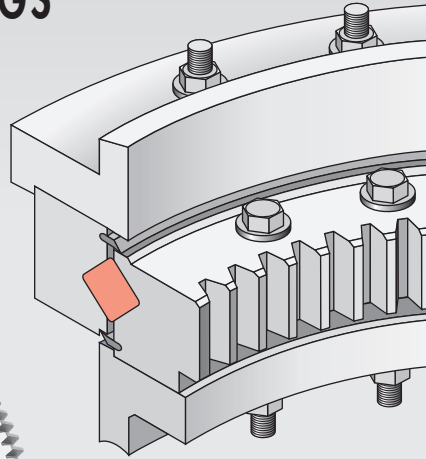
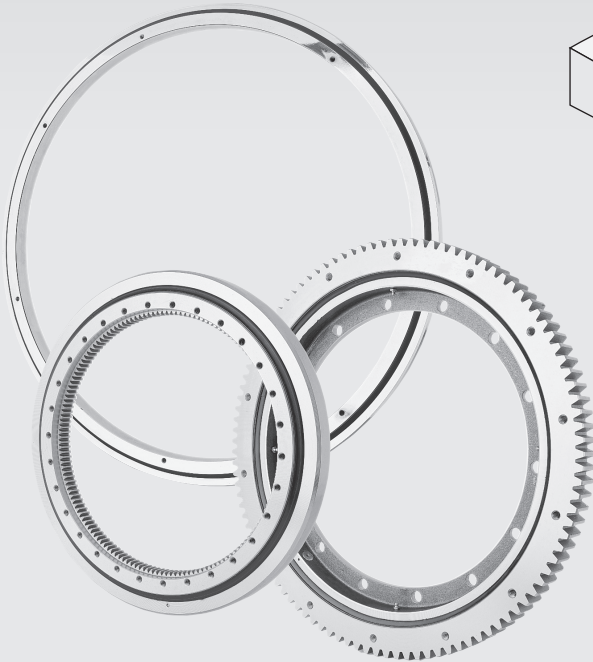




INSTALLATION AND MAINTENANCE SLEWING RINGS SPECIAL BEARINGS



GRUPE DEFONTAINE

We congratulate you on having chosen a ROLLIX slewing ring and we are sure that you will be totally satisfied by this product when employed following the conditions of use recommended by ROLLIX DEFONTAINE

WARNING

The guarantee given by ROLLIX is only valid as long as the instructions for assembly, use and maintenance of slewing rings, as laid down in the ROLLIX technical literature and catalogue, are followed.

In particular nominal, or exceptional loads should not exceed the capacity of the bearing, gear and attachment. Only bolts recommended by ROLLIX must be used for fixing holes.

STRUCTURES

SUPPORTS 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 transmitted. 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.

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

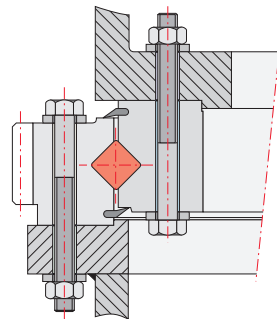
FITTING

The use of a slewing ring in any specific application calls for certain precautions or operations to be carried out prior to ensure that the ring is operating under the best conditions and gives the service life expected.

The following will assist in enabling the fitting operation to be carried out correctly.

INFORMATION

This manuel and instruction booklet is available in several foreign languages, that you can obtain from us upon simple request. We draw your attention so that you include our maintenance and proposal in those of your machine or failing that, to transmit it to the user.



The width of the supporting surfaces is to be at least equal to that of the ring.

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.

STRUCTURES

SHAPE TOLERANCES

Shape defects of the supports lead to deformations of the raceway. This can cause tight spots or possible seizure and will reduce the bearing service life.

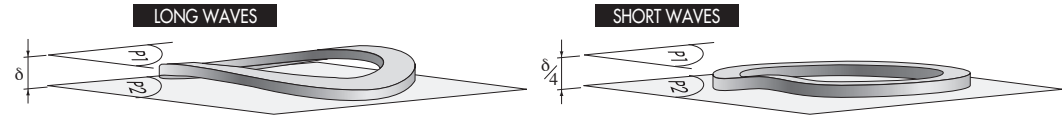
The maximum flatness defects must not exceed the values of the below table.

Raceway mean diameter (mm)	500	750	1000	1250	1500	2000	2500	3000
Maximum tolerance Crossed roller (mm)	0,10	0,12	0,15	0,18	0,20	0,25	0,29	0,32
Maximum tolerance Ball (mm)	0,12	0,18	0,21	0,25	0,28	0,33	0,38	0,42

SUPPORTING STRUCTURES

These maximum values are allowed for "long waves" in the circumferential direction. "Short waves" for example between two fastening holes, must not exceed 1/4 of the values in the below table.

Waves in the radial direction (conicity) must be less than 0,05 mm / m of raceway mean Ø.



STIFFNESS TOLERANCES

The stiffness of the supporting frames must be such that deflections do not exceed the values of the

below table under maximum load.

Raceway mean diameter (mm)	500	750	1000	1250	1500	2000	2500	3000
Maximum deflexion (mm)	0,25	0,30	0,35	0,45	0,55	0,65	0,80	1,00

PLASTICS CEMENTS

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

Several products are possible depending on the

dimensions and the amount of out of flatness to be compensated. Detailed instructions are available from our Commercial department.

INSTALLATION

TRANSPORT - HANDLING

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

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, which is indicated on the identification tag.

DELIVERY - STORAGE

The packed rings have an anticorrosive surface protection allowing a 6-month-storage in a covered and temperate room.

A suitable protection must be applied for longer storage.

It is necessary to regrease after each 18-month-period (see paragraph MAINTENANCE - LUBRICATION).

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 plastic caps or the Hc screws from the greasing holes.

WHEN INSTALLING THE BEARING :

STRUCTURE

- Make sure that supporting structures comply with specifications (see chapter STRUCTURES).
- 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.

See our technical instructions IT ETR 521, available upon request.

POSITIONNING

The hardening junction which is marked by a red 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 (see chapter MARKING).

INSTALLATION

FASTENING

- Check that the fasteners are really of the recommended grade, e.g. marked 10.9 on the head and that threads are properly lubricated.
- For bearings in normalized steel Z or N, the use of treated hardened flat washers is required as follows :

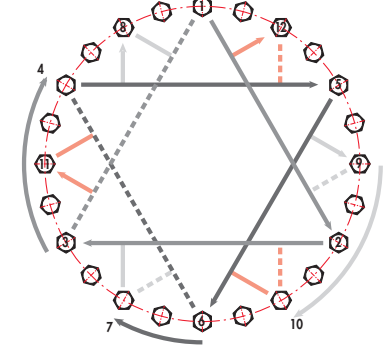
- the yield strength is greater than or equal to 600 MPa,
- the diameter $D_R = 2 d$,
- the thickness $h \geq 0,3 d$.

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.

STAR-SHAPED TIGHTENING



TIGHTENING TORQUE

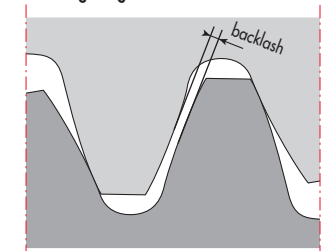
Diameter (mm)	10	12	14	16	18	20	22	24	27	30	33
Torque (N.m)	69	117	185	280	390	560	750	960	1400	1900	2600

WHEN INSTALLING THE PINION :

GEAR

- Adjust the driving pinion to the maximum eccentric point of the ring gear, marked by a blue line.
- At this stage, the backlash must be within the limits of the calculated values or minimum at $0,05 \times$ 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.

Checking the gear backlash



- Before running, lubricate the teeth of the slewing ring gear and of the pinion (see chapter MAINTENANCE).

INSTALLATION

INSTALLATION

TESTS - INSPECTION

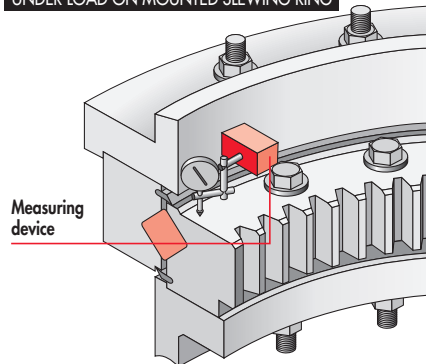
After final tightening of all fasteners :

- 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.

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 fasteners elongation corresponding to the instrument position.

DEFLECTION MEASUREMENT
UNDER LOAD ON MOUNTED SLEWING RING



MARKING

IDENTIFICATION TAG

Each ring is individually identified by a metallic tag riveted close to the filler plug on the ungeared ring.

This tag states :

- **manufacturing date,**
- **part number of the ring,**
- **its serial number,**
- **its weight in kilograms.**



CODING SYSTEM

ROLLIX bearings are designated by a part reference including numbers and letters, according to the following codes : GEOMETRY METALLURGY

06 1116 00 ZZ 1 2 A

- 06 1116 00 ZZ 1 2 A** Family
- 06 1116 00 ZZ 1 2 A** Mean raceway ball/roller pitch Ø
- 06 1116 00 ZZ 1 2 A** Variation N in the family
- 06 1116 00 ZZ 1 2 A** Material code letter ungeared ring
- 06 1116 00 ZZ 1 2 A** Material code letter geared ring
- 06 1116 00 ZZ 1 2 A** Gear treatment
- 06 1116 00 ZZ 1 2 A** Surface coating

MARKING

INSTALLATION MARKS

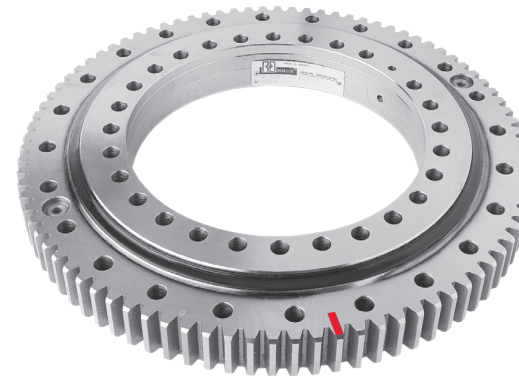
In order to permit the correct installation of the bearing, ROLLIX slewing rings are marked as follows.

Hardening junction :

- Located on the filler **plug** for ungeared ring.
 - Marked by a **red line** on the gear face for the geared ring.
- These areas must be placed as close as possible to the neutral axis of the loads : ideally at zero moment axis.

Gear run-out

- The maximum point of the gear run-out is marked by :
- **two blue lines** on the corresponding tips of the teeth,
 - a **O** stamped on the face opposite the mounting surface.
- The backlash of the driving pinion must be adjusted at this point.



MAINTENANCE

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 EP2 or equivalent.

Main properties required for purpose grease :

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

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 ND_M :
- for balls ≈ 60 000
- for rollers ≈ 30 000

GEAR

A protection against oxidation is applied.

MAINTENANCE

MAINTENANCE - LUBRICATION

GREASING HOLES

Radially or facially located, depending on design, these holes are generally tapped M10 x pitch . 1.00 and closed by plastic caps or Hc 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 Engineered Department whenever a detailed bearing calculation is provided.

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

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

D = raceway mean Ø of the bearing in mm.

H = overall height of the ring in mm.

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

Gear

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

SPECIFIC APPLICATIONS

Upon request, the ROLLIX Engineering Department will provide solutions for extreme conditions : temperature, speed, etc.

See our data sheet IT ETR 551.

CORRESPONDANCE TABLE

According to our experience, the grease mentioned in the below 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 ROLLIX 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/BECHER	Berulit GA 400
Energrease LS - EP2	BP	Energol WRL/GR 1.54 GS
Grease LMx	CASTROL	
Epexa 2 / Epexelf 2	ELF	Cardrexa DC1
Beacon EP2	ESSO	Surret Fluid NX
Mobilux EP2	MOBIL	Mobilac 81
Calithia EP2	SHELL	Malléus Fluid D

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

MAINTENANCE

PREVENTIVE MAINTENANCE

PROTECTION SURVEY

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

- absence of excessive stretch or tears,
- 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.

ROLLIX recommends to retighten the fasteners after the first two to four months of utilization and then proceed 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 seven years or every 14 000 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.

UTILIZATION LIMITS

CHECKING THE DEFLECTION UNDER LOAD

ROLLIX delivers 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 : J₀
- At time of survey : J₁

These measurements are made under the same initial conditions after having checked the tightening of fasteners (see chapter *INSTALLATION, Tests - Inspection*).

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.

The "slewing ring" product is a high technology product selected for precise parameters. It was designed and manufactured to the ISO 9000 standard and supplied based on the informations given in the questionnaire IT ETR 911. It will give you trouble free service if the operating conditions are in line with "ROLLIX" recommendations.

You are a designer, an installer or a retailer, it is your responsibility to check that your or your user's need have been correctly identified in our questionnaire IT ETR 911, that the installation requirements and our product maintenance conditions have to be fully respected.

In order to help you, we enclose a check-list which although not comprehensive, covers the minimum essential checks which have to be carried out in all cases.

In addition we suggest you make yourself aware of our guarantee conditions and their limitations.

CHOICE OF THE SLEWING RING

To choose a suitable slewing ring, did you take into consideration :

- the nominal loads
 - the overloads due to :
 - wind
 - snow
 - operating conditions
 - the loads due to dynamic effects
 - peak load
 - test overload
- This for :
- the raceway
 - the gear
 - the bolting
 - the maximum utilization speed

On receipt,

be sure that the slewing ring you receive is the one you have ordered (identification plate).

Storage conditions

- During the storage time, has the product been protected against external contamination ?
- If storage has exceeded 18 months, has the slewing ring been regreased before installation ?

Before assembly,

be sure that the product has not been subjected to shock loads resulting in an alteration of its characteristics (irreversible deformation) :

- seals are in place
- seals are not damaged (cut)
- your handling equipment are suitable for the product :
 - quality
 - size
 - weight

During assembly,

check :

- the flatness for the supporting base
 - the dimensions of the structure
 - the position of the filler plug
 - the position of the hardening junction
- in relation to the axis of maximum moments.

During fastening,

check :

- the grade of screws and bolts
- the numbers of bolts used
- the specified tightening torque
- that the tightening torque is achieved using properly lubricated threads
- that split, fan-shaped or elastic washers are not used
- that hardened flat washers are used if required

Assembly of the pinion gear (if necessary),

check :

- the pinion corresponds to the gear of the slewing ring
- there is no risk of interference
- the minimum backlash is maintained
- the measurement is determined at the point of :
 - maximum offset of the external gear
 - maximum offset of the internal gear
- the slewing ring/pinion center distance cannot vary
- the contact area of the pinion on the slewing ring gear face is uniform

Before operation,

be sure :

- the maximum slewing ring speed will not exceed the calculated value

- no objects will foul the slewing ring rotation
- no objects will damage the seals
- the slewing ring and its pinion do not cause any danger
 - to material
 - to people
- that protection complies with the recommendations of 89/392 CEE

check :

- the deflection under the maximum design load and record the results
- the rotation is without abnormal noise or tight spots

After operation,

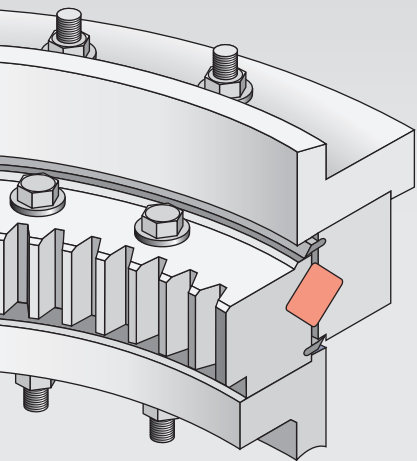
be sure :

- no deformation can affect the functioning of the assembly
- no deformation can decrease the product life ...

In operation,

be sure that the user :

- knows the lubrication specifications and in particular :
 - type of grease
 - frequency of lubrication
 - the method of regreasing
- and this for :
 - the rolling elements
 - the gear
- will observe the condition of seals
- knows the frequency
 - of checking bolt tightening
 - of bolt replacement
- knows the maximum permissible clearance in the product before dismounting
- or the designed maximum clearance allowable



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