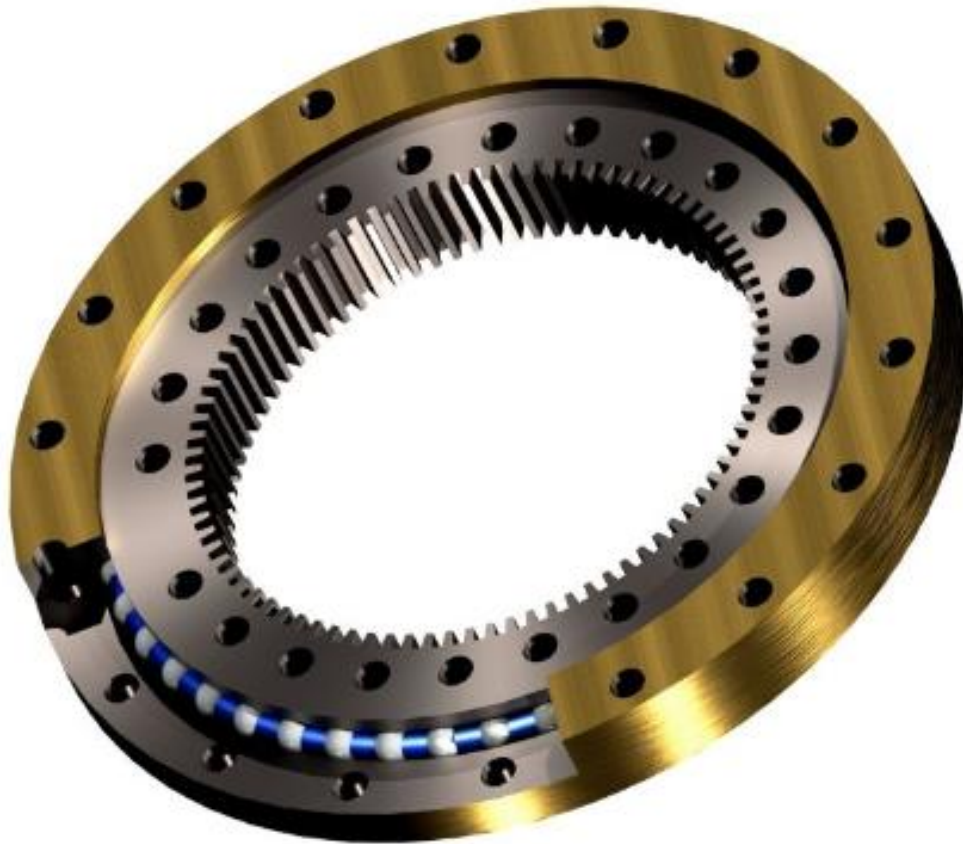


## Slew Bearing Installation and Maintenance Manual





The following information is for your protection. Please read carefully:

- The following instructions provide the information needed for correct installation and maintenance of slew bearings. Do not attempt to install or operate the slew bearing until all of the instructions are read and thoroughly understood. If you have any questions, please contact Cone Drive.
- Exceeding the product ratings, output speed, or duty cycle will void the warranty. Please contact Cone Drive with any questions regarding rating and service factors.
- This product is provided without protective covers. It is the responsibility of the purchaser or user to provide guards for all exposed gearing, shafting, couplings, sprockets, sheaves, belts chains or any other moving parts in accordance with local, state and federal requirements.
- Operation and repair of the bearings should only be done by qualified personnel.
- Do not alter the product without approval from Cone Drive.

### **Contact Information:**

Cone Drive

240 E 12<sup>th</sup> Street PO Box 272

Traverse City, MI 49685

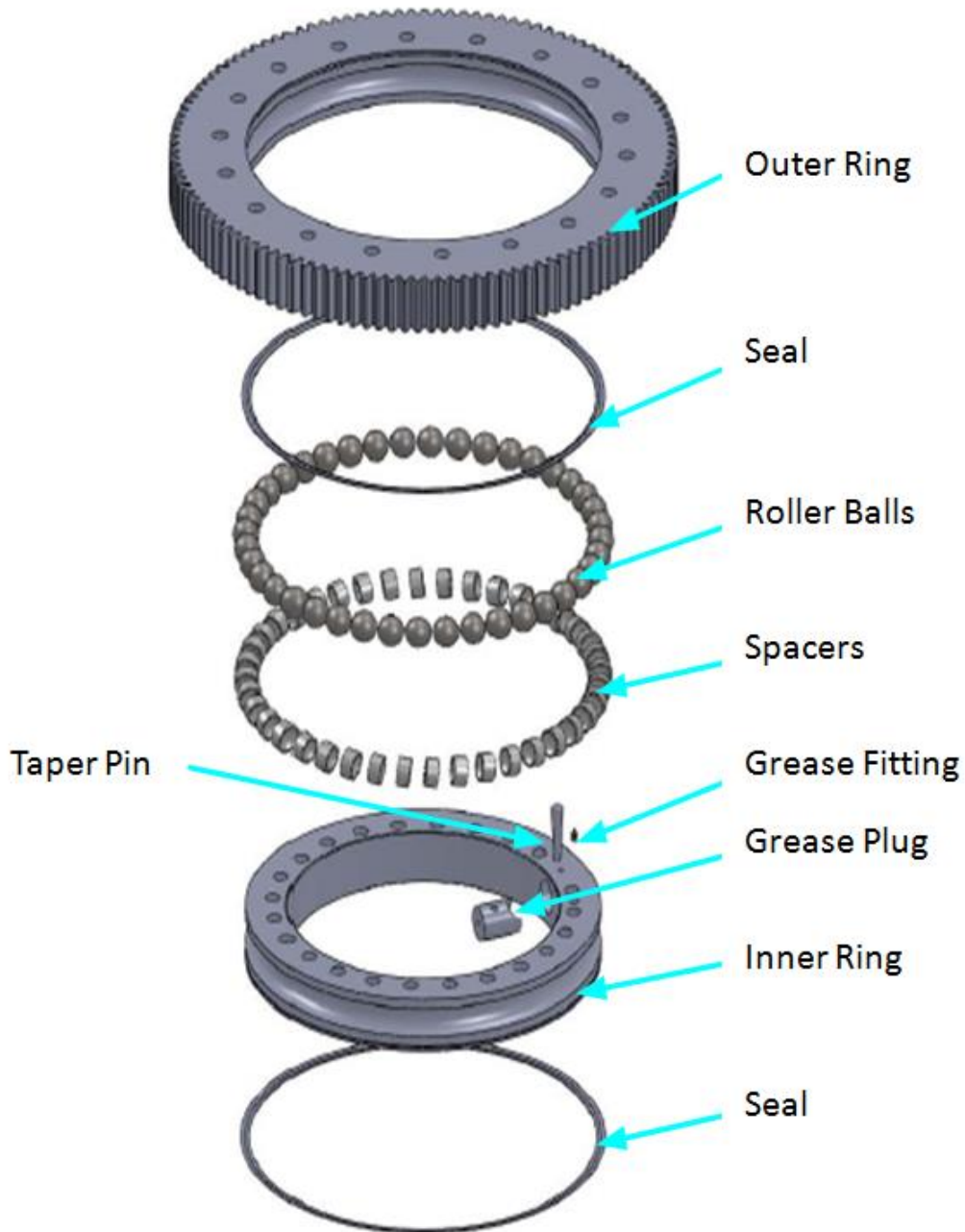
Ph: 231-946-8410

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## Exploded View of Slew Bearing



## **1. Transportation, handling and storage**

### **1.1 Transportation**

When transporting the slew bearing take special care to avoid impacts with the unit. The exposed nature of the slew bearing gearing can result in damage.

### **1.2 Handling**

When handling or moving the unit, install appropriately rated eyebolts or hoist rings into the mounting holes in the slew bearing.

### **1.3 Storage**

When storing the bearing for more than 3 months, it is recommended that the grease in the slew bearing be purged with new grease prior to start up.

When storing the bearing for a period of 5 months or less, store indoors in the as-shipped orientation. Keep the bearing away from heat and moisture sources. Slew bearings will come with surface corrosion protection that will prevent corrosion for a period of approximately 5 months (if enclosed in the shipping packaging); longer periods of storage require special protective measures.

## **2. Installation of Slewing Bearing**

### **2.1 Preparation**

- Check the slew bearing for physical damage.
- Lift the slew bearing with eye bolts. Ensure the eye bolts are fully threaded into the bolt hole. Use a minimum thread engagement of 1.5 times the bolt diameter.
- The slew bearings shall be mounted in an unloaded condition.

### **2.2 Cleaning**

- Clean the slew bearing mounting surfaces and the mounting structure using a cold solvent. Use a solvent that will not damage the rubber seals of the bearing.
- Take care not to get any solvent into the slew bearing.
- The mounting surface must be clean and smooth. Be sure to remove impurities from the mounting surface (such as rust, corrosion, flash, burrs, paint, welding slag, loose particles, etc.)
- Cleaning the slew bearings with steam or pressure washer is not recommended.

### 2.3 Permissible flatness deviation and maximum allowable deflection of the bearing mounting surface

To ensure sufficient stiffness to the load transmitted, the slew bearing must be mounted on a machined surface/base. This will ensure uniform distribution of the stresses induced to allow minimal deformation in the slew bearing.

The allowable degree of flatness deviation and the maximum allowable deflection of the bearing mounting surface are shown in Table 1. Measurements are to be taken circumferentially around the mounting surface structure. Peak values should not be measured more than once in 180 degrees and should resemble a smooth sinusoidal curve.

Diameter of Raceway (mm)	Flatness deviation of mounting surface (mm)	Maximum allowable deflection of mounting surface (mm)
< 250	0.04	0.05
250-500	0.05	0.1
500-750	0.09	0.3
750-1000	0.15	0.5
1000-1500	0.2	0.8
1500-2000	0.22	1
2000-2500	0.25	1.2
2500-4000	0.3	1.5

**Table 1: Permissible Flatness Deviations and Max Allowable Deflection of the Mounting Surface**

### 2.4 Mounting surface thickness

The surface thickness of the mounting structure should not be lower than the values shown in Table 2:

Diameter of raceway (mm)	500	750	1000	1250	1500	2000	2500	3000
Minimum thickness (mm)	25	30	35	40	50	60	70	80

**Table 2: Mounting Surface Thickness Based on Raceway Diameter**

## 2.5 Mounting Bolts

As the slew bearing manufacturer, we do not supply, warrant or recommend the mounting fasteners used.

### 2.5.1 Tightening Torques

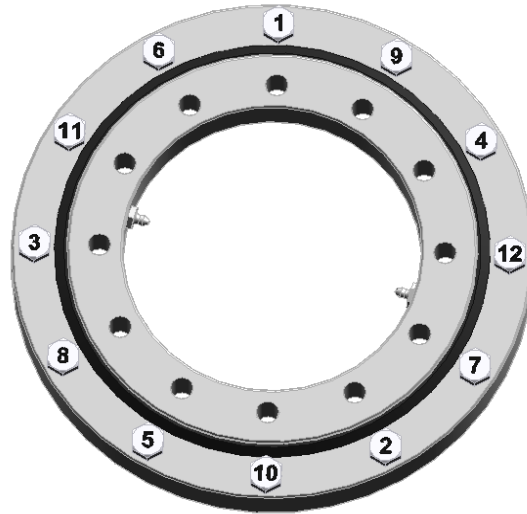
Use of split rings, split washers, or polymeric washers of any kind is not permissible, however it is recommend that the end user use flat washers of appropriate size and strength to minimize the bolt contact pressure.

Metric Mounting Bolts		Imperial Mounting Bolts	
Mounting bolt	Tightening Torque (N.m)	Mounting bolt	Tightening Torque (ft.lb)
	Class 10.9		Grade 8
M8	28	5/16-18UNC	18
M10	55	3/8-16UNC	35
M12	98	1/2-13UNC	80
M16	246	5/8-11UNC	159
M20	481	3/4-10UNC	285
M24	558	7/8-9UNC	455

**Table 3: Tightening Torques (for reference only)**

### 2.5.2 Bolt Torque Sequence

- Apply threadlocker to threads (such as Loctite 242 or 271) according to manufacturer’s instructions.
- Thread the bolts and washers, if required, into the slew bearing, hand tightening each bolt. Tighten one ring at a time. You can start with the inner ring or outer ring but you must follow the tightening procedure until the full tightening torque has been reached before moving to the next ring. The bolts should be tightened in a crosswise pattern as shown in Figure 1. Follow the crosswise pattern tightening each bolt to 30% of the tightening torque. Then repeat crosswise torque pattern tightening each bolt to 50% of tightening torque. Finally repeat the crosswise pattern tightening each bolt to 100% of the tightening torque. Proceed to the other ring and repeat the bolt torque sequence.



**Figure 1. Bolt Torque Sequence**

- Once a bolt is fully tightened, make a permanent mark on the bolt head and mounting structure. This mark will act as a visual indicator during inspection to confirm the bolt has not loosened.

## **2.6 Paint Repair**

- During installation of the slew bearing, any paint that is damaged shall be repaired. Failure to do so could result in corrosion issues and may affect the life of the bearing.

## **3. Maintenance, Checks & Lubrication**

### **3.1 Mounting Bolts and Checks**

- To compensate for settling in the system, it is necessary to retighten the bolts to the prescribed torque. This shall be done after approximately 100 hours of operation without external loads applied to the bolt. This inspection shall be repeated annually at a minimum.
- If a loose bolt is discovered, replace the bolt and mating washer with new ones.
- The running condition of the slew bearing equipment should be evaluated during use. If excessive noise and vibration are observed, the equipment should be shut down for inspection and troubleshooting.

### 3.2 Lubrication

- Slew bearings require the raceway to be lubricated and come prefilled with the grease listed in Table 4.

Parts to be lubricated	Slew Bearing/Raceway
Factory grease	Sinopec 7408B-1 or Sinopec 7408B-2
NLGI grade	1 or 2
Temperature Range in °C	-20-120°C
Thickener/soap type	Lithium Soap
Visual Appearance	Light yellow to brown, smooth and buttery
Viscosity (40 °C) cSt	100
Dropping Point °C	7408B-1: 189 and 7408B-2: 193

**Table 4: Factory Filled Raceway Grease**

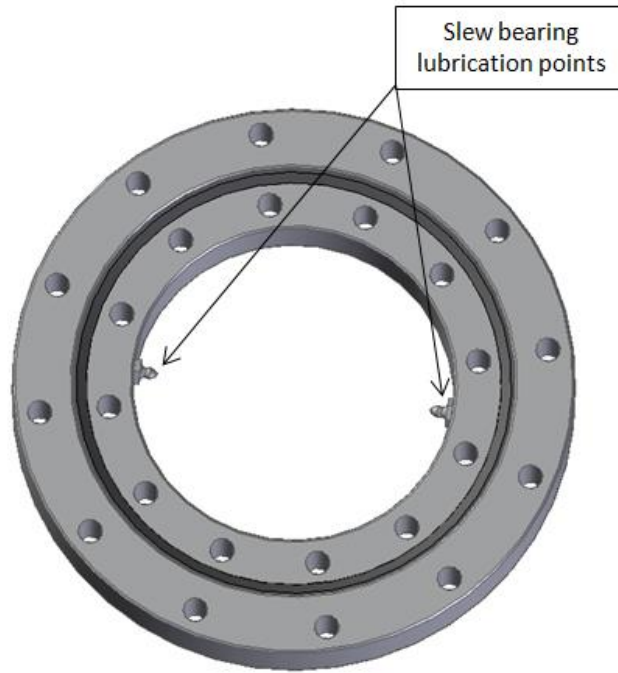
- If servicing the bearing, user must ensure that the grease selected is compatible with the lithium thickener/soap listed in the Sinopec 7408B-1 and 7408B-2. Alternative lubricant recommendation for the slew bearing raceway is listed in Table 5.

Brand	Bearing/Raceway Grease	Operating Temperature Range (°C)
Mobil	XHP 462-Moly	-40 ~+200

**Table 5: Alternative Raceway Grease (For Service)**

- Manufacturer provisions for handling the respective lubricants must be observed.
- While rotating the slewing bearing, inject grease into the cleaned grease fittings, according to Figure 2.
- Inject grease into grease fittings one shot/pump at a time. Each time the grease is injected, the raceway must be filled until grease weeps from the seal surface. When filling the bearing with grease, slowly rotate the bearing to ensure even distribution of the grease.
- Extra care must be taken when greasing the bearing to avoid over-pressurizing the bearing casing. Doing so may allow the seal to pop out of the seating surface. If this occurs, the seal must be re-seated prior to operation.





**Figure 2. Slew Drive Maintenance Points**

- Lubrication intervals for the slew bearings are specified in Table 6 and are valid for environmental operating temperatures of -30 °C to +60 °C. (Note that it is recommended to completely replace all the grease a minimum of every 3 years by filling the raceway cavity with new grease).

Grease-filled slewing bearing lubrication intervals	
Environment	Slew Bearing
Dry and clean workshop, industrial positioners with shielding (turntables/robots, etc.)	Every 500 hours of operation or once a year.
Difficult conditions in open grounds (crane/bulldozer, etc.) wind turbine, solar, man-lift	Every 30 hours of operation or once every 3 months
Aggressive climatic conditions sea/desert/arctic climate/very dirty surrounding/more than 70 continuous operating hours per week	Every 25 hours of operation or once every 2.5 months
Extreme conditions (tunneling machines, steel mills, oil field)	Every 20 hours of operation, or once every 2 months

**Table 6: Recommended Lubrication Intervals**

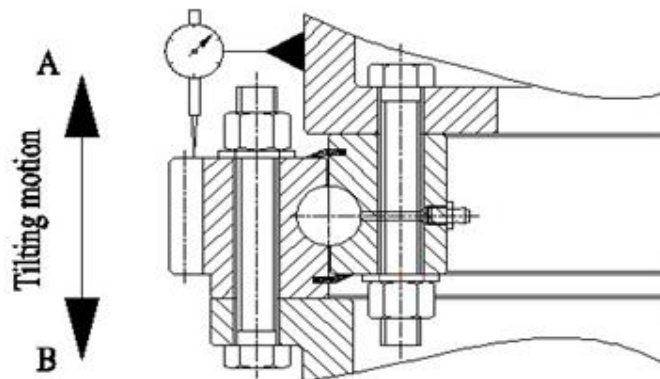
- For bearings with either internal or external teeth, grease shall be applied to allow total coverage of the teeth.
- Lubricants recommended for the gear teeth are listed in Table 7

Brand	Gear Grease	Operating Temperature Range (°C)
Sinopec	7420-1	-30 ~+120
Mobil	XHP 462-Moly	-40 ~+200
Mobil	Mobiltac 375N	-1 ~+121

**Table 7: Recommended Greases for Bearings with Internal or External Gear Teeth**

### 3.3 Slew Bearing Wear

As a slew bearing wears the amount of tilting clearance will increase. To determine the increase in clearance you must measure the initial clearance of the bearing and record it for future comparisons.



**Figure 3. Tilting Clearance Measurements**

- Determine the maximum tilting moment A-B and mark the measuring point. The measuring point should be as close as possible to the bearing pitch diameter.
- Attach the dial gauge as shown in Figure 3.
- Apply the defined tilting moment, minimum 50% of the max operational load in direction “A”. Set the dial gauge to zero.
- Apply the defined tilting moment, minimum 50% of the maximum operational load in “B” direction.
- The measured value displayed corresponds to the tilting clearance and serves as a basis for comparison for later inspections.
- If the recorded increase or delta is larger than the value shown in Table 8, replace the bearing.
- All subsequent measurements are performed at the same measuring point, with the same

position of the bearing rings relative to one another and in the same sequence.

- Record all measured values.

<b>Bearing Tilt Clearance</b>			
<b>Raceway Diameter (mm)</b>	<b>Rolling Element Diameter (mm)</b>	<b>Allowable Tilt Increase (mm)</b>	<b>Allowable Tilt Increase (in)</b>
< 200	14.00	0.64	0.025
< 300	19.84	0.89	0.035
< 430	22.23	1.02	0.040
< 640	25.40	1.14	0.045
< 830	31.75	1.40	0.055
< 1370	39.69	1.65	0.065
< 4300	60.00	2.29	0.090

**Table 8: Maximum Increase in Bearing Tilt Clearance**

- If the bearing has less wear than what is shown in Table 8 but starts to make noise, experiences rough rotation, requires more power to rotate, or has metal shavings in the grease, the bearing should be replaced.