25 + 1.73 \bullet 7.5 \bullet \frac{941}{1000} = 162.21 \text{ kNm}$$

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 (α_A = 1.6). You can find the tightening torques in our Installation and Maintenance Instructions, p. 50. If there are other conditions please talk to our Engineering Department.
- Bolts above M30 should be tightened with an hydraulic tightening device to 85% of the yield point. Details on this can be found in our Installation and Maintenance Instructions, p. 50.
- 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.

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

When a customer desires that the mounting bolts shall be secured, we recommend the following products (manufacturer specification is valid):

Loctite ®
Application of Loctite 270 is suitable for the highest level of connections. This prevents loosening and provides thread sealing.
Please observe the instructions and requirements of the manufacturer when using this product.

Nord-Lock ®
Nord-Lock, self-locking washers, are recommended for cases of vibration or dynamic loading cycles.
Due to a pair of square tapered washers with tapered surface gradients between both Nord-Lock securing washers greater than the gradient of the bolt threads, any loosening tendency of the bolt is immediately prevented.
Please observe the instructions and requirements of the manufacturer when using this product.

Other bolt securing systems are not approved.

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 $f_{z\ max}$ are calculated with a safety factor against fracture of 2, the values for $f_{z\ norm}$ are calculated with SF=1 with respect to the tooth base fatigue. The pinion is thereby taken into account as hardened and grounded with z_1=17 and x_1=0.5.
In the Series 120 and 920 the safety factor against fracture is 1.5 and the values for $f_{z\ norm}$ 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.

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

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

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

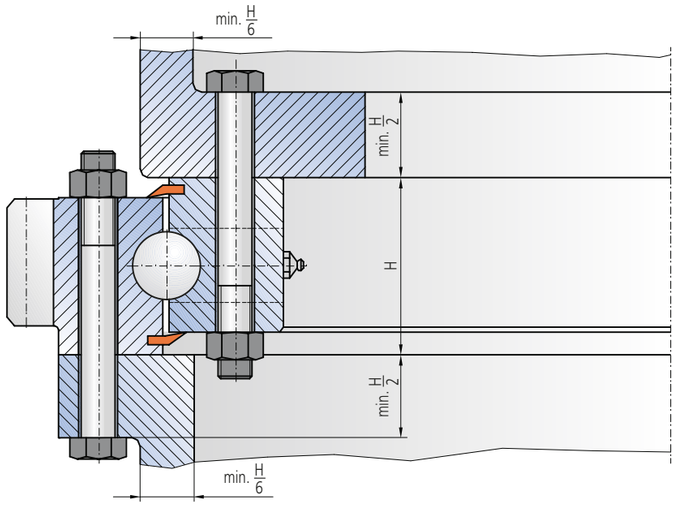
Greases with different thickeners and / or base oils should generally not be mixed. The manufacturer should always confirm if different grease types can be mixed.

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 and Maintenance Instructions)
- Maintain flatness according to Installation and Maintenance Instructions
- 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/mm²

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 and Maintenance Instructions".

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

Are all values in the permissible range

No

Yes

Selection completed

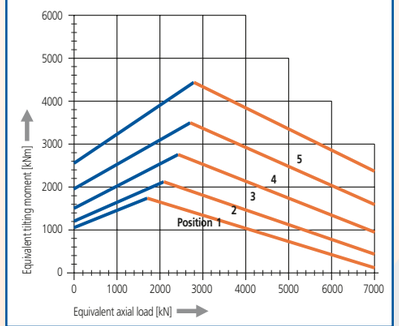
We recommend that the Slewing Ring selection is checked at IMO.
Please fill in the Application Data sheet on page 134 and provide a sketch of the application.

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	++	++	++	++	++	++	○	○	○	○	○	+	+	+	+	++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)

No liability accepted

Checking of the raceway and bolt connection



Checking of gearing

Drawing number	Position	Dimensions and weight: Outside diameter, outer ring D_a [mm]	Inside diameter, inner ring d_i [mm]	Inside diameter, outer ring D_i [mm]	Outside diameter, inner ring d_a [mm]	Weight [kg]	Mounting holes: Pitch circle diameter, outer ring L_a [mm]	Pitch circle diameter, inner ring L_i [mm]	Number of holes per pitch circle n [-]	Gearing and tooth forces: Pitch circle diameter d_0 [mm]	Module [mm]	Number of teeth z2 [-]	Addendum modification coeff. x [-]	Permissible tooth force $f_{z\,norm}$ [kN]	Maximum permissible tooth force $f_{z\,max}$ [kN]	Load ratings: Static $C_{0\,rad}$ [kN]	Static $C_{0\,ax\,T}$ [kN]	Static $C_{0\,ax\,H}$ [kN]	Dynamic C_{rad} [kN]	Dynamic $C_{ax\,T}$ [kN]	Dynamic $C_{ax\,H}$ [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

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.

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

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.

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]

No liability accepted

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 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 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 42 to check whether frictional contact is present.

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:
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 rpm

Special requirements:
Internal toothed design, no special precision required.
Diameter range about 1500 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 9 12-25 1255 / 1-03250

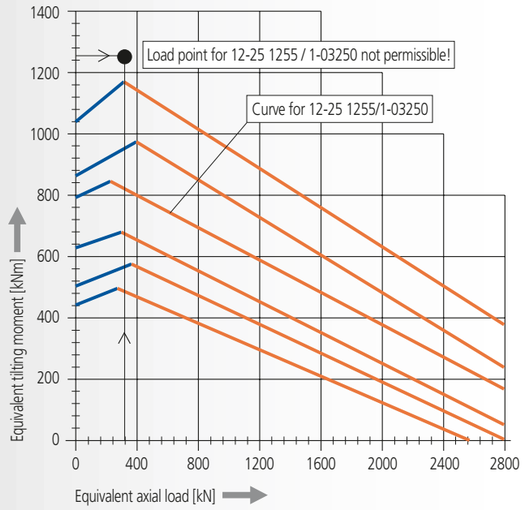
F_{axD} = 268 • 1.25 • 1.1 = 368.50 kN

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

$$M_{kD} = 670 \bullet 1.25 \bullet 1.1 + 1.73 \bullet 156.8 \bullet \frac{1250}{1000} = 1261.7 \text{ kNm}$$

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 is type 32-20 1400 / 2-06760.

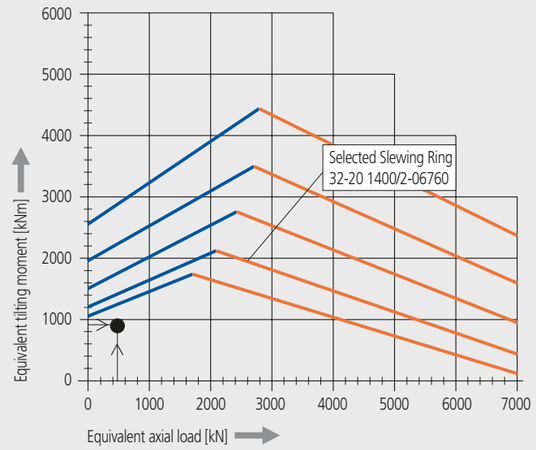
F_{axD} = 268 • 1.25 • 1.1 = 368.50 kN

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

M_{kD} = 670 • 1.25 • 1.1 = 921.3 kNm

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 1400 / 2-06760 is in the permissible zone, the next smaller size can also be used.

Static safety factor for the radial series (C_{0rad} = 698 kN) under radial load and the radial components of the tooth force:

$$S_{0rad} = \frac{698}{\left(47 + \frac{63}{\cos 20°}\right) \bullet 1.1 \bullet 1.25} = 4.45$$

The permissible tooth force $f_{z\,max}$ is 269 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 / 1400 = 14.3 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.

Preface

The following instructions give you all the information you need to be able to correctly install and maintain an IMO Slewing Ring.

All instructions are provided with a revision number. Installation and Maintenance Instructions with preceding revision numbers are invalid. The latest version is published on our homepage and can be downloaded from there in numerous languages (www.goimo.com). Please always check that you are working with the latest revision!

These instructions shall be attached to your product or to the final product or to the Installation and Maintenance Instructions. All work steps listed here are to be executed by suitably qualified personnel.

Please do not hesitate to contact our Engineering Department for any further assistance.

IMO accepts no liability for:

1. Non-compliance with Installation and Maintenance Instructions.
2. Failure to pass on content to third party.

Notice

The following text includes special notices and procedures that shall be observed.
The technical properties of Slewing Rings are to be found in our product catalogue or in the technical offer.

Contents

0. Transport, handling and storage provisions

0.1 Transport, handling and storage

1. Installation

1.1 Preparation for installation
1.1.1 Cleaning the Slewing Ring and the mounting structure
1.1.2 Determining permissible deviations and deformations of mounting structure
1.1.3 Lubricating of the Slewing Ring
1.1.4 Choice of mounting bolts
1.1.5 Choice of tightening torques
1.1.6 Tightening the bolts with a hydraulic tightening device

1.2 Installing the Slewing Ring
1.2.1 Positioning the Slewing Ring
1.2.2 Securing the Slewing Ring with bolts
1.2.3 Determining the existing tilting clearance
1.2.4 Setting the backlash
1.2.5 Operating test

2. Maintenance / safety checks and lubrication

2.1 Checking the mounting bolts
2.2 Checking the tilting clearance
2.3 Relubrication
2.4 Relubrication intervals
2.5 Lubricants
2.6 Dismantling the bearing

0. Transport, handling and storage provisions

0.1 Transport, handling and storage

Transport only in horizontal position. Impacts shall be avoided.

Wear work gloves when handling the Slewing Rings.
Slewing Rings are generally provided with threaded holes in which eye bolts can be fixed. This enables safe handling on a hoisting device. Please observe the relevant legal regulations when doing this.

Slewing Rings must be transported with the hoisting device connected to three uniformly distributed lifting points around the perimeter. Internal factory transport and installation shall only take place in a horizontal position. Transport crosses must be left in the Slewing Ring until it is properly installed.

Store only in horizontal position in closed rooms, if stacked there must be a stable intermediate layer. The corrosion protection coating has a shelf-life of approx. 3 months in closed packaging. Longer storage periods require special protective measures.
If in doubt, please contact IMO.

1. Installation

1.1 Preparation for installation

1.1.1 Cleaning the Slewing Ring and the mounting structure

1. Remove extraneous material from supporting surfaces (including paint residues, welding beads, burr formation).
2. Clear corrosion protection coating from supporting surfaces of the Slewing Ring.

In doing this, ensure that:

- Cleaning material does not penetrate into the Slewing Ring.
- Applicable provisions are observed (e.g. manufacturer provisions, protection of workers, environmental protection etc.).
- Cleaning material that attacks the sealing material is not used.

Applicable cleaning materials:
Cold solvents (e.g. white spirit, diesel oil, Kaltryl KEV).

1.1.2 Determining permissible flatness deviation δ_P perpendicularity deviation δ_W and permissible deformation δ_V of the mounting surface of the supporting structure

Table 1: Permissible flatness and perpendicularity deviations for standard Slewing Rings
Use the values of Roller Slewing Rings for preloaded Ball Slewing Rings

Raceway diameter [mm]		250	500	750	1000	1250
Flatness including perpendicularity deviation per supporting surface [mm]	Ball	0.08	0.10	0.13	0.15	0.18
	Roller	0.06	0.08	0.09	0.10	0.11

Raceway diameter [mm]		1500	1750	2000	2500	3000
Flatness including perpendicularity deviation per supporting surface [mm]	Ball	0.20	0.23	0.25	0.30	0.35
	Roller	0.13	0.14	0.15	0.17	0.20

Raceway diameter [mm]		3500	4000	4500	5000	5500
Flatness including perpendicularity deviation per supporting surface [mm]	Ball	0.40	0.45	0.50	0.55	0.60
	Roller	0.23	0.25	0.28	0.30	0.33

Table 2: Permissible deformation of mounting structure under maximum load for standard Slewing Rings

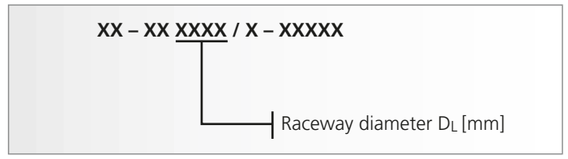
Raceway diameter [mm]		250	500	750	1000	1250
Flatness including perpendicularity deviation per supporting surface [mm]	Ball	0.21	0.27	0.35	0.40	0.48
	Roller	0.16	0.21	0.24	0.27	0.29

Raceway diameter [mm]		1500	1750	2000	2500	3000
Flatness including perpendicularity deviation per supporting surface [mm]	Ball	0.50	0.61	0.67	0.80	0.93
	Roller	0.35	0.37	0.40	0.45	0.48

Raceway diameter [mm]		3500	4000	4500	5000	5500
Flatness including perpendicularity deviation per supporting surface [mm]	Ball	1.06	1.20	1.33	1.46	1.59
	Roller	0.60	0.66	0.73	0.79	0.86

For Slewing Rings between the specified sizes the closest smaller value shall be taken. For Slewing Rings larger than the largest diameter, the value for the largest diameter given shall be used.

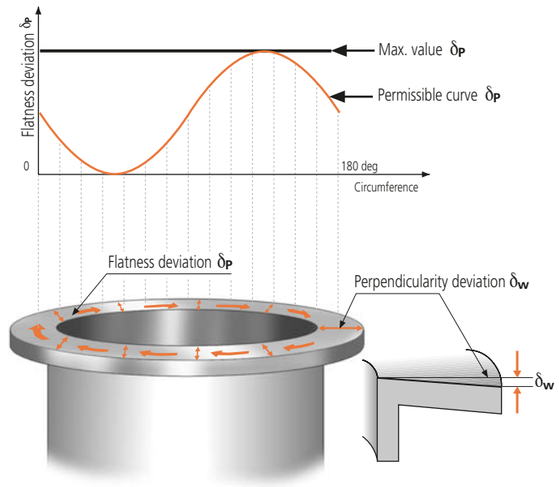
The size of the raceway diameter D_L can be taken from our identity number.



Permissible perpendicularity deviation δ_W (tilting) is based on the actual flange width and may only amount to one half of the values in Table 1.

The maximum residual value for flatness deviation δ_P (waviness) along the circumference may total to only once per 180 deg. The form must resemble a sine curve that gradually rises and falls.

Sketch: Permissible curve of flatness deviation of the mounting structure and flatness and perpendicularity deviations on the mounting structure



1.1.3 Lubricating the Slewing Ring

Slewing Rings are supplied fully lubricated. They shall be greased again prior to initial operation. It is essential to use the greases specified on the delivery drawing. Suitable grease types for normal cases are listed on Table 9.

- Inject grease into all grease nipples one after the other, while rotating the Slewing Ring, until a bead of grease forms at least on one sealing lip.

1.1.4 Choice of mounting bolts

Prescribed sizes, number and quality grades shall be used

- Grip ratio (grip length to diameter of bolt) shall be observed from minimum ≥5 to maximum ≤10.
- Bolts with a fully threaded shaft are not permissible.
- The function and lifespan as well as the durability of the bolt connection are affected in the case of non-compliance.
- If the permissible interfacial pressure is exceeded, use suitable washers of appropriate size and strength.
- Do not reuse bolts, nuts and washers.

Table 3: Permissible interfacial pressure for different materials

Materials	Max. surface pressure in N/mm²
St50 / C45N / 46Cr2N / 42CrMo4N	420
46Cr4V / 42CrMo4V	700

1.1.5 Choice of tightening torques

Mounting bolts are in normal cases adequately secured by correct preloading.

- Mounting bolts can be secured by Loctite. Nord- Lock bolt lock washers may be necessary in case of shock or vibration.
- Use of split rings, split washers etc. is not permissible.
- If washers are used ensure that they are of the correct strength class.

Table 4: Tightening torques and bolt tension forces for regular metric threads according to DIN13

Mounting bolt dimension	Tension cross-section A_S mm²	Core cross section Ad3 mm²	Tightening torque M_A[1] in Nm bolt strength class			Mounting initial preload F_M[2] in kN strength class		
			8.8	10.9	12.9	8.8	10.9	12.9
M4	8.78	7.75	2.25	3.31	3.87	4.05	5.95	6.96
M5	14.2	12.7	4.61	6.77	7.92	6.63	9.74	11.4
M6	20.1	17.9	7.80	11.5	13.4	9.36	13.7	16.1
M8	36.6	32.8	19.1	28.0	32.8	17.2	25.2	29.5
M10	58.0	52.3	38.0	55.8	65.3	27.3	40.2	47.0
M12	84.3	76.2	66.5	97.7	114	39.9	58.5	68.5
M14	115	105	107	156	183	54.7	80.4	94.1
M16	157	144	168	246	288	75.3	111	129
M18	192	175	229	336	394	91.6	134	157
M20	245	225	327	481	562	118	173	202
M22	303	282	450	661	773	147	216	253
M24	353	324	565	830	972	169	249	291
M27	459	427	837	1230	1439	223	328	384
M30	561	519	1131	1661	1944	271	398	466

[1] M_A according to VDI guideline 2230 (February 2003) for μ_K= 0.08 and μ_G= 0.12
[2] F_M according to VDI guideline 2230 (February 2003) for μ_G= 0.12

1.1.6 Tightening the bolts with a hydraulic tightening device

We recommend the use of a hydraulic tightening device for mounting bolts above M30.

Table 5: Bolt tension forces for using a hydraulic tightening device on regular metric threads according to DIN 13.

Mounting bolt dimension	Tension cross-section A_S mm²	Core cross section Ad3 mm²	Mounting initial preload F_M[1] in kN strength class		
			8.8	10.9	12.9
M24	353	324	198	282	324
M27	459	427	258	367	422
M30	561	519	314	448	515
M33	694	647	389	554	637
M36	817	759	458	653	750
M39	976	913	547	780	896
M42	1121	1045	629	896	1029
M45	1306	1224	733	1043	1199
M48	1473	1377	826	1177	1352
M52	1758	1652	986	1405	1614
M56	2030	1905	1139	1622	1864
M60	2362	2227	1325	1887	2168
M64	2676	2520	1501	2138	2457
M68	3055	2888	1714	2441	2804

[1] F_M for hydraulic tensioning device with preload to 85% of tensile limit

1.2 Installing the Slewing Ring

1.2.1 Positioning the Slewing Ring

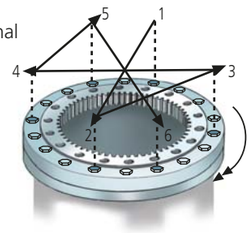
1. Determine the main load-carrying zone.
2. For all Slewing Rings the soft spot of the Slewing Ring raceway shall be placed at a 90 deg point to the maximum load zone. The soft spot is designated with a filling plug or a punched "S" mark.
3. With a gauge, check whether the supporting surface of the Slewing Ring is fully supported by the mounting structure.

1.2.2 Securing the Slewing Ring with bolts

The Slewing Ring shall be mounted in the unloaded condition. First the toothless bearing ring is attached and then the gear bearing ring.

The following procedure shall be followed in order to avoid deviations between the bolt tightening forces:

1. Lightly lubricate bolt threads in order to ensure uniform frictional resistance (does not apply to bolt locking devices with adhesive).
2. Preload the bolts, including washers, if required, cross-wise in 3 steps with 30%, 80%, 100% of the tightening torque or the hydraulically-applied pretension force.



3. Thereby rotate the unbolted ring several times. Repeat the procedure for the bearing ring which has not yet been bolted.

When applying a hydraulic fastening device, the tightening forces for preloading shall not exceed 90% of yield stress. The values given in Table 5 correspond with 85% of yield stress.

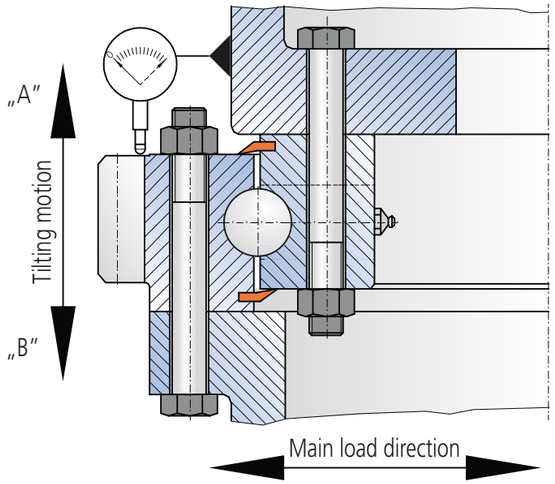
1.2.3 Determining the existing tilting clearance

The tilting clearance increases with raceway wear. To determine the increase in tilting clearance, it is necessary to take basic measurements after installation prior to putting the Slewing Ring into operation for the first time.

- Permanently designate the measuring point in the main load direction.
- Record all measured values.

Procedure

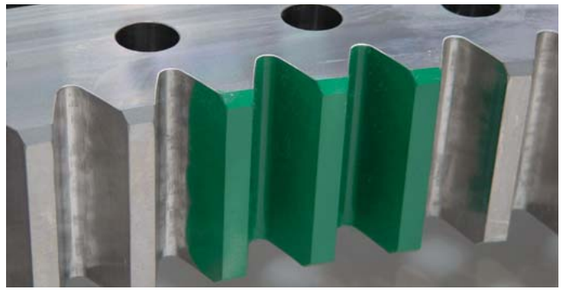
Tilting clearance measurement



1. Determine and mark the measuring point, if possible in the main load direction, on all bearing rings.
2. Attach the dial gauge – see sketch.
3. Apply the defined tilting torque, minimum 50% of the maximum operational load in "A" direction.
4. Set the dial gauge to zero.
5. Apply the defined tilting torque, minimum 50% of the maximum operational load in "B" direction.
6. The measured value displayed corresponds to the tilting clearance and serves as a basis for comparison for later inspections.

- All subsequent measurements are performed at the same measuring point, with the same loads, at the same position of the bearing rings relative to one another and in the same sequence.
- All the measured values are to be recorded.
- For purely axial or radial loads, tilting clearance is inspected by applying an additional tilting load.

1.2.4 Setting the backlash



In the case of geared Slewing Rings the backlash shall be set during the mounting procedure. The narrowest point of the gearing is marked in green for this purpose.

The set value is: δ_f = 0,03 to 0,04 x m

A gauge shall be used to measure the backlash. If deviations from the specified values are established the axis spacing shall be corrected by moving the pinion. Afterwards the Slewing Ring shall be rotated by one complete turn making sure that no narrow points occur.

Table 6: Permissible backlash

Module m in mm	4	5	6	8	10
Perm. backlash δ_f in mm	0.12 - 0.16	0.15 - 0.20	0.18 - 0.24	0.24 - 0.32	0.30 - 0.40
Module m in mm	12	14	16	18	20
Perm. backlash δ_f in mm	0.36 - 0.48	0.42 - 0.56	0.48 - 0.64	0.54 - 0.72	0.60 - 0.80
Module m in mm	22	24	25	28	30
Perm. backlash δ_f in mm	0.66 - 0.88	0.72 - 0.96	0.75 - 1.00	0.84 - 1.12	0.90 - 1.20

1.2.5 Operating test

If the mounting bolts are properly tightened, then the Slewing Ring shall rotate uniformly. Deviations of the mounting structure and the effect of external loads can strongly impact the friction torque.

1. Rotate the mounted Slewing Ring several times.
2. Check whether the Slewing Ring runs smoothly without jumping.
3. Perform further test runs under full load.

After the operating test, recheck the tightening torques of the mounting bolts.

2. Maintenance / safety checks and lubrication

2.1 Checking mounting bolts

To compensate for possible settling, it is necessary to retighten the bolts to the prescribed torque. This shall be done after no more than 100 hours of operation and without external load applied to the bolt connection.

The inspection shall be repeated after every 700 hours in operation or at least every 6 months. The inspection period shall be reduced under special operating conditions. In case of loose bolts, nuts and washers, replace all bolts, nuts and washers with new ones.

2.2 Checking the tilting clearance

Raceway wear leads to increased tilting clearance. It is therefore necessary to check the tilting clearance after 700 operating hours, or at the latest after 6 months.

Checking the increase in tilting clearance δ_K directly on the Slewing Ring

For the procedure to check increase in the tilting clearance, see P. 53.
The value (m1) determined after installation of the Slewing Ring is considered as the basic value and is deducted from the measured value (mx). The difference between mx and m1 may not exceed 0.45 mm.

$\delta_K = mx - m1 \quad \leq \delta_K$ perm

δ_K perm = according to Table 7

Checking the increase in tilting clearance δ_K not directly on Slewing Ring

The increase in tilting clearance is to be converted proportionally for each measurement (after the installation measurement) and compared with δ_K permissible.

For both checks:

- Reduce the inspection intervals to 200 operating hours if the measured increase in tilting clearance amounts to approx. 75% of the maximum permissible increase in tilting clearance.
- Reduce the inspection intervals once again after further increase in tilting clearance (to 50 – 100 operating hours).
- Replace the Slewing Ring if the maximum permissible increase in tilting clearance is reached.

The limits for δ_K permissible are given in the following table at which the Slewing Ring must always be exchanged.

Table 7: Supporting clearance

Rolling element diameter [mm]	12	16	20	25	32	40
Ball supporting clearance δ_K [mm]	1.02	1.16	1.30	1.48	1.72	2.00
Roller supporting clearance δ_K [mm]	0.18	0.25	0.32	0.40	0.52	0.65

Rolling element diameter [mm]	45	50	60	70	80	100
Ball supporting clearance δ_K [mm]	2.18	2.35	2.70	3.05	3.40	4.10
Roller supporting clearance δ_K [mm]	0.74	0.82	0.99	1.16	1.33	1.67

2.3 Relubrication of Slewing Ring

Grease types specified in the delivery drawing shall be used. Substitute lubricants which can be mixed together can be found in Tables 9 & 10.

Legal and manufacturer provisions about handling the respective lubricants must be observed.

2.3.1 Raceway system

1. Inject grease into all cleaned grease nipples one after the other while rotating the Slewing Ring, until a bead of fresh grease forms at least on one sealing lip or at the bearing gap.
2. Ensure that old grease can flow out of the Slewing Ring freely.
3. If possible continue to rotate the Slewing Ring.

2.3.2 Gear

1. Apply grease to the teeth of the Slewing Ring with a clean brush. Instead of a brush the grease can also be sprayed on, or applied by means of a suitable lubricating device (e.g. a lubricating pinion).
2. Remove excess and used grease. Adhesive lubricants have proved to be particularly effective in open gearing.

2.4 Relubrication intervals

Relubrication intervals depend mainly on the prevailing operating and environmental conditions as well as the version of the Slewing Ring.
Exact relubrication intervals can only be determined by tests under operating conditions.
In case no comparative results are available, the following table can be used for reference values.

Rotate the bearing rings during regreasing. Follow the accident prevention regulations while doing this.

Table 8: Lubricating intervals

Work conditions	Lubrication intervals
Dry and clean workshop (turntables / robots etc.)	approx. every 300 operating hours, or once every 6 months
Difficult conditions in open ground (crane / bulldozer etc.)	every 100 to 200 operating hours, or once every 4 months
Aggressive climatic conditions - sea/desert/ Arctic climate / very dirty environments / more than 70 operating hours per week	every 50 operating hours, or once every 2 months
Extreme conditions (tunnelling /steelmills / wind turbines)	Continuous lubrication (by central lubrication system or lubricators)

The specified values given are valid for the following conditions:

- Operating temperature on Slewing Ring in the range from – 25°C to 70°C
- Circumferential velocity in the permissible ranges
- Low to medium loads

The table can never replace values established through experience; the most frequent cause of failure of Slewing Rings is insufficient lubrication!

Slewing Rings shall generally be relubricated:

- after every cleaning, e.g. spraying off with water, washing system etc, before and after long inactive periods, e.g. for cranes and construction machines during winter months.

Cleaning the Slewing Ring with a steam jet or high-pressure cleaner is not permissible!

2.5 Lubricants

Lubricants for the raceway system

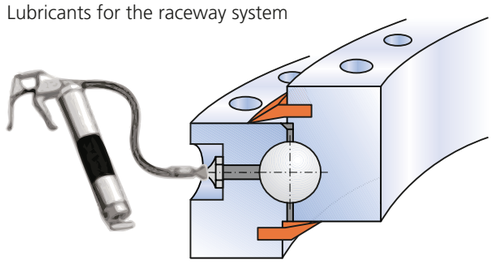


Table 9: Lubricants for the raceway

Supplier	Product name	Applicable temperature range
Aral	Aralub HLP 2	-30°C to + 120°C
Bechem	High-Lub L 2 EP	-20°C to + 120°C
BP	Energrease LS-EP 2	-20°C to + 120°C
Elf	Epexelf 2	-30°C to + 120°C
ExxonMobil	Mobilith SHC 460	-30°C to + 130°C
Klüber	Centoplex 2 EP	-20°C to + 130°C
Rhenus	Norlith MZP 2	-30°C to + 130°C
Shell	Alvania EP (LF) 2	-25°C to + 130°C

Lubricants for the gear

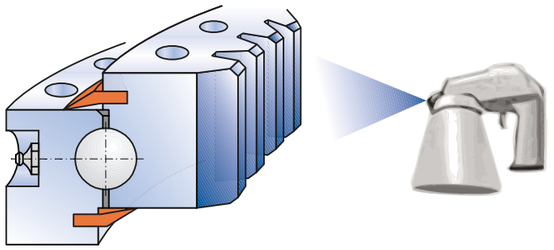


Table 10: Lubricants for the gear

Supplier	Product name	Applicable temperature range
Aral	Aralub LFZ 1	-20°C to + 120°C
Bechem	Berulit GA 400	-20°C to + 180°C
BP	Energol WRL	-20°C to + 120°C
Elf	Caloris 23	-15°C to + 160°C
ExxonMobil	Mobiltac 81	-20°C to + 120°C
Klüber	Grafloson CA 901	-20°C to + 180°C
Rhenus	Norplex AKG 0	-20°C to + 200°C
Shell	Aeroshell Grease 14	-54°C to + 93°C
Manke	Voler Compound 2000E	-40°C to + 120°C

2.6 Checking the seals

Within the course of maintenance work it is also essential to check the seals. Damaged seals must be exchanged. To obtain replacement seals please contact IMO and have the complete drawing number ready. The replacement seals can be cut to the required length and installed with simple tools.

2.7 Dismantling the bearing

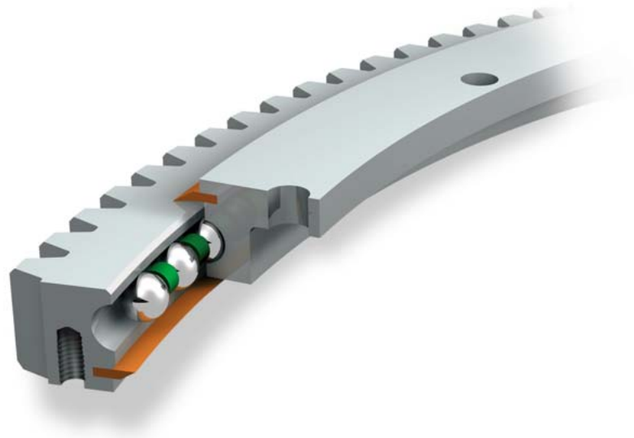
If it is found that the limits of tilting clearance have been exceeded during an inspection according to 2.2, the Slewing Ring must be exchanged. It is thereby necessary to proceed in the general sense in the reverse order to that for installation.

Slewing rings shall be disposed of according to the materials of the individual components and are not taken back by the manufacturer. The corresponding environmental regulations shall be strictly observed during their disposal.

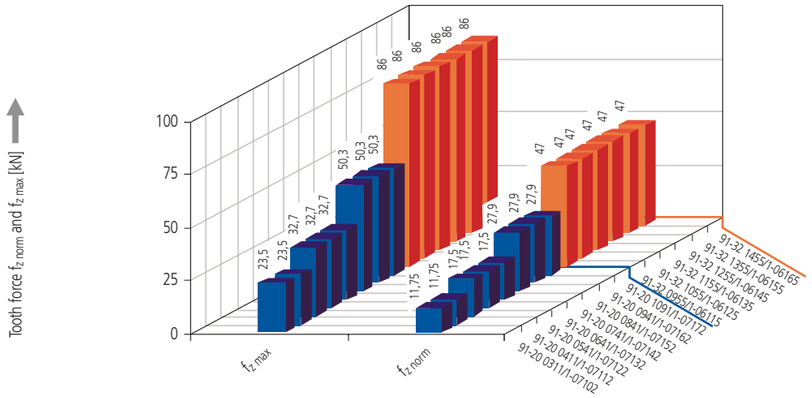
Series Overview - Ball Slewing Rings with flange rings

90 – 20 0311 / 0 – 07002

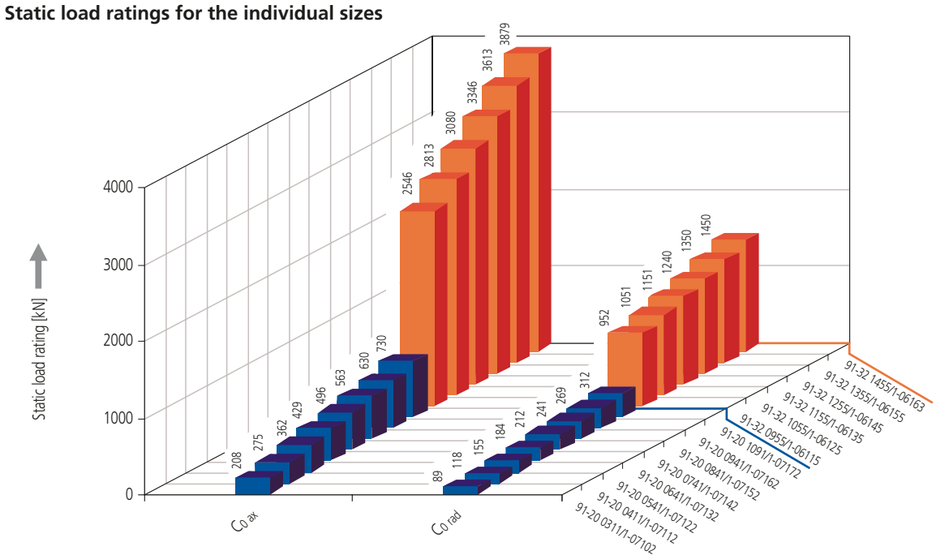
- **Drawing reference number**
- **Gearing heat treatment**
  - **0**: Untoothed
  - **1**: Normalized
- **Raceway diameter [D_L in mm]**
- **Rolling element diameter [D_w in mm]**
- **Gear type:**
  - **0**: Untoothed
  - **1**: External toothed
  - **2**: Internal toothed
- **Bearing design**
  - **9**: Ball Slewing Ring with flange rings



Permissible tooth force for the individual sizes



Static load ratings for the individual sizes



Operating conditions

Permissible temperature range -25°C to +70°C
Maximum permissible rotational speed n_{perm} = 40000 / D_L
With a horizontal rotational axis n_{perm} = 20000 / D_L
(D_L = raceway diameter)
"Compressive" load
Bolt grade 10.9

Typical applications

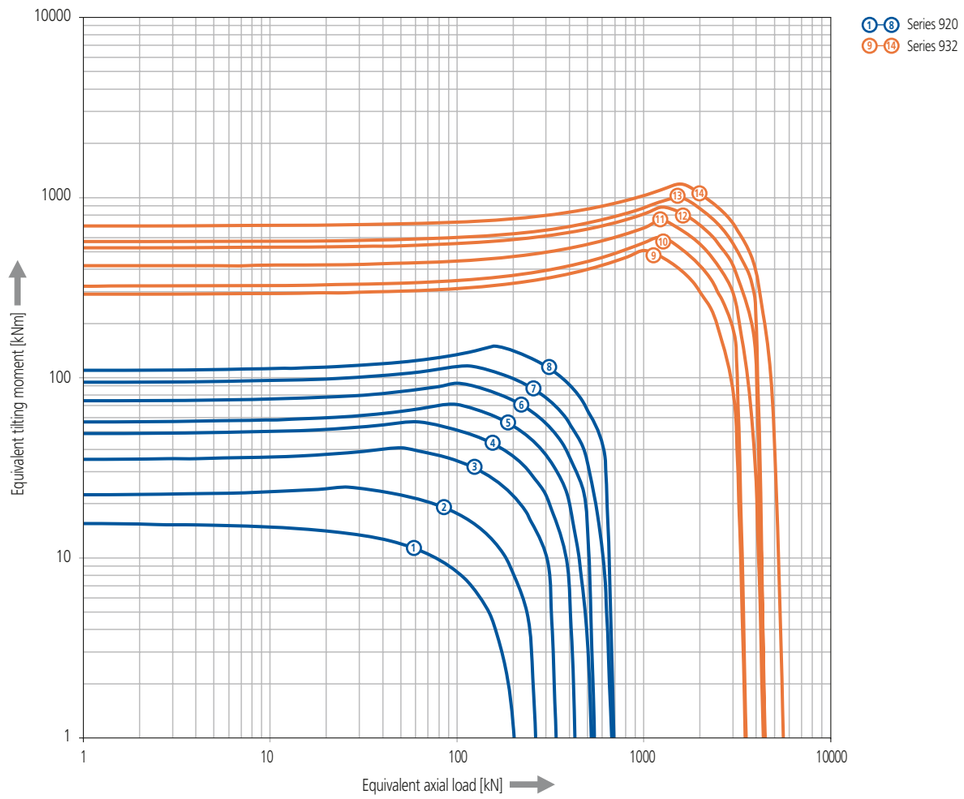
Simple turntables, slewing mechanisms, bogies, light cranes and construction machinery.

Characteristics

- Robust design for rough mounting structure
- Cost-optimized design
- Ideally suitable for applications with low precision requirements
- For Series 920 precision versions are available

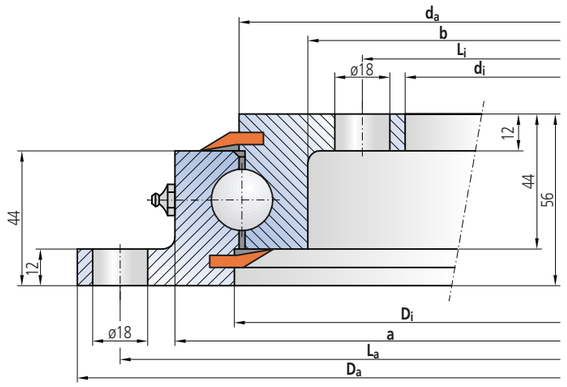
Limiting load diagrams, series 920 / 932

Please refer to the explanations in the Technical Information section of the catalog.



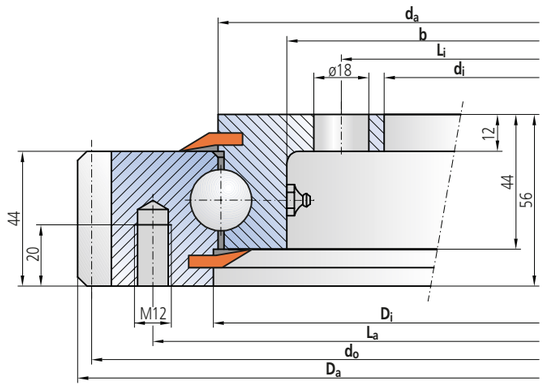
Untoothed

Drawing number	Position	Dimensions and weight: Outside diameter, outer ring D_a [mm]	Inside diameter, inner ring d_i [mm]	Inside diameter, outer ring D_i [mm]	Outside diameter, inner ring d_a [mm]	Diameter, outer ring a [mm]	Diameter, inner ring b [mm]	Weight G [kg]	Mounting holes: Pitch circle diameter, outer ring L_a [mm]	Number of holes, outer ring n_a [-]	Pitch circle diameter, inner ring L_i [mm]	Number of holes, inner ring n_i [-]	Load ratings Static: $C_{o\,rad}$ [kN]	$C_{o\,ax}$ [kN]	Dynamic: C_{rad} [kN]	C_{ax} [kN]
90-20 0311/0-07002	1	418	204	315.5	312.5	353	269	19	390	8	232	12	89	208	140	140
90-20 0411/0-07012	2	518	304	415.5	412.5	453	369	25	490	8	332	12	118	275	156	156
90-20 0541/0-07022	3	648	434	545.5	542.5	583	499	33	620	10	462	14	155	362	173	174
90-20 0641/0-07032	4	748	534	645.5	642.5	683	599	40	720	12	562	16	184	429	184	185
90-20 0741/0-07042	5	848	634	745.5	742.5	783	699	46	820	12	662	16	212	496	194	195
90-20 0841/0-07052	6	948	734	845.5	842.5	883	799	52	920	14	762	18	241	563	204	205
90-20 0941/0-07062	7	1048	834	945.5	942.5	983	899	58	1020	16	862	20	269	630	213	214
90-20 1091/0-07072	8	1198	984	1095.5	1092.5	1133	1049	68	1170	16	1012	20	312	730	224	225



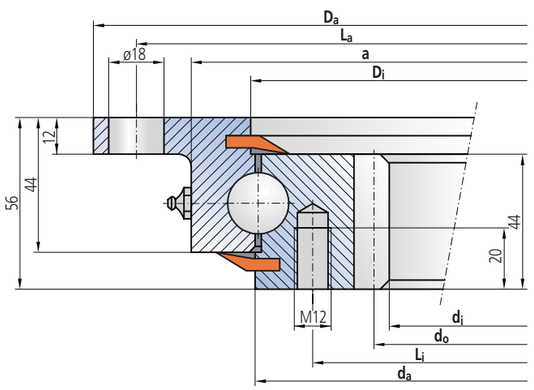
External toothed

Drawing number	Position	Dimensions and weight: Outside diameter, outer ring D_a [mm]	Inside diameter, inner ring d_i [mm]	Inside diameter, outer ring D_i [mm]	Outside diameter, inner ring d_a [mm]	Diameter, inner ring b [mm]	Weight G [kg]	Mounting holes: Pitch circle diameter, outer ring L_a [mm]	Number of holes, outer ring n_a [-]	Pitch circle diameter, inner ring L_i [mm]	Number of holes, inner ring n_i [-]	Gearing and tooth forces: Pitch circle diameter d_o [mm]	Module m [mm]	Number of teeth z2 [-]	Permissible tooth force $f_{z\,norm}$ [kN]	Maximum permissible tooth force $f_{z\,max}$ [kN]	Load ratings Static: $C_{o\,rad}$ [kN]	$C_{o\,ax}$ [kN]	Dynamic: C_{rad} [kN]	C_{ax} [kN]
91-20 0311/1-07102	1	404.0	204	315.5	312.5	269	23	355	10	232	12	395	5	79	11.75	23.5	89	208	140	140
91-20 0411/1-07112	2	504.0	304	415.5	412.5	369	30	455	10	332	12	495	5	99	11.75	23.5	118	275	156	156
91-20 0541/1-07122	3	640.8	434	545.5	542.5	499	42	585	14	462	14	630	6	105	17.5	32.7	155	362	173	174
91-20 0641/1-07132	4	742.8	534	645.5	642.5	599	53	685	16	562	16	732	6	122	17.5	32.7	184	429	184	185
91-20 0741/1-07142	5	838.8	634	745.5	742.5	699	56	785	18	662	16	828	6	138	17.5	32.7	212	496	194	195
91-20 0841/1-07152	6	950.4	734	845.5	842.5	799	68	885	18	762	18	936	8	117	27.9	50.3	241	563	204	205
91-20 0941/1-07162	7	1046.4	834	945.5	942.5	899	75	985	20	862	20	1032	8	129	27.9	50.3	269	630	213	214
91-20 1091/1-07172	8	1198.4	984	1095.5	1092.5	1049	87	1135	22	1012	20	1184	8	148	27.9	50.3	312	730	224	225

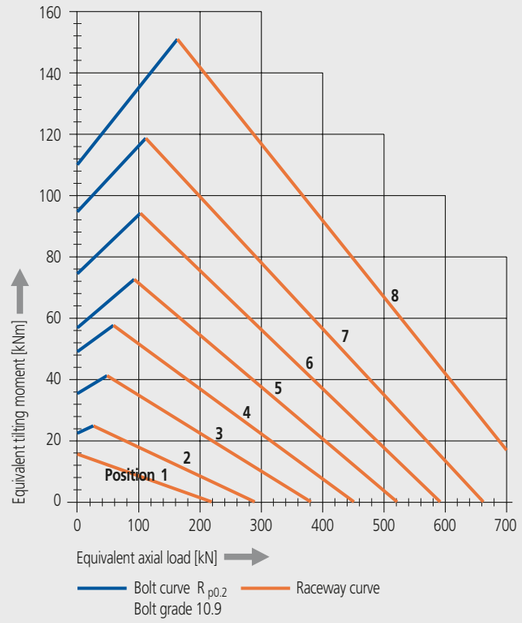


Internal toothed

Drawing number	Position	Dimensions and weight: Outside diameter, outer ring D_a [mm]	Inside diameter, inner ring d_i [mm]	Inside diameter, outer ring D_i [mm]	Outside diameter, inner ring d_a [mm]	Diameter, outer ring a [mm]	Weight G [kg]	Mounting holes: Pitch circle diameter, outer ring L_a [mm]	Number of holes, outer ring n_a [-]	Pitch circle diameter, inner ring L_i [mm]	Number of holes, inner ring n_i [-]	Gearing and tooth forces: Pitch circle diameter d_o [mm]	Module m [mm]	Number of teeth z2 [-]	Permissible tooth force $f_{z\,norm}$ [kN]	Maximum permissible tooth force $f_{z\,max}$ [kN]	Load ratings Static: $C_{o\,rad}$ [kN]	$C_{o\,ax}$ [kN]	Dynamic: C_{rad} [kN]	C_{ax} [kN]
92-20 0311/1-07202	1	418	225	315.5	312.5	353	21	390	8	275	12	235	5	47	11.9	22.7	89	208	140	140
92-20 0411/1-07212	2	518	325	415.5	412.5	453	28	490	8	375	12	335	5	67	11.9	22.7	118	275	156	156
92-20 0541/1-07222	3	648	444	545.5	542.5	583	39	620	10	505	16	456	6	76	17.5	32.9	155	362	173	174
92-20 0641/1-07232	4	748	546	645.5	642.5	683	46	720	12	605	18	558	6	93	17.5	32.9	184	429	184	185
92-20 0741/1-07242	5	848	648	745.5	742.5	783	52	820	12	705	20	660	6	110	17.5	32.9	212	496	194	195
92-20 0841/1-07252	6	948	736	845.5	842.5	883	63	920	14	805	20	752	8	94	28	50.5	241	563	204	205
92-20 0941/1-07262	7	1048	840	945.5	942.5	983	69	1020	16	905	22	856	8	107	28	50.5	269	630	213	214
92-20 1091/1-07272	8	1198	984	1095.5	1092.5	1133	83	1170	16	1055	24	1000	8	125	28	50.5	312	730	224	225



Limiting load diagram for "compressive" loads - **Series 920**



Please adhere strictly to the rules given in the Technical Information section when using above graph!

Radial clearance: 0 - 0.3 mm
Axial tilting clearance: 0 - 0.5 mm
Bearing ring material: C45N
4 Taper type grease nipples on the circumference
Mounting holes equally spaced
Raceway system supplied pre-lubricated
Dimensions without tolerances DIN ISO 2768 coarse

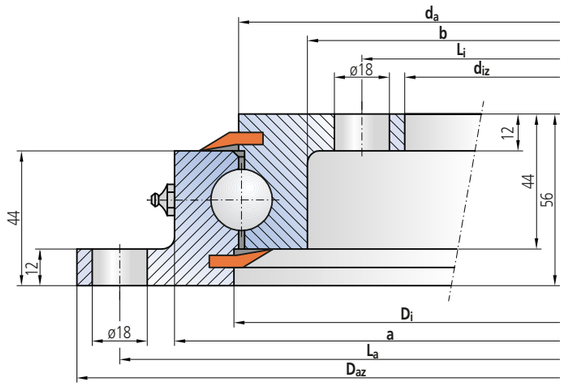
Design variants

If you require something different from the standard design, simply replace the last digit of the corresponding drawing number as follows:

90-20 0311/0-0700	**2**	**Standard design**
	1	= Reduced clearance radial clearance: 0 - 0.1 mm axial tilting clearance: 0 - 0.21 mm
	4	= Bearing rings without holes
	6	= Double number of holes
	7	= Backlash-free bearing with preload

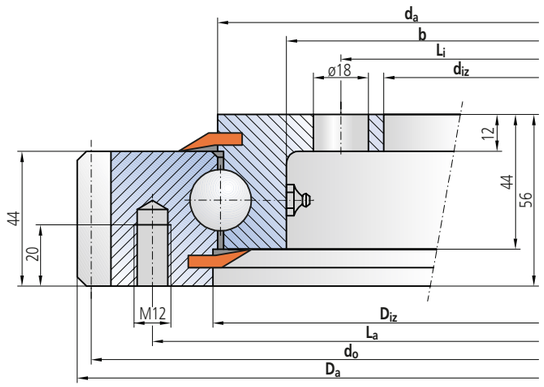
Untoothed

Drawing number	Position	Dimensions and weight: Outside diameter, outer ring, spigot D_{aZ} [mm]	Inside diameter, inner ring, spigot d_{iZ} [mm]	Inside diameter, outer ring D_i [mm]	Outside diameter, inner ring d_a [mm]	Diameter, outer ring a [mm]	Diameter, inner ring b [mm]	Weight G [kg]	Mounting holes: Pitch circle diameter, outer ring L_a [mm]	Number of holes, outer ring n_a [-]	Pitch circle diameter, inner ring L_i [mm]	Number of holes, inner ring n_i [-]	Load ratings Static: $C_{o\,rad}$ [kN]	$C_{o\,ax}$ [kN]	Dynamic: C_{rad} [kN]	C_{ax} [kN]
90-20 0311/0-07003	1	417-0.10	205+0.07	315.5	312.5	353	269	19	390	8	232	12	89	208	140	140
90-20 0411/0-07013	2	517-0.11	305+0.08	415.5	412.5	453	369	25	490	8	332	12	118	275	156	156
90-20 0541/0-07023	3	647-0.13	435+0.10	545.5	542,5	583	499	33	620	10	462	14	155	362	173	174
90-20 0641/0-07033	4	747-0.13	535+0.11	645.5	642.5	683	599	40	720	12	562	16	184	429	184	185
90-20 0741/0-07043	5	847-0.14	635+0.13	745.5	742.5	783	699	46	820	12	662	16	212	496	194	195
90-20 0841/0-07053	6	947-0.14	735+0.13	845.5	842.5	883	799	52	920	14	762	18	241	563	204	205
90-20 0941/0-07063	7	1047-0.17	835+0.14	945.5	942.5	983	899	58	1020	16	862	20	269	630	213	214
90-20 1091/0-07073	8	1197-0.17	985+0.14	1095.5	1092.5	1133	1049	68	1170	16	1012	20	312	730	224	225



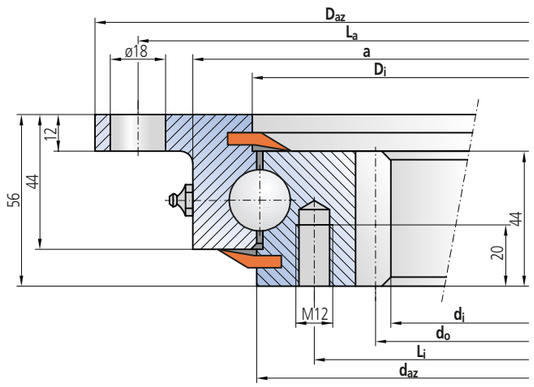
External toothed

Drawing number	Position	Dimensions and weight: Outside diameter, outer ring D_a [mm]	Inside diameter, inner ring, spigot d_{iZ} [mm]	Inside diameter, outer ring, spigot D_{iZ} [mm]	Outside diameter, inner ring d_a [mm]	Diameter, inner ring b [mm]	Weight G [kg]	Mounting holes: Pitch circle diameter, outer ring L_a [mm]	Number of holes, outer ring n_a [-]	Pitch circle diameter, inner ring L_i [mm]	Number of holes, inner ring n_i [-]	Gearing and tooth forces: Pitch circle diameter d_o [mm]	Module m [mm]	Number of teeth z2 [-]	Permissible tooth force $f_{z\,norm}$ [kN]	Maximum permissible tooth force $f_{z\,max}$ [kN]	Load ratings Static: $C_{o\,rad}$ [kN]	$C_{o\,ax}$ [kN]	Dynamic: C_{rad} [kN]	C_{ax} [kN]
91-20 0311/1-07103	1	404.0	205+0.07	317+0.09	312.5	269	23	355	10	232	12	395	5	79	11.75	23.5	89	208	140	140
91-20 0411/1-07113	2	504.0	305+0.08	417+0.10	412.5	369	30	455	10	332	12	495	5	99	11.75	23.5	118	275	156	156
91-20 0541/1-07123	3	640.8	435+0.10	547+0.11	542.5	499	42	585	14	462	14	630	6	105	17.5	32.7	155	362	173	174
91-20 0641/1-07133	4	742.8	535+0.11	647+0.13	642.5	599	53	685	16	562	16	732	6	122	17.5	32.7	184	429	184	185
91-20 0741/1-07143	5	838.8	635+0.13	747+0.13	742.5	699	56	785	18	662	16	828	6	138	17.5	32.7	212	496	194	195
91-20 0841/1-07153	6	950.4	735+0.13	847+0.14	842.5	799	68	885	18	762	18	936	8	117	27.9	50.3	241	563	204	205
91-20 0941/1-07163	7	1046.4	835+0.14	947+0.14	942.5	899	75	985	20	862	20	1032	8	129	27.9	50.3	269	630	213	214
91-20 1091/1-07173	8	1198.4	985+0.14	1097+0.17	1092.5	1049	87	1135	22	1012	20	1184	8	148	27.9	50.3	312	730	224	225

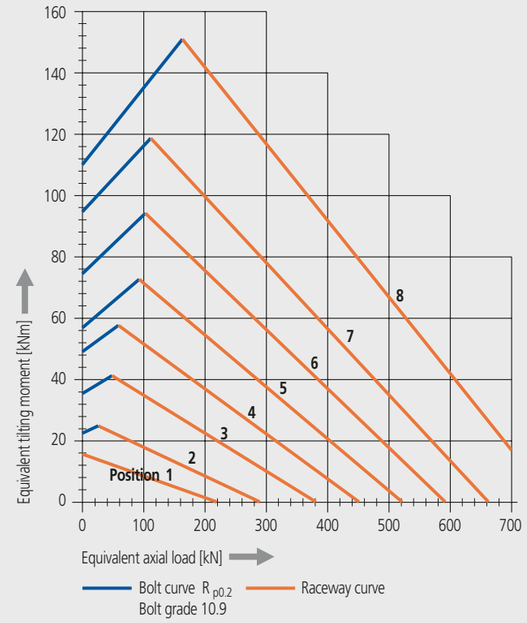


Internal toothed

Drawing number	Position	Dimensions and weight: Outside diameter, outer ring, spigot D_{aZ} [mm]	Inside diameter, inner ring d_i [mm]	Inside diameter, outer ring D_i [mm]	Outside diameter, inner ring, spigot d_{aZ} [mm]	Diameter, outer ring a [mm]	Weight G [kg]	Mounting holes: Pitch circle diameter, outer ring L_a [mm]	Number of holes, outer ring n_a [-]	Pitch circle diameter, inner ring L_i [mm]	Number of holes, inner ring n_i [-]	Gearing and tooth forces: Pitch circle diameter d_o [mm]	Module m [mm]	Number of teeth z2 [-]	Permissible tooth force $f_{z\,norm}$ [kN]	Maximum permissible tooth force $f_{z\,max}$ [kN]	Load ratings Static: $C_{o\,rad}$ [kN]	$C_{o\,ax}$ [kN]	Dynamic: C_{rad} [kN]	C_{ax} [kN]
92-20 0311/1-07203	1	417-0.10	225	315.5	311-0.08	353	21	390	8	275	12	235	5	47	11.9	22.7	89	208	140	140
92-20 0411/1-07213	2	517-0.11	325	415.5	411-0.10	453	28	490	8	375	12	335	5	67	11.9	22.7	118	275	156	156
92-20 0541/1-07223	3	647-0.13	444	545.5	541-0.11	583	39	620	10	505	16	456	6	76	17.5	32.9	155	362	173	174
92-20 0641/1-07233	4	747-0.13	546	645.5	641-0.13	683	46	720	12	605	18	558	6	93	17.5	32.9	184	429	184	185
92-20 0741/1-07243	5	847-0.14	648	745.5	741-0.13	783	52	820	12	705	20	660	6	110	17.5	32.9	212	496	194	195
92-20 0841/1-07253	6	947-0.14	736	845.5	841-0.14	883	63	920	14	805	20	752	8	94	28	50.5	241	563	204	205
92-20 0941/1-07263	7	1047-0.17	840	945.5	941-0.14	983	69	1020	16	905	22	856	8	107	28	50.5	269	630	213	214
92-20 1091/1-07273	8	1197-0.17	984	1095.5	1091-0.17	1133	83	1170	16	1055	24	1000	8	125	28	50.5	312	730	224	225



Limiting load diagram for "compressive" loads - **Series 920**



Please adhere strictly to the rules given in the Technical Information section when using above graph!

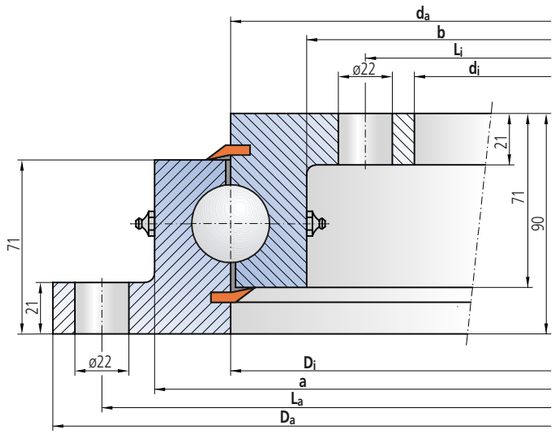
Bearing ring material: C45N
4 Taper type grease nipples on the circumference
Mounting holes equally spaced
Raceway system supplied pre-lubricated
Dimensions without tolerances DIN ISO 2768 coarse

Clearance of precision version

Position	Radial Clearance	Axial Clearance
1	max. 0.03	max. 0.03
2	max. 0.03	max. 0.03
3	max. 0.03	max. 0.03
4	max. 0.04	max. 0.04
5	max. 0.04	max. 0.04
6	max. 0.05	max. 0.05
7	max. 0.05	max. 0.05
8	max. 0.06	max. 0.06

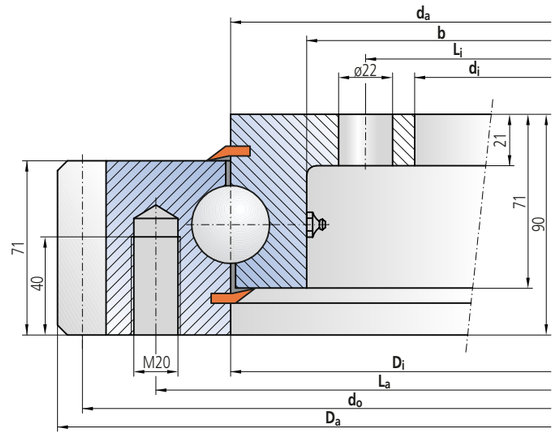
Untoothed

Drawing number	Position	Dimensions and weight							Mounting holes				Load ratings			
		Outside diameter, outer ring	Inside diameter, inner ring	Inside diameter, outer ring	Outside diameter, inner ring	Diameter, outer ring	Diameter, inner ring	Weight	Pitch circle diameter, outer ring	Number of holes, outer ring	Pitch circle diameter, inner ring	Number of holes, inner ring	Static		Dynamic	
		D_a [mm]	d_i [mm]	D_i [mm]	d_a [mm]	a [mm]	b [mm]	G [kg]	L_a [mm]	n_a [-]	L_i [mm]	n_i [-]	$C_{o\,rad}$ [kN]	$C_{o\,ax}$ [kN]	C_{rad} [kN]	C_{ax} [kN]
90-32 0955/0-06015	1	1100	805	955	955	1017	893	131	1060	30	845	30	1029	2754	411	479
90-32 1055/0-06025	2	1200	905	1055	1055	1117	993	145	1160	30	945	30	1137	3043	427	497
90-32 1155/0-06035	3	1300	1005	1155	1155	1217	1093	159	1260	36	1045	36	1245	3331	442	514
90-32 1255/0-06045	4	1400	1105	1255	1255	1317	1193	172	1360	42	1145	42	1353	3619	456	531
90-32 1355/0-06055	5	1500	1205	1355	1355	1417	1293	186	1460	42	1245	42	1460	3908	469	546
90-32 1455/0-06065	6	1600	1305	1455	1455	1517	1393	200	1560	48	1345	48	1568	4196	482	561



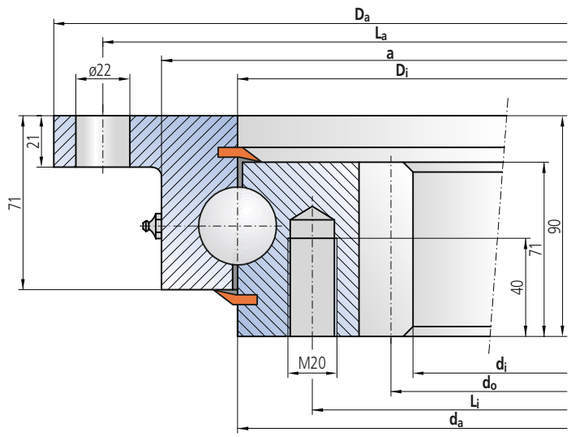
External toothed

Drawing number	Position	Dimensions and weight							Mounting holes				Gearing and tooth forces					Load ratings			
		Outside diameter, outer ring	Inside diameter, inner ring	Inside diameter, outer ring	Outside diameter, inner ring	Diameter, inner ring	Weight		Pitch circle diameter, outer ring	Number of holes, outer ring	Pitch circle diameter, inner ring	Number of holes, inner ring	Pitch circle diameter	Module	Number of teeth	Permissible tooth force	Maximum permissible tooth force	Static		Dynamic	
		D_a [mm]	d_i [mm]	D_i [mm]	d_a [mm]	b [mm]	G [kg]		L_a [mm]	n_a [-]	L_i [mm]	n_i [-]	d_o [mm]	m [mm]	z2 [-]	$f_{z\,norm}$ [kN]	$f_{z\,max}$ [kN]	$C_{o\,rad}$ [kN]	$C_{o\,ax}$ [kN]	C_{rad} [kN]	C_{ax} [kN]
91-32 0955/1-06115	1	1096.2	805	955	955	893	165		1016	30	845	30	1080	9	120	36	65	1029	2754	411	479
91-32 1055/1-06125	2	1198	905	1055	1055	993	183		1116	30	945	30	1180	10	118	43	76	1137	3043	427	497
91-32 1155/1-06135	3	1298	1005	1155	1155	1093	200		1216	36	1045	36	1280	10	128	43	76	1245	3331	442	514
91-32 1255/1-06145	4	1398	1105	1255	1255	1193	216		1316	42	1145	42	1380	10	138	43	76	1353	3619	456	531
91-32 1355/1-06155	5	1498	1205	1355	1355	1293	234		1416	42	1245	42	1480	10	148	43	76	1460	3908	469	546
91-32 1455/1-06165	6	1598	1305	1455	1455	1393	250		1516	48	1345	48	1580	10	158	43	76	1568	4196	482	561

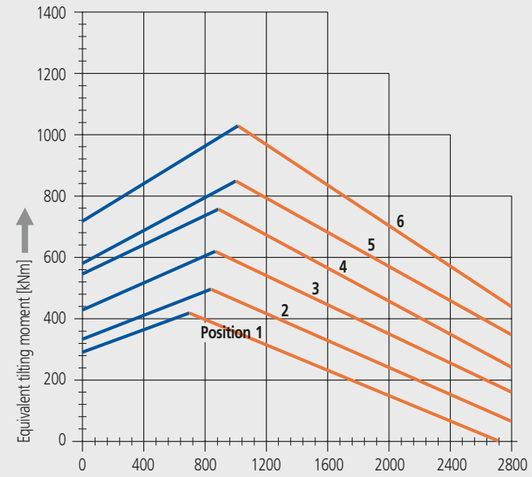


Internal toothed

Drawing number	Position	Dimensions and weight							Mounting holes				Gearing and tooth forces					Load ratings			
		Outside diameter, outer ring	Inside diameter, inner ring	Inside diameter, outer ring	Outside diameter, inner ring	Diameter, outer ring	Weight		Pitch circle diameter, outer ring	Number of holes, outer ring	Pitch circle diameter, inner ring	Number of holes, inner ring	Pitch circle diameter	Module	Number of teeth	Permissible tooth force	Maximum permissible tooth force	Static		Dynamic	
		D_a [mm]	d_i [mm]	D_i [mm]	d_a [mm]	a [mm]	G [kg]		L_a [mm]	n_a [-]	L_i [mm]	n_i [-]	d_o [mm]	m [mm]	z2 [-]	$f_{z\,norm}$ [kN]	$f_{z\,max}$ [kN]	$C_{o\,rad}$ [kN]	$C_{o\,ax}$ [kN]	C_{rad} [kN]	C_{ax} [kN]
92-32 0955/1-06215	1	1100	812	955	955	1017	159		1060	30	894	30	830	10	83	47	86	1029	2754	411	479
92-32 1055/1-06225	2	1200	912	1055	1055	1117	176		1160	30	994	30	930	10	93	47	86	1137	3043	427	497
92-32 1155/1-06235	3	1300	1012	1155	1155	1217	192		1260	36	1094	36	1030	10	103	47	86	1245	3331	442	514
92-32 1255/1-06245	4	1400	1112	1255	1255	1317	208		1360	42	1194	42	1130	10	113	47	86	1353	3619	456	531
92-32 1355/1-06255	5	1500	1212	1355	1355	1417	226		1460	42	1294	42	1230	10	123	47	86	1460	3908	469	546
92-32 1455/1-06265	6	1600	1312	1455	1455	1517	243		1560	48	1394	48	1330	10	133	47	86	1568	4196	482	561



Limiting load diagram for "compressive" loads - **Series 932**



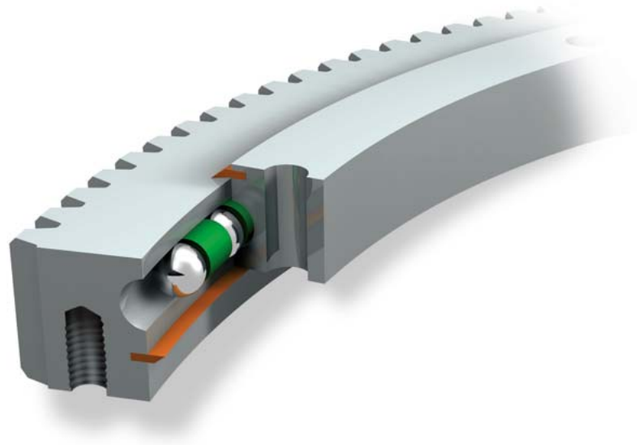
Please adhere strictly to the rules given in the Technical Information section when using above graph!

Radial clearance: 0 - 0.2 mm
Axial tilting clearance: 0 - 0.4 mm
Bearing ring material: C45N
6 Taper type grease nipples on the circumference
Mounting holes equally spaced
Raceway system supplied pre-lubricated.
Dimensions without tolerances DIN ISO 2768 coarse

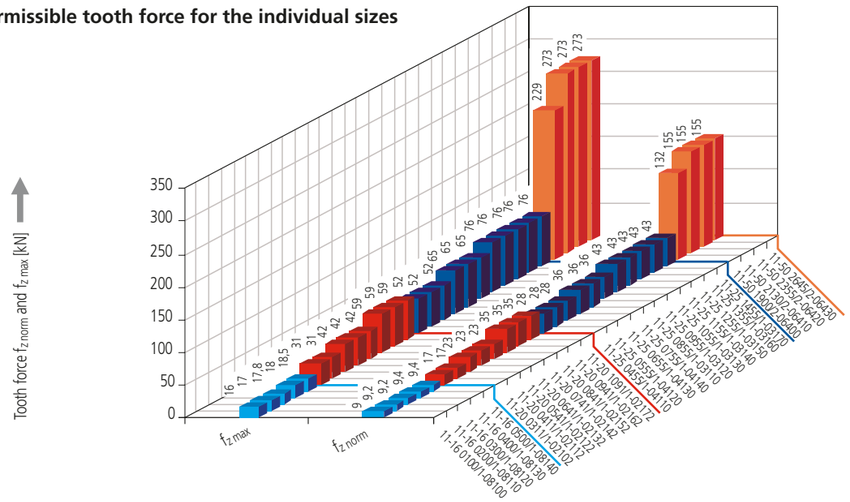
Series Overview - Single Row Ball Slewing Rings

10 – 16 0100 / 1 – 08000

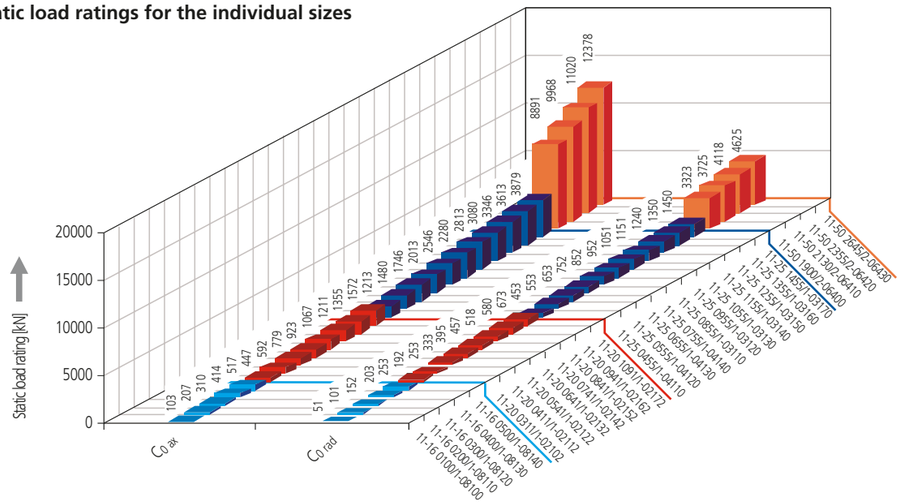
- **Drawing reference number**
- **Gearing heat treatment**
  - **0**: Untoothed
  - **1**: Normalized
  - **2**: Quenched and tempered
- **Raceway diameter [D_L in mm]**
- **Rolling element diameter [D_w in mm]**
- **Gear type:**
  - **0**: Untoothed
  - **1**: External toothed
  - **2**: Internal toothed
- **Bearing design**
  - **1**: Single Row Ball Slewing Ring



Permissible tooth force for the individual sizes



Static load ratings for the individual sizes



Operating conditions

Permissible temperature range -25°C to +70°C
Maximum permissible rotational speed n_{perm} = 40000 / D_L (for 120, 125, 150)
Maximum permissible rotational speed n_{perm} = 80000 / D_L (for 116)
(D_L = raceway diameter)
"Compressive" load
Bolt grade 10.9

Typical applications

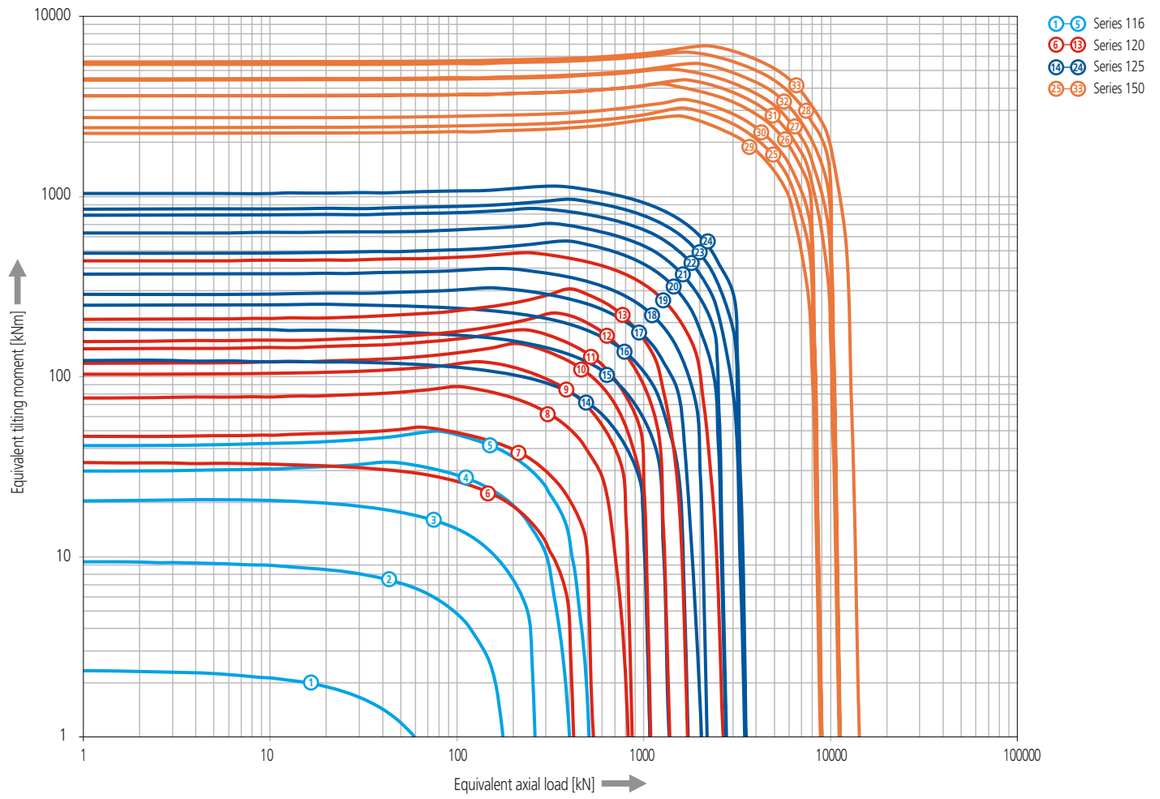
Turntables, slewing mechanisms, bogies, light to medium-sized cranes and construction machinery, winders, wind energy turbines, handling equipment.

Characteristics

- Robust design
- Insensitive to vibrations
- Cost-optimized design
- Medium precision
- For Series 116 & 120 precision versions are available

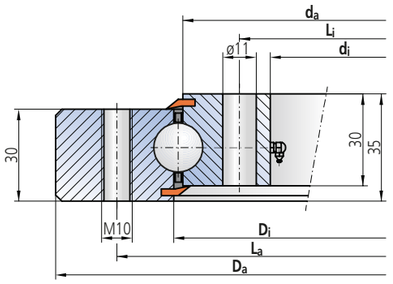
Limiting load diagrams, series 116, 120, 125, 150

Please refer to the explanations in the Technical Information section of the catalog.

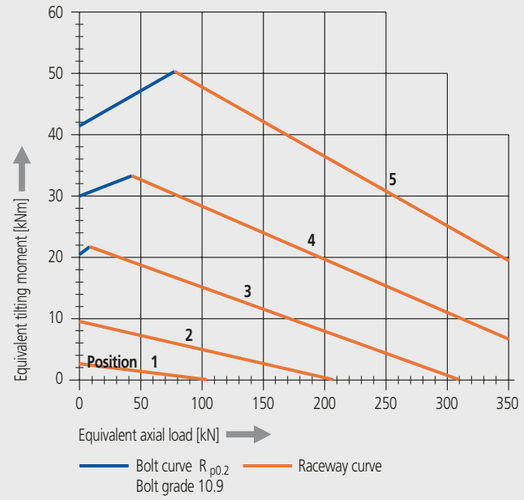


Untoothed

Drawing number	Position	Dimensions and weight					Mounting holes				Load ratings			
		Outside diameter, outer ring	Inside diameter, inner ring	Inside diameter, outer ring	Outside diameter, inner ring	Weight	Pitch circle diameter, outer ring	Number of holes, outer ring	Pitch circle diameter, inner ring	Number of holes, inner ring	Static		Dynamic	
		D_a [mm]	d_i [mm]	D_i [mm]	d_a [mm]	G [kg]	L_a [mm]	n_a [-]	L_i [mm]	n_i [-]	$C_{o\,rad}$ [kN]	$C_{o\,ax}$ [kN]	C_{rad} [kN]	C_{ax} [kN]
10-16 0100/0-08000	1	180	40	103	97	5	140	6	60	6	51	103	71	61
10-16 0200/0-08010	2	280	140	203	197	10	240	12	160	12	101	207	99	85
10-16 0300/0-08020	3	380	240	303	297	14	340	20	260	20	152	310	117	101
10-16 0400/0-08030	4	480	340	403	397	19	440	24	360	24	203	414	130	112
10-16 0500/0-08040	5	580	440	503	497	24	540	28	460	28	253	517	142	122



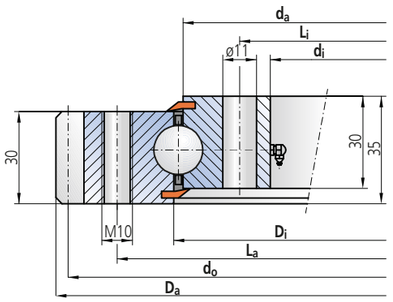
Limiting load diagram for "compressive" loads - **Series 116**



Please adhere strictly to the rules given in the Technical Information section when using above graph!

External toothed

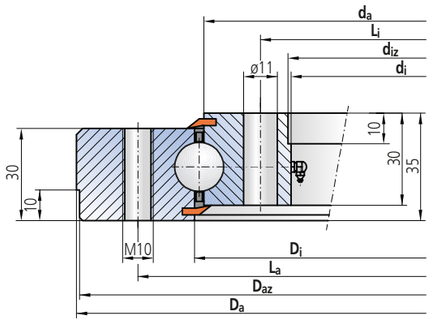
Drawing number	Position	Dimensions and weight					Mounting holes				Gearing and tooth forces					Load ratings			
		Outside diameter, outer ring	Inside diameter, inner ring	Inside diameter, outer ring	Outside diameter, inner ring	Weight	Pitch circle diameter, outer ring	Number of holes, outer ring	Pitch circle diameter, inner ring	Number of holes, inner ring	Pitch circle diameter	Module	Number of teeth	Permissible tooth force	Maximum permissible tooth force	Static		Dynamic	
		D_a [mm]	d_i [mm]	D_i [mm]	d_a [mm]	G [kg]	L_a [mm]	n_a [-]	L_i [mm]	n_i [-]	d_o [mm]	m [mm]	z2 [-]	$f_{z\,norm}$ [kN]	$f_{z\,max}$ [kN]	$C_{o\,rad}$ [kN]	$C_{o\,ax}$ [kN]	C_{rad} [kN]	C_{ax} [kN]
11-16 0100/1-08100	1	180	40	103	97	5	140	6	60	6	172	4	43	9.0	16.0	51	103	71	61
11-16 0200/1-08110	2	280	140	203	197	9	240	12	160	12	272	4	68	9.2	17.0	101	207	99	85
11-16 0300/1-08120	3	380	240	303	297	14	340	20	260	20	372	4	93	9.2	17.8	152	310	117	101
11-16 0400/1-08130	4	480	340	403	397	18	440	24	360	24	472	4	118	9.4	18.0	203	414	130	112
11-16 0500/1-08140	5	580	440	503	497	22	540	28	460	28	572	4	143	9.4	18.5	253	517	142	122



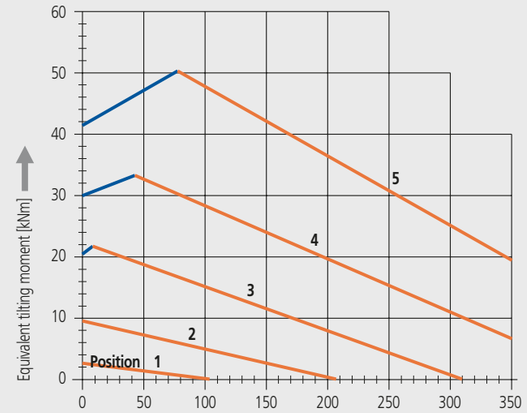
Radial clearance: 0 - 0.2 mm
Axial tilting clearance: 0 - 0.4 mm
Bearing ring material: C45N
1 Taper type grease nipple, form C in filling plug
Mounting holes equally spaced
Raceway system supplied pre-lubricated
Dimensions without tolerances DIN ISO 2768 coarse

Untoothed

Drawing number	Position	Dimensions and weight							Mounting holes				Load ratings			
		Outside diameter, outer ring	Outside diameter, outer ring, spigot	Inside diameter, inner ring	Inside diameter, inner ring, spigot	Inside diameter, outer ring	Outside diameter, inner ring	Weight	Pitch circle diameter, outer ring	Number of holes, outer ring	Pitch circle diameter, inner ring	Number of holes, inner ring	Static		Dynamic	
		D_a [mm]	D_{aZ} [mm]	d_i [mm]	d_{iZ} [mm]	D_i [mm]	d_a [mm]	G [kg]	L_a [mm]	n_a [-]	L_i [mm]	n_i [-]	$C_{o\,rad}$ [kN]	$C_{o\,ax}$ [kN]	C_{rad} [kN]	C_{ax} [kN]
10-16 0100/0-08003	1	180	178-0.06	40	42+0.04	103	97	5	140	6	60	6	51	103	71	61
10-16 0200/0-08013	2	280	278-0.08	140	142+0.06	203	197	10	240	12	160	12	101	207	99	85
10-16 0300/0-08023	3	380	378-0.09	240	242+0.07	303	297	14	340	20	260	20	152	310	117	101
10-16 0400/0-08033	4	480	478-0.10	340	342+0.09	403	397	19	440	24	360	24	203	414	130	112
10-16 0500/0-08043	5	580	578-0.11	440	442+0.10	503	497	24	540	28	460	28	253	517	142	122



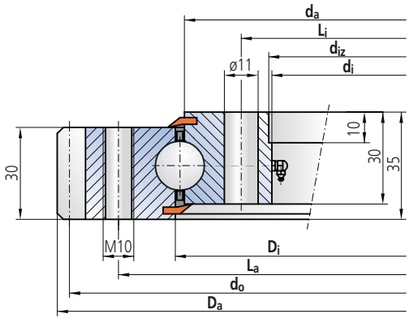
Limiting load diagram for "compressive" loads - **Series 116**



Please adhere strictly to the rules given in the Technical Information section when using above graph!

External toothed

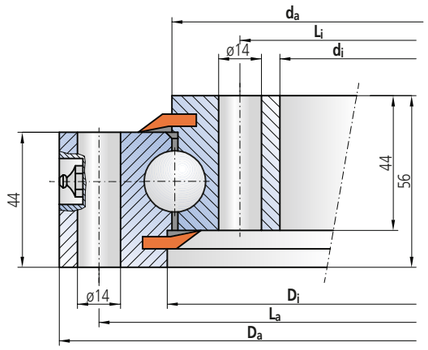
Drawing number	Position	Dimensions and weight						Mounting holes				Gearing and tooth forces					Load ratings			
		Outside diameter, outer ring	Inside diameter, inner ring	Inside diameter, inner ring, spigot	Inside diameter, outer ring	Outside diameter, inner ring	Weight	Pitch circle diameter, outer ring	Number of holes, outer ring	Pitch circle diameter, inner ring	Number of holes, inner ring	Pitch circle diameter	Module	Number of teeth	Permissible tooth force	Maximum permissible tooth force	Static		Dynamic	
		D_a [mm]	d_i [mm]	d_{iZ} [mm]	D_i [mm]	d_a [mm]	G [kg]	L_a [mm]	n_a [-]	L_i [mm]	n_i [-]	d_o [mm]	m [mm]	z2 [-]	$f_{z\,norm}$ [kN]	$f_{z\,max}$ [kN]	$C_{o\,rad}$ [kN]	$C_{o\,ax}$ [kN]	C_{rad} [kN]	C_{ax} [kN]
11-16 0100/1-08103	1	180	40	42 +0.04	103	97	5	140	6	60	6	172	4	43	9.0	16.0	51	103	71	61
11-16 0200/1-08113	2	280	140	142 +0.06	203	197	9	240	12	160	12	272	4	68	9.2	17.0	101	207	99	85
11-16 0300/1-08123	3	380	240	242 +0.07	303	297	14	340	20	260	20	372	4	93	9.2	17.8	152	310	117	101
11-16 0400/1-08133	4	480	340	342 +0.09	403	397	18	440	24	360	24	472	4	118	9.4	18.0	203	414	130	112
11-16 0500/1-08143	5	580	440	442 +0.10	503	497	22	540	28	460	28	572	4	143	9.4	18.5	253	517	142	122



Radial clearance max. 0.03 mm
Axial clearance: max. 0.03 mm
Bearing ring material: C45N
1 Taper type grease nipple, form C in filling plug
Mounting holes equally spaced
Raceway system supplied pre-lubricated
Dimensions without tolerances DIN ISO 2768 coarse

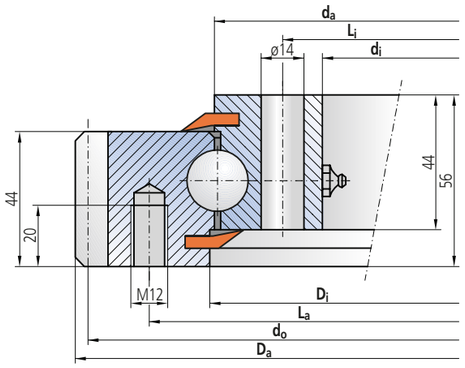
Untoothed

Drawing number	Position	Dimensions and weight: Outside diameter, outer ring Da [mm]	Inside diameter, inner ring di [mm]	Inside diameter, outer ring Di [mm]	Outside diameter, inner ring da [mm]	Weight G [kg]	Mounting holes: Pitch circle diameter, outer ring La [mm]	Number of holes, outer ring na [-]	Pitch circle diameter, inner ring Li [mm]	Number of holes, inner ring ni [-]	Load ratings: Static Co rad [kN]	Static Co ax [kN]	Dynamic C rad [kN]	Dynamic C ax [kN]
10-20 0311/0-02002	1	386	242	315.5	312.5	21	360	20	268	20	192	448	140	140
10-20 0411/0-02012	2	486	342	415.5	412.5	29	460	24	368	24	254	592	156	156
10-20 0541/0-02022	3	616	472	545.5	542.5	37	590	32	498	32	334	780	173	174
10-20 0641/0-02032	4	716	572	645.5	642.5	44	690	36	598	36	395	924	184	185
10-20 0741/0-02042	5	816	672	745.5	742.5	52	790	40	698	40	457	1068	194	195
10-20 0841/0-02052	6	916	772	845.5	842.5	59	890	40	798	40	519	1212	204	205
10-20 0941/0-02062	7	1016	872	945.5	942.5	66	990	44	898	44	580	1356	213	214
10-20 1091/0-02072	8	1166	1022	1095.5	1092.5	77	1140	48	1048	48	673	1572	224	225



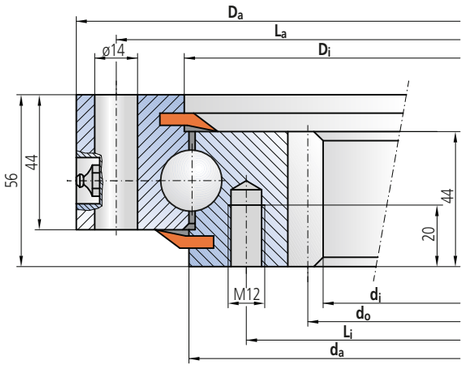
External toothed

Drawing number	Position	Dimensions and weight: Outside diameter, outer ring Da [mm]	Inside diameter, inner ring di [mm]	Inside diameter, outer ring Di [mm]	Outside diameter, inner ring da [mm]	Weight G [kg]	Mounting holes: Pitch circle diameter, outer ring La [mm]	Number of holes, outer ring na [-]	Pitch circle diameter, inner ring Li [mm]	Number of holes, inner ring ni [-]	Gearing and tooth forces: Pitch circle diameter do [mm]	Module m [mm]	Number of teeth z2 [-]	Permissible tooth force fz norm [kN]	Maximum permissible tooth force fz max [kN]	Load ratings: Static Co rad [kN]	Static Co ax [kN]	Dynamic C rad [kN]	Dynamic C ax [kN]
11-20 0311/1-02102	1	404.0	242	315.5	312.5	23	355	20	268	20	395	5	79	11.75	23.5	192	448	140	140
11-20 0411/1-02112	2	504.0	342	415.5	412.5	32	455	20	368	24	495	5	99	11.75	23.5	254	592	156	156
11-20 0541/1-02122	3	640.8	472	545.5	542.5	43	585	28	498	32	630	6	105	17.5	32.7	334	780	173	174
11-20 0641/1-02132	4	742.8	572	645.5	642.5	52	685	32	598	36	732	6	122	17.5	32.7	395	924	184	185
11-20 0741/1-02142	5	838.8	672	745.5	742.5	58	785	36	698	40	828	6	138	17.5	32.7	457	1068	194	195
11-20 0841/1-02152	6	950.4	772	845.5	842.5	71	885	36	798	40	936	8	117	27.9	50.3	519	1212	204	205
11-20 0941/1-02162	7	1046.4	872	945.5	942.5	77	985	40	898	44	1032	8	129	27.9	50.3	580	1356	213	214
11-20 1091/1-02172	8	1198.4	1022	1095.5	1092.5	90	1135	44	1048	48	1184	8	148	27.9	50.3	673	1572	224	225

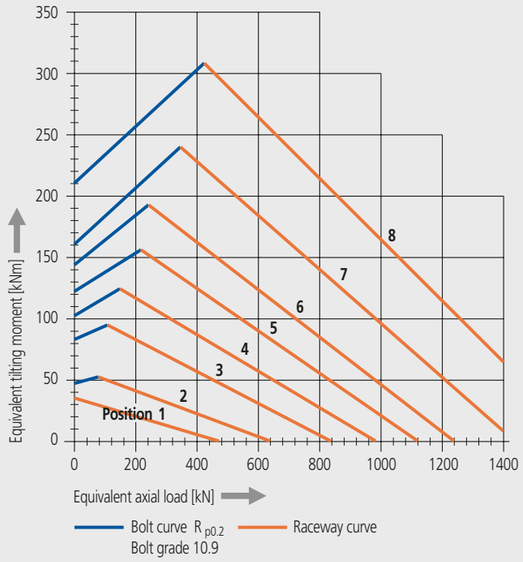


Internal toothed

Drawing number	Position	Dimensions and weight: Outside diameter, outer ring Da [mm]	Inside diameter, inner ring di [mm]	Inside diameter, outer ring Di [mm]	Outside diameter, inner ring da [mm]	Weight G [kg]	Mounting holes: Pitch circle diameter, outer ring La [mm]	Number of holes, outer ring na [-]	Pitch circle diameter, inner ring Li [mm]	Number of holes, inner ring ni [-]	Gearing and tooth forces: Pitch circle diameter do [mm]	Module m [mm]	Number of teeth z2 [-]	Permissible tooth force fz norm [kN]	Maximum permissible tooth force fz max [kN]	Load ratings: Static Co rad [kN]	Static Co ax [kN]	Dynamic C rad [kN]	Dynamic C ax [kN]
12-20 0311/1-02202	1	386	225	315.5	312.5	22	360	20	275	24	235	5	47	11.9	22.7	192	448	140	140
12-20 0411/1-02212	2	486	325	415.5	412.5	31	460	24	375	24	335	5	67	11.9	22.7	254	592	156	156
12-20 0541/1-02222	3	616	444	545.5	542.5	43	590	32	505	32	456	6	76	17.5	32.9	334	780	173	174
12-20 0641/1-02232	4	716	546	645.5	642.5	50	690	36	605	36	558	6	93	17.5	32.9	395	924	184	185
12-20 0741/1-02242	5	816	648	745.5	742.5	57	790	40	705	40	660	6	110	17.5	32.9	457	1068	194	195
12-20 0841/1-02252	6	916	736	845.5	842.5	69	890	40	805	40	752	8	94	28	50.5	519	1212	204	205
12-20 0941/1-02262	7	1016	840	945.5	942.5	75	990	44	905	44	856	8	107	28	50.5	580	1356	213	214
12-20 1091/1-02272	8	1166	984	1095.5	1092.5	91	1140	48	1055	48	1000	8	125	28	50.5	673	1572	224	225



Limiting load diagram for "compressive" loads - **Series 120**

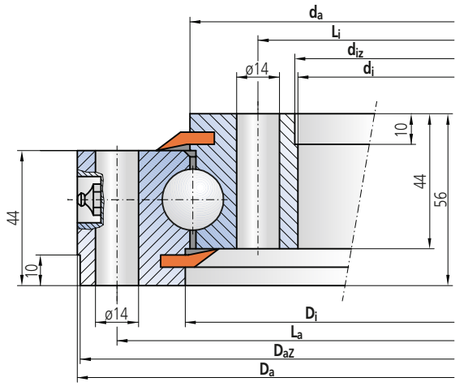


Please adhere strictly to the rules given in the Technical Information section when using above graph!

Radial clearance: 0 - 0.2 mm
Axial clearance: 0 - 0.4 mm
Bearing ring material: C45N
4 Taper type grease nipples on circumference
Mounting holes equally spaced
Raceway system supplied pre-lubricated
Dimensions without tolerances DIN ISO 2768 coarse

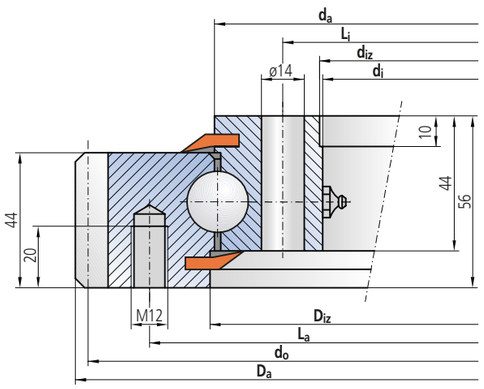
Untoothed

Drawing number	Position	Dimensions and weight: Outside diameter, outer ring D_a [mm]	Outside diameter, outer ring, spigot D_{aZ} [mm]	Inside diameter, inner ring d_i [mm]	Inside diameter, inner ring, spigot D_{iZ} [mm]	Inside diameter, outer ring D_i [mm]	Outside diameter, inner ring d_a [mm]	Weight G [kg]	Mounting holes: Pitch circle diameter, outer ring L_a [mm]	Number of holes, outer ring n_a [-]	Pitch circle diameter, inner ring L_i [mm]	Number of holes, inner ring n_i [-]	Load ratings: Static $C_{o\,rad}$ [kN]	Static $C_{o\,ax}$ [kN]	Dynamic C_{rad} [kN]	Dynamic C_{ax} [kN]
10-20 0311/0-02003	1	386	384.5-0.09	242	243.5+0.07	315.5	312.5	21	360	20	268	20	192	448	140	140
10-20 0411/0-02013	2	486	484.5-0.10	342	343.5+0.09	415.5	412.5	29	460	24	368	24	254	592	156	156
10-20 0541/0-02023	3	616	614.5-0.11	472	473.5+0.10	545.5	542.5	37	590	32	498	32	334	780	173	174
10-20 0641/0-02033	4	716	714.5-0.13	572	573.5+0.11	645.5	642.5	44	690	36	598	36	395	924	184	185
10-20 0741/0-02043	5	816	814.5-0.14	672	673.5+0.13	745.5	742.5	52	790	40	698	40	457	1068	194	195
10-20 0841/0-02053	6	916	914.5-0.14	772	773.5+0.13	845.5	842.5	59	890	40	798	40	519	1212	204	205
10-20 0941/0-02063	7	1016	1014.5-0.17	872	873.5+0.14	945.5	942.5	66	990	44	898	44	580	1356	213	214
10-20 1091/0-02073	8	1166	1164.5-0.17	1022	1023.5+0.17	1095.5	1092.5	77	1140	48	1048	48	673	1572	224	225



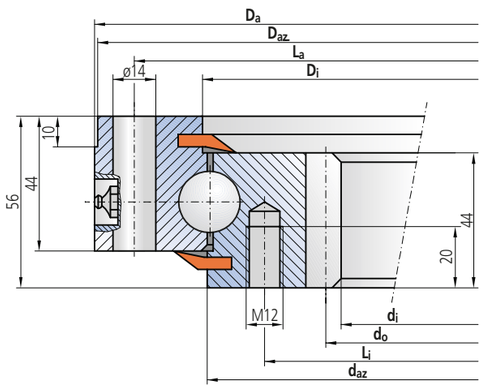
External toothed

Drawing number	Position	Dimensions and weight: Outside diameter, outer ring D_a [mm]	Inside diameter, inner ring d_i [mm]	Inside diameter, inner ring, spigot d_{iZ} [mm]	Outside diameter, outer ring, spigot D_{iZ} [mm]	Outside diameter, inner ring d_a [mm]	Weight G [kg]	Mounting holes: Pitch circle diameter, outer ring L_a [mm]	Number of holes, outer ring n_a [-]	Pitch circle diameter, inner ring L_i [mm]	Number of holes, inner ring n_i [-]	Gearing and tooth forces: Pitch circle diameter d_o [mm]	Module m [mm]	Number of teeth z2 [-]	Permissible tooth force $f_{z\,norm}$ [kN]	Maximum permissible tooth force $f_{z\,max}$ [kN]	Load ratings: Static $C_{o\,rad}$ [kN]	Static $C_{o\,ax}$ [kN]	Dynamic C_{rad} [kN]	Dynamic C_{ax} [kN]
11-20 0311/1-02103	1	404.0	242	243.5+0.07	317+0.09	312.5	23	355	20	268	20	395	5	79	11.75	23.5	192	448	140	140
11-20 0411/1-02113	2	504.0	342	343.5+0.09	417+0.10	412.5	32	455	20	368	24	495	5	99	11.75	23.5	254	592	156	156
11-20 0541/1-02123	3	640.8	472	473.5+0.10	547+0.11	542.5	43	585	28	498	32	630	6	105	17.5	32.7	334	780	173	174
11-20 0641/1-02133	4	742.8	572	573.5+0.11	647+0.13	642.5	52	685	32	598	36	732	6	122	17.5	32.7	395	924	184	185
11-20 0741/1-02143	5	838.8	672	673.5+0.13	747+0.13	742.5	58	785	36	698	40	828	6	138	17.5	32.7	457	1068	194	195
11-20 0841/1-02153	6	950.4	772	773.5+0.13	847+0.14	842.5	71	885	36	798	40	936	8	117	27.9	50.3	519	1212	204	205
11-20 0941/1-02163	7	1046.4	872	873.5+0.14	947+0.14	942.5	77	985	40	898	44	1032	8	129	27.9	50.3	580	1356	213	214
11-20 1091/1-02173	8	1198.4	1022	1023.5+0.17	1097+0.17	1092.5	90	1135	44	1048	48	1184	8	148	27.9	50.3	673	1572	224	225

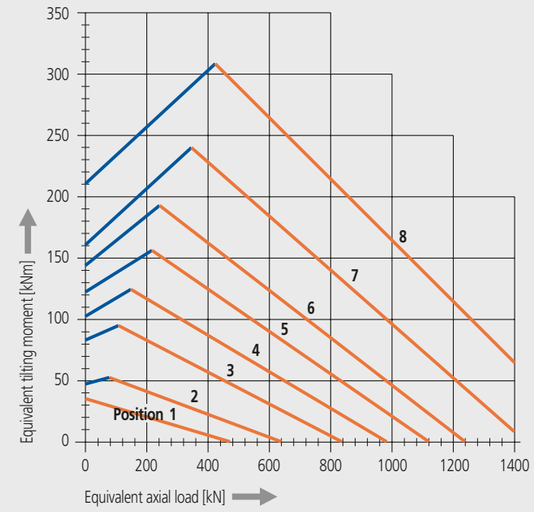


Internal toothed

Drawing number	Position	Dimensions and weight: Outside diameter, outer ring D_a [mm]	Outside diameter, outer ring, spigot D_{aZ} [mm]	Inside diameter, inner ring d_i [mm]	Inside diameter, outer ring D_i [mm]	Outside diameter, inner ring, spigot d_{aZ} [mm]	Weight G [kg]	Mounting holes: Pitch circle diameter, outer ring L_a [mm]	Number of holes, outer ring n_a [-]	Pitch circle diameter, inner ring L_i [mm]	Number of holes, inner ring n_i [-]	Gearing and tooth forces: Pitch circle diameter d_o [mm]	Module m [mm]	Number of teeth z2 [-]	Permissible tooth force $f_{z\,norm}$ [kN]	Maximum permissible tooth force $f_{z\,max}$ [kN]	Load ratings: Static $C_{o\,rad}$ [kN]	Static $C_{o\,ax}$ [kN]	Dynamic C_{rad} [kN]	Dynamic C_{ax} [kN]
12-20 0311/0-02203	1	386	384.5-0.09	225	315.5	311-0.08	22	360	24	275	24	235	5	47	11.9	22.7	192	448	140	140
12-20 0411/0-02213	2	486	484.5-0.10	325	415.5	411-0.10	31	460	24	375	24	335	5	67	11.9	22.7	254	592	156	156
12-20 0541/0-02223	3	616	614.5-0.11	444	545.5	541-0.11	43	590	32	505	32	456	6	76	17.5	32.9	334	780	173	174
12-20 0641/0-02233	4	716	714.5-0.13	546	645.5	641-0.13	50	690	36	605	36	558	6	93	17.5	32.9	395	924	184	185
12-20 0741/0-02243	5	816	814.5-0.14	648	745.5	741-0.13	57	790	40	705	40	660	6	110	17.5	32.9	457	1068	194	195
12-20 0841/0-02253	6	916	914.5-0.14	736	845.5	841-0.14	69	890	40	805	40	752	8	94	28	50.5	519	1212	204	205
12-20 0941/0-02263	7	1016	1014.5-0.17	840	945.5	941-0.14	75	990	44	905	44	856	8	107	28	50.5	580	1356	213	214
12-20 1091/0-02273	8	1166	1164.5-0.17	984	1095.5	1091-0.17	91	1140	48	1055	48	1000	8	125	28	50.5	673	1572	224	225



Limiting load diagram for "compressive" loads - **Series 120**



Please adhere strictly to the rules given in the Technical Information section when using above graph!

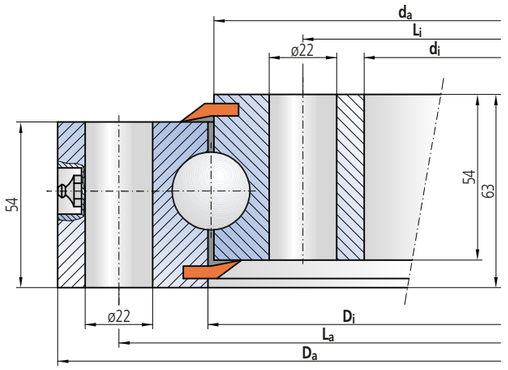
Bearing ring material: C45N
4 Taper type grease nipples on circumference
Mounting holes equally spaced
Raceway system supplied pre- lubricated
Dimensions without tolerances DIN ISO 2768 coarse

Clearance of precision version

Position	Radial Clearance	Axial Clearance
1	max. 0.03	max. 0.03
2	max. 0.03	max. 0.03
3	max. 0.03	max. 0.03
4	max. 0.04	max. 0.04
5	max. 0.04	max. 0.04
6	max. 0.05	max. 0.05
7	max. 0.05	max. 0.05
8	max. 0.06	max. 0.06

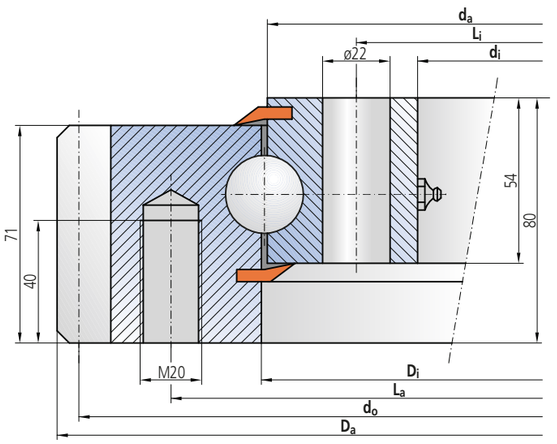
Untoothed

Drawing number	Position	Dimensions and weight: Outside diameter, outer ring D_a [mm]	Inside diameter, inner ring d_i [mm]	Inside diameter, outer ring D_i [mm]	Outside diameter, inner ring d_a [mm]	Weight G [kg]	Mounting holes: Pitch circle diameter, outer ring L_a [mm]	Number of holes, outer ring n_a [-]	Pitch circle diameter, inner ring L_i [mm]	Number of holes, inner ring n_i [-]	Load ratings: Static $C_{o\,rad}$ [kN]	Static $C_{o\,ax}$ [kN]	Dynamic C_{rad} [kN]	Dynamic C_{ax} [kN]
10-25 0455/0-04010	1	555	355	457	453	53	515	18	395	18	453	1213	249	289
10-25 0555/0-04020	2	655	455	557	553	65	615	20	495	20	553	1480	268	311
10-25 0655/0-04030	3	755	555	657	653	76	715	24	595	24	653	1746	284	331
10-25 0755/0-04040	4	855	655	757	753	90	815	24	695	24	752	2013	300	349
10-25 0855/0-03010	5	955	755	857	853	101	915	28	795	28	852	2280	316	367
10-25 0955/0-03020	6	1055	855	957	953	115	1015	30	895	30	952	2546	328	382
10-25 1055/0-03030	7	1155	955	1057	1053	128	1115	30	995	30	1051	2813	340	396
10-25 1155/0-03040	8	1255	1055	1157	1153	139	1215	36	1095	36	1151	3080	351	409
10-25 1255/0-03050	9	1355	1155	1257	1253	150	1315	42	1195	42	1240	3346	364	424
10-25 1355/0-03060	10	1455	1255	1357	1353	163	1415	42	1295	42	1350	3613	374	435
10-25 1455/0-03070	11	1555	1355	1457	1453	174	1515	48	1395	48	1450	3879	383	447



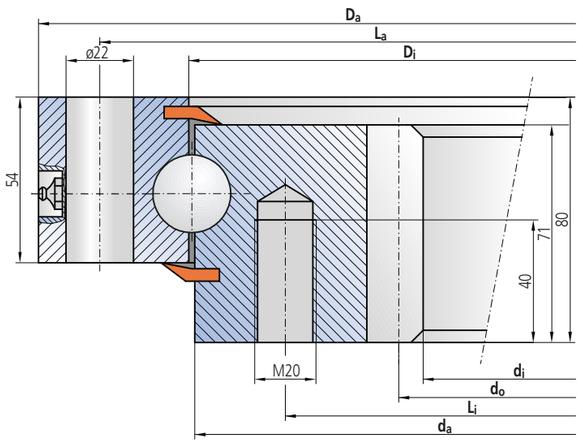
External toothed

Drawing number	Position	Dimensions and weight: Outside diameter, outer ring D_a [mm]	Inside diameter, inner ring d_i [mm]	Inside diameter, outer ring D_i [mm]	Outside diameter, inner ring d_a [mm]	Weight G [kg]	Mounting holes: Pitch circle diameter, outer ring L_a [mm]	Number of holes, outer ring n_a [-]	Pitch circle diameter, inner ring L_i [mm]	Number of holes, inner ring n_i [-]	Gearing and tooth forces: Pitch circle diameter d_o [mm]	Module m [mm]	Number of teeth z2 [-]	Permissible tooth force $f_{z\,norm}$ [kN]	Maximum permissible tooth force $f_{z\,max}$ [kN]	Load ratings: Static $C_{o\,rad}$ [kN]	Static $C_{o\,ax}$ [kN]	Dynamic C_{rad} [kN]	Dynamic C_{ax} [kN]
11-25 0455/1-04110	1	590.4	355	457	453	74	516	18	395	18	576	8	72	28	52	453	1213	249	289
11-25 0555/1-04120	2	694.4	455	557	553	93	616	20	495	20	680	8	85	28	52	553	1480	268	311
11-25 0655/1-04130	3	798.4	555	657	653	111	716	24	595	24	784	8	98	28	52	653	1746	284	331
11-25 0755/1-04140	4	898	655	757	753	125	816	24	695	24	882	9	98	36	65	752	2013	300	349
11-25 0855/1-03110	5	997	755	857	853	145	916	28	795	28	981	9	109	36	65	852	2280	316	367
11-25 0955/1-03120	6	1096	855	957	953	155	1016	30	895	30	1080	9	120	36	65	952	2546	328	382
11-25 1055/1-03130	7	1198	955	1057	1053	171	1116	30	995	30	1180	10	118	43	76	1051	2813	340	396
11-25 1155/1-03140	8	1298	1055	1157	1153	186	1216	36	1095	36	1280	10	128	43	76	1151	3080	351	409
11-25 1255/1-03150	9	1398	1155	1257	1253	201	1316	42	1195	42	1380	10	138	43	76	1240	3346	364	424
11-25 1355/1-03160	10	1498	1255	1357	1353	218	1416	42	1295	42	1480	10	148	43	76	1350	3613	374	435
11-25 1455/1-03170	11	1598	1355	1457	1453	233	1516	48	1395	48	1580	10	158	43	76	1450	3879	383	447

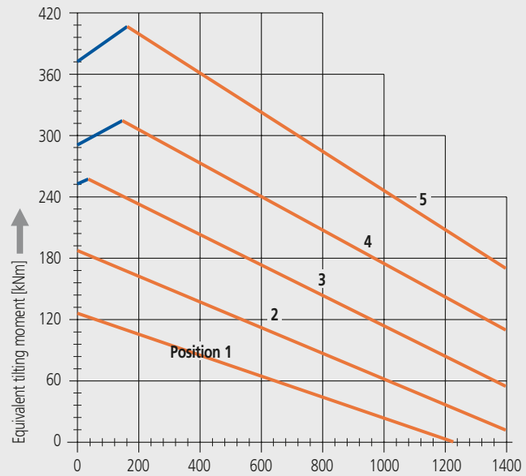


Internal toothed

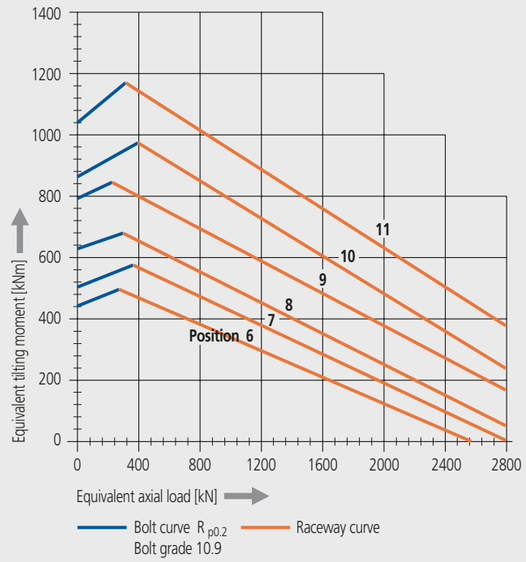
Drawing number	Position	Dimensions and weight: Outside diameter, outer ring D_a [mm]	Inside diameter, inner ring d_i [mm]	Inside diameter, outer ring D_i [mm]	Outside diameter, inner ring d_a [mm]	Weight G [kg]	Mounting holes: Pitch circle diameter, outer ring L_a [mm]	Number of holes, outer ring n_a [-]	Pitch circle diameter, inner ring L_i [mm]	Number of holes, inner ring n_i [-]	Gearing and tooth forces: Pitch circle diameter d_o [mm]	Module m [mm]	Number of teeth z2 [-]	Permissible tooth force $f_{z\,norm}$ [kN]	Maximum permissible tooth force $f_{z\,max}$ [kN]	Load ratings: Static $C_{o\,rad}$ [kN]	Static $C_{o\,ax}$ [kN]	Dynamic C_{rad} [kN]	Dynamic C_{ax} [kN]
12-25 0455/1-04210	1	555	304	457	453	64	515	18	394	18	320	8	40	32	64	453	1213	249	289
12-25 0555/1-04220	2	655	416	557	553	76	615	20	494	20	432	8	54	32	64	553	1480	268	311
12-25 0655/1-04230	3	755	512	657	653	102	715	24	594	24	528	8	66	32	64	653	1746	284	331
12-25 0755/1-04240	4	855	610	757	753	119	815	24	694	24	630	10	63	47	86	752	2013	300	349
12-25 0855/1-03210	5	955	710	857	853	137	915	28	794	28	730	10	73	47	86	852	2280	316	367
12-25 0955/1-03220	6	1055	810	957	953	149	1015	30	894	30	830	10	83	47	86	952	2546	328	382
12-25 1055/1-03230	7	1155	910	1057	1053	165	1115	30	994	30	930	10	93	47	86	1051	2813	340	396
12-25 1155/1-03240	8	1255	1010	1157	1153	180	1215	36	1094	36	1030	10	103	47	86	1151	3080	351	409
12-25 1255/1-03250	9	1355	1110	1257	1253	195	1315	42	1194	42	1130	10	113	47	86	1240	3346	364	424
12-25 1355/1-03260	10	1455	1210	1357	1353	212	1415	42	1294	42	1230	10	123	47	86	1350	3613	374	435
12-25 1455/1-03270	11	1555	1310	1457	1453	227	1515	48	1394	48	1330	10	133	47	86	1450	3879	383	447



Limiting load diagram for "compressive" loads - **Series 125**



Please adhere strictly to the rules given in the Technical Information section when using above graph!

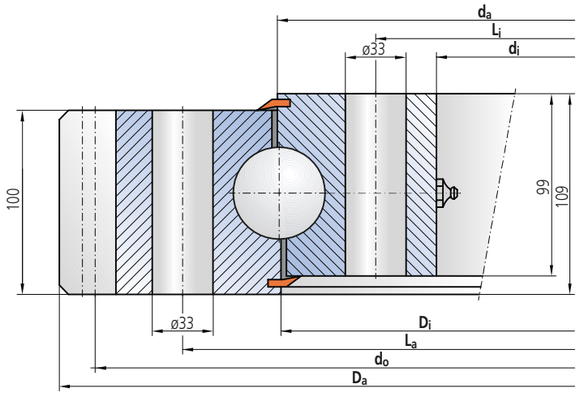


Please adhere strictly to the rules given in the Technical Information section when using above graph!

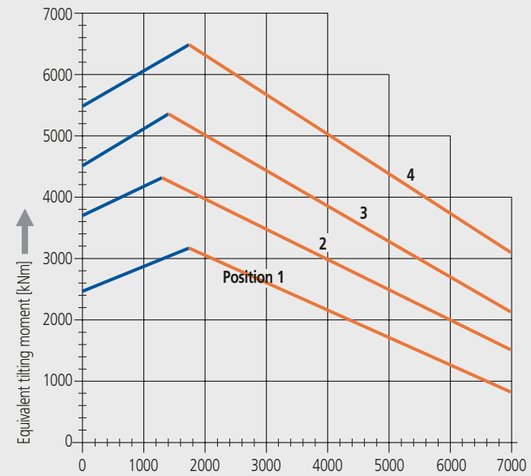
Radial clearance: 0 - 0.25 mm
Axial clearance: 0 - 0.4 mm
Bearing ring material: C45N
4 Taper type grease nipples on circumference
Mounting holes equally spaced
Raceway system supplied pre-lubricated
Dimensions without tolerances DIN ISO 2768 coarse

External toothed

Drawing number	Position	Dimensions and weight					Mounting holes			Gearing and tooth forces						Load ratings			
		Outside diameter, outer ring	Inside diameter, inner ring	Inside diameter, outer ring	Outside diameter, inner ring	Weight	Pitch circle diameter, outer ring	Pitch circle diameter, inner ring	Numbers of holes per pitch circle	Pitch circle diameter	Module	Number of teeth	Addendum modification coeff.	Permissible tooth force	Maximum permissible tooth force	Static		Dynamic	
		D_a [mm]	d_i [mm]	D_i [mm]	d_a [mm]	G [kg]	L_a [mm]	L_i [mm]	n [-]	d_o [mm]	m [mm]	z2 [-]	x2 [-]	$f_{z\,norm}$ [kN]	$f_{z\,max}$ [kN]	$C_{o\,rad}$ [kN]	$C_{o\,ax}$ [kN]	C_{rad} [kN]	C_{ax} [kN]
11-50 1900/2-06400	**1**	2139.2	1729	1898	1902	820	2005	1795	36	2100	14	150	+0.50	132	229	3323	8891	1129	1315
11-50 2130/2-06410	**2**	2380.8	1959	2128	2132	931	2235	2025	48	2336	16	146	+0.50	155	273	3725	9968	1177	1371
11-50 2355/2-06420	**3**	2604.8	2184	2353	2357	1024	2460	2250	54	2560	16	160	+0.50	155	273	4118	11020	1223	1425
11-50 2645/2-06430	**4**	2892.8	2474	2643	2647	1142	2750	2540	60	2848	16	178	+0.50	155	273	4625	12378	1279	1490



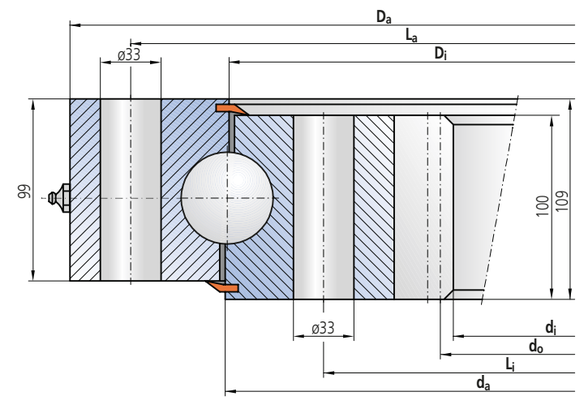
Limiting load diagram for "compressive" loads - **Series 150**

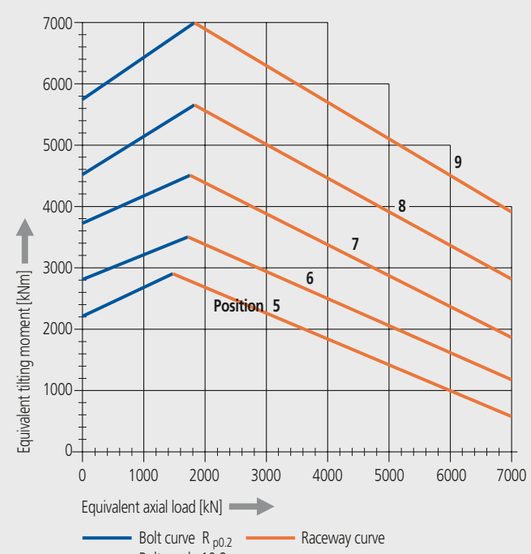


Please adhere strictly to the rules given in the Technical Information section when using above graph!

Internal toothed

Drawing number	Position	Dimensions and weight					Mounting holes			Gearing and tooth forces						Load ratings			
		Outside diameter, outer ring	Inside diameter, inner ring	Inside diameter, outer ring	Outside diameter, inner ring	Weight	Pitch circle diameter, outer ring	Pitch circle diameter, inner ring	Numbers of holes per pitch circle	Pitch circle diameter	Module	Number of teeth	Addendum modification coeff.	Permissible tooth force	Maximum permissible tooth force	Static		Dynamic	
		D_a [mm]	d_i [mm]	D_i [mm]	d_a [mm]	G [kg]	L_a [mm]	L_i [mm]	n [-]	d_o [mm]	m [mm]	z2 [-]	x2 [-]	$f_{z\,norm}$ [kN]	$f_{z\,max}$ [kN]	$C_{o\,rad}$ [kN]	$C_{o\,ax}$ [kN]	C_{rad} [kN]	C_{ax} [kN]
12-50 1800/2-06500	**5**	1971	1554	1798	1802	762	1905	1695	36	1568	14	112	-0.50	141	254	3148	8423	1105	1286
12-50 2000/2-06510	**6**	2171	1764	1998	2002	843	2105	1895	40	1778	14	127	-0.50	141	254	3457	9359	1153	1343
12-50 2240/2-06520	**7**	2411	1984	2238	2242	961	2345	2135	48	2000	16	125	-0.50	166	290	3917	10482	1198	1395
12-50 2490/2-06530	**8**	2661	2240	2488	2492	1053	2595	2385	54	2256	16	141	-0.50	166	290	4354	11652	1250	1256
12-50 2800/2-06540	**9**	2971	2544	2798	2802	1205	2905	2695	60	2560	16	160	-0.50	166	290	4896	13103	1301	1516





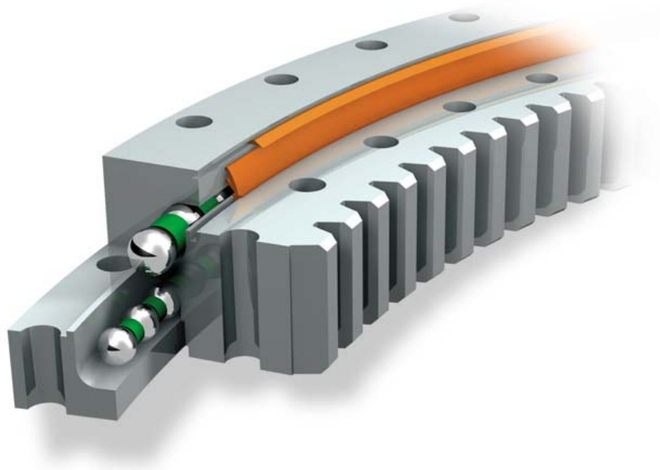
Please adhere strictly to the rules given in the Technical Information section when using above graph!

Radial clearance: 0 - 0.4 mm
Axial clearance: 0 - 0.75 mm
Bearing ring material: 42CrMo4V
9 to 12 Taper type grease nipples on circumference
Mounting holes equally spaced
Raceway system supplied pre-lubricated
Dimensions without tolerances DIN ISO 2768 coarse

Series overview - Double Axial Slewing Rings

81 – 40 2240 / 2 – 07600

- **07600** – Drawing reference number
- **2** – Gearing heat treatment
  2: Quenched and tempered
- **2240** – Raceway diameter [D_L in mm]
- **40** – Rolling element diameter [D_w in mm]
- **1** – Gear type:
  1: External toothed
  2: Internal toothed
- **81** – Bearing design
  8: Double Axial Slewing Ring



Operating conditions

Permissible temperature range -25°C to +70°C
Maximum permissible rotational speed n_{perm} = 40000 / D_L
(D_L = raceway diameter)
"Compressive" load
Bolt grade 10.9

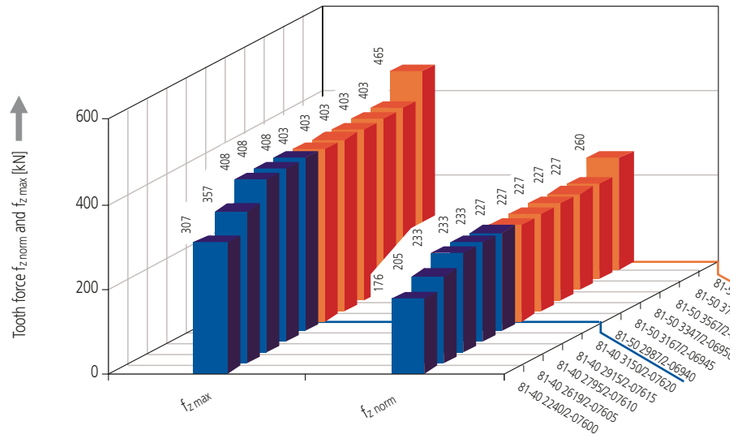
Typical applications

Turntables, slewing mechanisms, bogies, winders, medium-sized to large cranes and construction machinery.
Applications such as for Single Row Ball Slewing Rings with higher axial load.

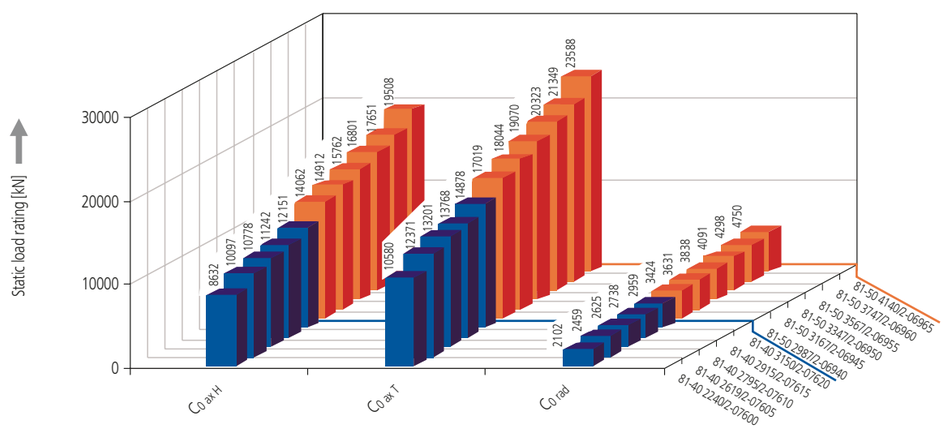
Characteristics

- Robust design
- Insensitive to rough mounting structure
- Suitable for vibration conditions
- High axial loads can be transmitted

Permissible tooth force for the individual sizes

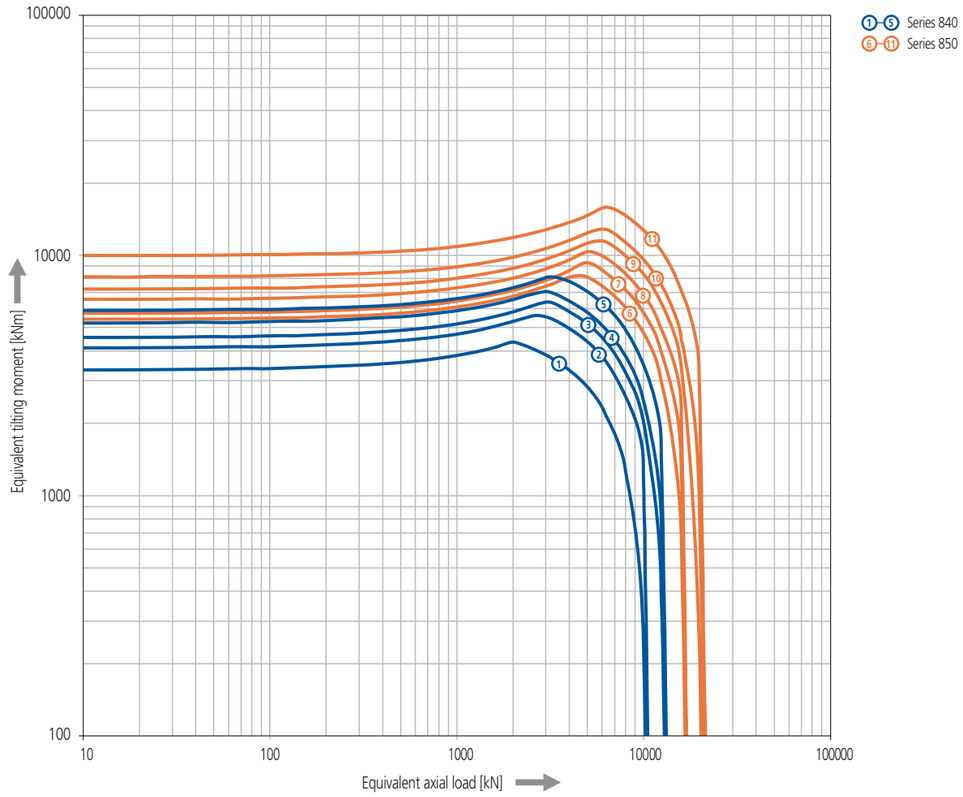


Static load ratings for the individual sizes



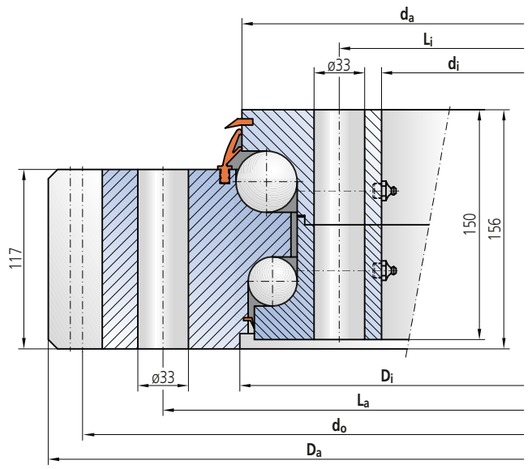
Limiting load diagrams, series 840, 850

Please refer to the explanations in the Technical Information section of the catalog.



External toothed

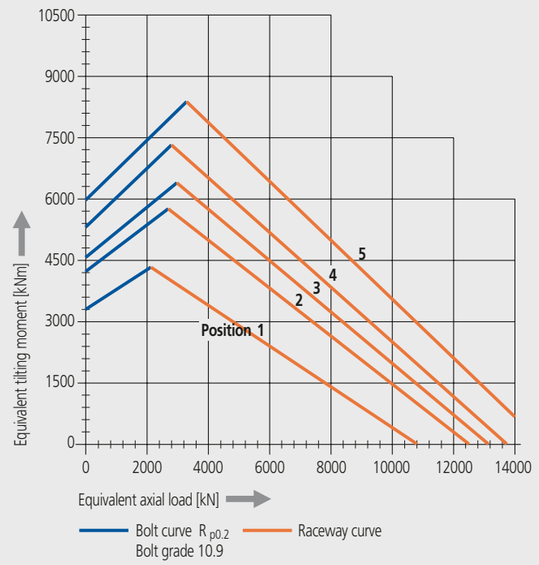
Drawing number	Position	Dimensions and weight					Mounting holes			Gearing and tooth forces						Load ratings					
		Outside diameter, outer ring	Inside diameter, inner ring	Inside diameter, outer ring	Outside diameter, inner ring	Weight	Pitch circle diameter, outer ring	Pitch circle diameter, inner ring	Numbers of holes per pitch circle	Pitch circle diameter	Module	Number of teeth	Addendum modification coeff.	Permissible tooth force	Maximum permissible tooth force	Static			Dynamic		
		D_a [mm]	d_i [mm]	D_i [mm]	d_a [mm]	G [kg]	L_a [mm]	L_i [mm]	n [-]	d_o [mm]	m [mm]	z2 [-]	x2 [-]	$f_{z\,norm}$ [kN]	$f_{z\,max}$ [kN]	$C_{o\,rad}$ [kN]	$C_{o\,ax\,T}$ [kN]	$C_{o\,ax\,H}$ [kN]	C_{rad} [kN]	$C_{ax\,T}$ [kN]	$C_{ax\,H}$ [kN]
81-40 2240/2-07600	**1**	2524.8	2090	2275	2272	1316	2375	2145	48	2480	16	155	+0.50	176	307	2102	10580	8632	536	1265	1007
81-40 2619/2-07605	**2**	2912.4	2465	2654	2651	1615	2755	2520	52	2862	18	159	+0.50	205	357	2459	12371	10097	568	1341	1067
81-40 2795/2-07610	**3**	3096.0	2645	2830	2827	1723	2930	2700	54	3040	20	152	+0.50	233	408	2625	13201	10778	580	1375	1091
81-40 2915/2-07615	**4**	3216.0	2765	2950	2947	1790	3050	2820	60	3160	20	158	+0.50	233	408	2738	13768	11242	590	1399	1109
81-40 3150/2-07620	**5**	3456.0	3000	3185	3182	1969	3285	3065	60	3400	20	170	+0.50	233	408	2959	14878	12151	607	1436	1141



Radial clearance: 0 - 0.4 mm
Axial tilting clearance: 0 - 0.4 mm
Bearing ring material: 42CrMo4V
4 to 6 Taper type grease nipples on each circumferential row

Mounting holes equally spaced
Raceway system supplied pre-lubricated
Dimensions without tolerances DIN ISO 2768 coarse

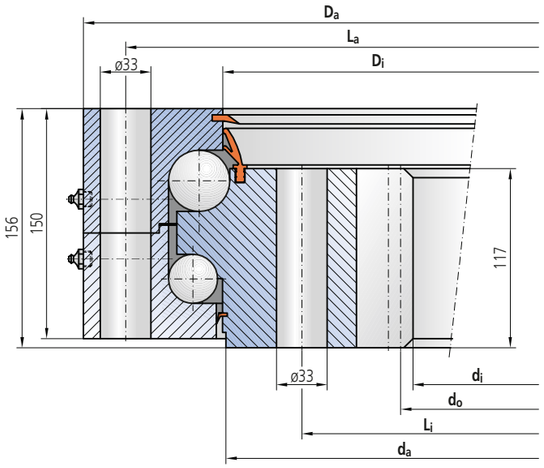
Limiting load diagram for "compressive" loads - **Series 840**



Please adhere strictly to the rules given in the Technical Information section when using above graph!

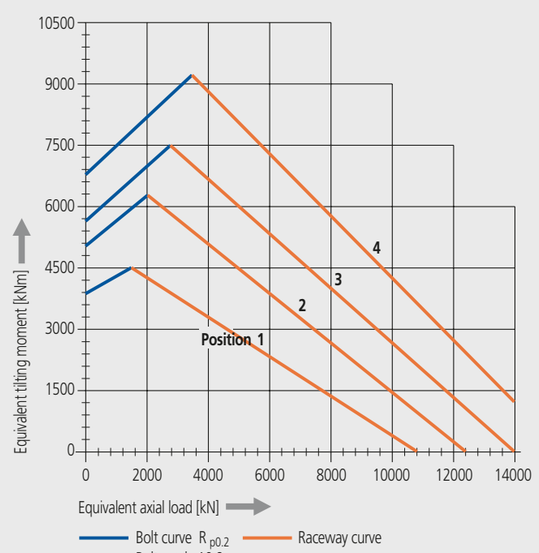
Internal toothed

Drawing number	Position	Dimensions and weight					Mounting holes			Gearing and tooth forces						Load ratings					
		Outside diameter, outer ring	Inside diameter, inner ring	Inside diameter, outer ring	Outside diameter, inner ring	Weight	Pitch circle diameter, outer ring	Pitch circle diameter, inner ring	Numbers of holes per pitch circle	Pitch circle diameter	Module	Number of teeth	Addendum modification coeff.	Permissible tooth force	Maximum permissible tooth force	Static			Dynamic		
		D_a [mm]	d_i [mm]	D_i [mm]	d_a [mm]	G [kg]	L_a [mm]	L_i [mm]	n [-]	d_o [mm]	m [mm]	z2 [-]	x2 [-]	$f_{z\,norm}$ [kN]	$f_{z\,max}$ [kN]	$C_{o\,rad}$ [kN]	$C_{o\,ax\,T}$ [kN]	$C_{o\,ax\,H}$ [kN]	C_{rad} [kN]	$C_{ax\,T}$ [kN]	$C_{ax\,H}$ [kN]
82-40 2199/2-07625	**1**	2350	1920	2168	2164	1238	2295	2065	52	1936	16	121	-0.50	178	338	2078	10387	8535	532	1267	1000
82-40 2622/2-07630	**2**	2770	2336	2590	2587	1495	2715	2485	60	2352	16	147	-0.50	178	338	2477	12731	10171	568	1345	1068
82-40 2950/2-07635	**3**	3100	2646	2918	2915	1764	3045	2815	60	2664	18	148	-0.50	214	385	2786	13934	11439	594	1403	1117
82-40 3300/2-07640	**4**	3450	3006	3268	3265	1935	3395	3165	66	3024	18	168	-0.50	214	385	3115	15587	12793	619	1462	1162



Radial clearance: 0 - 0.4 mm
Axial tilting clearance: 0 - 0.4 mm
Bearing ring material: 42CrMo4V
4 to 6 Taper type grease nipples on each circumferential row

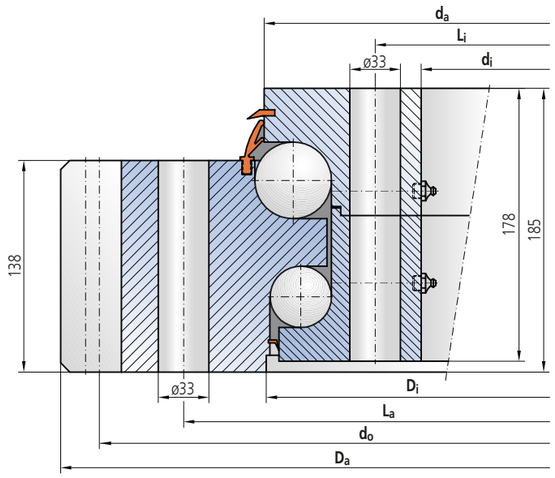
Mounting holes equally spaced
Raceway system supplied pre-lubricated
Dimensions without tolerances DIN ISO 2768 coarse



Please adhere strictly to the rules given in the Technical Information section when using above graph!

External toothed

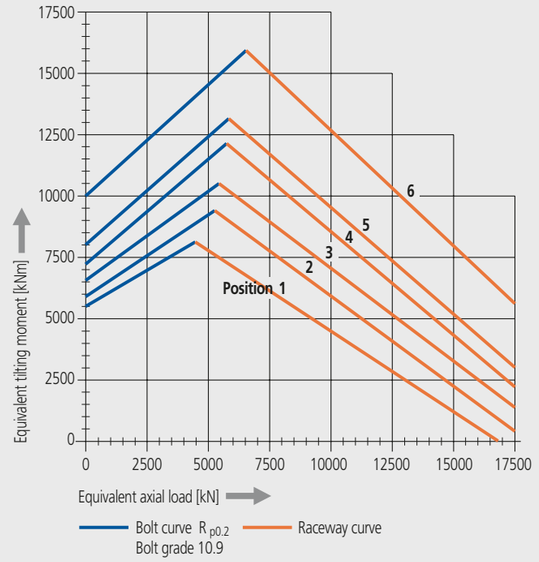
Drawing number	Position	Dimensions and weight					Mounting holes			Gearing and tooth forces						Load ratings					
		Outside diameter, outer ring	Inside diameter, inner ring	Inside diameter, outer ring	Outside diameter, inner ring	Weight	Pitch circle diameter, outer ring	Pitch circle diameter, inner ring	Numbers of holes per pitch circle	Pitch circle diameter	Module	Number of teeth	Addendum modification coeff.	Permissible tooth force	Maximum permissible tooth force	Static			Dynamic		
		D_a [mm]	d_i [mm]	D_i [mm]	d_a [mm]	G [kg]	L_a [mm]	L_i [mm]	n [-]	d_o [mm]	m [mm]	z2 [-]	x2 [-]	$f_{z\,norm}$ [kN]	$f_{z\,max}$ [kN]	$C_{o\,rad}$ [kN]	$C_{o\,ax\,T}$ [kN]	$C_{o\,ax\,H}$ [kN]	C_{rad} [kN]	$C_{ax\,T}$ [kN]	$C_{ax\,H}$ [kN]
81-50 2987/2-06940	**1**	3290.4	2820	3022	3025	2288	3130	2880	66	3240	18	180	+0.50	227	403	3424	17019	14062	749	1774	1408
81-50 3167/2-06945	**2**	3470.4	3000	3202	3205	2431	3310	3060	66	3420	18	190	+0.50	227	403	3631	18044	14912	766	1810	1439
81-50 3347/2-06950	**3**	3650.4	3180	3382	3385	2566	3490	3240	72	3600	18	200	+0.50	227	403	3838	19070	15762	782	1853	1469
81-50 3567/2-06955	**4**	3866.4	3400	3602	3605	2702	3710	3460	78	3816	18	212	+0.50	227	403	4091	20323	16801	799	1892	1502
81-50 3747/2-06960	**5**	4046.4	3580	3782	3785	2837	3890	3640	84	3996	18	222	+0.50	227	403	4298	21349	17651	814	1932	1530
81-50 4140/2-06965	**6**	4456.0	3970	4175	4178	3282	4285	4030	90	4400	20	220	+0.50	260	465	4750	23588	19508	844	2002	1587



Radial clearance: 0 - 0.5 mm
Axial tilting clearance 0 - 0.5 mm
Bearing ring material: 42CrMo4V
4 to 6 Taper type grease nipples on each circumferential row

Mounting holes equally spaced
Raceway system supplied pre-lubricated
Dimensions without tolerances DIN ISO 2768 coarse

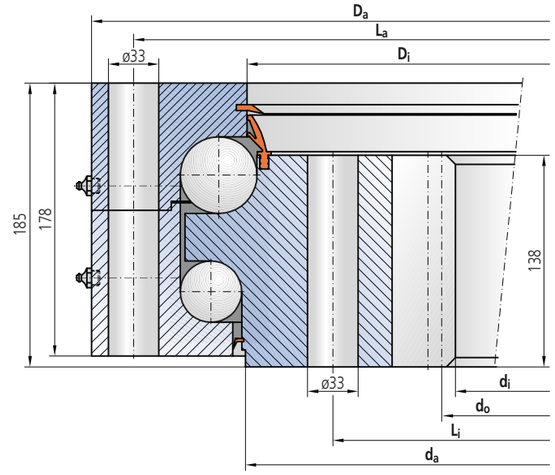
Limiting load diagram for "compressive" loads - **Series 850**



Please adhere strictly to the rules given in the Technical Information section when using above graph!

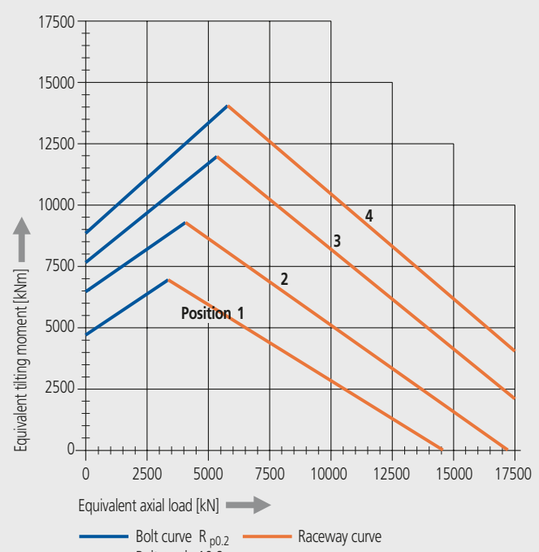
Internal toothed

Drawing number	Position	Dimensions and weight					Mounting holes			Gearing and tooth forces						Load ratings					
		Outside diameter, outer ring	Inside diameter, inner ring	Inside diameter, outer ring	Outside diameter, inner ring	Weight	Pitch circle diameter, outer ring	Pitch circle diameter, inner ring	Numbers of holes per pitch circle	Pitch circle diameter	Module	Number of teeth	Addendum modification coeff.	Permissible tooth force	Maximum permissible tooth force	Static			Dynamic		
		D_a [mm]	d_i [mm]	D_i [mm]	d_a [mm]	G [kg]	L_a [mm]	L_i [mm]	n [-]	d_o [mm]	m [mm]	z2 [-]	x2 [-]	$f_{z\,norm}$ [kN]	$f_{z\,max}$ [kN]	$C_{o\,rad}$ [kN]	$C_{o\,ax\,T}$ [kN]	$C_{o\,ax\,H}$ [kN]	C_{rad} [kN]	$C_{ax\,T}$ [kN]	$C_{ax\,H}$ [kN]
82-50 2559/2-06970	**1**	2725	2250	2522	2524	1892	2670	2410	60	2268	18	126	-0.50	240	440	2955	14580	12134	710	1678	1334
82-50 3040/2-06975	**2**	3205	2720	3002	3005	2295	3150	2890	72	2740	20	137	-0.50	272	495	3508	17321	14406	755	1785	1419
82-50 3520/2-06980	**3**	3685	3200	3482	3485	2657	3630	3370	78	3220	20	161	-0.50	272	495	4060	20056	16674	798	1888	1501
82-50 3839/2-06985	**4**	4005	3520	3801	3804	2905	3950	3690	84	3540	20	177	-0.50	272	495	4427	21873	18180	823	1948	1547



Radial clearance: 0 - 0.5 mm
Axial tilting clearance: 0 - 0.5 mm
Bearing ring material: 42CrMo4V
4 to 6 Taper type grease nipples on each circumferential row

Mounting holes equally spaced
Raceway system supplied pre-lubricated
Dimensions without tolerances DIN ISO 2768 coarse

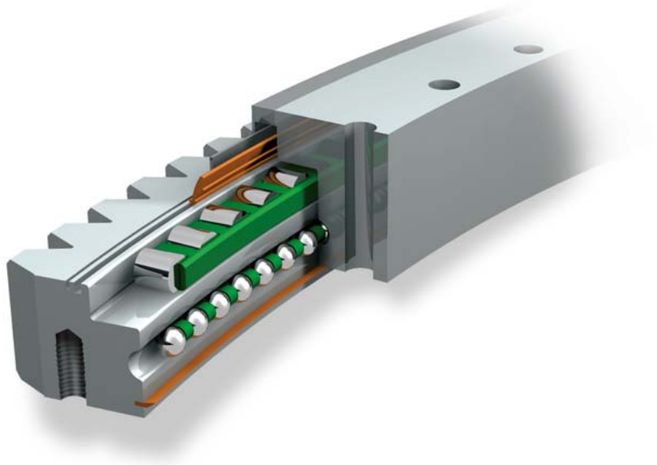


Please adhere strictly to the rules given in the Technical Information section when using above graph!

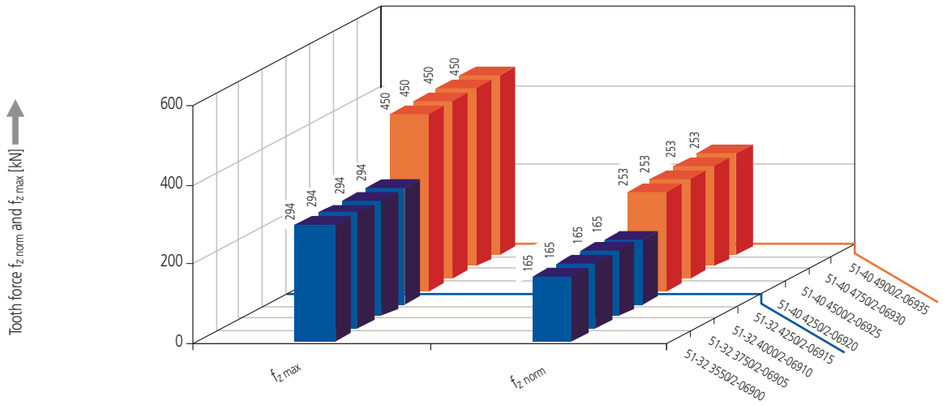
Series overview - Roller / Ball Combination Slewing Rings

51 – 32 3550 / 2 – 06900

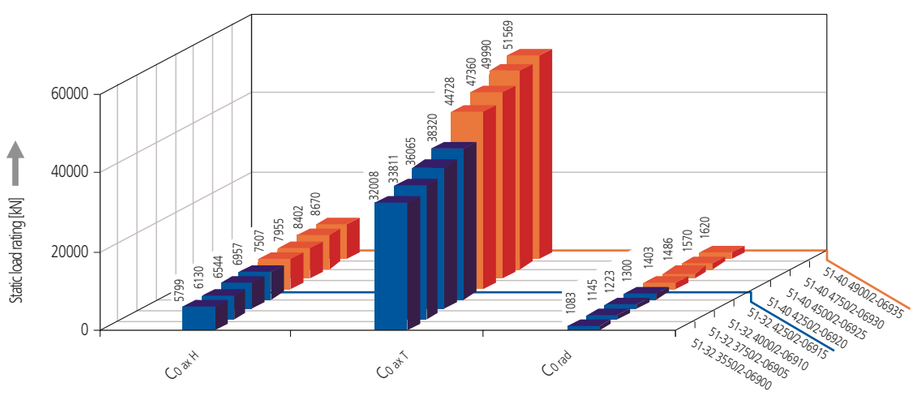
- **Drawing reference number**
- **Gearing heat treatment**
  2: Quenched and tempered
- **Raceway diameter [D_L in mm]**
- **Rolling element diameter [D_w in mm]**
- **Gear type:**
  1: External toothed
- **Bearing design**
  5: Roller / Ball Combination Slewing Ring



Permissible tooth force for the individual sizes



Static load ratings for the individual sizes



Operating conditions

Permissible temperature range -25°C to +70°C
Maximum permissible rotational speed $n_{perm} = 40000 / D_L$
For horizontal rotational axis $n_{perm} = 20000 / D_L$
(D_L = raceway diameter)
"Compressive" load
Bolt grade 10.9

Typical applications

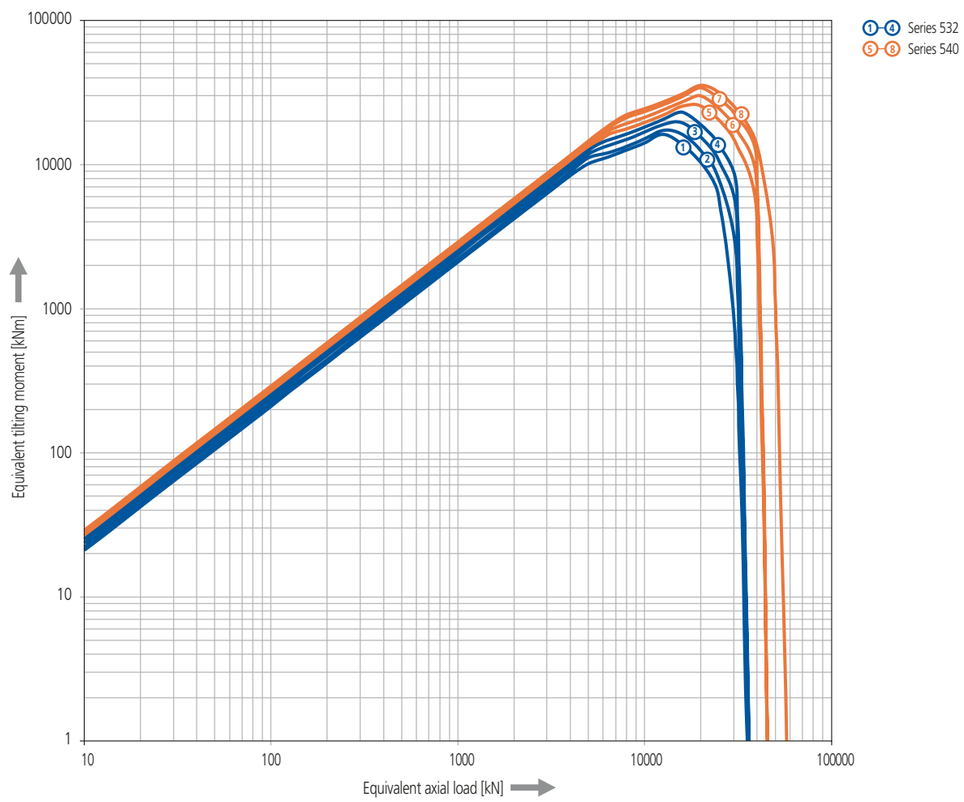
Reclaimers, stackers and other equipment for bulk materials handling, turntables.

Characteristics

- High axial load capacity
- Long service life if mainly axial loads
- High rigidity
- Good running precision

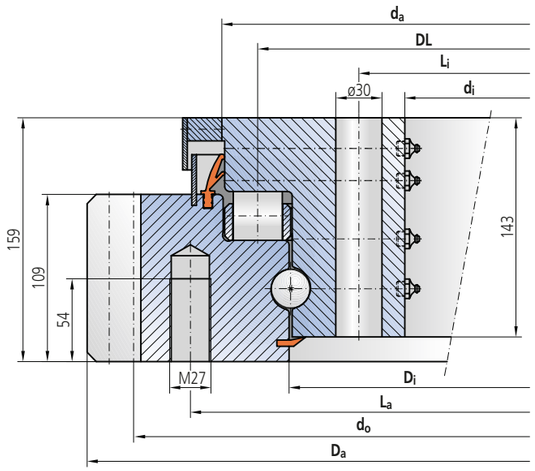
Limiting load diagrams, series 532, 540

Please refer to the explanations in the Technical Information section of the catalog.

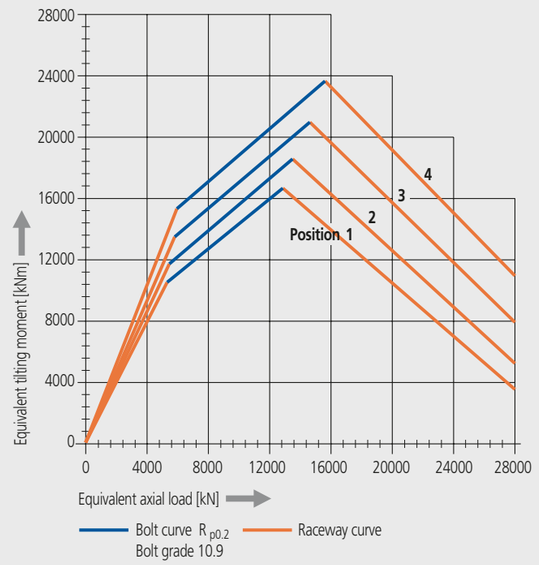


External toothed

Drawing number	Position	Abmessungen und Gewicht					Mounting holes			Gearing and tooth forces						Load ratings					
		Outside diameter, outer ring	Inside diameter, inner ring	Inside diameter, outer ring	Outside diameter, inner ring	Weight	Pitch circle diameter, outer ring	Pitch circle diameter, inner ring	Numbers of holes per pitch circle	Pitch circle diameter	Module	Number of teeth	Addendum modification coeff.	Permissible tooth force	Maximum permissible tooth force	Static			Dynamic		
		D_a [mm]	d_i [mm]	D_i [mm]	d_a [mm]	G [kg]	L_a [mm]	L_i [mm]	n [-]	d_o [mm]	m [mm]	z2 [-]	x2 [-]	$f_{z\,norm}$ [kN]	$f_{z\,max}$ [kN]	$C_{o\,rad}$ [kN]	$C_{o\,ax\,T}$ [kN]	$C_{o\,ax\,H}$ [kN]	C_{rad} [kN]	$C_{ax\,T}$ [kN]	$C_{ax\,H}$ [kN]
51-32 3550/2-06900	**1**	3772.8	3358	3509	3597	2028	3638	3418	76	3712	16	232	+1.00	165	294	1083	32008	5799	319	4948	606
51-32 3750/2-06905	**2**	3980.8	3558	3709	3797	2186	3846	3618	80	3936	16	246	+0.50	165	294	1145	33811	6130	325	5089	618
51-32 4000/2-06910	**3**	4220.8	3808	3959	4047	2278	4086	3868	84	4176	16	261	+0.50	165	294	1223	36065	6544	333	5273	633
51-32 4250/2-06915	**4**	4476.8	4058	4209	4297	2455	4342	4118	90	4416	16	276	+1.00	165	294	1300	38320	6957	341	5439	648



Limiting load diagram for "compressive" loads - **Series 532**

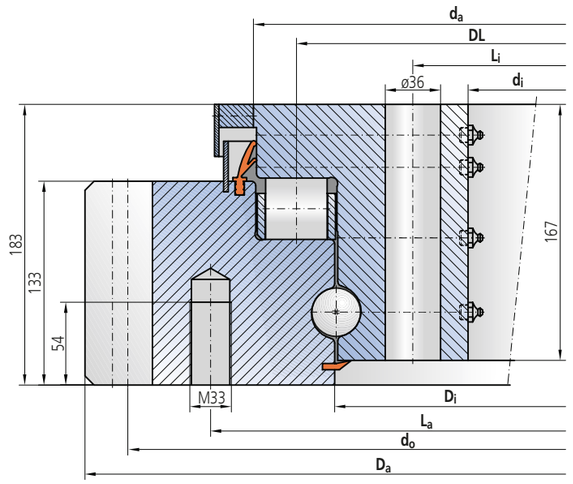


Please adhere strictly to the rules given in the Technical Information section when using above graph!

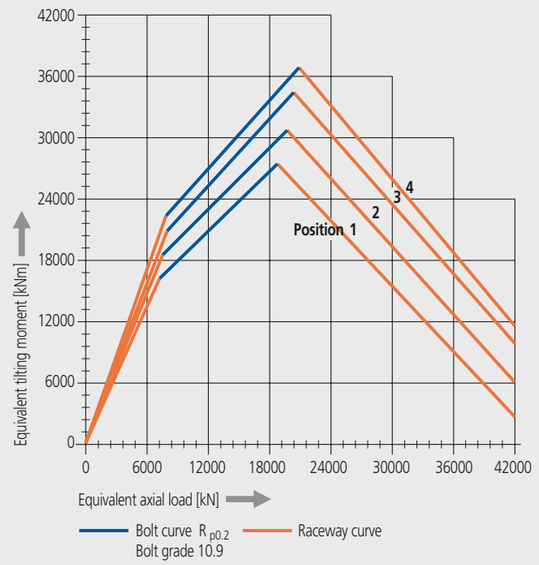
Radial clearance: 0 - 0.32 mm
Axial clearance: 0 - 0.32 mm
Bearing ring material: 42CrMo4V
10 to 12 Taper type grease nipples on each circumferential row
Mounting holes equally spaced
Raceway system supplied pre-lubricated
Dimensions without tolerances DIN ISO 2768 coarse

External toothed

Drawing number	Position	Dimensions and weight					Mounting holes			Gearing and tooth forces						Load ratings					
		Outside diameter, outer ring	Inside diameter, inner ring	Inside diameter, outer ring	Outside diameter, inner ring	Weight	Pitch circle diameter, outer ring	Pitch circle diameter, inner ring	Numbers of holes per pitch circle	Pitch circle diameter	Module	Number of teeth	Addendum modification coeff.	Permissible tooth force	Maximum permissible tooth force	Static			Dynamic		
		D_a [mm]	d_i [mm]	D_i [mm]	d_a [mm]	G [kg]	L_a [mm]	L_i [mm]	n [-]	d_o [mm]	m [mm]	z2 [-]	x2 [-]	$f_{z\,norm}$ [kN]	$f_{z\,max}$ [kN]	$C_{o\,rad}$ [kN]	$C_{o\,ax\,T}$ [kN]	$C_{o\,ax\,H}$ [kN]	C_{rad} [kN]	$C_{ax\,T}$ [kN]	$C_{ax\,H}$ [kN]
51-40 4250/2-06920	**1**	4536	4026	4200	4306	3469	4362	4098	68	4480	20	224	+0.50	253	450	1403	44728	7507	442	7415	840
51-40 4500/2-06925	**2**	4776	4276	4450	4556	3673	4612	4348	72	4720	20	236	+0.50	253	450	1486	47360	7955	451	7649	858
51-40 4750/2-06930	**3**	5016	4526	4700	4805	3796	4852	4598	76	4960	20	248	+0.50	253	450	1570	49990	8402	460	7877	876
51-40 4900/2-06935	**4**	5176	4676	4850	4956	4000	5012	4748	80	5120	20	256	+0.50	253	450	1620	51569	8670	466	8007	886



Limiting load diagram for "compressive" loads - **Series 540**



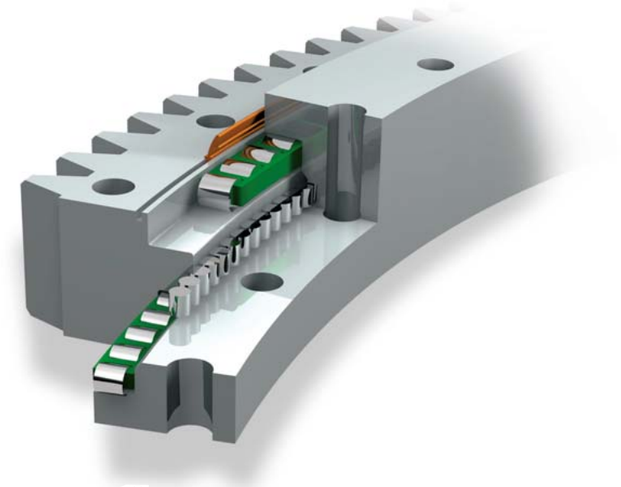
Please adhere strictly to the rules given in the Technical Information section when using above graph!

Radial clearance: 0 - 0.4 mm
Axial clearance: 0 - 0.4 mm
Bearing ring material: 42CrMo4V
14 to 16 Taper type grease nipples on each circumferential row
Mounting holes equally spaced
Raceway system supplied pre-lubricated
Dimensions without tolerances DIN ISO 2768 coarse

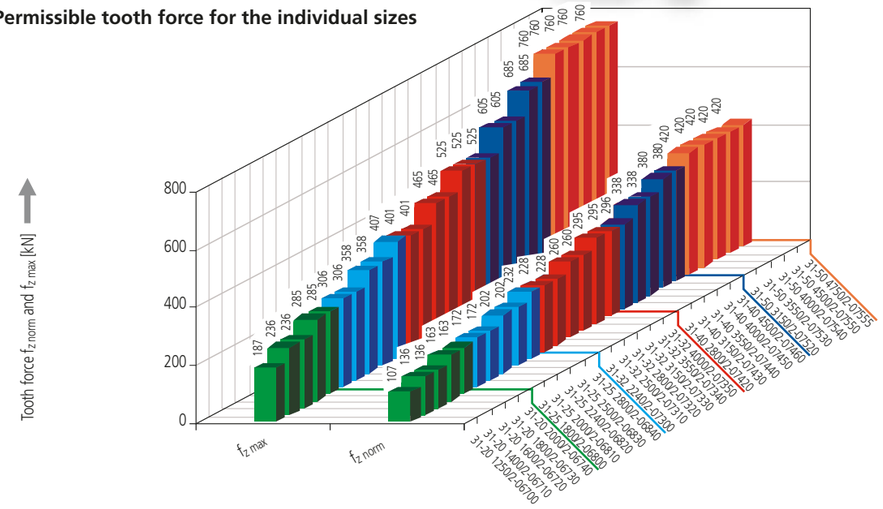
Series overview - Triple-Row Roller Slewing Rings

31 – 20 1250 / 2 – 06700

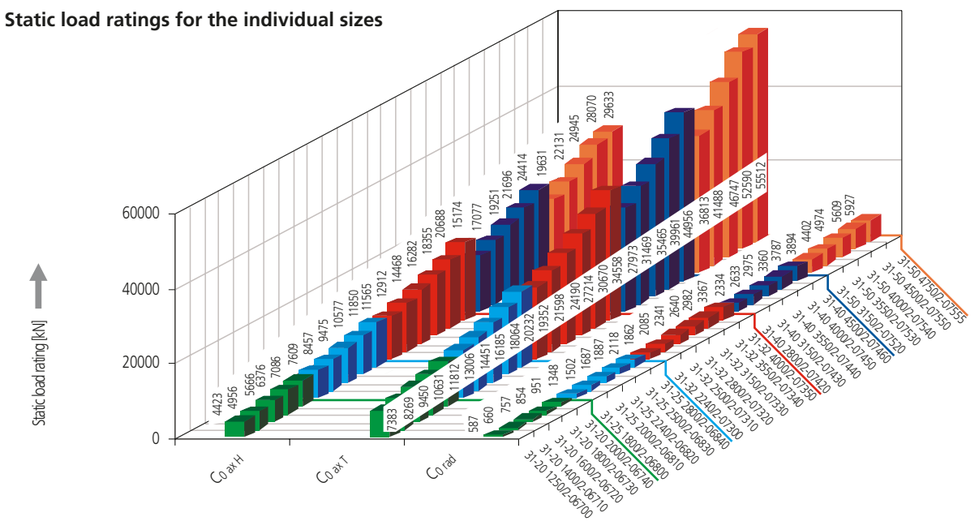
- **Drawing reference number**
- **Gearing heat treatment**
  2: Quenched and tempered
- **Raceway diameter [D_L in mm]**
- **Rolling element diameter [D_w in mm]**
- **Gear type:**
  1: External toothed
  2: Internal toothed
- **Bearing design**
  3: Triple Row Roller Slewing Ring



Permissible tooth force for the individual sizes



Static load ratings for the individual sizes



Operating conditions

Permissible temperature range -25°C to +70°C
Maximum permissible rotational speed $n_{perm} = 20000 / D_L$
(D_L = raceway diameter)
"Compressive" load
Bolt grade 10.9

Typical applications

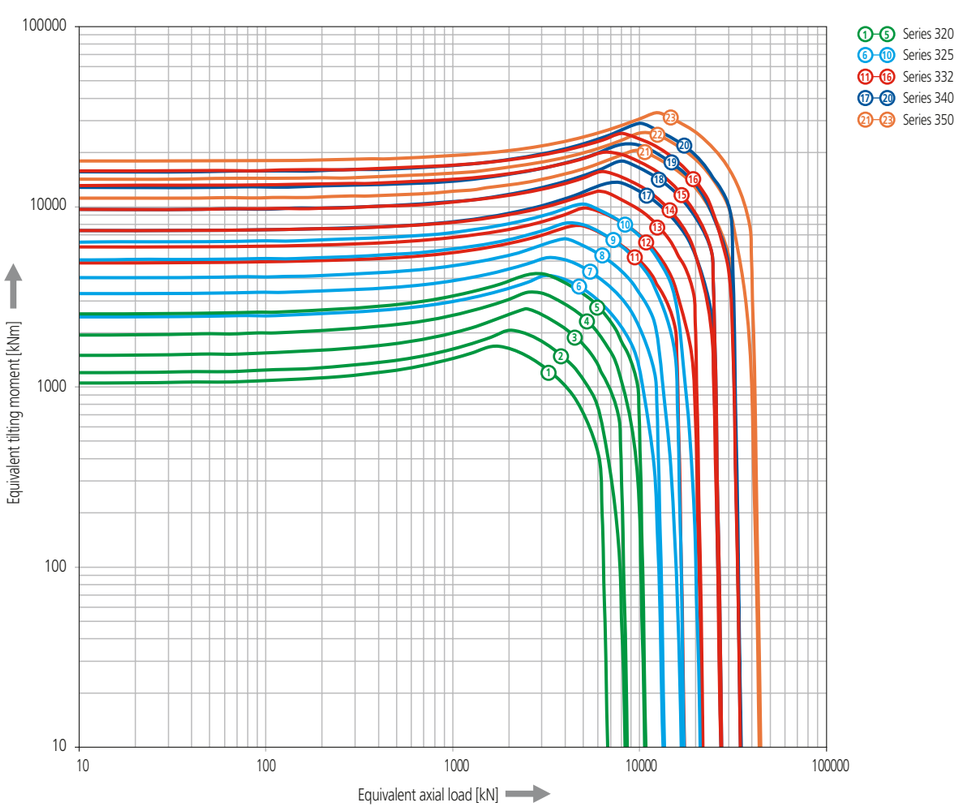
Heavy harbour cranes, shipboard cranes, ladle turrets and grab cranes, radar antennas, wind energy turbine main bearings, tunnel boring machines and loading buoys (oil, gas swivels), machine tools (in general where the application requires high duty cycles).

Characteristics

- High precision
- Highest axial load capacity
- Especially high tilting moment load capacity
- High rigidity
- Long service life

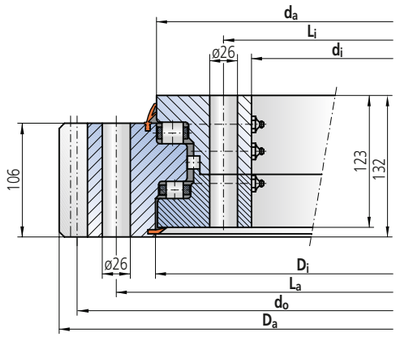
Limiting load diagrams, series 320, 325, 332, 340, 350

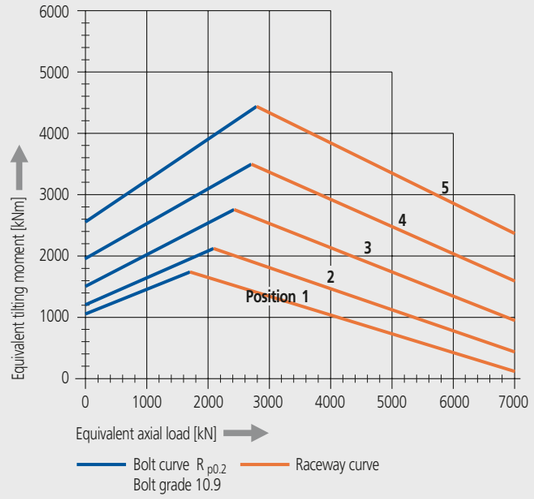
Please refer to the explanations in the Technical Information section of the catalog.



External toothed

Drawing number	Position	Dimensions and weight					Mounting holes			Gearing and tooth forces						Load ratings					
		Outside diameter, outer ring	Inside diameter, inner ring	Inside diameter, outer ring	Outside diameter, inner ring	Weight	Pitch circle diameter, outer ring	Pitch circle diameter, inner ring	Numbers of holes per pitch circle	Pitch circle diameter	Module	Number of teeth	Addendum modification coeff.	Permissible tooth force	Maximum permissible tooth force	Static			Dynamic		
		D_a [mm]	d_i [mm]	D_i [mm]	d_a [mm]	G [kg]	L_a [mm]	L_i [mm]	n [-]	d_o [mm]	m [mm]	z2 [-]	x2 [-]	$f_{z\,norm}$ [kN]	$f_{z\,max}$ [kN]	$C_{o\,rad}$ [kN]	$C_{o\,ax\,T}$ [kN]	$C_{o\,ax\,H}$ [kN]	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

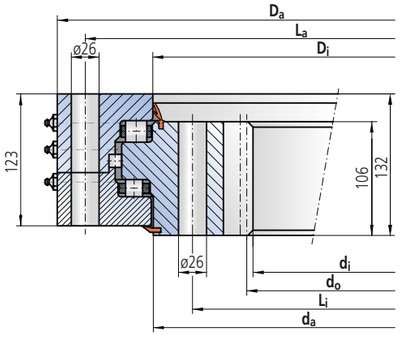




Please adhere strictly to the rules given in the Technical Information section when using above graph!

Internal toothed

Drawing number	Position	Dimensions and weight					Mounting holes			Gearing and tooth forces						Load ratings					
		Outside diameter, outer ring	Inside diameter, inner ring	Inside diameter, outer ring	Outside diameter, inner ring	Weight	Pitch circle diameter, outer ring	Pitch circle diameter, inner ring	Numbers of holes per pitch circle	Pitch circle diameter	Module	Number of teeth	Addendum modification coeff.	Permissible tooth force	Maximum permissible tooth force	Static			Dynamic		
		D_a [mm]	d_i [mm]	D_i [mm]	d_a [mm]	G [kg]	L_a [mm]	L_i [mm]	n [-]	d_o [mm]	m [mm]	z2 [-]	x2 [-]	$f_{z\,norm}$ [kN]	$f_{z\,max}$ [kN]	$C_{o\,rad}$ [kN]	$C_{o\,ax\,T}$ [kN]	$C_{o\,ax\,H}$ [kN]	C_{rad} [kN]	$C_{ax\,T}$ [kN]	$C_{ax\,H}$ [kN]
32-20 1250/2-06750	**1**	1397	1032	1219	1218	539	1345	1145	36	1044	12	87	-0.50	117	214	625	7383	4452	424	1464	1978
32-20 1400/2-06760	**2**	1547	1162	1369	1368	630	1495	1295	36	1176	14	84	-0.50	146	269	698	8269	4984	449	1558	1146
32-20 1600/2-06770	**3**	1747	1372	1569	1568	705	1695	1495	40	1386	14	99	-0.50	146	269	795	9450	5694	481	1674	1232
32-20 1800/2-06780	**4**	1947	1552	1769	1768	829	1895	1695	46	1568	16	98	-0.50	175	319	892	10631	6404	511	1789	1309
32-20 2000/2-06790	**5**	2147	1760	1969	1968	902	2095	1895	54	1776	16	111	-0.50	175	319	989	11812	7114	540	1886	1382



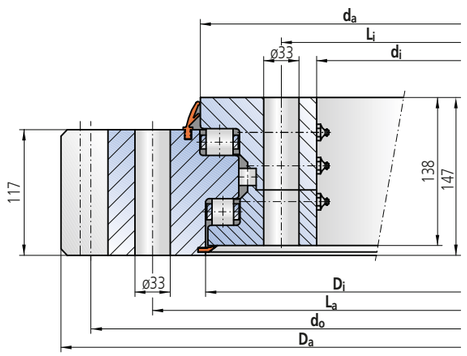
Bearing ring material: 42CrMo4V
3 to 5 Taper type grease nipples on each circumferential row
Mounting holes equally spaced
Raceway system supplied pre-lubricated
Dimensions without tolerances DIN ISO 2768 coarse

Clearances

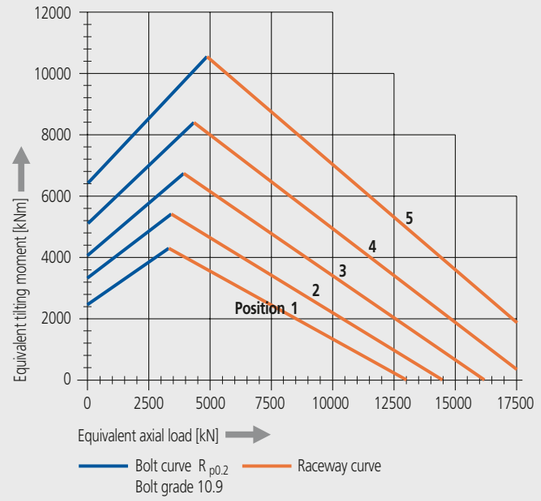
Position	Radial clearance	Axial clearance
1	max. 0.20	max. 0.07
2	max. 0.20	max. 0.07
3	max. 0.25	max. 0.08
4	max. 0.25	max. 0.08
5	max. 0.25	max. 0.08

External toothed

Drawing number	Position	Dimensions and weight					Mounting holes			Gearing and tooth forces						Load ratings					
		Outside diameter, outer ring	Inside diameter, inner ring	Inside diameter, outer ring	Outside diameter, inner ring	Weight	Pitch circle diameter, outer ring	Pitch circle diameter, inner ring	Numbers of holes per pitch circle	Pitch circle diameter	Module	Number of teeth	Addendum modification coeff.	Permissible tooth force	Maximum permissible tooth force	Static			Dynamic		
		D_a [mm]	d_i [mm]	D_i [mm]	d_a [mm]	G [kg]	L_a [mm]	L_i [mm]	n [-]	d_o [mm]	m [mm]	z2 [-]	x2 [-]	$f_{z\,norm}$ [kN]	$f_{z\,max}$ [kN]	$C_{o\,rad}$ [kN]	$C_{o\,ax\,T}$ [kN]	$C_{o\,ax\,H}$ [kN]	C_{rad} [kN]	$C_{ax\,T}$ [kN]	$C_{ax\,H}$ [kN]
31-25 1800/2-06800	**1**	2076.8	1619	1826	1836	1126	1925	1685	36	2032	16	127	+0.50	172	306	1348	13006	7609	728	2432	1784
31-25 2000/2-06810	**2**	2268.8	1819	2026	2036	1216	2125	1885	44	2224	16	139	+0.50	172	306	1502	14451	8457	772	2578	1881
31-25 2240/2-06820	**3**	2516.4	2059	2266	2276	1378	2366	2125	48	2466	18	137	+0.50	202	358	1687	16185	9475	821	2734	1999
31-25 2500/2-06830	**4**	2786.4	2319	2526	2536	1567	2625	2385	54	2736	18	152	+0.50	202	358	1887	18064	10577	870	2894	2123
31-25 2800/2-06840	**5**	3096.0	2619	2826	2836	1785	2925	2685	60	3040	20	152	+0.50	232	407	2118	20232	11850	926	3077	2252



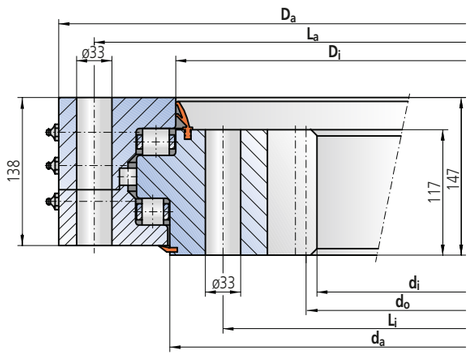
Limiting load diagram for "compressive" loads - **Series 325**



Please adhere strictly to the rules given in the Technical Information section when using above graph!

Internal toothed

Zeichnungsnummer	Position	Dimensions and weight					Mounting holes			Gearing and tooth forces						Load ratings					
		Outside diameter, outer ring	Inside diameter, inner ring	Inside diameter, outer ring	Outside diameter, inner ring	Weight	Pitch circle diameter, outer ring	Pitch circle diameter, inner ring	Numbers of holes per pitch circle	Pitch circle diameter	Module	Number of teeth	Addendum modification coeff.	Permissible tooth force	Maximum permissible tooth force	Static			Dynamic		
		D_a [mm]	d_i [mm]	D_i [mm]	d_a [mm]	G [kg]	L_a [mm]	L_i [mm]	n [-]	d_o [mm]	m [mm]	z2 [-]	x2 [-]	$f_{z\,norm}$ [kN]	$f_{z\,max}$ [kN]	$C_{o\,rad}$ [kN]	$C_{o\,ax\,T}$ [kN]	$C_{o\,ax\,H}$ [kN]	C_{rad} [kN]	$C_{ax\,T}$ [kN]	$C_{ax\,H}$ [kN]
32-25 1800/2-06850	**1**	1981	1520	1763	1774	1101	1915	1675	36	1536	16	96	-0.50	185	342	1424	13006	7660	751	2432	1787
32-25 2000/2-06860	**2**	2181	1728	1963	1974	1202	2115	1875	44	1744	16	109	-0.50	185	342	1577	14451	8508	793	2578	1890
32-25 2240/2-06870	**3**	2421	1944	2203	2214	1406	2355	2115	48	1962	18	109	-0.50	217	394	1763	16185	9526	832	2734	2008
32-25 2500/2-06880	**4**	2681	2214	2463	2474	1545	2615	2375	54	2232	18	124	-0.50	217	394	1963	18064	10628	889	2894	2126
32-25 2800/2-06890	**5**	2981	2500	2763	2774	1767	2915	2675	60	2520	20	126	-0.50	248	449	2194	20232	11901	943	3077	2255



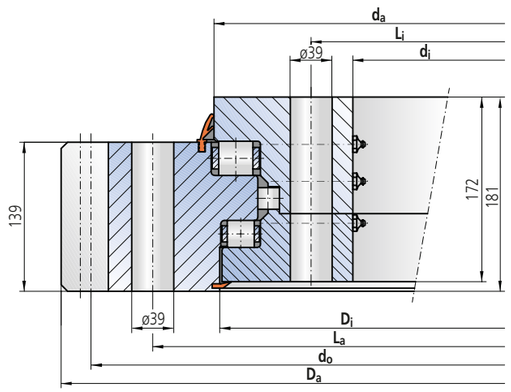
Bearing ring material: 42CrMo4V
6 to 10 Taper type grease nipples on each circumferential row
Mounting holes equally spaced
Raceway system supplied pre-lubricated
Dimensions without tolerances DIN ISO 2768 coarse

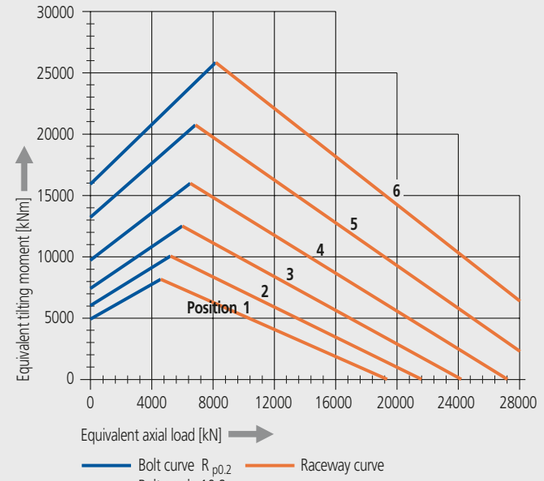
Clearances

Position	Radial clearance	Axial clearance
1	max. 0.25	max. 0.08
2	max. 0.25	max. 0.08
3	max. 0.33	max. 0.10
4	max. 0.33	max. 0.10
5	max. 0.40	max. 0.13

External toothed

Drawing number	Position	Dimensions and weight					Mounting holes			Gearing and tooth forces						Load ratings					
		Outside diameter, outer ring	Inside diameter, inner ring	Inside diameter, outer ring	Outside diameter, inner ring	Weight	Pitch circle diameter, outer ring	Pitch circle diameter, inner ring	Numbers of holes per pitch circle	Pitch circle diameter	Module	Number of teeth	Addendum modification coeff.	Permissible tooth force	Maximum permissible tooth force	Static			Dynamic		
		D_a [mm]	d_i [mm]	D_i [mm]	d_a [mm]	G [kg]	L_a [mm]	L_i [mm]	n [-]	d_o [mm]	m [mm]	z2 [-]	x2 [-]	$f_{z\,norm}$ [kN]	$f_{z\,max}$ [kN]	$C_{o\,rad}$ [kN]	$C_{o\,ax\,T}$ [kN]	$C_{o\,ax\,H}$ [kN]	C_{rad} [kN]	$C_{ax\,T}$ [kN]	$C_{ax\,H}$ [kN]
31-32 2240/2-07300	**1**	2552.4	2022	2270	2281	1975	2395	2100	40	2502	18	139	+0.50	228	401	1862	19352	11565	1028	3833	2727
31-32 2500/2-07310	**2**	2822.4	2282	2530	2541	2260	2655	2360	44	2772	18	154	+0.50	228	401	2085	21598	12912	1091	4048	2870
31-32 2800/2-07320	**3**	3136.0	2582	2830	2841	2576	2955	2660	48	3080	20	154	+0.50	260	465	2341	24190	14468	1158	4312	3088
31-32 3150/2-07330	**4**	3476.0	2932	3180	3191	2828	3305	3010	56	3420	20	171	+0.50	260	465	2640	27214	16282	1235	4614	3265
31-32 3550/2-07340	**5**	3889.6	3332	3580	3591	3249	3705	3410	66	3828	22	174	+0.50	295	525	2982	30670	18355	1316	4948	3489
31-32 4000/2-07350	**6**	4351.6	3782	4030	4041	3752	4155	3860	72	4290	22	195	+0.50	295	525	3367	34558	20688	1405	5249	3712

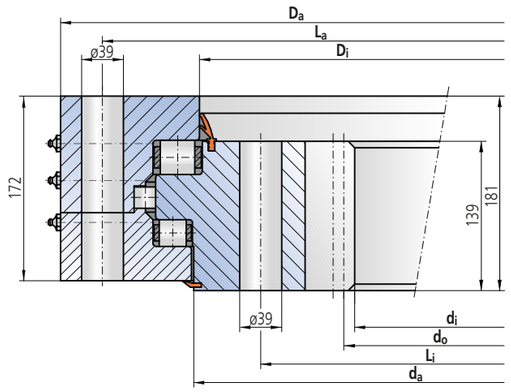




Please adhere strictly to the rules given in the Technical Information section when using above graph!

Internal toothed

Zeichnungsnummer	Position	Dimensions and weight					Mounting holes			Gearing and tooth forces						Load ratings					
		Outside diameter, outer ring	Inside diameter, inner ring	Inside diameter, outer ring	Outside diameter, inner ring	Weight	Pitch circle diameter, outer ring	Pitch circle diameter, inner ring	Numbers of holes per pitch circle	Pitch circle diameter	Module	Number of teeth	Addendum modification coeff.	Permissible tooth force	Maximum permissible tooth force	Static			Dynamic		
		D_a [mm]	d_i [mm]	D_i [mm]	d_a [mm]	G [kg]	L_a [mm]	L_i [mm]	n [-]	d_o [mm]	m [mm]	z2 [-]	x2 [-]	$f_{z\,norm}$ [kN]	$f_{z\,max}$ [kN]	$C_{o\,rad}$ [kN]	$C_{o\,ax\,T}$ [kN]	$C_{o\,ax\,H}$ [kN]	C_{rad} [kN]	$C_{ax\,T}$ [kN]	$C_{ax\,H}$ [kN]
32-32 2240/2-07360	**1**	2458	1908	2199	2210	2010	2380	2085	40	1926	18	107	-0.50	240	445	1966	19352	11658	1057	3833	2740
32-32 2500/2-07370	**2**	2718	2178	2459	2470	2210	2640	2345	44	2196	18	122	-0.50	240	445	2189	21598	13006	1119	4048	2909
32-32 2800/2-07380	**3**	3018	2460	2759	2770	2542	2940	2645	48	2480	20	124	-0.50	278	508	2445	24190	14561	1187	4312	3083
32-32 3150/2-07390	**4**	3368	2820	3109	3120	2807	3290	2995	56	2840	20	142	-0.50	278	508	2744	27214	16375	1260	4614	3276
32-32 3550/2-07400	**5**	3768	3190	3509	3520	3302	3690	3395	66	3212	22	146	-0.50	305	559	3089	30670	18449	1341	4948	3489
32-32 4000/2-07410	**6**	4218	3652	3959	3970	3664	4140	3845	72	3674	22	167	-0.50	305	559	3471	34558	20781	1427	5249	3742



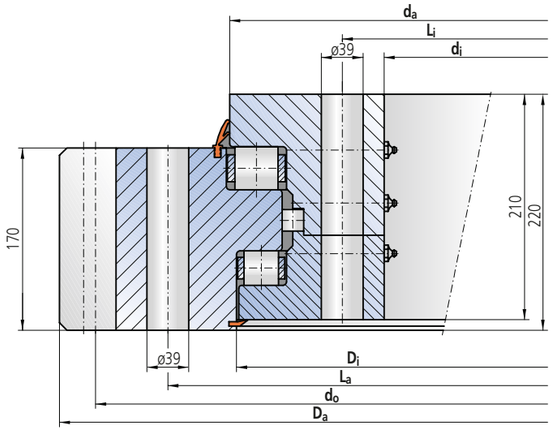
Bearing ring material: 42CrMo4V
7 to 9 Taper type grease nipples on each circumferential row
Mounting holes equally spaced
Raceway system supplied pre-lubricated
Dimensions without tolerances DIN ISO 2768 coarse

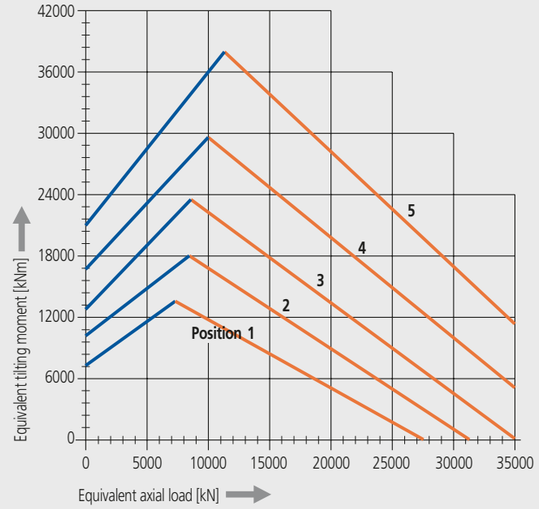
Clearances

Position	Radial clearance	Axial clearance
1	max. 0.33	max. 0.10
2	max. 0.33	max. 0.10
3	max. 0.40	max. 0.13
4	max. 0.50	max. 0.15
5	max. 0.50	max. 0.15
6	max. 0.50	max. 0.17

External toothed

Drawing number	Position	Dimensions and weight					Mounting holes			Gearing and tooth forces						Load ratings					
		Outside diameter, outer ring	Inside diameter, inner ring	Inside diameter, outer ring	Outside diameter, inner ring	Weight	Pitch circle diameter, outer ring	Pitch circle diameter, inner ring	Numbers of holes per pitch circle	Pitch circle diameter	Module	Number of teeth	Addendum modification coeff.	Permissible tooth force	Maximum permissible tooth force	Static			Dynamic		
		D_a [mm]	d_i [mm]	D_i [mm]	d_a [mm]	G [kg]	L_a [mm]	L_i [mm]	n [-]	d_o [mm]	m [mm]	z2 [-]	x2 [-]	$f_{z\,norm}$ [kN]	$f_{z\,max}$ [kN]	$C_{o\,rad}$ [kN]	$C_{o\,ax\,T}$ [kN]	$C_{o\,ax\,H}$ [kN]	C_{rad} [kN]	$C_{ax\,T}$ [kN]	$C_{ax\,H}$ [kN]
31-40 2800/2-07420	**1**	3136.0	2562	2837	2850	3267	2965	2640	48	3080	20	154	+0.50	296	525	2334	27973	15174	1157	5915	4329
31-40 3150/2-07430	**2**	3515.6	2912	3187	3200	3812	3315	2990	56	3454	22	157	+0.50	338	605	2633	31469	17077	1233	6291	4603
31-40 3550/2-07440	**3**	3911.6	3312	3587	3600	4255	3715	3390	66	3850	22	175	+0.50	338	605	2975	35465	19251	1315	6692	4899
31-40 4000/2-07450	**4**	4363.2	3762	4037	4050	4805	4165	3840	72	4296	24	179	+0.50	380	685	3360	39961	21696	1402	7154	5227
31-40 4500/2-07460	**5**	4867.2	4262	4537	4550	5410	4665	4340	84	4800	24	200	+0.50	380	685	3787	44956	24414	1494	7649	5603



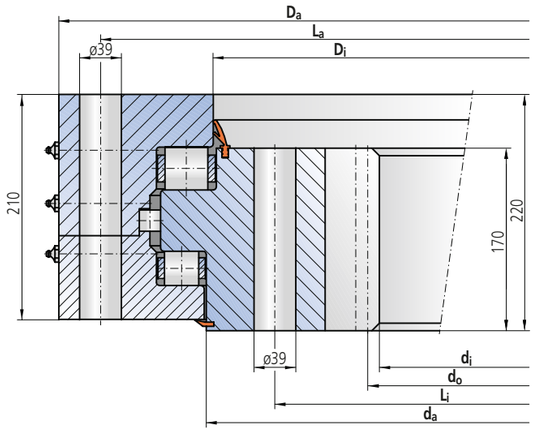


Bolt grade 10.9

Please adhere strictly to the rules given in the Technical Information section when using above graph!

Internal toothed

Drawing number	Position	Dimensions and weight					Mounting holes			Gearing and tooth forces						Load ratings					
		Outside diameter, outer ring	Inside diameter, inner ring	Inside diameter, outer ring	Outside diameter, inner ring	Weight	Pitch circle diameter, outer ring	Pitch circle diameter, inner ring	Numbers of holes per pitch circle	Pitch circle diameter	Module	Number of teeth	Addendum modification coeff.	Permissible tooth force	Maximum permissible tooth force	Static			Dynamic		
		D_a [mm]	d_i [mm]	D_i [mm]	d_a [mm]	G [kg]	L_a [mm]	L_i [mm]	n [-]	d_o [mm]	m [mm]	z2 [-]	x2 [-]	$f_{z\,norm}$ [kN]	$f_{z\,max}$ [kN]	$C_{o\,rad}$ [kN]	$C_{o\,ax\,T}$ [kN]	$C_{o\,ax\,H}$ [kN]	C_{rad} [kN]	$C_{ax\,T}$ [kN]	$C_{ax\,H}$ [kN]
32-40 2800/2-07470	**1**	3038	2460	2750	2763	3213	2960	2635	48	2480	20	124	-0.50	314	577	2452	27973	15438	1188	5915	4352
32-40 3150/2-07480	**2**	3388	2794	3100	3113	3683	3310	2985	56	2816	22	128	-0.50	357	658	2751	31469	17362	1262	6291	4625
32-40 3550/2-07490	**3**	3788	3190	3500	3513	4171	3710	3385	66	3212	22	146	-0.50	357	658	3093	35465	19561	1443	6692	4920
32-40 4000/2-07500	**4**	4238	3624	3950	3963	4810	4160	3835	72	3648	24	152	-0.50	398	740	3478	39961	21783	1428	7154	5234
32-40 4500/2-07510	**5**	4738	4128	4450	4463	5367	4660	4335	84	4152	24	173	-0.50	398	740	3905	44956	24501	1519	7649	5610



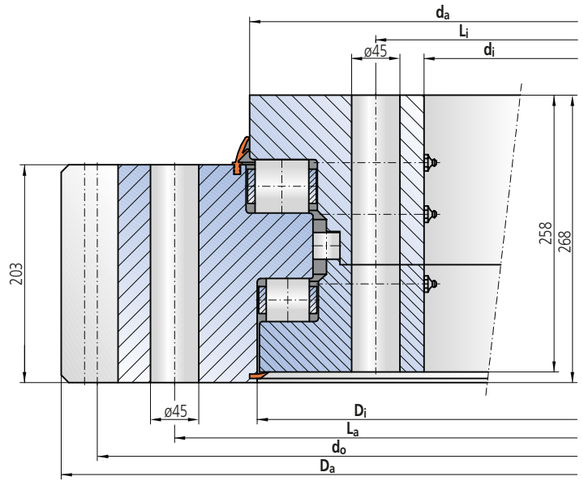
Bearing ring material: 42CrMo4V
7 to 14 Taper type grease nipples on each circumferential row
Mounting holes equally spaced
Raceway system supplied pre-lubricated
Dimensions without tolerances DIN ISO 2768 coarse

Clearances

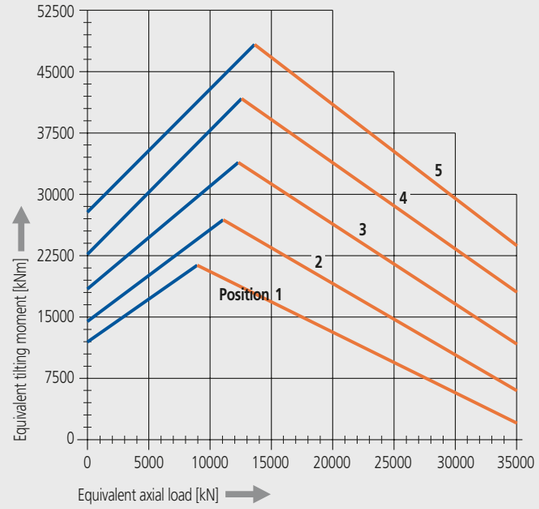
Position	Radial clearance	Axial clearance
1	max. 0.40	max. 0.13
2	max. 0.50	max. 0.15
3	max. 0.50	max. 0.15
4	max. 0.50	max. 0.17
5	max. 0.60	max. 0.20

External toothed

Drawing number	Position	Dimensions and weight					Mounting holes			Gearing and tooth forces						Load ratings					
		Outside diameter, outer ring	Inside diameter, inner ring	Inside diameter, outer ring	Outside diameter, inner ring	Weight	Pitch circle diameter, outer ring	Pitch circle diameter, inner ring	Numbers of holes per pitch circle	Pitch circle diameter	Module	Number of teeth	Addendum modification coeff.	Permissible tooth force	Maximum permissible tooth force	Static			Dynamic		
		D_a [mm]	d_i [mm]	D_i [mm]	d_a [mm]	G [kg]	L_a [mm]	L_i [mm]	n [-]	d_o [mm]	m [mm]	z2 [-]	x2 [-]	$f_{z\,norm}$ [kN]	$f_{z\,max}$ [kN]	$C_{o\,rad}$ [kN]	$C_{o\,ax\,T}$ [kN]	$C_{o\,ax\,H}$ [kN]	C_{rad} [kN]	$C_{ax\,T}$ [kN]	$C_{ax\,H}$ [kN]
31-50 3150/2-07520	**1**	3571.2	2885	3196	3210	5298	3350	2975	48	3504	24	146	+0.50	420	760	3894	36813	19631	1770	8590	6296
31-50 3550/2-07530	**2**	3955.2	3285	3596	3610	5830	3750	3375	54	3888	24	162	+0.50	420	760	4402	41488	22131	1887	9129	6696
31-50 4000/2-07540	**3**	4411.2	3735	4046	4060	6578	4200	3825	60	4344	24	181	+0.50	420	760	4974	46747	24945	2011	9715	7138
31-50 4500/2-07550	**4**	4915.2	4235	4546	4560	7456	4700	4325	68	4848	24	202	+0.50	420	760	5609	52590	28070	2144	10438	7634
31-50 4750/2-07555	**5**	5179.2	4485	4796	4810	7870	4950	4575	76	5112	24	213	+0.50	420	760	5927	55512	29633	2209	10721	7862



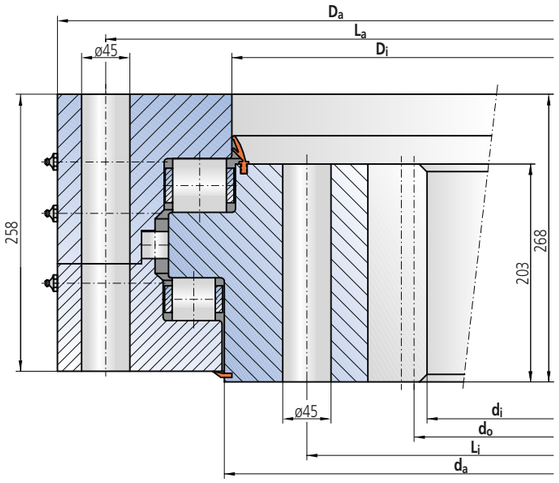
Limiting load diagram for "compressive" loads - **Series 350**



Please adhere strictly to the rules given in the Technical Information section when using above graph!

Internal toothed

Drawing number	Position	Dimensions and weight					Mounting holes			Gearing and tooth forces						Load ratings					
		Outside diameter, outer ring	Inside diameter, inner ring	Inside diameter, outer ring	Outside diameter, inner ring	Weight	Pitch circle diameter, outer ring	Pitch circle diameter, inner ring	Numbers of holes per pitch circle	Pitch circle diameter	Module	Number of teeth	Addendum modification coeff.	Permissible tooth force	Maximum permissible tooth force	Static			Dynamic		
		D_a [mm]	d_i [mm]	D_i [mm]	d_a [mm]	G [kg]	L_a [mm]	L_i [mm]	n [-]	d_o [mm]	m [mm]	z2 [-]	x2 [-]	$f_{z\,norm}$ [kN]	$f_{z\,max}$ [kN]	$C_{o\,rad}$ [kN]	$C_{o\,ax\,T}$ [kN]	$C_{o\,ax\,H}$ [kN]	C_{rad} [kN]	$C_{ax\,T}$ [kN]	$C_{ax\,H}$ [kN]
32-50 3150/2-07560	**1**	3415	2736	3090	3104	5128	3325	2950	48	2760	24	115	-0.50	440	820	4110	36813	19756	1820	8590	6309
32-50 3550/2-07570	**2**	3815	3120	3490	3504	5916	3725	3350	54	3144	24	131	-0.50	440	820	4618	41488	22256	1935	9129	6709
32-50 4000/2-07580	**3**	4265	3576	3940	3954	6623	4175	3800	60	3600	24	150	-0.50	440	820	5190	46745	25070	2059	9715	7150
32-50 4500/2-07590	**4**	4765	4080	4440	4454	7427	4675	4300	68	4104	24	171	-0.50	440	820	5825	52590	28195	2189	10438	7664
32-50 4750/2-07595	**5**	5015	4320	4690	4704	7840	4925	4550	76	4344	24	181	-0.50	440	820	6143	55512	29758	2250	10721	7873



Bearing ring material: 42CrMo4V
8 to 12 Taper type grease nipples on each circumferential row
Mounting holes equally spaced
Raceway system supplied pre-lubricated
Dimensions without tolerances DIN ISO 2768 coarse

Clearances

Position	Radial clearance	Axial clearance
1	max. 0.5	max. 0.15
2	max. 0.5	max. 0.15
3	max. 0.5	max. 0.17
4	max. 0.6	max. 0.20
5	max. 0.6	max. 0.20

Overview

10 – 12 0120 / 0 – 03659

Drawing reference number

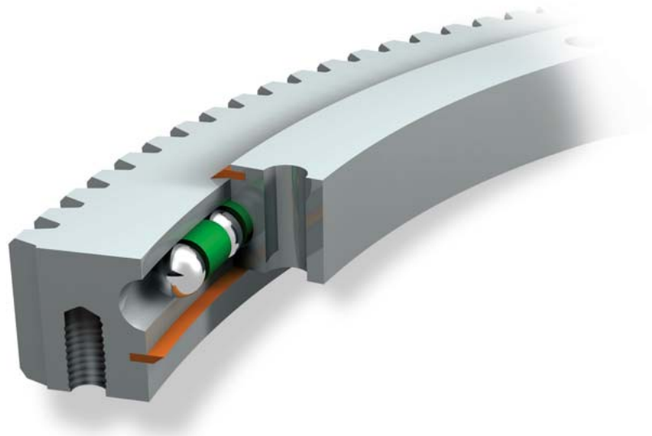
Gearing heat treatment
0: Untoothed
1: Normalized
2: Quenched and tempered

Raceway diameter [D_L in mm]

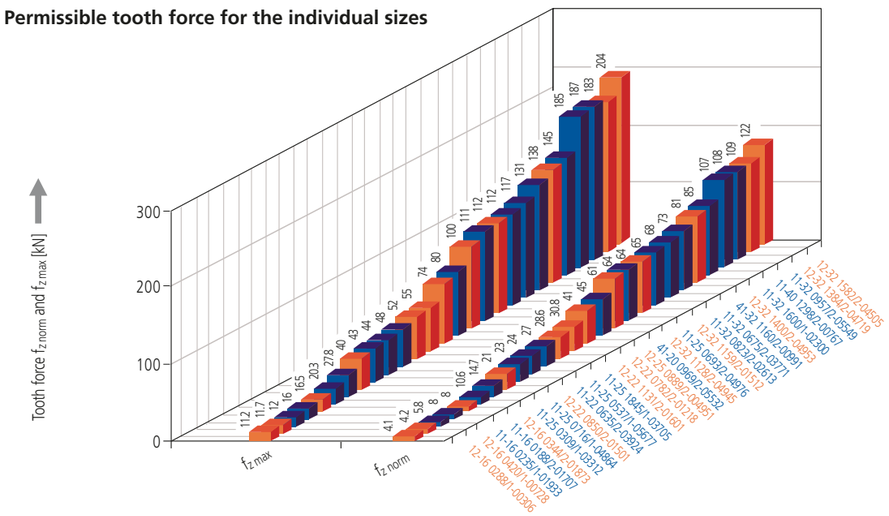
Rolling element diameter [D_W in mm]

Gear type:
0: Untoothed
1: External toothed
2: Internal toothed

Bearing design
1: Single Row Ball Slewing Ring
2: Cross Roller Slewing Ring
3: Triple Row Roller Slewing Ring
4: Double Row Ball Slewing Ring
5: Ball / Roller Combination Slewing Ring
6: Gear rim / pinion / ring
7: Wire race bearing / fitting element
8: Double Axial Slewing Ring
9: Ball Slewing Ring with flange rings
0: Special Slewing Ring



Permissible tooth force for the individual sizes



Operating conditions

Permissible temperature range -25°C to +70°C
Maximum permissible rotational speed n_{perm} = 40000 / D_L
(D_L = raceway diameter)
“Compressive” load
Bolt grade 10.9

Characteristics

- Robust design
- For high levels of vibration
- Cost-optimized design
- Medium precision
- Wide range of diameters

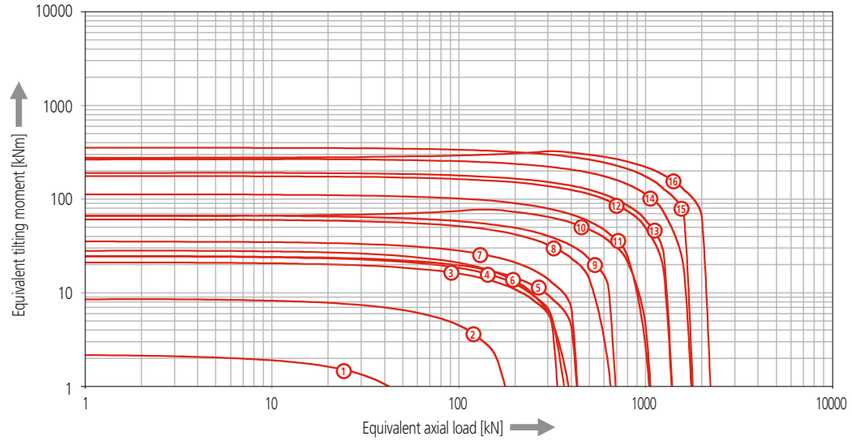
Typical applications

Turntables, slewing mechanisms, bogies, light to medium-sized cranes, construction machinery, wind energy turbines and winders (applications such as double axial Slewing Rings with increased radial load).

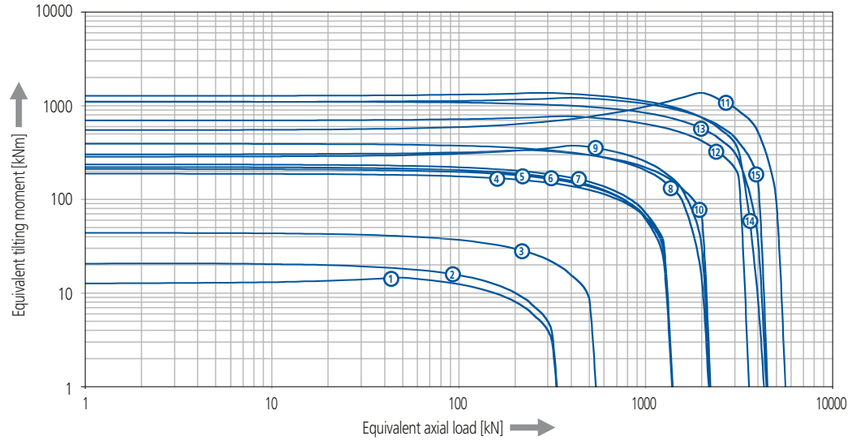
Limiting load diagrams for other standard types

Please refer to the explanations in the Technical Information section of the catalog.

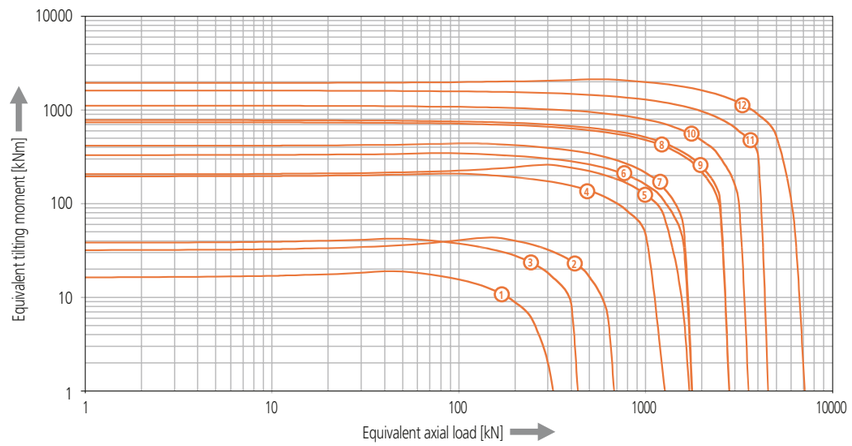
Limiting load diagrams for standard types, untoothed



Limiting load diagrams for standard types, external toothed

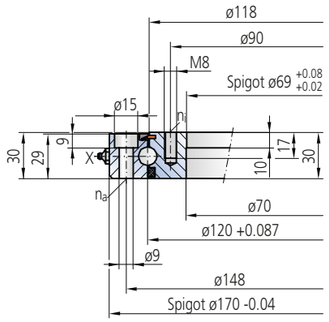


Limiting load diagrams for standard types, internal toothed

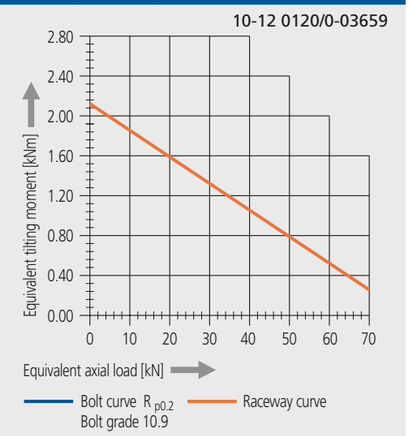


Size 10-12 0120/0-03659

Weight	Mounting holes: Number of holes, outer ring	Mounting holes: Number of holes, inner ring	Load ratings: Static		Load ratings: Dynamic		Material, inner / outer ring	Transport holes	Taper type grease nipple DIN 71412	Clearance: Radial clearance	Clearance: Axial tilting clearance
G [kg]	**n_a** [-]	**n_i** [-]	**$C_{o\,rad}$** [kN]	**$C_{o\,ax}$** [kN]	**C_{rad}** [kN]	**C_{ax}** [kN]		**T** [-]	**X**	**S_{rad}** [mm]	**S_{kipp}** [mm]
4	6	6	29	78	43	50	C45N	-	2 x AM8x1	0 - 0.03	0 - 0.03



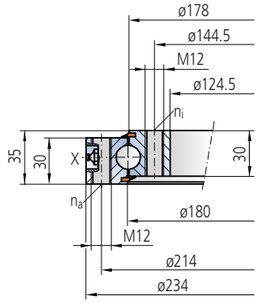
Limiting load diagram for "compressive" loads



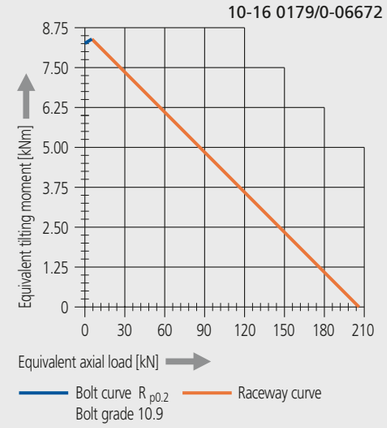
Please adhere strictly to the rules given in the Technical Information section when using above graph!

Size 10-16 0179/0-06672

Weight	Mounting holes: Number of holes, outer ring	Mounting holes: Number of holes, inner ring	Load ratings: Static		Load ratings: Dynamic		Material, inner / outer ring	Transport holes	Taper type grease nipple DIN 71412	Clearance: Radial clearance	Clearance: Axial tilting clearance
G [kg]	**n_a** [-]	**n_i** [-]	**$C_{o\,rad}$** [kN]	**$C_{o\,ax}$** [kN]	**C_{rad}** [kN]	**C_{ax}** [kN]		**T** [-]	**X**	**S_{rad}** [mm]	**S_{kipp}** [mm]
7	12	12	78	209	89	103	C45N	-	2 x AM8x1	0.04 - 0.14	0.07 - 0.23



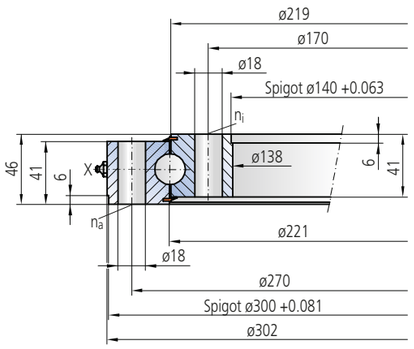
Limiting load diagram for "compressive" loads



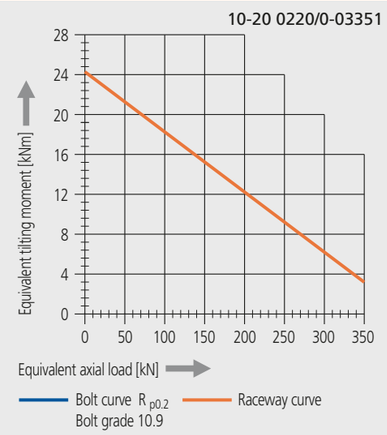
Please adhere strictly to the rules given in the Technical Information section when using above graph!

Size 10-20 0220/0-03351

Weight	Mounting holes: Number of holes, outer ring	Mounting holes: Number of holes, inner ring	Load ratings: Static		Load ratings: Dynamic		Material, inner / outer ring	Transport holes	Taper type grease nipple DIN 71412	Clearance: Radial clearance	Clearance: Axial tilting clearance
G [kg]	**n_a** [-]	**n_i** [-]	**$C_{o\,rad}$** [kN]	**$C_{o\,ax}$** [kN]	**C_{rad}** [kN]	**C_{ax}** [kN]		**T** [-]	**X**	**S_{rad}** [mm]	**S_{kipp}** [mm]
16	10	10	181	485	177	205	C45N	-	2 x AM6	0.05 - 0.20	0.10 - 0.40



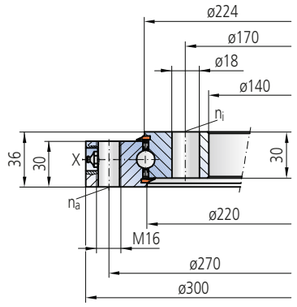
Limiting load diagram for "compressive" loads



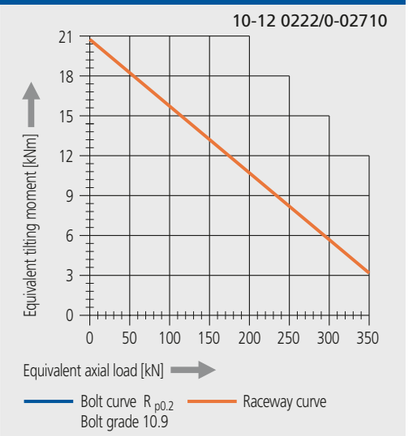
Please adhere strictly to the rules given in the Technical Information section when using above graph!

Size 10-12 0222/0-02710

Weight	Mounting holes: Number of holes, outer ring	Mounting holes: Number of holes, inner ring	Load ratings: Static		Load ratings: Dynamic		Material, inner / outer ring	Transport holes	Taper type grease nipple DIN 71412	Clearance: Radial clearance	Clearance: Axial tilting clearance
G [kg]	**n_a** [-]	**n_i** [-]	**$C_{o\,rad}$** [kN]	**$C_{o\,ax}$** [kN]	**C_{rad}** [kN]	**C_{ax}** [kN]		**T** [-]	**X**	**S_{rad}** [mm]	**S_{kipp}** [mm]
11	12	12	156	417	86	100	C45N	-	2 x AM6	0 - 0.05	0 - 0.10



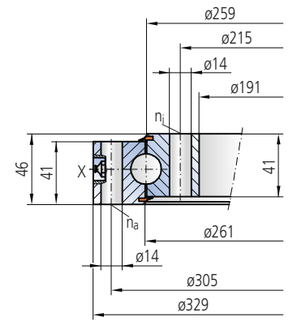
Limiting load diagram for "compressive" loads



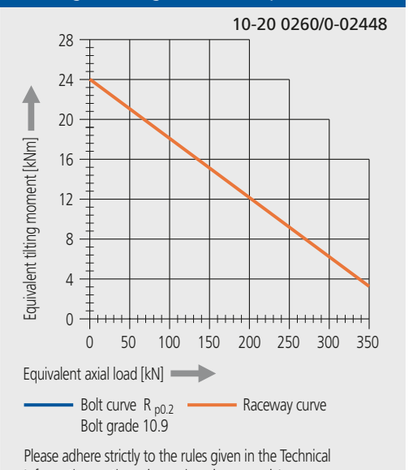
Please adhere strictly to the rules given in the Technical Information section when using above graph!

Size 10-20 0260/0-02448

Weight	Mounting holes: Number of holes, outer ring	Mounting holes: Number of holes, inner ring	Load ratings: Static		Load ratings: Dynamic		Material, inner / outer ring	Transport holes	Taper type grease nipple DIN 71412	Clearance: Radial clearance	Clearance: Axial tilting clearance
G [kg]	**n_a** [-]	**n_i** [-]	**$C_{o\,rad}$** [kN]	**$C_{o\,ax}$** [kN]	**C_{rad}** [kN]	**C_{ax}** [kN]		**T** [-]	**X**	**S_{rad}** [mm]	**S_{kipp}** [mm]
15	16	16	151	403	143	166	C45N	-	2 x AM6	0.05 - 0.20	0.08 - 0.33



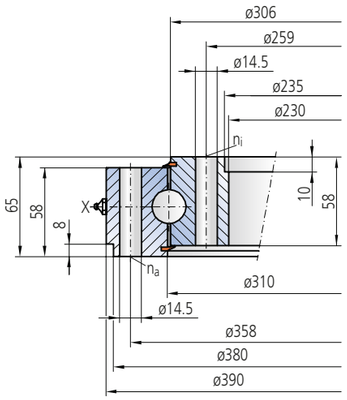
Limiting load diagram for "compressive" loads



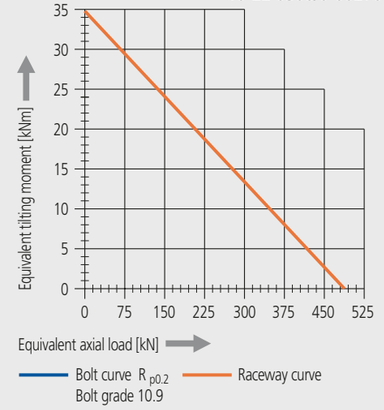
Please adhere strictly to the rules given in the Technical Information section when using above graph!

Size 10-22 0308/0-00270

Gewicht	Mounting holes: Number of holes, outer ring	Mounting holes: Number of holes, inner ring	Load ratings: Static		Load ratings: Dynamic		Material, inner / outer ring	Transport holes	Taper type grease nipple DIN 71412	Clearance: Radial clearance	Clearance: Axial tilting clearance
G [kg]	**n_a** [-]	**n_i** [-]	**$C_{o\,rad}$** [kN]	**$C_{o\,ax}$** [kN]	**C_{rad}** [kN]	**C_{ax}** [kN]		**T** [-]	**X**	**S_{rad}** [mm]	**S_{kipp}** [mm]
28	24	28	185	494	172	200	C45N	-	4 x AM8x1	0 - 0.10	0 - 0.15



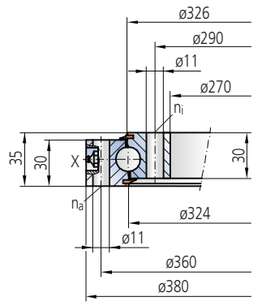
Limiting load diagram for "compressive" loads



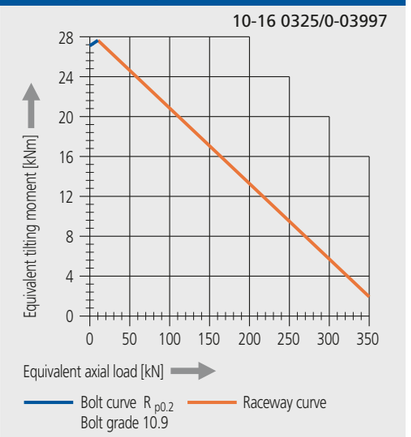
Please adhere strictly to the rules given in the Technical Information section when using above graph!

Size 10-16 0325/0-03997

Weight	Mounting holes: Number of holes, outer ring	Mounting holes: Number of holes, inner ring	Load ratings: Static		Load ratings: Dynamic		Material, inner / outer ring	Transport holes	Taper type grease nipple DIN 71412	Clearance: Radial clearance	Clearance: Axial tilting clearance
G [kg]	**n_a** [-]	**n_i** [-]	**$C_{o\,rad}$** [kN]	**$C_{o\,ax}$** [kN]	**C_{rad}** [kN]	**C_{ax}** [kN]		**T** [-]	**X**	**S_{rad}** [mm]	**S_{kipp}** [mm]
12	24	24	142	380	114	132	C45N	-	2 x AM6	0.04 - 0.14	0.07 - 0.23



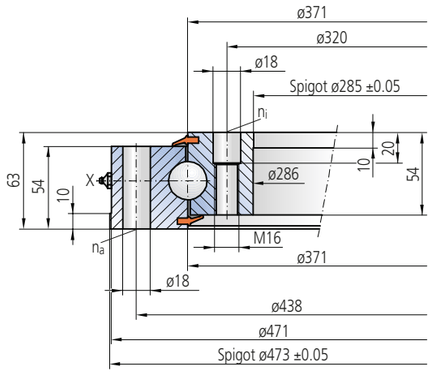
Limiting load diagram for "compressive" loads



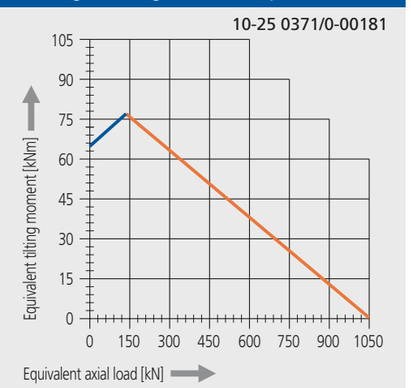
Please adhere strictly to the rules given in the Technical Information section when using above graph!

Size 10-25 0371/0-00181

Weight	Mounting holes: Number of holes, outer ring	Mounting holes: Number of holes, inner ring	Load ratings: Static		Load ratings: Dynamic		Material, inner / outer ring	Transport holes	Taper type grease nipple DIN 71412	Clearance: Radial clearance	Clearance: Axial tilting clearance
G [kg]	**n_a** [-]	**n_i** [-]	**$C_{o\,rad}$** [kN]	**$C_{o\,ax}$** [kN]	**C_{rad}** [kN]	**C_{ax}** [kN]		**T** [-]	**X**	**S_{rad}** [mm]	**S_{kipp}** [mm]
41	16	16	392	1050	298	346	C45N	-	2 x AM10x1	0.06 - 0.25	0.10 - 0.41



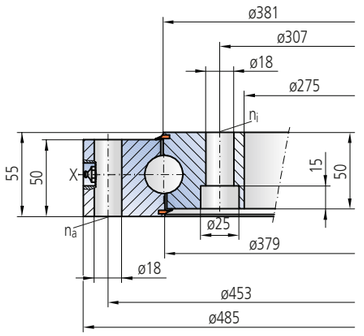
Limiting load diagram for "compressive" loads



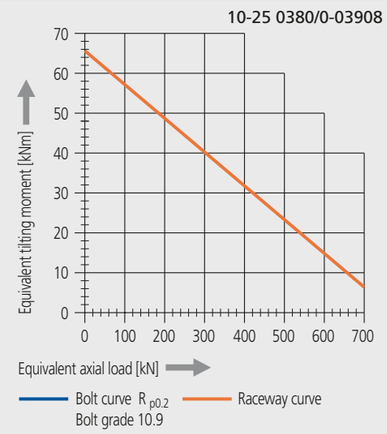
Please adhere strictly to the rules given in the Technical Information section when using above graph!

Size 10-25 0380/0-03908

Weight	Mounting holes: Number of holes, outer ring	Mounting holes: Number of holes, inner ring	Load ratings: Static		Load ratings: Dynamic		Material, inner / outer ring	Transport holes	Taper type grease nipple DIN 71412	Clearance: Radial clearance	Clearance: Axial tilting clearance
G [kg]	**n_a** [-]	**n_i** [-]	**$C_{o\,rad}$** [kN]	**$C_{o\,ax}$** [kN]	**C_{rad}** [kN]	**C_{ax}** [kN]		**T** [-]	**X**	**S_{rad}** [mm]	**S_{kipp}** [mm]
43	16	16	282	755	226	263	C45N	-	4 x AM10x1	0.06 - 0.25	0.11 - 0.41



Limiting load diagram for "compressive" loads

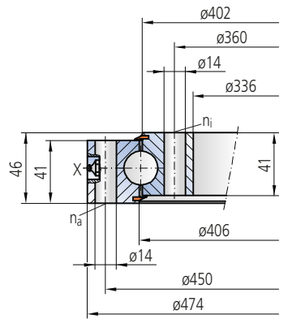


Please adhere strictly to the rules given in the Technical Information section when using above graph!

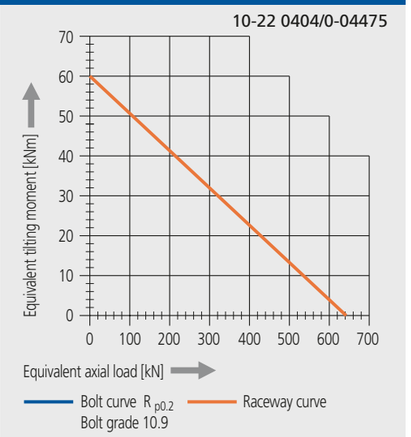
Size 10-22 0404/0-04475

Weight	Mounting holes: Number of holes, outer ring	Mounting holes: Number of holes, inner ring	Load ratings: Static		Load ratings: Dynamic		Material, inner / outer ring	Transport holes	Taper type grease nipple DIN 71412	Clearance: Radial clearance	Clearance: Axial tilting clearance
G [kg]	**n_a** [-]	**n_i** [-]	**$C_{o\,rad}$** [kN]	**$C_{o\,ax}$** [kN]	**C_{rad}** [kN]	**C_{ax}** [kN]		**T** [-]	**X**	**S_{rad}** [mm]	**S_{kipp}** [mm]
22	29*	30	242	649	193	225	C45N	-	2 x AM8x1	0.05 - 0.15	0.05 - 0.15

*Spaced for 30



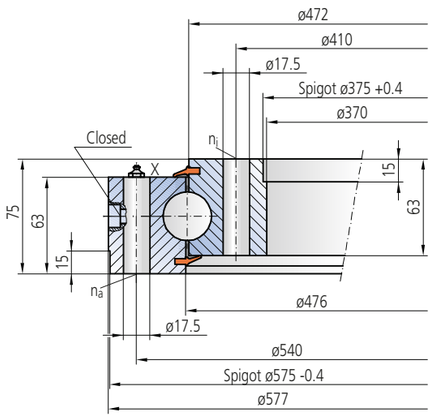
Limiting load diagram for "compressive" loads



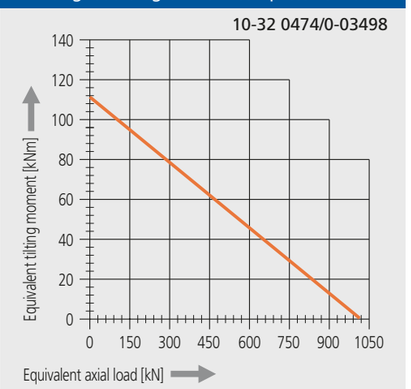
Please adhere strictly to the rules given in the Technical Information section when using above graph!

Size 10-32 0474/0-03498

Weight	Mounting holes: Number of holes, outer ring	Mounting holes: Number of holes, inner ring	Load ratings: Static		Load ratings: Dynamic		Material, inner / outer ring	Transport holes	Taper type grease nipple DIN 71412	Clearance: Radial clearance	Clearance: Axial tilting clearance
G [kg]	**n_a** [-]	**n_i** [-]	**$C_{o\,rad}$** [kN]	**$C_{o\,ax}$** [kN]	**C_{rad}** [kN]	**C_{ax}** [kN]		**T** [-]	**X**	**S_{rad}** [mm]	**S_{kipp}** [mm]
68	24	24	381	1019	319	371	C45N	-	6 x AM8x1	0.07 - 0.30	0.12 - 0.48



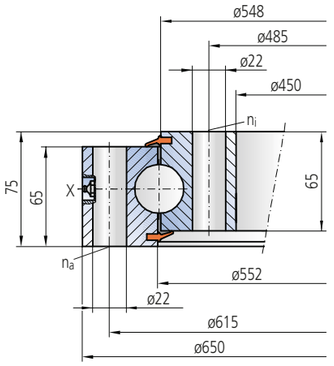
Limiting load diagram for "compressive" loads



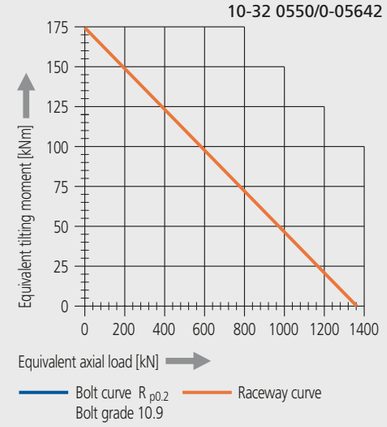
Please adhere strictly to the rules given in the Technical Information section when using above graph!

Size 10-32 0550/0-05642

Weight	Mounting holes: Number of holes, outer ring	Mounting holes: Number of holes, inner ring	Load ratings: Static		Load ratings: Dynamic		Material, inner / outer ring	Transport holes	Taper type grease nipple DIN 71412	Clearance: Radial clearance	Clearance: Axial tilting clearance
G [kg]	**n_a** [-]	**n_i** [-]	**$C_{o\,rad}$** [kN]	**$C_{o\,ax}$** [kN]	**C_{rad}** [kN]	**C_{ax}** [kN]		**T** [-]	**X**	**S_{rad}** [mm]	**S_{kipp}** [mm]
75	24	24	514	1377	339	394	42CoMo4V	-	4 x AM10x1	0.08 - 0.32	0.13 - 0.52



Limiting load diagram for "compressive" loads

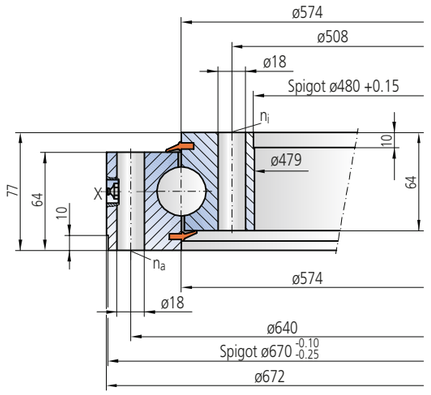


Please adhere strictly to the rules given in the Technical Information section when using above graph!

Size 10-32 0574/0-05823

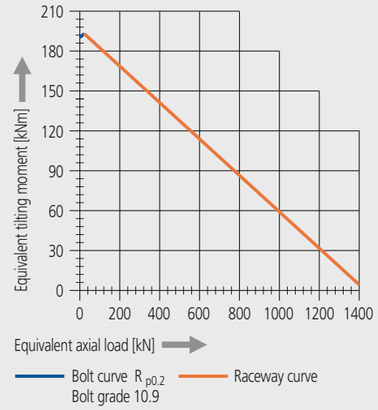
Weight	Mounting holes: Number of holes, outer ring	Mounting holes: Number of holes, inner ring	Load ratings: Static		Load ratings: Dynamic		Material, inner / outer ring	Transport holes	Taper type grease nipple DIN 71412	Clearance: Radial clearance	Clearance: Axial tilting clearance
G [kg]	n_a [-]	n_i [-]	$C_{o\,rad}$ [kN]	$C_{o\,ax}$ [kN]	C_{rad} [kN]	C_{ax} [kN]		**T** [-]	**X**	S_{rad} [mm]	S_{kipp} [mm]
77	36	35*	537	1437	344	400	C45N	-	2 x AM10x1	0 - 0.10	0 - 0.15

*Spaced for 36



Limiting load diagram for "compressive" loads

10-32 0574/0-05823

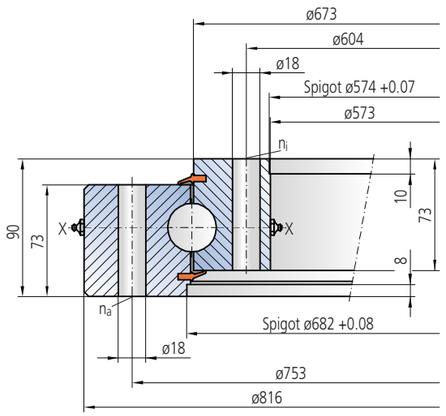


Please adhere strictly to the rules given in the Technical Information section when using above graph!

Size 10-32 0675/0-05584

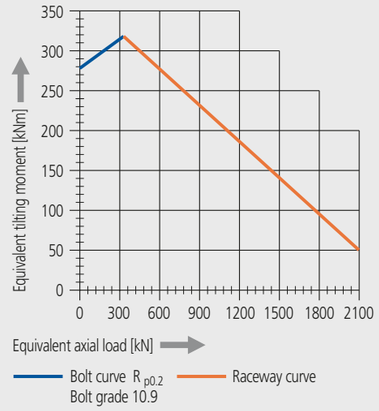
Weight	Mounting holes: Number of holes, outer ring	Mounting holes: Number of holes, inner ring	Load ratings: Static		Load ratings: Dynamic		Material, inner / outer ring	Transport holes	Taper type grease nipple DIN 71412	Clearance: Radial clearance	Clearance: Axial tilting clearance
G [kg]	n_a [-]	n_i [-]	$C_{o\,rad}$ [kN]	$C_{o\,ax}$ [kN]	C_{rad} [kN]	C_{ax} [kN]		**T** [-]	**X**	S_{rad} [mm]	S_{kipp} [mm]
131	36	35*	899	2406	486	565	42CoMo4V	-	** 4 x AM8x1	0 - 0.10	0 - 0.20

*Spaced for 36
**On each ring



Limiting load diagram for "compressive" loads

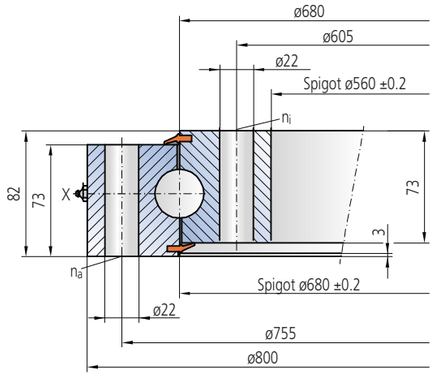
10-32 0675/0-05584



Please adhere strictly to the rules given in the Technical Information section when using above graph!

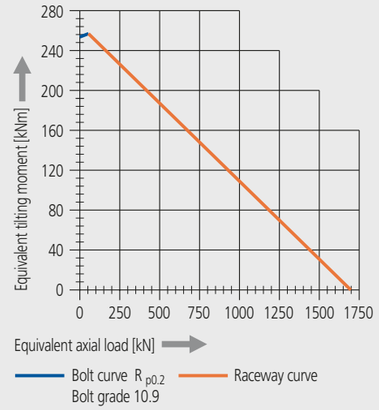
Size 10-32 0680/0-00928

Weight	Mounting holes: Number of holes, outer ring	Mounting holes: Number of holes, inner ring	Load ratings: Static		Load ratings: Dynamic		Material, inner / outer ring	Transport holes	Taper type grease nipple DIN 71412	Clearance: Radial clearance	Clearance: Axial tilting clearance
G [kg]	**n_a** [-]	**n_i** [-]	**$C_{o\,rad}$** [kN]	**$C_{o\,ax}$** [kN]	**C_{rad}** [kN]	**C_{ax}** [kN]		**T** [-]	**X**	**S_{rad}** [mm]	**S_{kipp}** [mm]
120	24	24	636	1702	365	425	C45N	-	8 x AM10x1	0.08 - 0.32	0.13 - 0.52



Limiting load diagram for "compressive" loads

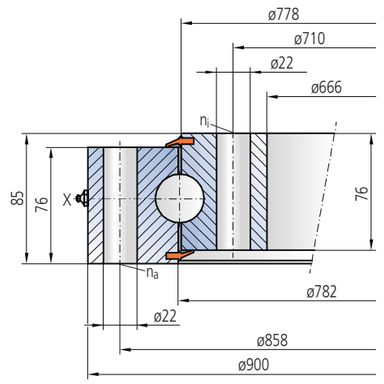
10-32 0680/0-00928



Please adhere strictly to the rules given in the Technical Information section when using above graph!

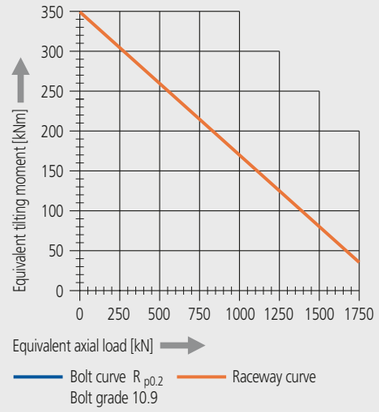
Size 10-32 0780/0-00367

Weight	Mounting holes: Number of holes, outer ring	Mounting holes: Number of holes, inner ring	Load ratings: Static		Load ratings: Dynamic		Material, inner / outer ring	Transport holes	Taper type grease nipple DIN 71412	Clearance: Radial clearance	Clearance: Axial tilting clearance
G [kg]	**n_a** [-]	**n_i** [-]	**$C_{o\,rad}$** [kN]	**$C_{o\,ax}$** [kN]	**C_{rad}** [kN]	**C_{ax}** [kN]		**T** [-]	**X**	**S_{rad}** [mm]	**S_{kipp}** [mm]
125	32	32	730	1952	385	448	C45N	-	4 x AM10x1	0.10 - 0.30	0.10 - 0.50



Limiting load diagram for "compressive" loads

10-32 0780/0-00367

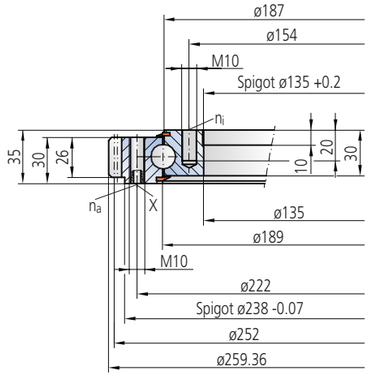


Please adhere strictly to the rules given in the Technical Information section when using above graph!

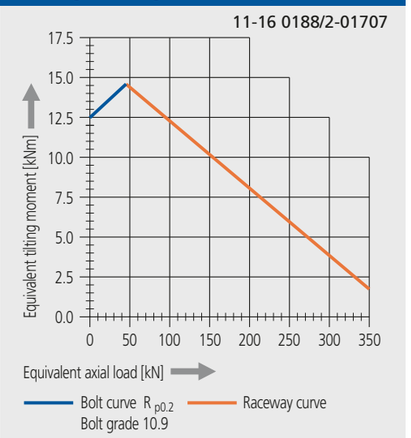
Size 11-16 0188/2-01707

Weight	Mounting holes: Number of holes, outer ring	Mounting holes: Number of holes, inner ring	Gearing and tooth forces: Module	Number of teeth	Addendum modification coeff.	Permissible tooth force	Maximum permissible tooth force	Load ratings: Static		Dynamic		Material, inner / outer ring	Transport holes	Lubrication holes	Clearance: Radial clearance	Axial tilting clearance
G [kg]	n_a [-]	n_i [-]	**m** [mm]	**z2** [-]	**x2** [-]	$f_{z\,norm}$ [kN]	$f_{z\,max}$ [kN]	$C_{o\,rad}$ [kN]	$C_{o\,ax}$ [kN]	C_{rad} [kN]	C_{ax} [kN]		**T** [-]	**X**	S_{rad} [mm]	S_{kipp} [mm]
7.5	16	15*	4	62	0.50	8	16	143	384	121	141	C45N 42CrMo4V	-	2 x ø10	0.03 - 0.10	0.05 - 0.20

*Spaced for 16



Limiting load diagram for "compressive" loads



Please adhere strictly to the rules given in the Technical Information section when using above graph!

Size 11-16 0235/1-01933

Weight	Mounting holes: Number of holes, outer ring	Mounting holes: Number of holes, inner ring	Gearing and tooth forces: Module	Number of teeth	Addendum modification coeff.	Permissible tooth force	Maximum permissible tooth force	Load ratings: Static		Dynamic		Material, inner / outer ring	Transport holes	Taper type grease nipple DIN 71412	Clearance: Radial clearance	Axial tilting clearance
G [kg]	n_a [-]	n_i [-]	**m** [mm]	**z2** [-]	**x2** [-]	$f_{z\,norm}$ [kN]	$f_{z\,max}$ [kN]	$C_{o\,rad}$ [kN]	$C_{o\,ax}$ [kN]	C_{rad} [kN]	C_{ax} [kN]		**T** [-]	**X**	S_{rad} [mm]	S_{kipp} [mm]
13	12	12	4	78	–	5.8	12	143	384	132	153	C45N	-	2 x AM8x1	0.04 - 0.16	0.07 - 0.26

Limiting load diagram for "compressive" loads

Please adhere strictly to the rules given in the Technical Information section when using above graph!

Size 11-25 0309/1-03312

Weight	Mounting holes: Number of holes, outer ring	Mounting holes: Number of holes, inner ring	Gearing and tooth forces: Module	Number of teeth	Addendum modification coeff.	Permissible tooth force	Maximum permissible tooth force	Load ratings: Static		Dynamic		Material, inner / outer ring	Transport holes	Taper type grease nipple DIN 71412	Clearance: Radial clearance	Axial tilting clearance
G [kg]	n_a [-]	n_i [-]	**m** [mm]	**z2** [-]	**x2** [-]	$f_{z\,norm}$ [kN]	$f_{z\,max}$ [kN]	$C_{o\,rad}$ [kN]	$C_{o\,ax}$ [kN]	C_{rad} [kN]	C_{ax} [kN]		**T** [-]	**X**	S_{rad} [mm]	S_{kipp} [mm]
30	24	23*	5	80	–	10.6	20.3	229	614	209	242	C45N	-	4 x AM8x1	0.06 - 0.25	0.10 - 0.41

*Spaced for 24

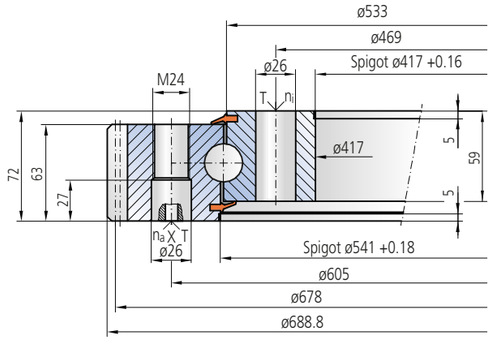
Limiting load diagram for "compressive" loads

Please adhere strictly to the rules given in the Technical Information section when using above graph!

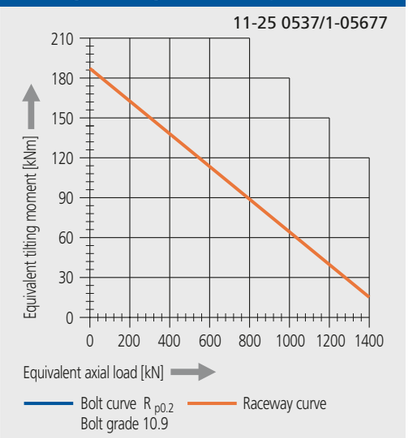
Size 11-25 0537/1-05677

Weight	Mounting holes: Number of holes, outer ring	Mounting holes: Number of holes, inner ring	Gearing and tooth forces: Module	Number of teeth	Addendum modification coeff.	Permissible tooth force	Maximum permissible tooth force	Load ratings: Static		Dynamic		Material, inner / outer ring	Transport holes	Lubrication holes	Clearance: Radial clearance	Axial tilting clearance
G	**n_a**	**n_i**	**m**	**z2**	**x2**	**$f_{z\,norm}$**	**$f_{z\,max}$**	**$C_{o\,rad}$**	**$C_{o\,ax}$**	**C_{rad}**	**C_{ax}**		**T**	**X**	**S_{rad}**	**S_{kipp}**
[kg]	[-]	[-]	[mm]	[-]	[-]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]		[-]		[mm]	[mm]
91	30	29*	6	112	0.50	24	44	568	1519	344	400	42CrMo4N	3 x M16	2 x ø8	0.06 - 0.25	0.11 - 0.41

*Spaced for 30



Limiting load diagram for "compressive" loads



Please adhere strictly to the rules given in the Technical Information section when using above graph!

Size 11-22 0635/2-03924

Weight	Mounting holes: Number of holes, outer ring	Mounting holes: Number of holes, inner ring	Gearing and tooth forces: Module	Number of teeth	Addendum modification coeff.	Permissible tooth force	Maximum permissible tooth force	Load ratings: Static		Dynamic		Material, inner / outer ring	Transport holes	Taper type grease nipple DIN 71412	Clearance: Radial clearance	Axial tilting clearance
G	**n_a**	**n_i**	**m**	**z2**	**x2**	**$f_{z\,norm}$**	**$f_{z\,max}$**	**$C_{o\,rad}$**	**$C_{o\,ax}$**	**C_{rad}**	**C_{ax}**		**T**	**X**	**S_{rad}**	**S_{kipp}**
[kg]	[-]	[-]	[mm]	[-]	[-]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]		[-]		[mm]	[mm]
79	40	40	6	122	–	23	43	536	1434	305	355	42CrMo4V	-	4 x AM10x1	0 - 0.10	0 - 0.30

Limiting load diagram for "compressive" loads

Please adhere strictly to the rules given in the Technical Information section when using above graph!

Size 11-32 0675/2-03771

Weight	Mounting holes: Number of holes, outer ring	Mounting holes: Number of holes, inner ring	Gearing and tooth forces: Module	Number of teeth	Addendum modification coeff.	Permissible tooth force	Maximum permissible tooth force	Load ratings: Static		Dynamic		Material, inner / outer ring	Transport holes	Taper type grease nipple DIN 71412	Clearance: Radial clearance	Axial tilting clearance
G	**n_a**	**n_i**	**m**	**z2**	**x2**	**$f_{z\,norm}$**	**$f_{z\,max}$**	**$C_{o\,rad}$**	**$C_{o\,ax}$**	**C_{rad}**	**C_{ax}**		**T**	**X**	**S_{rad}**	**S_{kipp}**
[kg]	[-]	[-]	[mm]	[-]	[-]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]		[-]		[mm]	[mm]
137	36	35*	10	81	0.50	68	117	899	2406	486	565	42CrMo4N 42CrMo4V	-	**3 x AM10x1	0 - 0.10	0 - 0.21

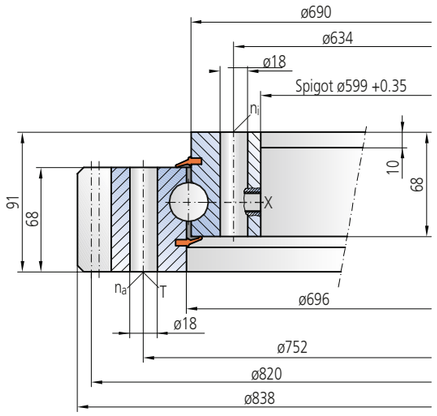
*Spaced for 36
**On each ring

Limiting load diagram for "compressive" loads

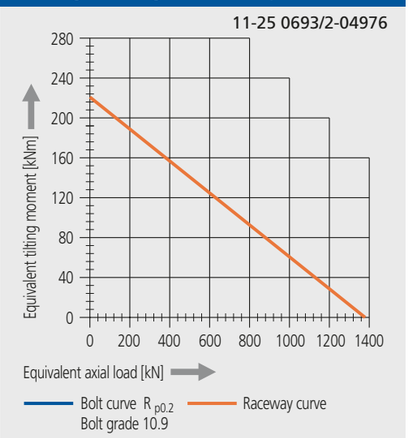
Please adhere strictly to the rules given in the Technical Information section when using above graph!

Size 11-25 0693/2-04976

Weight	Mounting holes: Number of holes, outer ring	Mounting holes: Number of holes, inner ring	Gearing and tooth forces: Module	Number of teeth	Addendum modification coeff.	Permissible tooth force	Maximum permissible tooth force	Load ratings: Static		Dynamic		Material, inner / outer ring	Transport holes	Lubrication holes	Clearance: Radial clearance	Axial tilting clearance
G	**n_a**	**n_i**	**m**	**z2**	**x2**	**$f_{z\,norm}$**	**$f_{z\,max}$**	**$C_{o\,rad}$**	**$C_{o\,ax}$**	**C_{rad}**	**C_{ax}**		**T**	**X**	**S_{rad}**	**S_{kipp}**
[kg]	[-]	[-]	[mm]	[-]	[-]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]		[-]		[mm]	[mm]
132	42	42	10	81	0.50	64	111	514	1376	285	332	42CrMo4V	3 x M16	4 x R1/4"	0.06 - 0.25	0.11 - 0.41



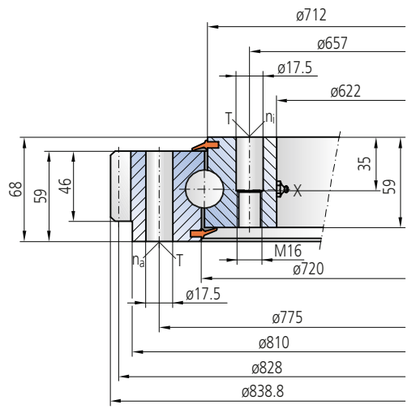
Limiting load diagram for "compressive" loads



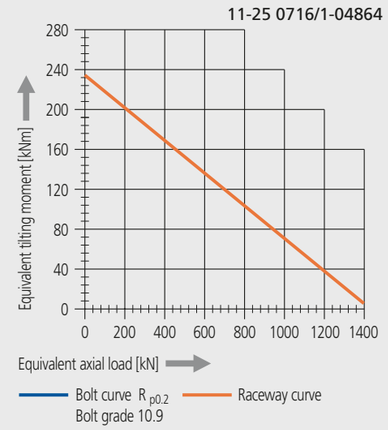
Please adhere strictly to the rules given in the Technical Information section when using above graph!

Size 11-25 0716/1-04864

Weight	Mounting holes: Number of holes, outer ring	Mounting holes: Number of holes, inner ring	Gearing and tooth forces: Module	Number of teeth	Addendum modification coeff.	Permissible tooth force	Maximum permissible tooth force	Load ratings: Static		Dynamic		Material, inner / outer ring	Transport holes	Taper type grease nipple DIN 71412	Clearance: Radial clearance	Axial tilting clearance
G	**n_a**	**n_i**	**m**	**z2**	**x2**	**$f_{z\,norm}$**	**$f_{z\,max}$**	**$C_{o\,rad}$**	**$C_{o\,ax}$**	**C_{rad}**	**C_{ax}**		**T**	**X**	**S_{rad}**	**S_{kipp}**
[kg]	[-]	[-]	[mm]	[-]	[-]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]		[-]		[mm]	[mm]
96	40	40	6	138	0.50	14.7	27.8	531	1422	287	334	C45N	3 x M16	4 x AM10x1	0 - 0.10	0 - 0.30



Limiting load diagram for "compressive" loads

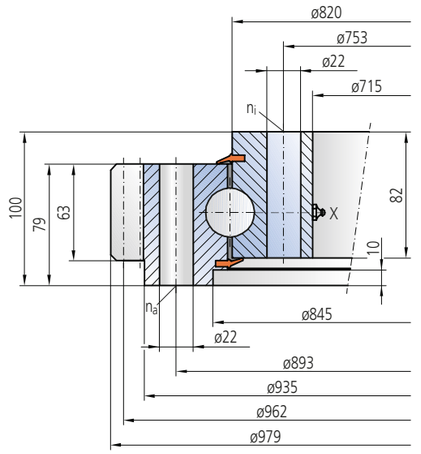


Please adhere strictly to the rules given in the Technical Information section when using above graph!

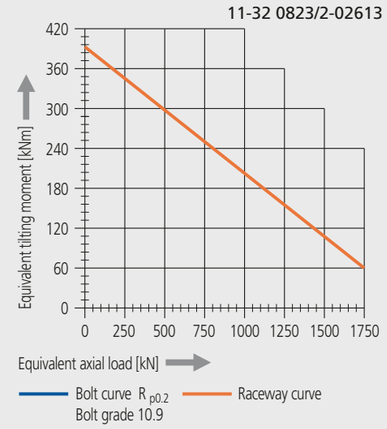
Size 11-32 0823/2-02613

Weight	Mounting holes: Number of holes, outer ring	Mounting holes: Number of holes, inner ring	Gearing and tooth forces: Module	Number of teeth	Addendum modification coeff.	Permissible tooth force	Maximum permissible tooth force	Load ratings: Static		Dynamic		Material, inner / outer ring	Transport holes	Taper type grease nipple DIN 71412	Clearance: Radial clearance	Axial tilting clearance
G	**n_a**	**n_i**	**m**	**z2**	**x2**	**$f_{z\,norm}$**	**$f_{z\,max}$**	**$C_{o\,rad}$**	**$C_{o\,ax}$**	**C_{rad}**	**C_{ax}**		**T**	**X**	**S_{rad}**	**S_{kipp}**
[kg]	[-]	[-]	[mm]	[-]	[-]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]		[-]		[mm]	[mm]
177	36	35*	10	94	1.10	65	112	770	2060	393	458	42CrMo4V	-	4 x AM10x1	0.08 - 0.32	0.13 - 0.52

*Spaced for 36



Limiting load diagram for "compressive" loads

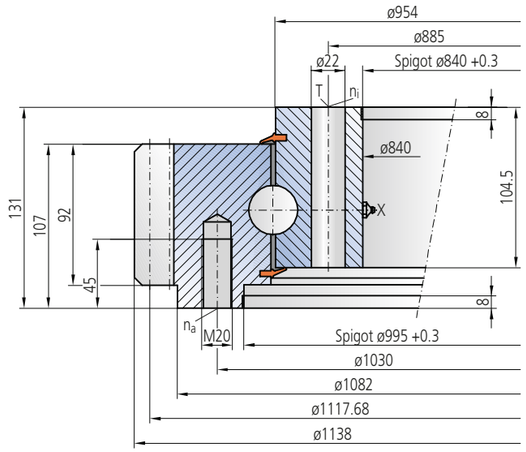


Please adhere strictly to the rules given in the Technical Information section when using above graph!

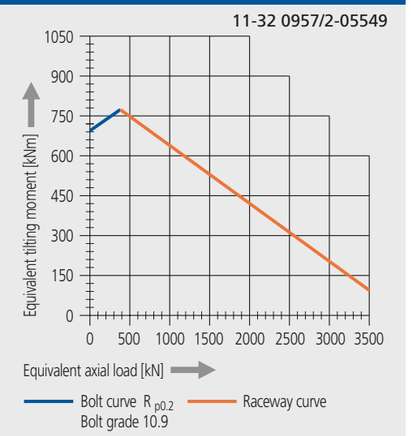
Size 11-32 0957/2-05549

Weight	Mounting holes: Number of holes, outer ring	Mounting holes: Number of holes, inner ring	Gearing and tooth forces: Module	Gearing and tooth forces: Number of teeth	Gearing and tooth forces: Addendum modification coeff.	Gearing and tooth forces: Permissible tooth force	Gearing and tooth forces: Maximum permissible tooth force	Load ratings: Static	Load ratings: Static	Load ratings: Dynamic	Load ratings: Dynamic	Material, inner / outer ring	Transport holes	Lubrication holes	Clearance: Radial clearance	Clearance: Axial tilting clearance
G [kg]	**n_a** [-]	**n_i** [-]	**m** [mm]	**z2** [-]	**x2** [-]	**$f_{z\,norm}$** [kN]	**$f_{z\,max}$** [kN]	**$C_{o\,rad}$** [kN]	**$C_{o\,ax}$** [kN]	**C_{rad}** [kN]	**C_{ax}** [kN]		**T** [-]	**X**	**S_{rad}** [mm]	**S_{kipp}** [mm]
324	42	41*	12	91	1.07	108	187	1459	3906	553	644	42CrMo4V	3 x M16	3 x R1/4"	0.08 - 0.32	0.13 - 0.52

*Spaced for 42



Limiting load diagram for "compressive" loads

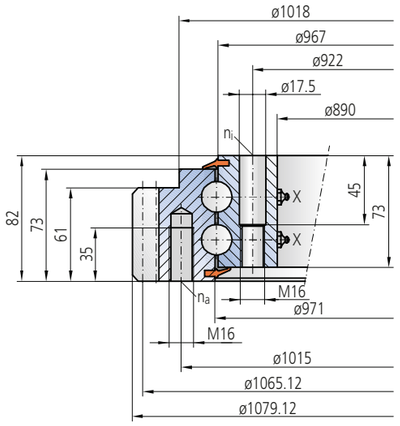


Please adhere strictly to the rules given in the Technical Information section when using above graph!

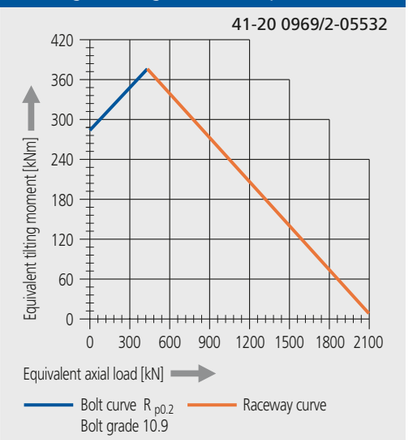
Size 41-20 0969/2-05532

Weight	Mounting holes: Number of holes, outer ring	Mounting holes: Number of holes, inner ring	Gearing and tooth forces: Module	Gearing and tooth forces: Number of teeth	Gearing and tooth forces: Addendum modification coeff.	Gearing and tooth forces: Permissible tooth force	Gearing and tooth forces: Maximum permissible tooth force	Load ratings: Static	Load ratings: Static	Load ratings: Dynamic	Load ratings: Dynamic	Material, inner / outer ring	Transport holes	Taper type grease nipple DIN 71412	Clearance: Radial clearance	Clearance: Axial tilting clearance
G [kg]	**n_a** [-]	**n_i** [-]	**m** [mm]	**z2** [-]	**x2** [-]	**$f_{z\,norm}$** [kN]	**$f_{z\,max}$** [kN]	**$C_{o\,rad}$** [kN]	**$C_{o\,ax}$** [kN]	**C_{rad}** [kN]	**C_{ax}** [kN]		**T** [-]	**X**	**S_{rad}** [mm]	**S_{kipp}** [mm]
213	30	30	8	131	1.07	45	80	798	2135	312	363	42CrMo4V	-	*2 x AM10x1	0 - 0.10	0 - 0.20

*On each row



Limiting load diagram for "compressive" loads

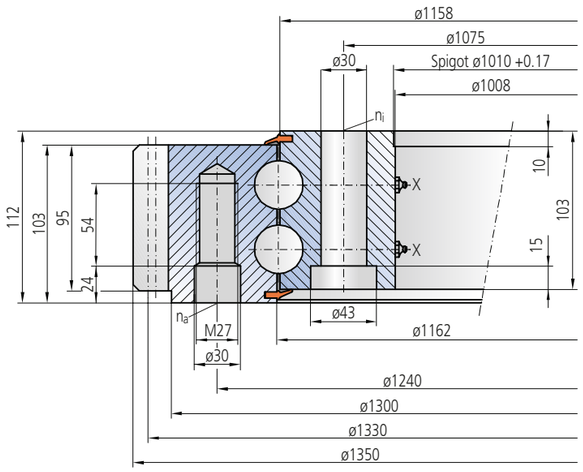


Please adhere strictly to the rules given in the Technical Information section when using above graph!

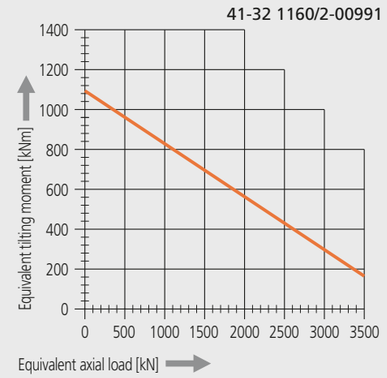
Size 41-32 1160/2-00991

Weight	Mounting holes: Number of holes, outer ring	Mounting holes: Number of holes, inner ring	Gearing and tooth forces: Module	Gearing and tooth forces: Number of teeth	Gearing and tooth forces: Addendum modification coeff.	Gearing and tooth forces: Permissible tooth force	Gearing and tooth forces: Maximum permissible tooth force	Load ratings: Static	Load ratings: Static	Load ratings: Dynamic	Load ratings: Dynamic	Material, inner / outer ring	Transport holes	Taper type grease nipple DIN 71412	Clearance: Radial clearance	Clearance: Axial tilting clearance
G [kg]	**n_a** [-]	**n_i** [-]	**m** [mm]	**z2** [-]	**x2** [-]	**$f_{z\,norm}$** [kN]	**$f_{z\,max}$** [kN]	**$C_{o\,rad}$** [kN]	**$C_{o\,ax}$** [kN]	**C_{rad}** [kN]	**C_{ax}** [kN]		**T** [-]	**X**	**S_{rad}** [mm]	**S_{kipp}** [mm]
429	40	40	10	132	0.50	73	131	1545	4134	594	692	42CrMo4N 42CrMo4V	-	*4 x AM10x1	0 - 0.10	0 - 0.25

*On each row



Limiting load diagram for "compressive" loads

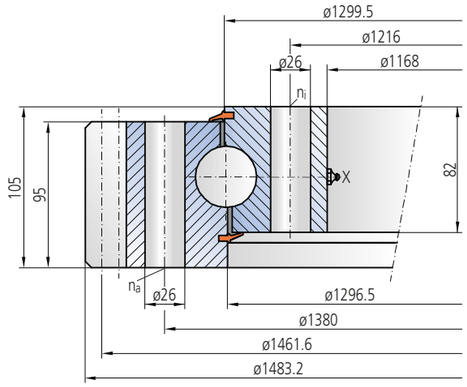


Please adhere strictly to the rules given in the Technical Information section when using above graph!

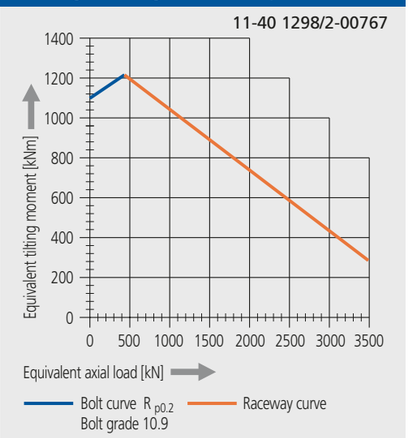
Size 11-40 1298/2-00767

Weight	Mounting holes: Number of holes, outer ring	Mounting holes: Number of holes, inner ring	Gearing and tooth forces: Module	Number of teeth	Addendum modification coeff.	Permissible tooth force	Maximum permissible tooth force	Load ratings: Static		Dynamic		Material, inner / outer ring	Transport holes	Taper type grease nipple DIN 71412	Clearance: Radial clearance	Axial tilting clearance
G	**n_a**	**n_i**	**m**	**z2**	**x2**	**$f_{z\,norm}$**	**$f_{z\,max}$**	**$C_{o\,rad}$**	**$C_{o\,ax}$**	**C_{rad}**	**C_{ax}**		**T**	**X**	**S_{rad}**	**S_{kipp}**
[kg]	[-]	[-]	[mm]	[-]	[-]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]		[-]		[mm]	[mm]
362	60	59*	12	120	0.90	107	185	1676	4485	586	682	42CrMo4V	-	4 x AM10x1	0.10 - 0.30	0.17 - 0.54

*Spaced for 60



Limiting load diagram for "compressive" loads



Please adhere strictly to the rules given in the Technical Information section when using above graph!

Size 11-32 1600/1-02300

Weight	Mounting holes: Number of holes, outer ring	Mounting holes: Number of holes, inner ring	Gearing and tooth forces: Module	Number of teeth	Addendum modification coeff.	Permissible tooth force	Maximum permissible tooth force	Load ratings: Static		Dynamic		Material, inner / outer ring	Transport holes	Taper type grease nipple DIN 71412	Clearance: Radial clearance	Axial tilting clearance
G	**n_a**	**n_i**	**m**	**z2**	**x2**	**$f_{z\,norm}$**	**$f_{z\,max}$**	**$C_{o\,rad}$**	**$C_{o\,ax}$**	**C_{rad}**	**C_{ax}**		**T**	**X**	**S_{rad}**	**S_{kipp}**
[kg]	[-]	[-]	[mm]	[-]	[-]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]		[-]		[mm]	[mm]
479	40	40	14	126	0.50	85	145	1497	4005	503	586	C45N	-	8 x AM10x1	0.08 - 0.32	0.13 - 0.52

Limiting load diagram for "compressive" loads

Please adhere strictly to the rules given in the Technical Information section when using above graph!

Size 11-25 1845/1-03705

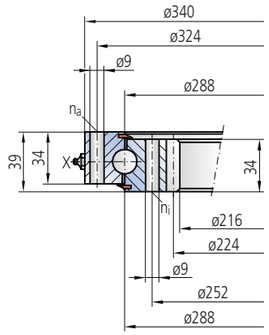
Weight	Mounting holes: Number of holes, outer ring	Mounting holes: Number of holes, inner ring	Gearing and tooth forces: Module	Number of teeth	Addendum modification coeff.	Permissible tooth force	Maximum permissible tooth force	Load ratings: Static		Dynamic		Material, inner / outer ring	Transport holes	Taper type grease nipple DIN 71412	Clearance: Radial clearance	Axial tilting clearance
G	**n_a**	**n_i**	**m**	**z2**	**x2**	**$f_{z\,norm}$**	**$f_{z\,max}$**	**$C_{o\,rad}$**	**$C_{o\,ax}$**	**C_{rad}**	**C_{ax}**		**T**	**X**	**S_{rad}**	**S_{kipp}**
[kg]	[-]	[-]	[mm]	[-]	[-]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]		[-]		[mm]	[mm]
261	36	36	8	244	0.00	27	48	1951	5220	543	633	C45N	-	6 x AM10x1	0 - 0.10	0.10 - 0.20

Limiting load diagram for "compressive" loads

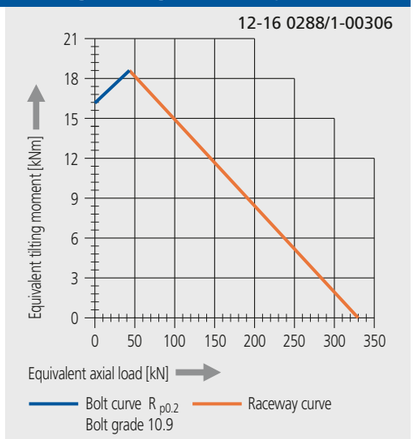
Please adhere strictly to the rules given in the Technical Information section when using above graph!

Size 12-16 0288/1-00306

Weight	Mounting holes: Number of holes, outer ring	Mounting holes: Number of holes, inner ring	Gearing and tooth forces: Module	Gearing and tooth forces: Number of teeth	Gearing and tooth forces: Addendum modification coeff.	Gearing and tooth forces: Permissible tooth force	Gearing and tooth forces: Maximum permissible tooth force	Load ratings: Static	Load ratings: Static	Load ratings: Dynamic	Load ratings: Dynamic	Material, inner / outer ring	Transport holes	Taper type grease nipple DIN 71412	Clearance: Radial clearance	Clearance: Axial tilting clearance
G [kg]	**n_a** [-]	**n_i** [-]	**m** [mm]	**z2** [-]	**x2** [-]	**$f_{z\,norm}$** [kN]	**$f_{z\,max}$** [kN]	**$C_{o\,rad}$** [kN]	**$C_{o\,ax}$** [kN]	**C_{rad}** [kN]	**C_{ax}** [kN]		**T** [-]	**X**	**S_{rad}** [mm]	**S_{kipp}** [mm]
12	20	20	4	56	–	4.1	11.2	126	337	108	126	C45N	-	2 x AM8x1	0 - 0.10	0 - 0.20



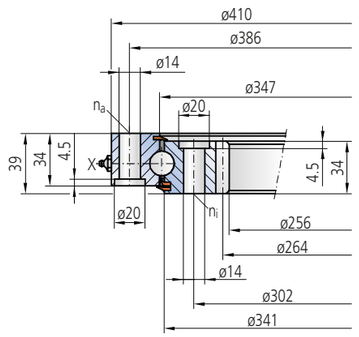
Limiting load diagram for "compressive" loads



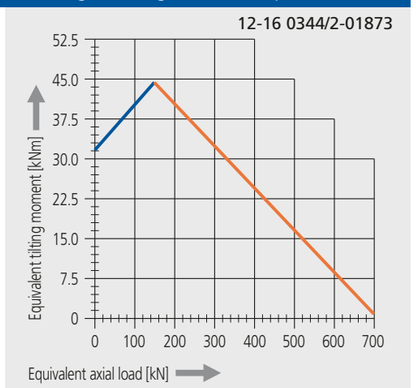
Please adhere strictly to the rules given in the Technical Information section when using above graph!

Size 12-16 0344/2-01873

Weight	Mounting holes: Number of holes, outer ring	Mounting holes: Number of holes, inner ring	Gearing and tooth forces: Module	Gearing and tooth forces: Number of teeth	Gearing and tooth forces: Addendum modification coeff.	Gearing and tooth forces: Permissible tooth force	Gearing and tooth forces: Maximum permissible tooth force	Load ratings: Static	Load ratings: Static	Load ratings: Dynamic	Load ratings: Dynamic	Material, inner / outer ring	Transport holes	Taper type grease nipple DIN 71412	Clearance: Radial clearance	Clearance: Axial tilting clearance
G [kg]	**n_a** [-]	**n_i** [-]	**m** [mm]	**z2** [-]	**x2** [-]	**$f_{z\,norm}$** [kN]	**$f_{z\,max}$** [kN]	**$C_{o\,rad}$** [kN]	**$C_{o\,ax}$** [kN]	**C_{rad}** [kN]	**C_{ax}** [kN]		**T** [-]	**X**	**S_{rad}** [mm]	**S_{kipp}** [mm]
24	16	16	4	66	–	8	16.5	262	702	154	179	42CrMo4V C45N	-	2 x AM8x1	0 - slight preload	0 - slight preload



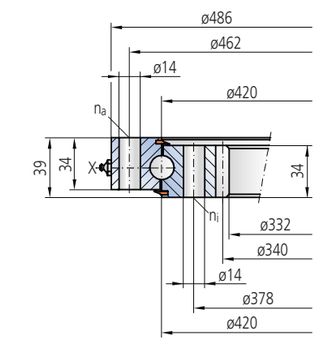
Limiting load diagram for "compressive" loads



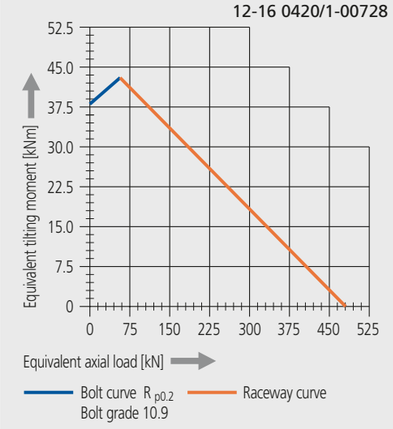
Please adhere strictly to the rules given in the Technical Information section when using above graph!

Size 12-16 0420/1-00728

Weight	Mounting holes: Number of holes, outer ring	Mounting holes: Number of holes, inner ring	Gearing and tooth forces: Module	Gearing and tooth forces: Number of teeth	Gearing and tooth forces: Addendum modification coeff.	Gearing and tooth forces: Permissible tooth force	Gearing and tooth forces: Maximum permissible tooth force	Load ratings: Static	Load ratings: Static	Load ratings: Dynamic	Load ratings: Dynamic	Material, inner / outer ring	Transport holes	Taper type grease nipple DIN 71412	Clearance: Radial clearance	Clearance: Axial tilting clearance
G [kg]	**n_a** [-]	**n_i** [-]	**m** [mm]	**z2** [-]	**x2** [-]	**$f_{z\,norm}$** [kN]	**$f_{z\,max}$** [kN]	**$C_{o\,rad}$** [kN]	**$C_{o\,ax}$** [kN]	**C_{rad}** [kN]	**C_{ax}** [kN]		**T** [-]	**X**	**S_{rad}** [mm]	**S_{kipp}** [mm]
24	16	16	4	85	–	4.2	11.7	184	491	124	145	C45N	-	2 x AM8x1	0.04 - 0.16	0.07 - 0.26



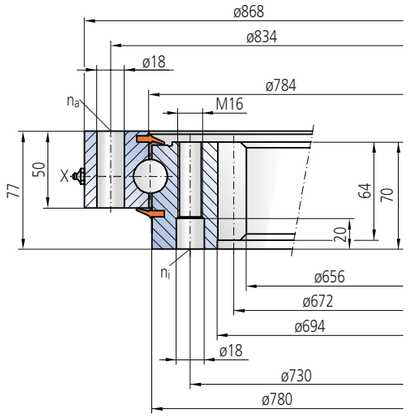
Limiting load diagram for "compressive" loads



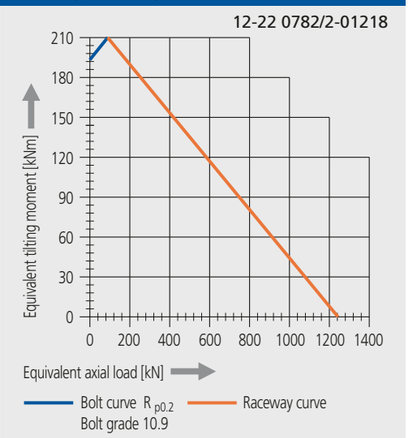
Please adhere strictly to the rules given in the Technical Information section when using above graph!

Size 12-22 0782/2-01218

Weight	Mounting holes: Number of holes, outer ring	Mounting holes: Number of holes, inner ring	Gearing and tooth forces: Module	Number of teeth	Addendum modification coeff.	Permissible tooth force	Maximum permissible tooth force	Load ratings: Static		Dynamic		Material, inner / outer ring	Transport holes	Taper type grease nipple DIN 71412	Clearance: Radial clearance	Axial tilting clearance
G [kg]	**n_a** [-]	**n_i** [-]	**m** [mm]	**z2** [-]	**x2** [-]	**$f_{z\,norm}$** [kN]	**$f_{z\,max}$** [kN]	**$C_{o\,rad}$** [kN]	**$C_{o\,ax}$** [kN]	**C_{rad}** [kN]	**C_{ax}** [kN]		**T** [-]	**X**	**S_{rad}** [mm]	**S_{kipp}** [mm]
103	24	24	8	82	-1.00	30.8	55	469	1255	248	289	42CrMo4V C45N	-	4 x AM10x1	0 - 0.10	0 - 0.25



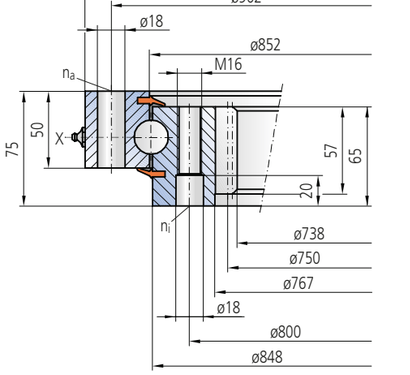
Limiting load diagram for "compressive" loads



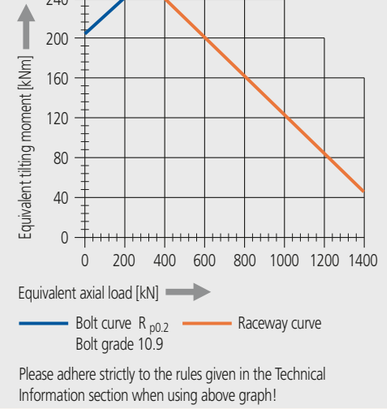
Please adhere strictly to the rules given in the Technical Information section when using above graph!

Size 12-22 0850/2-01501

Weight	Mounting holes: Number of holes, outer ring	Mounting holes: Number of holes, inner ring	Gearing and tooth forces: Module	Number of teeth	Addendum modification coeff.	Permissible tooth force	Maximum permissible tooth force	Load ratings: Static		Dynamic		Material, inner / outer ring	Transport holes	Taper type grease nipple DIN 71412	Clearance: Radial clearance	Axial tilting clearance
G [kg]	**n_a** [-]	**n_i** [-]	**m** [mm]	**z2** [-]	**x2** [-]	**$f_{z\,norm}$** [kN]	**$f_{z\,max}$** [kN]	**$C_{o\,rad}$** [kN]	**$C_{o\,ax}$** [kN]	**C_{rad}** [kN]	**C_{ax}** [kN]		**T** [-]	**X**	**S_{rad}** [mm]	**S_{kipp}** [mm]
100	24	24	6	124	-0.50	21	40	614	1642	256	298	42CrMo4V C45N	-	4 x AM10x1	0 - 0.10	0 - 0.25



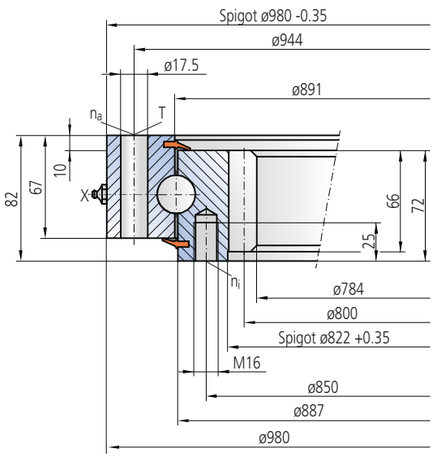
Limiting load diagram for "compressive" loads



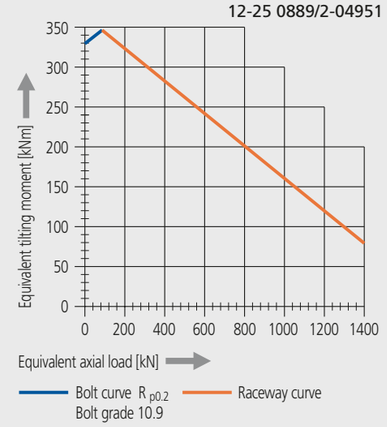
Please adhere strictly to the rules given in the Technical Information section when using above graph!

Size 12-25 0889/2-04951

Weight	Mounting holes: Number of holes, outer ring	Mounting holes: Number of holes, inner ring	Gearing and tooth forces: Module	Number of teeth	Addendum modification coeff.	Permissible tooth force	Maximum permissible tooth force	Load ratings: Static		Dynamic		Material, inner / outer ring	Transport holes	Taper type grease nipple DIN 71412	Clearance: Radial clearance	Axial tilting clearance
G [kg]	**n_a** [-]	**n_i** [-]	**m** [mm]	**z2** [-]	**x2** [-]	**$f_{z\,norm}$** [kN]	**$f_{z\,max}$** [kN]	**$C_{o\,rad}$** [kN]	**$C_{o\,ax}$** [kN]	**C_{rad}** [kN]	**C_{ax}** [kN]		**T** [-]	**X**	**S_{rad}** [mm]	**S_{kipp}** [mm]
126	36	36	8	100	–	41	74	660	1766	312	363	42CrMo4V	4 x M10	4 x AM10x1	0.06 - 0.25	0.11 - 0.41



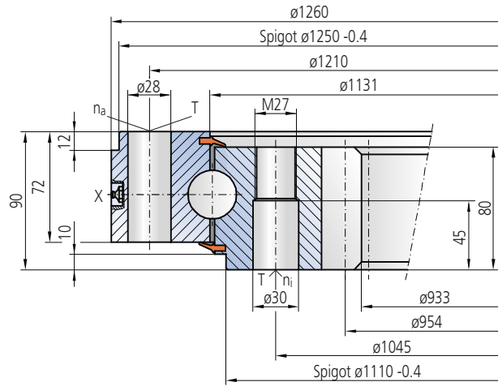
Limiting load diagram for "compressive" loads



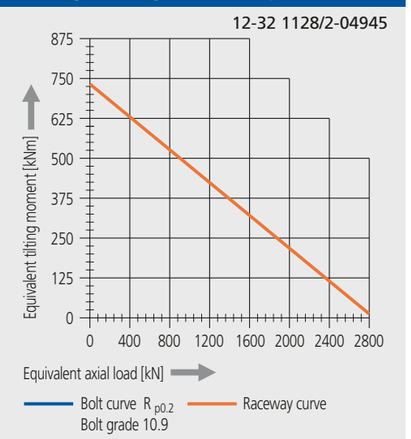
Please adhere strictly to the rules given in the Technical Information section when using above graph!

Size 12-32 1128/2-04945

Weight	Mounting holes: Number of holes, outer ring	Mounting holes: Number of holes, inner ring	Gearing and tooth forces: Module	Gearing and tooth forces: Number of teeth	Gearing and tooth forces: Addendum modification coeff.	Gearing and tooth forces: Permissible tooth force	Gearing and tooth forces: Maximum permissible tooth force	Load ratings: Static	Load ratings: Static	Load ratings: Dynamic	Load ratings: Dynamic	Material, inner / outer ring	Transport holes	Taper type grease nipple DIN 71412	Clearance: Radial clearance	Clearance: Axial tilting clearance
G [kg]	**n_a** [-]	**n_i** [-]	**m** [mm]	**z2** [-]	**x2** [-]	**$f_{z\,norm}$** [kN]	**$f_{z\,max}$** [kN]	**$C_{o\,rad}$** [kN]	**$C_{o\,ax}$** [kN]	**C_{rad}** [kN]	**C_{ax}** [kN]		**T** [-]	**X**	**S_{rad}** [mm]	**S_{kipp}** [mm]
280	40	40	12	77	-1.25	61	100	1055	2823	442	515	42CrMo4V	2 x M20	4 x AM10x1	0 - 0.30	0 - 0.60



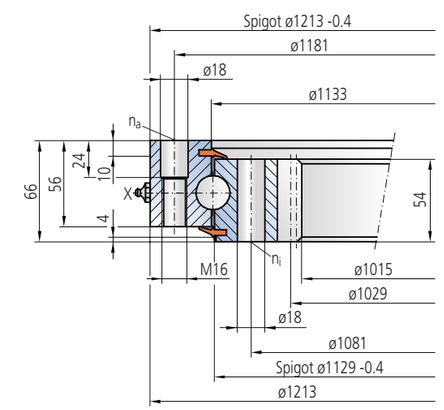
Limiting load diagram for "compressive" loads



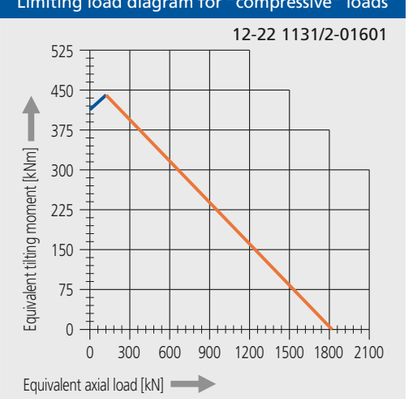
Please adhere strictly to the rules given in the Technical Information section when using above graph!

Size 12-22 1131/2-01601

Weight	Mounting holes: Number of holes, outer ring	Mounting holes: Number of holes, inner ring	Gearing and tooth forces: Module	Gearing and tooth forces: Number of teeth	Gearing and tooth forces: Addendum modification coeff.	Gearing and tooth forces: Permissible tooth force	Gearing and tooth forces: Maximum permissible tooth force	Load ratings: Static	Load ratings: Static	Load ratings: Dynamic	Load ratings: Dynamic	Material, inner / outer ring	Transport holes	Taper type grease nipple DIN 71412	Clearance: Radial clearance	Clearance: Axial tilting clearance
G [kg]	**n_a** [-]	**n_i** [-]	**m** [mm]	**z2** [-]	**x2** [-]	**$f_{z\,norm}$** [kN]	**$f_{z\,max}$** [kN]	**$C_{o\,rad}$** [kN]	**$C_{o\,ax}$** [kN]	**C_{rad}** [kN]	**C_{ax}** [kN]		**T** [-]	**X**	**S_{rad}** [mm]	**S_{kipp}** [mm]
127	40	40	7	146	-0.50	28.6	52	678	1815	284	331	42CrMo4V C45N	-	4 x AM10x1	0.05 - 0.22	0.10 - 0.40



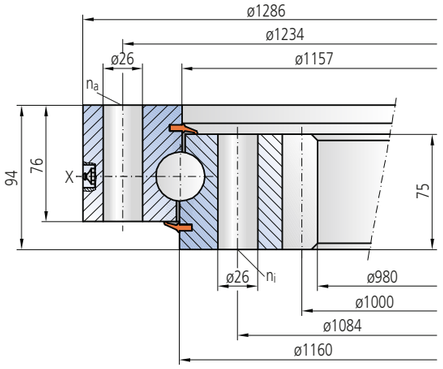
Limiting load diagram for "compressive" loads



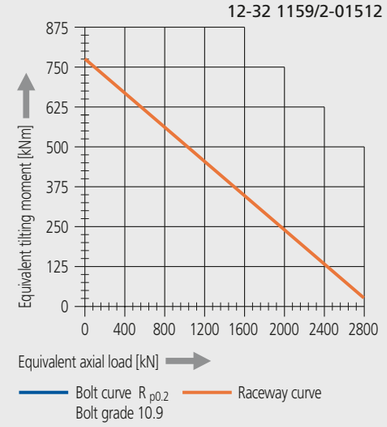
Please adhere strictly to the rules given in the Technical Information section when using above graph!

Size 12-32 1159/2-01512

Weight	Mounting holes: Number of holes, outer ring	Mounting holes: Number of holes, inner ring	Gearing and tooth forces: Module	Gearing and tooth forces: Number of teeth	Gearing and tooth forces: Addendum modification coeff.	Gearing and tooth forces: Permissible tooth force	Gearing and tooth forces: Maximum permissible tooth force	Load ratings: Static	Load ratings: Static	Load ratings: Dynamic	Load ratings: Dynamic	Material, inner / outer ring	Transport holes	Taper type grease nipple DIN 71412	Clearance: Radial clearance	Clearance: Axial tilting clearance
G [kg]	**n_a** [-]	**n_i** [-]	**m** [mm]	**z2** [-]	**x2** [-]	**$f_{z\,norm}$** [kN]	**$f_{z\,max}$** [kN]	**$C_{o\,rad}$** [kN]	**$C_{o\,ax}$** [kN]	**C_{rad}** [kN]	**C_{ax}** [kN]		**T** [-]	**X**	**S_{rad}** [mm]	**S_{kipp}** [mm]
269	42	42	10	100	–	64	112	1084	2901	447	521	42CrMo4V C45N	-	4 x AM10x1	0.08 - 0.32	0.13 - 0.52



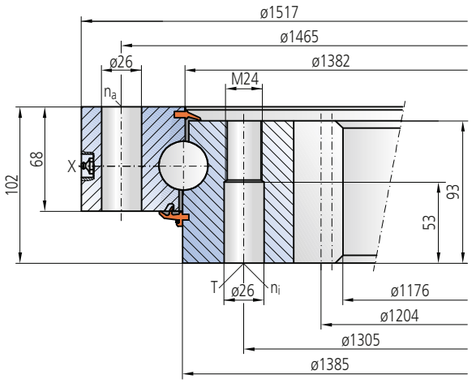
Limiting load diagram for "compressive" loads



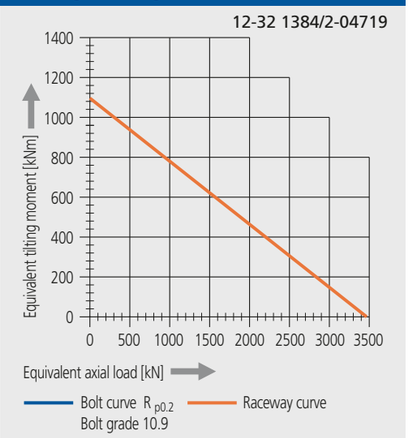
Please adhere strictly to the rules given in the Technical Information section when using above graph!

Size 12-32 1384/2-04719

Weight	Mounting holes: Number of holes, outer ring	Mounting holes: Number of holes, inner ring	Gearing and tooth forces: Module	Gearing and tooth forces: Number of teeth	Gearing and tooth forces: Addendum modification coeff.	Gearing and tooth forces: Permissible tooth force	Gearing and tooth forces: Maximum permissible tooth force	Load ratings: Static	Load ratings: Static	Load ratings: Dynamic	Load ratings: Dynamic	Material, inner / outer ring	Transport holes	Taper type grease nipple DIN 71412	Clearance: Radial clearance	Clearance: Axial tilting clearance
G	**n_a**	**n_i**	**m**	**z2**	**x2**	**$f_{z\,norm}$**	**$f_{z\,max}$**	**$C_{o\,rad}$**	**$C_{o\,ax}$**	**C_{rad}**	**C_{ax}**		**T**	**X**	**S_{rad}**	**S_{kipp}**
[kg]	[-]	[-]	[mm]	[-]	[-]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]		[-]		[mm]	[mm]
432	48	48	14	85	-0.50	109	183	1295	3464	477	556	42CrMo4V	3 x M16	6 x AM10x1	0.08 - 0.32	0.13 - 0.52



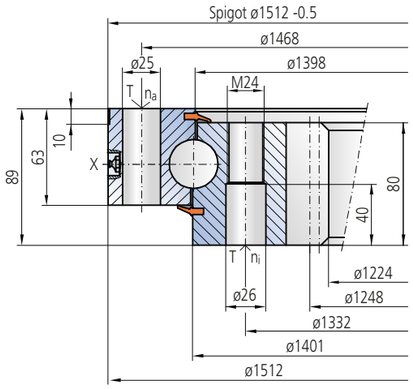
Limiting load diagram for "compressive" loads



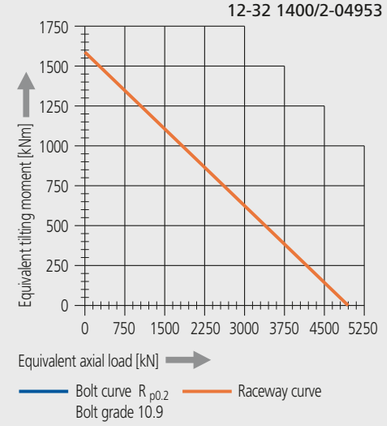
Please adhere strictly to the rules given in the Technical Information section when using above graph!

Size 12-32 1400/2-04953

Weight	Mounting holes: Number of holes, outer ring	Mounting holes: Number of holes, inner ring	Gearing and tooth forces: Module	Gearing and tooth forces: Number of teeth	Gearing and tooth forces: Addendum modification coeff.	Gearing and tooth forces: Permissible tooth force	Gearing and tooth forces: Maximum permissible tooth force	Load ratings: Static	Load ratings: Static	Load ratings: Dynamic	Load ratings: Dynamic	Material, inner / outer ring	Transport holes	Taper type grease nipple DIN 71412	Clearance: Radial clearance	Clearance: Axial tilting clearance
G	**n_a**	**n_i**	**m**	**z2**	**x2**	**$f_{z\,norm}$**	**$f_{z\,max}$**	**$C_{o\,rad}$**	**$C_{o\,ax}$**	**C_{rad}**	**C_{ax}**		**T**	**X**	**S_{rad}**	**S_{kipp}**
[kg]	[-]	[-]	[mm]	[-]	[-]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]		[-]		[mm]	[mm]
289	60	60	12	103	-0.50	81	138	1865	4990	635	740	42CrMo4V	3 x M16	15 x AM10x1	0.06 - 0.25	0.11 - 0.41



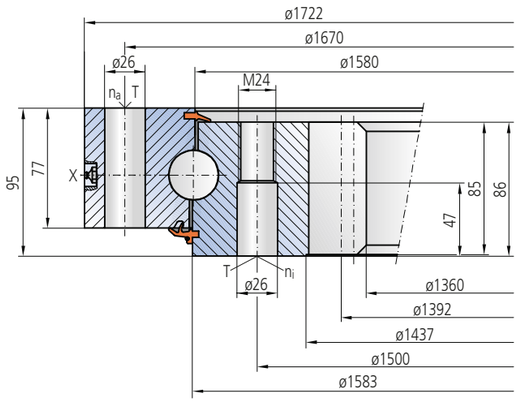
Limiting load diagram for "compressive" loads



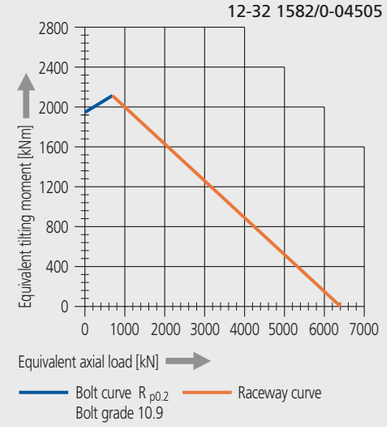
Please adhere strictly to the rules given in the Technical Information section when using above graph!

Size 12-32 1582/2-04505

Weight	Mounting holes: Number of holes, outer ring	Mounting holes: Number of holes, inner ring	Gearing and tooth forces: Module	Gearing and tooth forces: Number of teeth	Gearing and tooth forces: Addendum modification coeff.	Gearing and tooth forces: Permissible tooth force	Gearing and tooth forces: Maximum permissible tooth force	Load ratings: Static	Load ratings: Static	Load ratings: Dynamic	Load ratings: Dynamic	Material, inner / outer ring	Transport holes	Taper type grease nipple DIN 71412	Clearance: Radial clearance	Clearance: Axial tilting clearance
G	**n_a**	**n_i**	**m**	**z2**	**x2**	**$f_{z\,norm}$**	**$f_{z\,max}$**	**$C_{o\,rad}$**	**$C_{o\,ax}$**	**C_{rad}**	**C_{ax}**		**T**	**X**	**S_{rad}**	**S_{kipp}**
[kg]	[-]	[-]	[mm]	[-]	[-]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]		[-]		[mm]	[mm]
469	60	60	16	86	-0.50	122	204	2413	6456	667	778	42CrMo4V	3 x M16	5 x AM10x1	0.08 - 0.32	0.13 - 0.52



Limiting load diagram for "compressive" loads



Please adhere strictly to the rules given in the Technical Information section when using above graph!

Application Data Sheet - Slewing Rings

Please copy, fill in and send to: IMO Momentenlager GmbH
Imostraße 1 - D-91350 Gremsdorf, Germany - Fax:+49-9193/6395-40

Alternatively, you can fill in this sheet online at www.goimo.com

1. Contact:

Firm: Homepage:
Contact person: Email:
Address: Phone:
City: Fax:
Zip Code:

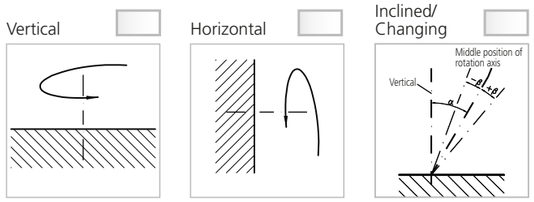
2. Application description (please attach additional sketch):

New Application: No ☐ Yes ☐

Exchangeable with existing solution: No ☐ Yes ☐ If yes: what should be considered? Replacement for: pls fill in below!

Position of rotation axis:

Vertical ☐ Horizontal ☐ Inclined/ Changing ☐

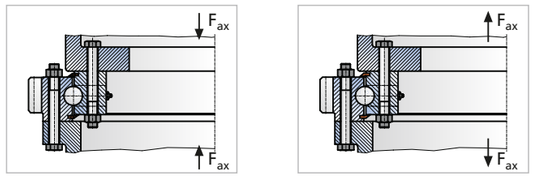


α ☐ Degrees Middle position of rotation axis

±β ☐ Degrees Angle range

Type of load:

"Compressive" axial load ☐ "Suspended" axial load ☐



Ambient temperature:	minimum ☐ °C	normal ☐ °C	maximum ☐ °C			
Do shocks or vibrations occur?	No ☐	Yes ☐				
Special seals required?	No ☐	Yes ☐	against:			
Works Certificate?	No ☐	Yes ☐	type:	(e.g. ISO 10474 3.1B according to EN 10204)		
Test certificate from authority required?	No ☐	Yes ☐	type:	(e.g. ISO 10474 3.2 according to EN 10204)		
Special conditions or specifications to be considered?	No ☐	Yes ☐	which:	(e.g. Lloyds; ABS; API; BV; DNV etc.)		

3. Gearing

which ring is with gear? internal ☐ external ☐ none ☐ (without gearing)

		Slewing Ring	Drive pinion	Number of drive pinions
Module	m	☐ mm	☐ mm	☐ -
Number of teeth	z	☐ -	☐ -	
Width of teeth	b	☐ mm	☐ mm	Centre distance
Addendum modification coeff.	x	☐ -	☐ -	☐ mm

Application Data Sheet - Slewing Rings

4. Load parameters:

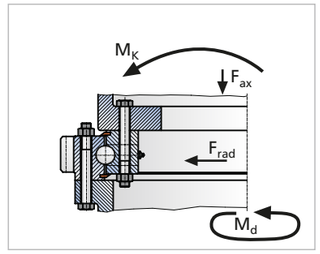
			Operating load		Test load	Extreme load
			Normal	Maximum		
Axial load	F_{ax}	kN				
Radial load	F_{rad}	kN				
Tilting moment	M_k	kNm				
perm gearing circumferential force	$f_{z\ norm}$	kN				
max gearing circumferential force	$f_{z\ max}$	kN				
Torque (Slewing Ring)	M_d	kNm				
Duty (% of rotation)	ED	%				
Continuous rotation without interruption ☐						
Rotational speed (Slewing Ring)	n	rpm				
Rotational speed max (Slewing Ring)	n_{max}	rpm				
if: Interrupted rotation ☐ Cycle description						
Slewing angle	δ_{S1}	degrees				
Slewing time	t_{S1}	s				
Interruption time	t_{U1}	s				
Angular acceleration	α_b	rad/s²				

Slewing direction: One direction only ☐ Alternating directions ☐

Peculiarities:

Any additional application service factor? No ☐ Yes ☐ Which one:

Equipment utilization time in years: yrs
Average operating hours per year: hrs



5. Offer data:

Yearly usage: pieces per year
Required delivery time: weeks
Proposal required by: date
Lot size: pieces per delivery lot
Target price: price per unit

6. Remarks:

Date: **Processed by:**

Drawing number	Page
10-12 0120/0-03659	104
10-12 0222/0-02710	106
10-16 0100/0-08000	66
10-16 0100/0-08003	68
10-16 0179/0-06672	104
10-16 0200/0-08010	66
10-16 0200/0-08013	68
10-16 0300/0-08020	66
10-16 0300/0-08023	68
10-16 0325/0-03997	108
10-16 0400/0-08030	66
10-16 0400/0-08033	68
10-16 0500/0-08040	66
10-16 0500/0-08043	68
10-20 0220/0-03351	104
10-20 0260/0-02448	106
10-20 0311/0-02002	70
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10-20 0641/0-02033	72
10-20 0741/0-02042	70
10-20 0741/0-02043	72
10-20 0841/0-02052	70
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10-20 0941/0-02062	70
10-20 0941/0-02063	72
10-20 1091/0-02072	70
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92-32 1155/1-06235	62
92-32 1255/1-06245	62
92-32 1355/1-06255	62
92-32 1455/1-06265	62

Products listed according to drawing reference number

No.	Page	No.	Page	No.	Page	No.	Page	No.	Page	No.	Page	No.	Page	No.	Page
00181	108	02213	72	04040	74	06672	104	07017	59	07122	58	07224	59	07490	98
00270	106	02222	70	04110	74	06700	92	07021	59	07123	60	07226	59	07500	98
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02053	72	03130	74	06045	62	06925	88	07062	58	07164	59	07267	59	08010	66
02062	70	03140	74	06055	62	06930	88	07063	60	07166	59	07271	59	08013	68
02063	72	03150	74	06065	62	06935	88	07064	59	07167	59	07272	58	08020	66
02072	70	03160	74	06115	62	06940	82	07066	59	07171	59	07273	60	08023	68
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02112	70	03230	74	06155	62	06960	82	07073	60	07176	59	07300	96	08043	68
02113	72	03240	74	06165	62	06965	82	07074	59	07177	59	07310	96	08100	66
02122	70	03250	74	06215	62	06970	82	07076	59	07201	59	07320	96	08103	68
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02132	70	03270	74	06235	62	06980	82	07101	59	07203	60	07340	96	08113	68
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02162	70	03771	118	06420	76	07006	59	07111	59	07213	60	07400	96	08143	68
02163	72	03908	108	06430	76	07007	59	07112	58	07214	59	07410	96		
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02173	72	03997	108	06510	76	07012	58	07114	59	07217	59	07430	98		
02202	70	04010	74	06520	76	07013	60	07116	59	07221	59	07440	98		
02203	72	04020	74	06530	76	07014	59	07117	59	07222	58	07470	98		
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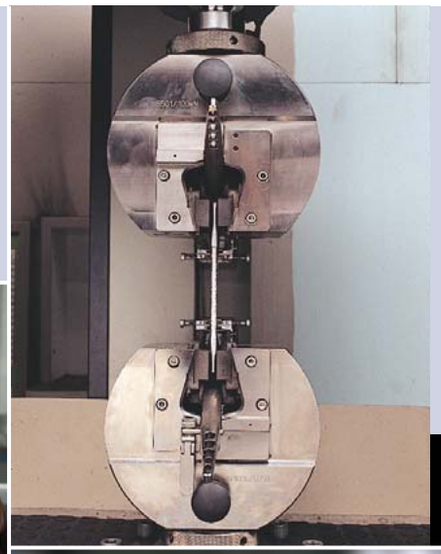
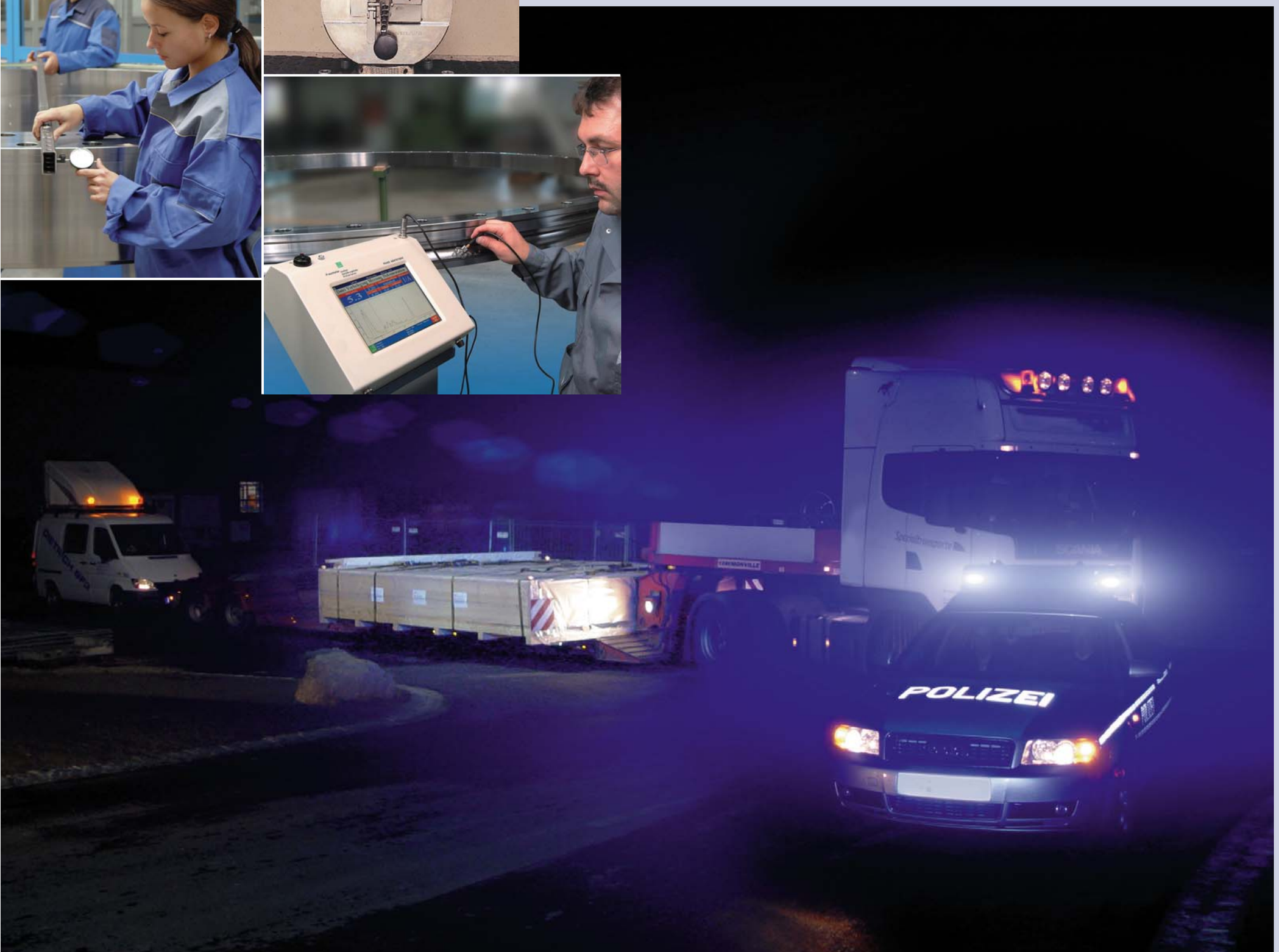
Acceptance testing of a Roller Slewing Ring.



Destructive and non-destructive material tests are performed according to the latest industry recognized methods (i.e. ultrasonic testing, developed by the Fraunhofer Institute).

For custom configurations, we also supply material certificates according to EN 10204-3.1B. This certificate logs the actual values of material characteristics such as tensile strength, apparent yielding point, notched bar impact work, extension and chemical analysis.



Quality Assurance
EN ISO 9001:2000 certified

The delivery of a Roller Slewing Ring of over 5 m in diameter for an overseas crane (seaworthy packing). The wide-load transportation required police escort.

Quality Assurance

EN ISO 9001:2000 certified

"We want you to be satisfied"

IMO Slewing Rings have to meet the highest quality requirements because they are often used as safety critical machine components.

Development, design, calculation, manufacturing and sales are performed strictly according to EN ISO 9001:2000 certified procedures.

IMO Holding GmbH
IMO Energy GmbH & Co. KG
IMO Momentenlager GmbH & Co. KG

IMO Antriebseinheit GmbH & Co. KG

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