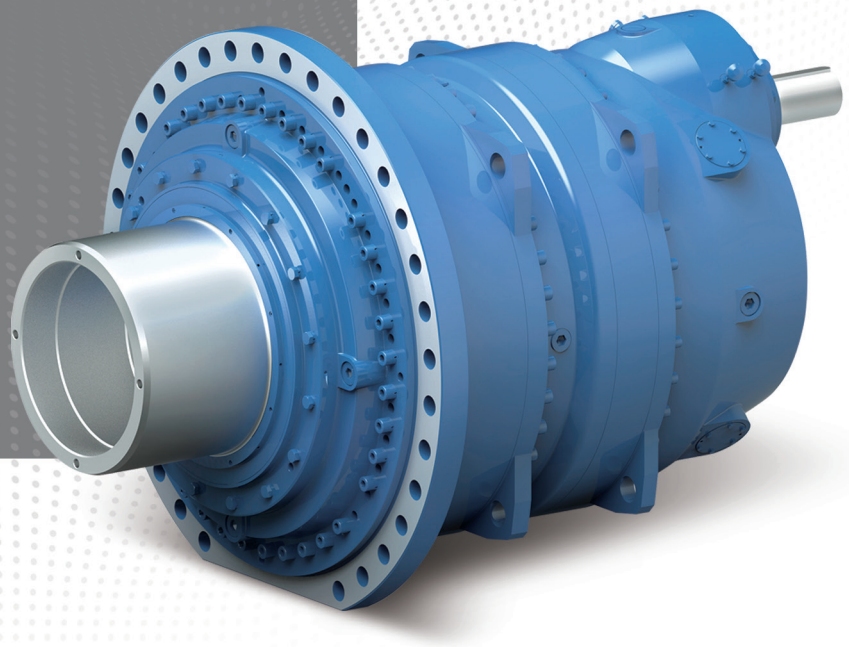
NGC

MPG Series
Gearboxes for Roller Press
Operating Manual



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Revision history:

The last input in the edition and date columns will prevail.

Version	Modification Content	Modification Date	Modified by	Remarks

Contents

1. General Instructions

1.1 Prompts and Explanations

Some prompt signs are used in this operating manual, as shown in Table 1-1, with the purpose of emphasizing some contents of the manual and attracting readers' attention.

Table 1-1 Prompts

Prompts	Meanings	Possible Consequences of Non-compliance
Warning!	It may cause danger.	Casualties or major property damage
Cautions!	It may cause property damage	Damaging equipment or degrading equipment performance
Danger!	It easily causes danger.	Casualties or major property damage
Reminder!	Important reminders and information	

The “NGC” mentioned in this manual refers specifically to Nanjing High Speed &Accurate Gear (Group) Co., Ltd.

1.2 Direction for Operating Manual

As an integral part of the gearbox installation provided, this manual contains important instructions for the operation, use and maintenance of the gearbox. It must be properly stored and ready for immediate reference. Following the Operation Manual is a prerequisite to ensure the normal operation of the gearbox and to achieve specified product performance and efficiency.

Warning!

Anyone involved in the installation, operation, maintenance and repair of the gearbox must carefully read and understand the Operation Manual and strictly comply with it. NGC will not be held responsible for any product damage or destruction resulting from the failure to follow the Operation Manual.

The “roller mill gearbox" mentioned in this manual can be used in building material industry, metallurgical industry, and chemical industry. The gearbox can only be used under the conditions specified in the product ordering requirements.

1.3 Copyright

2. Safety Precautions

2.1 Correct Use of the Products

The gearboxes have been designed and manufactured with advanced technology and are shipped in a safe and operationally reliable condition. Users are not allowed to make any changes or modifcations which may affect the safety and reliability of the gearboxes.
The gearbox can only be used under the conditions specifed in the relevant order contract which defnes the performance and delivery requirements.

2.2 User's Responsibilities

The user must ensure that all personnel involved in the installation, operation, maintenance and repair of the gearboxes have carefully read and understood this Operation Manual and will strictly abide by the above provisions at all times. This is to avoid personnel injuries, system damage, failure shutdown and environmental pollution as a result of misoperation.

The slewing drive part of the gearboxes, such as the output gear (shaft), coupling and locking plate must be protected against accidents.

During the transportation, assembly, installation, debugging, disassembly, operation and maintenance of the products, relevant safety rules and laws and regulations must be followed.
Gearboxes can only be operated, maintained and repaired by professional technicians.
Do not clean gear units with high-pressure cleaning products.
Do not work on the gearbox unless it is stationary. The gearbox must be protected against accidental startup (for example, by locking or removing fuses in the power supply unit). At the switching device of the power supply, a notice must be posted in a conspicuous place, indicating that work is in progress on the gearbox.
No welding is allowed on the gearbox. Do not use the gearbox as a grounding point for welding operations. Otherwise, it may cause permanent damage to parts such as precision gears and bearings.
In case of abnormal phenomena (such as over temperature or abnormal sound) during operation, shut it down immediately and report to our after-sales service department in time.
When installing the drive system on the equipment, the equipment manufacturer shall observe the instructions in this Manual.
All damaged standard components, such as bolts and studs, must be replaced with standard components with the same technical specifications (such as length and strength grade), and must be replaced one by one with the same installation torque.

2.3 Operator’s Responsibilities

To protect the environment, the following shall be noted:
Packaging materials shall be properly disposed of or recovered as per relevant regulations.
For the oil replacement, the used oil shall be collected by an appropriate container. In case of oil spill, immediately clean it with oil adsorbent.
Protective agent (e.g. anti-rust agent) shall be stored separately from used oil.
Contaminants such as used oil, protective agent, oil adsorbent or oil-absorbing cloth must be disposed of in line with relevant local environmental laws and regulations.
In case the noise of a gearbox exceeds local regulations, relevant maintenance shall be conducted.
After the end of the service life of the gearbox, drain the internal lubricating oil first, remove the preservatives (including paint),and dispose of the waste as per the relevant local regulations. Then split the gearbox and other accessories, and recover or dispose of the waste. The whole process must follow the relevant local regulations.

2.4 Environmental Protection

Dangerous voltage contact may result in shock and burns. Caution: Non-professionals shall not operate electrical components. Power and control circuits must be switched off before installation and maintenance. Before electrical operations, ensure that the electrical equipment is powered off and the product is reliably shut down.

Under operating conditions, the surface of the gearbox may reach a higher temperature, which poses a risk of scalding.

When replacing the oil, keep an eye on the oil temperature to prevent scalding by hot oil.

During transportation, lifting and installation of the drive system, it shall be ensured that all connecting parts (such as couplings) are tightened reliably to prevent casualties and product damage resulting from falling objects.

2.5 Special Hazards

Under working conditions, the surface of the gearbox may reach a high temperature within the allowable range and there is a risk of being burned.

When changing the oil, users shall pay attention to the oil temperature to prevent from being burned by the hot oil.

In the process of the transportation, lifting, and installation of the gearbox, users shall ensure that all connection parts (such as couplings) are fastened to prevent personal injuries or product damage that can be caused by falling objects.

The following dangers may occur during the installation, operation, and maintenance of this equipment:

2.5.1 Electric Shock

Danger!

Electric shock!

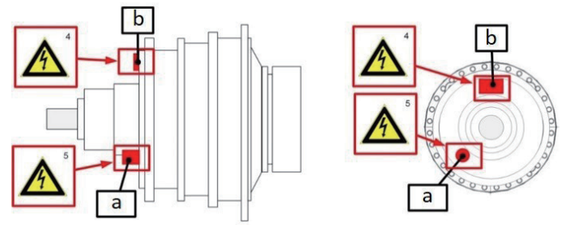
The gearbox may be equipped with an electric heater. Possible injuries may caused at the following positions of:

Junction boxes

Corresponding joints of cables

Electric heaters

Electric shocks may occur at these positions. The power must be switched off during any operation on the gearbox and ensure that the power supply must not be switched on again during this time. Otherwise, it will directly endanger lives or cause serious electric shock.



Position	Name	Position	Name
a	Electric heater	b	Junction box

Before performing any operation on this product, users must first confirm that the power supply has been cut off and there is no risk of re-closing switch. Then, they should check each electrical component and connector.

A junction box attached with this product is provided for using with all electrical components of the product. Terminals of temperature sensor and heater are set in this junction box.

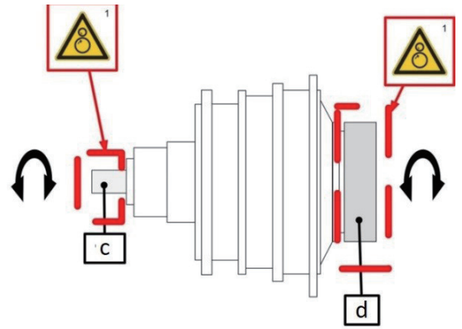
If all electrical components are installed before delivery, all electrical components are wired to the junction box. If electrical components are not installed before delivery, the electrical components must be wired in accordance with the wiring diagram provided by our company. It should be noted that the length and position of the wires to be used must be calculated according to the conditions of the site, and the wires shall not contact with the hot surface of the housings or the rotating parts in the running equipment. In addition, an emergency switch and a main switch must be set in advance.

2.5.2 Rotating Parts

Danger!

Twisted wound or bruises!

The input shaft and output shaft will rotate when the gearbox is connected to the motor. Do not put fingers, hands, or limbs in the areas of input shaft or output shaft. Otherwise, it will directly endanger lives or cause serious injuries.



Position	Name	Position	Name
c	Input shaft	d	Output shaft

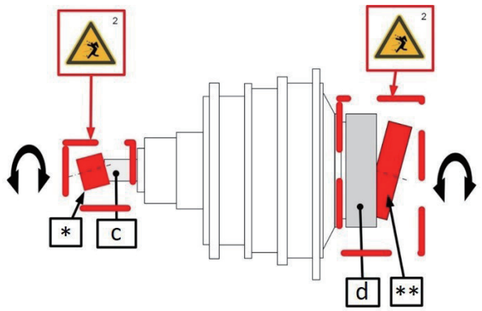
When the product is running, the input shaft and output shaft will rotate. The couplings or the components connected to them will rotate at a relatively high speed. Loose clothes, hands, arms, and legs may be twisted or bruised. Operators must take adequate safeguard procedures to avoid this. Please note that protective equipment is not included in our company's scope of supply.

2.5.3 Flying Parts

Danger!

Flying Parts!

During the installation of couplings of the input shaft and output shaft, some parts will be broken off if the allowable tolerance range is exceeded. This will cause the component fragments to fly off at an accelerated speed during the operation. Please pay special attention to the required values and tolerance range of the connection. Otherwise, it will directly endanger lives or cause serious injuries.



Position	Name	Position	Name
*	Input shaft coupling	c	Input shaft
**	Shrink disk of output shaft	d	Output shaft

The connection at the input shaft and the output shaft must be determined in accordance with the geometric tolerance given by our company. Otherwise the components are likely to be broken off. During the high-speed operation, the broken pieces will be thrown off at an accelerated rate, resulting in personal injuries or even life-threatening danger.

3. Product Overview

3.1 Introduction to Product Functions

The MPG roller mill planetary gearbox is one of the derivative series of NGC's MP standard industrial planetary gearboxes.
The roller mill gearbox is one of the planetary gearboxes with case-hardended tooth used in the cement industry, which is mainly used on the transmission of roller press.
The layout of the typical driver of a roller mill is shown in Figure 3-1.

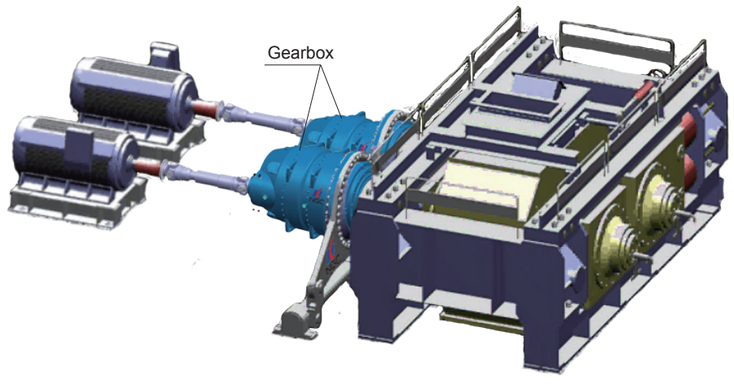


Figure 3-1 Schematic Diagram of Roller Mill Drive System

The input of the gearbox is connected to the main motor through the input coupling.
The output of the gearbox is connected to the main roller shaft of the roller mill through the hollow shaft with a shrink disk. A torque arm is installed on the output side of the gearbox.
The Gearbox for Roller Press are used in pairs and the two gearboxes are arranged symmetrically.
Each of the two gearboxes is equipped with a thin oil station to ensure the lubrication and heat dissipation of the gearboxes.
Planetary gearboxes for roller press are divided into two types: two-stage transmissions (2 planetary stages) or three-stage transmissions (1 helical stage + 2 planetary stages).

In general, they are horizontally installed. If users have special needs, please notify our company in advance for confirmation.

3.2 Nameplate Technical Specifications

The nameplate of the gearbox contains important technical parameters, especially the "sales order number", which is the important identity information of the gearbox. Please record and save the information properly.

Cautions!

Loss of the nameplate will cause the following consequences:

— The original information of the gearbox cannot be queried.

— The information of the gearbox's internal parts cannot be queried.

— The future maintenance and repair of the gearbox will be influenced.

Reminder!

The nameplate information of the gearbox is shown in Figure 3-2.

3.2.1 NGC CRM system QR-code scanning service

1. Connect your mobile phone or other mobile communication device to the internet and open the app (wechat or explorer). Scan the QR code on the gearbox plate as shown in the image below.

Figure 3-2 Gearbox Nameplate

2. Enter NGC CRM service system. Fill in the contact person, phone number, field address and service demand info to submit after-sale service request.

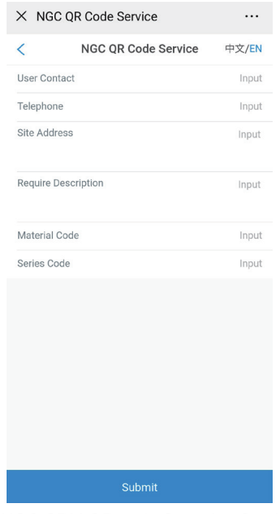


Figure 3-3 NGC CRM QR-code Scanning Service System

After the service request is received, our service team will respond in 24 hours.

3.3 Gearbox Model Description

The gearboxes for Roller Press of our company are divided into two types: MPGC2H XX and MPGH2H XX. The specific naming rules are shown in Figure 3-4. Wherein, the Type C involves the coaxial arrangement of the input and output shafts, and the Type H involves the offset arrangement of the input and output shafts.

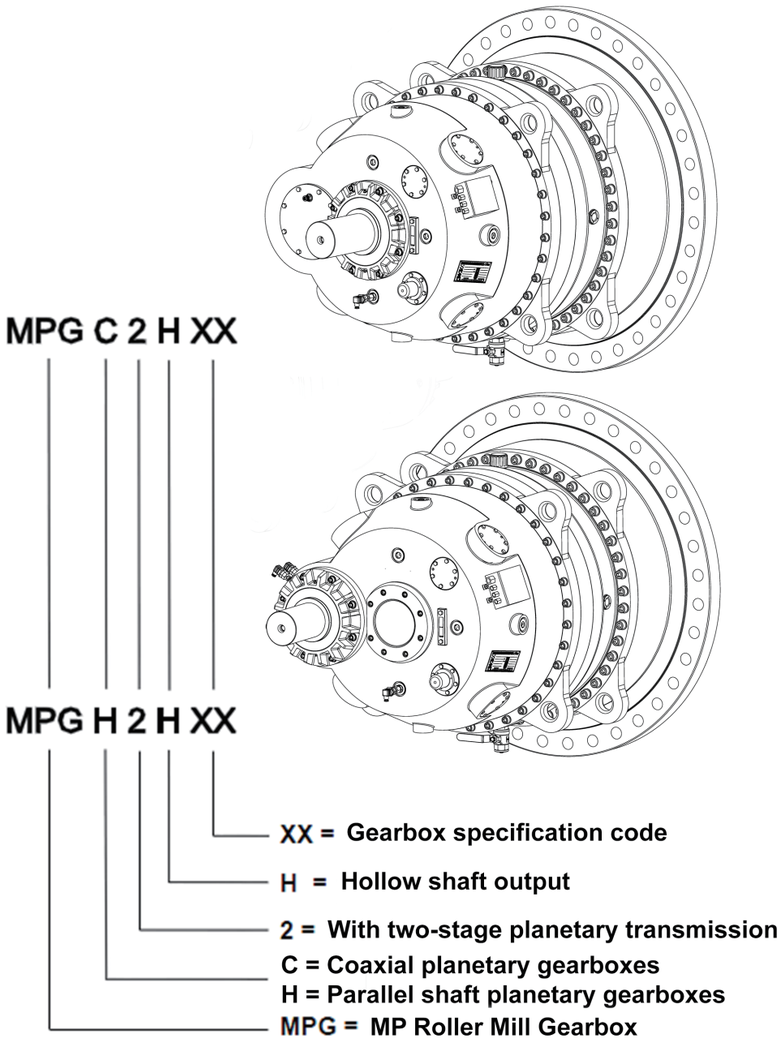


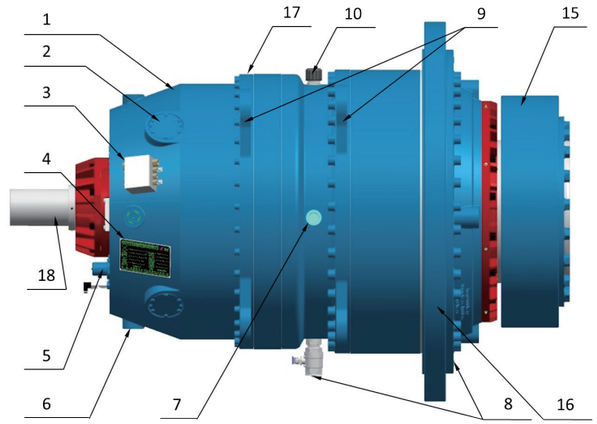
Figure 3-4 Gearbox Model Naming Rules

Reminder!

Our company's common roller mill gearbox models are shown above. If the structure and form of the ordered product are different from the above two types, and the model number on the nameplate is also different, please consult NGC's after-sales department for details.

4. Product Technical Description

4.1 Gearbox Outline Structure



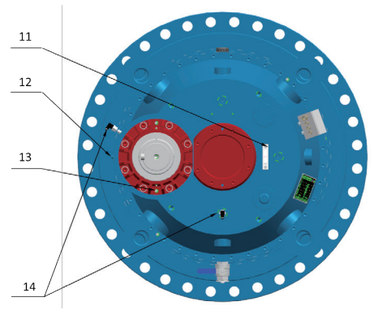


Figure 4-1 Schematic Diagram of the Outline of the Roller Mill Gearbox

1. Gearbox	2.Observation Window Cover/ Oil Filler	3. Junction Box	4. Nameplate
5. Heater	6. Main Oil Inlet of Oil Station (Conneting oil station)	7. Round Oil Indication Mark	8. Oil Inlet of Oil Station(1 out of 2, Connecting oil station)
9. Lifting eye	10. Air Filter/Oil filler	11. Long Oil Indication Mark	12. High Speed Shaft Bearing Oil Inlet
13. Oil Cup	14.Platinum thermal resistance	15. Shrink disk	16. Output housing flange(Connecting torque arm)
17. Vibration Meter (Optional)	18. Gearbox High Speed Shaft (Connecting input coupling)		

Explanation: The roller mill gearbox designed by our company is interchangeable when applied to dynamic rollers and static rollers. During designing and manufacturing, interfaces such as oil inlet, oil outlet, breathers, and oil sump temperature measuring point (with RTD) are usually set up in two places, with longitudinally symmetrical arrangement. When the dynamic roller gearbox and the static roller gearbox are interchanged, the above interfaces (such as oil inlet, breathers, oil outlet, and oil sump temperature detection point) should be adjusted correspondingly. When one interface is used, the other should be plugged with a screw plug.

4.2 Lubrication and Cooling

4.2.1 Lubrication Method

Our company's standard roller mill planetary gearboxes adopt the splash lubrication method. Therefore, the splash lubrication is recommended.

Reminder!

Our company also manufactures roller mill gearboxes with forced lubrication method, which is interchangeable for dynamic and static rollers as well. Its outline is a bit different from that shown in Figure 4-1. The outline drawing in contract data is the right one for order.

The gearbox lubrication method is implemented in accordance with the contract.

a. Splash Lubrication:

The gearbox body is capable of storing oil. The oil is injected into the gearbox through the oil inlet on the gearbox (Figure 4-1 oil supply of lubrication station) until reaching the middle line of the oil leveler (Figure 4-1 oil leveler). The gears and bearing components which are not submerged in the oil are lubricated by the splashing oil.

b. Forced Lubrication:

Each bearing and gear of the gearbox is equipped with a forced lubrication point, which is supplied with oil by the oil station and the pipeline.

c. Grease Lubrication:

The grease shall be injected into the labyrinth through the grease cups at the input and output side on a regular basis.

Reminder!

The lubrication method of the gearbox is determined according to the order technical contract. The relationship between the common lubrication methods and the configuration of the gearbox's supporting oil station is shown in Figure 4-2.

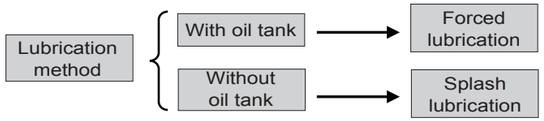


Figure 4-2 Corresponding Relationship Between Lubrication Methods and Station Configuration

4.2.2 Cooling

The oil station can be equipped with plate or pipe bundle coolers according to users' needs. Oil-water coolers are commonly used. The oil-water cooler is an important part of the lubricating oil cooling system, which can cool the lubricating oil of the gearbox.

Cooling water: It is required to use the recycled purified water and the following requirements should be met:

Cooling Water Temperature	Cooling Water Pressure	PH Value	Chlorine Ion Content	Turbidity
≤ 30 °C	0.2 - 0.4 MPa	7 - 9	≤ 50 mg/L	≤ 10 FTU

Cooling water pressure must not exceed 0.4 MPa.

If the gearbox stops running for a long period of time, the cooling water must be totally drained to prevent it from freezing. The compressed air can be used to drain the water remaining in the cooler.

4.2.3 Lubricating Oil

Lubricating oil: ISO VG320 gear oil; mineral oil Mobligear XMP 320 is recommended. Please ensure the high quality and cleanliness of the lubricating oil.

4.2.4 Oil Station

1. Working ambient conditions

a) The working ambient temperature is -10°C to 45°C;

b) The cooling water inlet temperature is no more than 30°C (highest temperature);

c) The chloride ion content in the cooling water is no more than 300 mg/L;

d) The power supply voltage is AC 380 V / 220 V ± 5%;

e) The voltage frequency is 50 ± 1% Hz;

f) The altitude is no more than 1000 meters;

g) The air humidity is no more than 90%;

The use of other ambient temperatures or operating conditions requires the consent of NGC.

2. Maintenance

a) The gear oil pump shaft seal ring should be checked frequently. If there is any leakage or damage, it should be replaced immediately.

b) The oil cooler must be inspected and cleaned every five to ten months according to the water quality.

c) The double-cylinder mesh oil filter should be disassembled and washed every three months to remove the internally deposited dirt and replace it according to the seal.

d) The magnetic filter should be cleaned every three months.

e) The lowest oil level should be checked in the fuel tank. If water is found, the two valves at the lower part of the fuel tank should be opened to drain the water.

f) The lubricant of the fuel tank should be sampled and tested once a month, to determine whether to change the lubricant according to the oil quality.

Note: Please refer to the corresponding instructions for the use and maintenance methods of each group of components.

4.3 Bearings

Rolling bearings are used inside the gearbox. The bearing brand and calculated life meet the technical requirements of the order contract.

Recommended configurations:

Support bearings of the output planetary carrier: high-quality bearings made in China;

Other bearings: imported brands.

Area	SKF	FAG	TIMKEN	NKS	China brand
Asia	√	√	√	√	√
USA	√	√	√		
EU	√	√			

4.4 Seal

Both input and output shafts use radial shaft seal rings. Material: FKM or NBR.

For the cement industry, a professionally designed sealing structure is adopted. The junction interface of each box is double sealed with Loctite glue and O-shape rings to prevent leakage.

4.5 Temperature Detection

Temperature detection points of the gearbox are shown in Figure 4-1. The RTD marked in the figure refers to the temperature detection points.

The specific information is as follows:

The temperature measurement component of the gearbox adopts PT100 platinum thermal resistance.

There are 3 general temperature detection points in the gearbox: detection points at the high-speed shaft input bearing and the oil sump.

The temperature requirement of interlock protection of the input shaft bearings is: 80°C (warning), 85°C (shutting down).

The temperature requirement of interlock protection of the oil sump is: 65°C (warning), 70°C (shutting down).

Platinum thermal resistance:

1. Implementation standard: QJ / NGC 10 015 - 2018

2. Ambient conditions

a) Installation altitude: -1000 - 5000 m;

b) Ambient temperature: -40℃ - +85℃ ;

c) Working temperature: -50℃ - +250℃ ;

d) Relative air humidity: ≤ 100%

4.6 Couplings

Generally, cardan shaft couplings are used at the input shaft of the gearbox.

If rigid couplings or other input or output components (such as gears, pulleys, flywheels, and fluid couplings) that generate additional radial or axial forces are used, they must be specified in the contract.

Cautions!

The manufacturing accuracy of the couplings must meet the relevant national standards. The installation and use of the input coupling should be carried out in strict accordance with the operating instructions of the couplings. If this part is not within the NGC's scope of supply, the relevant information of this part shall be provided by its supplier.

During the installation, each component must be accurately aligned with each other, in order to minimize additional forces generated by angular and axis deviations, which would lead to the premature wear of the flexible coupling components. Among them, the initial deviation of the centering of the gearbox's input shaft and the motor output shaft is within ±0.2 mm.

For information about coupling maintenance and operation, please check the relative coupling operating instructions for reference.

4.7 Connection with the electric Motor

When it is required to connect with the electric motor, the relevant regulations in the motor operating instruction should be observed.

Cautions!

Do not use motor whose speed and power exceed the rated speed and power specified on the nameplate on the gearbox. Otherwise, the gearbox may be damaged.

4.8 Heating Device

If a heating device of the gearbox is required, it must be specified in the order technical contract.

Reminder!

If the gearbox is equipped with a heating device as required, users shall strictly follow the local (especially foreign users) voltage and frequency values provided when they place the orders, ensuring the proper and reliable running of the our company's heating device.

4.8.1 Maintenance and precautions

a) The heater core must be completely immersed in the oil to avoid burning the component;

b) The heated medium should be non-corrosive;

c) When carbon deposits are found on the surface of the heater, the carbon deposits must be removed completely before use, so as not to reduce the efficiency or even burn out the component;

d) The component should be stored in a dry place. If the insulation resistance of the component is reduced to 1 megohm after long-term storage, the component can be dried in an oven at about 200°C for several hours (or the component can be electrified for a few hours with low voltage) to restore the insulation resistance.

4.9 Shrink Disk

Shrink disk is the device for transmitting torque between the hollow shaft of gearbox and the roller shaft of roller press. If shrink disk of the gearbox is required, it must be specified in the order technical contract.

4.10 Torque Arm

The torque arm is connected with the output flange of the gearbox to withstand the torque.

4.11 Junction Box

Implementation standard: QJ / NGC 10 022 - 2018

Ambient conditions:

a) Ambient temperature: -25℃ - 55℃

b) Corrosion by strong acid, strong alkali, salt, chloride and ammonium ion

4.12 Air Filter

Maintenance

a) The working status of the air filter should be often checked, and when a problem was found, the air filter should be repaired or replaced in time.

b) It must be turned off during checking or repairing.

c) The filter element should be checked at least every six months. If clogged, it can be blown off with high pressure air. If deformed, corroded, or used for more than two years, it should be replaced immediately.

5. Product Transportation, Lifting, and Storage

5.1 Supply Check

Ensure that each field staff who participates in taking the delivery has received relevant training. It is recommended to have professionals with rich on-site experiences participate in this work.

Carefully check whether the information on the nameplate is in conformity to the order requirement, and keep the information clearly visible.

Refer to the "NGC Packing List" for the list of products shipped in a random order. Check the items in accordance with this packing list to make sure that the shipped items and quantity are accurate.

Cautions!

If unknown problems or damages are found in the gearbox and its accessories, do not put them into installation and operation. Please contact NGC's after-sales department in time.

5.2 Transportation

During the transportation and storage, the gearbox should be placed on a wooden bracket or a flat and dry base. Do not place it directly on the concrete floor. When the gearbox is transported, it is necessary to use lifting products and bearing devices with sufficient load capacity, and make reliable fixation to prevent impact and shaft rotation.

When the gearbox is transported, waterproof measures should be taken to prevent rain from contaminating the gearbox.

Damage to the gearbox due to the rough handling should be avoided during the transportation, loading, and unloading.

Gearboxes must be moved and stored in a horizontal position or kept in the same position as the actual working position. It is not allowed to stack the gearboxes.

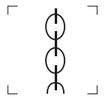
Gearboxes are delivered after assembly, and some small parts can be packaged and shipped separately.

Gearboxes can be packaged in different ways, depending on the transport distance, size, and transport environment. Unless otherwise specified in the contract, the packaging shall be in accordance with the NGC's packaging specifications.

When the packing box is lifted with a lifting rope, the angle between the top of the lifting rope and the crane jib should not exceed 60°. If it cannot be satisfied due to the height of the goods, please consult the NGC's post-market service department.

The transportation, loading, and unloading must be performed according to the storage and transportation warning signs on the packing box. The meanings of the storage and transportation warning signs are shown in Table 5-1.

Table 5 -1 Storage and Transportation Warning Signs

S/N	Sign Name	Icon	S/N	Sign Name	Icon
1	Handle with care		5	Center of gravity	
2	Stacking prohibited		6	Upward	
3	Stacking layer limit		7	Afraid of rain	
4	Lift here		8	Forklift forbidden	

Reminder!

For rust prevention and packaging types during the transportation of the gearbox, please refer to sections 5.5 and 5.6.

5.3 Lifting

In the process of lifting the gearbox, it is necessary to use lifting and carrying products that are capable to withstand the weight of the gearbox. Relevant operation should be performed by professional technicians with relevant professional qualification certificates.

When the gearbox is lifted, special attention shall be paid to the lifting position and lifting lugs that are specifically designed for lifting the gearbox shall be used. In addition, the gearbox shall be lifted according to Figure 5-1 and handled with care.

When the gearbox is lifted, damage to the gearbox itself shall be avoided, such as the impact to the external mounting shaft ends and the base.

Properly fix the gearbox accessories such as keys and temperature resistance wires to avoid falling off.

Warning!

When lifting the product, users must not stand under the product (goods). Personal injury may be caused due to falling of the gearbox or its components, resulting in unnecessary personal and property damage.

Before the lifting, please confirm the weight of the gearbox by means of the nameplate, the packing box, the outline drawing, the sample, and other relative materials. If it exceeds the rated range of the lifting equipment, the product (goods) should not be lifted.

For gearboxes with the weight of more than 20t, operate smoothly and slowly during the initial lifting to prevent personal injuries and goods damage.Do not hang eyebolts on the screw holes at the high-speed shaft end when lifting the product.

Do not directly use output flanges for lifting! If the gear unit is equipped with shrink disks, axially fix for the shrink disks before lifting must be done.

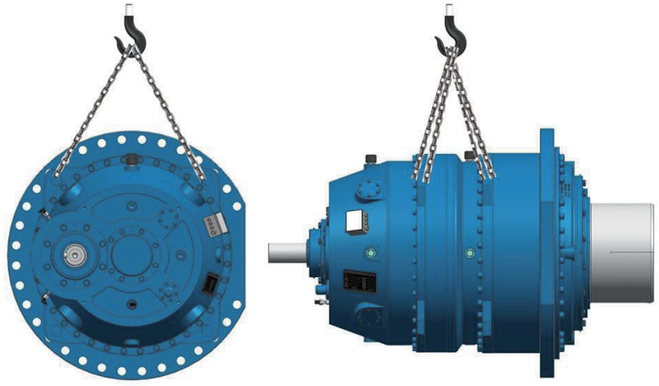


Figure 5-1 Schematic Diagram of the Lifting of the Roller Mill Gearbox

5.4 Storage

Gearboxes should be placed in a dry, ventilated, covered, and vibration-free environment. Gearboxes must not be placed in a potentially hazardous environment, such as in an environment with chemical agents, unless otherwise specified in the order contract.

There should be protective covers that prevent dust and other impurities from entering the gearboxes.

Gearboxes cannot come into direct contact with water, such as rain and snow, even during transient transshipment.

Gearboxes have been treated with rust prevention before delivery. Under the condition that the atmospheric corrosivity is not more than the Level C3 as specified in the ISO12944-2 standard and the factory prevention measures of the gearbox are intact, the corrosion protection period is 6 months indoor storage from the delivery date. If prescribed separately in the order contract, it shall be executed according to the relevant provisions of the contract. When the storage period exceeds the allowable anti-rust period, the rust prevention treatment should be performed again.

If the storage period exceeds the specified time limit, the internal protection of the gearbox should be carried out to remove moisture, dust, and other impurities attached to the parts of the gearbox. At the same time, it is recommended to use the rust preventive oil to have the gearbox contacted with the oil for more than 5 minutes (use the rust preventive oil to wash the gearbox with splash lubrication). If the conditions are limited, a certain amount of volatile rust preventive oil can be added into the box after being confirmed by the technical department of NGC.

If the outer surface of the gearbox is repainted, the non-metallic parts on the gearbox (such as cables) should be carefully protected to prevent the solvent in the paint from contacting with the rubber and cause the aging of the rubber, which will affect the performance of the gearbox.

Before the gearbox is installed and used, rust inspection is required. When the parts are rusted, mechanical rust removal should be done in accordance with Table 5-2. After the rust is removed from the parts, it must be cleaned, dried, and rust-proofed in a timely manner to avoid the secondary rust of the part.

Table 5-2 Methods for Mechanical Rust Removal

Methods	Materials and Tools	Applicability	Remarks
Scraping	Non-metal scrapers Metal scrapers	1. Non-metal scrapers are applicable to precision machined surfaces. 2. Metal scrapers are applicable to ordinary machined surfaces and the non-machined surfaces.	Select the hardness of the metal scraper according to the hardness of the rusted metal to prevent the scraper from scratching the surface. Use kerosene during scraping.
Sanding	Sandpaper with different sizes and abrasives	1. Coarse sandpaper is used for non-machined surfaces. 2. Fine sandpaper is used for non-matching machined surfaces. 3. Bearings cannot be sanded. 4. Rust removal by sandpaper will affect the dimensional accuracy.	Use lubricating oil to sand precision surfaces.
Brushing	Steel brushes, copper brushes, and other brushes	The method is suitable for removing thick rust on non-machined surfaces.	Solvent-based cleaning agents can be used for wetting before the rust removal, and talcum powder can be used to brush the rust off.
Polishing	Polishing machines and cloth wheels	Polishing will not influence the smooth finish and dimensional accuracy of the parts.	Immediately wash the gearbox and perform rust prevention after polishing.
High pressure water spray	High-pressure water spray equipment with the pressure no less than 9.8 MPa	It is applicable to the casting box.	
Grinding	Grinding paste, flannel, cotton cloth	Grinding will not influence the smooth finish and dimensional accuracy of the parts. It is suitable for removing rust on machined surfaces.	Dip the cloth in the abrasive and repeatedly rub the parts vigorously. Wash the gearbox and perform rust prevention immediately after the rust is removed.

Cautions!

When the gearbox is stored, the input shaft must not be rotated. The gearbox should be placed on a base (such as a wooden base) that can isolate vibration to avoid the fretting corrosion of the gearbox during the long-term storage.

After the acceptance of the gearbox, if operations that will affect the airtightness of the gearbox occur (such as opening the inspection plate, removing the protective film of the input and output through-covers, and tearing off the protective film of the air filter), rust prevention should be performed again to avoid the internal corrosion of the gearbox.

It is not allowed to stack the gearbox units.

After gearboxes are used or debugged, users can refer to Table 5-3 to store the gearbox if there is a need.

Table 5-3 Information on Gearbox Storage and Rust Prevention

Rust Prevention + Packaging	Storage Conditions	Storage Period
Standard rust prevention + standard packaging	Covered, rain-proof, no corrosive steam, no vibration, good ventilation, relative humidity < 50%, and little change in temperature	Three months if the surface protection is intact.
Long-acting rust prevention + standard packaging	Covered, rain-proof, no corrosive steam, no vibration, good ventilation, relative humidity < 50%, and little change in temperature	Six months if the surface protection is intact.
Long-acting rust prevention+ long-acting packaging	Covered, rain-proof, no corrosive steam, no vibration, good ventilation, relative humidity < 50%, and little change in temperature	Eight months if the surface protection is intact.

Reminder!

For definitions of concepts such as “standard rust prevention”, “standard packaging”, “long-acting rust prevention”, and “long-acting packaging”, please refer to Section 5.5.

The roller mill gearboxes newly delivered by our company have not been filled with the oil. The outside and inside of the gearboxes have been treated with rust prevention. The specific storage conditions and period are shown in Table 5-4. The gearbox packing grade is performed according to the relevant requirements of the technical agreement. The rust prevention period is closely related to the storage conditions. The rust prevention period in Table 5-4 is only for technical reference without legal effect. If there is a need to avoid the special environmental conditions that may be encountered during transportation (such as shipping) and storage (such as climatic conditions and termites), it should be clearly stated in the contract.

Table 5-4 Information on Gearbox Rust Prevention

Storage Conditions	Rust Prevention Period
Covered, rain-proof, no corrosive steam, no vibration, good ventilation, relative humidity < 50%, little change in temperature, and no outdoor storage	Grade 1 packaging: 2 years (expected) Grade 2 packaging: 1 year (expected) Grade 3 packaging: 6 months (expected)

When the gearbox is stored for a long time, the input shaft must be rotated at least every 6 months to change the position of the rollers of all rolling bearings inside the gearbox.

Cautions!

It is not allowed to stack the gearboxes.

5.5 Rust Prevention

5.5.1 Internal Rust Prevention

Standard rust prevention: Discharge the lubricating oil from the gearbox, so that the residual oil film can make a certain rust protection on the gearbox. And then seal the oil inlet and the oil return ports, as well as the air filter.

Long-term rust prevention: Discharge the lubricating oil from the gearbox, so that the rust preventive oil will circulate through the oil circuit. Then add the volatile rust preventive oil, and seal the oil inlet and the oil return ports, as well as the air filter.

Cautions!

The lubricating oil used for commissioning should be clean and the water content of the lubricating oil should meet the work requirements.

After the gearbox is unsealed, it is necessary to remove the sealed package of the air filter in time. Then, the filter can be restored to enable the gearbox to operate normally.

5.5.2 External Rust Prevention

Generally, the following external rust prevention measures are adopted:

- The antirust agent is applied to the unpainted function surface of the bare shaft.
- Small spare parts and losable parts, such as bolts and nuts, shall be placed in plastic antirust bags.
- The antirust agent should be applied on screw threads of the gearbox.
- Both threaded holes and blind holes need to be plugged with plastic plugs.
- The supporting external motor and other instruments should be wrapped with volatile antirust films for protection.
- External connection pipelines and the inside of the oil station are sprayed with the rust preventive oil, and pipe orifices are sealed with plastic films or plugs.
- If the gearbox is stored for more than 3 months, the unpainted surface protective layers must be checked regularly. The protective layers or the part where the paint has peeled off must be renovated.
- If the gearbox is stored for more than 6 months, it is required to regularly check whether the above internal and external components are rusted. In addition, the input shaft must be manually rotated for more than one circle to avoid the occurrence of Brinell indentation. The inside and outside of the output shaft should be replenished with rust preventive oil.

5.6 Packaging

Standard packaging: The gearbox is fixed on a carriage without a protective cover.

Availability: Short-distance or land transportation

Long-term packaging: The gearbox is placed in a wooden protective box.

Availability: Long distance or marine transportation

Cautions!

Under normal circumstances, gearboxes will be packaged according to NGC's packaging standards (standard rust prevention + standard packaging). If it is separately specified in the order contract, the packaging shall be performed according to the relevant provisions in the contract.

6. Product Installation and Disassembly

6.1 Overview

The assembly and installation of the product should be performed by professional technicians. NGC will not be liable for any damage caused by improper assembly and installation.

During the installation process, parts (especially standard parts and electrical components) that are damaged due to bumping and other reasons should be promptly replaced or repaired. The specific measures must be confirmed by NGC. It is advised to connect with NGC's after-sales department to consult relevant information in a timely manner.

At the installation planning stage, there should be sufficient work space left around the gear unit for product installation and future maintenance and repair.

The supporting instruments should be installed according to the operating instructions of each instrument.

Cautions!

Direct exposure of the gearbox to the sunlight may cause overheating of the product. Protective facilities such as protective covers and ceilings should be provided.

Warning!

No welding operation shall be performed on the gearbox.

The gearbox cannot be used as a ground point for welding operations, which can cause permanent damage to precision components such as internal gears and bearings.

All fastening points specified in the product design shall witness the tightening of the connectors. For the tightening torque, please refer to relevant information.

To ensure sufficient lubrication, the gearbox and lubrication system must be installed in accordance with the positions specified in the order contract.

6.2 Product Base

When designing the base of the product, designers should ensure that resonance will not be generated and vibrations will not be transmitted from the bases of adjacent products. The structure used to install the product must be of appropriate rigidity.

Reminder!

For structure size, space requirement, and supply facilities of shared media (such as shared media pipelines for connecting separate oil coolers), please refer to the relevant technical documents and materials of the order.

6.3 Input Coupling Installation

6.3.1 Use a suitable cleaner to remove the rust protection layer from the input shaft and the product installation surface.

Warning!

When using cleaners containing solvent additives, users shall ensure that the placement area is placed is well-ventilated.

Do not let the oil seal touch the cleaner.

Please observe the rules and regulations regarding the use of flammable and combustible materials.

6.3.2 Install couplings on shafts and fix them. If necessary, heat the couplings to the proper drying temperature before installation. For details, please refer to the technical documents of the couplings.

Warning!

Use appropriate tools and tooling to install mount the couplings. Do not install the coupling by pressing or tapping, which will cause permanent damage to the gearbox and other units.

Protect oil seals of the gearbox to prevent damages. When the heating temperature reaches +100 to +150 °C, use rags with cold water to cool the gearbox in time to reduce thermal radiation.

Prevent people from being burned by heated elements.

Gently pushed the couplings onto the shafts until they reaches the proper positions specified in the outline drawing.

Cautions!

Lifting products must be hung on the lifting points shown in Chapter 5 "Product Transportation, Lifting, and Storage". When the gear unit is equipped with other auxiliary components, the corresponding lifting point should be determined according to the dimensional drawing of the order.

6.3.3 Special Considerations for Universal Joint Couplings

(a) For integral hoisting, please use the wooden box for lifting according to Figure 6-1.

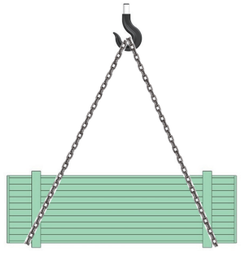


Figure 6-1 Schematic Diagram of the Hoisting with Wooden Boxes

If there is no wooden box, please refer to Figure 6-2 for hoisting.

Figure 6-2 Schematic Diagram of Hoisting

(b) To ensure the synchronous operation of the input and output ends of the universal shaft and without any velocity fluctuation, the fork heads on both ends and the intermediate shaft must be formed a W- or Z-shape during the installation. In addition, the inclined angles between the center lines of the fork heads and the axis of the intermediate shaft, i.e. β1 and β2, are required to be equal.

Cautions!

Do not hammer the joint bearings.

For safety, install a protective cover on the couplings.

6.4 Shrink Disk Installation

The installation and disassembly of shrink disks should follow the operating instructions of shrink disks.

The following content is for reference only. If there is any discrepancy with the actual operating instructions of shrink disks, please follow the operating instructions.

Warning!

Shrink disks cannot be disassembled before first tensioning.

In the area of the shrink disk seat, there should be no grease on the hollow shaft hole and the roller shaft.

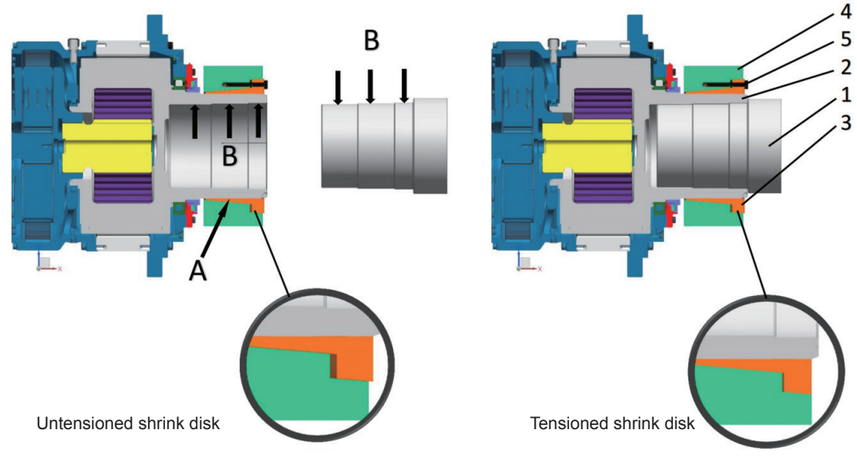
It is not allowed to use the contaminated solvent or the dirty rag to remove the grease.

If there are kerfs in the inner ring of the shrink disk and the hollow shaft of the output rotating stand of the gearbox, the kerf in the inner ring of the shrink disk should be offset by 90° from that in the hollow shaft of the output rotating stand when the shrink disk is installed.

(a) Install the shrink disk on the output hollow shaft of the gearbox. H, the distance between the end face of the shrink disk and the end face of the output shaft, must comply with the requirements of the outline drawing of the ordered goods.

Cautions!

Do not tighten up the locking bolt until the roller shaft is installed.



A. Grease added B. No grease allowed

1. Roller shaft 2. Hollow shaft 3. Inner ring 4. Outer ring 5. Tightening bolt

Figure 6-3 Shrink Disk Installation

(b) Smoothly shift and install the gearbox with the shrink disk onto the roller shaft. The whole process should be performed slowly to let the air in the hollow shaft discharge from the air hole.

(c) Install four diagonal set bolts to fix positions and do not tighten them. Then use tools to tighten all the locking bolts step by step and one by one. Each time tighten 30-45° and repeat several times to fully tighten them.

Cautions!

During the initial installation, do not diagonally tighten the bolts in diagonal positions.

(d) Tighten the bolts according to the tightening torque.

Cautions!

To avoid bolt overloading, do not exceed the specified maximum tightening torque during tightening (see Table 6-1).

Reminder!

After each time of assembly, L, the distance between the end faces of the shrink disk's inner and outer rings, can be measured and recorded. Please refer to the value of L for reassembly to ensure that the bolt is properly pre-tightened and avoid human operation errors.

Table 6-1 Maximum Tightening Torque of Shrink Disk Bolts

Bolt specification	Maximum Tightening Torque of Each Bolt (μ = 0.1)	
	Strength Level 10.9 Nm	Strength Level 12.9Nm
M 6	12	14.5
M 8	29	35
M 10	58	70
M 12	100	121
M 14	160	193
M 16	240	295

M 20	470	570
M 24	820	980
M 27	1210	1450
M 30	1640	1970
M 33	2210	2650
M 36	2850	3420

6.5 Shrink Disc Disassembly

The disassembly process is roughly the same as the installation process:

Loosen the tensioned bolts one by one and step by step. Each time loosen 30-45° and repeat several times to fully loosen them. If the shrink disk's inner ring and outer ring cannot be separated, screw off several locking bolts and then screw the bolts into disassembly screw holes for disassembly.

Remove the shrink disk from the hollow shaft.

Reminder!

The output hollow shaft of the gearbox is equipped with an auxiliary oil hole for disassembly, which can be used together with other disassembling methods. After the pressure oil is injected, the hollow shaft can be removed from the roller shaft.

6.6 Washing and Lubrication of Shrink Disks

Disassembly and cleaning are required only if the shrink disk is dirty before the re-installation.

Reminder!

After the shrink disk is cleaned, only the sliding surface inside the shrink disk is required to be lubricated with grease. It is recommended to add the lubricating oil containing the molybdenum disulfide additive.

6.7 Oil Station Installation

The installation of the lubricating oil station should follow the operating instructions of the oil station. If the lubricating oil station is not within NGC's scope of supply, users should ask the relevant supplier for its instructions.

Cautions!

Before connecting pipelines and the gearbox, wash the pipelines with the circulation oil to ensure that the inside of the connecting pipeline is clean and has no foreign matter after configuration.

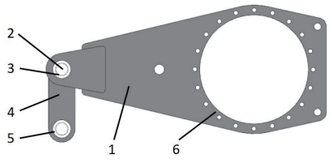
After the lubricating oil station is installed and connected with the gearbox, it should be washed with the circulation oil. The lubricating oil should be heated to 40-50°C. The oil pumping time should be no less than 24 hours. It is required to check and clean the oil station filter every 30 minutes until the filter has no obvious impurities within an hour.

6.8 Torque Arm Installation

Before installation, remove the grease on junction surface of the gearbox's output flange and torque arm. Coat it with Loctite glue 640 to increase the safety of torque transmission and prevent rust.

6.8.1 One-sided Torque Arm

See Figure 6-4 for the coupling device.

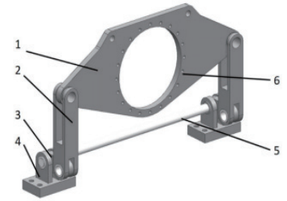


1. One-sided torque arm; 2.shaft; 3. Spherical bearings; 4. Rod piece; 5. Spherical bearings; 6. Gearbox output flange;

Figure 6-4 One-sided Torque Arm

6.8.2 Double-sided Torque Arm

See Figure 6-5 for the coupling device.



1. Double-sided torque arm; 2. Rod piece; 3. Spherical bearings; 4. Bearing seat; 5. shaft; 6. Gearbox output flange;

Figure 6-5 Double-sided Torque Arm

6.9 Tightening Torque of Ordinary Bolts

Table 6-2 Maximum Tightening Torque of Bolts

Bolt Specifications	Maximum Tightening Torque of the Bolt (Nm)	
	Strength Level 8.8	Strength Level 10.9
M 6	7	10
M 8	18	25
M 10	35	49
M 12	61	86
M 14	113	159
M 16	149	210
M 20	290	409
M 24	500	705
M 30	1004	1416
M 36	1749	2466
M 42	2806	3956
M 48	4236	5973
M56	6791	9575
M64	10147	14307
M72	14689	20711

Note: For bolt tightening torques of other levels, the coefficients relative to level 8.8 are as follows: Level 4.8 = 0.5; Level 10.9 = 1.41; Level 12.9 = 1.69.

6.10 System Installation Order

The gearbox is only a part of the roll crusher system. Users can install it according to the installation order of the host system.

Cautions!

Supporting tooling equipment (such as overhead cranes) is recommended for installing the gearbox on the roller shaft, because the gearbox should be supported before the shrink disk is completely installed. The gearbox should be adjusted horizontally along with the matching roller shaft to ensure a smooth installation.

After the gearbox is installed, the user should check whether the position of the input shaft is horizontal. A reference method is to check whether the positions of the two oil seals of the gearbox are on the same row.

7. Commissioning, Startup and Shutdown

7.1 Preparation Before Commissioning

After the gearbox is installed and before its first trial run, please make sure that all the installation tools have been removed and the gearbox is in a quasi-safe operating state, avoiding damages due to flying out of the installation tools.

Check whether all the anchor bolts are tightened and confirm that the gearbox has been fixed correctly.

Confirm the input rotation direction of the gearbox.

Confirm that there is no foreign matter in the lubricating oil station and connecting pipelines, and check the connections of oil circuits to make sure that there is no leakage.

Confirm that the gearbox temperature detectors are installed and correctly wired and set.

Confirm that the relevant instrumentation of the on-site lubrication system has been installed and correctly wired and set.

Confirm that the gearbox chain protection system can work reliably and has been set according to Table 7-1.

Table 7-1 Gearbox Chain Protection Requirements (Splash Lubrication)

Gearbox	
Detection Control Point	Chain Protection Requirements
Bearing temperature detection	If T ≥ 80°C, the system will generate an alarm. If T ≥ 85°C, the gearbox will be shut down.
Oil sump temperature detection	If T ≥ 65°C, the system will generate an alarm. If T ≥ 70°C, the gearbox will be shut down. If T ≤ 25°C, it is not allowed to run the oil pump motor. If T ≤ 25°C, the heater starts. If T ≤ 35°C, the heater stops.
Lubricating Oil Station	
Detection Control Point	Chain Protection Requirements
Filter pressure difference detection	ΔP ≥ 0.2 MPa, the system will generate an alarm. Users shall manually switch it and clean the filter.
Supply port temperature detection	If T ≤ 30°C, it is not allowed to start the main motor of the gearbox. If T ≥ 45°C, the system will generate an alarm and open the water inlet of the cooler. If T ≤ 35°C, the water inlet of the cooler closes. If T ≤ 55°C, the main motor of the gearbox will be shut down.
Supply port pressure detection (if any)	If P ≤ 0.08 MPa, the system will generate an alarm. If P ≤ 0.04 MPa, the main motor of the gearbox will be shut down.
Supply port flow detection (if any)	If F ≤ 80% of the nominal flow rate, the system will generate an alarm. If F ≤ 70% of the nominal flow rate, the main motor of the gearbox will be shut down.

Cautions!

When the gearbox chain protection triggers a shutdown, the main motor of the gearbox must be shut down first, and the lubrication station can be shut down until the gearbox is stopped.

When control points of the gearbox and lubricating oil station system exceed the scope of Table 7-1 or special designs, users should contact NGC to request a list of specific chain protection requirements and implement relevant operations accordingly.

Other chain requirements of the lubricating oil station should be performed in accordance with the instructions of the station. If there are any ambiguities, users should contact NGC and confirm the relevant matters.

Before commissioning, unscrew the drain plug and release the rust-preventing agent that is placed inside the gearbox before the delivery, or discharge the residual oil in the gearbox (a small amount of oil left after the factory test) into an appropriate container. Then deal with the residual oil according to relevant regulations. Inject fresh lubricating oil into the gearbox or the oil station.

Cautions!

Precautions for filling the lubrication system are as follows:

1. **Wear safety gloves and goggles during operation.**
2. **For specific safety operation requirements, refer to relevant instructions provided by the lubricating oil supplier. The lubricating oil must be provided by a regular supplier.**
3. **Make sure that VG320 industrial gear oil has been used as the gearbox lubricating oil according to the requirements of NGC.**
4. **Make sure that the lubricating oil is clean. The recommended cleanliness is -/17/14 (GB/T 14039-2002) (the maximum filter aperture 25 μm).**
5. **Do not mix different types of lubricating oil. The use of mixed lubricating oil will cause unpredictable risks to the gearbox.**
6. **Make sure the oil level in the gear box or lubricating oil station is normal. A standard roller press gearbox uses splash lubrication and its housings acts as an oil tank. Therefore, its oil level should reach the midpoint of the oil leveler (after the oil flushing with the oil in oil station, the oil must be filled to midpoint of the oil leveler due to its loss in pipes).**

When the lubricating oil station is turned on, manually rotate the input shaft of the gearbox according to the rotation direction of the gearbox to confirm that the gearbox components can be flexibly rotated without any abnormal jamming or noise.

Confirm that the product has been properly installed and the centering with the upstream and downstream equipment (connection to the input and output shafts) meets the requirements.

Confirm that the oil level is normal.

Confirm that the external rotating parts (such as the input couplings) are equipped with protective covers.

Confirm that the electrical equipment must be grounded.

Confirm that all relevant safety and security measures are in place.

Confirm that all fastening bolts are tightened with the correct torque.

Confirm that there are no loose parts on the product and there are no other sundries on or around the product.

Confirm that there are no loose parts in the upstream and downstream equipment.

Confirm that the power supply is properly connected and it is safe and reliable.

Confirm the power safety.

Confirm that all installation and assembly are completed.

Confirm that the product is in the safe start state that has been set.

Confirm that the connections on the operating side are properly installed and are in safe conditions.

Confirm that the inlet and return oil temperature is normal.

Confirm that the supply pressure of the oil station is normal.

Confirm that the filter pressure difference is normal.

Confirm that the oil leveleror oil level sight glasses and their seals are intact and undamaged.

Confirm that the breather is properly installed and unobstructed.

Confirm that grease has been injected into place where it is needed.

Confirm that all wires are not in direct contact with the outer surface of the gearbox.

Confirm that the monitoring device is properly connected and functions well.

7.2 Startup

7.2.1 Lubrication System Startup

Before starting the gearbox, start the lubrication system first.

Start the oil station to enable oil flushing and check whether there is an oil leakage in the gearbox and the oil station system.

Implement oil flushing until there is no foreign matter in filters of the oil station.

During this period, if the oil level of the gearbox or oil tank reduces, users may add lubricating oil to a proper amount.

When operating the lubricating oil station, users shall comply with the specifications and chain control requirements of the oil station operating instructions.

After all control requirements are met, turn on the lubricating oil station.

Check whether the oil pump operation status is normal.

Check lubricating oil pressure: (splash lubrication)

— General pressure range of supply port of the lubricating oil station: 0.2 - 0.3 MPa;

— General pressure range of gearbox inlet: 0.08 - 0.12 MPa;

7.2.2 Main Motor Startup

Start the main motor when the lubricating system is working properly, the oil temperature meets the requirements, and the oil level is stable.

7.2.3 Gearbox Commissioning

Reminder!

As the first stage of operation, NGC proposes to pre-operate the gearbox according to Table 7-2. Users can also conduct break-in operation with the main machine system according to the linkage trail run specification of the roller press system.

Table 7-2 Gearbox Running-in Procedure

Step	Load	Time	Requirement
1	No load	2 hours	No oil leakage, no abnormal noise, and no abnormal heating
Then increase the load evenly based on the following four stages:			
2.1	25% load	≥ 2 hours	Observe and record the current changes in each stage. Observe (a) whether the gearbox noise or vibration is too large, (b) whether the temperature rises too high, (c) whether there is oil leakage, and (d) whether the support swing is too large. If there is any abnormality, unload and stop the gearbox immediately. Then, provide feedback to our company after-sales service department in time.
2.2	50% load	≥ 2 hours	
2.3	75% load	≥ 2 hours	
2.4	100% load	≥ 2 hours	

7.3 Stopping Operation

Before the grinding rollers stop load must be removed from the roller press.

The main motor shall shut down.

After the mill stops rotating, the lubrication system needs to reduce to the normal gearbox temperature for stopping.

Then stop water supply to the lubricant cooler.

When the temperature is low, the cooling water is easy to freeze. Therefore, all the cooling water needs to be drained completely to prevent freezing.

When the temperature is low, the lubricating oil in the gearbox and the lubrication pipelines should be drained.

If the roller press is stopped for a short period of time, the oil pump may not be turned off to ensure that the machine can start at any time.

After stopping the oil pump and before starting the roller press again, users should check the lubricating oil temperature and then restart the oil pump. In addition, users should check whether the oil level of the gearbox is in the specified position. Otherwise, it is not allowed to start the machine.

Reminder!

Be sure to lock the drive unit to prevent accidental starting. Hang a warning sign on the start switch.

When the gearbox will not be used for a long period of time, start the gearbox unit once every 1 month or so.

If the shutdown period exceeds 6 months, pay attention to the rust prevention inside the gearbox (see Section 5.4 and 5.5).

8. Product Running

8.1 Product Running Environment

Permitted ambient temperature for storage: -40°C - +50°C;

Permitted ambient temperature for running: -20°C - +45°C;

Permitted ambient humidity for running: < 90%;

Environment requirements: No moisture, no corrosive gas, no explosive gas and steam, little change in temperature, and good ventilation;

It should be installed in places where inspection, maintenance, and other operations can be easily performed.

Cautions!

The installation and operation beyond the conditions above belong to the scope of special orders. Please contact us!

8.2 Notice

During the equipment operation, be sure to monitor the equipment for the following phenomena:

- Overheat
- Abnormal sound
- Abnormal vibration
- Possible leaks in box and shaft seals
- Abnormal oil level

Reminder!

When checking the oil level, users should stop the gear unit operation first.

If any abnormal phenomenon occurs during the equipment operation or the system generates alarms, relevant measures should be conducted immediately. Use the troubleshooting table given in Chapter 10 to determine the cause of the failure.

9. General Instructions

9.1 General Considerations for Product Maintenance

Cautions!

Only professional technicians can maintain and repair the product, and they should follow relevant rules in the operating manual during the maintenance and repair.

The maintenance intervals listed in Table 9-1 depend on the operating conditions of the gear unit. The following operating parameters are provided for reference only:

Daily running time: 24 hours

Load coefficient: ≤ 100%

Maximum oil temperature: 65°C

If the operating conditions are different, the frequency of product maintenance should be adjusted accordingly.

Table 9-1 Product Maintenance and Repair Items

Maintain Content	Intervals	Remarks
Check the oil temperature.	Every day	
Check the gear unit for abnormal noise.	Every day	
Check the lubricating oil level.	Once a week	The oil level should reach the midpoint of the level indicator or oil level sight glasses.
Check the tightening of gear unit and associated device.	Once a month	
Check the gear unit for oil leakage.	Once a month	

Check the filter of the lubricating oil station system.	Once a month	Refer to oil station instructions or consult the oil station manufacturer.
Clean the filter element or replace the filter element.	Once a month	Refer to oil station instructions or consult the oil station manufacturer.
Check whether the oil contains water.	After 700-hour running of the product, but no longer than 6 months	See section 9.2.1.
Replace the lubricating oil for the first time after the product goes into operation.	After 700-hour running of the product	See section 9.2.2.
Subsequently replace the lubricating oil.	Every 5000-hour running	See section 9.2.2.
Clean the air filter.	Once every 3 month	See section 9.2.3.
Grease seals.	After 700-hour running of the product, but no longer than 2 months	See section 9.2.4.
Clean the gearbox outer surfaces.	At the time of replacing the lubricating oil	See section 9.2.5.
Check the oil station system.	At the time of replacing the lubricating oil	See section 9.2.6.
Implement a complete inspection of the gear unit.	About once every 2 years	

After checking the gearbox, users should reseal the disassembled parts such as inspection plates and oil screw plugs (with gaskets or glue) to prevent oil leakage.

Inspection of the gearbox appearance and its surrounding environment: At present, daily manual inspections cannot be replaced by electronic monitoring. Some subtle oil leaks, minor cracks, and minor abnormal noise cannot be detected in the electronic monitoring room. Therefore, it is essential to carry out visual detection on the gearbox every day.

Users should mainly observe the following changes: Noise, operating data, and oil level.

Data recording: Check and record data of pressure gauges and thermometers or other displayed data on time. Compare the recorded data with the requirements in Chapter 7. Identify the reasons when there are any abnormalities. If necessary, shut down the gearbox for inspection and contact the NGC's after-sales department.

Inspection of the gearbox sound and vibration: Regularly check the gearbox for abnormal noise and vibration. If there is abnormal noise and vibration, analyze the reason and solve it in time.

After 2000 hours of initial operation and every 4500 hours of formal operation, check the following items:

- The looseness of all the bolts connecting the box body and the frame; re-tighten the anchor bolts according to the torque requirements.
- The flatness and levelness of the foundation slab; if the flatness and levelness exceed the requirements in Section 6.3, handle the problem in time.
- The positional accuracy of the motor shaft and the input shaft of the gearbox; if the accuracy exceeds the requirements in Section 6.4, handle the problem in time.

9.2 Product Maintenance and Repair Instructions

9.2.1 Checking Lubricating Oil

Users are recommended to check and clean the oil station filter every 0.5 hours during the commissioning of the gearbox. After the gearbox is formally operated, the oil station filter should be cleaned every 700 hours. During the cleaning, attention should be paid to the source and type of impurities on the filter.

If the lubricating oil is mixed with water and other impurities, it will cause the bearings and gears to rust and damage. Therefore, regular tests of the lubricating oil are required. The first test time is 700 hours after the use of the gearbox, and then frequency should be kept once every six months. Regular oil test is an essential measure to maintain the normal operation of the gearbox. Lubricating oil tests must be performed by a qualified inspection agency.

Reminder!

For more reliable results, users are recommended to provide an unused oil sample of the same type and same brand as the reference when sending the used lubricating oil to the inspection agency. The sample must be stored in a clean, transportable, and sealed container.Users should regularly check the oil level of the oil tank. When it is lower than the safety level specified in the instruction of the oil station, users shall add new oil into the oil tank and identify the reason. If the oil level of the oil tank rises, there may be a possibility of cold water entering. Users can take and check samples by draining the oil with the drain plug on the bottom of the oil tank.

9.2.2 Changing Lubricating Oil

It is recommended that the lubricating oil of the gearbox be changed after the first 700 hours of operation. If the operation conditions are good, a final judgment can be made based on the test results. However, the first oil change should not exceed 2200 hours after the initial operation.

When changing the oil, users should flush the gearbox inner surfaces with oil to remove the oil sludge, the residual oil and other impurities. Use the same lubricating oil that is used during the normal operation. Make sure that all residues are completely removed before adding new oil.

When changing the oil in the gearbox, users should follow the steps below:

1. Switch off the drive power to stop the gear unit.
2. Ensure that the lubricating oil is returned to the oil tank of the oil station.
3. Place an appropriate container under the drain plug of the oil tank.
4. Remove the drain plug to make the oil drain into the container.
5. Open the oil filling hole of the oil station.
6. Inject new oil after cleaning the oil tank of the oil station.
7. Check the level shown on the oil level indicator.

Cautions!

When changing the lubricating oil of the gear unit, users should add the lubricating oil of the same type. Do not mix gear oils of different types and produced by different manufacturers. When changing the lubricating oil, drain the lubricating oil immediately after the product has just stopped operation. If the temperature is low, preheat the lubricating oil and complete the changing before the oil in the oil tank cools. Be careful when changing the lubricating oil to prevent scalding caused by the hot oil that comes out. Wear protective gloves. If the test indices of the lubricating oil exceeds the standard, immediately change the lubricating oil. Otherwise, NGC will not bear the responsibility related to this gearbox. When changing the lubricating oil, users should be sure to thoroughly remove the impurities in the cooler and filter.

Reminder!

The discharge and disposal of the used lubricating oil in the gearbox must comply with the relevant requirements of the local environmental protection department.

9.2.3 Adding Grease to Seals

Switch off the drive power to stop the gear unit.

Add lithium grease to the lubricating point of each seal. Lubricating points are fitted with standard grease nipples.

Reminder!

Remove the grease that is exposed outside the seal first.

9.2.4 Cleaning the Gearbox

Switch off the drive power to stop the gear unit.

Use a scrubbing brush to remove dust and dust and dirt to the gearbox body.

Dust should not be accumulated on the exposed surface of the gearbox. Excessive dust can affect heat dissipation.

Remove all rust.

Cautions!

Do not use high-pressure cleaning equipment to clean the gear unit.

9.2.5 Checking the Oil Cooling System

Operate according to the lubrication station operating manual.

9.2.6 Maintenance

Precautions for gearbox removal

- Notify our company for technical support when inspecting and updating the gearbox.
- Conduct disassembly and inspection in a special place that must be clean and free of other sundries.
- When disassembling, users should remove the external oil pipelines. Wrap the two ends of the removed pipes with plastic cloth to prevent the dirty oil from seeping into the oil pipes.
- When assembling or disassembling any component, special attention shall be paid to the positions of assembly marks and locating pins, which should be placed at the same positions as before when reassembling.
- Prevent any sundries from falling into the gearbox and keep the gearbox clean.

Precautions for the disassembly inspection of the gearbox

After the gearbox disassembly, check the components thoroughly and make a detailed record:

- Tooth surface contact patterns;
- Bearing wear condition;
- Replacement of the wearing parts after checking.

Precautions for the gearbox reassembly

- Make sure that the gearbox reassembly meets the requirements of the gearbox assembly drawing and is carried out according to the assembly technical conditions.
- When reassembling, users should thoroughly clean all parts.
- If bolts, nuts, locking parts, and other connectors are damaged during disassembly, make sure to replace them with new ones.
- When installing the joint surface, users should clean all the old sealant on the surface and replace it with a new sealant.
- During the regular overhaul, change new lubricating oil and recheck the centering of the gearbox.

9.3 Lubricating Oil

Users are recommended to select the lubricating oil in accordance with the specified viscosity grade. The grade should be applied to the using conditions in the contract.

10. Faults, Causes and Solutions

10.1 General Information on Product Failures

Reminder!

If the product failures and abnormal operations occur within the warranty period and the gear unit needs maintenance, the problem must be solved by the after-sales department of NGC. If the product failures and abnormal operations occur beyond the warranty period and the causes cannot be determined, we recommend that you contact our after-sales service department.

Warning!

For damage to the product caused by improper use of the gear unit, unauthorized modification without the permission of NGC, or use of spare parts that are not provided by NGC, NGC will no longer assume any guaranty responsibility.

It is required to stop the gear unit before the troubleshooting.

It is required to lock the drive to prevent accidental starting. A warning sign should be attached to the start switch.

10.2 Possible Faults

Refer to Table 10-1 for details of possible Faults.

Table 10-1 List of Gearbox Faults

Faults	Possible Reasons	Solutions
Suddenly increased vibration and noise of the gearbox	Gear parts are damaged.	Contact NGC's after-sales department of the industrial gearbox in a timely manner. If the gear parts are damaged, order spare parts of the gearbox and replace the damaged ones.
	Bearings are damaged.	Contact NGC's after-sales department of the industrial gearbox in a timely manner. If the bearings are damaged, order new bearings and replace the damaged ones.
	Motor centerline offsets.	Correct the centerline and check the cause of the offset.
Abnormal temperature of the gearbox	The gearbox is overloaded.	Check motor voltage and current.
	The oil level in the gearbox is too low or too high.	Check the oil level in the gearbox or the oil level of the oil station.
	The oil ages seriously.	Confirm the date of the last changing of the lubricating oil. If possible, test the oil product. Determine whether to change new lubricating oil based on the date of the last changing and the test result.
	The oil pump is damaged.	Check whether the oil pump is damaged, and determine whether to repair or replace the oil pump according to the inspection result.
	The filter is damaged.	Check whether the filter is damaged, and determine whether to repair or replace the filter according to the inspection result.
	The cooling water system is damaged.	Check the cooling water system, including cooling water temperature, valves, and other parameters and parts, and determine whether to repair or replace some parts according to the inspection results.
	Bearings are damaged.	Check bearings. If the bearing is damaged, order a new bearing to replace the damaged one.
	Lubricating oil brand does not meet the requirement.	Check whether the brand of the purchased lubricating oil is in conformity to the instruction. If the two are not identical, re-purchase the right one.
Oil leakage of the gearbox	The oil level in the gearbox is too high.	Check and adjust the internal oil level.
	The air filter is not unobstructed.	Make sure that the air filter should be kept clean and unobstructed. Clean or replace the air filter if necessary.
	Bolts are loose.	Check and tighten coupling bolts according to torque requirements.
	FEY seal ring is damaged.	Replace the damaged one with a new seal ring.
	Seals are damaged.	Replace the damaged ones with new oil seals.
Too high bearing temperature	The temperature of the inlet oil is too high.	Check whether the oil temperature of the gearbox is too high.
	Bearing lubrication is insufficient.	Check whether the oil circuit is clogged.
	Bearing clearance is not appropriate.	Measure and adjust the bearing clearance.
	The resistance temperature detector fails.	Check whether the resistance temperature detector has failed.
	Bearing load is too large.	Check the gearbox for overloading.
Flowmeter alarm of the gearbox	Lubricating oil temperature is too low.	Heat the lubricating oil.
	The filter is too dirty.	Clean the filter as required and replace the filter screen if there is too much dust.
	Oil leaks from pipelines.	Check pipelines and connectors. Tighten or replace seals.
Pressure alarm of the gearbox	The oil pump is damaged.	Check whether the oil pump is damaged, and repair or replace the oil pump as required.
	The filter is too dirty.	Clean the filter as required and replace the filter screen if there is too much dust.
	Pipelines are clogged or leaking.	Check pipelines and connectors. Tighten or replace seals.
Abnormal vibration and noise of couplings	Couplings are damaged.	Replace the couplings.
	Coupling bolts are loose.	Check whether the coupling bolts are loose and tighten them according to torque requirements.
	Centering deviation occurs.	Correct the base, check the centerline, and adjust the centering.
lubrication station faults		Refer to the operating manual of the lubrication station.

11. Spare Parts

11.1 Description of Spare Part Warehouse

Storing the most important spare parts and quick-wear parts can ensure that the gearbox is always ready for use.

If users need to order spare parts, please contact the after-sales department of our company.

Parts in the gearbox with a certain lifetime include shafts, gears, bearings, and oil seals.

Quick-wear parts inside and outside the gearbox include rubber rings, seal rings, resistance temperature detectors, breathers, and standard parts for replacement.

We only assume warranty responsibility for original spare parts that we provide.

Cautions!

It is a stark reminder that only the spare parts provided or approved by NGC can be used for NGC gearboxes. The installation or use of spare parts that are not provided or confirmed by NGC will alter the structural characteristics of the gearbox. In addition, it will lead to risks related to reliability and security of the operation. In this case, NGC will no longer assume any responsibility for this gearbox.

The service life of quick-wear parts is easily affected by various conditions and cannot enjoy the same warranty period as the gearbox. If wear or aging occurs, the parts should be replaced in time.

The ordering and replacement of gearbox spare parts shall be conducted under the guidance of relevant business units of NGC.

If users need to order related spare parts, please contact NGC's sales department. NGC will provide a spare parts list and other related information in a timely manner.

12. Customer Service

12.1. General Description of Customer Service

The gearbox is a relatively complex product. The related services need to be properly completed by NGC's technicians who are familiar with the product structure and are trained professionally.

If the gearbox needs to be unpacked and maintained at the site, the operation must be conducted under the guidance of NGC's professional technicians.

If the standard components of the gearbox need to be replaced, such as the resistance temperature detectors, the pressure gauges, and oil seals, it is suggested that they should be replaced by the after-sales service staff of NGC. The replacement can also be done by the user at the site, but it must first be agreed and confirmed by NGC.

If users disassemble or modify the gearbox by themselves without the consent of NGC, NGC will no longer be responsible for this gearbox.

For any questions regarding the gearboxe, please consult NGC's after-sales department.

Reminder!

If users need assistance from NGC's customer service department, please provide the following information as much as possible:

Complete nameplate data;

Type and extent of fault;

Occurence time of the fault occurred and accompanying phenomenon;

Related data record or digital photographs;

User information and contact information.

Reminder!

The gearbox products provided by our company contain state-specified chemicals such as lubricating oil and paint. They must be used, stored, and disposed in accordance with relevant national regulations. Specific requirements are as follows:

The used lubricating oil must be collected and stored in a closed container that meets the requirement of relevant environmental regulations. Any leakage is not allowed. The lubricating oil that cannot be used again must be recycled and disposed by the unit with environmental protection qualifications.

The scrapped parts containing hazardous wastes such as lubricating oil and paint must be disposed by the unit with environmental protection qualifications in accordance with environmental requirements before undergoing sale or other treatment.

If the used lubricating oil or the scrapped parts containing hazardous wastes such as lubricating oil and paint cannot be disposed in time, the owner is obliged to set up a storehouse that meets the requirements of environmental protection, safety, fire protection, and other related laws and regulations to classify and separately store the hazardous wastes.

12.2 Contact Information

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