SLEWING DRIVE MANUAL

for

CONSTRUCTION MACHINERY

Please read all instructions and manuals carefully before installation

REV：D

2024.03

Cone Drive by Timken

No.85 Yun Gu Road | Chang Shou Zhou Zhuang| Jiang Yin | Jiangsu, (214424) |
T: +86 510 86366260 | F: +86 510 86366200

General:

- The purchasers are responsible for providing safety precautions and guarantee correct installation of all equipment.
- Please read this manual carefully before installation. The working characteristics of the slewing drives can only be ensured when complying with the manual.
- This manual contains the information required for correct installation and maintenance of the slewing drives.
- All the following steps need to be operated by technical personnels.
- Please don't hesitate to contact service engineers for any further assistance.
- The documents guide purchasers on how to install and maintain the slewing drive correctly. The latest version is published on our homepage and can be downloaded from www.conedrive.com.cn. Please always check that you are working with the latest revision.

After-Sale Service:

Address: Changshou Yungu No.85 Road, Zhouzhuang Town , Jiangyin, Jiangsu P.R. China

Cone Drive (Jiangsu) Power Transmission Co., LTD

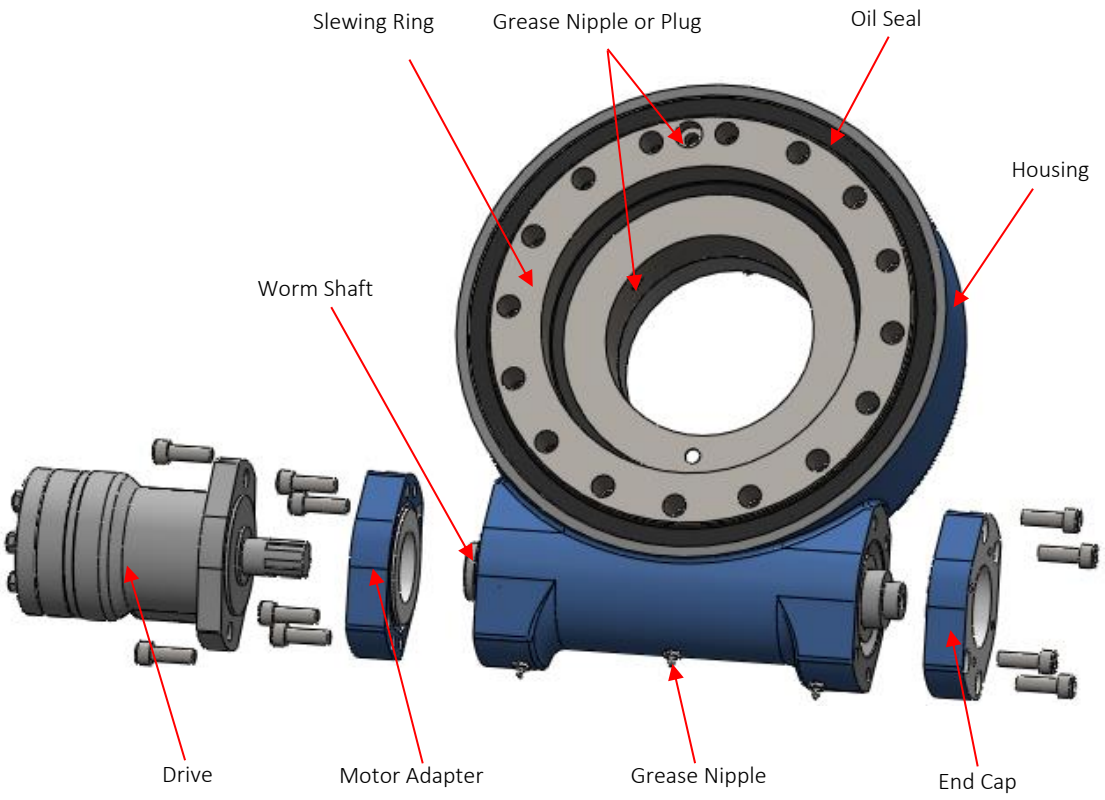
Phone: +86-510-86366206

Fax: +86-510- 86366200

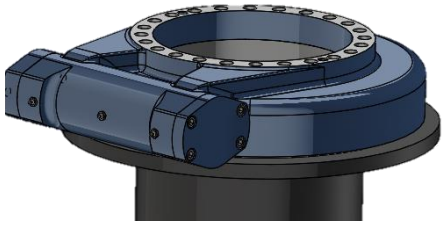
Postcode: 214400

Web: www.conedrive.com.cn
Email: sales@conedrive.com.cn

Structure Diagram of Slewing Drive

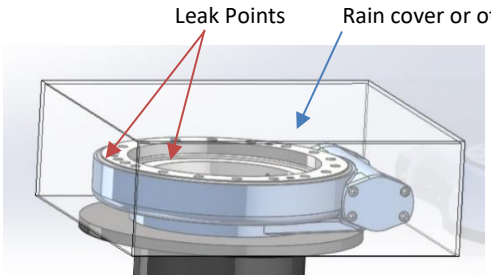


Installation



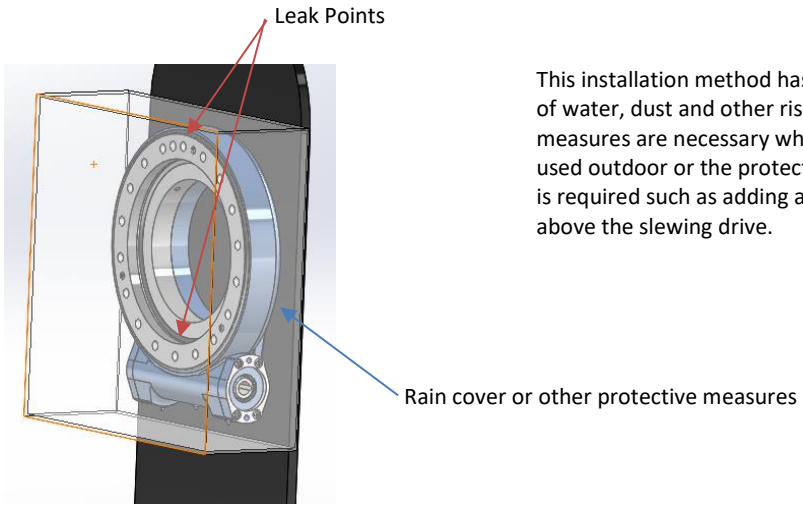
Housing up can be effectively waterproof and dustproof.

Horizontal installation and housing up



This installation method has leakage risks of water, dust and other risks. Protective measures are necessary when the drive is used outdoor or the protective capability is required such as adding a rain cover above the slewing drive.

Horizontal installation and slewing ring up



This installation method has leakage risks of water, dust and other risks. Protective measures are necessary when the drive is used outdoor or the protective capability is required such as adding a rain cover above the slewing drive.

Vertical installation

- **Inclined installation to horizontal panel complies with above protection requirements as well.**
- **When the slewing drives are used in construction machinery and have special protection requirements, refer to the above requirements for installation.**
- **Choose a suitable installation according to the actual operating conditions and protection requirements.**

Content

1 Transportation, Handling and Storage

1.1 Transportation and Handling

- Please keep the slewing drive in prescribed position and avoid any collision.
- Wear work gloves and be careful when handling the slewing drives. Use the thread holes on the slewing drive for lifting. Do not use the electric motor or hydraulic motor as the lifting point.

1.2 Storage

During storage, please keep the packing boxes placing in the prescribed direction and storing in a closed room to avoid getting wet. In the closed packing, the surface is anticorrosive and rustproof for about 3 months. If longer storage is needed, please take special protective measures.

Special protective measures: 1.Carry out VCI anti-corrosion bag;

2.Smearing the anti-rust oil on the exposed surface.

3.Check again regularly(Check the environment & products)

4.All other effective measures that customers can carry out.

2 Installation and Maintenance

2.1 Preparation

- Check the slewing drive for physical damage.
- Clean the slewing drive and the mounting structure.
- Remove extraneous materials from mounting surfaces. (Such as iron filings, burrs, paint, welding slag, etc.).
- If there are shipment bolts, remove them before installation. The difference between shipment bolts and positioning bolts is shown in Figure 2.1.1.

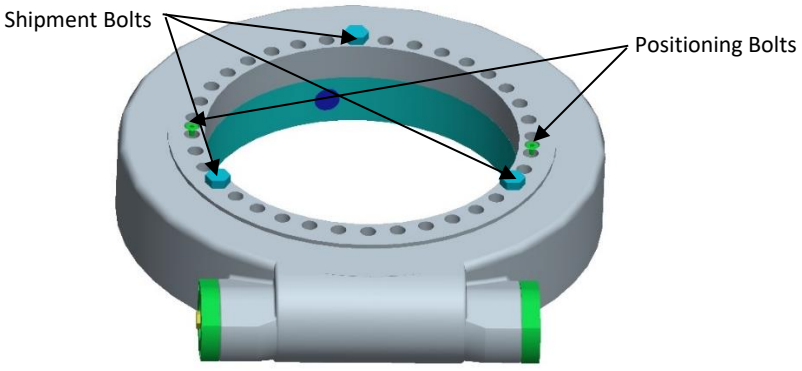


Figure2.1.1

2.2 Permissible Requirement

Permissible horizontal Deviation of the mounting surface when Horizontal installation (see Table 2.2.1)

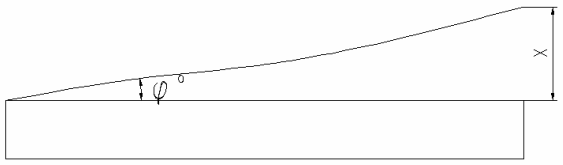
Table 2.2.1

Model		3 "	5 "	7 "	9 "	12 "	14 "	17 "	19 "	21 "	25 "	28 "
Vertical Deviation	[mm]	0.07	0.09	0.11	0.16	0.23	0.26	0.38	0.32	0.42	0.49	0.95
Angular Deviation	°	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.15

Permissible Flatness Deviation of the mounting surfaces connected with slewing drive（see Table 2.2.2）

Table 2.1.2

Model		3 "	5 "	7 "	9 "	12 "	14 "	17 "	19 "	21 "	25 "	28 "
Flatness Deviation	[mm]	0.04	0.1	0.1	0.12	0.15	0.15	0.15	0.15	0.2	0.2	0.25



φ – Angular Deviation
χ – Vertical Deviation

2.3 Mounting Bolts Selection

- Please select specifications, model and quality grade of bolts correctly. The bolts whose intensity grades are higher than 10.9 are recommended.
- The length of the bolt into the screw hole is generally 2 times the nominal diameter of the bolt.
- Don't allow the bolt to be screwed thread hole outside. Otherwise it will cause interference and damages parts.
- To reduce the contact stress, high strength flat washers are acceptable.

If not, it may affect the performance, service life and tensile strength of the slewing drive bolt connection.

2.3.1 Tightening Torque

- The installation of bolts should be fixed by the proper preload under normal situation.
- Do not use the fracture spring washer, flat mat ,etc.

Tightening torque for mounting bolts ,reference only.

Table2.3.1

Specification	Tightening torque（Nm）		
	8.8 Class	10.9 Class	12.9 Class
M8	26±4	33±3	45±6
M10 / 3/8”-16UNC	52±7	72±6	90±10
M12 / 1/2”-13UNC	90±12	120±10	150±20
M16 / 5/8”-11UNC	225±35	305±25	380±50
M18	310±45	415±35	521±70
M20 / 3/4”-10UNC	410±50	600±50	750±100

2.3.2 Installation Slewing Drive

- The slewing drive shall be mounted in unloaded condition.
- Apply some thread lock liquid on threads of bolts.
- Tighten the bolts by specified torque. Ensure that the bolts are installed into the holes straight, inclined installation is not permitted.
- Tighten the bolts and washers crosswise, tightening order is shown in Figure 2.3.1. Tighten all the bolts diagonally to 30% tightening torque. Then tighten the bolts repeatedly and diagonally to 50% tightening torque. Finally, tighten the bolts to 100% tightening torque.

Figure2.3.1

- All the threaded holes should be fixed with bolts. Check the intensity of bolts if the holes cannot be fixed completely due to structure limit. And seal them to prevent water and dust from entering the slewing driver
- Once the bolts are tightened, make a permanent mark on the bolts head and the stationary structure. This will be used later for bolt looseness inspection.
- Double check the connecting of slewing drive and structure is correct. Guarantee all the bolts mounting, pins ,keys ,and standard components are installed reliably.

2.4 Maintenance, Inspection and lubrication

2.4.1 Paint Repair

Corrosion coating has been painted on the slewing drive according to Cone drive standard or customers’ requirements before delivery. If there is no special requirements, all the exposed surfaces will be coated except pilot.

The finishing paint will be damaged inevitably during the installation of slewing drive. Paint repair is necessary to improve the rust prevention and anticorrosion performance of slewing drive after the whole device installation was completed.

Note:

1.Remove the oil, grease, rust and dirt from damaged surfaces, ensure these surfaces are clean.

2. The coating repair of bolts or other components that provided by Cone drive also should be taken into account.

3.Corrosion protection surfaces don't include machined surfaces and corners of these machined surfaces. Please take into account during paint repair.

2.4.2 Inspection of Mounting Bolts

About 100 hours after the initial assembly, it is necessary to retighten the bolts to the prescribed tightening torque. This inspection should be repeated annually. The inspection frequency may be increased under bad working conditions(Such as Coal mine machinery). Once the bolts are loose, replace all bolts and washers with new bolts and washers.

2.4.3 Lubrication of Slewing Drive

Our products have been injected with enough grease before delivery. We recommend that the re-lubrication should be based on the actual situation.

- Raceway of slewing ring has been injected with grease.
- The meshing place of worm and slewing ring has been injected with grease.
  Note: Open housing slewing drives (S, W series) are not injected this place with grease before delivery. Customers should add grease after receiving the products and ensure that the tooth surfaces are full of grease.
- Tapered roller bearings have been injected with grease.

The grease name is Sinopec 7420-1 at the meshing place of worm and slewing bearing and the cavity of tapered roller bearing. The grease name is Sinopec 7029D-2 at the raceway of slewing ring.

Grease Name	Sinopec 7029D-2	Sinopec 7420-1
Working Temperature (℃)	-40～+180	-20～+100
Appearance	Milky white	Black
Dropping Point (℃)	271	180
Cone penetration, 0.1mm	278	315

Note: This grease is harmless to human and circumstance. The grease can be adjusted appropriately for the special grease requirements of the slewing drives.

Later maintenance: add grease to the grease nipples one by one. The recommended injection amount of slewing drives is shown in Table 2.4.3.1.

Table2.4.3.1

Location of Injection	Injection Amount (units: g)										
	3 "	5 "	7 "	9 "	12 "	14 "	17 "	19 "	21 "	25 "	28 "
Raceway of slewing ring	/	/	15-20	30-35	45-50	55-60	70-75	100-110	120-130	140-150	200-220
The meshing	33-35	50-60	55-65	90-	100-	100-	110-	120-	130-	130-	150-

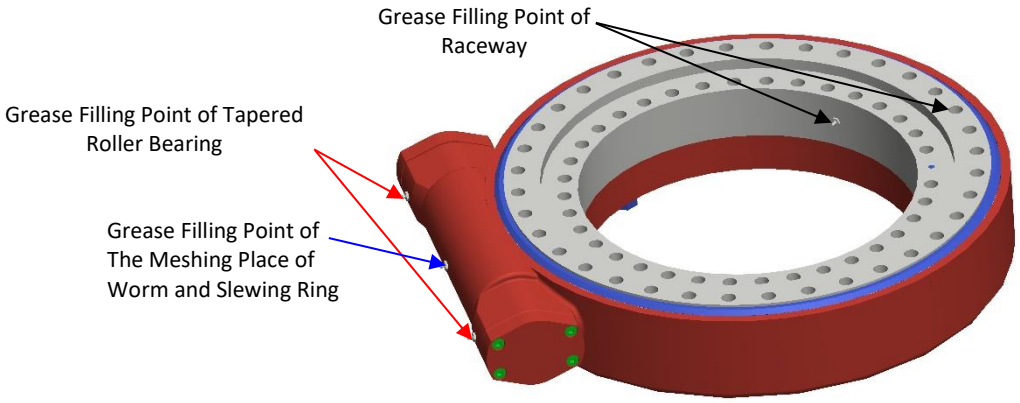
place of worm and slewing ring				100	110	110	120	130	140	140	170
Tapered roller bearing	7±0.5	7±0.5	7±0.5	10±0.5	10±0.5	10±0.5	10±0.5	10±0.5	10±0.5	10±0.5	15±0.5

Inject grease into slewing drives while rotating the slewing drives CW and CCW.
If the customers cannot purchase the same type of grease, the following grease can be used for reference, as shown in Table 2.4.3.2

Tble2.4.3.2

Grease Name	Instead Grease				
Sinopec 7420-1	Mobil SHC 1000	G.BESLUX PLEX EH-2/G	BECHEM HIGH-LUB FA 50 Mo	KLUBER BE 41-1501	FUCHS STABYL HD
Sinopec 7029D-2	Mobil XHP460	Mobil SHC220			

Note: Each grease manufactory has their own grease composition, different greases couldn't be equal, so we don't suggest to mix them together. Recommend to use Cone drive original grease.



Before first use

- Slewing drive should be done no-load rotation test for 10~30 minutes before normal use. Double check whether there are abnormal conditions or not, such as abnormal noises, vibration. If everything is OK, please add the load for normal use, otherwise please contract Cone drive's service engineer.

Re-lubrication frequency:

- Lubrication frequency depends mainly on the current operating and environmental conditions.
- Exact lubrication frequency can only be determined by test under actual working conditions.
- If abnormal conditions occur during use, please lubricate according to the instructions. Note: Abnormal conditions that caused by lack of lubrication include large noise of rotary

transmission, large amount of oil leakage and so on.

- If no reference is available, please refer to Table 2.4.3.3 below.

Table 2.4.3.3

Work conditions	Grease-filled slewing drive lubrication intervals
Dry and clean workshop, industrial positioners (turntables/robots, etc.)	Every 500 hours of operation or once every 1 year
Bad conditions in the outside （ crane, wind equipment and mobile elevating work platforms, etc. ）	Every half a year
Aggressive climatic conditions such as sea, desert, Arctic climate, very dirty surrounding, more than 70 continuous operating hours per week	Every 150 hours of operation or once Every 3 months
Extreme conditions (tunneling machines, steel mills, oil field, etc.)	Every 50 operating hours, at least, however every 2 months

The normal working conditions are as below：

- Operating temperature of slewing drive :-30℃ —+60℃.
- Output speed of slewing drive :<1rpm. (Maximum speed depends on torque load applied.）
- Medium and low load. (see Table 2.4.3.4)

Table 2.4.3.4

Model	Type / Serie	3”	5”	7”	9”	12”	14”	17”	19”	21”	25”	28”
Rated Torque (kN·m)	S/SE/SEA/SEB	0.16	0.24	0.6	1.85	2	2.4	3	/	4.4	5.5	/
	W/WE/WEA/WEB	/	/	1.2	2.3	2.7	3.2	4	5.7	4.4	11	13.5

The values in the Table 2.4.3.4 cannot replace the correct load in actual work. Poor lubrication is the most common cause of slewing drives failure.

Note:

1. When you receive the slewing drive or if the slewing drive has been out of operation for more than 3 months , please re-lubricate the slewing drive according to the above table before operation After re-lubrication, please rotate the slewing drive without load to ensure the slewing drive is full lubricated.
2. Tighten torque of grease nipple and plug: 9-16Nm

3 Input Power

3.1 Hydraulic Motor

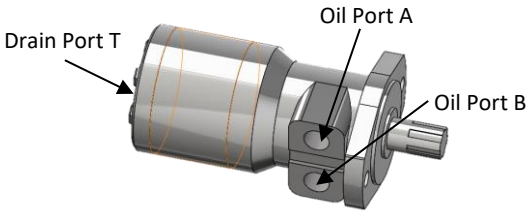
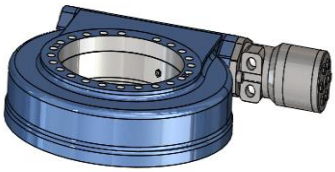


Figure 3.1.1

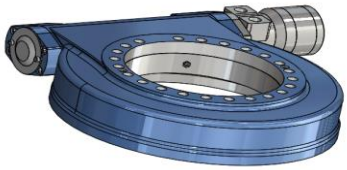
Oil Port A，B	7/8-14UNF(17)	G1/2(15)
Drain Port T	7/16-20UNF(12)	G1/4(12)

The position of hydraulic motor oil ports is shown below

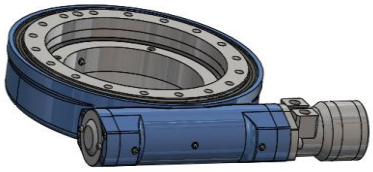
Away



Inside



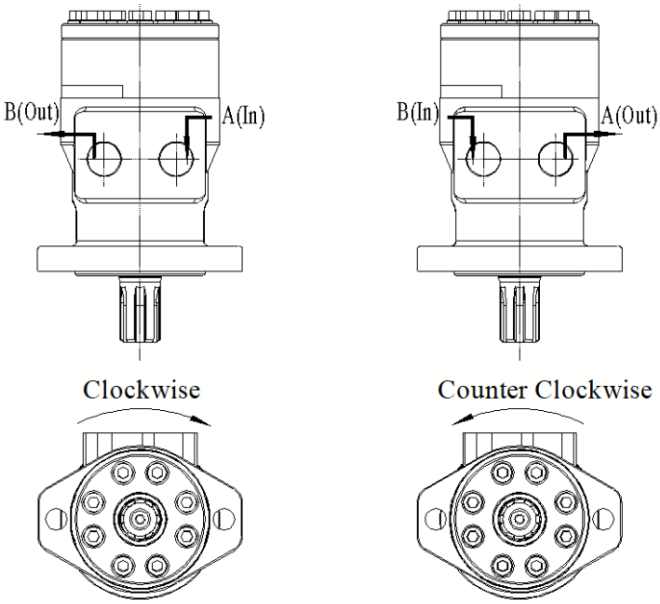
Down



Up

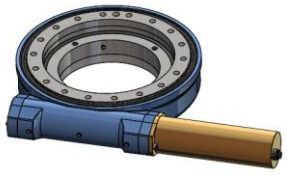
Installation of hydraulic motor:

1. Clean the mounting surfaces
2. Tighten the connection bolts between the motor and motor adapter. And tighten the torque according to Table 2.3.1. Then connect the oil pipe and motor oil ports correctly and reliably.
3. Power on the hydraulic motor and check the hydraulic Motor Rotation. As shown ,see below. From the end of the output shaft, port A input, port B output, clockwise rotation. Conversely: port B input, port A output, counterclockwise rotation.

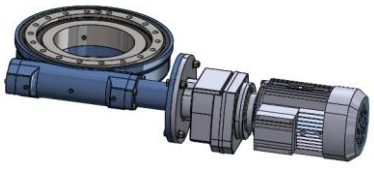


4. Rotate the motor without load to make sure it rotates smoothly. In case of abnormal rotation, please check hydraulic system, joint, rotary reducer, worm, etc.
5. After no-load test, load to rated load operation.
6. For special hydraulic motor specifications, please read the hydraulic motor manual attached with our products in detail.

3.2 Reducer Motor



DC Motor



AC Motor

Installation of reduction motor:

1. Clean the mounting surfaces.
2. Tighten the connection bolts between the motor and motor adapter. And tighten the torque according to Table 2.3.1.
3. Power on the motor and check the rotation. If the direction of rotation is not as expected, adjust the two power cords interchangeably.
4. Rotate the motor without load to make sure it rotates smoothly. In case of abnormal rotation, please check the electrical system, connection shaft, rotary reducer, worm, etc.
5. After no-load test, load to rated load operation.
6. For unconventional motors such as brushless DC motors, please read the motor manual attached with our products in detail.

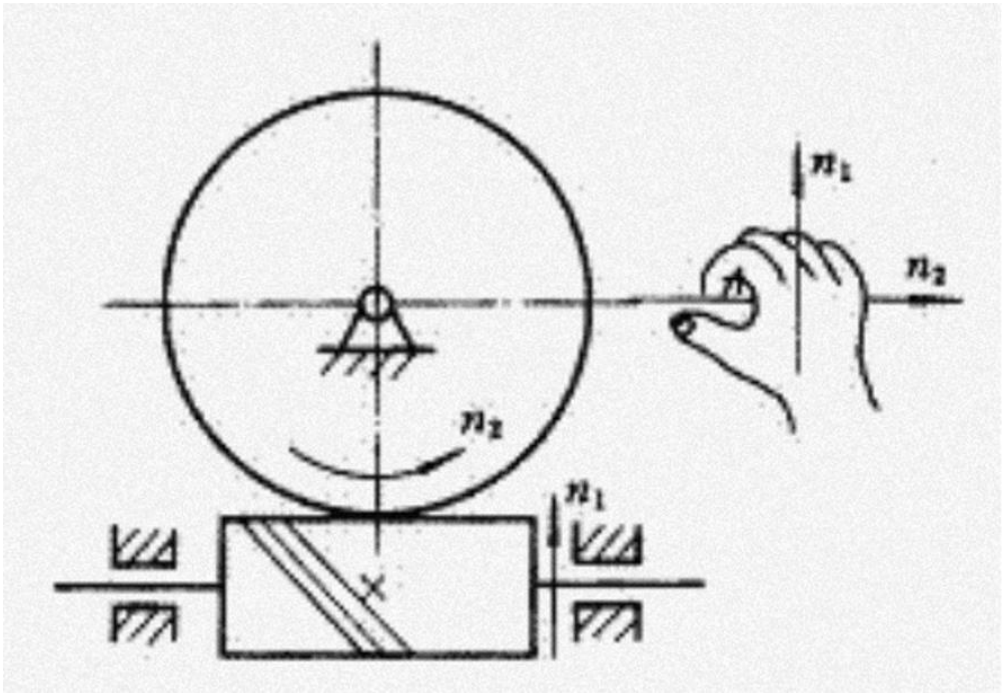
Note: Please remove the key and motor at the same time to prevent from omission.

4 Slewing drive rotation definition

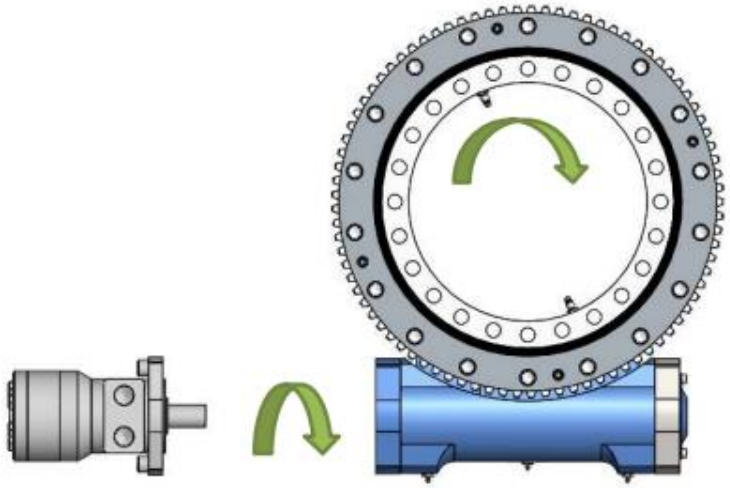
If there is no special description, all Cone drive's worm shafts are right hand. Purchasers can confirm the direction of worm gear or output side according to below picture.

Four fingers point to the direction of worm shaft rotation and thumb point to the force direction of worm shaft. Then the direction of worm gear or output side rotation is opposite this direction.

See below picture.



For example: See below picture: From the end of the output shaft, it is counterclockwise rotation. According to the above definition, the force direction of slewing bearing aim to left side, so it rotates clockwise.



5 Seals' maintenance

Seals, framework seals and other rubber parts are quick-wear parts, we suggest check every 3 months, if no abnormal condition, replacement can be done according to the actual condition. We suggest first replacement should be done after 3 months.

Cone drive accepts no liability for:

- Failure to pass the manual to the related third party
- Non-compliance with Installation and Maintenance Instructions
- Any omissions or errors in following the manual
- Please send back to Cone drive for disassembly when the slewing drive breaks down.Without Cone drive's approval ,all disassembly analysises and conclusions are ineffective.