



SLEWING DRIVE (Solar Tracking)

VE SERIES SLEWING DRIVE MANUAL

Please read all instructions and manuals carefully before installation

Rev: E

2024.03



Cone Drive by Timken

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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:

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Content

1	Transportation、 Handling and Storage	1
1.1	Transportation and Handling.....	1
1.2	Storage	1
2	Installation	1
2.1	Preparation.....	1
2.2	Mounting Bolts Selection.....	2
2.2.1	Tightening Torque	2
2.3	Installation Slewing Drive	2
3.	Maintenance, Inspection and Lubrication	4
3.1	Paint Repair	4
3.2	Inspection of mounting bolts.....	5
3.3	Lubrication of Slewing Drive	5
3.4	Lubrication instruction	11
4.	Instruction of DC & AC motor	12
4.1	Checking motor operation	12
4.2	Motor Wire Definition.....	13
4.3	Motor exchange instruction	16
4.3.1	DC motor exchange	16
4.3.2	AC motor exchange	18
5.	Slewing drive rotation definition.....	19
6	Caution items of sealing protection.....	20
6.1	Sealing protection performance.....	20
6.2	Seals' maintenance	20

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 square tube for lifting. Do not use the DC motor as the lifting point.



✓ **RIGHT**



✗ **WRONG**

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

2.1 Preparation

- Ensure that the stand columns of the tracker are in the same straight line in the horizontal direction,
- Ensure that all the slewing drive supports on the stand columns are in the same horizontal plane and same height,

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- After taking out the slewing drive from the packing box, place it on the installation position of stand columns. Do not move and place the slewing drive irregularly that will cause bumps,
- Check the slewing drive for physical damage.
- Clean the slewing drive and the mounting brackets, remove extraneous materials from mounting surfaces.
- Double check the caution mark on the motor housing and make oneself clear that DC motor can't be used as the force point during installation

2.2 Mounting Bolts Selection

- Please check the grip length of bolts carefully, too long or too short is not permissible.
- Please take prescribed size, number and quality grades. The bolts whose intensity grades are higher than 10.9 and high strength flat washers are recommended, spring washers are not recommended.

2.2.1 Tightening Torque

Information of this table is for reference only

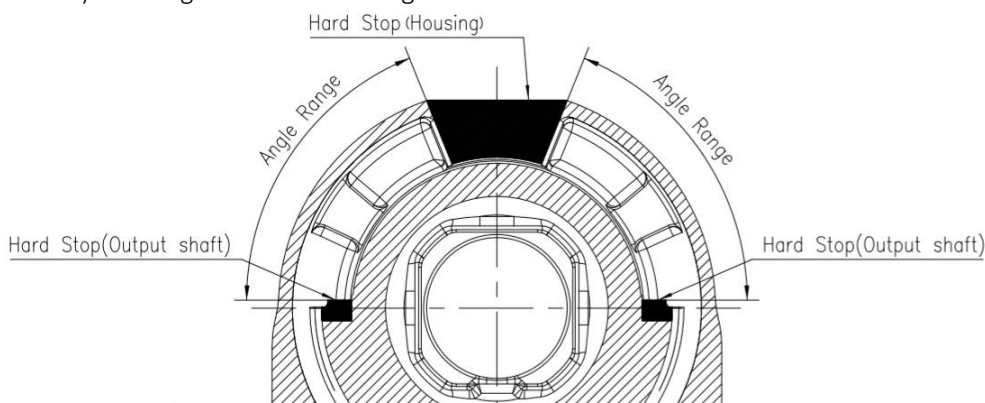
Table 1

Metric Bolts			
Mounting bolt Dimension	Tightening torque (Nm)		
	Class 8.8	Class 10.9	Class 12.9
M6	10±2	14±2	19±2
M8	26±4	33±4	45±6
M10	52±7	72±6	90±10
M12	91±13	120±10	150±20
M16	225±35	305±25	380±50
M18	310±45	415±35	478±30
M20	410±50	600±50	750±100

2.3 Installation Slewing Drive

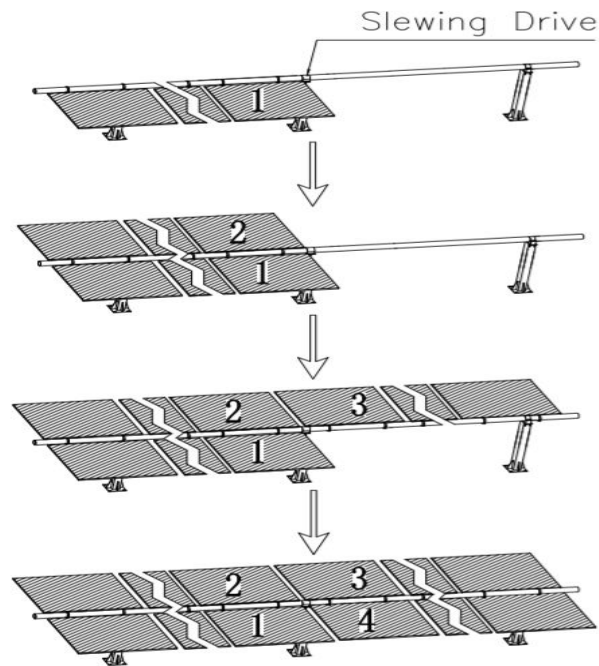
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- The slewing drive shall be mounted in unloaded condition.
- Apply some thread lock liquid to threads of bolts.
- Tighten the bolts by specified torque. Ensure that the bolts are installed into the holes straight, inclined installation is not permitted.
- Tighten the bolts and washers crosswise, 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.
- 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.
- 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.
- Ensure that DC motor is away from force to avoid the damage during installation.
- Ensure that all the components are away from force to avoid the damage during installation (Such as transmission shaft, square output shaft...etc).
- Double check the connecting of slewing drive and structure is correct. Guarantee all the bolts mounting, pins ,keys ,and standard components are installed reliably.
- There is hard limit inside slewing drive, when it is required to rotate the main tube with DC motor during installing of PV modules, pay attention to the hard limit inside the slewing drive, the hard limit cannot be blocked, and the motor should have overload protection measures. Under the rated voltage, the protection current shall not exceed 1.2 times of the rated current specified by the motor or the peak current of the motor, otherwise will lead to the following damage:
 - 1) Hard limit will be broken
 - 2) Slewing drive will be broken
 - 3) DC motor will be broken
 - 4) Damage inside the slewing drive and DC motor and shorten the lifetime



**Mechanical hard limit structure
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If the modules layout is 2P structure, Cone drive suggest to install the modules as the below picture, install side 1 first, then side 2 and side 3, last side 4. This can decrease the output torque of slewing drive.



3. Maintenance, Inspection and Lubrication

3.1 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, such as housing, square output shaft or other shapes output shaft and grooves.

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.

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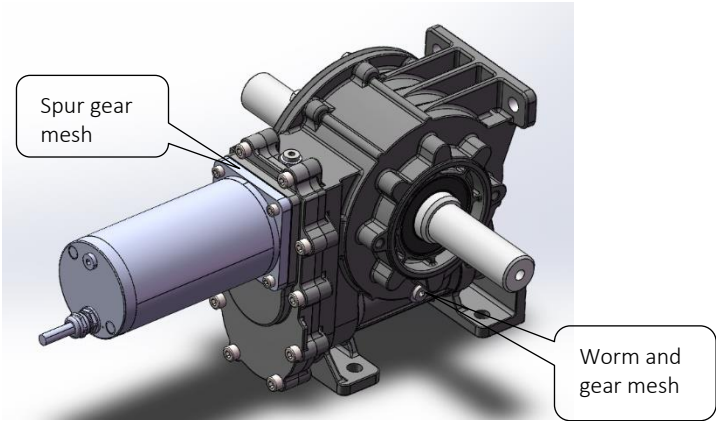
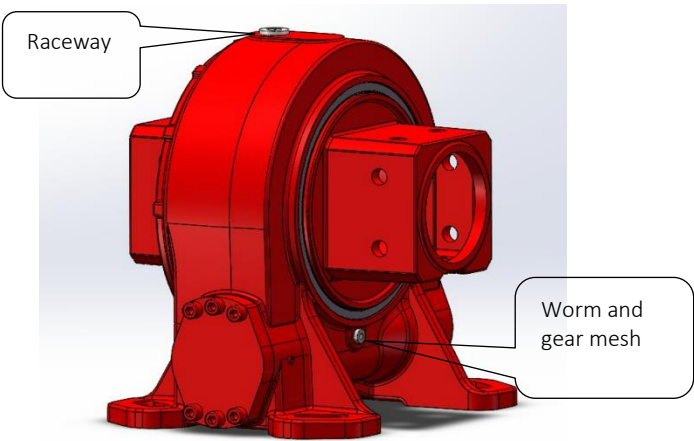
3. Corrosion protection surfaces don't include machined surfaces and corners of these machined surfaces. Please take into account during paint repair.

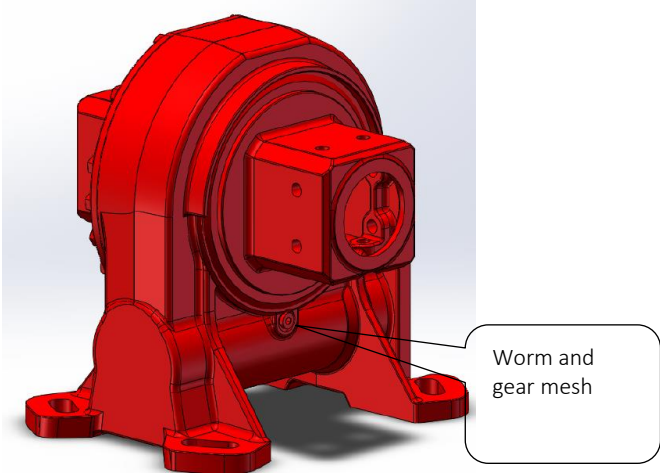
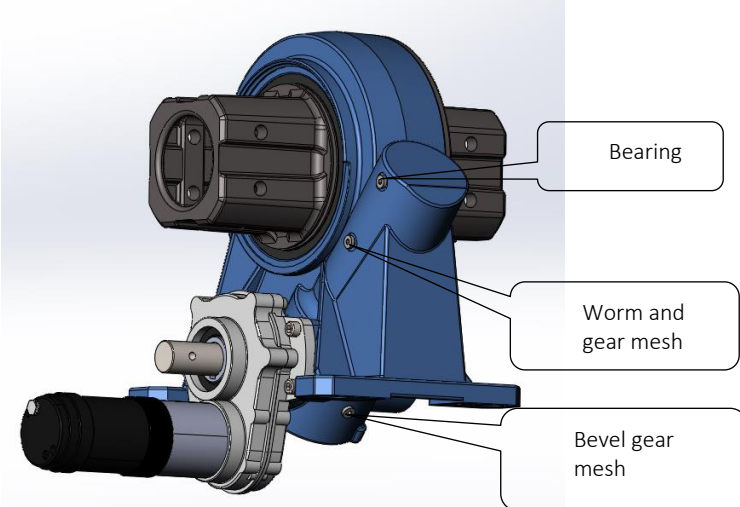
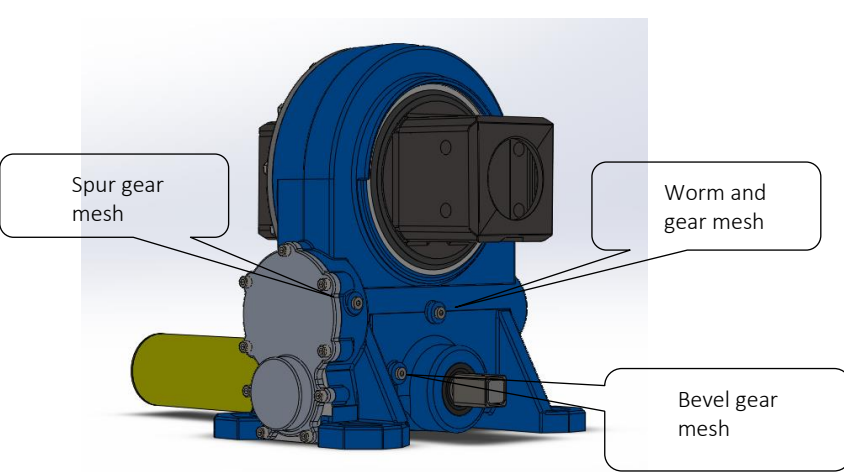
3.2 Inspection of mounting bolts

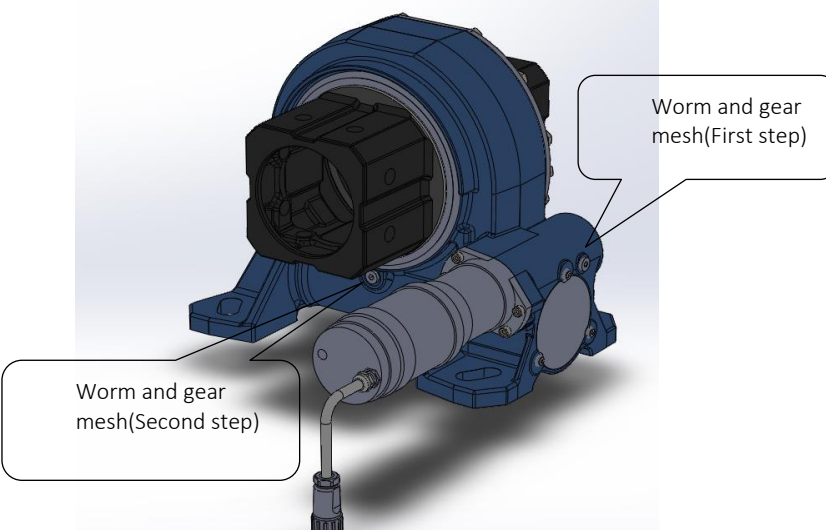
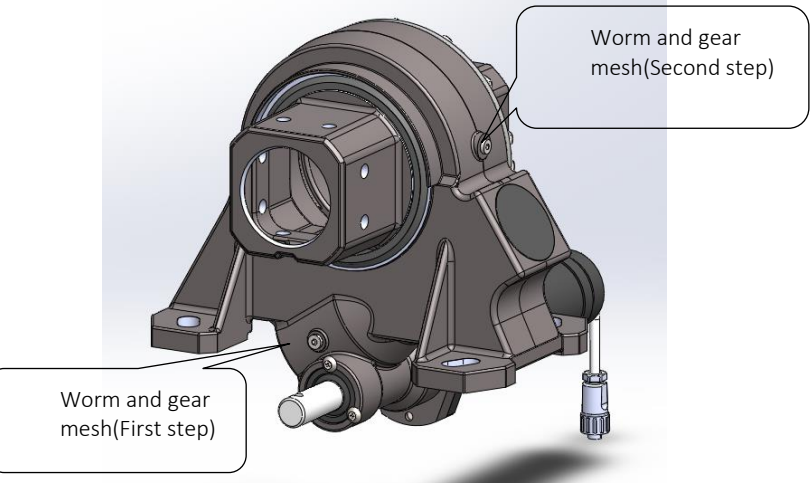
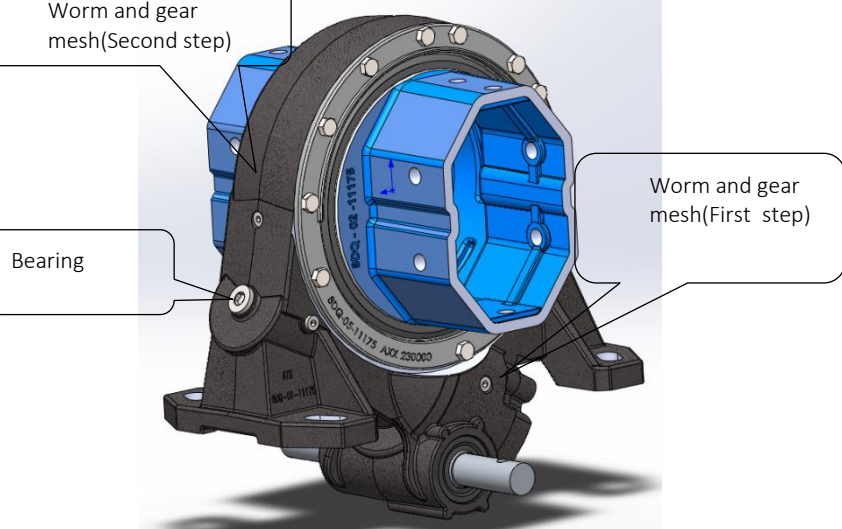
To compensate for possible settling, it is necessary to retighten the bolts to the prescribed torque. This shall be done after one month of operation. This inspection shall be repeated annually.

The inspection frequency may be reduced under special operating conditions, for example this should be done after strong winds.

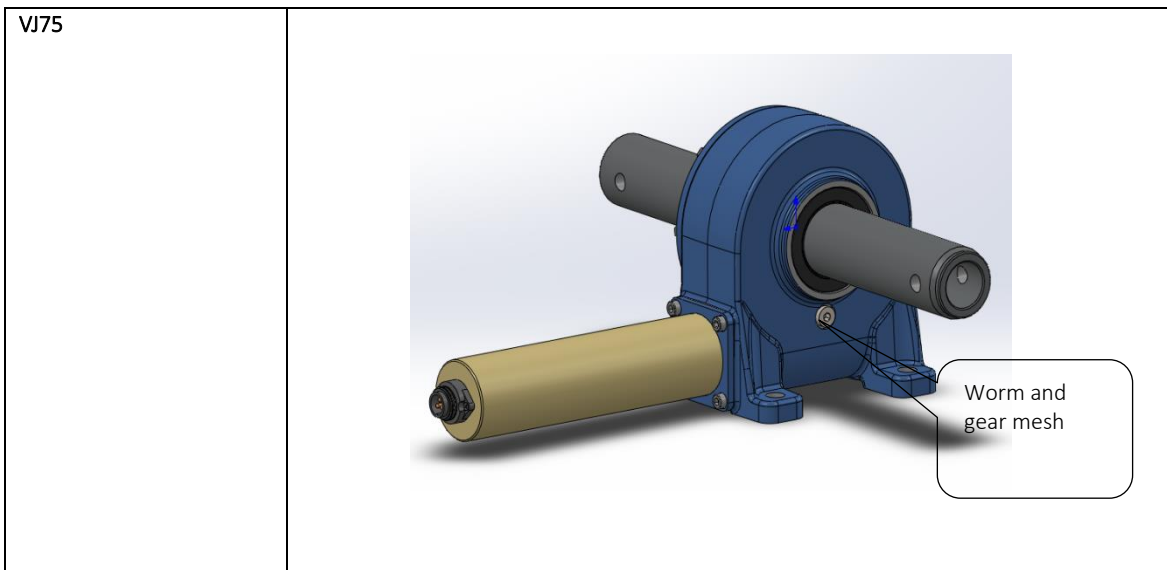
3.3 Lubrication of Slewing Drive

<p>VE5C</p>	
<p>VE8GA</p>	

<p>VE5D/VE6D/VE7D/VE7DP/ VE8D/VE9D</p>	
<p>VE8DB</p>	
<p>VE8DH</p>	

<p>VE5DN/VE6DN/VE8DN</p>	 <p>Worm and gear mesh(First step)</p> <p>Worm and gear mesh(Second step)</p>
<p>VE7DQ</p>	 <p>Worm and gear mesh(First step)</p> <p>Worm and gear mesh(Second step)</p>
<p>VE5DQ /VE8DQ</p>	 <p>Worm and gear mesh(Second step)</p> <p>Bearing</p> <p>Worm and gear mesh(First step)</p>

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- Our products have been injected enough grease before they leave factory. See the figure below for re-lubrication reference.

Slewing drive size	Lubrication point	Grease type	Grease quantity each time
VE5C	Gear and worm mesh	Sinopec HF7B (150)-00#	50g (or 50ml)
	Spur gear mesh	HF7C-2	20g (or 20ml)
VE5D	Gear and worm mesh	Sinopec HF7B (150)-00#	50-80g (or 50-80ml)
VE6D	Gear and worm mesh	Sinopec HF7B (150)-00#	60-100g (or 60-100ml)
VE7D	Gear and worm mesh	Sinopec HF7B (150)-00#	60-100g (or 60-100ml)
VE7DP	Gear and worm mesh	Sinopec HF7B (150)-00#	80-120g (or 80-120ml)
VE8DA	Gear and worm mesh	Sinopec HF7B (150)-00#	80-120g (or 80-120ml)
VE8DB	Gear and worm mesh	Sinopec HF7B (150)-0#	80-120g (or 80-120ml)
	Bevel gear mesh	Sinopec 7029D	80-120g (or 80-120ml)
VE8DH	Gear and worm mesh	Sinopec HF7B (150)-00#	80-120g (or 80-120ml)
	Spur gear mesh		30-50g (or 30-50ml)
	Bevel gear mesh		30-50g (or 30-50ml)
VE5DN	Worm and gear mesh (First step)	Sinopec HF7B (150)-0#	20-30g (or 20-30ml)
	Worm and gear mesh (Second step)		50-80g (or 50-80ml)

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VE6DN	Worm and gear mesh (First step)	Sinopec HF7B (150)-0#	20-30g (or 20-30ml)
	Worm and gear mesh (Second step)		50-80g (or 50-80ml)
VE8DN	Worm and gear mesh (First step)	Sinopec HF7B (150)-0#	20-30g (or 0-30ml)
	Worm and gear mesh (Second step)		80-120g (or 80-120ml)
VE5DQ	Worm and gear mesh (First step)	Sinopec HF7B (150)-0#	20-30g (or 20-30ml)
	Worm and gear mesh (Second step)		50-80g (or 50-80ml)
	Bearing		20-30g (or 20-30ml)
VE7DQ	Worm and gear mesh (First step)	Sinopec HF7B (150)-0#	20-30g (or 0-30ml)
	Worm and gear mesh (Second step)		60-100g (or 60-100ml)
VE8DQ	Gear and worm mesh (First step)	Sinopec HF7B (150)-0#	40-60g (or 40-60ml)
	Gear and worm mesh (Second step)		80-120g (or 80-120ml)
	Bearing		40-60g (or 40-60ml)
VE8GA	Gear and worm mesh	Sinopec HF7B (150)-00#	120-150g (or 120-150ml)
	Raceway	Sinopec 7029D	20-30g (or 20-30ml)
VE9D	Gear and worm mesh	Sinopec HF7B (150)-00#	120-150g (or 120-150ml)
VJ75	Gear and worm mesh	Sinopec HF7B (150)-00#	30-40g (or 30-40ml)

- **Lubrication frequency**

We suggest check every 3 years, if no abnormal condition, lubrication can be done according to the actual condition. We suggest first lubrication should be done after 3 years.

Grease filling is carried out from the oil plug hole, inject grease into slewing drive while rotating the slewing drive.

Insufficient lubrication will shorten the service life of the slewing drives, and even damage the slewing drives

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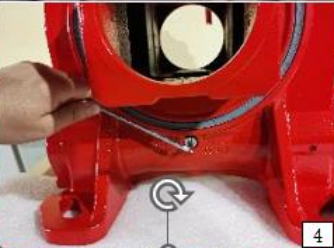






Note: Abnormal condition that caused by Insufficient lubrication include slewing drive noise, huge oil leakage, abnormal motor current increase etc.

● Grease data sheet and alternative grease

Typical Data	HF7B (150)-00#	HF7B (150)-0#	HF7C-2	Sinopec 7029D
Color	Yellow	Yellow	Black	Light yellow
Thickener	Polyurea	Polyurea	Soap	Polyurea
Base oil	PAO	PAO	PAO	PAO
Drop point °C	225	225	190	264
NLGI grade	00	0	2	2
Penetration (60 strokes),0.1mm	421	372	70	285
Corrosion prevention (45#steel,100°C,3h)	Pass	Pass	Pass	Pass
Working temperature, °C	-40°C to +150°C	-40°C to +150°C	-40°C to +150°C	-40°C to +180°C
Alternative grease	Mobile: SHC Polyrex 005	Mobile: SHC Polyrex 005	NYE: Theolube 380	Mobile: SHC Polyrex 462
			NYE: Theolube 380-G1	Mobil: Polyrex 222
			Shell: AERO SHELL grease 64	
			Total : multisensory complex SHD220	
			Total: multisensory complex SHD100	
			MOLYKOTE: EM30L grease	
			Brugarolas: G.BESLUX PLEX H-2/S	

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.**

3.4 Lubrication instruction

	科恩卓（江苏）传动有限公司	Title	Page
	Cone Drive (Jiangsu) Power Transmission Co., LTD	VE8GA-2230 grease adding instructor	1/2
Operating pictures		Operating steps	Operating tools
		1. Manual oil gun	
			
			
			
			
			
	科恩卓（江苏）传动有限公司		
	Cone Drive (Jiangsu) Power Transmission Co., LTD	VE8GA-2230 grease adding instructor	2/2
Operating pictures		Operating steps	Operating tools
		7. Connect the oil tube with the oil gun, add grease through the grease hole (about 200 to 250g, for worm and gear lubrication)	Oil gun
			
			

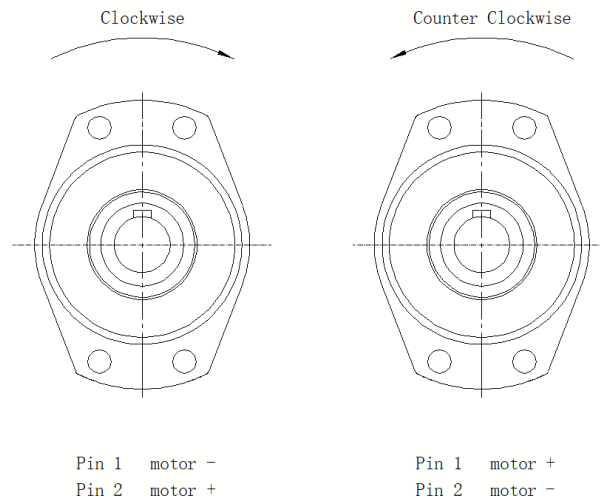
Note:

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

4. Instruction of DC & AC motor

4.1 Checking motor operation

- Standard 24V DC reducer motor, power on the motor and check the rotation. DC motor steering should comply with GB1971-2006 standard. If Pin1 connects negative pole of power, Pin2 connects positive pole of power, DC motor rotates clockwise when operator faces to the extend shaft of DC motor. Exchange the connection of two pins, DC motor steering will be counter clockwise.



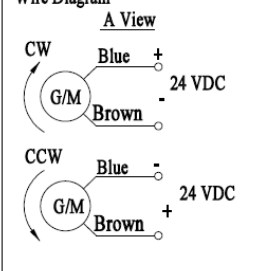
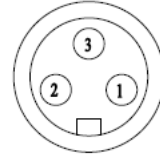
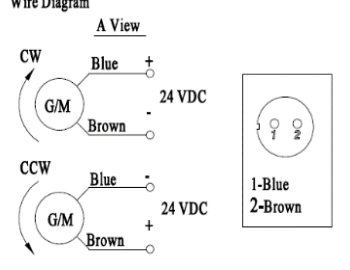
- Rotate the motor without load to make sure it rotates smoothly. In case of abnormal rotation, please check the electrical system, rotary reducer, worm, etc.
- After the test under no load condition successfully, add to the rated load.
- Motor protection from over-current should be taken into consideration. The protection current shall not exceed 1.2 times of the rated current specified by the motor or the peak current of the motor.
- For unconventional motors such as brushless DC motors, please read the motor manual attached



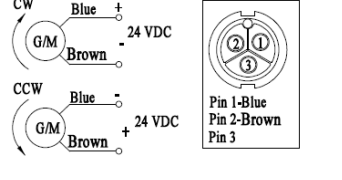
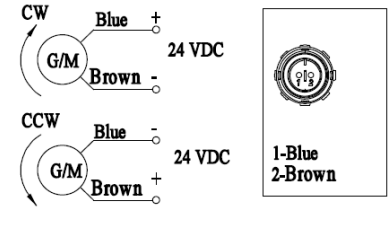
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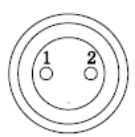
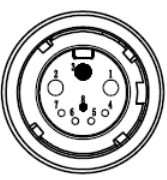
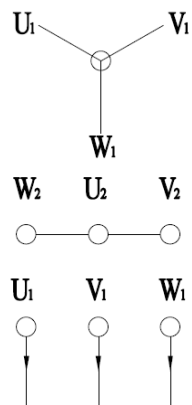
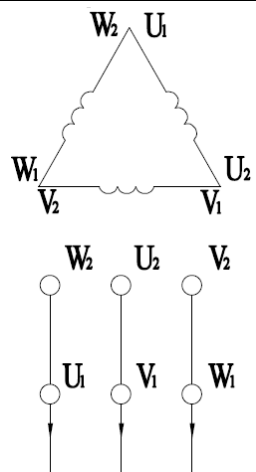
with our products in detail.

4.2 Motor Wire Definition

According to the approved drawing or below wire define if there is no special requirements:

Item	Connecting type for customer's TCU	Wire define
Option 1	Cable	<div style="border: 1px solid black; padding: 5px;"> <p>Wire Define:</p> <ol style="list-style-type: none"> 1. Black motor - 2. Red motor + 3. Yellow/Green GND </div>
Option 2	Cable	<div style="border: 1px solid black; padding: 5px;"> <p>Wire Diagram</p> <p style="text-align: center;">A View</p>  </div>
Option 3	Weipu SP2111/P3	<div style="border: 1px solid black; padding: 5px;">  <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Wire Define:</p> <p>Pin1 motor-</p> <p>Pin2 motor+</p> <p>Pin3 GND</p> </div> </div>
Option 4	Weipu SP2110/P2	<div style="border: 1px solid black; padding: 5px;"> <p>Wire Diagram</p> <p style="text-align: center;">A View</p>  </div>

Option 5	Weipu SP2110/P7	<p>Wire Define:</p> <p>Pin 1 motor -</p> <p>Pin 2 motor +</p> <p>Pin 3 hall GND</p> <p>Pin 4 hall +(5~24)V</p> <p>Pin 5 hall A</p> <p>Pin 6 hall B</p> <p>Pin E Ground</p>
Option 6	Weipu SP2113/P3	 <div style="border: 1px solid black; padding: 5px; width: fit-content; margin-left: auto; margin-right: auto;"> <p>Wire Define:</p> <p>pin1 Motor -</p> <p>pin2 Motor +</p> <p>pin3 GND</p> </div>
Option 7	Weipu WA22J7Z1	 <div style="border: 1px solid black; padding: 5px; width: fit-content; margin-left: auto; margin-right: auto;"> <p>Wire Define:</p> <p>Pin 1 motor -</p> <p>Pin 2 motor +</p> <p>Pin 3 hall GND</p> <p>Pin 4 hall+(5-24)V</p> <p>Pin 5 hall A</p> <p>Pin 6 hall B</p> <p>Pin E Ground</p> </div>
Option 8	Chogori 23003111-01	<p>Wire Diagram</p> <p style="text-align: center;">A View</p>  <div style="border: 1px solid black; padding: 5px; width: fit-content; margin-left: auto; margin-right: auto;"> <p>Pin 1-Blue</p> <p>Pin 2-Brown</p> <p>Pin 3</p> </div>
Option 9	LLT-M12-10002M3001	<p>Wire Diagram</p> <p style="text-align: center;">A View</p>  <div style="border: 1px solid black; padding: 5px; width: fit-content; margin-left: auto; margin-right: auto;"> <p>1-Blue</p> <p>2-Brown</p> </div>

Option 10	EC02681-2023-BF	 <p style="margin-top: 10px;">Wire Define: Pin 1 motor + Pin 2 motor -</p>
Option 11	RL-M19-2MZMT	<p style="text-align: center;">插头正视图</p>  <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>电机接线定义:</p> <p>pin1 Motor - pin2 Motor + pin3 Plug pin4 None pin5 None pin6 None pin7 None pin8 Plug</p> </div>
Option 12 (Three-phase AC motor)	Y connection	
Option 13 (Three-phase AC motor)	Delta connection	


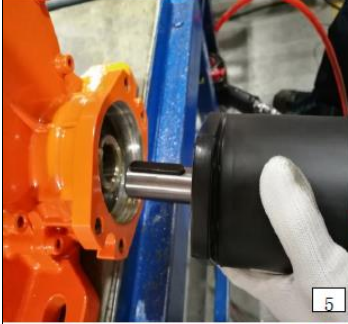






Note: After finishing the connection of motor cable, customers need confirm below items:

1. If there is connector or receptacle, please confirm it is installed and locked correctly, unlock condition is not permitted.
2. Confirm that the motor cable is fixed in tracker system or structure to avoid it damages caused by wind swing.



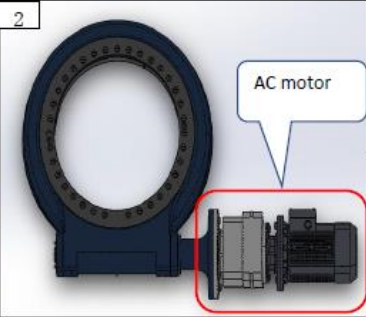
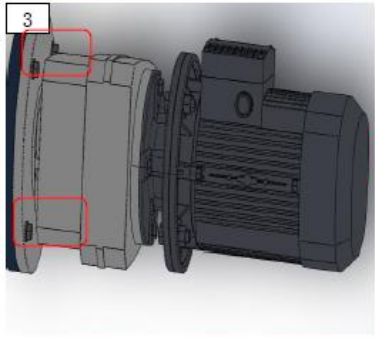
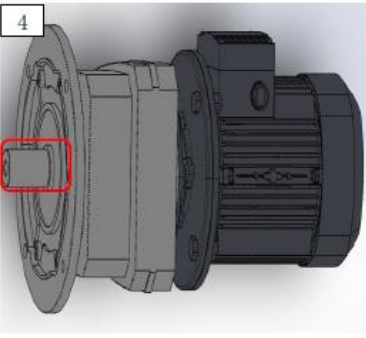
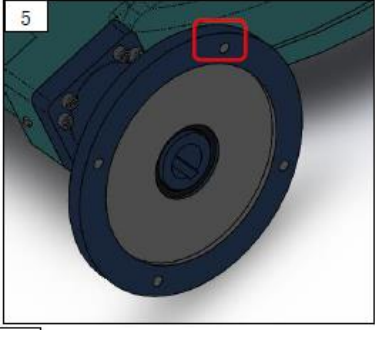
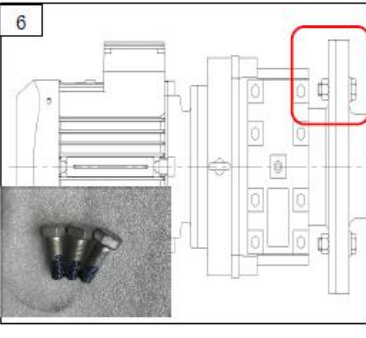
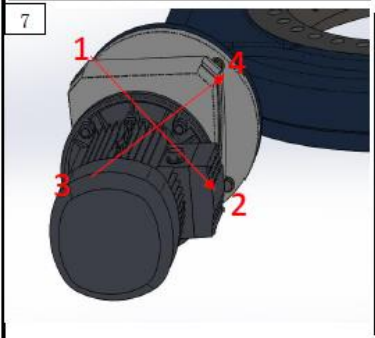
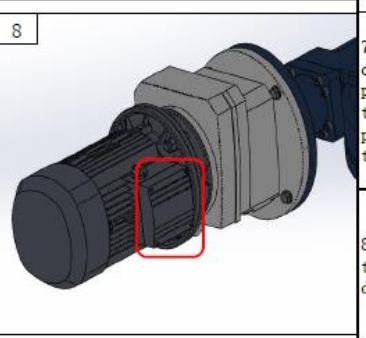
4.3 Motor exchange instruction

4.3.1 DC motor exchange

 科恩卓（江苏）传动有限公司 Cone Drive (Jiangsu) Power Transmission Co., LTD		标题 Title 更换电机作业指导书 Replace motor operation instruction	
作业图片 Working pictures		操作步骤 Operation steps	操作工具 Operation tools
 1	 2	1. 图为准备更换螺栓的装置 1.The picture shows the device for the replacement of bolts	
 3	 4	3. 更换新的电机 Replace a new motor	电动扳手 6mm加长接头 Electric wrench 6mm extension joint
		4. 自检电机“O”型圈与平键 自检有无缺失 Self check motor “O” type ring and flat key self check whether missing	

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作业图片 Working pictures		操作步骤 Operation steps	操作工具 Operation tools
		5. 对准键槽孔, 装入电机 Align the keyway hole and load the motor	
		6. 4-M8螺钉涂抹243螺纹胶 7. 手工预拧入4-M8螺钉 Manually pre-screw the 4-M8 screw	乐泰243螺纹胶 LOCTITE 243
		8. 对角依次拧紧螺钉 (30-36N.M) Tighten the screws in turn diagonally (30-36N.M)	电动扳手 6mm加长接头 Electric wrench 6mm extension joint
 科恩卓（江苏）传动有限公司 Cone Drive (Jiangsu) Power Transmission Co., LTD		标题 Title 更换电机作业指导书 Replace motor operation instruction	
作业图片 Working pictures		操作步骤 Operation steps	操作工具 Operation tools
		9. 在螺钉处划线 Mark the screw	记号笔 Marker pen
		10. 图为完成电机更换的装置 picture shows the device for completing the motor replacement	

4.3.2 AC motor exchange

 Cone Drive (Jiangsu) Power Transmission Co., LTD		Title Motor disassembly and assembly operation instructions	
Work pictures		steps	tooling
1	2	1. Place a layer of cardboard, cloth, or pearl cotton on the table top (Avoid paint bump on the surface of the device) Hoist the product onto the workbench (picture 1)	bridge crane
 		2. Picture 2 shows the AC motor of the Slew drives to be disassembled	
3	4	3. Disassembly the bolts that connect the AC motor with the Slew drives (Bolts are not allowed to be reused) (picture 3)	Tools for removing bolts
 		4. The disassembled AC motor needs to be placed separately Brush motor shaft end with grease or oil	
5	6	5. Clean the hole that assembly the bolts	
 		6. Assembly the AC motor to the Slew drives. Bolts thread threadlocker, screw the bolts and nuts. mark a line on the bolts surface (means the bolts are screwed)	threadlocker Tools for screwing the bolt
7	8	7. Screw the bolts in the order of 1 to 4, in line with the principle of diagonal cross tightening. (The bolts must be pretightened and then tightened)	
 		8. The direction needs to be the same as before the demolition	

Note:

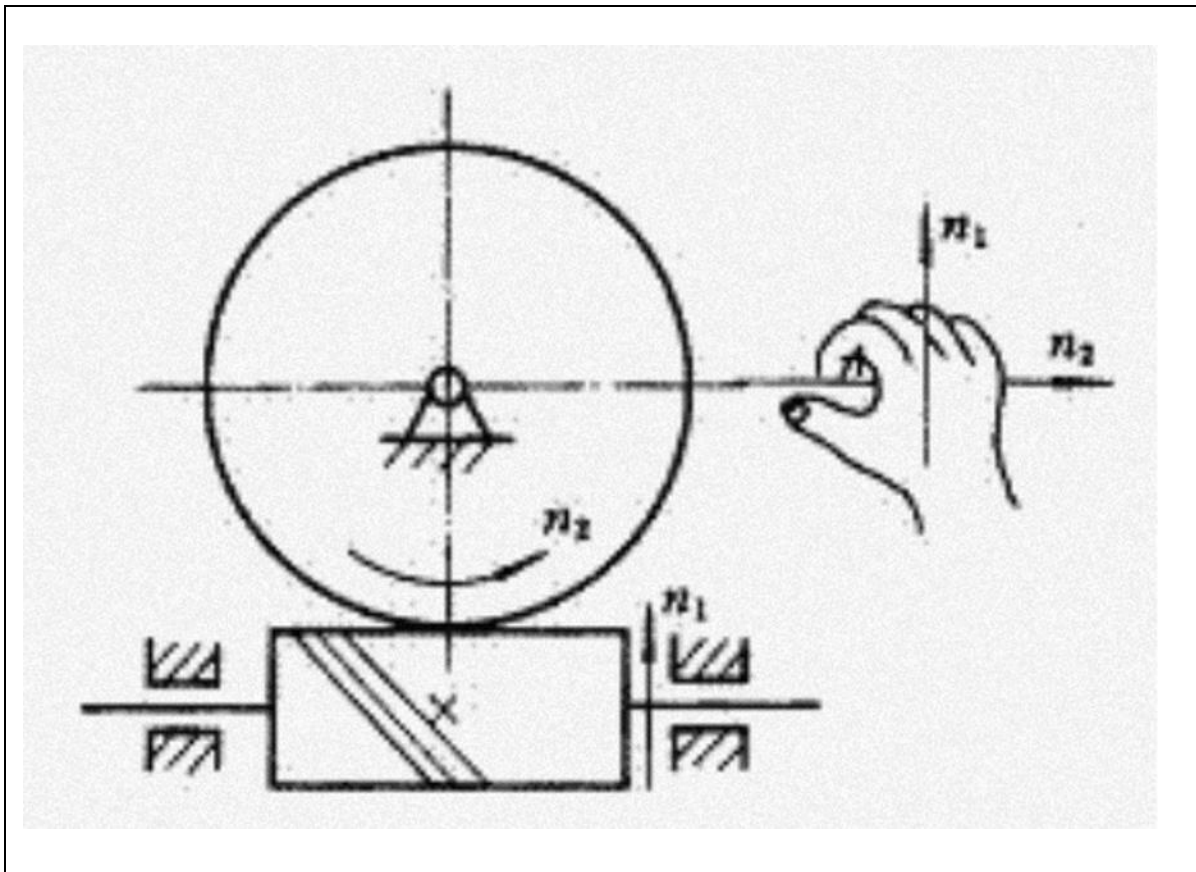
1. Do not use the DC motor as the force point during transportation, installation and maintenance.
2. 'O'-ring in the motor flange should be installed correctly during assembly and maintenance.

5. 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.



6 Caution items of sealing protection

6.1 Sealing protection performance

All the slewing drives have been tested the sealing performance in Cone drive's workshop before delivery. And have got the IP65 or better certificate from the third party. All the conclusions are based on static IP class.

6.2 Seals' maintenance

Seals, framework seals and other rubber parts are quick-wear parts, we suggest check every 5 years, if no abnormal condition, replacement can be done according to the actual condition.

We suggest first replacement should be done after 5 years.

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 analyses and conclusions are ineffective.