



slewing rings



mounting and maintenance





PRESERVATION, PACKAGING, TRANSPORT AND STORING

Before packaging the slewing rings are preserved with a liquid preservation agent providing protection against corrosion for approximately 12 months in a temperature controlled store. The store temperature should be $20 \pm 5 \text{ }^\circ\text{C}$ with relative humidity max. 60 %.

After preservation the slewing rings are wrapped with PE foil band, then packed on pallets or boxes. Slewing rings should always be transported and be stored horizontally, if possible on a pallet.

MOUNTING AND MAINTENANCE OF SLEWING RINGS

Standard design slewing rings are suitable for operating temperatures ranging from 253 K ($-20 \text{ }^\circ\text{C}$) to 333 K ($60 \text{ }^\circ\text{C}$).

Seating surfaces of the connecting structure for slewing rings up to diameter 3 000 mm must meet following conditions:

- a) machining roughness max. $R_a = 12.6$ (usually 6.3),
 - b) maximum permissible flatness deviation $a = 0.1 \cdot D_s$ [mm],
 - c) maximum deflection of connecting structure under maximum operating load should not exceed value $y = 0.5 \cdot D_s$ [mm],
- where: D_s – slewing ring mean diameter [m].

The variation of flatness can occur only once within the 180° section. To prevent local bearing overloading due to seating surface out of flatness or deflection of the connecting structure, any possible variation within the section $0^\circ - 90^\circ - 180^\circ$ should increase or decrease gradually.

Before assembling it is necessary to clean all surfaces thoroughly from burrs, paint residues, etc. Seating surfaces should be dry, without lubricant. Furthermore it is necessary to inspect flatness of the seating surfaces. Feeler gauges are used to check slewing ring adaptation.

The unhardened area of the non rotating ring should be mounted so that it is positioned in the least loaded zone – i.e. in the plane perpendicular to the main load plane. The unhardened area is marked on the respective ring non-functional surface with symbol "X" by stamping or with a red line.

When assembling a geared slewing ring it is important to adjust the backlash in the gear correctly. It is adjusted with a feeler gauge or with another suitable method in the zone of maximum radial gear runout. The extent of the backlash should be in the range of $(0,025 \div 0,035) \cdot m$, where "m" means the gear module. The backlash should be inspected again after the slewing ring is finally fixed on the machine. The zone of the maximum radial gear runout is marked with a blue line in the gap between the teeth.

Slewing rings are fixed on the machine with pre-stressed bolts. Before assembly the mounting bolts should be coated slightly with oil. The necessary tightening torque for corresponding bolt size and material is indicated in Table 1.

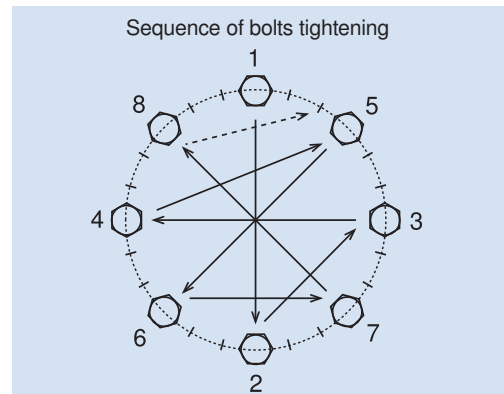


Table 1















Bolt Thread Size	Bore Diameter [mm] DIN/ISO 273	Tightening torque at $\mu = 0.14$ [Nm]	
		Rigidity Class of Bolt 8.8	Rigidity Class of Bolt 10.9
M 12	14	78	117
M 14	16	126	184
M 16	17.5	193	279
M 18	20	270	387
M 20	22	387	558
M 24	26	666	954
M 27	30	990	1 395
M 30	33	1 350	1 890
		Grade 5	Grade 8
UNC 5/8"-11	18	180	260
UNC 3/4"-10	21	320	460
UNC 7/8"-9	25	520	730
UNC 1"-8	27.5	770	1 100
UNC 1 1/8"-7	32	970	1 560
UNC 1 1/4"-7	35	1 370	2 190
		Grade 5	Grade 8
UNF 5/8"-18	18	210	290
UNF 3/4"-16	21	360	510
UNF 7/8"-14	25	580	820
UNF 1"-12	27.5	860	1 210
UNF 1 1/8"-12	32	1 100	1 760
UNF 1 1/4"-12	35	1 520	2 440

MAINTENANCE

Maintenance involves regular relubrication of raceways and gear together with inspection of the fastening bolts and wear of the bearing.

PSL slewing rings will be filled with the solid lubricant on the lithium base with the consistence degree NLGI 2 with „EP“ additives. Recommended lubricants are shown in Table 2.

Table 2

Producer	Recommended Lubricant for		Producer	Recommended Lubricant for	
	Raceway	Gear		Raceway	Gear
	Aralub HLP 2 (-30 °C to +120 °C) (243 K to 393 K)	Aralub MKA - Z 1 (-20 °C to +200 °C) (258 K to 473 K)		Klüberlub BE 41-542 (-20 °C to +140 °C) (253 K to 413 K)	Grafloscon C-SG 0 Ultra (-30 °C to +200 °C) (243 K to 473 K)
	Energrease LS-EP 2 (-25 °C to +140 °C) (248 K to 413 K)	Energrease LC 2 (-30 °C to +150 °C) (243 K to 423 K)		Mobilux EP 2 (-25 °C to +120 °C) (248 K to 393 K)	Mobilgear OGL 461 (-20 °C to +120 °C) (253 K to 393 K)
	Spheerol EPL 2 (-20 °C to +140 °C) (253 K to 413 K)	Castrol LZV - EP (-30 °C to +150 °C) (243 K to 423 K)		MOL Liton LT 2EP (-30 °C to +120 °C) (243 K to 393 K)	MOL Alugear OEPG (-15 °C to +100 °C) (258 K to 373 K)
	EPEXA 2 (-20 °C to +140 °C) (253 K to 413 K)	CARDREXA DC 1 (-20 °C to +120 °C) (253 K to 393 K)		Shell Alvania EP 2 (-25 °C to +130 °C) (248 K to 403 K)	Shell Maleus OGH (-20 °C to +130 °C) (253 K to 403 K)
	Beacon EP 2 (-20 °C to +110 °C) (253 K to 383 K)	Multi purpose grease (Moly) (-25 °C to +150 °C) (248 K to 423 K)		Multifak EP 2 (-30 °C to +120 °C) (243 K to 393 K)	Crater 2x Fluid or 5x Fluid (-12 °C to +116 °C) (261 K to 389 K)
	Ronex MP (-25 °C to +130 °C) (248 K to 403 K)	Dynagear (-20 °C to +100 °C) (258 K to 373 K)		Multis EP2 (-30 °C to +150 °C) (243 K to 423 K)	Total Cardrexa GR 1 - AL (-30 °C to +120 °C) (243 K to 393 K)
	Lagermeister EP 2 (-20 °C to +130 °C) (253 K to 403 K)	Ceplatyn 300 (-30 °C to +250 °C) (243 K to 523 K)		Unoba EP 2 (-18 °C to +143 °C) (255 K to 416 K)	Gearite HD CF 4800 (-12 °C to +120 °C) (285 K to 393 K)

Relubrication interval and lubricant quantity primarily depends on operating conditions, i.e. load, rotational speed, operational environment properties, etc. For low-speed applications (mobile cranes, construction cranes, etc.) the relubrication interval is about 200 operating hours. For machines with a higher rotational speed or for equipment operating under permanent rotational speed or in tropical conditions (excavators, universal finishing machines, magnetic separators, etc.), the relubrication interval is shorter – it is about 70 to 100 operating hours. The quantity of necessary grease for each relubrication can be approximately calculated using the following formula:

$$Q_m = 0.3 \cdot D_s^2 \text{ [kg]}$$

where: D_s – slewing ring mean diameter [m]

When relubricating, the lubricant should be uniformly distributed in the inner space of the slewing ring. The most suitable way of achieving this is to apply the lubricant while the bearing rotates or by application from several positions around the circumference.



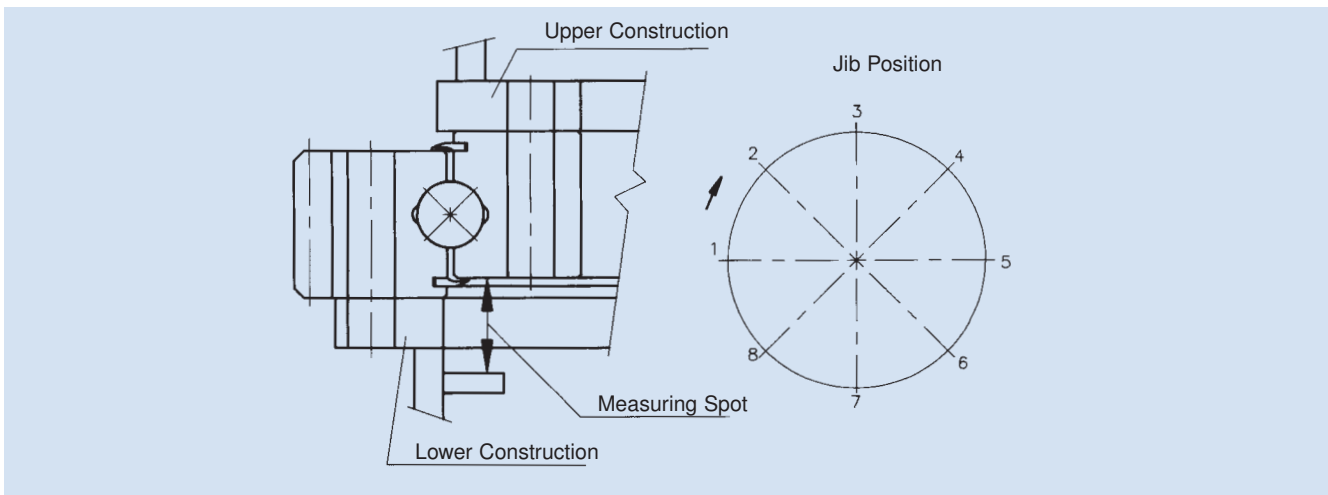
During service it is necessary to regularly recheck the fixing bolts torque at the in recommended intervals. Individual inspection intervals vary according to machine operation conditions.

When inspecting, the following method can be used (approximately valid for crane operation):

Inspection No.	Number of Operating Hours	Inspecting Action
1.	About 200 Hours	– inspection of all bolts torque – if more than 10 % of bolts are loose, another inspection is necessary after about 200 operating hours
2.	About 600 Hours	– inspection of all bolts torque
3. and further	After about 2 000 Hours	– if one or more bolts are loose to less than 80 % of the prescribed torque, these and both adjoining bolts must be replaced by new ones – if 20 % of all bolts have less than 80 % of prescribed torque, all bolts must be replaced by new ones
	Each 12 000 Hours	– replace all bolts by new ones

Note: Specified inspection intervals must be shortened by 1/2 up to 1/3 for machines loaded more heavily by vibrations or dynamically.

In addition to the fixing bolts check, raceway wear checking is also carried out in operation (mainly at significant important rotary connections) using the measurement method "tilting clearance". The tilting clearance is the difference of the mutual ring displacement in axial direction measured under load by minimum and maximum tilting moment. In the operation register of the equipment the initial tilting clearance is recorded (in the jib position 1 to 8) and its enlargement is then followed in certain time intervals. The principle of the tilting clearance measurement and an example of the measuring record are shown in Figure.



More detailed technical information concerning inspection of slewing rings can be provided on request by the experts of PSL, Department of Technical Advisory Services.

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