



Global Bearing Services B.V.

General Technical Information Slewing Bearings

SUPPORT STRUCTURES

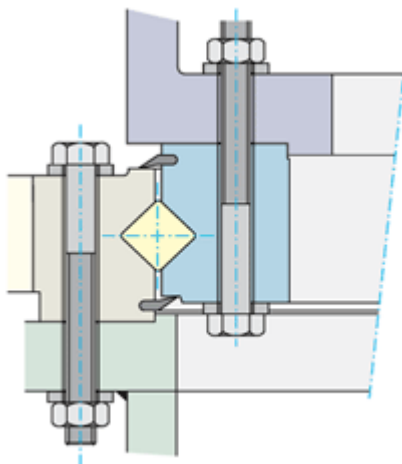
CHASSIS DESIGN

The slewing ring has a moderate axial stiffness : the diameter is large compared to the cross section.
It must be mounted on a machined supporting base, ensuring sufficient stiffness with regard to the loads to be transpitted.
This makes it possible to ensure an even distribution of stresses and to avoid any deformation during operation, which would be harmful to the good working of the ring.

Therefore, it is necessary to use supporting bases with a minimum thickness not less than the values indicated in the table above.
The width of the supporting surfaces is to be at the least equal to that of the ring

Raceway mean diameter (mm)	500	750	1000	1250	1500	2000	2500	3000	4000	5000	6000
Minimum thickness (mm)	25	30	35	40	50	60	70	80	100	120	150

We recommend structural reinforcements in a circular frame placed directly beneath the raceway.
For better loading uniformity, thick circular frames are preferred to thin reinforcements with ribs.





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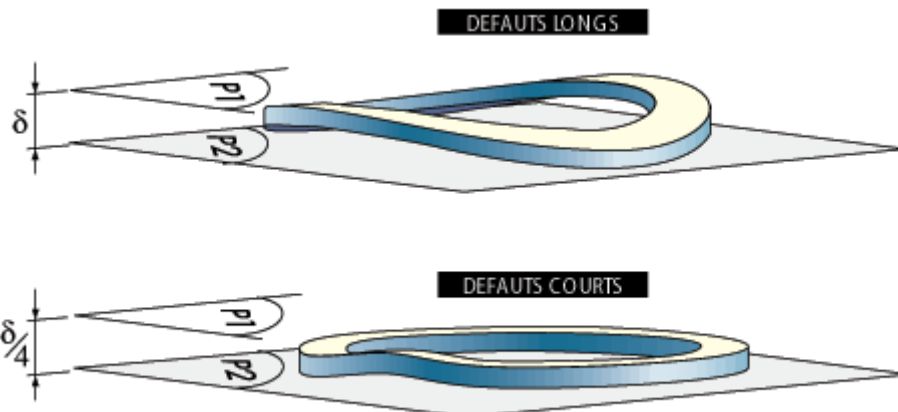
SUPPORT STRUCTURE TOLERANCES

Shape defects of the supports lead to deformation of the raceway.
This can cause tight spots or possible seizure and will reduce the bearing service life.
The maximum flatness defects must not exceed the values of the following table.

Raceway mean diameter (mm)	500	750	1000	1250	1500	2000	2500	3000	4000	5000	6000
Maximum tolerance Crossed roller (mm)	0,10	0,12	0,15	0,18	0,20	0,25	0,29	0,32	0,43	0,46	0,50
Maximum tolerance Balls (mm)	0,12	0,18	0,21	0,25	0,28	0,33	0,38	0,42	0,45	0,50	0,55

These maximum values are allowable for "long waves" in the circumferential direction.

"Short waves" for example between two fastening holes, must not exceed 1/4 of the values (see sketch below).
Waves in the radial direction (conicity) must be less than 0,05 mm/m of raceway mean diam.



STIFFNESS TOLERANCES

The stiffness of the supporting structures must be such that deflections do not exceed the values of the following table under maximal load.

Raceway mean diameter (mm)	500	750	1000	1250	1500	2000	2500	3000	4000	5000	6000
Maximum deflection(mm)	0,25	0,30	0,35	0,45	0,55	0,65	0,81	1,00	1,25	1,8	2,4

PLASTIC CEMENTS

If the above tolerances could not be met, then Epoxy-type resins can be used instead of finishing-machining of the surfaces.

Several products are possible depending on the dimensions and the amount of out of flatness to be compensated.
More information is available from our sales department.



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TRANSPORT HANDLING

Our slewing rings are carefully packed (wrapped) in order to avoid any damage during transport.

However during the transport the bearing needs to be protected against the environment.

(the wrapping is not suitable to expose the bearing to an outside environment.)

Transport and storage are to be carried out in horizontal position only; transport in other positions requires special methods.

As with any mechanical precision part, the rings must be handled with care avoiding any shocks, particularly along the radial axis.

Handling should be carried out with suitable equipment for the weight of the part.

DELIVERY - STORAGE

The packed (wrapped) rings have a greased or oiled surface allowing limited storage in a covered and temperate environment.

A suitable protection must be applied for longer storage. It is necessary to regrease before taking the bearing in operation.

UNPACKING - PREPARATION

When unwrapping the bearing :

- Take care not to cut the protective seals when removing the packing paper.
- Cut this paper, preferably on the external diameter, and not on the upper or lower faces. When degreasing the bearing :
- Use a standard commercially available solvent. **Chlorine containing solvents are prohibited.**
- Take care not to introduce any solvent under the seals or in the raceways.
- Before fitting the grease nipples or junction pipes, remove the caps or screws from the greasing holes.



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INSTALLATION

WHEN INSTALLING THE BEARING :

Structure

- Make sure that supporting structures comply with specifications
- Check for chips, weld seam particles, corrosion signs, etc.
- Check the good mating of the rings on the supports.

SPIGOTS

When loads along the radial axis are important, especially when the bearing is placed vertically, it is then mandatory to use the centerings provided for that purpose.

The intercalative structural adhesive type LOCTITE 586 provides a good means to limit the relative displacements between rings and supports.

POSITIONING

The hardening junction which is marked by a red/green line on the geared ring, and located at the filler plug on the other ring, must be placed **at 90° to the main load axis** or to the arm supporting the load.

Fastening

- Check that fasteners are really of the recommended grade, e.g. marked 10.9 on the head and that threads are properly lubricated.
- For bearings the use of treated hardened flat washers is required as follows :
- the yield strength is greater than or equal to 600 Mpa,
- the diameter $DR = 2 d$,
- the thickness $h > 0,3 d$.

The elastic washers type Belleville, Grower or others of whatever type or pattern are absolutely prohibited and will void all warranty.

- Install all fasteners and tighten lightly.
- Then tighten to the specified value using a properly calibrated torque wrench ; hydraulic devices are advisable.
- Use a "star shape" pattern when torquing which ensures a uniform tightening over the whole periphery.

The tightening torque to be applied is defined in the following table for bolt grade 10.9 and a screw/nut friction factor of 0,12 according to VDI 2230.

TIGHTENING TORQUE

Clamping Force and Tightening Torque **0,75 X** Yield Strength

For Quality **10.9** with Yield Strength **940 N/MM2**

Tightening Strength = **743 N/MM2**

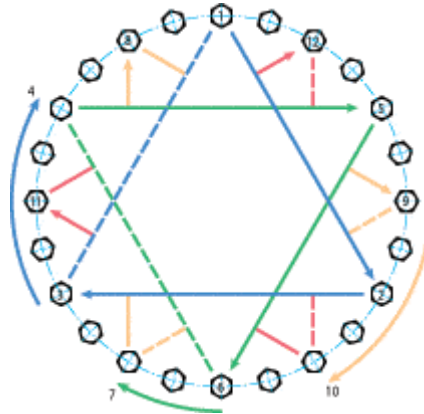
Tightening method < M30 Torque manual/hydraulic
 > M30 Always hydraulic puling of the bolt/rod end

DIAM	SW	BZK	Clamping Force KN	Tightening Torque NM
M12	22	10	56	117
M14		12	77	184
M16	27	14	106	279
M18		14	129	387
M20	32	17	166	558
M22	36	17	208	747
M24	41	19	239	954
M27	46	19	315	1395
M30	50	22	385	1890



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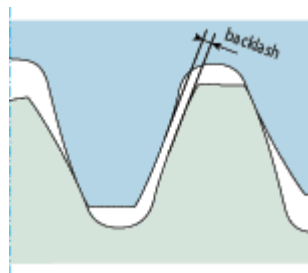
STAR-SHAPED TIGHTENING



WHEN INSTALLING THE PINION

Gear

- The pinion should be located approximately at 90° of the major loading axis.
- Adjust the driving pinion to the maximum eccentric point of the ring gear, marked by a blue/red line.
- At this stage, the backlash must be within the limits of the calculated values or minimum at 0,05 x module.
- When several pinions are used, each one must be adjusted to the same conditions.
- During tests, make sure that good alignment of the pinion and of the slewing ring axes permits a satisfactory contact across all the gear width.
- Before running, lubricate the teeth of the slewing ring gear and of the pinion



Tests - inspections

After final tightening of all fasteners :

- Rotate the ring for at least 3 turns.
 - Recheck the backlash value on the gear mesh over one full revolution.
 - Measure the total deflection under a known load. The checked points should be marked.
- It is advisable to register these values in a maintenance logbook specific to the machine,

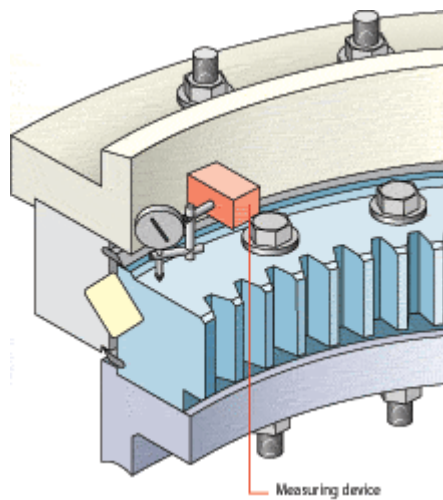


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Operating process :

- Place a measuring device between the two rings as close as possible to the raceway on the main load axis : precision grade 0,1 mm minimum.
- Calibrate to zero, under a known load.
- Apply a measured load.
- Read the deflection value at the point considered.
- Repeat this measurement in the previously marked points.
- Take into account the deflection of the support chassis and the fasteners elongation corresponding to the instrument position.

DEFLECTION MEASUREMENT UNDER LOAD MOUNTED SLEWING RING





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MAINTENANCE - LUBRICATION

A suitable lubrication is essential for the longevity of the raceways and gears.
The operating conditions such as loads, temperatures, speeds, vibrations, etc... determine the choice of lubricant.

RACEWAY

Unless otherwise specified, the slewing rings are delivered greased.
Standard grease : ESSO BEACON EP 2 or equivalent.

Main properties required for multipurpose grease :

As being a significant component of the bearing, grease will improve the bearing capabilities and lifetime.

Recommendations for bearing lubricant :

- Lithium-base soap.
- Minimum viscosity of the base : 150 mm²/sec.
- Grade NLGI 2.
- Anti-wear and extreme pressure additives.
- Service temperature : - 30° C to + 120° C
- 4 ball test : weld load : ASTM D 2596 (NT24) > 300
- Maximum NDM : for balls = 60 000 for rollers = 30 000

GEAR

greased or oiled surface protection against oxidation is applied.

GREASING HOLES

Radially or axially located, depending on design, these holes are generally tapped M10 x pitch 1.00 and closed by caps or screws.
Remove these plugs before fitting the slewing ring with grease nipples or linked to a centralized lubrication system.

Caution:

The filler plug for the rolling elements has a blind tapped hole which is not a greasing hole.

REGREASING METHODS

Whenever the application allows it, greasing must be carried out during rotation at slow speed, on two revolutions minimum, through all the greasing holes.

GREASING FREQUENCY

Raceway and gear.

The greasing frequency varies according to utilization and environment.

We recommend regreasing every 150 hours in normal usage.

This frequency is to be reduced to 50 hours when the conditions of application are severe or if the environment is dusty or wet.

Greasing is required, before and after a long idle period.

Regrease every 6 months, while rotating, during prolonged idle periods.

GREASE QUANTITY

Raceway :

The grease quantity is defined by the Engineering Department whenever a detailed bearing calculation is provided.

Approximate practical formula to determine the minimum necessary quantity "Q" in cm³ :

$Q = 0,005/3 \times D \times H$ with :

D = raceway mean Ø of the bearing in mm.

H = overall height of the ring in mm.

In all cases, a light extrusion of new grease must appear at the protection seal lips.

Gear :

The grease must entirely cover the flanks of the pinion and of the ring gear whether applying by brush or spraying.



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CORRESPONDANCE TABLE

According to our experience, the greases mentioned in the opposite table are compatible with each other and with the components of the bearings.

It is possible to use other lubricants provided that you are sure of their compatibility with the standard recommendation beforehand. Greases containing molybdenum disulphide MoS₂ are strictly forbidden!

BEARING	GREASE BRAND	GEAR
Aralub HLP2	ARAL	Aralub LFZ1
Rhus L 474/2	MOTUL/BECHEM	Berulit GA 400
Energrease LS - EP2	BP	Energol WRL/GR 154 GS
Grease LMX	CASTROL	
Epexa 2 / Epexelf 2	ELF	Cardrexa DC1
Beacon EP2	ESSO	Surret Fluid NX
Mobilux EP2	MOBIL	Mobilgear OGL 007
Retina EP2 - Alvania EPLF2	SHELL	Mallés GL 205
Multis EP2 - Lical EP2	TOTAL FINA ELF	Ceran AD

This table is subject to change in accordance with the manufacturers' research works

PREVENTIVE MAINTENANCE

PROTECTION SURVEY

A visual examination makes it possible to ensure the integrity of the protective seals :

- Absence of excessive stretch or rips,
- correct positioning,
- wear of the friction lip.

If necessary, replace the seal.

After regreasing, wipe clean residue of old grease and check for pollutants such as sand, coal, metallic particles, etc.

FASTENER SURVEY

It is particularly important to check that the required preload level of the bolts is still maintained as the fasteners of the slewing rings are essentially working in fatigue.

We recommend retightening the fasteners after the first two to four months of utilization and then proceeding to a systematic yearly check.

If any bolt is found loose, a further in deep examination is essential. The necessary preservative measures must then be exercised. Some regulations impose the replacement of fasteners every 5 years or every 10 000 working hours.

In any case, refer to local rules and regulations enforced connected with the application.

ORIENTATION SURVEY

During cleaning prior to regreasing of the gear :

- Check carefully for any foreign body at the tooth root, ring and pinion.
- Check the even load distribution of the pinion on the entire width of the ring gear and correct the alignment of the axes if needed.
- Check the backlash value.



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CHECKING THE DEFLECTION UNDER LOAD

We deliver its bearings with a preload ensuring proper functioning and optimum safety. During the product life, the preload decreases resulting in a noticeable increase of deflection under load. The bearing must be replaced when the deflection becomes incompatible with the proper functioning of the machine and with the required safety conditions for the type of material used.

ROTATION SURVEY

To quantify the wear factor, it is necessary to know the deflection under load.

- In new condition : J_0
- At time of survey : J_1

These measurements are made under the same initial conditions after having checked the tightening of fasteners. It is most advisable to register the measured values in the maintenance logbook specific to the machine.

Wear is the difference : $u = J_1 - J_0$.

- The bearing must be placed under survey when : $u \geq J_0$.
- Its replacement must be considered when : $u \geq 1,5 J_0$. and it is required when : $u \geq 2 J_0$.

In any case, refer to laws and regulations in force pertaining to the application in the concerned country.