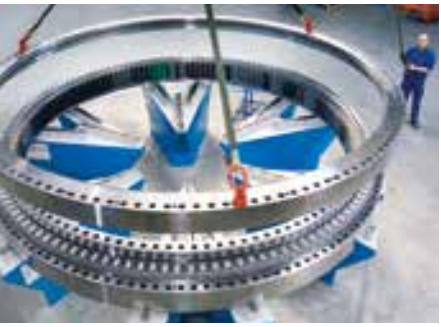
IMO

Slewing Ring
Product Catalog

DV 313 E

www.imo.de



Depending on the application and type, large diameter **IMO Slewing Rings** can be up to 6 meters in diameter and weigh more than 20 tons.

They are used for various appplications, including construction machinery, agriculture & forestry, tunneling & mining, ship buildung, conveyor & transportation systems, and medical technology.

Additionally, IMO is a leading supplier of blade, yaw, and main bearing for on- and offshore wind turbines, and even provides blade bearings for tidal stream systems.

Worm or pinion driven **IMO Slew Drives** consist of a ball or roller slewing ring, a drive train, and a completely enclosed and sealed housing.

These convenient, ready-to-insall systems can replace complex systems with multiple parts to reduce design and assembly time.

They are used around the world for steering in equipment such as gantry cranes and heavy-duty transporters, as well as for rotating, tilting, and positioning in machinery, including construction equipment and slew drilling rigs.

IMO Slew Drives are also used within the renewable energy industry in small wind turbines, solar trackers, and solar thermal tower plants.

Preface and Imprint

IMO has developed, manufactured and sold large diameter slewing rings to customers for many years worldwide.

This catalog presents our comprehensive standard range of ball- and roller slewing rings up to diameters of more than 6000 mm. If your application requires a customized product please contact our Application Engineering Department.
This catalog carries a reference number and replaces all previous editions. Data of earlier catalogs that do not correspond to the information of this issue therefore are no longer valid.

In the back of this catalog or at www.imo.de you find an **"Application Data Sheet"**. Please do fill it in – it is the performance specification for the use of our products. Slewing Rings are high-tech products optimized to the specific demands and environmental conditions of your application. Thus it is important to fill in the form as exactly and as detailed as possible before returning it to us.

You will then receive our recommendation for the ideal IMO product for your application and thus benefit directly from our profound experience.

IMO terms and conditions shall apply to all quotations and purchase orders.

Furthermore our Installation & Operating Manual needs to be followed strictly, it is important for the reliability and safety of our product and has considerable influence on its service-life. Additionally the Installation & Operating Manual contains practical information on the layout of your adjacent structure. Any liability for technical design, especially the aforementioned adjacent structures however, is hereby excluded.

There are separate brochures about the IMO group and IMO products for selected applications as well as a catalog of our comprehensive product portfolio of Slew Drives.

The latest versions of all mentioned documents canbe downloaded at **www.imo.de**. Please contact us to receive a hard copy.

All information in this catalog has been carefully reviewed and checked. For omissions and errors in this publication however we cannot accept responsibility.

Product and application images presented in this catalog show potential fields of application for which IMO Slewing Rings might in principle be used after technical verification of our application engineering. They are not intended to be understood as fundamental designs. All engineering design work is to be based on the technical data listed in this catalog. Please contact our Engineering Department for specific questions.

Our products are being continuously refined. Products, product range and specifications contained in this publication are subject to change withoutnotice.

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IMO® is a registered trademark

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IMO Ball and Roller Slewing Rings as well as **IMO Slew Drives** are quality products made in Gremsdorf, Germany and distributed worldwide.

The IMO Group with headquarters located in the south of Germany has more than 25 years of experience in designing and manufacturing Slewing Rings and Slew Drives.

We are certified according to the standards DIN EN ISO 9001, 14001 and BS OHSAS 18001.

Several times, IMO has achieved awards for its product innovations at Exhibitions for Ideas-Invention-New Products. In our sector we are one of the leading suppliers.

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

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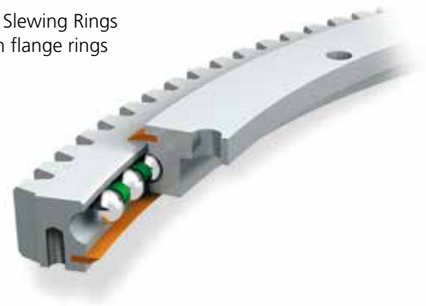
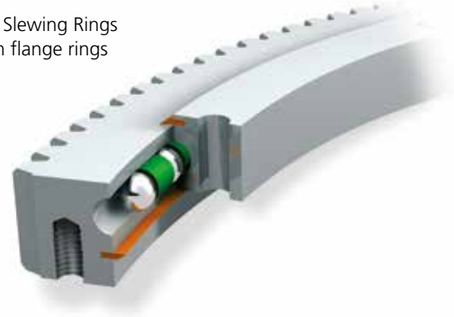
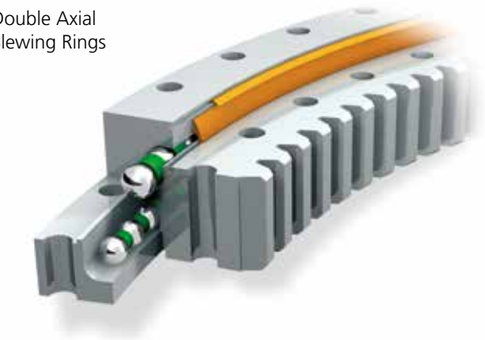
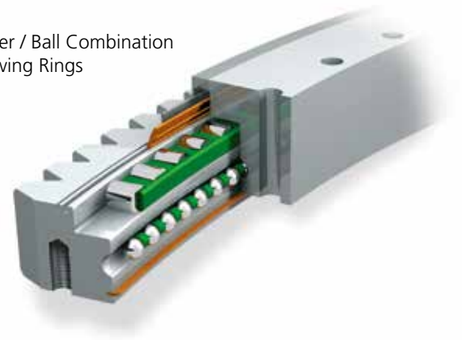
Design types	Series	Raceway diameters D_L [mm]	Maximum tangential tooth force.[1] $f_{z\,max}$ [kN]	Maximum tilting moment [1) 2)] $M_{k\,max}$ [kNm]	Load carrying capacity [1)] Static axial load rating $C_{0\,ax}$ [kN]	Load carrying capacity [1)] Static radial load rating $C_{0\,rad}$ [kN]	Weight [1)] G [kg]	Clearance
Ball Slewing Rings with flange rings 	**Series 920**	from 311 to 1091	from 23 to 51	from 16 to 151	from 208 to 370	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 442 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
Ball Slewing Rings with flange rings 	**Series 116**	from 100 to 500	from 16 to 18.5	from 4 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 23 to 51	from 36 to 311	from 448 to 1572	from 192 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 132 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

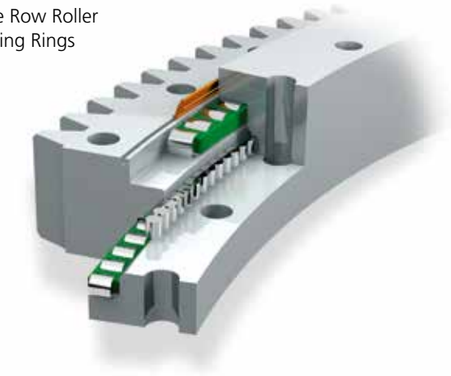
Product Line Overview / Comparison

Design types	Series	Raceway diameters D_W [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] $f_{z\,max}$ [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
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 		from 120 to 1845	from 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

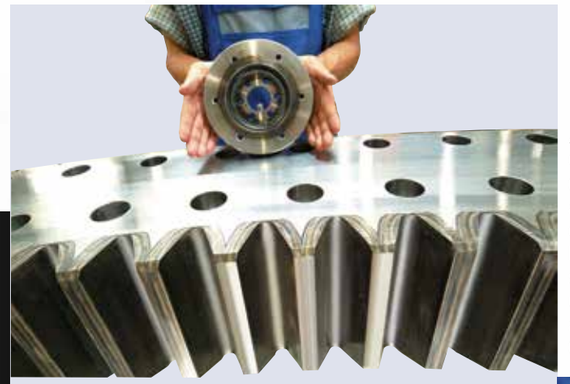
2) The tilting moment capacity for each unit should be confirmed by referring to the limiting load diagram for each individual model

Service

Our service for you:

- technical consulting
- dimensioning and calculation
- design and drawing
- Integration of your FE-calculations
- FE- calculations including complex adjacent structures
- product trainings
- integration support
- disassembly and inspection
- assessment and optimization advice
- repair and reconditioning of used Slewing Rings
- lubricant analysis and seal inspection
- wear measurement
- check of bolts
- organization of certificates from
  - rolled rings
  - calculations
  - final Slewing Rings

  through for example DNV, Bureau Veritas, Lloyds Register of Shipping ...
- express service for urgently needed components or prototypes
- work on building sites : leading industrial climbers level 3 with FISAT-certificate
- inspection of personal protective equipment

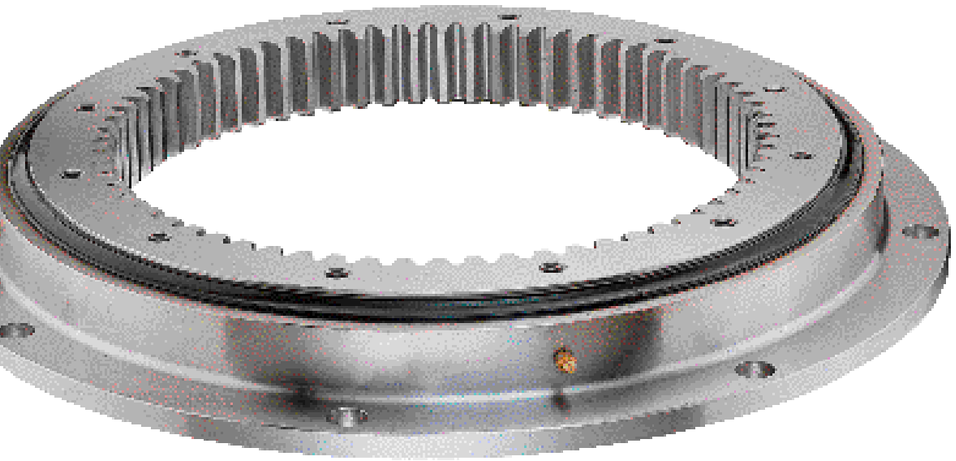


A comparison of the Slewing Rings: On the left are the smallest (internal diameter 40 mm / 1.57 in) and the largest (outside diameter 6000 mm / 236 in) IMO Slewing Rings. Below is the smallest raceway roller which we use (diameter 12 mm / 1/2 in) and the largest ball (diameter 80 mm / 3 in).

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

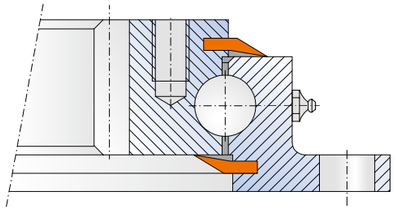
- Replaces traditional systems using fixed and floating bearings as well as king pins
- Ball and Roller Type Slewing Ring configurations
- Available in diameters more than 6000 mm (4 to 236 in)
- Integrated mounting holes
- Available with integral internal or external gearing of bearing rings (modules 1 to 30 mm / 0.04 to 1.18 in)
- Sealed raceway system with grease lubrication
- Standard series and special designs
- Certified to meet DIN EN 10204 requirements for materials, dimensions and operating specifications

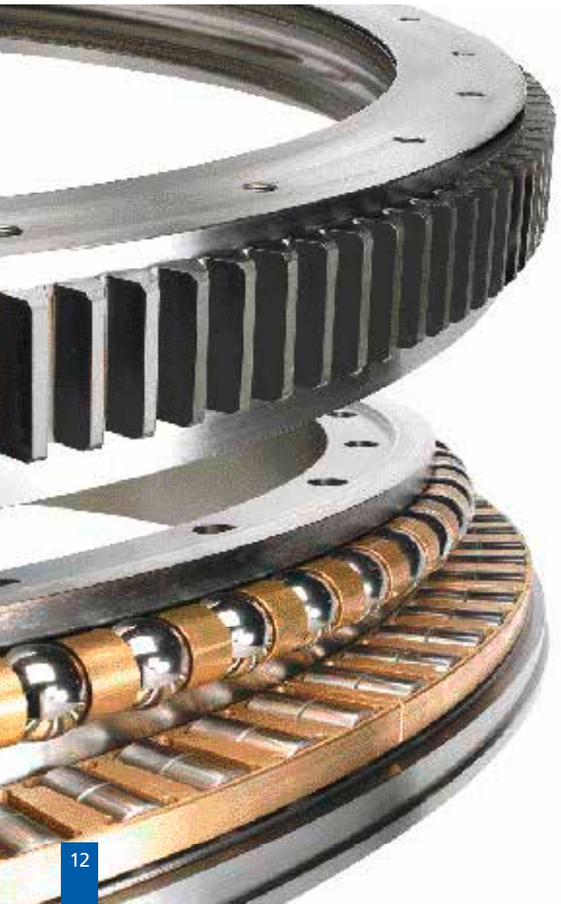
"Diameters more than 6000 mm – we supply XXL Slewing Rings!"



Ball Slewing Rings with flange rings

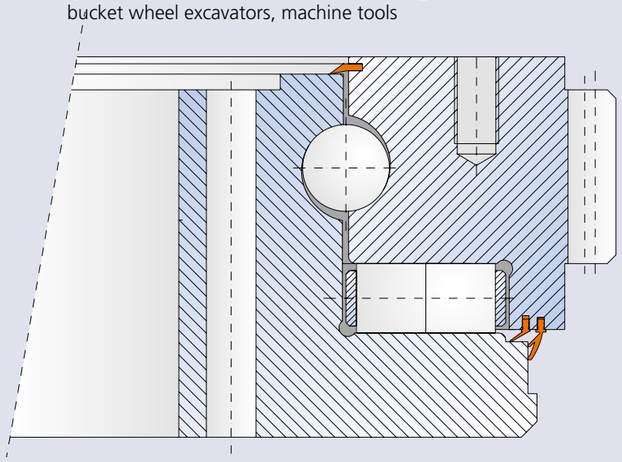
- Single row design with four-point raceway geometry
- Untoothed rings with flange thicknesses of 12 and 21 mm
- Ball diameters 20 and 32 mm
- Available ex stock or with a short delivery time as standard series in 14 sizes
- Raceway diameters of 311 to 1,091 mm or 955 to 1,455 mm
- For applications with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

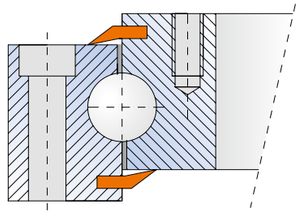




Roller / Ball Combination Slewing Rings

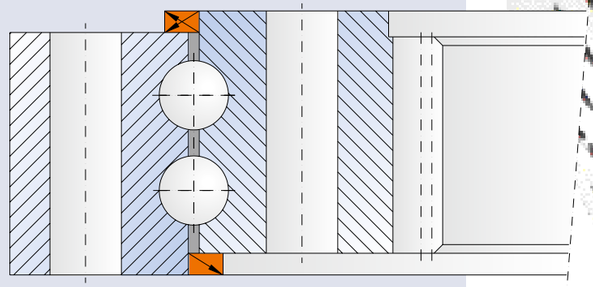
- Roller raceway to take up the axial loads
- Ball raceway provides support for radial loads. All parts are retained together as a unit during fitting
- Ball diameters 25 to 80 mm, roller diameters up to 100 mm
- Used in application with a dominant axial force and low radial load / tilting moments
- Standard series with outside diameters more than 6,000 mm
- Frequently produced as special designs according to customer requirements
- Typical applications: Bulk materials handling, stacker reclaimers, bucket wheel excavators, machine tools

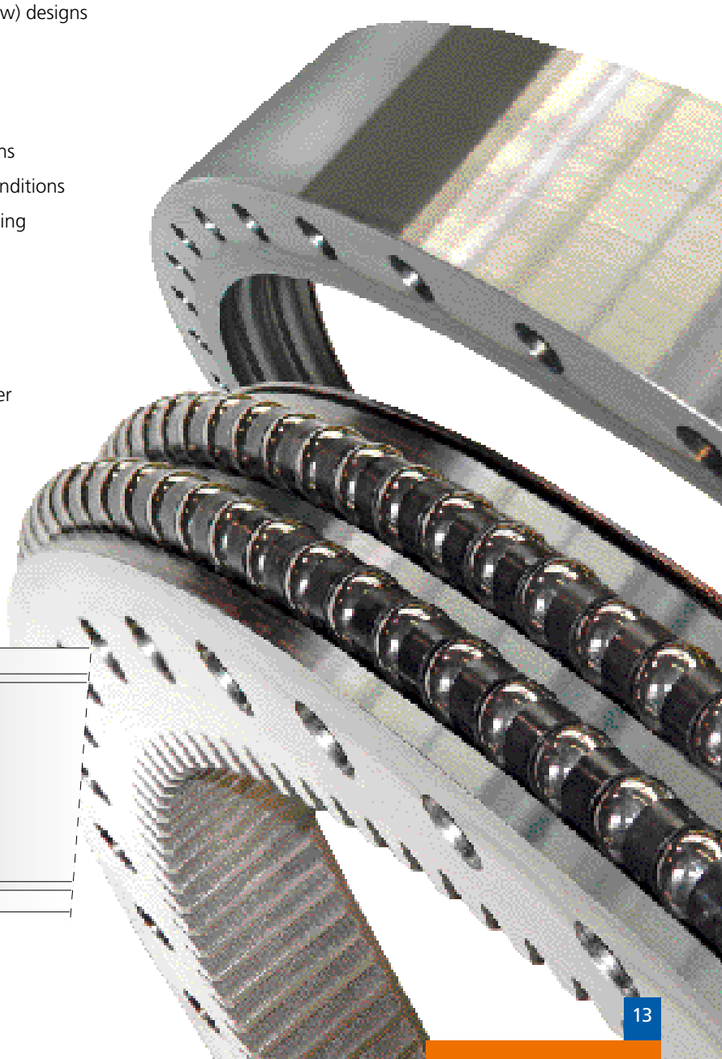




Ball Slewing Rings

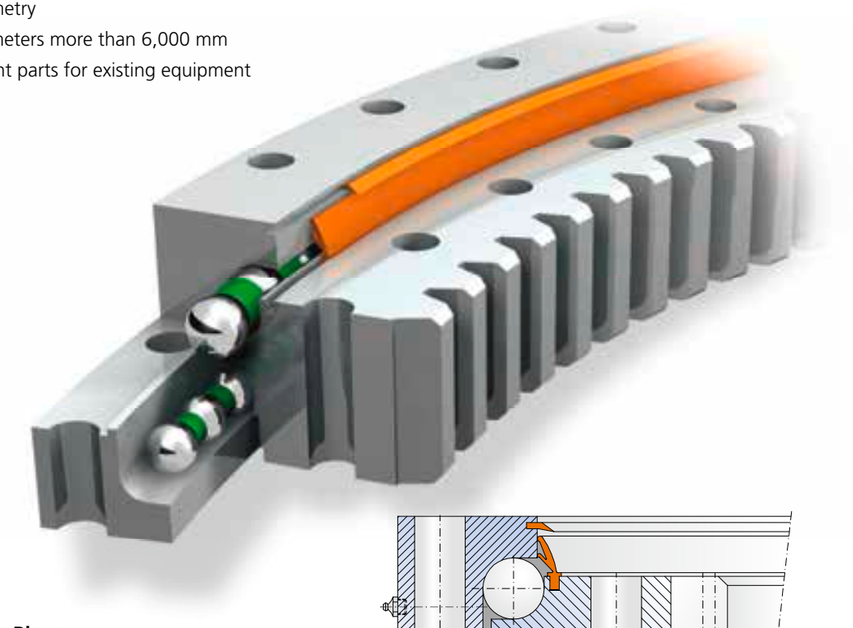
- Single row (picture above) and double row (picture below) designs
- Ball diameters 12 to 80 mm
- Four-point raceway geometry
- Optional preloaded raceway system and centerings
- Enables robust designs for arduous application conditions
- High resistance to ‚false brinelling' in heavy vibration conditions
- Reduced sensitivity to shape deformations in the mounting structure
- Higher static load capacity than similar designed 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 more than 6,000 mm)
- Frequently used in wind energy turbines, cranes, construction machinery, mechanical engineering and special purpose machinery

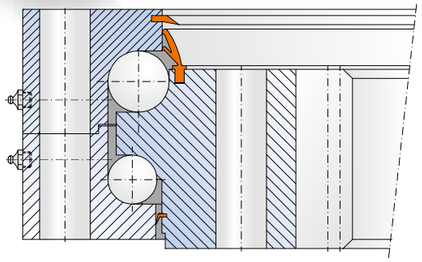




Double Axial Slewing Rings

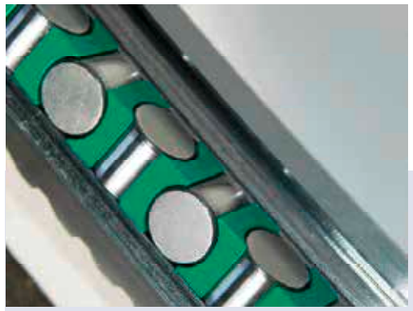
- Double row design with large supporting balls and smaller retaining balls
- Ball diameters 20 to 80 mm
- Both raceways in two point geometry
- Standard series with outside diameters more than 6,000 mm
- Used in cranes and as replacement parts for existing equipment
- Special designs can be supplied

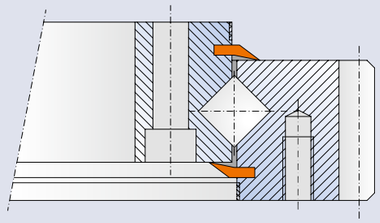


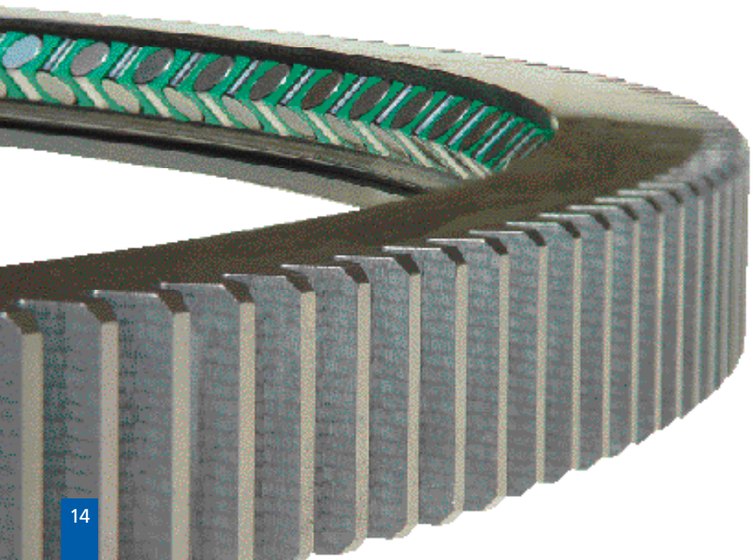


Cross Roller Slewing Rings

- 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

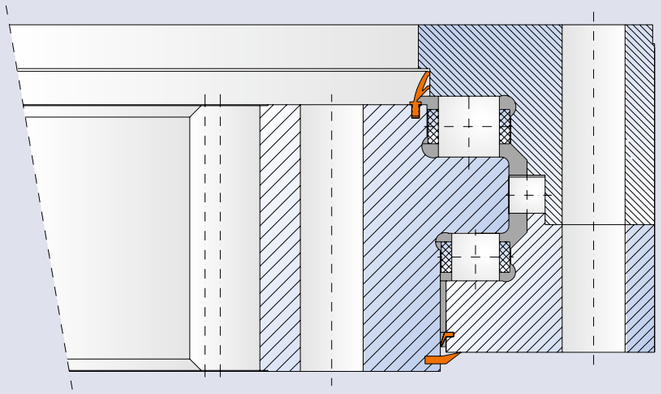


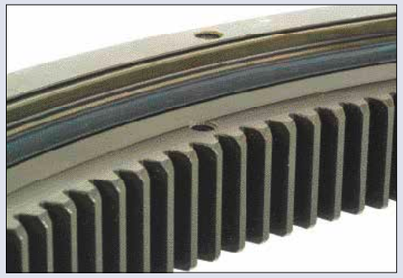




Roller Slewing Rings

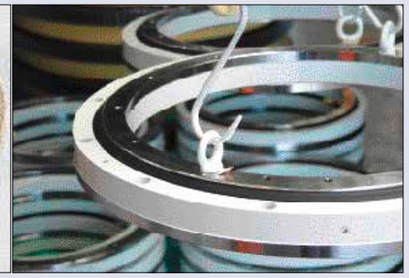
- Triple Row Roller Slewing Ring
- Roller diameters 10 to 100 mm
- Plastic, steel or brass cage segments according to loads (can also be supplied with closed cage)
- Designed to provide the combination of the highest capacity in the smallest configuration
- Greater static and dynamic load capacity, higher 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





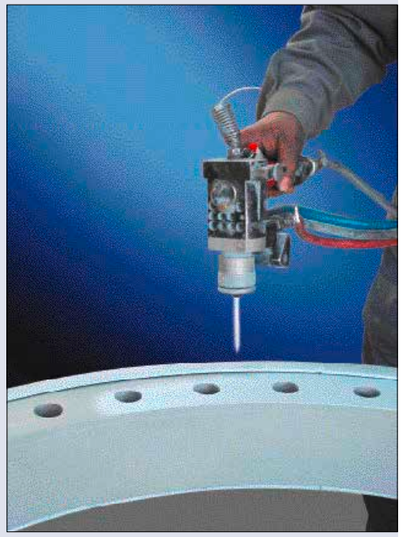
ZnFeCo coating, dark-coloured, according to MIL specification

ZnFe coating



Priming and multi-coat painting

Zinc-coated surface (flame-sprayed)



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

Surface coating

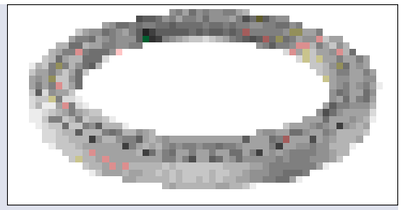
Depending on the requirements of the application, the surfaces of our Slewing Rings can be provided with metallic and non-metallic coatings, which ensure effective corrosion protection.

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

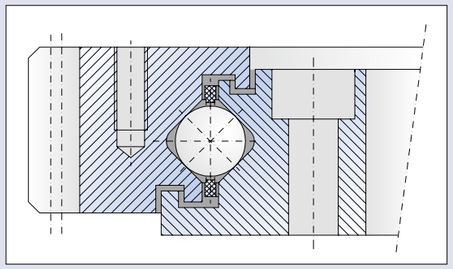
External straight gear, quenched and tempered

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

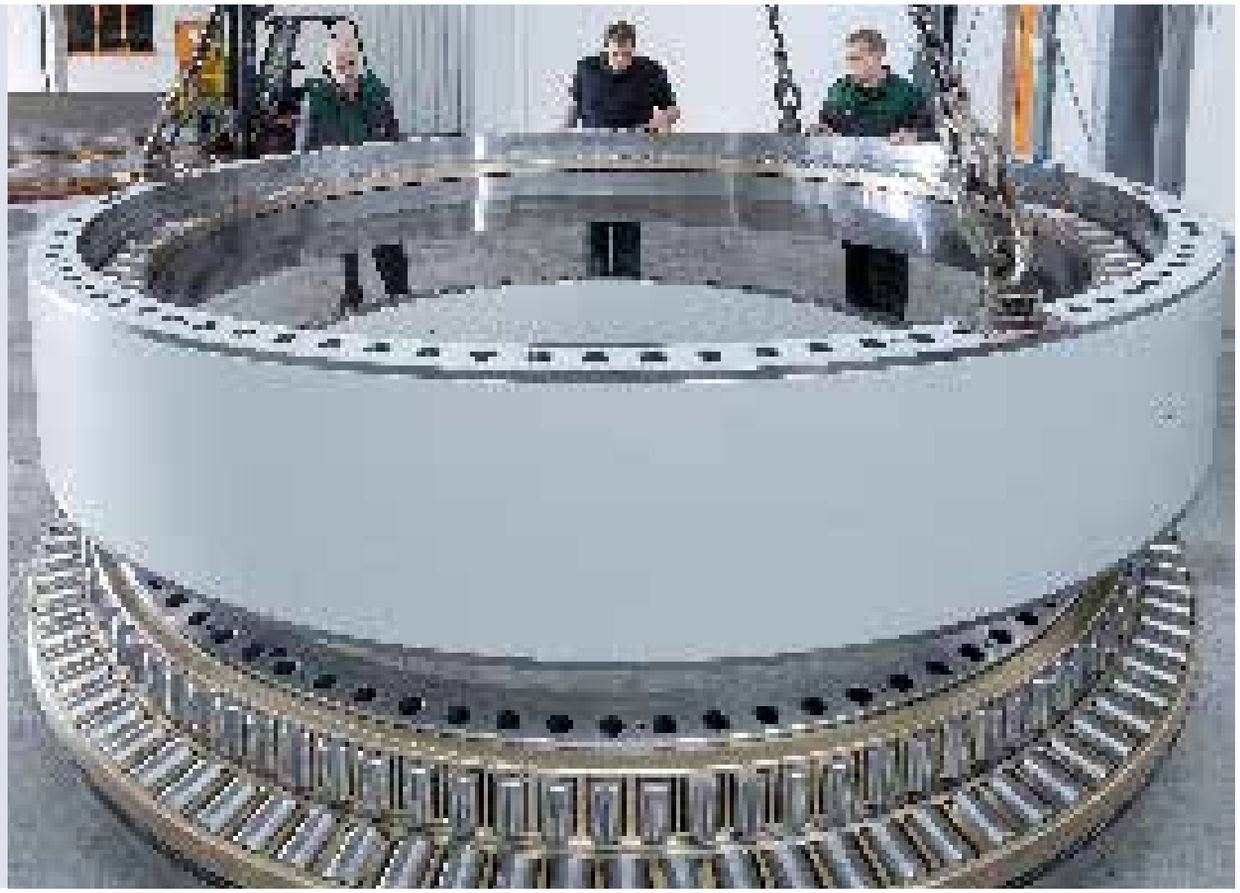


Special materials

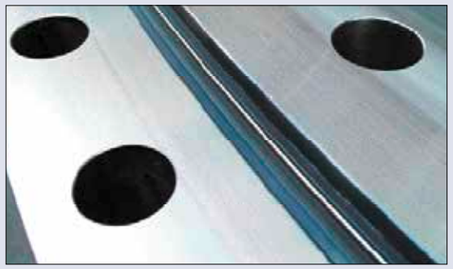
Special Slewing Rings with ceramic balls (dry running), stainless steel rings, square-sectioned raceway (low friction torque) and labyrinth seal.

Ceramic and steel balls

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



3-row roller bearing used as main bearing of a 5 MW wind turbine. Weight of the bearing: 17 t.



Seals

NBR70 seal fixed with stainless steel wire

Steel plate as primary seal

Rolling element separation

Steel cage segments for a crane Slewing Ring

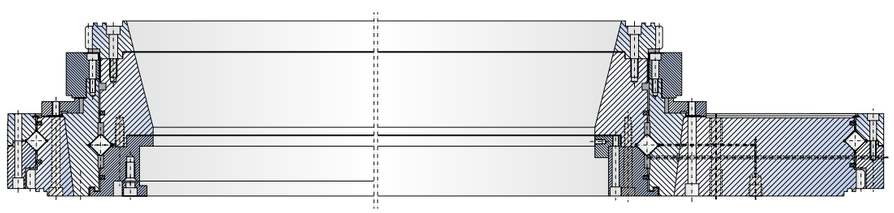
Brass cage for Ball Slewing Ring with longer service life and higher rotational speed requirements

Plastic cage for high circumferential speeds

Plastic spacers for low circumferential speeds

Rolling element guided brass roller cage made for horizontal axis rotation

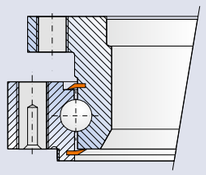
"We show what is possible!"

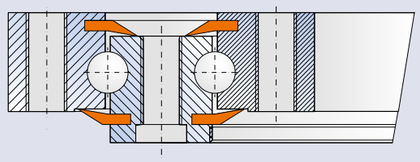


Eccentric bearing unit from a machine tool used for diesel engine crankshaft machining. The bearing unit contains two high precision Cross Roller raceways and one slide bearing. The integrated toothing makes it possible to adjust the eccentricity allowing machining of all crankshaft bearing surfaces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

Other special designs

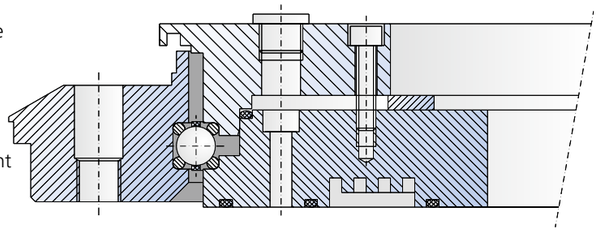
- Slewing Rings matched to customer requirements, e.g. custom mounting hole patterns or prototype designs
- Geometry of the Slewing Ring adapted to the installation conditions
- Suitable for extreme temperatures and vacuums
- Special cages for high circumferential speeds
- Special sealing systems for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





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!



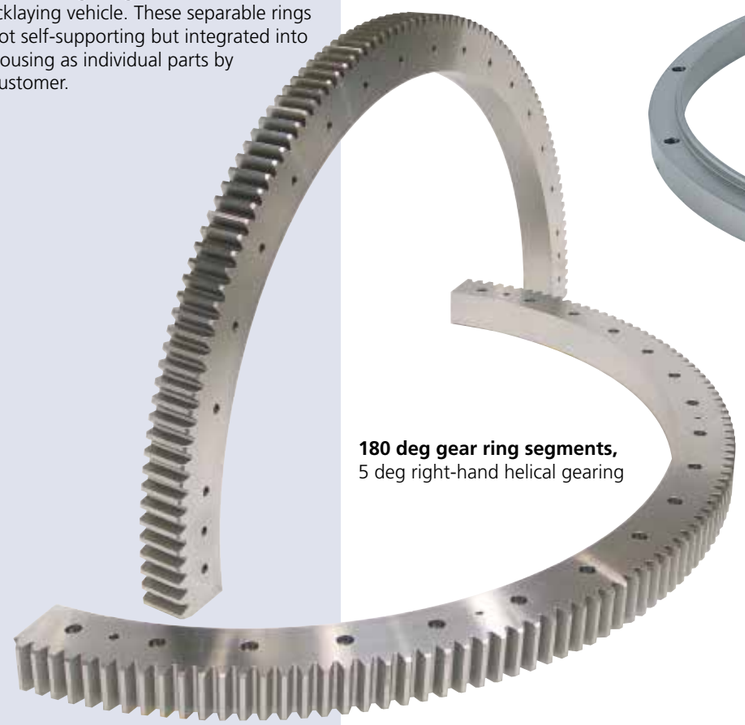
IMO: "Engineering at its best!"

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 more than 6,000 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.

IMO

"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** offer plenty…

- 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.

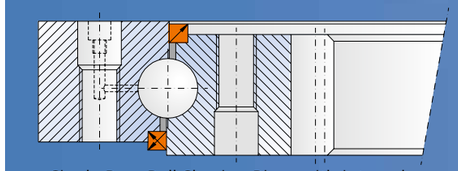
We are ready to design customized solutions for you.
You can find our comprehensive standard programm in our **product catalog Slew Drives**. This catalog can be downloaded - as any other of our brochures - in the download section on **www.imo.de.**
On request we can supply a hard copy as well.

Applications
Wind Turbines

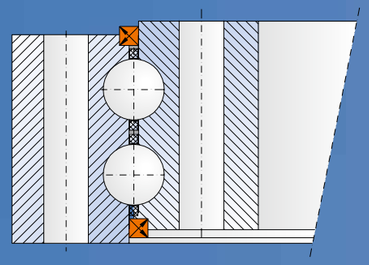
IMO Slewing Rings - approved for use in arctic conditions (operation down to -30°C, proof of structural integrity under load at -40°C)

Offshore - the future!

Onshore-windfarm:
3 MW turbines with rotor diameters of 90 m.



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).

Three-row roller bearing with closed brass cages used as main bearing for a shaftless direct driven 5 MW wind turbine.

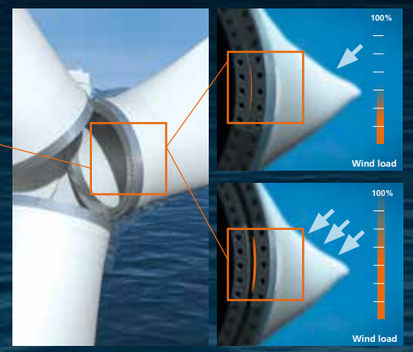
Measuring the gearing of a blade bearing used in a 7 MW Offshore turbine with a ball diameter of 80 mm, an outer diameter of around 5 m and a total weight of 8000 kg.

A wind energy turbine with rotor diameter of 104 m and power of 3.4 MW. This turbine can provide electric power for around 2500 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.

T-SOLID
pitch on the safe side

NEXT LEVEL PITCH BEARING

Blade bearings of wind turbines are being challenged by bigger rotors including the trend to continuous pitching. IMO has developed the new blade bearing T-Solid especially for offshore and low site wind turbines.



The aerodynamic forces act upon the center of pressure on the blade and result in high moment loads on the pitch bearing. These loads create deformations on the blade root, the pitch bearing and the hub.

The value potential:

extended service life
- no raceway edge loading
- extreme failsafe running ability

increased pitch activity possible

less deformation under load
- less leakage
- less wear

smooth running
- no drive torque peaks

less torque under load
- allows smaller pitch drives
- higher pitch dynamics possible
- increased efficiency
- less pitch failures

Characteristics:

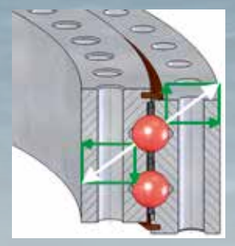
- three-ring-design, inner or outer ring split
- double row axial raceways, 90 deg ball contact angle
- single row radial raceway, 0 deg roller contact angle
- ball separation by spacers
- no filling plug required

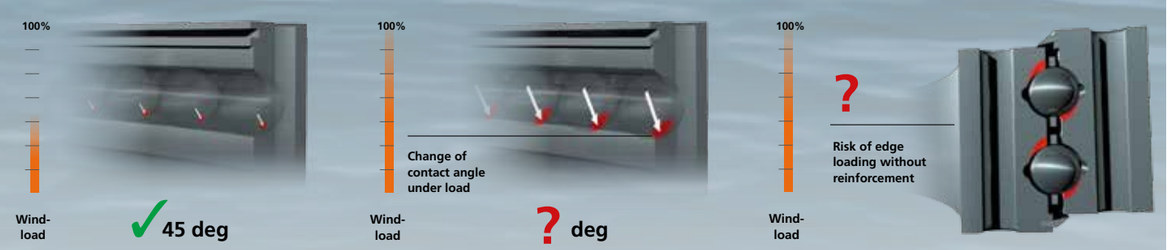
Innovation
Wind Turbines

Loads transmitted in a different way

Conventional

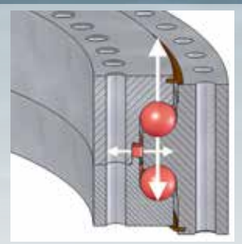
- all loads resolve into axial and radial components
- radial component causes bearing gap widening
- ball contact angle moves towards raceway edge

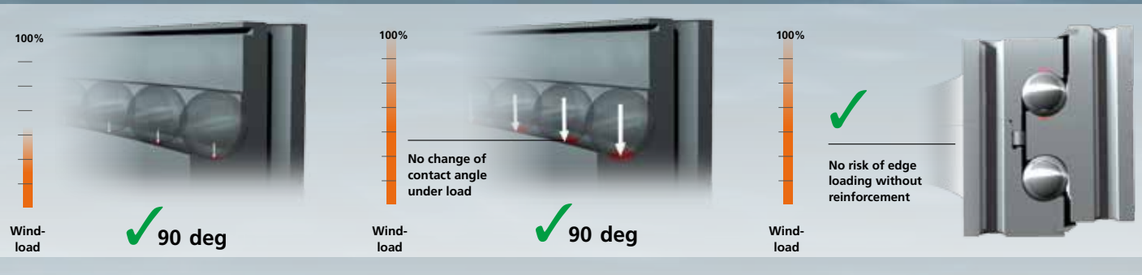




T-SOLID
pitch on the safe side

- axial load components carried by axial raceways
- radial loads carried by radial raceways
- insignificant bearing gap widening
- constant ball contact angle



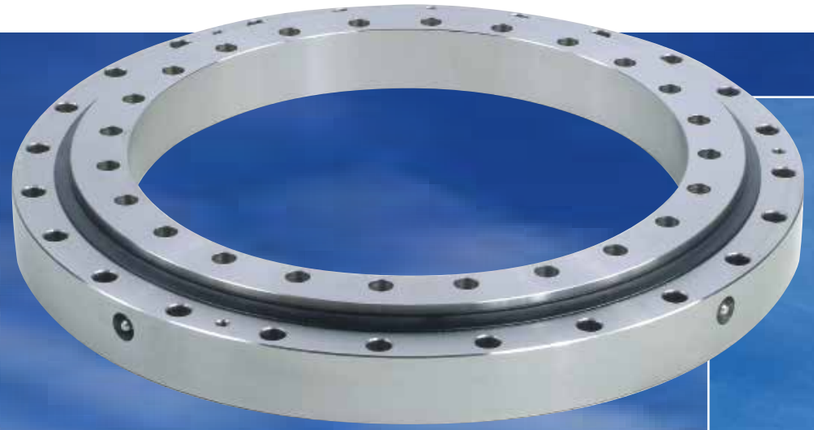


T-SOLID
pitch on the safe side

unfolds new perspectives for reduced cost of ownership, ensuring your return on investment!

Find more information at **www.t-solid.com**

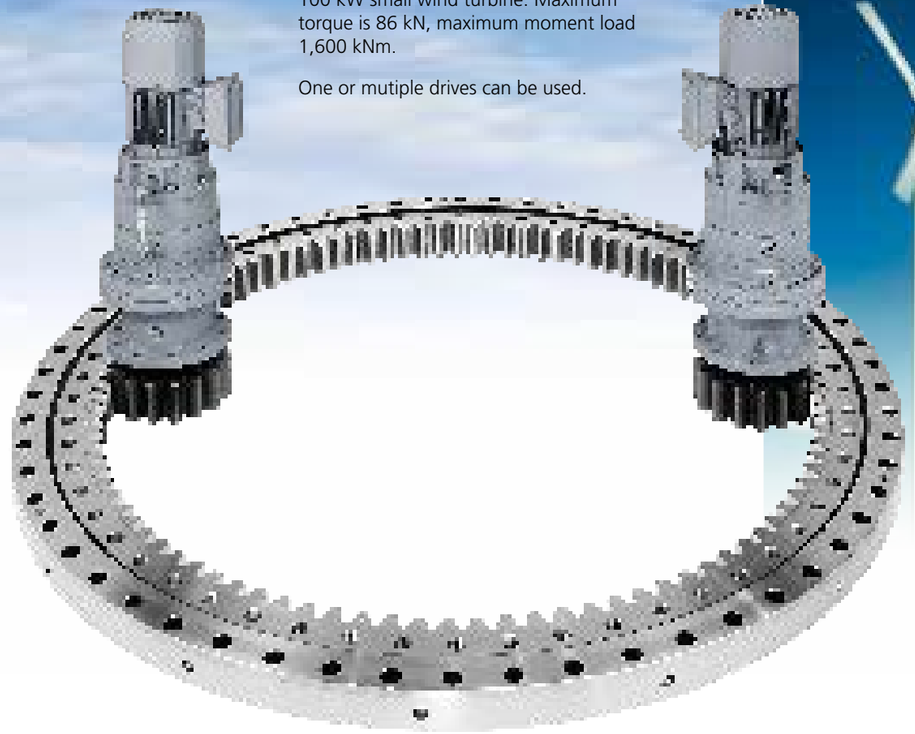
Applications
Small Wind Turbines



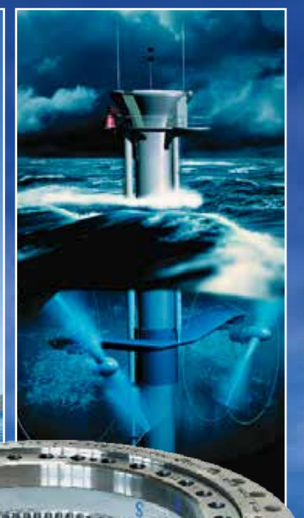
This bearing, available with internal, external or no gear, is used as pitch bearing for a 50 kW small wind turbine. Maximum moment load of this bearing is 144 kNm.

This Slew Drive SP-HE 1400 with AC drive and brakes is in use as yaw bearing at a 100 kW small wind turbine. Maximum torque is 86 kN, maximum moment load 1,600 kNm.

One or mutiple drives can be used.

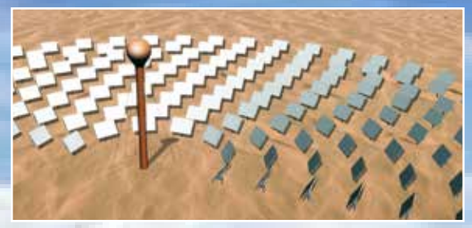


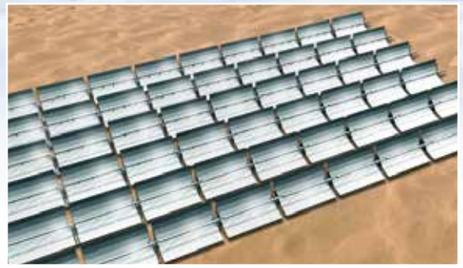
Applications
Solar & Tidal Stream Systems



A 3-row roller bearing with special seal and an outer diameter of about 1.5 m supports and turns the rotors of a - up to now unique - tidal stream system.

As this way of energy exploitation is continually working - independently from weather conditions - the system and consequently the bearing is under load 24/7.





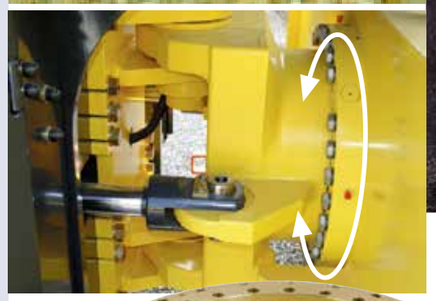
Designed for high accuracy positioning: WD-LB (above) and WD-LC.

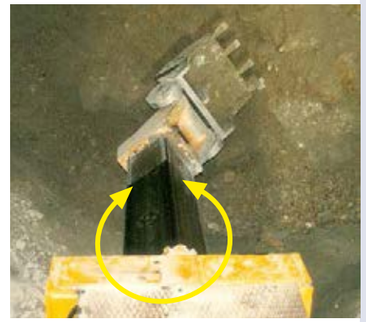
Applications
Construction Machinery & Excavators

This floating dredger uses a 3-row roller bearing with a diameter of 5,200 mm and a weight of 20 t. The dredger bucket can contain about 30 t of sand.

Tandem asphalt compaction rollers use untoothed Slewing Rings as a steering bearing (some designs are partly coated on the surface to prevent corrosion). In the split roller, Slewing Rings with special seals are used.

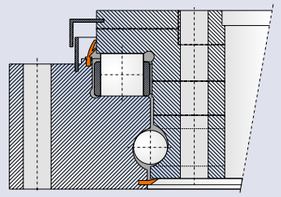
The vibratory roller of the refuse compactor in the picture uses untoothed Slewing Rings in the knuckle joint.





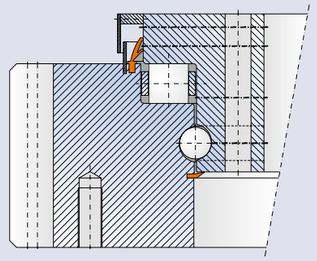
Slew Drive SP-HC 0698 with hydrostatic gear for turning an excavator boom, part of a cutter bar.

Applications
Mining



Bucket wheel excavators and stacker reclaimers use large diameter (over 5,000 mm – 196 in) Ball / Roller Combination Slewing Rings as main bearings.

Cross section of a typical main Slewing Ring. This unit is a combination type with external toothing and a diameter of 4,800 mm (189 in).



Shipboard cranes

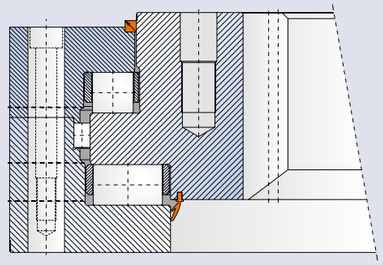
Harbour pontoon crane

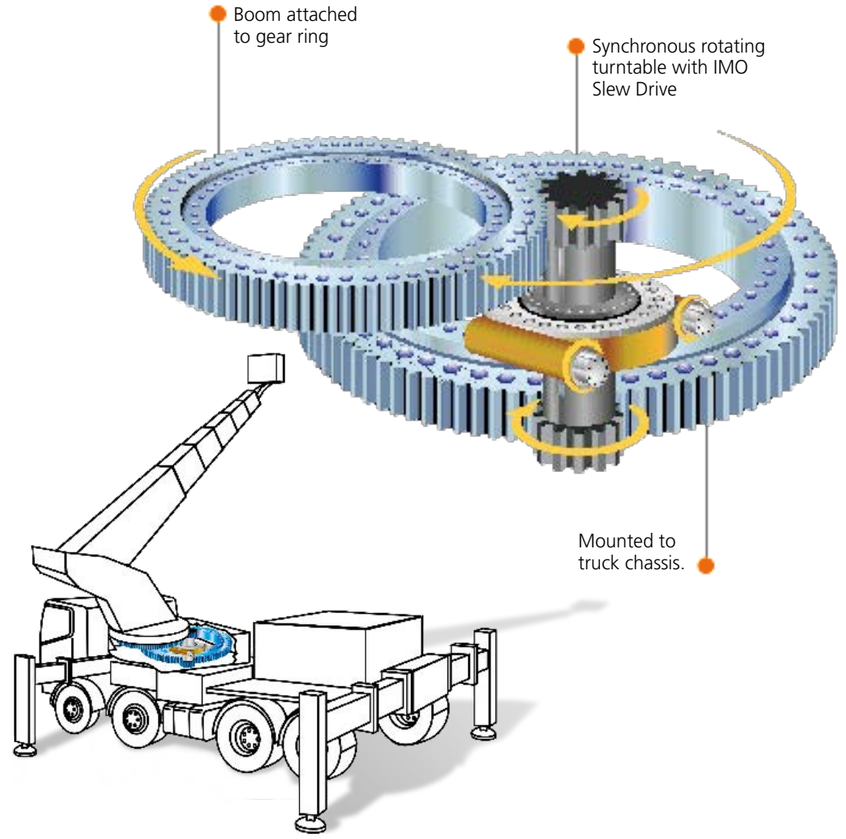
Railway slewing cranes

Harbour cranes, mobile harbour 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 diameterof about 5,000 mm and root and flank hardened internal toothing. This Slewing Ring for an Indonesian harbour pontoon crane was manufactured and shipped by IMO in only 8 weeks.





Manlift platform

Applications
FSPO - Crude Oil Production Systems

External toothed Ball Slewing Rings with a diameter of 3,000 mm (118 in) are used in this oil spill barrier reel on an FSPO (Floating Production Storage Offloading) unit.

Slewing Rings for **offshore applications** have to meet special approval requirements regarding material characteristics and safety under catastrophic load cases. The arduous environmental conditions require high perfomance sealing systems. Inspection and approval by the certifying authorities is often required.

Depending on the required load carrying capacity, Single Row Ball or Triple Row Roller Slewing Rings (often with internal toothing) are used in offshore cranes.

Applications
Offshore

ABS

energy API

BUREAU VERITAS

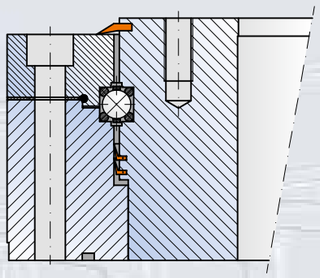
DNV

GL Germanischer Lloyd

Lloyd's Register

We are able to fulfill the specifications of all major certification companies.

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 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.

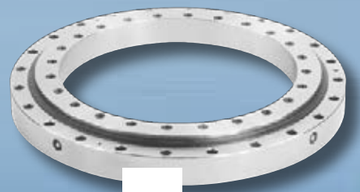


Ball Slewing Ring with root and flank hardened external toothing for a ship`s thruster on a vessel. The stamp by Lloyd's Register of Shipping can be clearly seen.

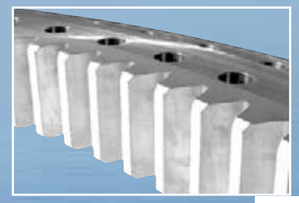
Slewing Rings find a multitude of applications on ships. Below is an examples of an offshore supply vessel.

Applications
Ship Equipment

Untoothed Slewing Ring for a fire-fighting gun.



Internal toothed Slewing Ring for a provision crane.



Gear ring (external diameter of about 1,700 mm – 67 in) with hardened toothing for a crane winch.

Slewing Ring for the launching gear of a sea rescue boat.

Three Row Roller Slewing Ring with internal toothing and an external diameter of about 3,000 mm (118 in), for a large shipboard crane.

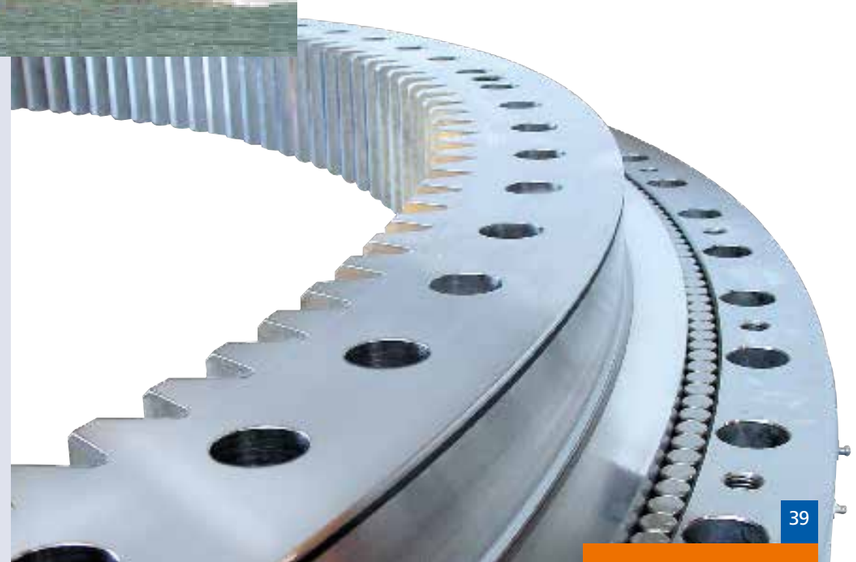
Large shipboard crane with a Triple Row external toothed Roller Slewing Ring. The high load capacity and compact proportions of this type of Slewing Ring are ideally matched to the mast and base block proportions of the crane.

Applications
Ship Cranes

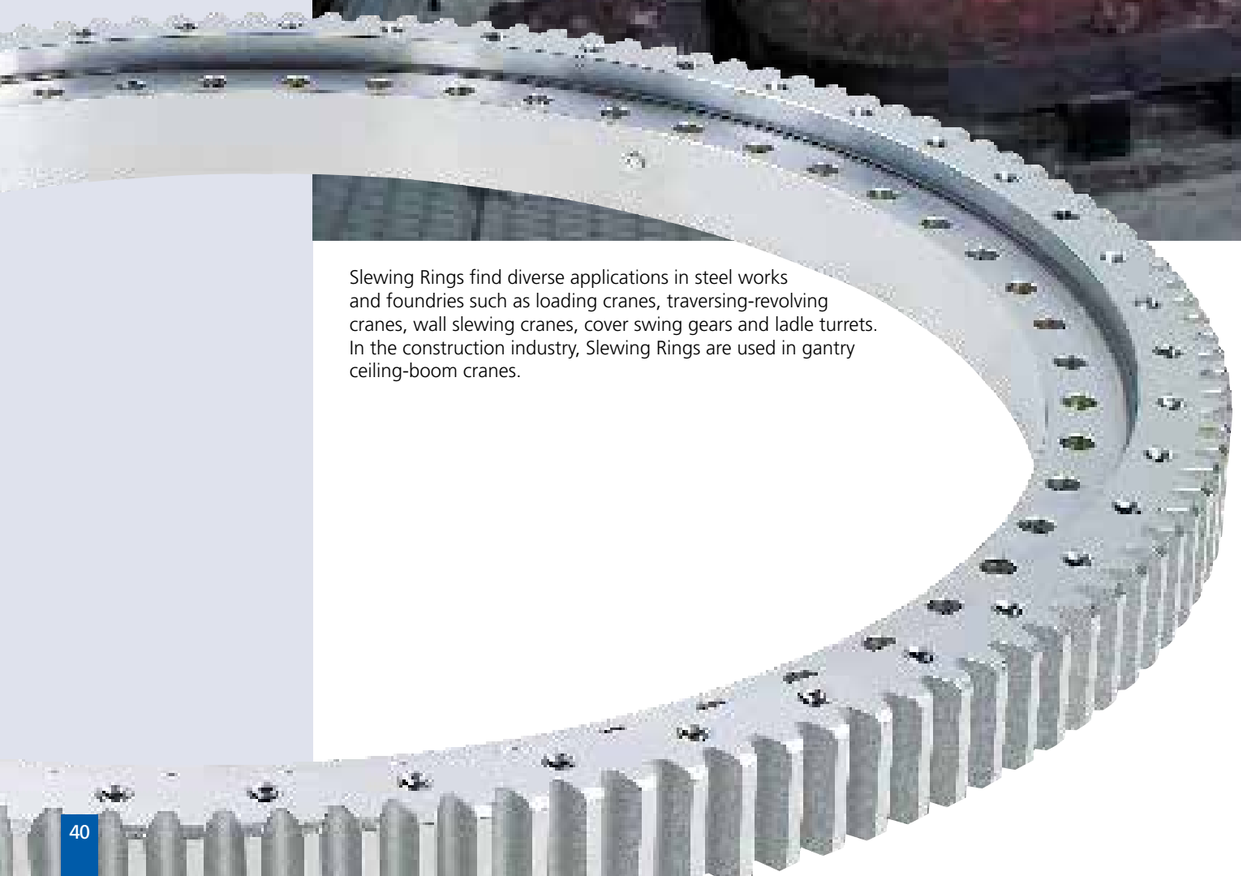
Shipboard cranes on container vessels use internal toothed Triple Row Roller Slewing Rings. The examples in this photograph are fitted with Slewing Rings that are 2,650 mm (104 in) in diameter and carry tilting moments up to 15,000 kNm (11,063,983 ft-lb).

Deep sea fishing vessels use Ball Slewing Rings for shipboard cranes and net handling equipment. Typical external diameters range between 600 to 1,500 mm (23,6 to 59 in).

Internal toothed Triple Row Roller Slewing Rings are used on this ship-board crane. The photograph shows a partially dismantled Slewing Ring with one of the rings removed to reveal a row of rollers.



Applications
Industry Cranes



Slewing Rings find diverse applications in steel works and foundries such as loading cranes, traversing-revolving cranes, wall slewing cranes, cover swing gears and ladle turrets. In the construction industry, Slewing Rings are used in gantry ceiling-boom cranes.

External toothed Ball Slewing Rings with a diameter of about 3,000 mm (118 in) are used to turn the special crane trolley when melting aluminium.

Gantry crane with rotable loading device in a concrete factory.

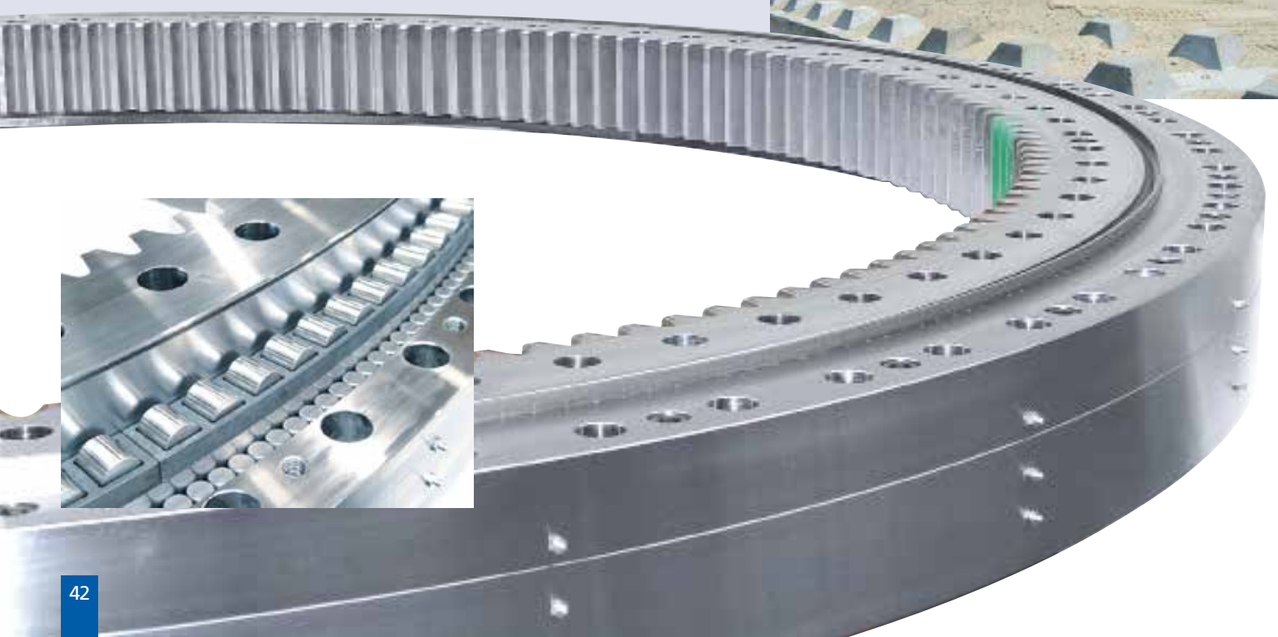
Applications

Bulk Handling & Materials Handling

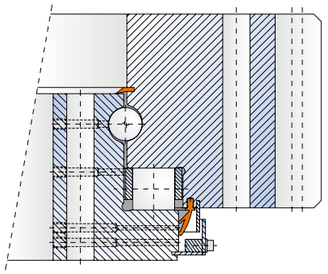
This stacker on board of a ship is swivelled by means of an internal toothed, Triple Row Roller Slewing Ring.

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.

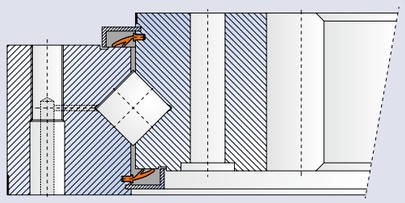


Specification:

- 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.



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

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

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

Applications
Foundries & 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).

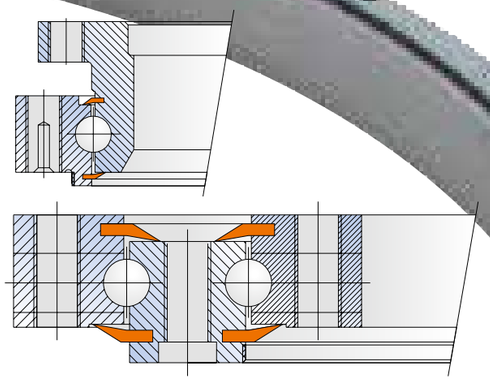
Applications
Public Transportation Systems

Berliner Verkehrsbetriebe

Trams and subways use special design Ball Slewing Rings as hinge bearings between carriage sections and carriages and bodies.

Berliner Verkehrsbetriebe

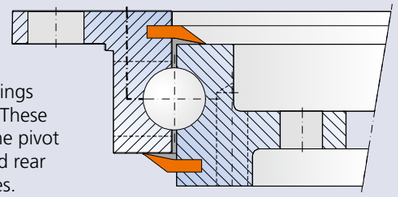
Berliner Verkehrsbetriebe



Difficult geometric conditions in the mounting structures of rail vehicles present real challenges for the design of Slewing Rings. High performance seals and long service lives are important requirements.

We manufacture machined annular spacers to connect the diesel engine and the gear on coaches and buses.

IMO has already supplied more than a thousand Slewing Rings for articulated buses. These Slewing Rings form the pivot between the front and rear sections of the vehicles.

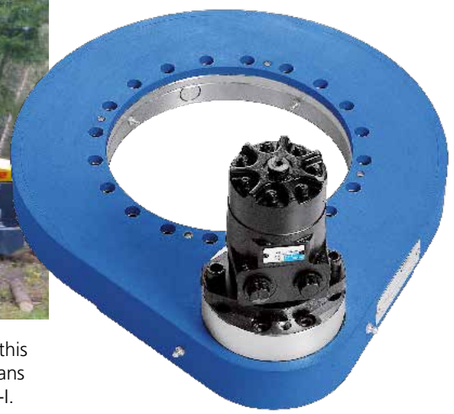


Untoothed Ball Slewing Rings with a diameter of 400 mm (16 in) form the hinge of the air cargo luggage ramp as shown in the picture taken at Frankfurt airport.

Applications
Agriculture & Forestry

Slew Drives series WD-L and SP-I are used by these wood-choppers to position the chipper and the expulsion tool as well as to maneuver the grappler.

Slewing the grappler of this forwarder is done by means of a Slew Drive series SP-I.



These flail mowers rely on Slew Drives series WD-L to position the mower.

This work boat which is used in Dutch canals is fitted with a WD-L series Slew Drive to move the boom of the excavator.

Harvesters use our Ball Slewing Rings and Slew Drives for the axle swing arm, the crane boom, the harvester head (with a chain saw) and a rotatable cab.

An untoothed Ball Slewing Ring with a raceway diameter of about 700 mm (27 in), forms the hinge which connects this trailer and tractor.

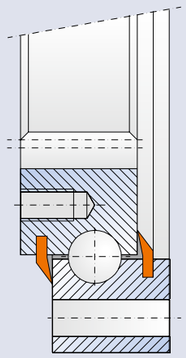
Applications
Special Purpose Machinery

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

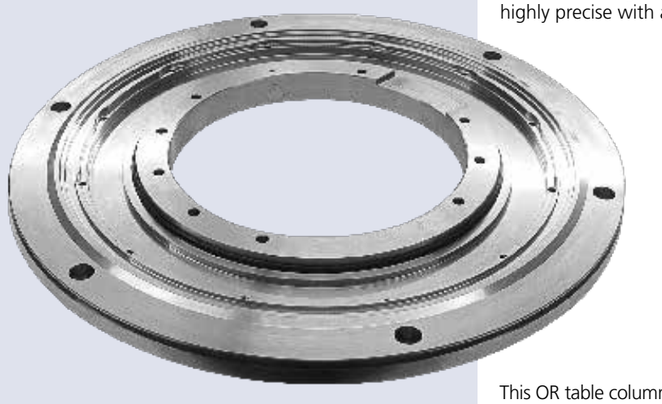
We supply leading manufacturers of blow moulders for the production of PET-plastic bottles. Because of the high circumferential speed, the Slewing Rings are equipped with closed cages.

IMO has a leading position in supplying Slewing Rings to the bottling industry. Our products ranging from 200 up to 6,000 mm (236 in) external toothed Slewing Rings, are used in machines for cleaning, filling, equipping and labelling.

Applications
Medical Technology



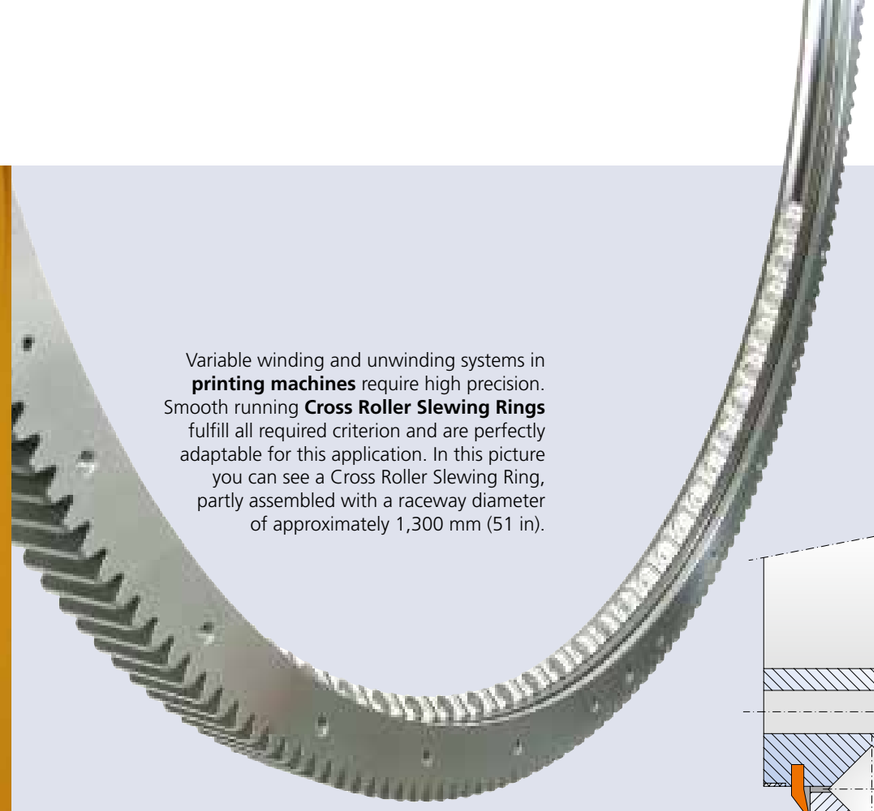
Linear accelerators are used in oncology for radiation therapies. The Ball Slewing Rings with horizontal rotational axes have to be highly precise with a minimum of running noise and friction torque.



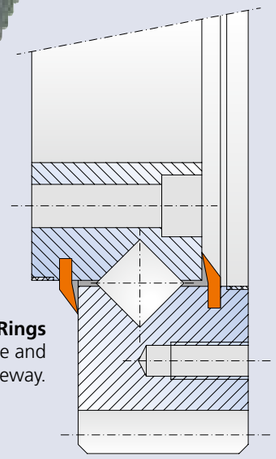
TRUMPF Medizin Systeme

This OR table column is positioned by means of a special bearing. The deployed Slewing Ring is a customized version with specific countours and made of stainless steel.

Applications
Special Mechanical Engineering



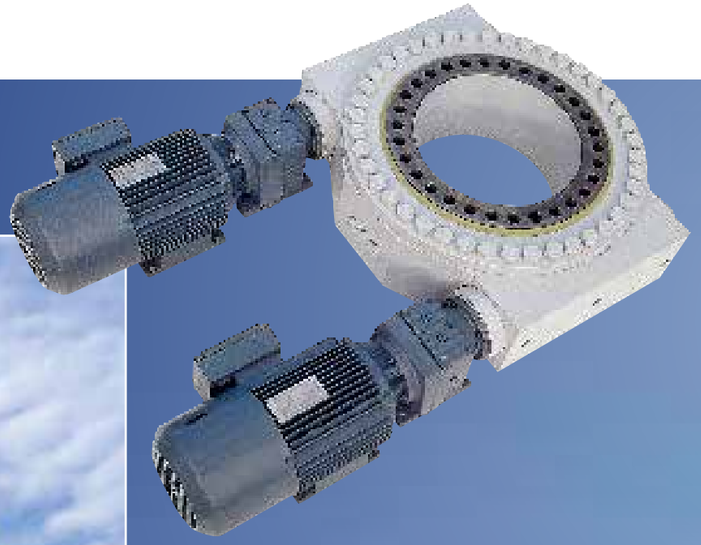
Variable winding and unwinding systems in **printing machines** require high precision. Smooth running **Cross Roller Slewing Rings** fulfill all required criterion and are perfectly adaptable for this application. In this picture you can see a Cross Roller Slewing Ring, partly assembled with a raceway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

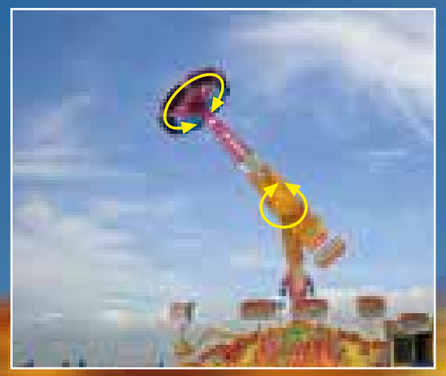
Applications
Amusement Park Rides

„When it comes to safety, there are no compromises!“



A ride in “Zero g” guarantees thrills and also zero gravity for a short time. The gondolas are rotated with our Slew Drive WD-HE 0373.

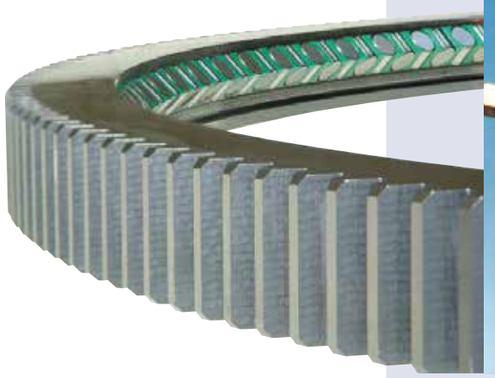
“Night Fly” – how would you feel if you could not rely on the engineering of an amusement park ride and its components.



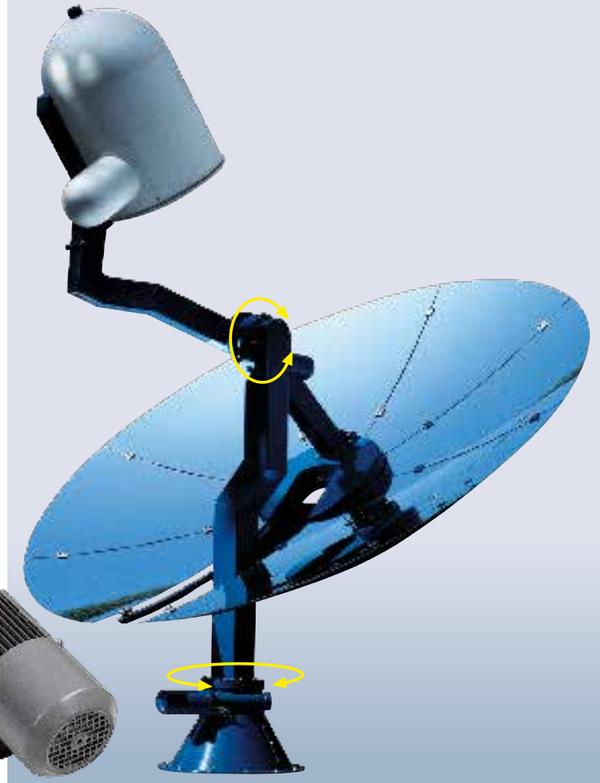
“Ultra Max” – everything revolves „around IMO“!

“Tango” is one of the most breathtaking amusement park rides in its class. Each gondola is driven in its three rotational axes via five Slewing Rings which have adv internally hardened toothing.

Cross Roller Slewing Rings are ideal where high precision, rigidity and smooth running are required. The picture below shows one partially assembled.



Slew Drives of WD-series fitted with electric motors used for the yaw and pitch controls of this solar table.



Petronas Towers, Kuala Lumpur, Malaysia.
For many years, until 2004, the Petronas Towers at 452 m (1,483 ft), were the highest skyscrapers worldwide.
A window cleaning system is integrated in the roof just below the top of the towers. The equipment contains OEM components from different important suppliers. And the Slewing Rings? Made by IMO of course!

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 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 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 gearing circumferential 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 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
M_D	kNm	transferable torque ot toothing
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_{zul}	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
$\delta_{k\ zul}$	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

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.

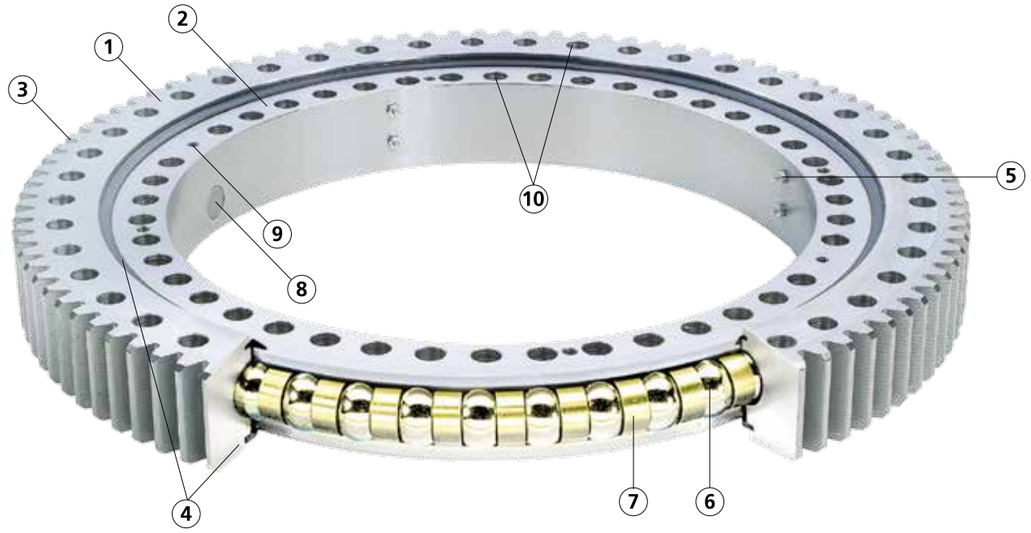


Figure 1

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).

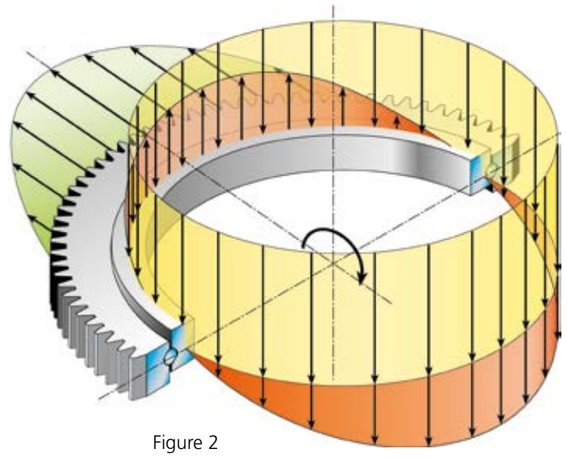


Figure 2

- 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!**

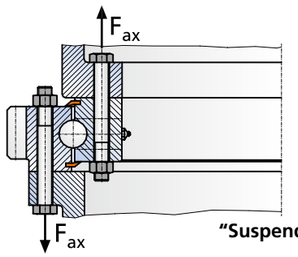


Figure 3 **"Suspended" loads**

- 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

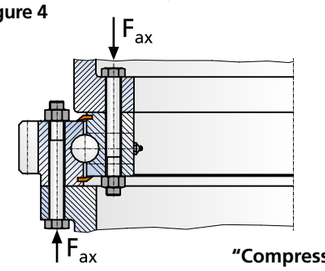


Figure 4 **"Compressive" loads**

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

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

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

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

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

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

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

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

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

Duty

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

Static load capacity of raceway

Static load capacity of the Slewing Ring is determined by:

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

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

Limiting load diagrams are valid under the following condition:

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

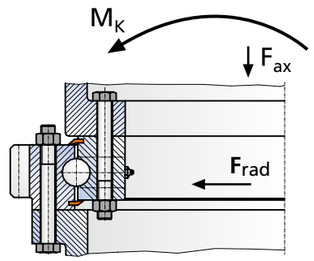


Figure 5

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

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

Table 1: Application service factors

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

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

Equivalent axial load for limited load diagram:

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

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

Radial load of toothing:

$$F_{radZ} = \frac{F_z}{\cos 20°}$$

Equivalent radial load:

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

Equivalent tilting moment for limited load diagram:

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

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

This calculation is only valid if:

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

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

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

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

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

Calculation example:

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

Load:

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

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

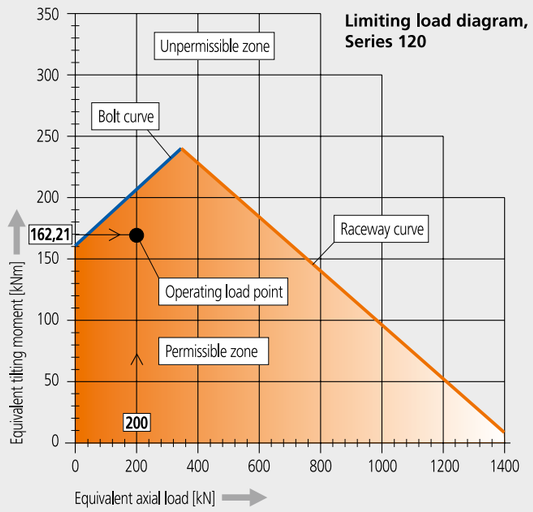
The following values are achieved with an application service factor of 1.25:

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

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

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

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



Limiting load diagram, Series 120

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

Mounting bolts

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

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

Static load carrying capacity of the mounting bolts

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

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

Dynamic load carrying capacity of the mounting bolts

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

Frictional capability of bolt connection

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

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

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

Adequate measures to increase the radial load:

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

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

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

Securing the mounting bolts

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

Friction torque

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Gear

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

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

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

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

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

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

Drive pinion

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

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

Tooth backlash

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

Tooth backlash to be set

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

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

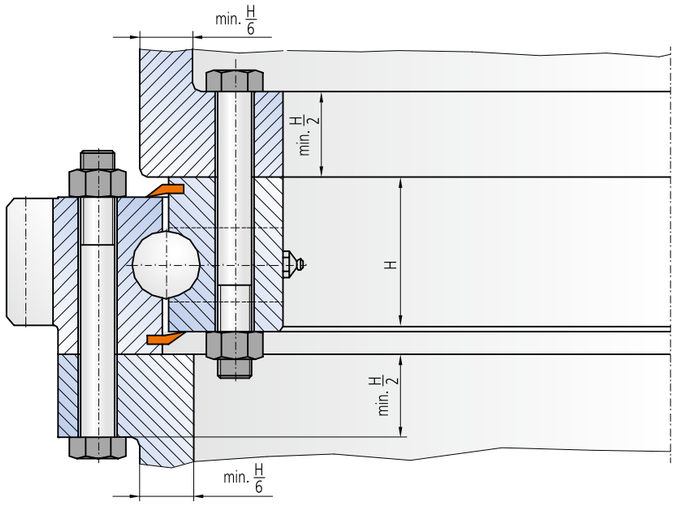
Greases with different thickeners and / or base oils should generally not be mixed. The manufacturer should always confirm if different grease types can be mixed.

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

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

A few simple steps for selecting a Slewing Ring

You will find a detailed procedure on the following pages!

Start

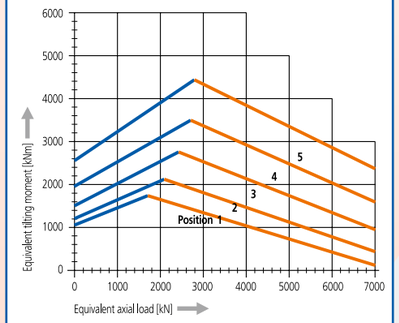
- Load data determined
- Rotational speed known
- Tooth forces calculated
- Application factors selected

Selecting a design

Selection list for optimum series																
	Series															
Requirement	**920**	**932**	**120**	**116**	**125**	**150**	**320**	**325**	**332**	**340**	**350**	**840**	**850**	**532**	**540**	**Special design**
Robust design	++	++	++	++	++	++	○	○	○	○	○	+	+	+	+	++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

Zeichnungsnummer	Position	Abmessungen und Gewicht					Befestigungsbohrungen			Verzahnung und Zahnkräfte				Tragzahlen						
		Außendurchmesser Außenring	Innendurchmesser Innenring	Innendurchmesser Außenring	Außendurchmesser Innenring	Gewicht	Lochkreisdurchmesser außen	Lochkreisdurchmesser innen	Bohrungsanzahl je Lochkreis	Teilkreisdurchmesser	Modul	Zähnezahl	Profilverschiebung	zulässige Zahnkraft	maximal zulässige Zahnkraft	statisch			dynamisch		
		D_a [mm]	d_i [mm]	D_i [mm]	d_a [mm]	[kg]	L_a [mm]	L_i [mm]	n [-]	d_o [mm]	[mm]	z2 [-]	x [-]	$f_{z\,norm}$ [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

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 148 and provide a sketch of the application.

The correct Slewing Ring in 5 steps

Step 1: Determining the load

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

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

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

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 2: Determining the Size

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

Step 3: Static checking of raceway

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

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

Step 4: Checking of bolt connection

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

Step 5: Static checking of gearing

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

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

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

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

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

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

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

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

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

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

Reading off the load point on the limiting load diagram.

Limiting load diagram, Series 125

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

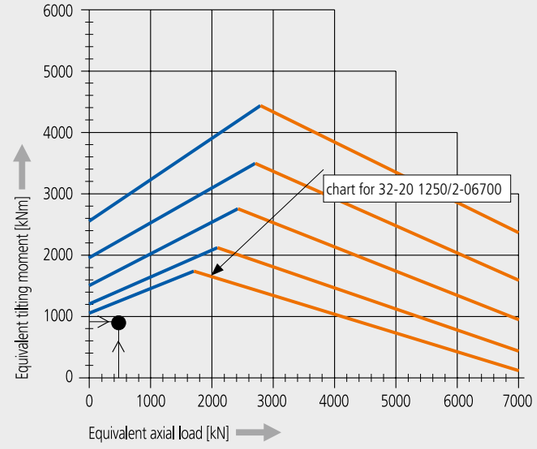
$$F_{axD} = 268 \bullet 1.25 \bullet 1.1 = 368.50 \text{ kN}$$

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

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

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

Limiting load diagram, Series 320



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

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

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

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

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

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

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

Please follow our Installation & Operating Manual.

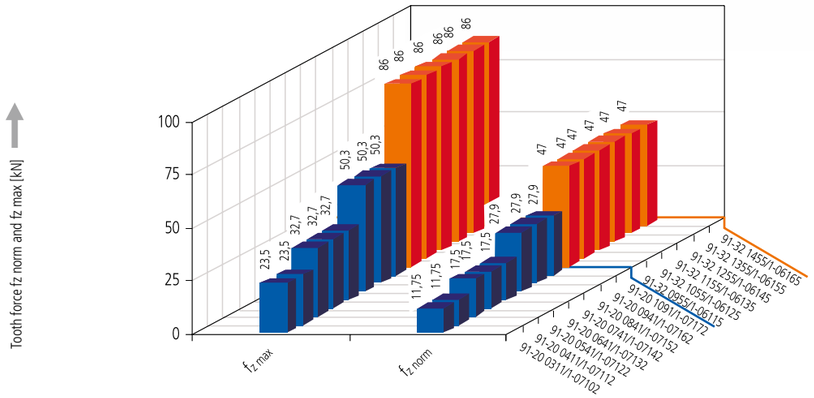
Following the Installation & Operating Manual is important for the reliability and safety of our product and has considerable influence on its expected service-life. The latest edition of the Installation & Operating Manual is to be found at **www.imo.de.**
Contact us to receive a paper copy.

Series Overview - Ball Slewing Rings with flange rings

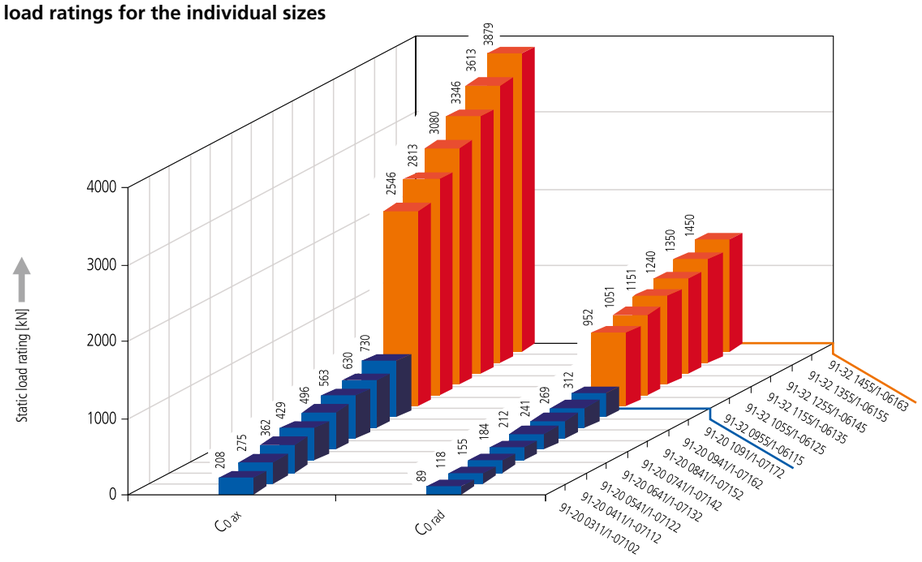
90 – 20 0311 / 0 – 07002

- **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

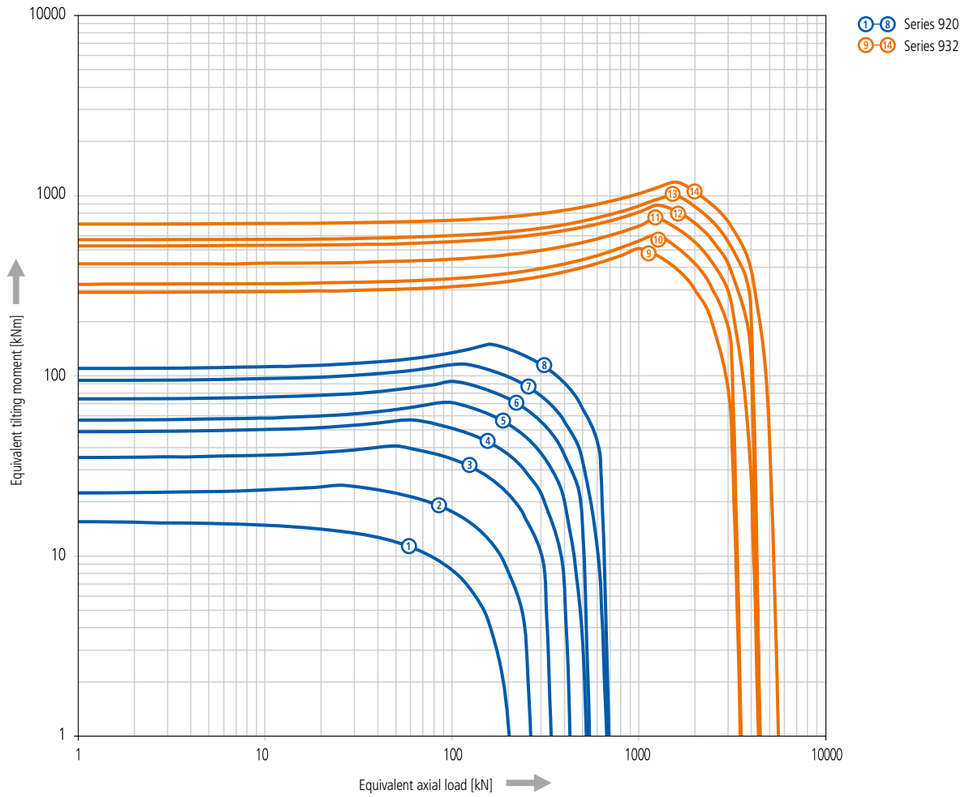
Simple turntables, slewing mechanisms, bogies, light cranes and construction machinery.

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

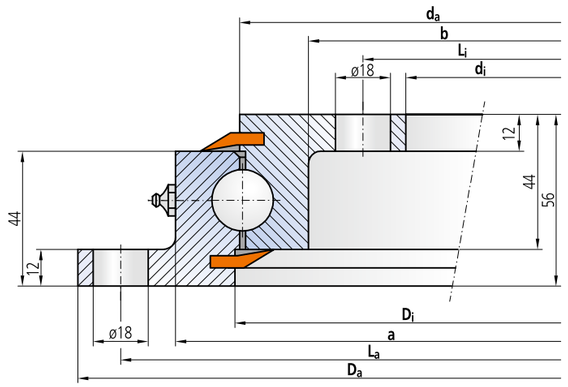
Limiting load diagrams, series 920 / 932

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



Untoothed

Drawing number	Position	Dimension 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]	Static $C_{o\,ax}$ [kN]	Dynamic C_{rad} [kN]	Dynamic 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

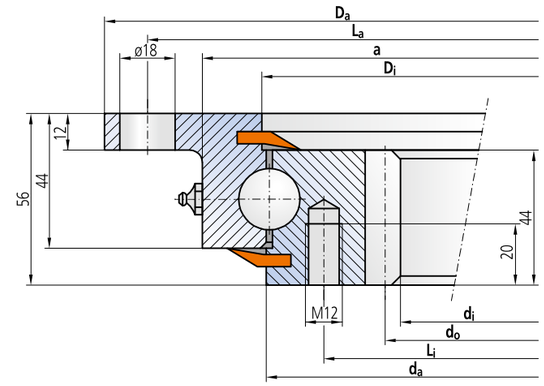


External toothed

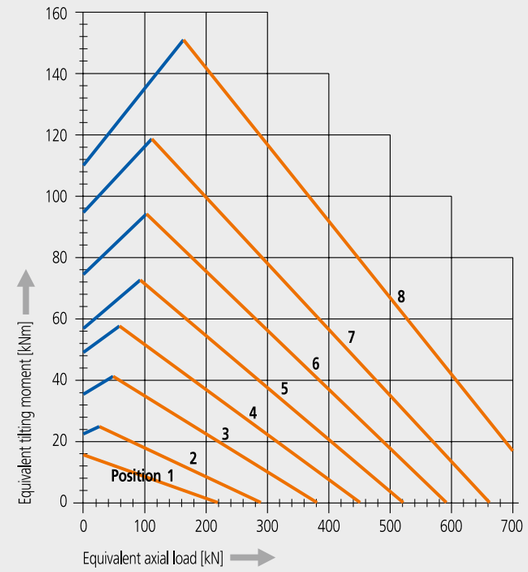
Drawing number	Position	Dimension and weight: Outside diameter, outer ring D_a [mm]	Inside diameter, inner ring d_i [mm]	Inside diameter, outer ring D_i [mm]	Outside diameter, inner ring d_a [mm]	Diameter, inner ring b [mm]	Weight G [kg]	Mounting holes: Pitch circle diameter, Outer ring L_a [mm]	Number 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: Teilkreisdurchmesser d_o [mm]	Modul m [mm]	Zähnezahl z2 [-]	zulässige Zahnkraft $f_{z\,norm}$ [kN]	maximal zulässige Zahnkraft $f_{z\,max}$ [kN]	Load ratings: Static $C_{o\,rad}$ [kN]	Static $C_{o\,ax}$ [kN]	Dynamic C_{rad} [kN]	Dynamic 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	Dimension 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: Teilkreisdurchmesser d_o [mm]	Modul m [mm]	Zähnezahl z2 [-]	zulässige Zahnkraft $f_{z\,norm}$ [kN]	maximal zulässige Zahnkraft $f_{z\,max}$ [kN]	Load ratings: Static $C_{o\,rad}$ [kN]	Static $C_{o\,ax}$ [kN]	Dynamic C_{rad} [kN]	Dynamic 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**



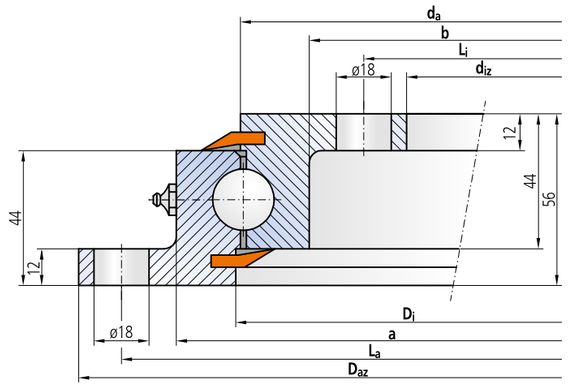
Bolt curve $R_{p0.2}$ Bolt grade 10.9 — Raceway curve

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

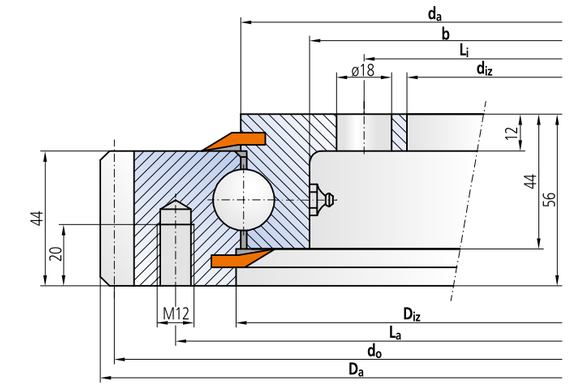
Untoothed

Drawing number	Position	Dimension and weight: Outside diameter, outer ring Zentrierung	Inside diameter, inner ring Zentrierung	Inside diameter, outer ring	Outside diameter, inner ring	Diameter, Outer ring	Diameter, inner ring	Weight	Mounting holes: Pitch circle diameter, outer ring	Number of holes, outer ring	Pitch circle diameter, inner ring	Number of holes, inner ring	Load ratings: Static		Dynamic	
		D_{az} [mm]	d_{iz} [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]
90-20 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



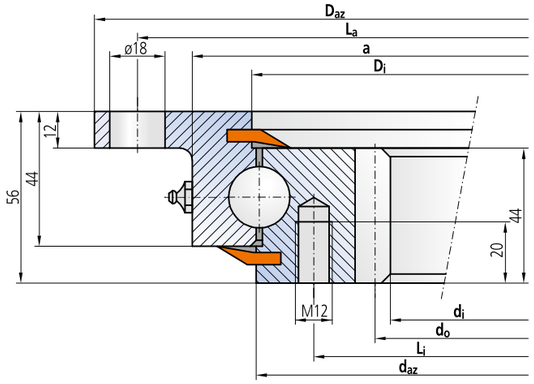
External toothed

Drawing number	Position	Dimension and weight: Outside diameter, outer ring	Inside diameter, inner ring Zentrierung	Inside diameter, outer ring Zentrierung	Outside diameter, inner ring	Diameter, inner ring	Weight	Mounting holes: Pitch circle diameter, outer ring	Number of holes, outer ring	Pitch circle diameter, inner ring	Number of holes, inner ring	Gearing and tooth forces: Teilkreisdurchmesser	Modul	Zähnezahl	zulässige Zahnkraft	maximal zulässige Zahnkraft	Load ratings: Static		Dynamic	
		D_a [mm]	d_{iz} [mm]	D_{iz} [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]
91-20 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

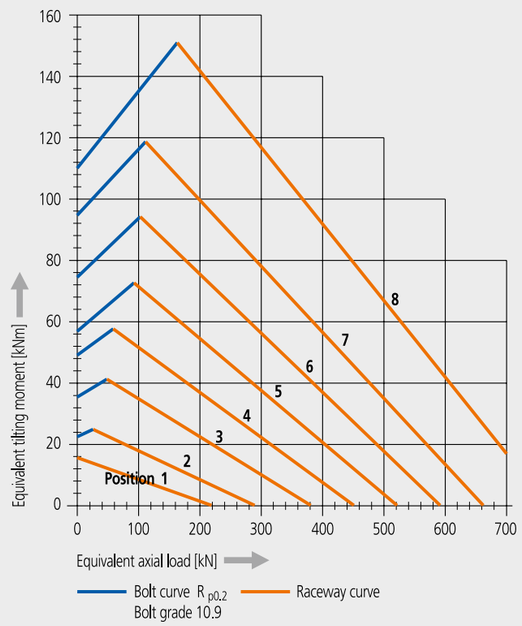


Internal toothed

Drawing number	Position	Dimension and weight: Outside diameter, outer ring Zentrierung	Inside diameter, inner ring	Inside diameter, outer ring	Outside diameter, inner ring Zentrierung	Diameter, outer ring	Weight	Mounting holes: Pitch circle diameter, outer ring	Number of holes, outer ring	Pitch circle diameter, inner ring	Number of holes, inner ring	Gearing and tooth forces: Teilkreisdurchmesser	Modul	Zähnezahl	zulässige Zahnkraft	maximal zulässige Zahnkraft	Load ratings: Static		Dynamic	
		D_{az} [mm]	d_i [mm]	D_i [mm]	d_{az} [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]
92-20 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!

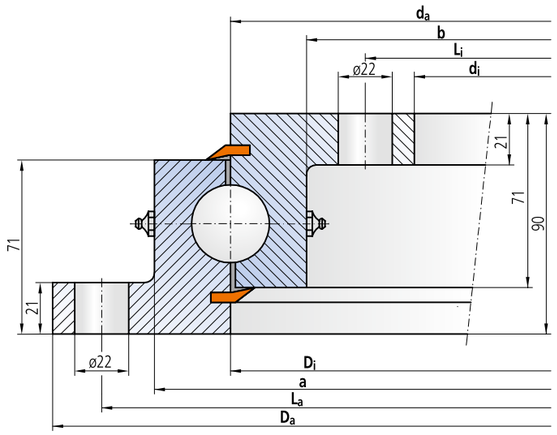
Bearing ring material: C45N
4 Taper type grease nipples on the circumference
Mounting holes equally spaced
Raceway system supplied pre-lubricated
Dimensions without tolerances DIN ISO 2768 coarse

Clearance of precision version

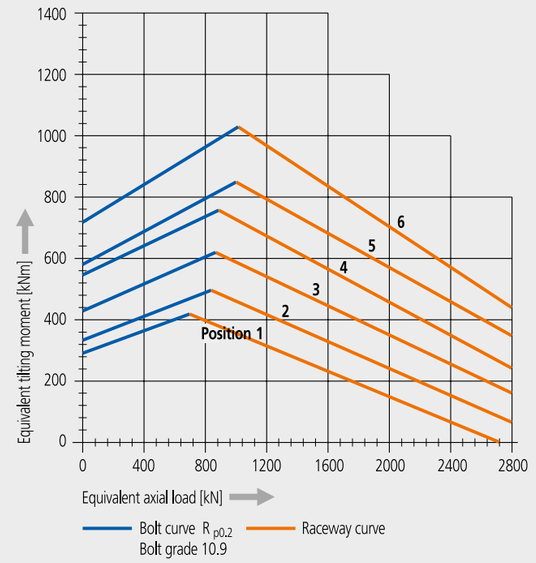
Position	Radial Clearance	Axial Clearance
1	max. 0.03	max. 0.03
2	max. 0.03	max. 0.03
3	max. 0.03	max. 0.03
4	max. 0.04	max. 0.04
5	max. 0.04	max. 0.04
6	max. 0.05	max. 0.05
7	max. 0.05	max. 0.05
8	max. 0.06	max. 0.06

Untoothed

Drawing number	Position	Dimension 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]	Static $C_{o\,ax}$ [kN]	Dynamic C_{rad} [kN]	Dynamic 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



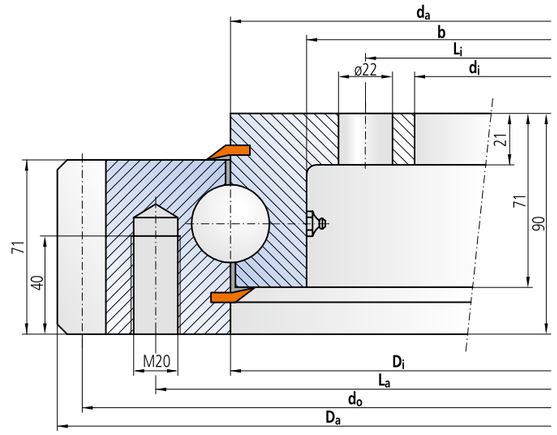
Limiting load diagram for "compressive" loads – **Series 932**



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

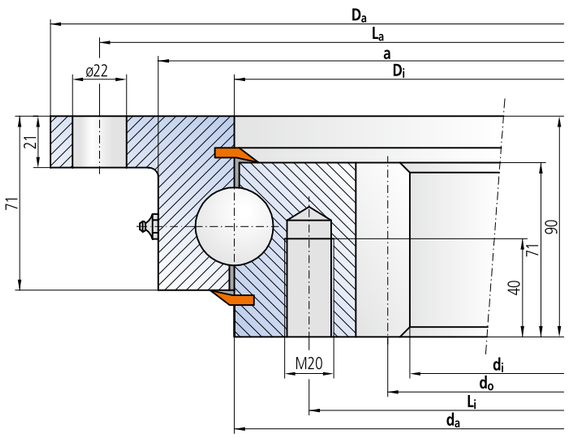
External toothed

Drawing number	Position	Dimension 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: Teilkreisdurchmesser d_o [mm]	Modul m [mm]	Zähnezahl z2 [-]	zulässige Zahnkraft $f_{z\,norm}$ [kN]	maximal zulässige Zahnkraft $f_{z\,max}$ [kN]	Load ratings: Static $C_{o\,rad}$ [kN]	Static $C_{o\,ax}$ [kN]	Dynamic C_{rad} [kN]	Dynamic 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



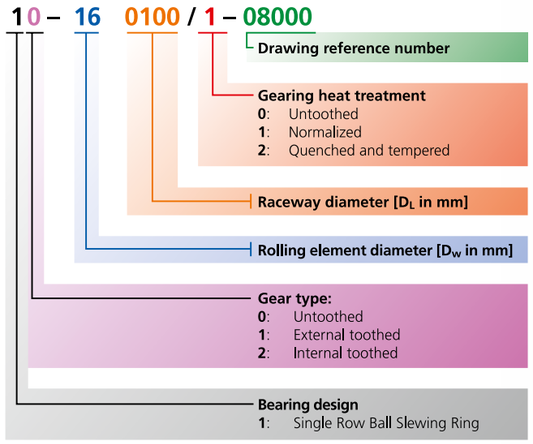
Internal toothed

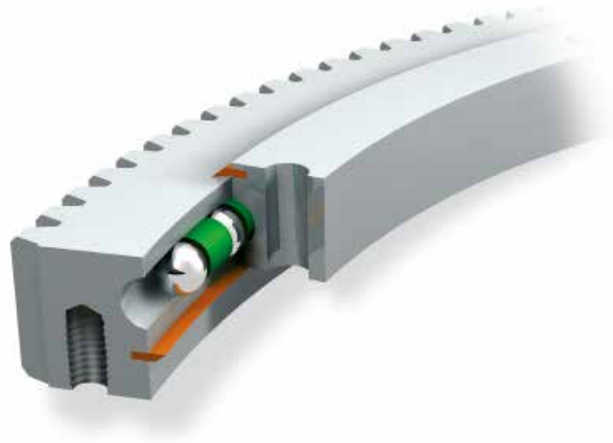
Drawing number	Position	Dimension and weight: Outside diameter, Outer ring D_a [mm]	Inside diameter, inner ring d_i [mm]	Inside diameter, Outer ring D_i [mm]	Outside diameter, inner ring d_a [mm]	Diameter, Outer ring a [mm]	Weight G [kg]	Mounting holes: Pitch circle diameter, Outer ring L_a [mm]	Number 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: Teilkreisdurchmesser d_o [mm]	Modul m [mm]	Zähnezahl z2 [-]	zulässige Zahnkraft $f_{z\,norm}$ [kN]	maximal zulässige Zahnkraft $f_{z\,max}$ [kN]	Load ratings: Static $C_{o\,rad}$ [kN]	Static $C_{o\,ax}$ [kN]	Dynamic C_{rad} [kN]	Dynamic 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



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





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

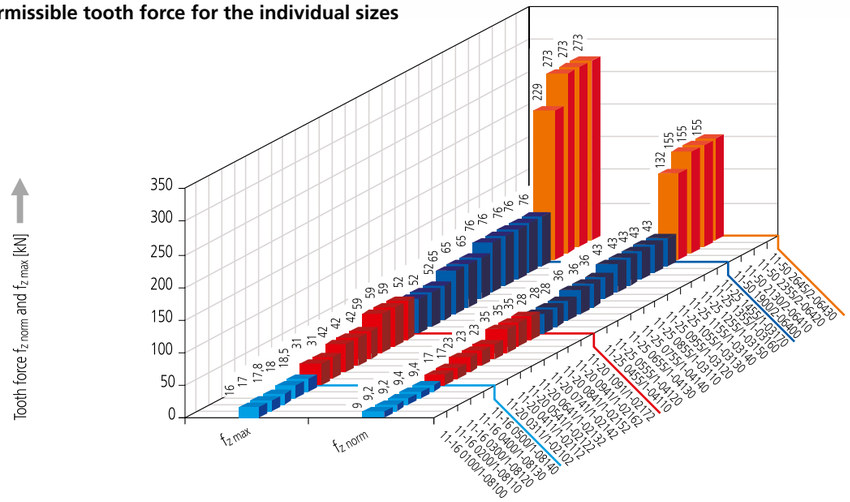
Typical applications

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

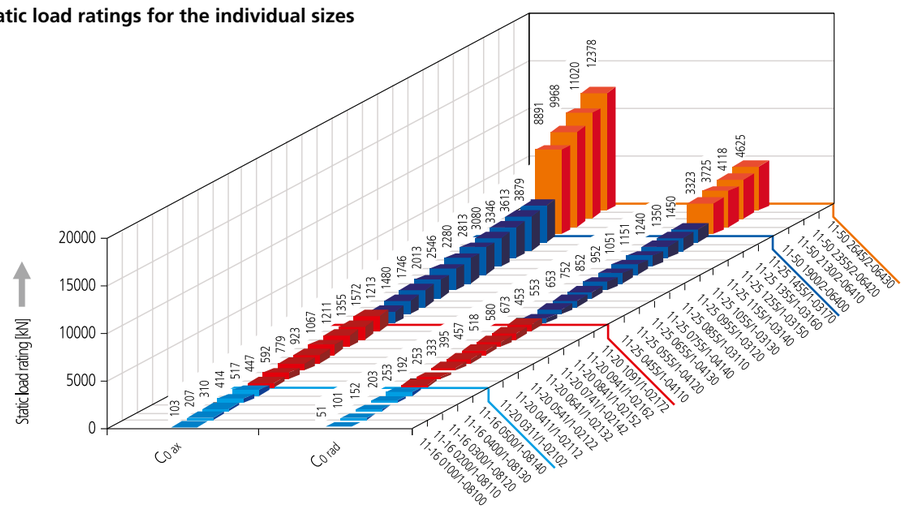
Characteristics

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

Permissible tooth force for the individual sizes

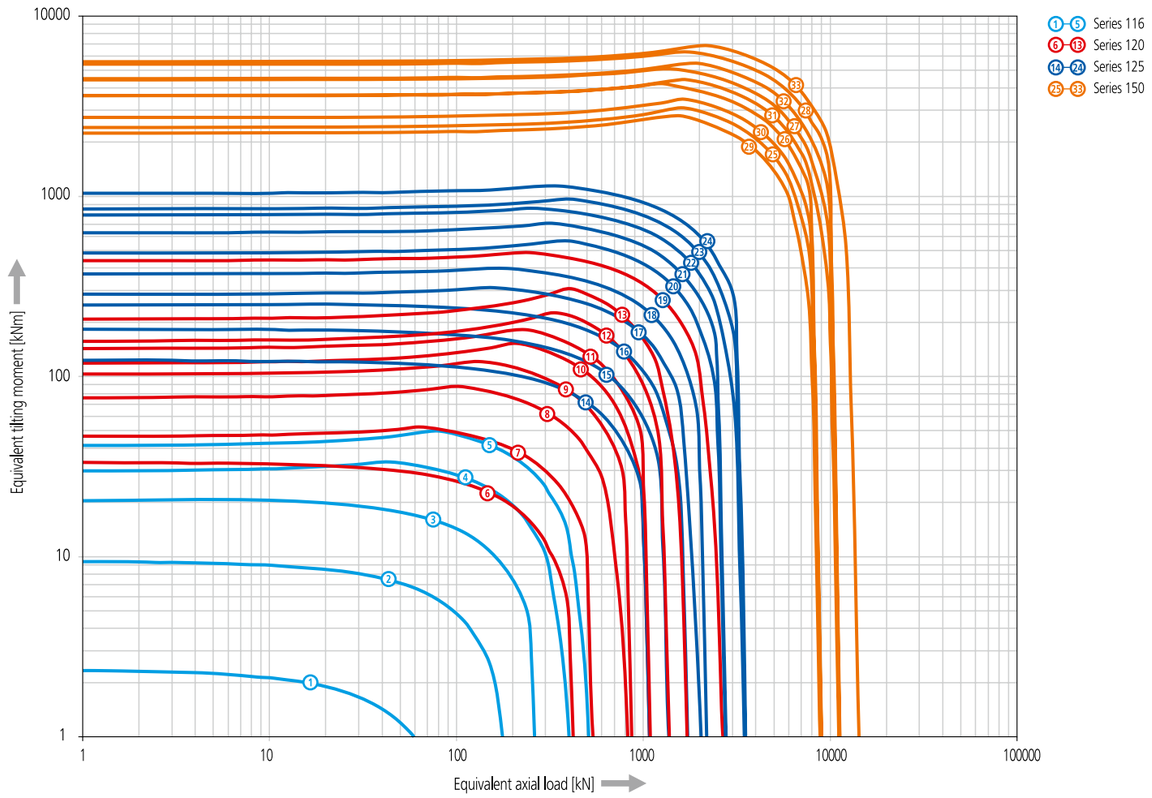


Static load ratings for the individual sizes



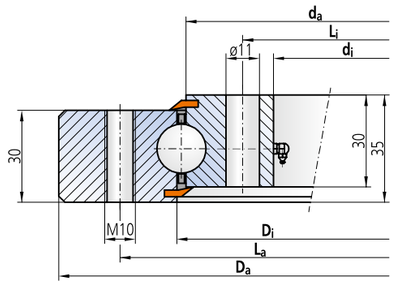
Limiting load diagrams, series 116, 120, 125, 150

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

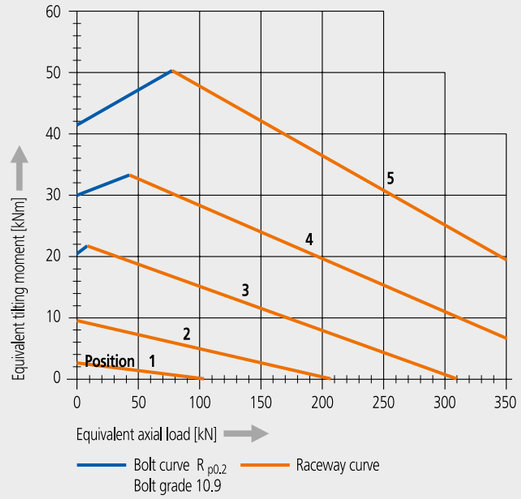


Untoothed

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



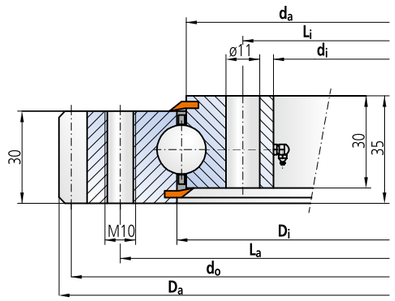
Limiting load diagram for "compressive" loads – **Series 116**



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

External toothed

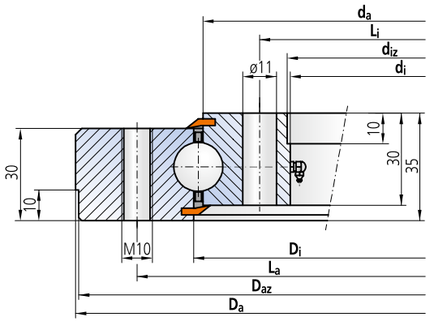
Drawing number	Position	Dimensions and weight					Mounting holes				Gearing and tooth forces					Load ratings			
		Outside diameter, outer ring	Inside diameter, inner ring	Inside diameter, outer ring	Outside diameter, inner ring	Weight	Pitch circle diameter, outer ring	Number of holes, outer ring	Pitch 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	140	6	6	60	6	172	4	43	9.0	16.0	51	103	71	61
11-16 0200/1-08110	**2**	280	140	203	197	240	12	12	160	12	272	4	68	9.2	17.0	101	207	99	85
11-16 0300/1-08120	**3**	380	240	303	297	340	20	20	260	20	372	4	93	9.2	17.8	152	310	117	101
11-16 0400/1-08130	**4**	480	340	403	397	440	24	24	360	24	472	4	118	9.4	18.0	203	414	130	112
11-16 0500/1-08140	**5**	580	440	503	497	540	28	28	460	28	572	4	143	9.4	18.5	253	517	142	122



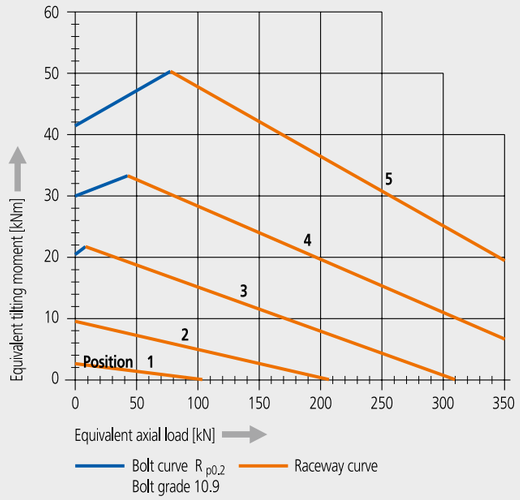
Radial clearance: 0 - 0.2 mm
Axial tilting clearance: 0 - 0.4 mm
Bearing ring material: C45N
1 Taper type grease nipple, form C in filling plug
Mounting holes equally spaced
Raceway system supplied pre-lubricated
Dimensions without tolerances DIN ISO 2768 coarse

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



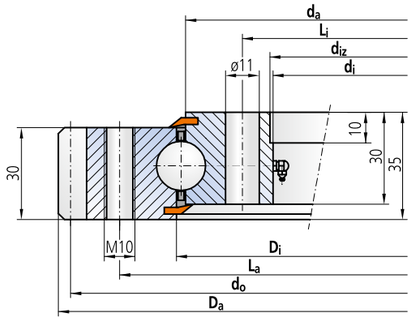
Limiting load diagram for "compressive" loads – **Series 116**



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

External toothed

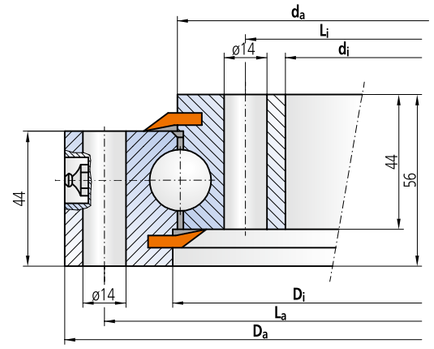
Drawing number	Position	Dimensions and weight						Mounting holes				Gearing and tooth forces					Load ratings			
		Outside diameter, outer ring	Inside diameter, inner ring	Inside diameter, inner ring, spigot	Inside diameter, outer ring	Outside diameter, inner ring	Weight	Pitch circle diameter, outer 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

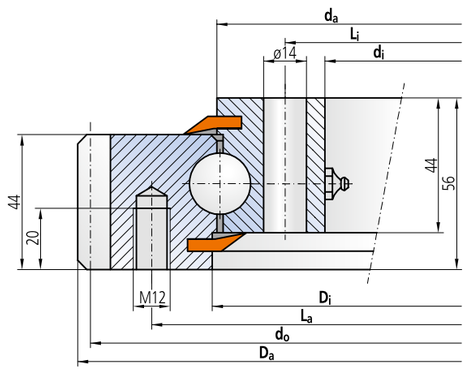
Untoothed

Drawing number	Position	Dimensions and weight					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]
10-20 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



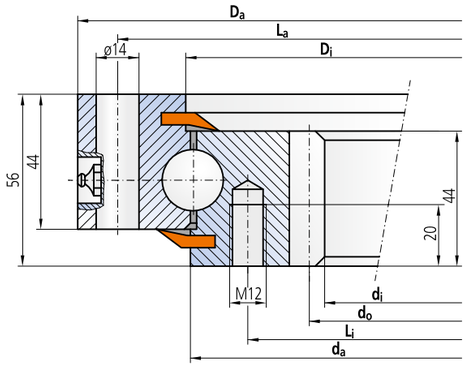
External toothed

Drawing number	Position	Dimensions and weight					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]
11-20 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

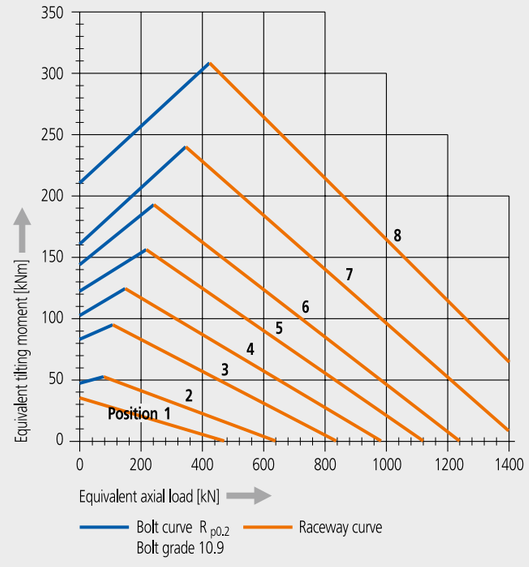


Internal toothed

Drawing number	Position	Dimensions and weight					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]
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**

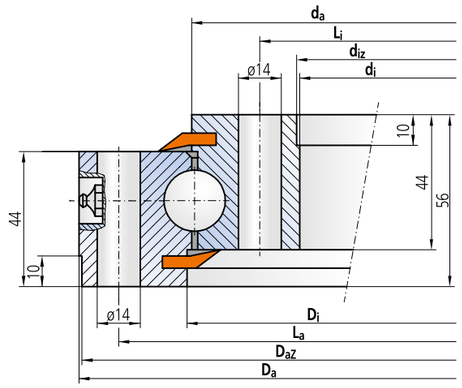


Please adhere strictly to the rules given in the Technical Information section when using above graph!

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

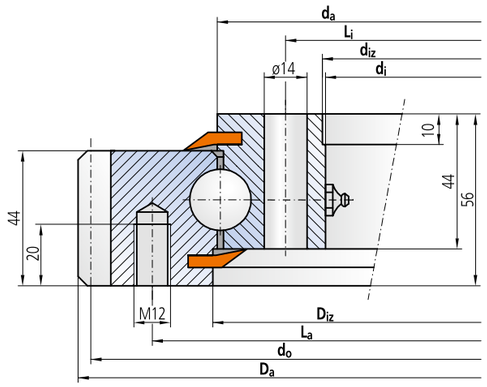
Untoothed

Drawing number	Position	Dimensions and weight: Outside diameter, outer ring Da [mm]	Outside diameter, outer ring, spigot Daz [mm]	Inside diameter, inner ring di [mm]	Inside diameter, inner ring, spigot diz [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 0311/0-02003	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



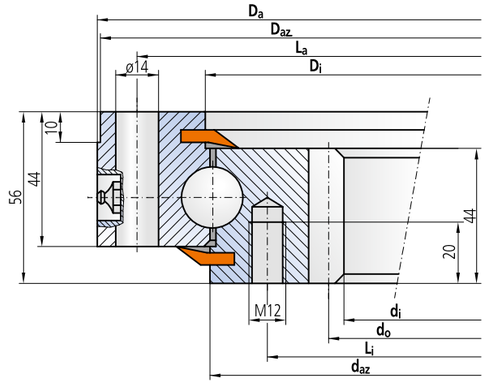
External toothed

Drawing number	Position	Dimensions and weight: Outside diameter, outer ring Da [mm]	Inside diameter, inner ring di [mm]	Inside diameter, inner ring, spigot diz [mm]	Inside diameter, outer ring, spigot Diz [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 0311/1-02103	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

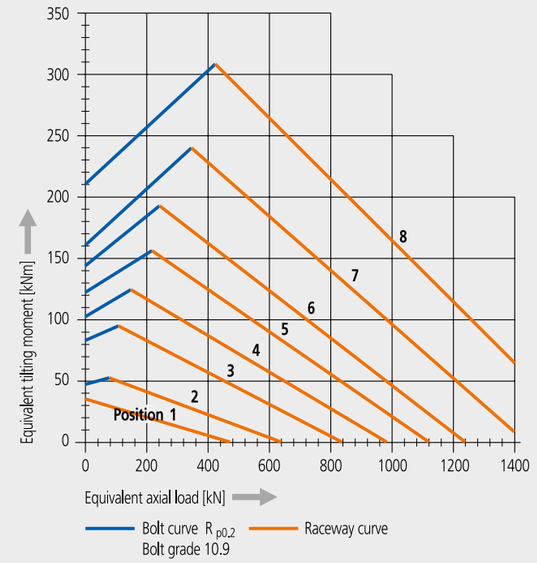


Internal toothed

Drawing number	Position	Dimensions and weight: Outside diameter, outer ring Da [mm]	Outside diameter, outer ring, spigot Daz [mm]	Inside diameter, inner ring di [mm]	Inside diameter, outer ring Di [mm]	Outside diameter, outer ring, spigot daz [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 0311/0-02203	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!

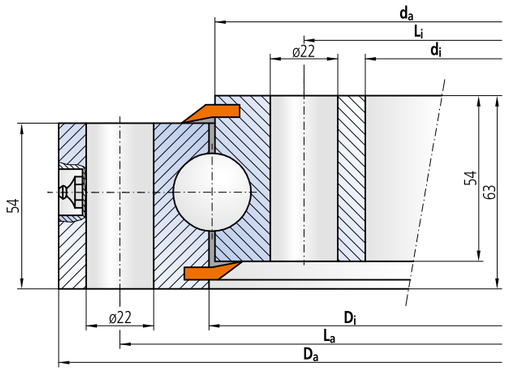
Bearing ring material: C45N
4 Taper type grease nipples on circumference
Mounting holes equally spaced
Raceway system supplied pre- lubricated
Dimensions without tolerances DIN ISO 2768 coarse

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

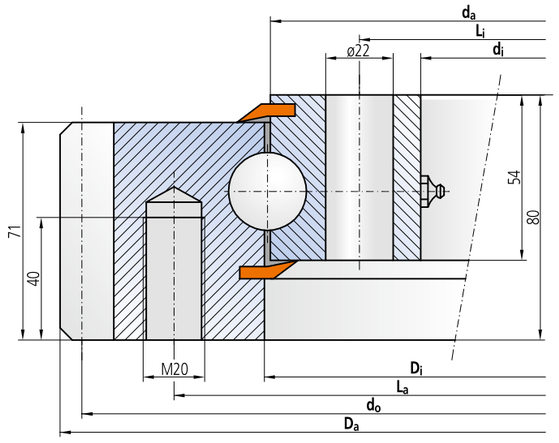
Untoothed

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



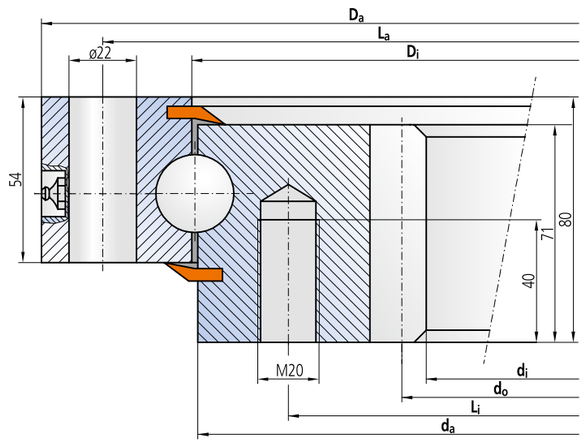
External toothed

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

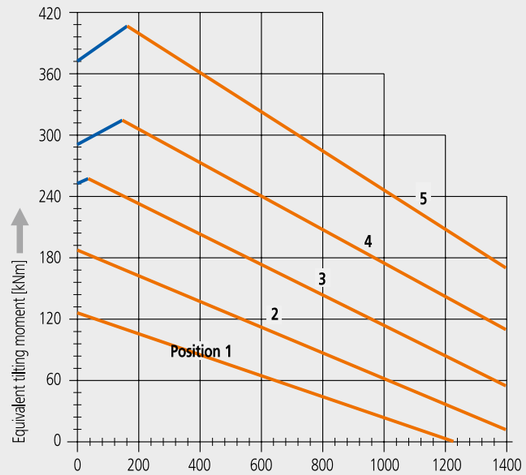


Internal toothed

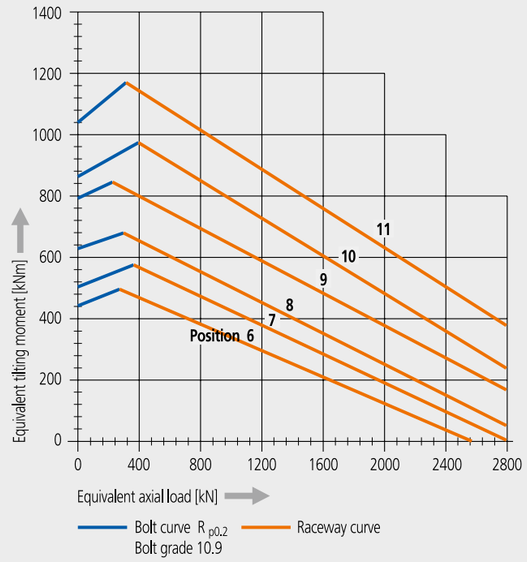
Drawing number	Position	Dimensions and weight: Outside diameter, outer ring D_a [mm]	Inside diameter, inner ring d_i [mm]	Inside diameter, outer ring D_i [mm]	Outside diameter, inner ring d_a [mm]	Weight G [kg]	Mounting holes: Pitch circle diameter, outer ring L_a [mm]	Number of holes, outer ring n_a [-]	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!

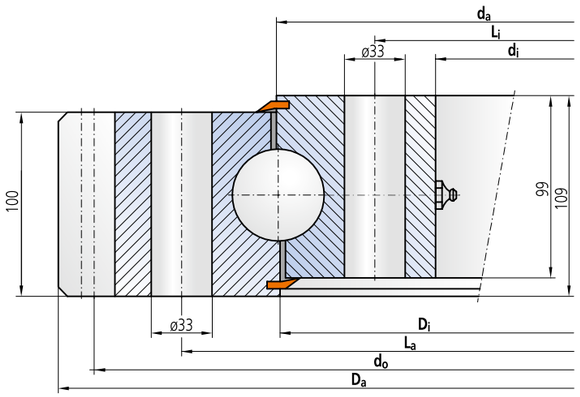


Please adhere strictly to the rules given in the Technical Information section when using above graph!

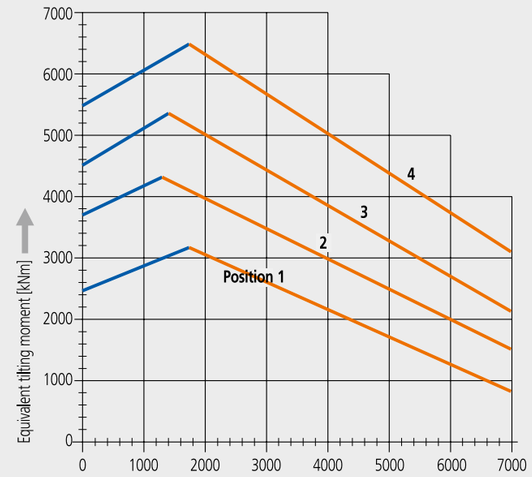
Radial clearance: 0 - 0.25 mm
Axial clearance: 0 - 0.4 mm
Bearing ring material: C45N
4 Taper type grease nipples on circumference
Mounting holes equally spaced
Raceway system supplied pre-lubricated
Dimensions without tolerances DIN ISO 2768 coarse

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	Number of holes per pitch circle	Pitch circle diameter	Module	Number of teeth	Addendum midification 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



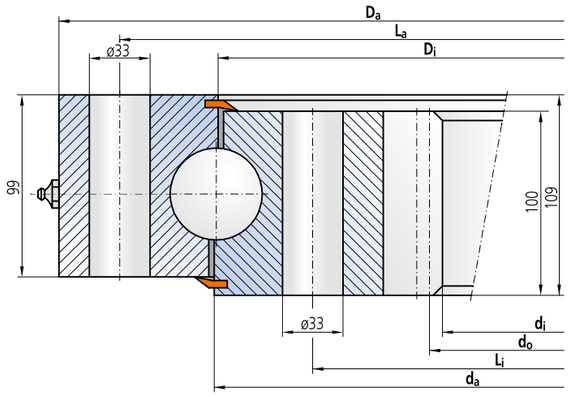
Limiting load diagram for "compressive" loads – **Series 150**

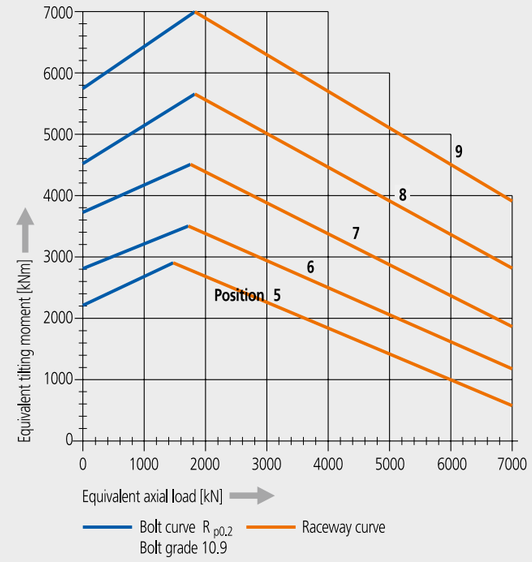


Please adhere strictly to the rules given in the Technical Information section when using above graph!

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	Number of holes per pitch circle	Pitch circle diameter	Module	Number of teeth	Addendum midification 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

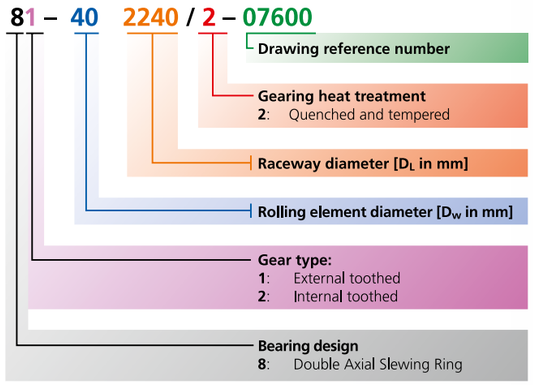


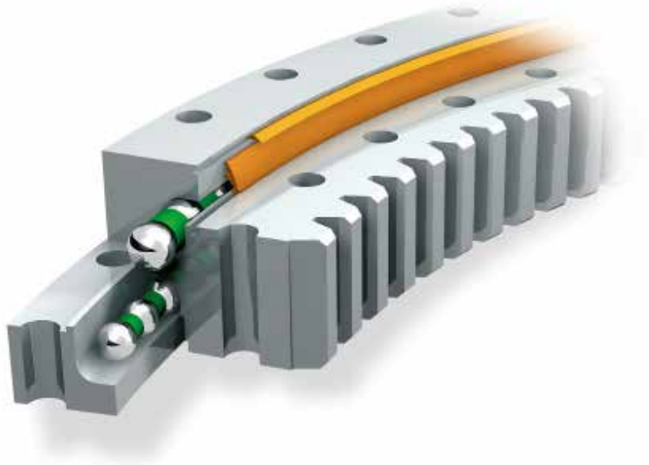


Please adhere strictly to the rules given in the Technical Information section when using above graph!

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





Operating conditions

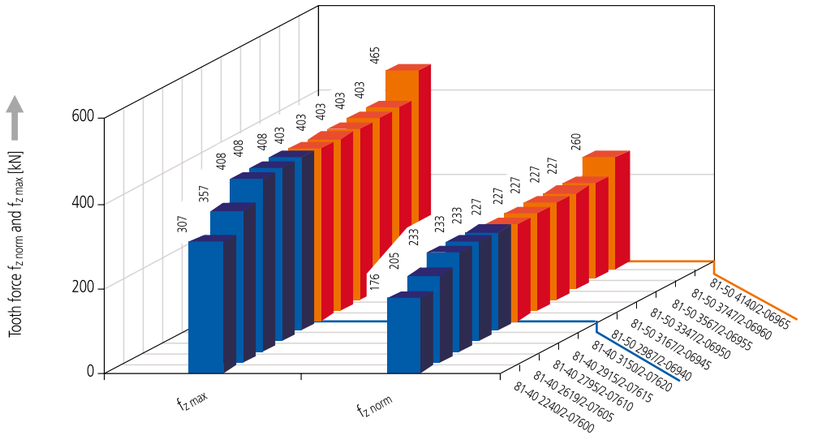
Permissible temperature range -25°C to +70°C
Maximum permissible rotational speed n_{perm} = 40000 / D_L
(D_L = raceway diameter)
“Compressive” load
Bolt grade 10.9

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.

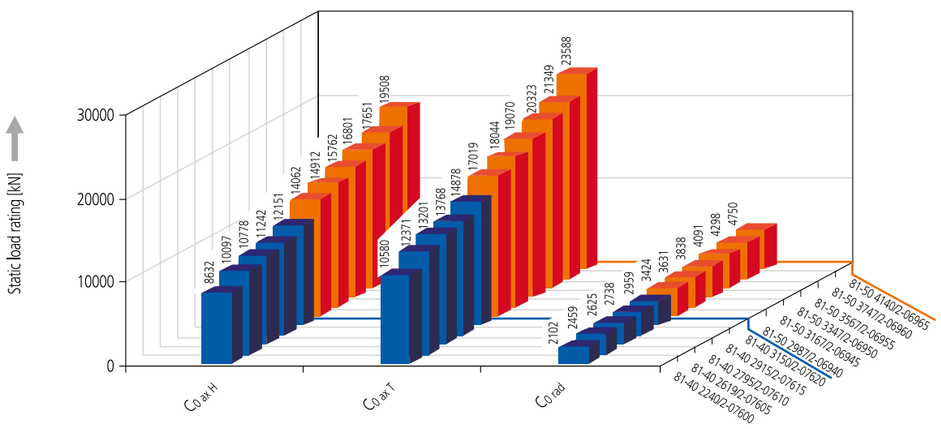
Characteristics

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

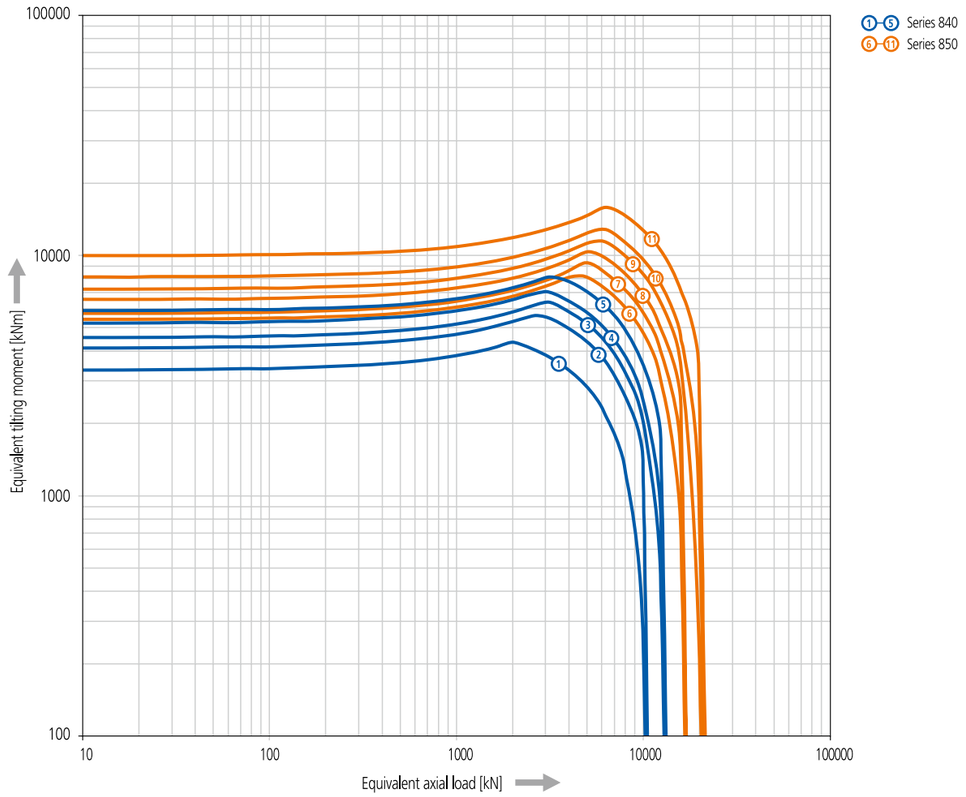
Permissible tooth force for the individual sizes



Static load ratings for the individual sizes

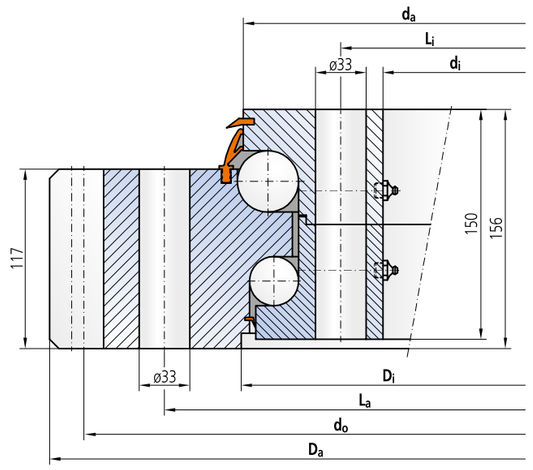


Limiting load diagrams, series 840, 850
Please refer to the explanations in the Technical Information section of the catalog.



External toothed

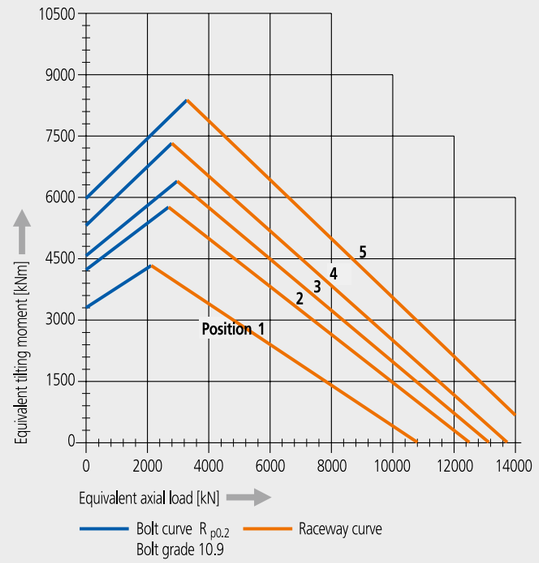
Drawing number	Position	Dimensions and weight					Mounting holes			Gearing and thooth forces						Load ratings					
		Outside diameter, outer ring	Inside diameter, inner ring	Inside diameter, outer ring	Outside diameter, inner ring	Weight	Pitch circle diameter, outer ring	Pitch circle diameter, inner ring	Number 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	40	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

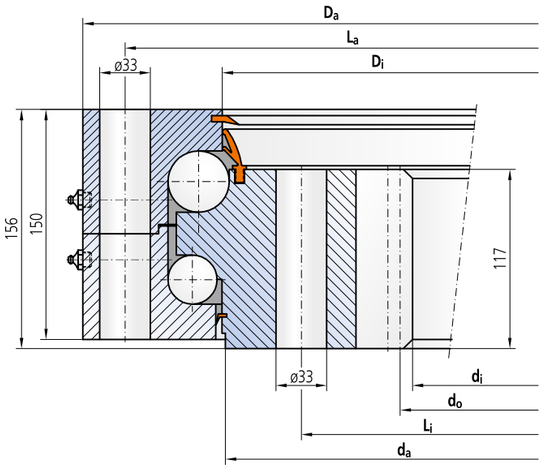
Limiting load diagram for "compressive" loads – **Series 840**



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

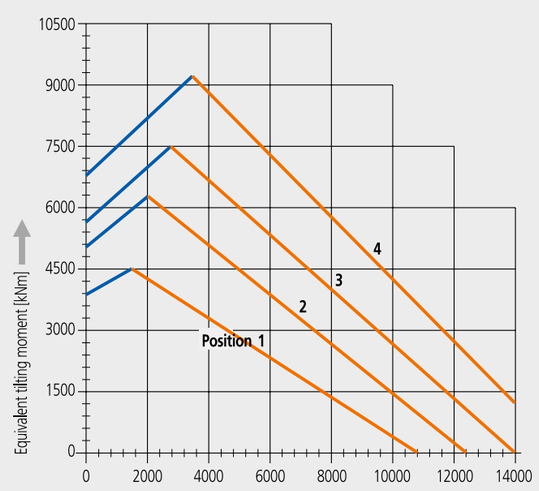
Internal toothed

Drawing number	Position	Dimensions and weight					Mounting holes			Gearing and thooth 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	Number 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

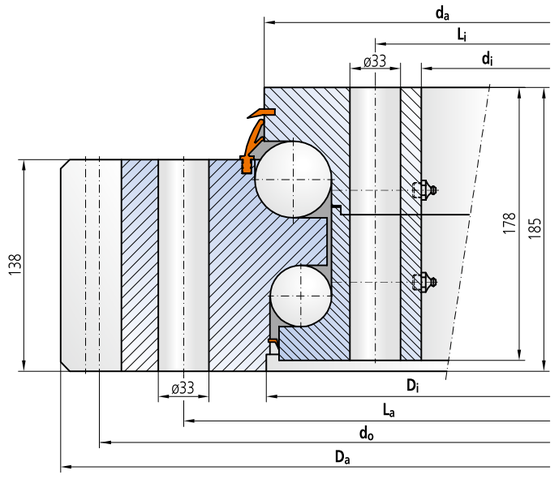
Mounting holes equally spaced
Raceway system supplied pre-lubricated
Dimensions without tolerances DIN ISO 2768 coarse



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

External toothed

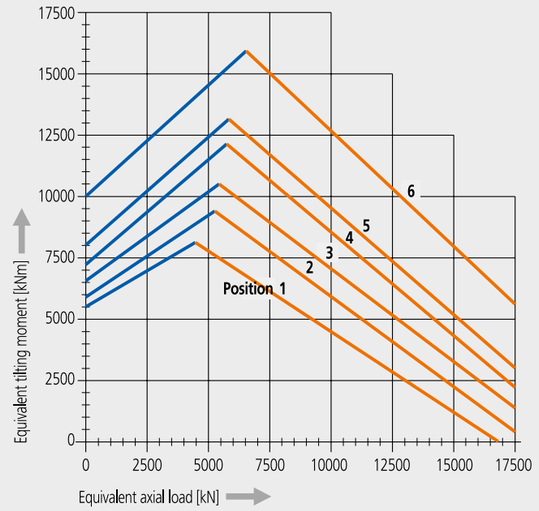
Drawing number	Position	Dimensions and weight					Mounting holes			Gearing and thooth forces						Load ratings					
		Outside diameter, outer ring	Inside diameter, inner ring	Inside diameter, outer ring	Outside diameter, inner ring	Weight	Pitch circle diameter, outer ring	Pitch circle diameter, inner ring	Number 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

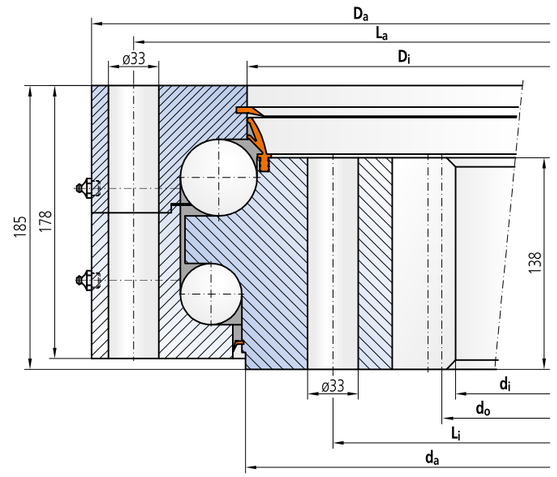
Limiting load diagram for "compressive" loads – **Series 850**



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

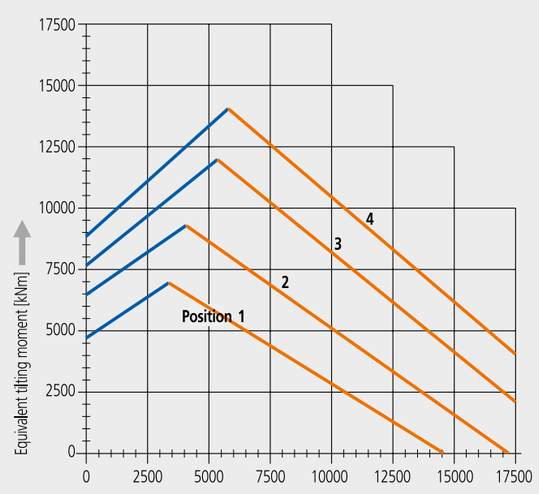
Internal toothed

Drawing number	Position	Dimensions and weight					Mounting holes			Gearing and thooth 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	Number 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

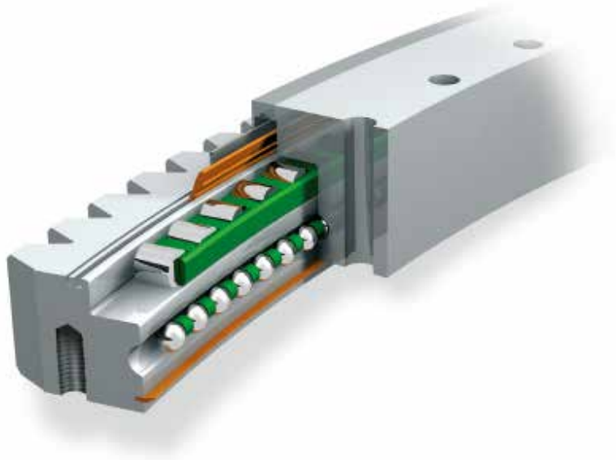


Please adhere strictly to the rules given in the Technical Information section when using above graph!

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



Operating conditions

Permissible temperature range -25°C to +70°C
Maximum permissible rotational speed nperm = 20000 / D_L
(D_L = raceway diameter)
Only compressive load
Only vertical rotating axis
Bolt grade 10.9

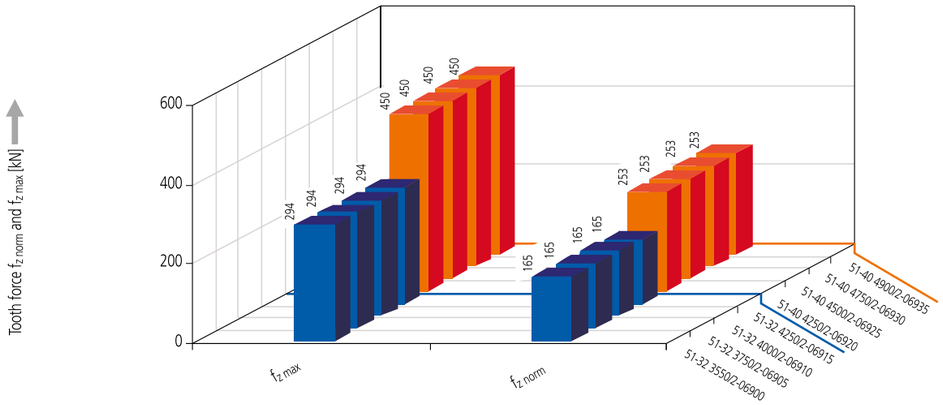
Typical applications

Stacker reclaimers and other equipment for bulk materials handling, turntables.

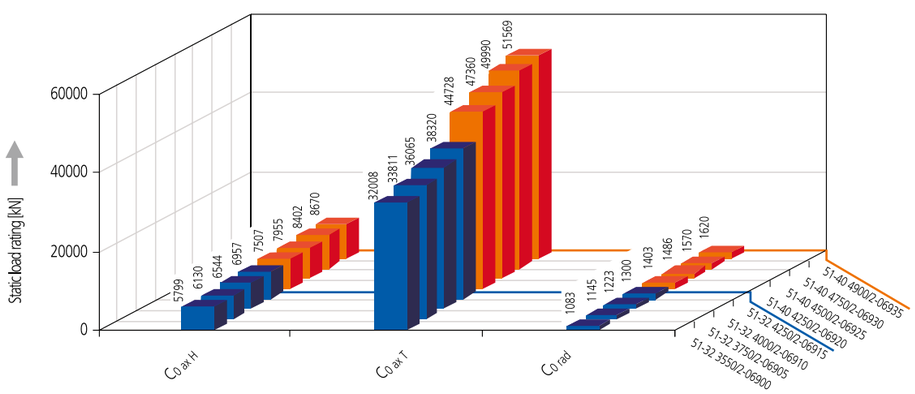
Characteristics

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

Permissible tooth force for the individual sizes

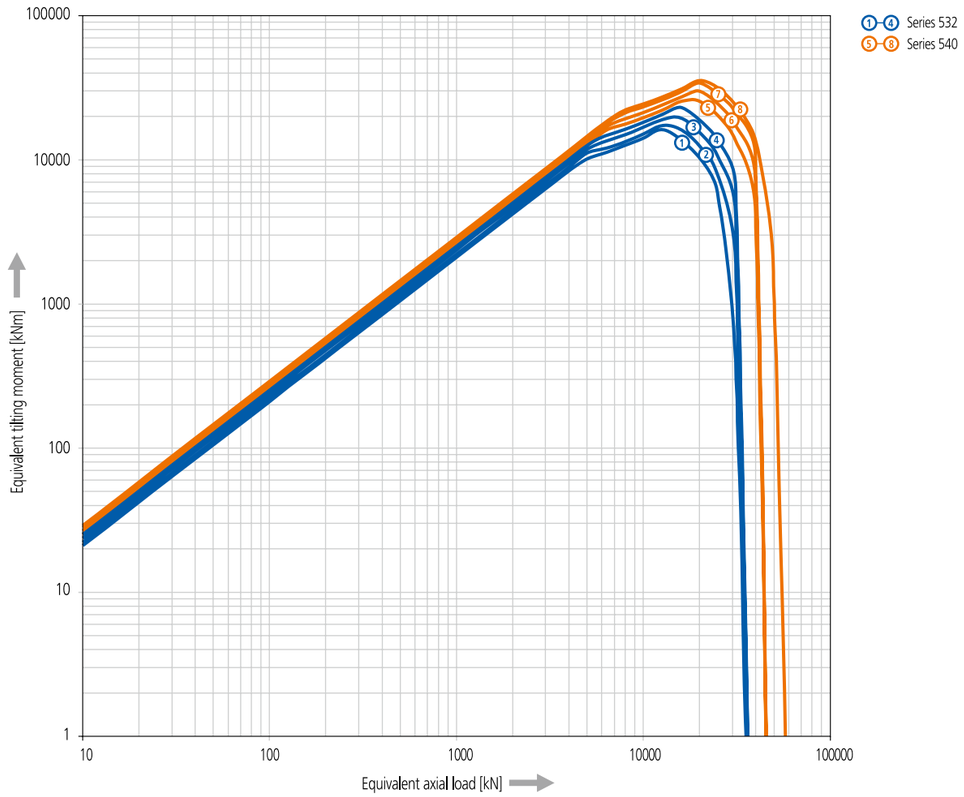


Static load ratings for the individual sizes



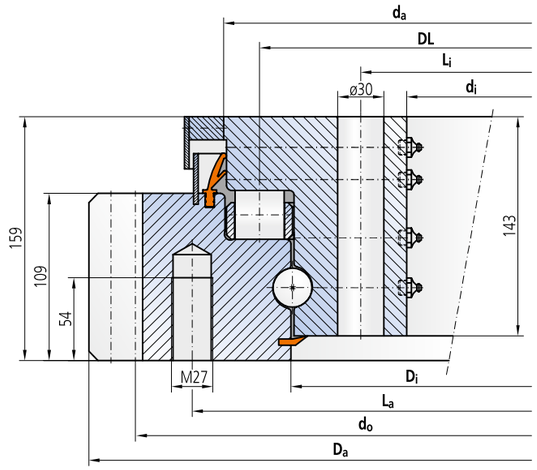
Limiting load diagrams, series 532, 540

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

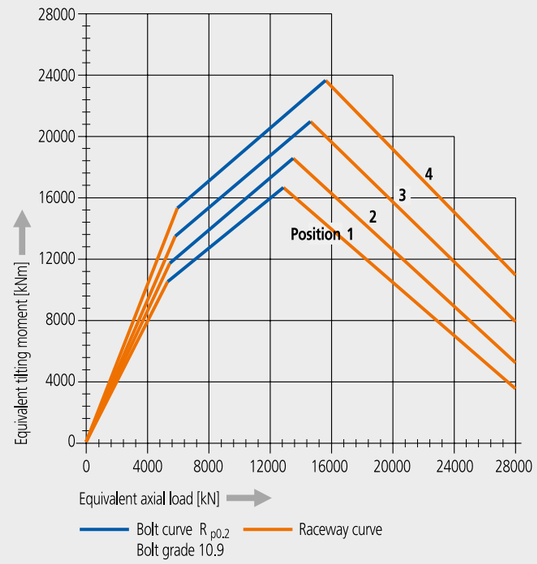


External toothed

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	Number 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**

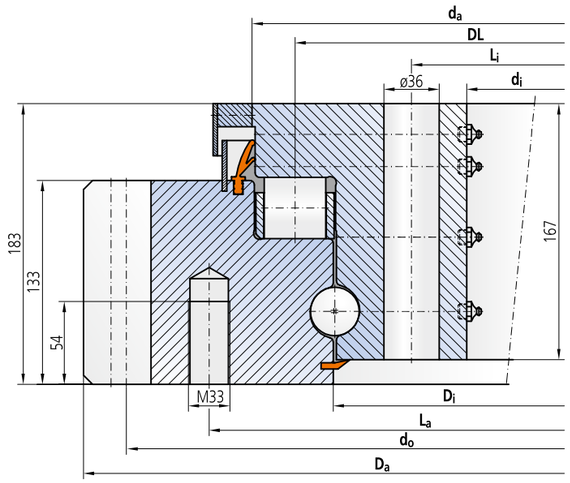


Please adhere strictly to the rules given in the Technical Information section when using above graph!

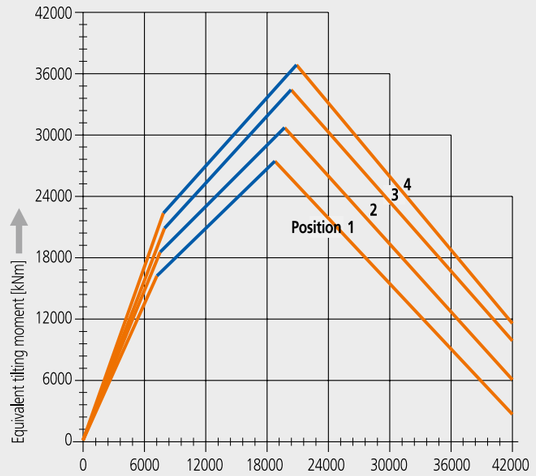
Radial clearance: 0 - 0.32 mm
Axial clearance: 0 - 0.32 mm
Bearing ring material: 42CrMo4V
10 to 12 Taper type grease nipples on each circumferential row
Mounting holes equally spaced
Raceway system supplied pre-lubricated
Dimensions without tolerances DIN ISO 2768 coarse

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	Number 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	4806	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 – **Reihe 540**



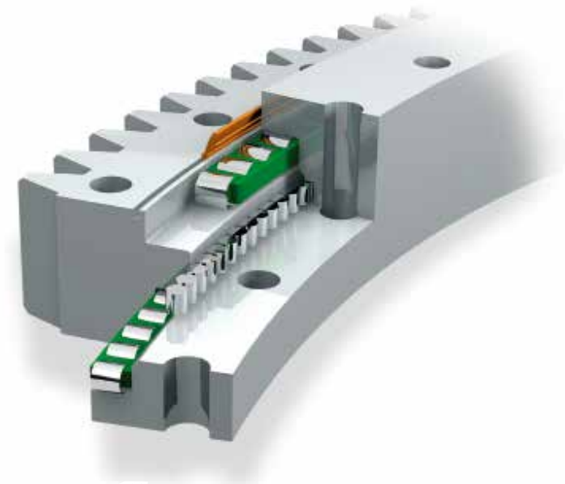
Please adhere strictly to the rules given in the Technical Information section when using above graph!

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

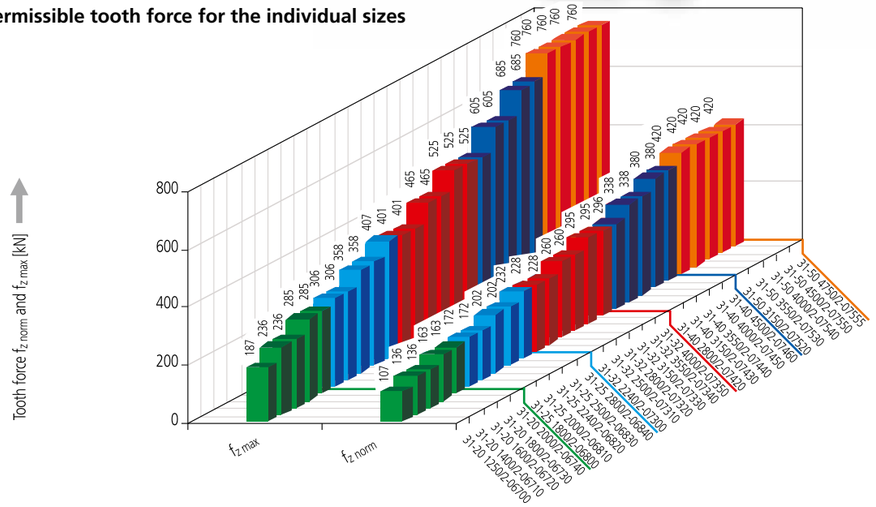
Series overview - Triple Row Roller Slewing Rings

31 – 20 1250 / 2 – 06700

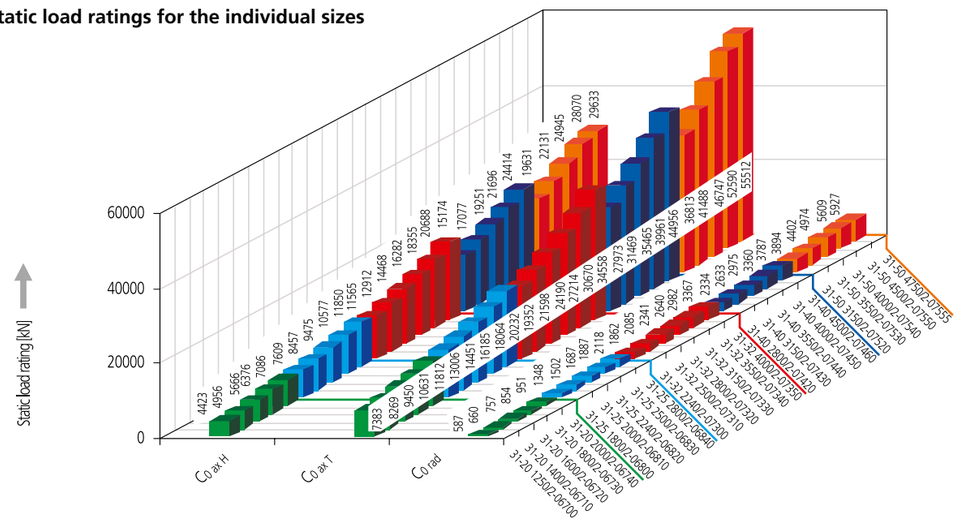
- **Drawing reference number**
- **Gearing heat treatment**
  2: Quenched and tempered
- **Raceway diameter [D_L in mm]**
- **Rolling element diameter [D_w in mm]**
- **Gear type:**
  1: External toothed
  2: Internal toothed
- **Bearing design**
  3: Triple Row Roller Slewing Ring



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

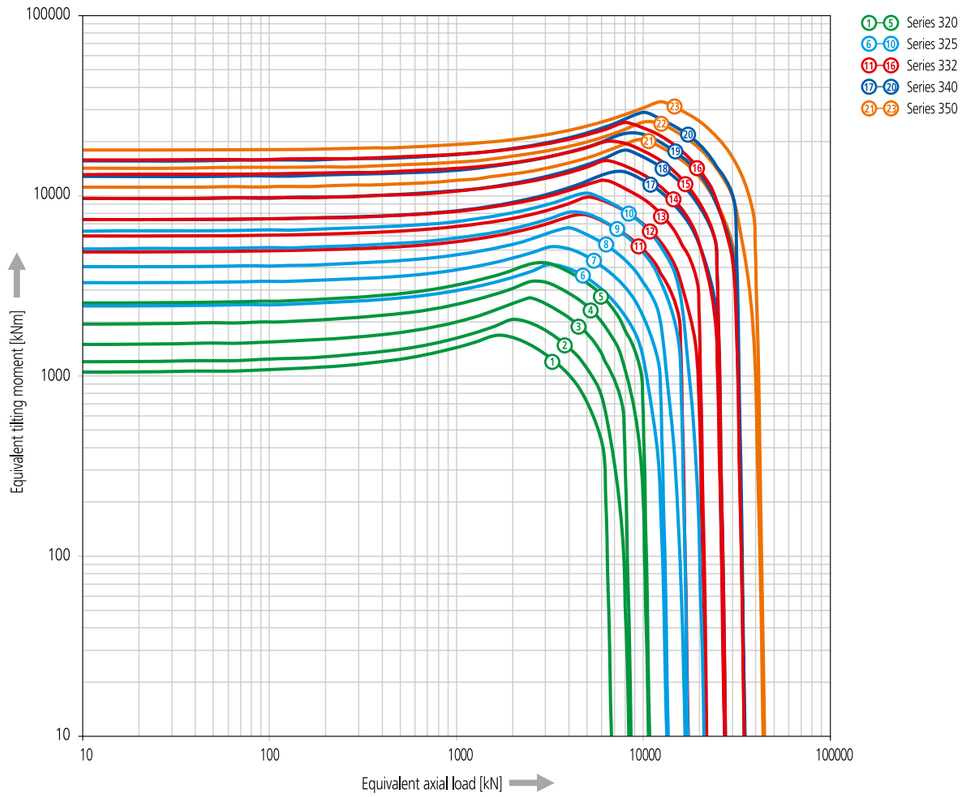
Heavy harbour cranes, shipboard cranes, ladle turrets and grab cranes, radar antennas, wind energy turbine main bearings, tunnel boring machines and loading buoys (oil, gas swivels), machine tools (in general where the application requires high duty cycles).

Characteristics

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

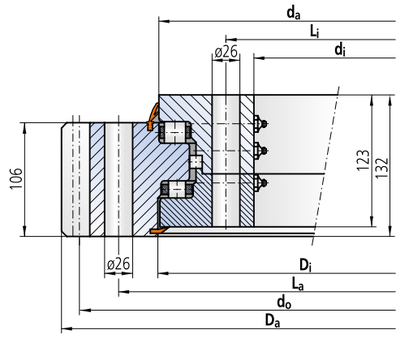
Limiting load diagrams, series 320, 325, 332, 340, 350

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

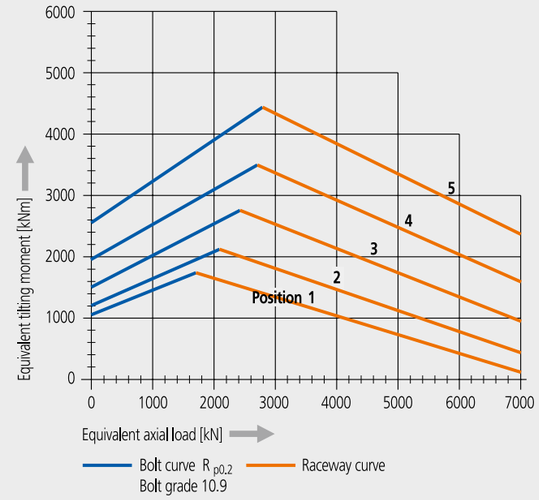


External toothed

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	Number 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	395	1371	999
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	419	1462	1076
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	451	1580	1156
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	481	1668	1224
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	509	1768	1299



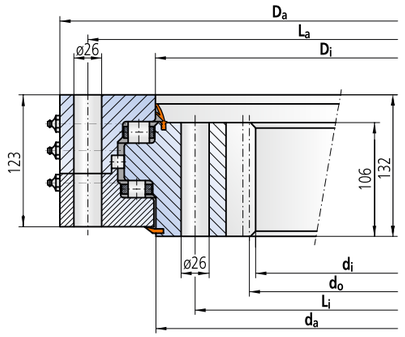
Limiting load diagram for "compressive" loads – **Series 320**



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	Number 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	407	1371	1005
32-20 1400/2-06760	**2**	1547	1162	1369	1368	630	1495	1295	36	1176	14	84	-0.50	146	269	698	8269	4984	432	1462	1075
32-20 1600/2-06770	**3**	1747	1372	1569	1568	705	1695	1495	40	1386	14	99	-0.50	146	269	795	9450	5694	463	1580	1162
32-20 1800/2-06780	**4**	1947	1552	1769	1768	829	1895	1695	46	1568	16	98	-0.50	175	319	892	10631	6404	492	1668	1236
32-20 2000/2-06790	**5**	2147	1760	1969	1968	902	2095	1895	54	1776	16	111	-0.50	175	319	989	11812	7114	519	1768	1307



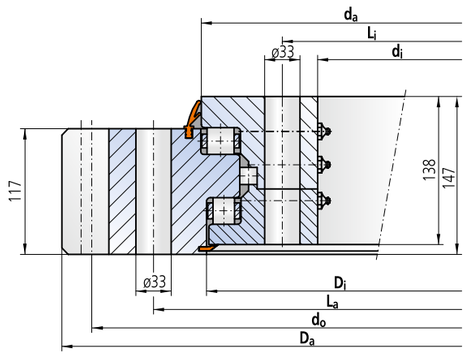
Bearing ring material: 42CrMo4V
3 to 5 Taper type grease nipples on each circumferential row
Mounting holes equally spaced
Raceway system supplied pre-lubricated
Dimensions without tolerances DIN ISO 2768 coarse

Clearances

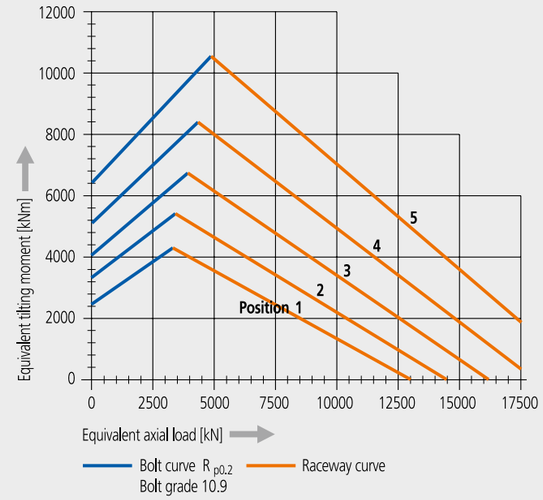
Position	Radial clearance	Axial clearance
1	max. 0.20	max. 0.07
2	max. 0.20	max. 0.07
3	max. 0.25	max. 0.08
4	max. 0.25	max. 0.08
5	max. 0.25	max. 0.08

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	Number 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	701	2265	1664
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	743	2417	1769
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	790	2559	1889
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	838	2723	1983
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	890	2908	2132



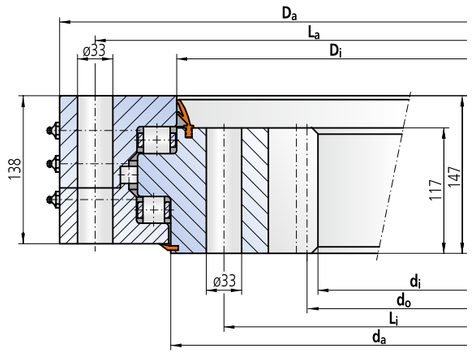
Limiting load diagram for "compressive" loads – **Series 325**



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

Internal toothed

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	Number 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	722	2265	1667
32-25 2000/2-06860	**2**	2181	1728	1963	1974	1202	2115	1875	44	1744	16	109	-0.50	185	342	1577	14451	8508	762	2417	1773
32-25 2240/2-06870	**3**	2421	1944	2203	2214	1406	2355	2115	48	1962	18	109	-0.50	217	394	1763	16185	9526	808	2559	1886
32-25 2500/2-06880	**4**	2681	2214	2463	2474	1545	2615	2375	54	2232	18	124	-0.50	217	394	1963	18064	10628	855	2723	1996
32-25 2800/2-06890	**5**	2981	2500	2763	2774	1767	2915	2675	60	2520	20	126	-0.50	248	449	2194	20232	11901	907	2908	2121



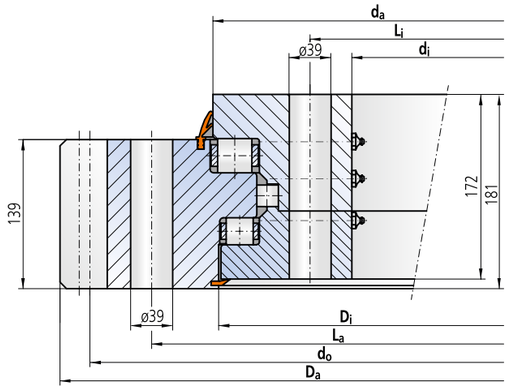
Bearing ring material: 42CrMo4V
6 to 10 Taper type grease nipples on each circumferential row
Mounting holes equally spaced
Raceway system supplied pre-lubricated
Dimensions without tolerances DIN ISO 2768 coarse

Clearances

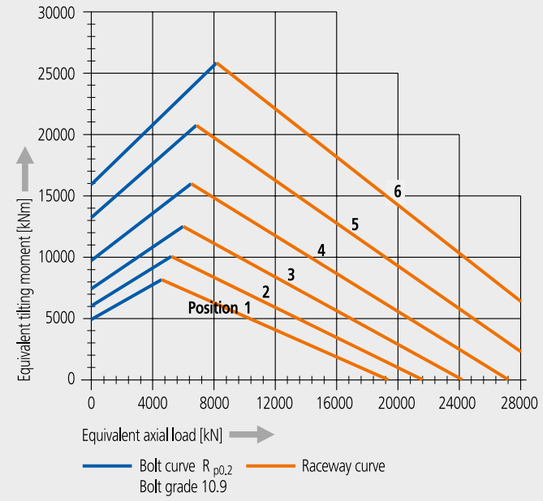
Position	Radial clearance	Axial clearance
1	max. 0.25	max. 0.08
2	max. 0.25	max. 0.08
3	max. 0.33	max. 0.10
4	max. 0.33	max. 0.10
5	max. 0.40	max. 0.13

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	Number 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	988	3600	2561
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	1049	3837	2717
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	1114	4105	2879
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	1187	4368	3096
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	1266	4603	3277
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	1351	4955	3486



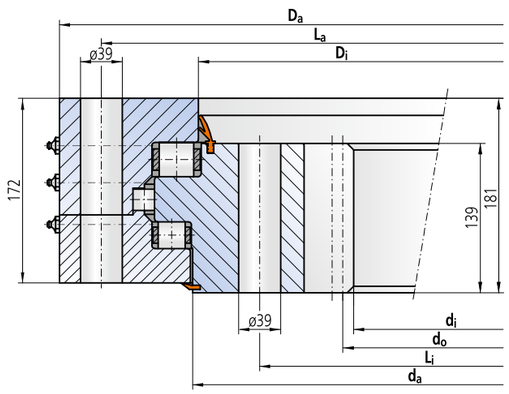
Limiting load diagram for "compressive" loads – **Series 332**



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	Number 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	1017	3600	2583
32-32 2500/2-07370	**2**	2718	2178	2459	2470	2210	2640	2345	44	2196	18	122	-0.50	240	445	2189	21598	13006	1076	3837	2720
32-32 2800/2-07380	**3**	3018	2460	2759	2770	2542	2940	2645	48	2480	20	124	-0.50	278	508	2445	24190	14561	1141	4105	2906
32-32 3150/2-07390	**4**	3368	2820	3109	3120	2807	3290	2995	56	2840	20	142	-0.50	278	508	2744	27214	16375	1212	4368	3092
32-32 3550/2-07400	**5**	3768	3190	3509	3520	3302	3690	3395	66	3212	22	146	-0.50	305	559	3089	30670	18449	1291	4603	3273
32-32 4000/2-07410	**6**	4218	3652	3959	3970	3664	4140	3845	72	3674	22	167	-0.50	305	559	3471	34558	20781	1372	4955	3509



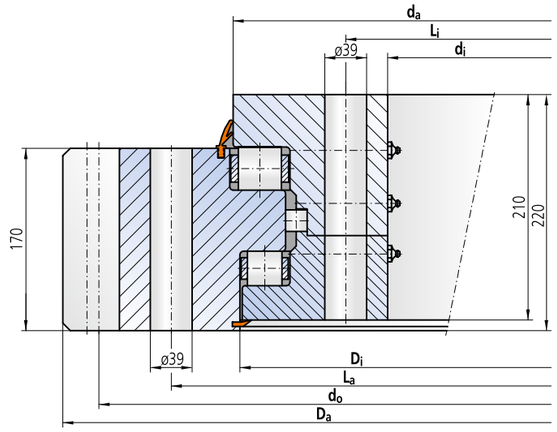
Bearing ring material: 42CrMo4V
7 to 9 Taper type grease nipples on each circumferential row
Mounting holes equally spaced
Raceway system supplied pre-lubricated
Dimensions without tolerances DIN ISO 2768 coarse

Clearances

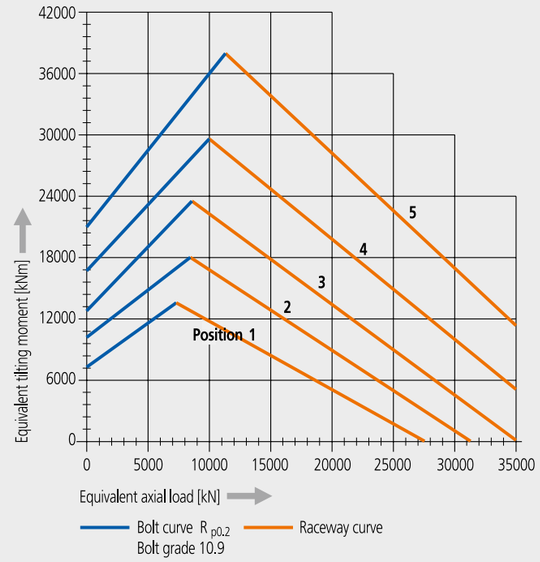
Position	Radial clearance	Axial clearance
1	max. 0.33	max. 0.10
2	max. 0.33	max. 0.10
3	max. 0.40	max. 0.13
4	max. 0.50	max. 0.15
5	max. 0.50	max. 0.15
6	max. 0.50	max. 0.17

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	Number 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	1113	5534	4066
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	1186	5834	4344
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	1265	6268	4605
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	1348	6658	4945
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	1437	7122	5275



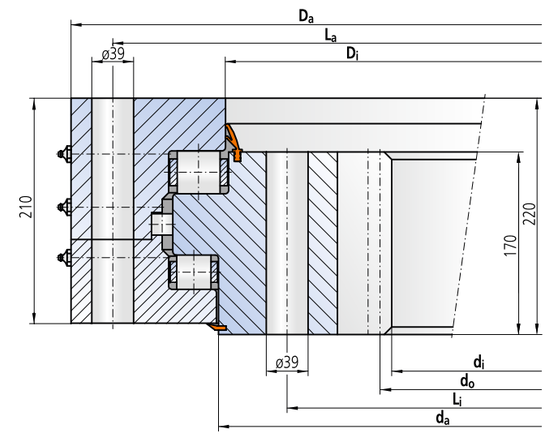
Limiting load diagram for "compressive" loads – **Series 340**



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	Number 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	1143	5534	4061
32-40 3150/2-07480	**2**	3388	2794	3100	3113	3683	3310	2985	56	2816	22	128	-0.50	357	658	2751	31469	17362	1214	5834	4365
32-40 3550/2-07490	**3**	3788	3190	3500	3513	4171	3710	3385	66	3212	22	146	-0.50	357	658	3093	35465	19561	1292	6268	4601
32-40 4000/2-07500	**4**	4238	3624	3950	3963	4810	4160	3835	72	3648	24	152	-0.50	398	740	3478	39961	21783	1373	6658	4976
32-40 4500/2-07510	**5**	4738	4128	4450	4463	5367	4660	4335	84	4152	24	173	-0.50	398	740	3905	44956	24501	1461	7122	5270



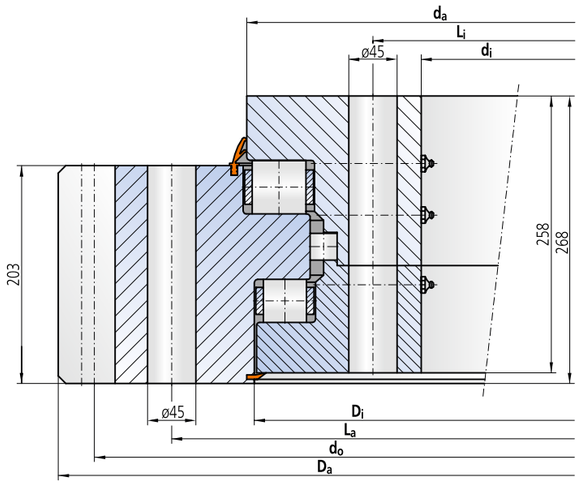
Bearing ring material: 42CrMo4V
7 to 14 Taper type grease nipples on each circumferential row
Mounting holes equally spaced
Raceway system supplied pre-lubricated
Dimensions without tolerances DIN ISO 2768 coarse

Clearances

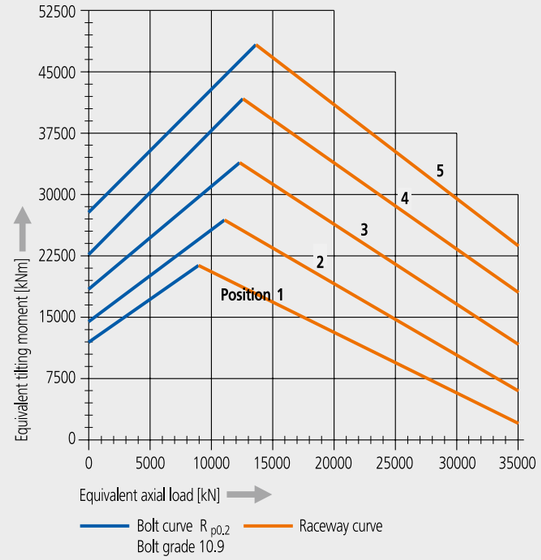
Position	Radial clearance	Axial clearance
1	max. 0.40	max. 0.13
2	max. 0.50	max. 0.15
3	max. 0.50	max. 0.15
4	max. 0.50	max. 0.17
5	max. 0.60	max. 0.20

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	Number 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	1702	7913	5838
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	1815	8409	6272
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	1934	9018	6662
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	2062	9632	7088
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	2124	9850	7293



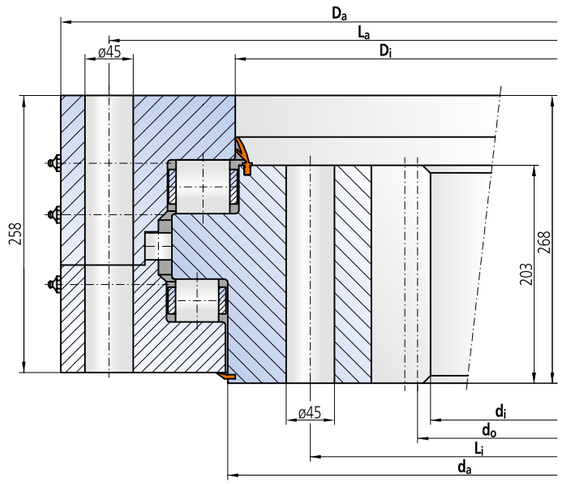
Limiting load diagram for "compressive" loads – **Series 350**



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	Number 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	1750	7913	5830
32-50 3550/2-07570	**2**	3815	3120	3490	3504	5916	3725	3350	54	3144	24	131	-0.50	440	820	4618	41488	22256	1861	8409	6264
32-50 4000/2-07580	**3**	4265	3576	3940	3954	6623	4175	3800	60	3600	24	150	-0.50	440	820	5190	46745	25070	1980	9018	6654
32-50 4500/2-07590	**4**	4765	4080	4440	4454	7427	4675	4300	68	4104	24	171	-0.50	440	820	5825	52590	28195	2105	9632	7118
32-50 4750/2-07595	**5**	5015	4320	4690	4704	7840	4925	4550	76	4344	24	181	-0.50	440	820	6143	55512	29758	2164	9850	7322



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

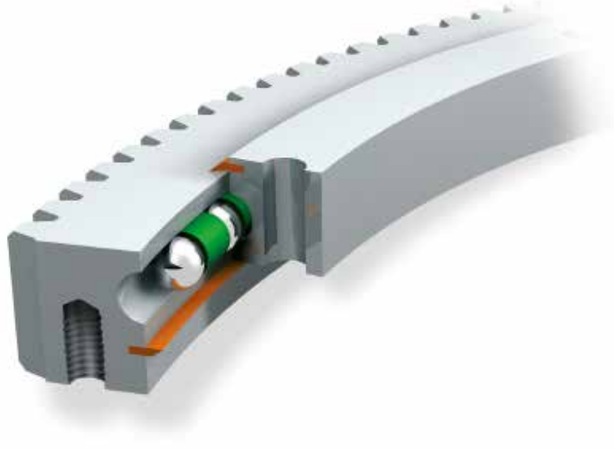
Gearing heat treatment
0: Untoothed
1: Normalized
2: Quenched and tempered

Raceway diameter [D_L in mm]

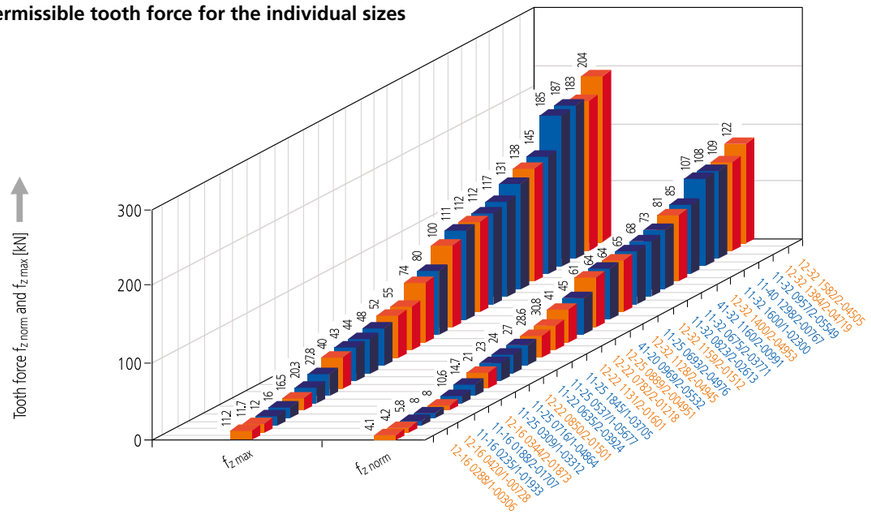
Rolling element diameter [D_W in mm]

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

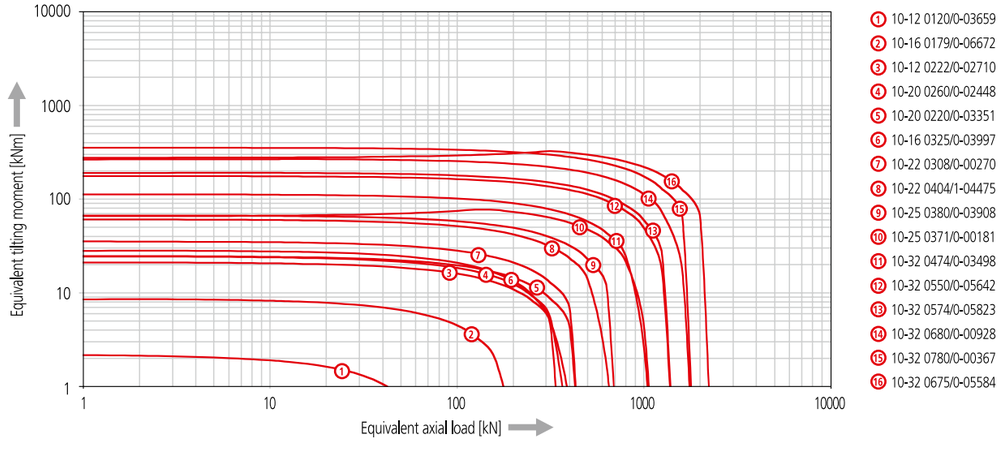
Typical applications

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).

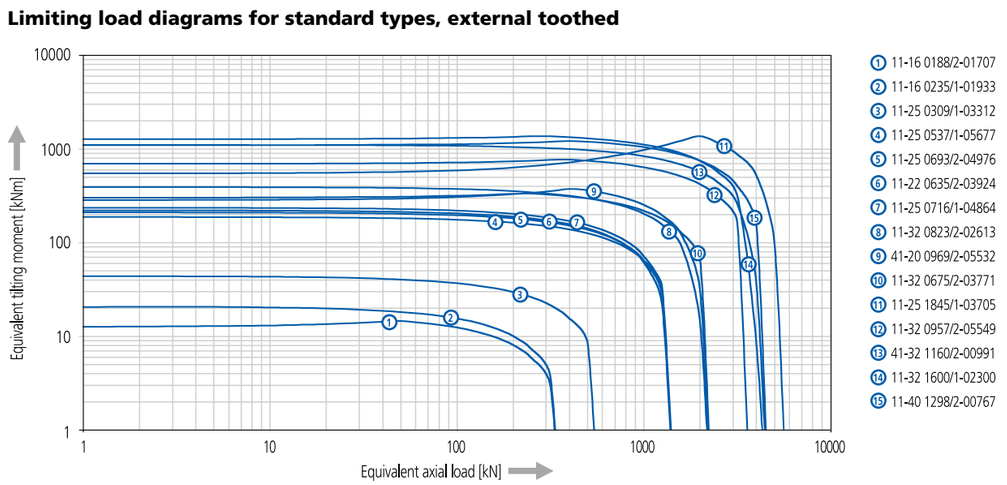
Limiting load diagrams for other standard types

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

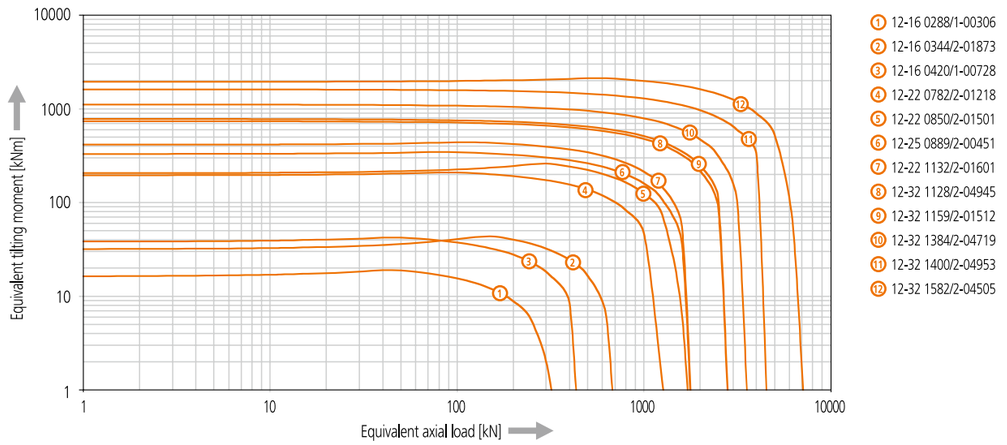
Limiting load diagrams for standard types, untoothed



Limiting load diagrams for standard types, external toothed

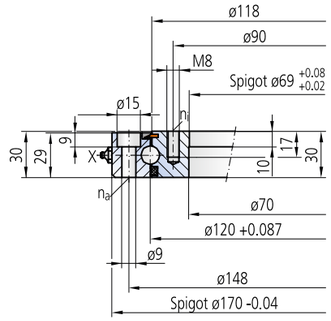


Limiting load diagrams for standard types, internal toothed

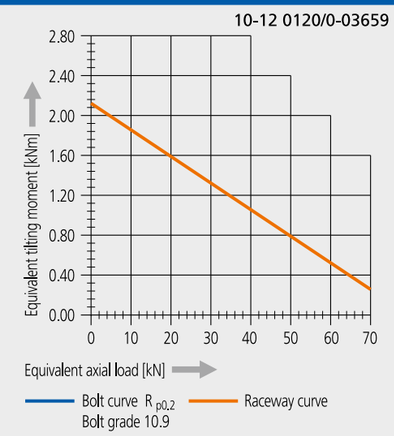


Size 10-12 0120/0-03659

Weight	Mounting holes: Number of holes, outer ring	Mounting holes: Number of holes, inner ring	Load ratings: Static	Load ratings: Static	Load ratings: dynamisch	Load ratings: dynamisch	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



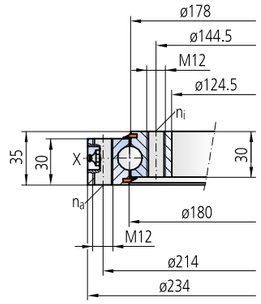
Limiting load diagram for "compressive" loads



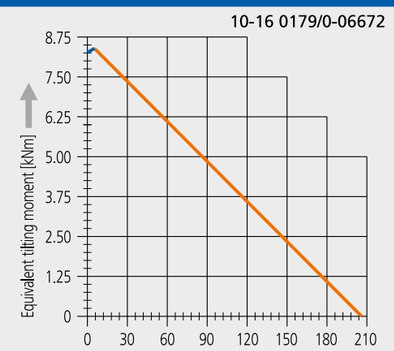
Please adhere strictly to the rules given in the Technical Information section when using above graph!

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: Static	Load ratings: dynamisch	Load ratings: dynamisch	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



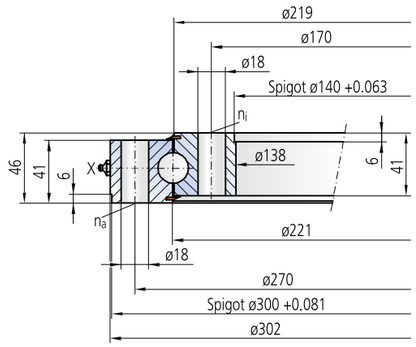
Limiting load diagram for "compressive" loads



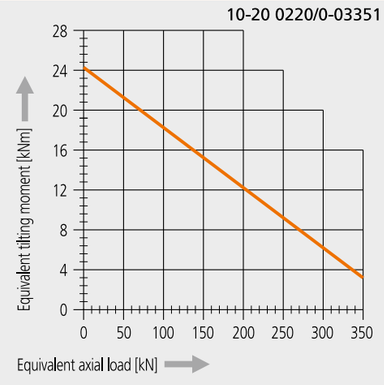
Please adhere strictly to the rules given in the Technical Information section when using above graph!

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: Static	Load ratings: dynamisch	Load ratings: dynamisch	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



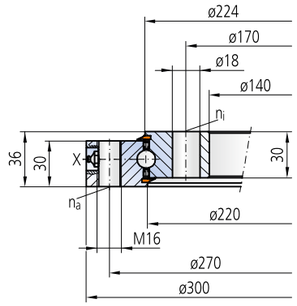
Limiting load diagram for "compressive" loads



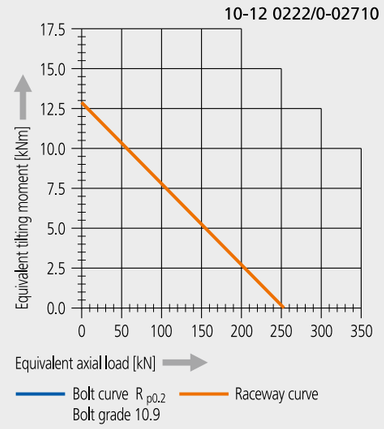
Please adhere strictly to the rules given in the Technical Information section when using above graph!

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: dynamisch		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	143	253	70	82	C45N	-	2 x AM6	0 - 0.05	0 - 0.10



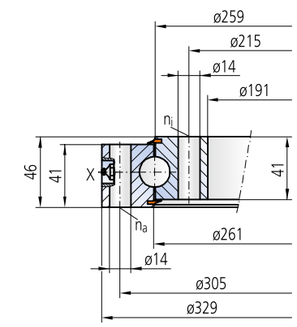
Limiting load diagram for "compressive" loads



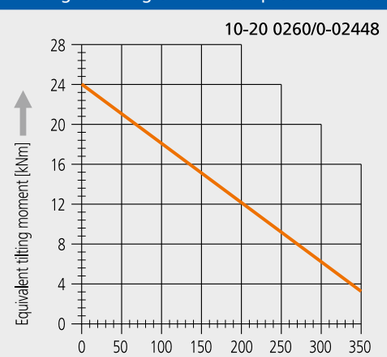
Please adhere strictly to the rules given in the Technical Information section when using above graph!

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: dynamisch		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



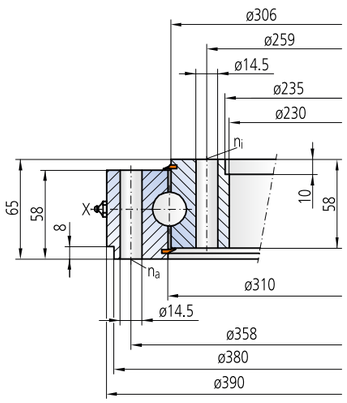
Limiting load diagram for "compressive" loads



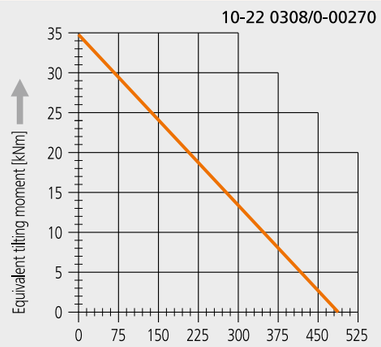
Please adhere strictly to the rules given in the Technical Information section when using above graph!

Size 10-22 0308/0-00270

Weight	Mounting holes: Number of holes, outer ring	Mounting holes: Number of holes, inner ring	Load ratings: Static		Load ratings: dynamisch		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



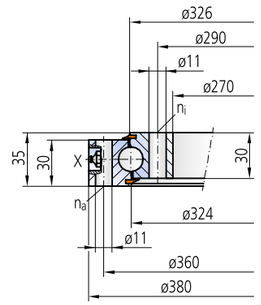
Limiting load diagram for "compressive" loads



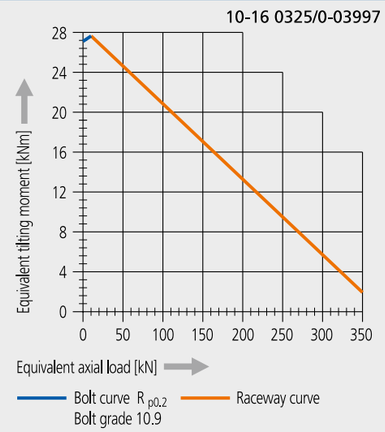
Please adhere strictly to the rules given in the Technical Information section when using above graph!

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



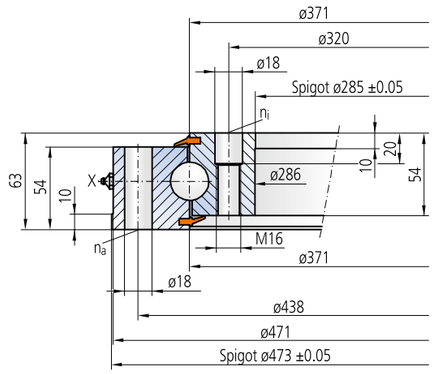
Limiting load diagram for "compressive" loads



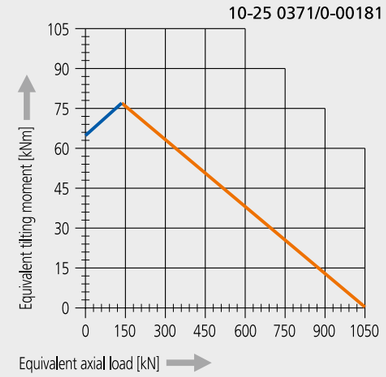
Please adhere strictly to the rules given in the Technical Information section when using above graph!

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



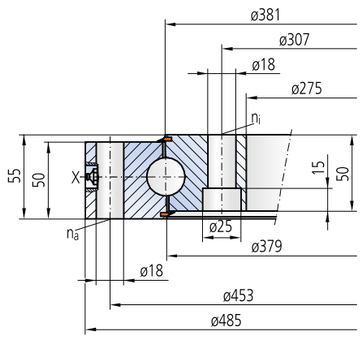
Limiting load diagram for "compressive" loads



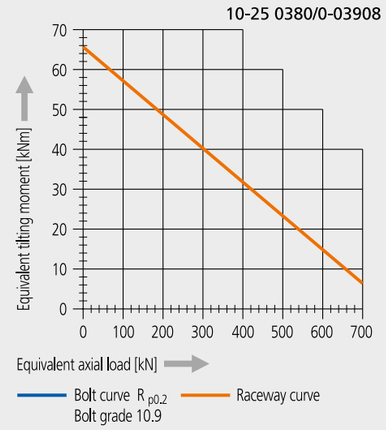
Please adhere strictly to the rules given in the Technical Information section when using above graph!

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: Static	Load ratings: dynamisch	Load ratings: dynamisch	Material, inner / outer ring	Transport holes	Taper type grease nipple DIN 71412	Clearance: Radial clearance	Clearance: Axial tilting clearance
G	**n_a**	**n_i**	**$C_{o\,rad}$**	**$C_{o\,ax}$**	**C_{rad}**	**C_{ax}**		**T**	**X**	**S_{Rad}**	**S_{kipp}**
[kg]	[-]	[-]	[kN]	[kN]	[kN]	[kN]		[-]		[mm]	[mm]
43	16	16	282	755	226	263	C45N	-	2x AM10x1	0.06 - 0.25	0.11 - 0.41



Limiting load diagram for "compressive" loads

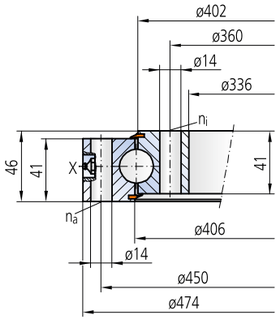


Please adhere strictly to the rules given in the Technical Information section when using above graph!

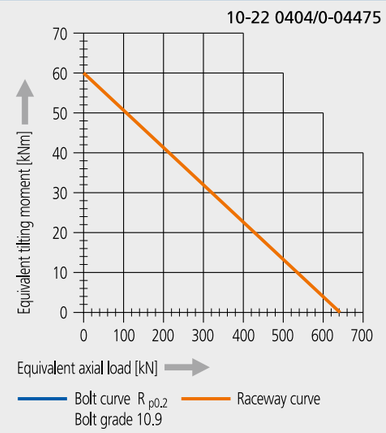
Size 10-22 0404/0-04475

Weight	Mounting holes: Number of holes, outer ring	Mounting holes: Number of holes, inner ring	Load ratings: Static	Load ratings: Static	Load ratings: dynamisch	Load ratings: dynamisch	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



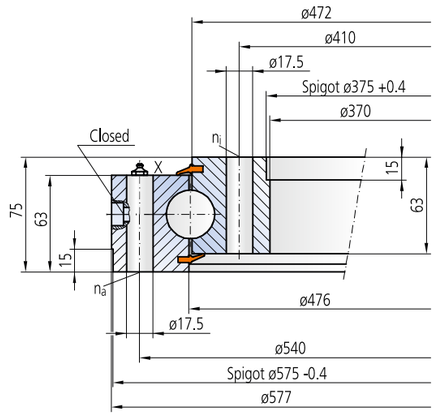
Limiting load diagram for "compressive" loads



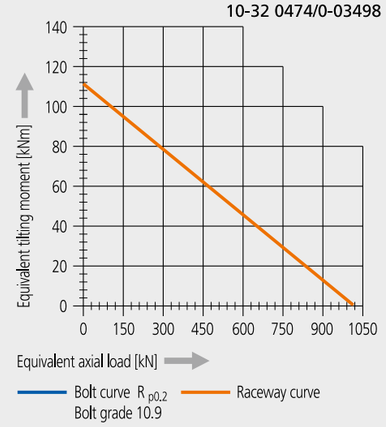
Please adhere strictly to the rules given in the Technical Information section when using above graph!

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: Static	Load ratings: dynamisch	Load ratings: dynamisch	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



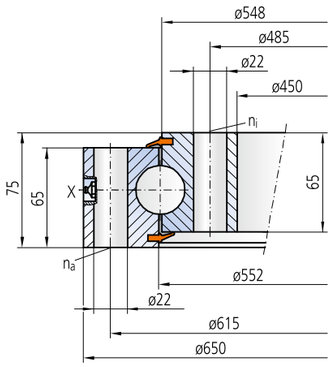
Limiting load diagram for "compressive" loads



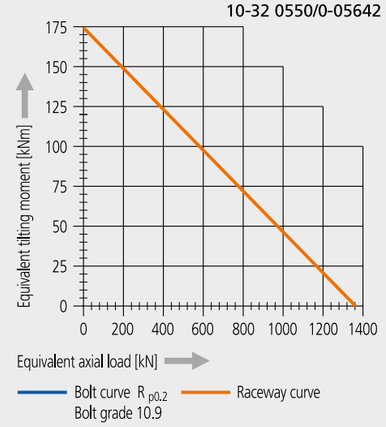
Please adhere strictly to the rules given in the Technical Information section when using above graph!

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: Static	Load ratings: dynamisch	Load ratings: dynamisch	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	-	4x AM10x1	0.08 - 0.32	0.13 - 0.52



Limiting load diagram for "compressive" loads

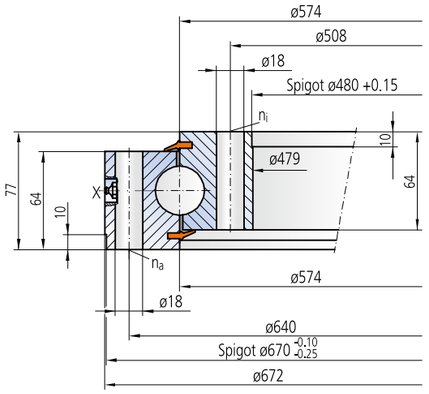


Please adhere strictly to the rules given in the Technical Information section when using above graph!

Size 10-32 0574/0-05823

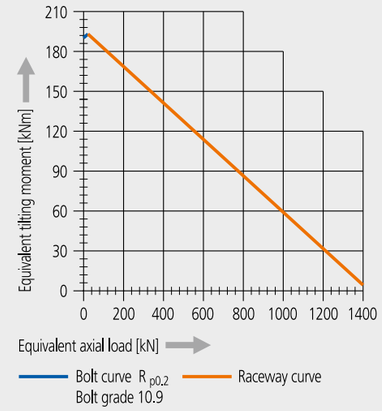
Weight	Mounting holes: Number of holes, outer ring	Mounting holes: Number of holes, inner ring	Load ratings: Static	Load ratings: Static	Load ratings: dynamisch	Load ratings: dynamisch	Material, inner / outer ring	Transport holes	Taper type grease nipple DIN 71412	Clearance: Radial clearance	Clearance: 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

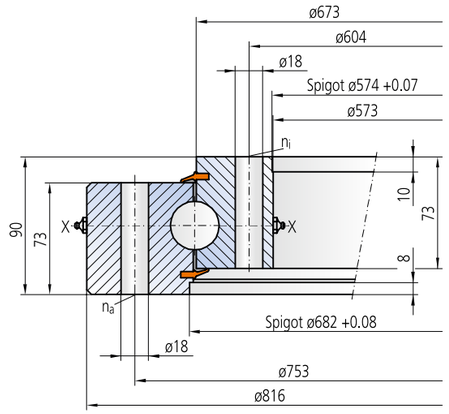


Please adhere strictly to the rules given in the Technical Information section when using above graph!

Size 10-32 0675/0-05584

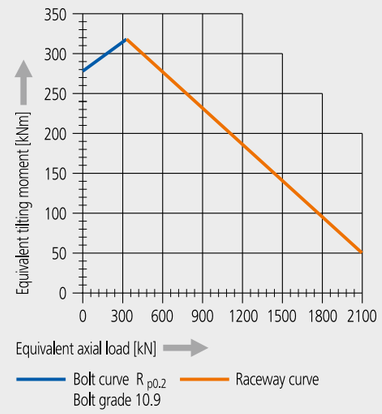
Weight	Mounting holes: Number of holes, outer ring	Mounting holes: Number of holes, inner ring	Load ratings: Static	Load ratings: Static	Load ratings: dynamisch	Load ratings: dynamisch	Material, inner / outer ring	Transport holes	Taper type grease nipple DIN 71412	Clearance: Radial clearance	Clearance: 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	-	je 4x AM8x1	0 - 0.10	0 - 0.20

* Spaced for 36



Limiting load diagram for "compressive" loads

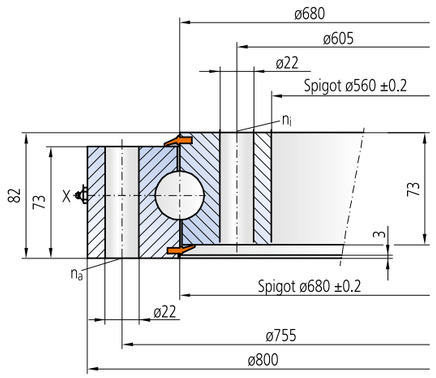
10-32 0675/0-05584



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

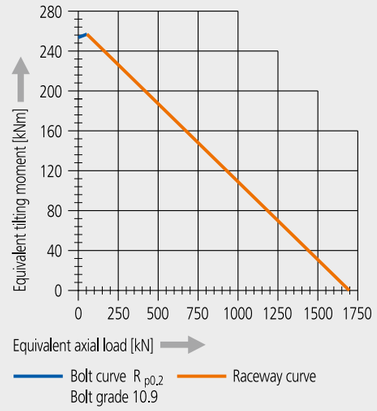
Size 10-32 0680/0-00928

Weight	Mounting holes: Number of holes, outer ring	Mounting holes: Number of holes, inner ring	Load ratings: Static	Load ratings: Static	Load ratings: dynamisch	Load ratings: dynamisch	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

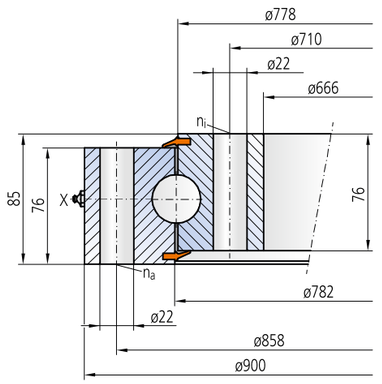
10-32 0680/0-00928



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

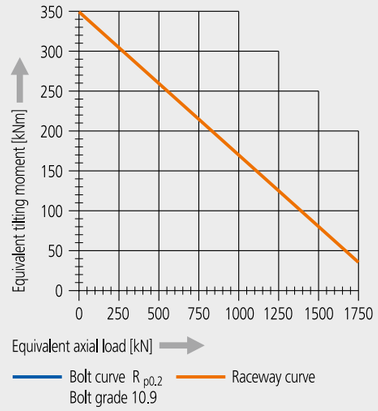
Size 10-32 0780/0-00367

Weight	Mounting holes: Number of holes, outer ring	Mounting holes: Number of holes, inner ring	Load ratings: Static	Load ratings: Static	Load ratings: dynamisch	Load ratings: dynamisch	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

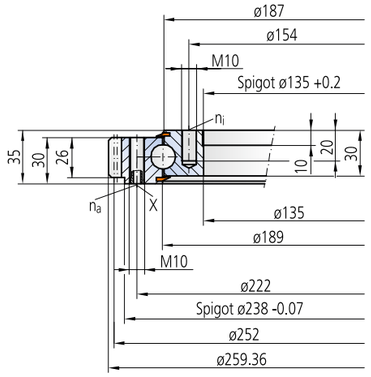


Please adhere strictly to the rules given in the Technical Information section when using above graph!

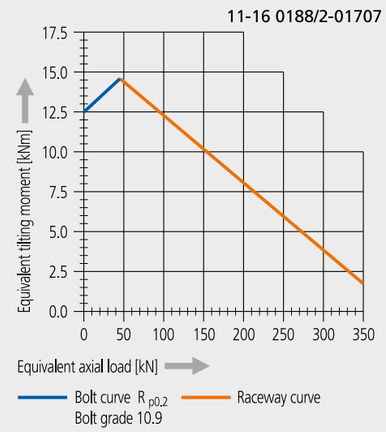
Size 11-16 0188/2-01707

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		dynamisch		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]
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		dynamisch		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		dynamisch		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

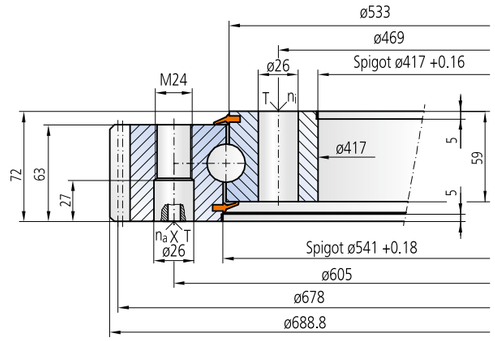
Limiting load diagram for "compressive" loads

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

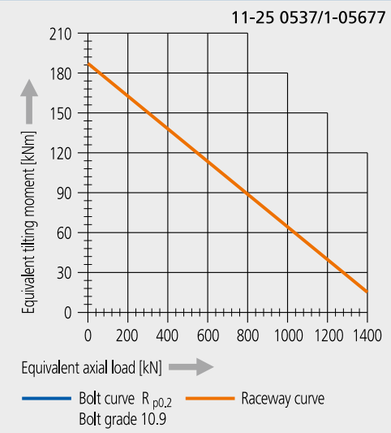
Size 11-25 0537/1-05677

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		dynamisch		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]
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		dynamisch		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]
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		dynamisch		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]
137	36	35*	10	81	0.50	68	117	899	2406	486	565	42CrMo4C 42CrMo4V	-	je 3x AM10x1	0 - 0.10	0 - 0.21

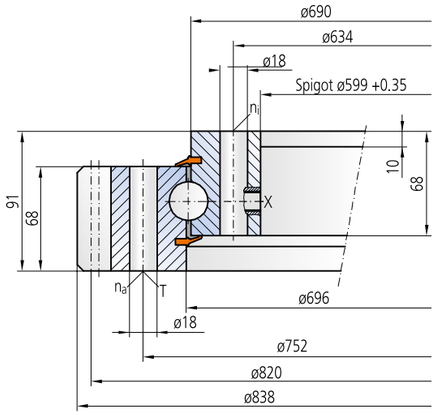
* Spaced for 36

Limiting load diagram for "compressive" loads

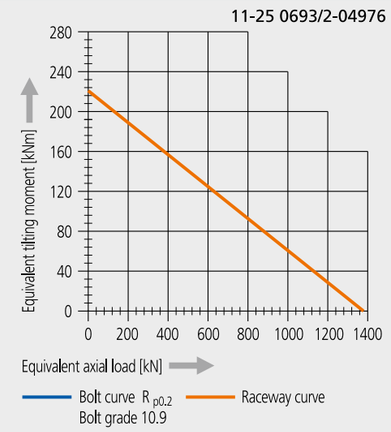
Please adhere strictly to the rules given in the Technical Information section when using above graph!

Size 11-25 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		dynamisch		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]
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



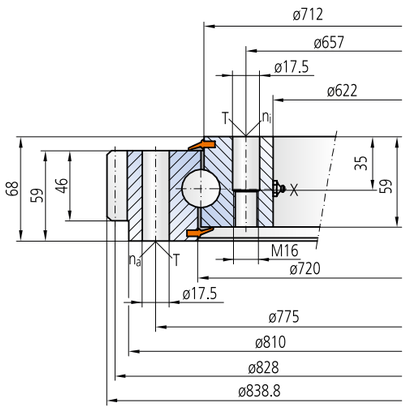
Limiting load diagram for "compressive" loads



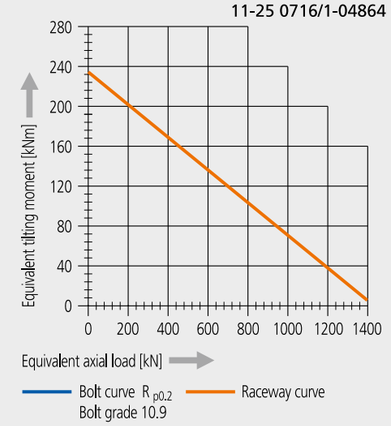
Please adhere strictly to the rules given in the Technical Information section when using above graph!

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		dynamisch		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]
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

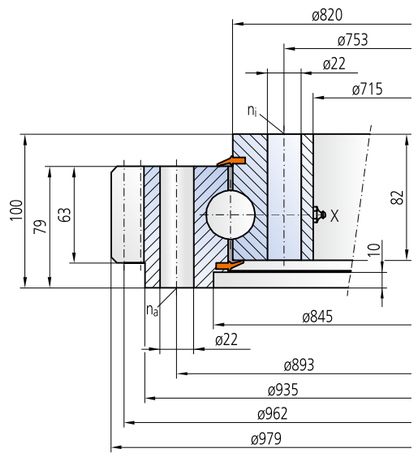


Please adhere strictly to the rules given in the Technical Information section when using above graph!

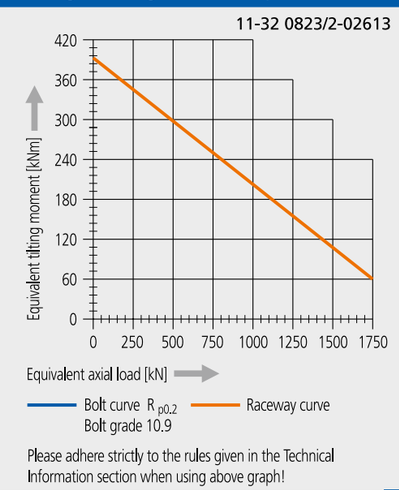
Size 11-32 0823/2-02613

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		dynamisch		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]
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

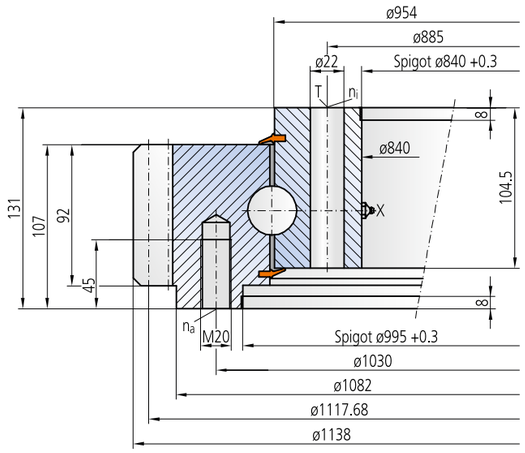


Please adhere strictly to the rules given in the Technical Information section when using above graph!

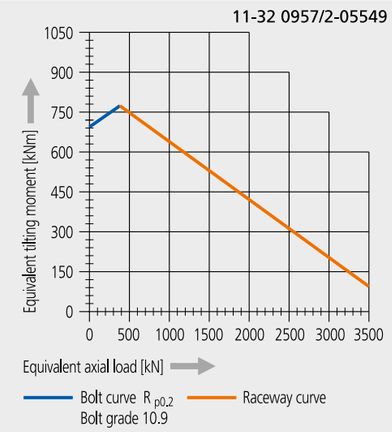
Size 11-32 0957/2-05549

Weight	Mounting holes: Number of holes, outer ring	Mounting holes: Number of holes, inner ring	Gearing and tooth forces: Module	Number of teeth	Addendum modification coeff.	Permissible tooth force	Maximum permissible tooth force	Load ratings: Static		dynamisch		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]
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

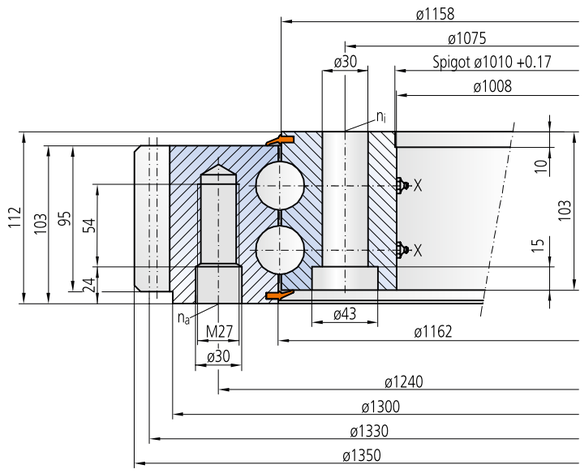
Weight	Mounting holes: Number of holes, outer ring	Mounting holes: Number of holes, inner ring	Gearing and tooth forces: Module	Number of teeth	Addendum modification coeff.	Permissible tooth force	Maximum permissible tooth force	Load ratings: Static		dynamisch		Material, inner / outer ring	Transport 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]
213	30	30	8	131	1.07	45	80	798	2135	231	363	42CrMo4V	-	je 2 x AM10x1	0 - 0.10	0 - 0.20

Limiting load diagram for "compressive" loads

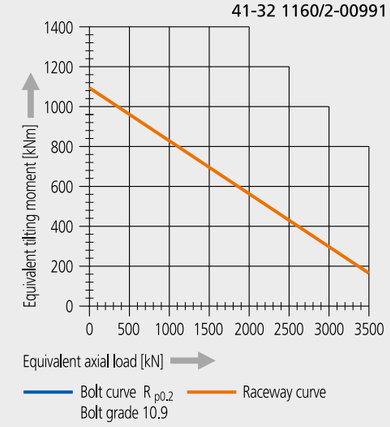
Please adhere strictly to the rules given in the Technical Information section when using above graph!

Size 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	Number of teeth	Addendum modification coeff.	Permissible tooth force	Maximum permissible tooth force	Load ratings: Static		dynamisch		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]
429	40	40	10	132	0.50	73	131	1545	4134	594	692	42CrMo4C 42CrMo4V	-	je 4x AM10x1	0 - 0.10	0 - 0.25



Limiting load diagram for "compressive" loads

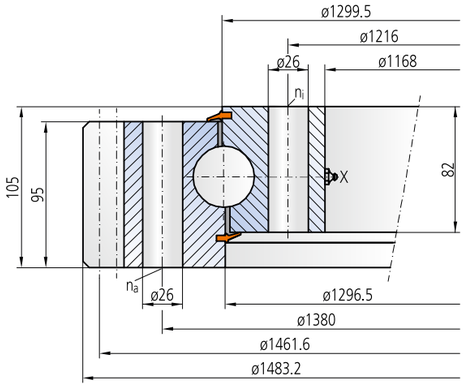


Please adhere strictly to the rules given in the Technical Information section when using above graph!

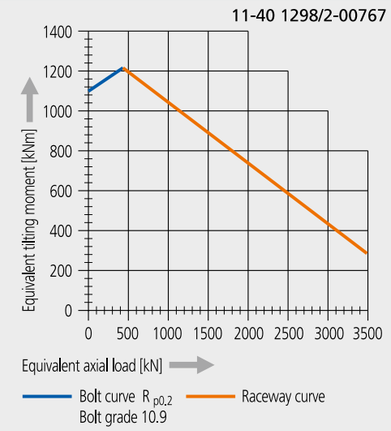
Size 11-40 1298/2-00767

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	Static	dynamisch	dynamisch	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]
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



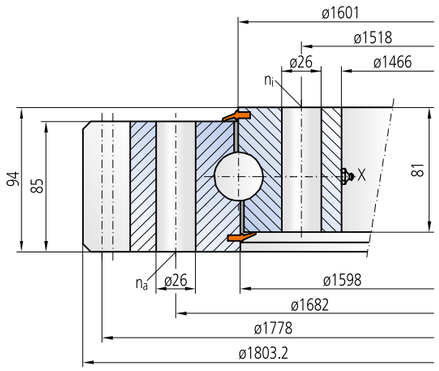
Limiting load diagram for "compressive" loads



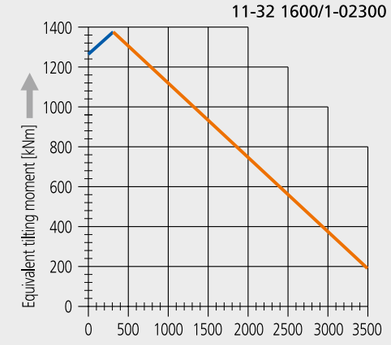
Please adhere strictly to the rules given in the Technical Information section when using above graph!

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	Static	dynamisch	dynamisch	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]
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



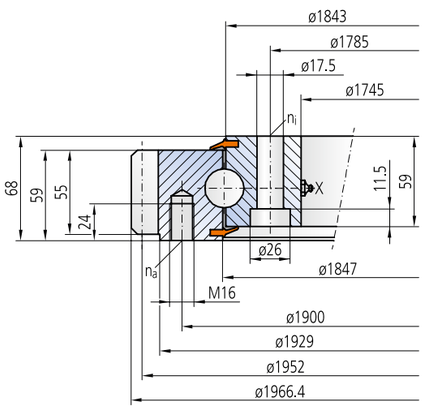
Limiting load diagram for "compressive" loads



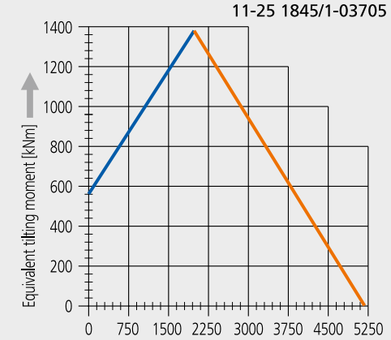
Please adhere strictly to the rules given in the Technical Information section when using above graph!

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	Static	dynamisch	dynamisch	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]
261	36	36	8	244	0.00	27	48	1951	5220	543	633	C45N	-	6 x AM10x1	0 - 0.10	0.10 - 0.20



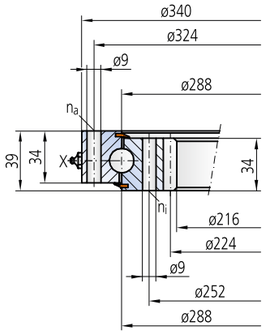
Limiting load diagram for "compressive" loads



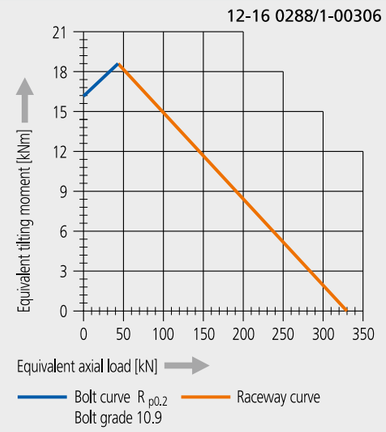
Please adhere strictly to the rules given in the Technical Information section when using above graph!

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	Number of teeth	Addendum modification coeff.	Permissible tooth force	Maximum permissible tooth force	Load ratings: Static		dynamisch		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]
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

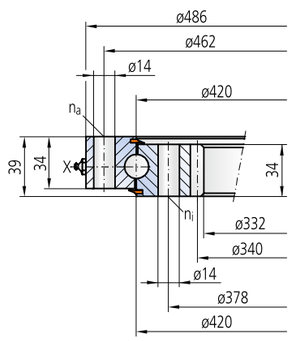
Weight	Mounting holes: Number of holes, outer ring	Mounting holes: Number of holes, inner ring	Gearing and tooth forces: Module	Number of teeth	Addendum modification coeff.	Permissible tooth force	Maximum permissible tooth force	Load ratings: Static		dynamisch		Material, inner / outer ring	Transport 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]
24	16	16	4	66	-	8	16.5	262	702	154	179	42CrMo4V C45N	-	2 x AM8x1	0 - leichte Vorspannung	0 - leichte Vorspannung

Limiting load diagram for "compressive" loads

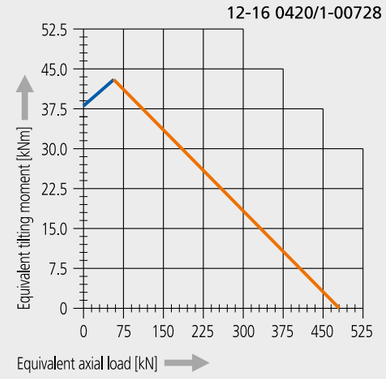
Please adhere strictly to the rules given in the Technical Information section when using above graph!

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	Number of teeth	Addendum modification coeff.	Permissible tooth force	Maximum permissible tooth force	Load ratings: Static		dynamisch		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]
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



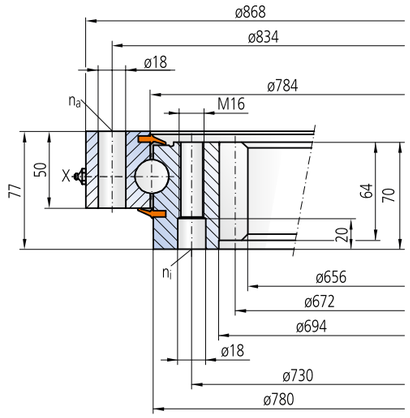
Limiting load diagram for "compressive" loads



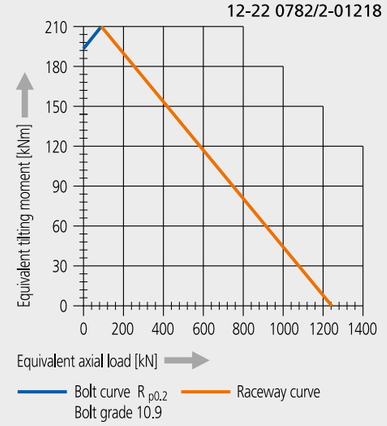
Please adhere strictly to the rules given in the Technical Information section when using above graph!

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		dynamisch		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

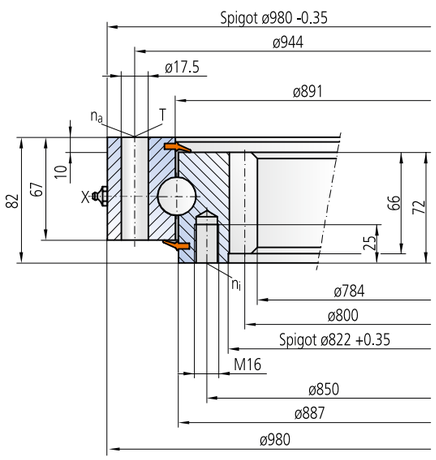
Weight	Mounting holes: Number of holes, outer ring	Mounting holes: Number of holes, inner ring	Gearing and tooth forces: Module	Number of teeth	Addendum modification coeff.	Permissible tooth force	Maximum permissible tooth force	Load ratings: Static		dynamisch		Material, inner / outer ring	Transport 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

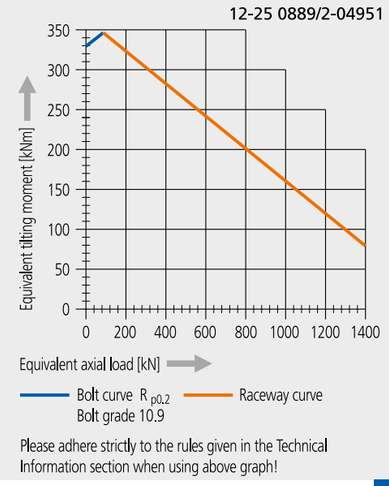
Please adhere strictly to the rules given in the Technical Information section when using above graph!

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		dynamisch		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	176	312	363	42CrMo4V	4 x M10	4 x AM10x1	0.06 - 0.25	0.11 - 0.41



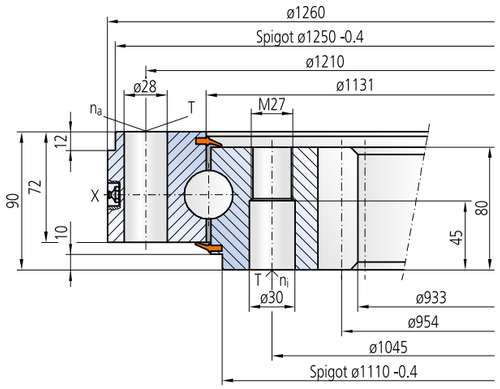
Limiting load diagram for "compressive" loads



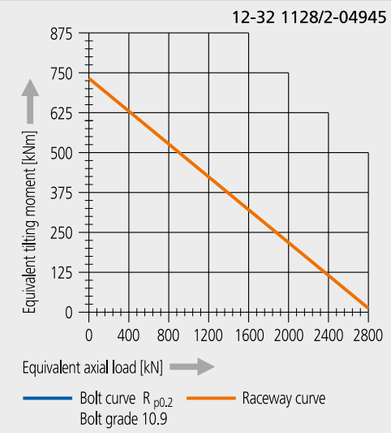
Please adhere strictly to the rules given in the Technical Information section when using above graph!

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	Number of teeth	Addendum modification coeff.	Permissible tooth force	Maximum permissible tooth force	Load ratings: Static	Static	dynamisch	dynamisch	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]
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



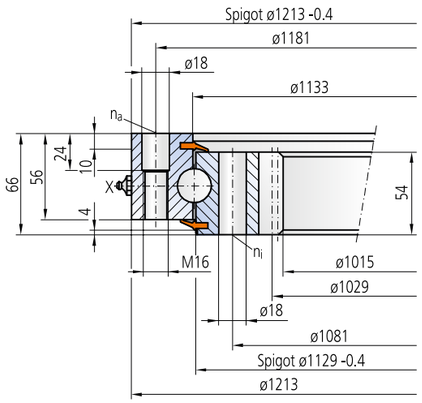
Limiting load diagram for "compressive" loads



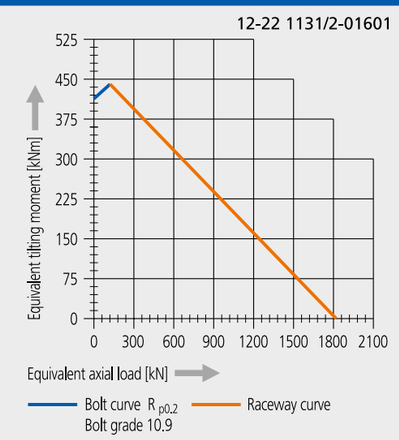
Please adhere strictly to the rules given in the Technical Information section when using above graph!

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	Number of teeth	Addendum modification coeff.	Permissible tooth force	Maximum permissible tooth force	Load ratings: Static	Static	dynamisch	dynamisch	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]
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



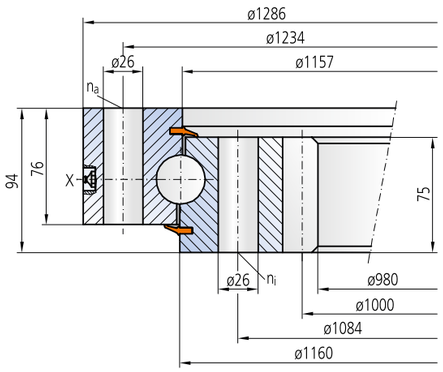
Limiting load diagram for "compressive" loads



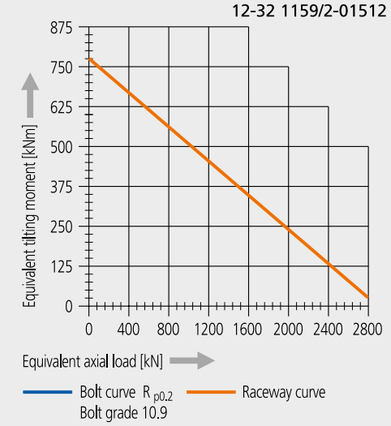
Please adhere strictly to the rules given in the Technical Information section when using above graph!

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	Number of teeth	Addendum modification coeff.	Permissible tooth force	Maximum permissible tooth force	Load ratings: Static	Static	dynamisch	dynamisch	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]
269	42	42	10	100	-	64	112	1084	2901	447	521	42CrMo4V C45N	-	4 x AM10x1	0.08 - 0.32	0.13 - 0.52



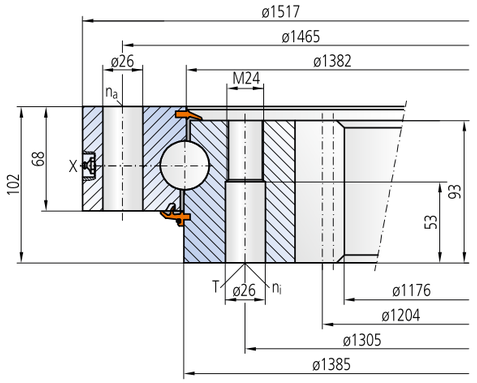
Limiting load diagram for "compressive" loads



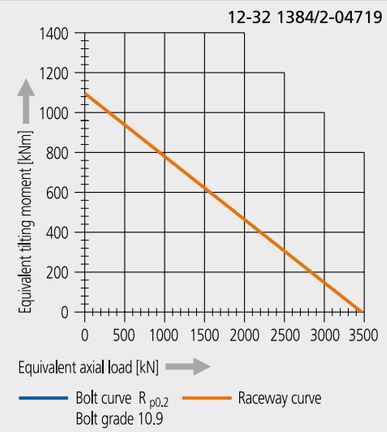
Please adhere strictly to the rules given in the Technical Information section when using above graph!

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	Number of teeth	Addendum modification coeff.	Permissible tooth force	Maximum permissible tooth force	Load ratings: Static		dynamisch		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]
432	48	48	14	85	-0.50	109	183	1295	3464	477	556	42CrMo4V	3 x M16	6x 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

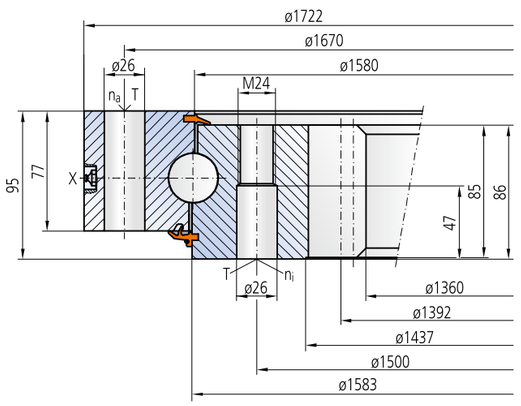
Weight	Mounting holes: Number of holes, outer ring	Mounting holes: Number of holes, inner ring	Gearing and tooth forces: Module	Number of teeth	Addendum modification coeff.	Permissible tooth force	Maximum permissible tooth force	Load ratings: Static		dynamisch		Material, inner / outer ring	Transport 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]
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

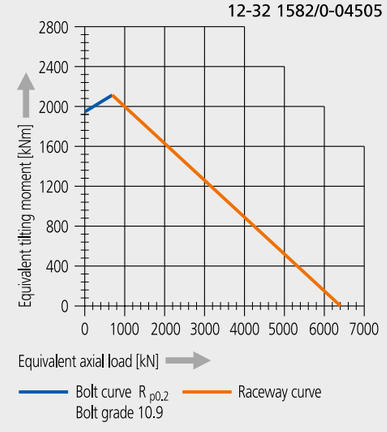
Please adhere strictly to the rules given in the Technical Information section when using above graph!

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	Number of teeth	Addendum modification coeff.	Permissible tooth force	Maximum permissible tooth force	Load ratings: Static		dynamisch		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]
469	60	60	16	86	-.050	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 fill in the form and return to:

IMO GmbH & Co. KG - Imostraße 1 - 91350 Gremsdorf, Germany
Fax: +49 9193 6395-4145
Email: slewing.rings@imo.de

1. Contact / Customer

Company | Home page
Contact person | Email
Street | Phone
Country | Fax
ZIP/City

2. Application description (please include a drawing)

Are detailed specifications available? (Please countercheck them with this sheet). Please briefly describe the application.

New design Yes ☐ No ☐ > Existing type/drawing:

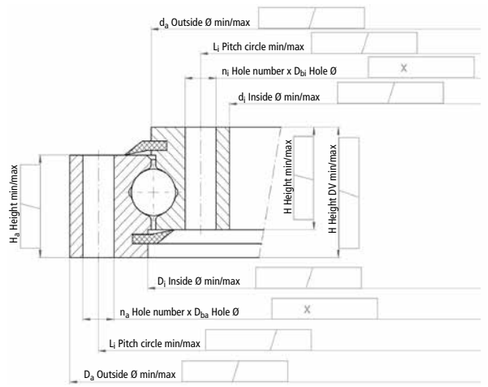
What must be given special consideration? What problems arose? Application-specific requirements?

Operating temperature Minimum ☐ °C Normal ☐ °C Maximum ☐ °C
Survival temperature (outside of operation) Minimum ☐ °C Maximum ☐ °C
Are special seals required? No ☐ Yes ☐ against
Are inspection reports required? No ☐ Yes ☐ which (e.g. 3.1 according to EN 10204)
Are acceptances required? No ☐ Yes ☐ which (e.g. 3.2 according to EN 10204)
Standards/certifying authorities to be considered? No ☐ Yes ☐ which (e.g. Lloyds, ISO, DNV, GL, etc.)
Anti-corrosion agent desired? No ☐ Yes ☐ which (e.g. galvanization, paint, etc.)

Position of rotation axis: Vertical ☐ Horizontal ☐ Changing ☐ α ☐ Degrees middle position of rotation axis +/- β ☐ Degrees angle range

3. Dimensions of the slewing ring

Specify minimum and maximum values.
Please enter fixed dimensions under „min“.
Please include drawings, if available.



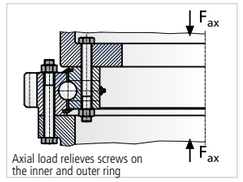
4. Gearing (If possible, please include a drawing of the pinion.)

Which ring is geared: internal ☐ external ☐ none ☐

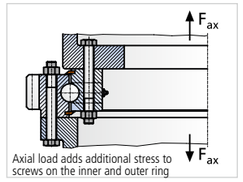
		Slewing ring	Drive pinion	Number of drives / pinions
Module	m	☐ mm		☐
Number of teeth	z	☐	☐	
Tooth width	b	☐ mm	☐ mm	Center distance
Profile correction factor	x	☐	☐	☐ mm
Head height adjustment factor	k	☐	☐	
Helix angle	beta	☐ °		

5. Loads / Load type

Supported load ☐ Hanging axial load ☐ Mixed axial load ☐

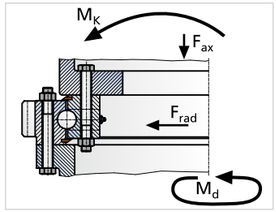


Axial load relieves screws on the inner and outer ring



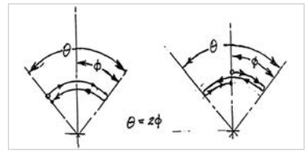
Axial load adds additional stress to screws on the inner and outer ring

	Inner ring	Outer ring
Tensile force on		
Compressive force on		



Load-increasing application factors must be included in the loads.

			Operating load during the rotary motion		Load during downtime of the bearing	
			Normal	Maximum	Maximum	Extreme load
Axial load	F_{ax}	kN				
Radial load	F_{rad}	kN				
Tilting moment	M_k	kNm				
Gear circumferential force	f_z	kN				
Torque (slewing ring)	M_d	kNm				
Duty percentage	ED	%				
Continuous rotation without interruption						
Rotational speed (slewing ring)	n	rpm				
Rotational speed max. (slewing ring)	n_{max}	rpm				
Operating hours per year		h/a				
or: Rotary motion with interruption → cycle description:						
Slewing angle	θ	Degrees				
Angular acceleration	α_b	rad/s²				
Slewing time	t_{s1}	Sec.				
Interruption time	t_{u1}	Sec.				
Number of cycles per operating hour		1/h				
Operating hours per year		h/a				



Shocks or vibrations
No ☐ Yes ☐

Direction of rotation
Same ☐ Changning ☐

Equipment utilization time in years ☐ a

6. Issue of offer

Foreseeable annual requirement ☐ Units/year
Planned lot size ☐ Unis/delivery
Desired delivery time ☐ Weeks
Customer price proposal ☐ Euro/unit
Desired offer date ☐

7. Comments

Date **Name of the editor**

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Notes

Quality Assurance
DIN EN ISO 9001 certified

Inspection of a roller bearing by means of 3D measurement equipment

For custom configurations we provide inspection reports according to DIN EN 10204 for material and/or the final slewing ring. Material certificates document the chemical composition and the mechanical characteristics.

During the final testing the slewing ring diameter and the surface condition are inspected before the bearing is ready for delivery.

Quality Assurance

DIN EN ISO 9001 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 DIN EN ISO 9001 certified procedures.

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References:

References

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