

USER MANUAL

Production of slewing rings, gear wheels and machine elements.

TRANSPORTATION, INSTALLATION AND MAINTENANCE OF LARGE SIZE SLEWING RINGS

1. Transportation:

Due to unstable construction large size slewing rings from Ø200 to Ø5000 mm of different structural shapes, when transported, should be handled with special care. For transportation handling, large size slewing rings are provided with special boreholes for clamping bolts, by which the slewing ring is fixed and ready for transportation.

2. Storing:

When transported and stored, slewing rings should be placed in a horizontal position on a flat and level surface. Any shocks and impacts on the slewing rings must be prevented, especially in radial direction. For a long-term storage, dry and dust-free storage with ambient temperature from -20°C to +50°C is recommended. Relative air humidity should not exceed 65%. All the slewing rings are protected against corrosion for ca. 12 months.

3. Lubrication:

Tracks of slewing rings are lubricated with prescribed high-quality grease. The toothing of the gear-tooth system is not greased and therefore has to be greased before installation.

Depending on operating conditions, environmental influences and slewing ring implementation, the slewing rings must be lubricated again at specified intervals.

Slewing bearing should be relubricated before the first run test, and prior to putting the slewing bearing into operation.

Automatic lubricating procedure should be repeated weekly or daily and manual lubricating procedure should be repeated at least every 3 months. With a slewing ring subject to high humidity, significant temperature variation and high number of revolutions, the lubricating procedure should be repeated more frequently! During the lubricating procedure slewing rings must rotate.

We recommend the following lubricants:

- CASTROL SPHEEROL EPL2
- MOBILITH SHC 220
- MOBIL- MOBILUX EP2

Grease should stay the same or equivalent to the first application.

4. Installation:

Installation work has to be performed according to instructions of the manufacturer and general requirements for installation of machine elements requiring careful attention and precise accuracy. Large slewing rings should be mounted only by prudent and specially skilled fitters. The mounting surfaces as well as the slewing ring are to be cleaned from any impurity. Paint, remains of grease and slushing oil are to be removed. Care is to be taken, not to damage the seals during cleaning and to prevent contact with corrosive agents.

Careful attention is to be paid to assure that the connecting piece of construction is even, finished with minimal variation in flatness as possible. (Variation tolerances, indicated in Table 1 are recommended!)

With regard to the maximum moment acting on the slewing ring, the slewing ring should be installed in such a way that the red mark on it is aligned with the range of the minimum moment.

On the gear the point of maximum deviation of the pitch circle is indicated by a green mark. The slewing ring and the gearing, respectively are to be installed

TABLE 1 - Permissible tolerances for plainness (P) of treated seating surfaces

| CIRCLE DIAMETER DL (mm) | DOUBLE ROW SLEWING RING | SINGLE ROW SLEWING RING |
|-------------------------|-------------------------|-------------------------|
| 900 | 0.16 | 0.12 |
| to 1300 | 0.20 | 0.16 |
| to 2000 | 0.30 | 0.20 |
| to 3000 | 0.35 | 0.25 |

TABLE 1a - Maximum permissible bending of the seating surface under maximum load

| CIRCLE DIAMETER DM (mm) | MAXIMUM BENDING (mm) |
|-------------------------|----------------------|
| 900 | 0.5 |
| to 1300 | 0.7 |
| to 2000 | 0.9 |
| to 3000 | 1.5 |

so, that at this point the tooth flank clearance of the gear and counter gear is about 0.03 modules of torsion shear.

A very important part of the mounting procedure is correct fixing of the slewing ring on the connection piece of the construction. As for the choice of screws with nuts and washers used, it is essential to follow the manufacturer's recommendations. The required physical properties of assembly screws and nuts are indicated in the stability computation, enclosed with every offer, which is made on the basis of conditions and loading data supplied by the customer.

If no data on slewing ring pressure are supplied by the customer, the manufacturer can not assume any responsibility as to the right choice of the slewing ring.

Fixing of slewing rings

Before being screwed down, the screws, nuts and washers must be degreased and only slightly oiled. Overlubricated bolts, nuts, and washers have lower friction constant, which, with the same tightening torque, results in higher tension in the bolts. In this case the bolts are to be screwed down with the lowest tightening torque indicated (see Table 2).

The bolts are to be screwed down gradually, crosswise and with specified tightening torque.

Screwing down has to be done by a scaled torque wrench. In the table the tightening torque is indicated as "MA".

For tightening of bolts, larger than M 24, use of special hydraulically-operated clamping apparatus is recommended, which can be ordered with the slewing ring.

Bolts should be tightened up after around 100 working hours, later check-ups are to be performed at 3 months intervals.

After having been screwed down, the slewing ring should be lubricated with specified grease at all points of lubrication, until the grease starts oozing out of joints.

After checking the running of the gearing system (proper backlash of the teeth) also lubricate the gear.

NOTE:

Fixing of a slewing ring on the mounting surface by clamping bolts is a very important task, which also affects safety, frequency of damages and working life of slewing rings, so let us again point out that this operation has to be performed only by a skilled and trained fitter.

Attention to the required quality of the assembly screws and nuts, as well as to the tightening torque moment, prescribed by the manufacturer is an absolute necessity.

5. Maintenance:

The construction of large size slewing ring with normal service conditions and regular maintenance ensures a long working life.

As slewing ring wear, internal clearance will increase - for specification on maximum safety clearance, please, consult the manufacturer!

Supplement: Table 1, Table 1a, Table 2

TABLE 2 - Permissible clamping powers and attachment moments for studs with normal metric thread DIN 13

| | µm | Al | As | A3 | DI | DK | FSp | MSp | Ma |
|-----|------|-------|--------------------|-------|------|----|--------|------|------|
| | 0.14 | | (mm ²) | | (mm) | | (N) | (Nm) | |
| M12 | 8.8 | 113.1 | 84.3 | 76.2 | 13.5 | 19 | 38500 | 89 | 79 |
| | 10.9 | | | | | | 54100 | 124 | 112 |
| M14 | 8.8 | 153.9 | 115.4 | 104.7 | 15.5 | 22 | 52800 | 141 | 126 |
| | 10.9 | | | | | | 74300 | 198 | 178 |
| M16 | 8.8 | 201.1 | 156.7 | 144.1 | 17.5 | 24 | 72700 | 216 | 194 |
| | 10.9 | | | | | | 102300 | 303 | 273 |
| M18 | 8.8 | 254.5 | 192.5 | 175.1 | 20 | 27 | 88400 | 298 | 268 |
| | 10.9 | | | | | | 124300 | 419 | 377 |
| M20 | 8.8 | 314.2 | 224.8 | 225.2 | 22 | 30 | 113600 | 422 | 379 |
| | 10.9 | | | | | | 159800 | 593 | 533 |
| M22 | 8.8 | 380.1 | 303.4 | 281.5 | 24 | 32 | 142000 | 570 | 513 |
| | 10.9 | | | | | | 199700 | 802 | 721 |
| M24 | 8.8 | 452.4 | 352.5 | 324.3 | 26 | 36 | 163600 | 727 | 653 |
| | 10.9 | | | | | | 230100 | 1022 | 919 |
| M27 | 8.8 | 572.6 | 459.4 | 427.1 | 30 | 41 | 215500 | 1077 | 969 |
| | 10.9 | | | | | | 303000 | 1515 | 1363 |
| M30 | 8.8 | 706.9 | 560.6 | 519.0 | 33 | 46 | 261800 | 1460 | 1314 |
| | 10.9 | | | | | | 368200 | 2053 | 1847 |

Al - section of bolt's shank (mm)

As - stress cross - sectional area of the thread (mm²)

A3 - section of thread's body (mm)

DI - inner diameter of the head's nut's seating surface (hole diameter) (mm)

DK - outer diameter of the head's nut's seating surface (width across flats) (mm)

FSp - permissible clamping power in the bolt (N)

MSp - theoretical attachment moment (Nm)

MA - attachment moment for quick-action clamp (Nm) MA = 0.9 x MSp