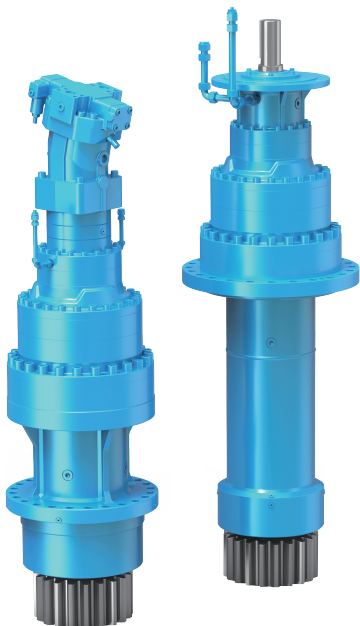


BONENG



PS Planetary Rotary Gear Units Instruction

01/2022

Note: You must conform to the following instructions

All the data in this instruction is only for the use manual, application example and suggestion. If need refer to the data when operating, it needs technical test.

Our products will be updated when time goes by, if there is no prompt updated information, please give us support.

The drawing in the instruction is only for the use manual, the exact products may be a little different.

All rights are reserved by BONENG, including copy rights and transfer rights.

Contents

Important notes	01
1.Safety instruction	02
2.About products	02
2.1 The name plate	02
2.2 Gear unit type description	03
2.3 Feature description	03
2.4 Products description	03
2.5 Notes	04
3.Transportation and storage	05
3.1 Transportation	05
3.2 Storage	05
4.Assembly	05
4.1 Remove the packaging	05
4.2 Assembly condition	06
4.3 Mounting position	06
4.4 Assembly description	06
5.Debugging	11
5.1 Oil lubrication add	11
5.2 Hydraulic motor drive debugging	14
5.3 Motor drive debugging	14
6.Maintenance and repair	14
6.1 Clean and check	14
6.2 Examine	15
6.3 Maintenance plan	15
6.4 Repair	16
7.Dismantling and replace	17
8.Faults checking and resolve	17
9.After sales service	19

Important notes

When assembling, please note these safety alarms.



Dangerous
Possible result: If disobeyed, may cause death or heavy accident.



Alarm:
Possible result: If disobeyed, may cause heavy hurt or death.



Be careful:
Possible result: If disobeyed, may cause light hurt or damage the gear units.



Suggestion and correct information.



Observing the provisions of this manual can make the device run without failure, and also meet the requirements of quality defect claims. Therefore, please read this manual before using the transmission device for work. This manual contains important installation and maintenance tips. Please keep the manual close to the equipment for easy installation and maintenance.

1 Safety description

Safety description mainly refer to the employ of gearbox. When use the gearbox, please pay attention to the relevant safety tips in instruction book!

Operation instruction is an organic part of gearbox we provided.

The person who install, operate, preserve and fix the gearbox must read this instruction book carefully and follow its rules.

Only follow the stipulations of the instruction book, can we achieve barrier-free operation, and perform any quality assurance.

Under the premise of following instruction, you also should notice:

Relevant provisions of safety and accident prevention of the state (area);

Special regulations and requirements of related equipment;

Security warnings and signs on the equipment;

The following conditions will lead to personal injury and property damage:

Misuse;

Installation or operation mistakes;

In violation of regulations to dismantle the necessary shielding or main case.

If due to violation of the stipulations of this manual and cause of any damage or downtime, our company is not responsible for it.

In order to continue the pursuit of technology progress, we reserve the right to modify it.

Through continuous improvement, on the basis of keeping basis characteristics, be benefit of further providing the use performance and job security.

2 About products

The products are PS planetary rotary gear units, we call rotary gear units.

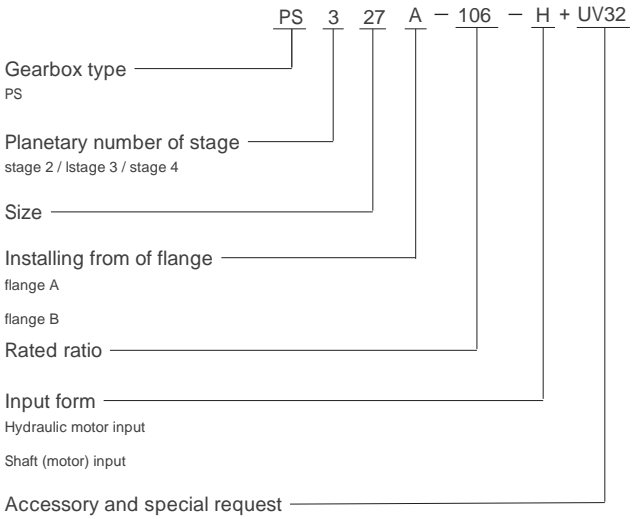
2.1 The name plate

⊕		BONENG		CE ⊕	
Type					
n ₂				RPM	
P ₁		kW	T ₂	N · m	
n ₁		RPM	i		
Oil		L		kg	
NO.			Date		
⊕				⊕	



All the information on the name plate is very important. Please read careful and keep it clean. When service required, please offer the products number on the name plate and the operation time and the fault situation.

2.2 Gear unit type description



2.3 Feature description

The rated output torque for PS is 11000N.m - 590000N.m. For the specific product feature date, please refer the catalogue or BONENG relative technical material.

2.4 Products description

PS planetary rotary gear units are incorporated with built in planetary gear units, drive units, output pinion and other relative accessories. It is used on rotary driving mechanism of port crane, Lorry - mounted crane and mobile crane, building crane, deck crane, container gantry crane, cars and crawler crane, offshore platform crane etc.

2.4.1 Gear units

PS gear units with big output torque, large range of ratio and stability.

The sun gear and planetary gear material are excellent alloy steel which is carburized and quenched, internal gear material is excellent alloy steel which surface is hardened, all the gears are grinded.

Planetary rack and the middle connect flange material are nodular cast iron which has high loading force.

2.4.2 Drive unit

The PS drive unit is motor or hydraulic motor (see figure 1 and 2) .

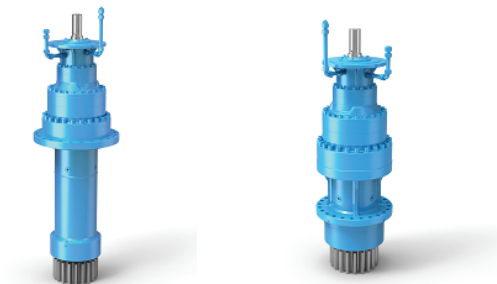


Figure 1 motor drive

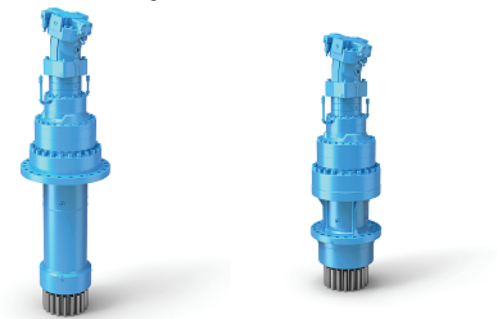


图2 Figure 2 hydraulic motor drive

2.5 Notes

Any change on the rotary gear unit is prohibited. The adverse consequences caused are not within warranty scope.

Any welding on the gear unit is forbidden. And can't make the gear unit as the welding site, it will damage the precision gear and bearings etc.

Any abnormality happened (For example, Higher temperature or abnormal noise), stop the gear unit immediately and check the fault and solve it.

Make sure use all the original spare parts from BONENG, which can avoid accident by inappropriate spare parts.



If need get the oil sample or drain out the oil lubrication, please open the oil outlet carefully to avoid the oil spray or spill out.



Only the gear unit is stopped, dismantle work can be done.

3 Transportation and storage

Before transport, please read the instruction carefully and comply with them to stock the gear units.

3.1 Transportation

Comply with the local Country transport law and rules.

When lifting by hoist or forklift, must be done by the qualified person.

According to the weight and measurement, choose the correct lifting tool (hoist or forklift) and lifting tools (chain and hook or belt and rope).

During transport, make sure it is fixed well.

When transporting, make sure lift and put down lightly to avoid damage.

3.2 Storage

Gear units should be stocked in anti - corrosive condition.

Gear units should be stocked in good ventilation and anti - rust environment. It will be kept well for 12 months.

If stocked in air condition, the anti - rust can be kept for 18 months. Keep away from the humid place.

4 Assembly

Before assembly, prepare following material,

Products overall dimension drawing.

Products technical data.

Products operation instructions.

4.1 Remove the packaging

The standard packing is wooden case. To avoid the damp, the internal pack is with anti - rust film and the dryer.

Follow the steps to remove the packaging.

- 1.Put the packaging on a certain loading and explanate place
- 2.Open the package from up side
- 3.Check the package surface
- 4.Check the gear unit type
- 5.Use the suitable lifting tool to fetch the gear unit out
- 6.Put the gear unit to available place and avoid leaning.



Do the packaging disposal as the local law.

4.2 Assembly condition

Confirm the products in good condition (No damage during transporting or stock).

Confirm the coordinate of site condition with the name plate.

Make sure the oil inlet and outlet is sealed well to avoid pollution.

When installing outdoors, direct sunshine should be avoided. Otherwise the heat concentration will affect the gear units performance.

Keep certain place for the maintenance and repair.

Any damage caused by incorrect assembly will not be protected by BONENG.



Standard products: ambient temperature: - 20 - +50 , no oil, acid, harmful gas, steam, radiomaterial .

4.3 Mounting position

The acquiescent installation location of gearbox is vertical installation (the pinion is downward).

Other installation location need be instructed in advance.

4.4 Assembly description

Following assemble instructions include the motor drive, hydraulic motor drive and the flange installation (Flange A and Flange B). Customer assembles your gear units.

4.4.1 Assembly prepare

Clean the mounting surface.

When mounting the sealing (O type sealing or oil sealing), take measure to avoid scratch it.

When the gear units are stocked over 1 year, change the oil, lubrication and oil lubrication etc before mounting.

Tools: wrench, wrench torque, work piece, input and output fasten device, lubrication (anti - rust oil), screw sealing (screw glue).

Make sure the winch gear unit mounting size is the same as the mount support connection.

If there is no input drive for gear unit, confirm the input size of the gear unit is the same as the output size of the drive units.

Confirm the mounting sequence of the spare parts.

4.4.2 Hoisting schematic drawing

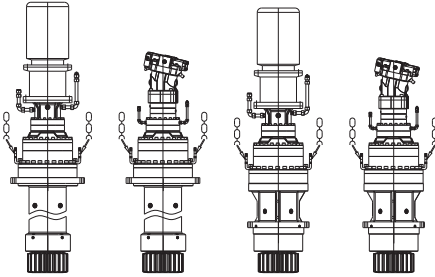


Figure 3 Hoisting installation schematic drawing of gear box



Increase lifting points according to the weight of gear units.
Forbid the shaft end thread with flying rings as lifting points.

4.4.3 Gear box installation

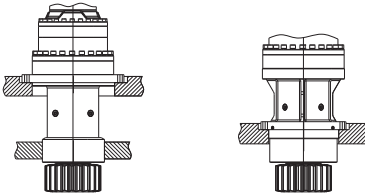


Figure 4 Installation instruction of gearbox and steel structure.

When the output flange of gear units connect with the steel structure, the screw level must be 10.9

4.4.4 Hydraulic motor mounting

If the gear unit is exclusive the hydraulic motor, assemble the hydraulic motor as followings:

- 1.Lift the hydraulic motor and fix it on the hoisting tools. Transfer it to the input part of gear unit according figure 5.

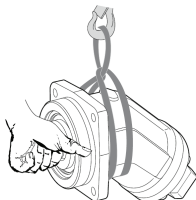


Figure 5 motor lifting

i Choose suitable hoisting installation methods according to the different varieties of hydraulic motors.

- 2.Put O ring into the O ring groove of input flange as figure 6
- 3.Hold the end of motor by hands to make sure the flange face is on the same level with the input flange face of gear unit and then push the hydraulic motor into the input flange of gear unit.
- 4.Use 8.8 tighten level screw to fix the motor. The screw supplied by customer.

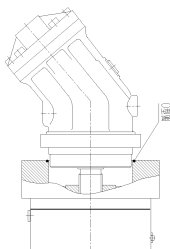


Figure 6: flange O ring mounting

i Must keep the O ring perfect during assembly, if there is scratch or crush, replace the new one.

Choose suitable installation methods according to the different varieties of hydraulic motors.

4.4.5 Connect the hydraulic motor gear unit with the hydraulic system

Connect the A/B oil port of the motor with the oil system of the main hydraulic device.

Connect the oil outlet of the motor with the oil tank of hydraulic system.

Connect the brake oil port with the brake release oil port of the brake.



To make sure the gear unit run well, the oil outlet of motor should connect with the oil tank directly, if not, must make sure the pressure of the motor is not more than 1.5 Bar.

4.4.6 Motor mounting

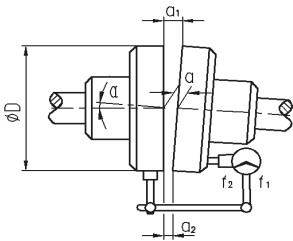
For the new assembled or stocked over 3 months motor, must check the safety before using. When assemble the coupling or limiting torque coupling, must align the coaxiality. Big coaxial tolerance will cause the vibrations which will damage the bearings and the mesh of gears.

When the motor shaft connect with the input shaft of gear unit by coupling (figure 7), must align the level by meter and meet the following data showed in " the coaxial precision table " .

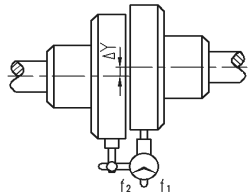
When connect the box terminal, must keep it clean, no liquid or waste.



If the stock environment for motor is very moist, dry the motor before mounting.



Angular deflection test



deviation test

Figure7

The coaxial precision table

Outer diameter/O.D	$n < 500 \text{r/min}$		$500 \sim 1500 \text{r/min}$		$> 1500 \text{r/min}$	
	a1 - a2	Y	a1 - a2	Y	a1 - a2	Y
D 100	0.05	0.05	0.04	0.04	0.03	0.03
100 < D 200	0.06	0.06	0.05	0.05	0.04	0.04
200 < D 400	0.12	0.10	0.10	0.08	0.08	0.06
400 < D 800	0.20	0.16	0.16	0.12	0.12	0.10

4.4.7 Connect the motor drive gear unit with the electric system

Connect the motor with the electric system.

Connect the electromagnetic and hydraulic brake with the electric system.



Confirm no oil or lubrication grease on the brake block and the brake wheel.

Check the wire, protective circuit and fuse plug before connecting the motor.



Special earth protector should be done for motor base.

Brake should do safe earth connection.

4.4.8 Assembly completed

Remove all tools, such as hooks and work piece.

Recheck all the connection units correct fixed and tightened.

4.4.9 Screw tighten torque

When the friction factor is 0.125, the screw tighten torque is showed as following table.

Screw type	Screw strength8.8	Screw strength10.9
M6	9.5 Nm	13 Nm
M8	23 Nm	32 Nm
M10	46 Nm	64 Nm
M12	80 Nm	110 Nm
M14	125 Nm	180 Nm
M16	195 Nm	275 Nm
M18	270 Nm	390 Nm
M20	385 Nm	540 Nm
M22	510 Nm	720 Nm
M24	660 Nm	930 Nm
M27	980 Nm	1400 Nm
M30	1350 Nm	1850 Nm
M36	2350 Nm	3300 Nm

5 Debugging



Test according to the relative technical data to avoid the damage.

Before debugging, make sure all the connections for electric or hydraulic are done or closed.

Do debugging till all assembly work finished.

5.1 Fill the lubrication in gearbox

The gearbox are out of lubrication before delivery, please fill the oil lubrication before running.

The oil level should be on the middle of the oil glass.

Table 1: Lubrication

Ambient temperature	-20 +40
Adhesiveness of oil brand	VG220



When ambient temperature is lower than -10 , use synthetic oil only.

To length the gear unit life, suggest to use synthetic oil.

When ambient temperature is over the range of the table, please consult BONENG technical department.

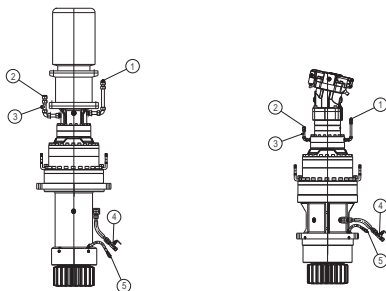
Oil quantity table: this is the suggest value. Different stage and ratio, the oil quantity is different.

Fill the oil according to the oil glass level.

Oil Level (L)												
2	PS20	PS22	PS24	PS25	PS26	PS27	PS29	PS31	PS32	PS33	PS34	PS36
3	8	9	14	16	25	28	45	50	-	-	-	-
4	-	-	16	18	27	30	48	55	80	-	-	-
	-	-	-	-	29	32	50	58	85	150	160	180

The step of filling oil is as followings,

- 1.Remove the oil plug and breather on the top of the lubrication tube on the input part, and fill the oil from the oil port.
- 2.Stop filling the oil when the lubrication oil level on the middle of the oil glass.
- 3.Tighten the breather.



Breather Oil plug (oiling) Oil glass Ball valve(oil drainage) Grease fitting(greasing)

Figure 8: the oil port structure



All gears and rolling bearings in gearbox are with immersion oil lubrication.

The bearings under the input shaft are with grease.

5.2 The debugging for the hydraulic motor gear unit

Prepare following documents before debugging

- The gear unit hydraulic principle diagram.
- The driven machine hydraulic principle diagram.
- The outline for hydraulic system.



Prepare the pressure meter and pressure test line to record the gear unit running.

5.2.1 Filling oil for hydraulic system

To prevent the gear unit hydraulic parts, please fill the oil and draw the air out on motor housing before debugging.

Fill the oil by the filter car (filter precession is $10\ \mu\text{m}$). Running is not allowed when filling oil.

Fill the oil through the upper oil inlet on the motor housing (see figure 9 T1) with full.

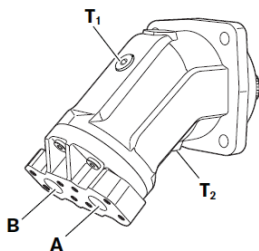


Figure 9 motor oil inlet

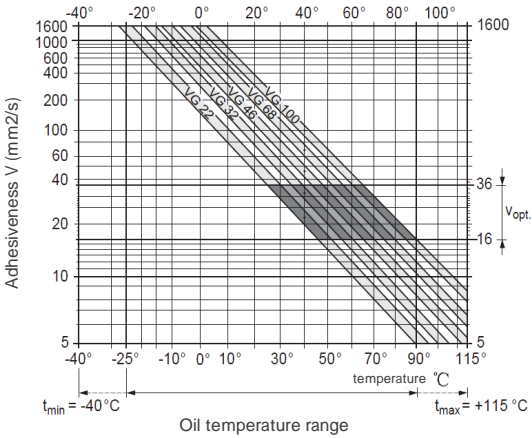


Must use mineral oil. If need use special oil, must get the approval from BONENG technician.

For the sake of hydraulic unit life, the oil cleanliness level should be kept above 20/18/15 stipulated in ISO 4406. When oil temperature is very high ($85\text{ }^{\circ}\text{C}$ - $110\text{ }^{\circ}\text{C}$), the cleanliness for the oil should be kept above 19/17/14 as ISO 4406 stipulated.

Choose suitable lubrication oil to make sure the gear unit running well if the temperature is different. Suggest use VG32 in winter, for very low temperature, suggest use VG22 or special oil for the lower temperature. And suggest use VG46 in summer. If the outside temperature is very high, suggest use VG68.

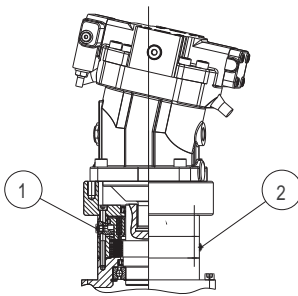
Suggest the oil adhesiveness and brand in figure 10, the part with shadow is the best temperature for the relative oil brand. Customer can choose the suitable oil brand according to the ambient temperature and machine average temperature.



5.2.2 Filling oil for multi piece brake

Brake is out of lubrication before delivery, please fill the oil lubrication before running. The steps for filling the oil on brake,

1. Open the oil inlet upper on the brake,
2. Filling the oil (Different brake will fill different oil level, for exact oil level, please consult BONENG technical department)



Parking brake oil mouth(M12 × 1.5) Breather(oiling)



Brake is used for parking brake and not allowed to use for dynamic brake.

5.2.3 Running test

Make sure the gear unit assembly completed and all the pressure testing accessories are connected well before running test.

When temperature is lower -10℃, suggest heat the hydraulic oil and lubrication oil of gear units first then start up the gear unit.

Running the gear unit for some times without loading to make sure all the air in the tube is exhausted. And check the pressure system to operate well.

5.3 Motor drive gear unit debugging

The motor starting electric current is 5 to 7 times than operating current, the continuous starting times is not more than 3.

Adjust the motor rotation as required.

Adjust the distance on the electromagnetic brake pad and keep the same distance.

Adjust the brake torque of the electromagnetic brake as required.



Prepare the electric control principle diagram before debugging.

During motor operating, the housing surface temperature is not over 80℃.

Make sure the motor fan ventilate well.

The tolerance of current and average on phase is not exceeded of 10% during motor operating.

Switch off the motor immediately when the motor rotor speed is very low or not run with loading.

6 Maintenance and repair

Maintenance should be made periodically as this instruction.

Lengthen the gear unit life through the periodical maintenance and repair.

The after sales service person of BONENG will do the repair during the quality warranty.

The quality warranty will be invalid if customer dismantle, change or repair the gear unit during warranty period.



Do the maintenance and repair only when machine and equipments are stopped and the gear unit is dismantled completely.

6.1 Clean and maintenance

Keep the winch gear unit clean and make sure the gear unit to work normally.

Using the suitable cover and protect device to seal all the ports to prevent the cleaner to enter into the system.

Clean the oil port using dry cotton fabric.

If the raffle penetrates into the hydraulic system or gear unit, please contact BONENG after sales service and we will do the special washing to avoid damage the hydraulic unit and gear unit.



Jetting machine is forbidden to clean the hoist gear unit.

Corrosive cleaner or solvent is not allowed.

6.2 Checking

Checked by eyes and sound are the best way.

Following situation can be checked by eyes.

The oil leakage from winch gear unit.

Well sealing on hydraulic system.

Normal oil level on gear unit.

No over abrasion on the part of gear units.

Following situation can be checked by sound.

If there is harsh noise, it shows the gear unit damaged.

If there is big noise from hydraulic motor, it shows the hydraulic system is sucking air and there is air in the lubrication oil.

If there is big hum when motor operating, it shows the electric current is big or operate with default phase.

6.3 Maintenance plan

Table1 “ Gear units maintenance plan ” is only suitable for planetary gear unit. Please do the planetary gear unit maintenance plan as the equipment maintenance rules.

Table 2 “ Hydraulic system and accessories maintenance plan ” is only suitable for hydraulic system and accessories. Please do the hydraulic system and accessories maintenance plan as the equipment maintenance rules.

Table 3 “ Electric system and accessories maintenance plan ” is only suitable for electric system and accessories. Please do the electric system and accessories maintenance plan as the equipment maintenance rules.

Table 1 Gear units maintenance plan

Measures	Periods
Check oil temperature	Daily
Check oil level	Daily
Check gear unit for leaks	Monthly
Test oil for water content	200 operating hours following start - up
First oil change	200 operating hours following start - up
Subsequent oil changes	Every year or 1000 operating hours
Clean the breather	Every 3 months
Check tightness of fastening bolts	After first oil change, thereafter, after every second oil change
Carry out complete inspection of gear unit	Approx. every 2 years simultaneously with due oil change

Table2 Hydraulic system and accessories maintenance plan

Measures	Periods
Check the hydraulic hose, oil port connection for leaks	Daily
Check the noise during the hydraulic accessories working	Weekly
Check the noise during the multiple disc brake working	Weekly
Change the lubrication oil for the multiple disc brake	Every 2000 hours
Check tightness of fastening bolts for the hydraulic accessories	Every 3 months
Change the filter element	According to the filter period or the alarm from filter
Analysis the oil: adhesive, degree of aging and muddiness	After 2000 operating hours once per year at least

Table 3 Electric system and accessories maintenance plan

Measures	Periods
Change the grease for motor	Every 6 months
Check tightness of fastening bolts for electric accessories	Every 3 months
Check the same distance on the brake pad	Every 3 months
Change the brake friction plate	The thickness for the brake friction is lower than the stipulated or be burned
Check tightness of main spring for brake	Every 3 months

6.4 Repair

Boneng will offer the complete service for the winch gear units.

During warranty, repaired working should be done by the after sales service of Boneng. If dismantle the gear units/ change/ alter the product by self, the quality guarantee will be invalid. Must use the original spare parts from Boneng for repair.


7 Dismantling and replace


Use the standard tools to dismantle the drive unit, special tools are not needed.


Incorrect operating will hurt the drive units.

Hitting products is forbidden when dismantle. No shaft force or high pressure on the core parts of drive units and the housing of gear units.

Handle the products lightly during dismantle.

-  Keep the dismantle spot is clean and keep the contaminant away from the hydraulic system and gear units.
After dismantle on the hydraulic driving gear unit, must keep the hydraulic unit oil port and tube connection sealed and protect them.

-  Recycle the oil and lubrication etc.

-  Do the dismantle working only after the gear units stopping, no loading and cooling down.

8 Faults checking and resolve

Following faults checking table will help you to find the reason. We can ' t make sure it is complete, in fact, there may be the reason excluded in the table.

Table 4 planetary rotary gear units fault.

Table 5 hydraulic system and unit fault.

Table 6 electric system and unit fault.


-  Record the fault problem and send the information to customer service of Boneng in time.
If the faults are not found in above table, and can ' t find the problem, please contact the customer service of Boneng.

Table 4 planetary rotary gear units fault

Malfunctions	Causes	Remedy
Changes in gear unit noise	Damage to gear teeth	1.Check all teeth 2.Replace any damaged parts
	Excessive bearing play	Contact customer service
	Bearing defective	
Loud noises	Fastening is loose	Tighten bolts/nuts to prescribed torque
Operating temperature too high	Oil level in gear unit housing too high or too low	1.Cooling the planetary gear units. 2.Check oil level 3.Filling more oil or drain out some oil if the level is too high
	Oil too old or badly contaminated	Check date of last oil change. And change the oil if necessary. Do it as the state on 6.4.2
Oil leakage	Output sealing defective	Check the sealings, if necessary, replace seals. If can ' t confirm the problem, contact customer service.
	Input sealing defective	
Oil foams	The new filled oil is not matched with the remained oil in the gear units	Clean the oil and change the new oil.

Table 5 hydraulic system and unit fault.

Malfunctions	Causes	Remedy
Oil leakage on the connection of motor and brake	O type sealing rings defective	Change the seals
Oil leakage on the connection of hose	Sealing rings defective	Change the seals
Brake noise when gear unit operating	The pressure on the reducing valve is too low	check the brake pressure on motor integrate block
	Brake damaged	Repair/change
Noise when motor operating	Motor sucks air	check the oil port pressure on motor integrate
	Motor defective	Repair/change
	Cushion valve pressure is too low	Reset the cushion valve pressure
	Motor defective	Repair/change
Oil leakage from the mounting face of motor and motor integrate block	O type sealing rings defective	Change the seals
	The mounting face of motor integrate block is damaged	Repair/change

Table 6 electric system and unit fault

Malfunctions	Causes	Remedy
Motor doesn ' t run	Fuse burn out	Change the fuse
	Bad contact on stator coil	Open terminal box and test the bad contact point with testing light
	Motor may be with over loading	Reduce the load
	Main wire defective	Check the electric wire
Motor rote speed is slow	Electric pressure is low	Use the more higher pressure power or use the voltage transformer
	Main circuit break, default phase	Check the electric wire connection
Motor vibration	Support base is unstable	Fasten the support base
	Coupling position is incorrect	Correct the coupling position
Abnormal noise from motor	Bearing defective	Change
Loud noise from the magnetic block brake	Brake bush is badly worn	Change
Brake bad	Brake spring is loose or damaged	Repair/change
Brake can ' t work	Brake spring is too tight	Adjust the spring tightness

BONENG