RST-NT1041-1803-02



Operation Manual of Mud Pump Transmission NT-1041



LUOYANG REASTAR TRANSMISSION CO., LTD.

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Operation Manual Of Mud Pump Transmission

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If failure occurs within the warranty period, and constitutes a breach of warranty, repair or replacement parts will be furnished on a no-charge basis and these parts will be covered by the remainder of the unexpired warranty which remains in effect on the complete unit.

Aug 3, 2012

Introduction

This operation manual introduces technical parameters, installation and technical requirements of mud pump transmission. Customers or users should read this manual operation carefully before using. Correct using, operation and maintenance can effectively eliminate the risk of danger and damages, reduce maintenance costs, reduce downtime, improve the reliability of mud pump transmission and prolong service life.

Important Notice: Users should be pay special attention to the notes which are marked \bigwedge signs, otherwise it may lead to personal injuries and property damages.

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General Information

This publication provides the information necessary for the operation and maintenance of the Reastar Co., Ltd equipment. Specific engineering details and performance characteristics can be obtained from the Product Service Department of Reastar Co., Ltd, Luoyang City, Henan Province, China.

Operation and maintenance personnel responsible for this equipment should have this manual at their disposal and be familiar with its contents. Applying the information in the manual will result in consistent performance from the unit and help reduce downtime.

Special Tools

Engineering drawings are included for the fabrication of special tools that should be used during disassembly and assembly of a unit. Repair of this equipment should not be attempted without special tools. Reastar does not manufacture these tools for general use.

Replacement Parts

Parts Lists

Engineering assembly drawings are provided in appropriate sections of this manual to facilitate ordering spare or replacement parts. Current bill of materials are available from Reastar or the nearest Authorized Reastar Distributor.

Ordering Parts

MWARNING

All replacement parts or products (including hoses and fittings) must be of Reastar origin or equal, and otherwise identical with components of the original equipment. Use of any other parts or products will void the warranty and may result in malfunction or accident, causing injury to personnel and /or serious damage to the equipment.

Renewal parts and service parts kits may be obtained from any authorized Reastar distributor or service dealer.

Parts Shipment

Furnish the complete shipping information and postal address. State specifically whether the parts are to be shipped by freight, express, etc. If shipping instructions are not specified, the equipment will be shipped the best way, considering time and expense. Reastar Co., Ltd will not be responsible for any charges incurred by this procedure.

Reastar Co., Ltd having stipulated the bill of material number on the unit's nameplate absolves itself of any responsibility resulting from any external, internal or installation

changes made in the field without the express written approval of Reastar. All returned parts, new or old, emanating from any of the above-stated changes will not be accepted for credit. Furthermore, any equipment which has been subjected to such changes will not be covered by a Reastar warranty.

Preventative Maintenance/Troubleshooting

Frequent reference to the information provided in this manual regarding daily operation and limitations of this equipment will assist in obtaining trouble free operation. Schedules are provided for the recommended maintenance of the equipment and, if observed, minimum repairs (aside from normal wear) will result.

In the event a malfunction does occur, a troubleshooting table is provided to help identify the problem area and lists information that will help determine the extent of the repairs necessary to get a unit back into operation.

Lifting Bolt Holes

Most Reastar products have provisions for attaching lifting bolts. The holes provided are always of adequate size and number to safely lift the Reastar product.

ACAUTION

These lifting points must not be used to lift the complete power unit. Lifting excessive loads at these points could cause failure at the lift point (or points) and result in damage or personal injury.

A CAUTION

Selecting eyebolts to obtain maximum thread engagement with bolt shoulder tight against housing. The bolt should be close but not contact with the bottom of bolt hole.

Safety

General

All personnel operating and maintaining this equipment must comply with safety regulations. Reastar, Incorporated will not be responsible for personal injury resulting from careless use of hand tools, lifting equipment, power tools, or unrecognized maintenance/code of practice.

Important Safety Notice

Because of the possible danger to person(s) or property from accidents which may result from the use of this products, it is important that safety regulations are followed. This machine must be used according to the specifications. Proper installation, maintenance, and operation procedures must be observed. Inspection should be made as necessary to assure safe operations under general conditions. Proper protective device should be provided to the operator. These devices are neither provided by Reastar Co., Ltd nor are they the responsibility of Reastar Co., Ltd.

Sources of Service Information

Each series of manuals issued by Reastar Co., Ltd is current effective at the time of printing. When necessary, changes are made to reflect development of technology and update in product.

Individual product service bulletins are issued to provide the construction site with immediate notice of new service information.

For the latest service information on Reastar products, contact any Reastar distributor, or contact the Product Service Department, Reastar, Co., Ltd, 19, GuanLin Road, Luolong District, Luoyang City, Henan Province, China, or by e-mail at support@reastar.com.

Warranty

Equipment for which this manual was written has a limited warranty. For details of the warranty, refer to the warranty statement at the front of this manual.

Description and Specifications

General

NT series transmission of mud pump is a drive product aiming at portable mud pump for oil device. The design of the product is based on our analysis and integration of the mud pump's drive system. Based on the functions of clutch controlling and transmission, the product meets the demand of variable pressure and flow for the mud pump under different working condition by manual shifting, thereby reduce the replacement of cylinder sleeve and relieving labor intensity. The product shortens the length of the drive chain and reduces the weight of pumping set, so the total set is compact and can move conveniently.

Numbers and Letters—Model Identity

NT-1041

- N ——Mud Pump
- T ——Transmission
- 10—The maximum output torque 7380.5ft-lbs (10000N.m)
- 4 ——Number of stalls
- 1——Flywheel housing:
 - 0 0#;
 - 1 1#;
 - 2 2#;

System Description

The product consists of an air clutch and a four-speed gearbox.

The air clutch contains an air clutch and a set of control system. The function of the clutch is as follows:

1. Disconnect the gearbox with engine so as to reduce the engine's starting load ,which facilitates the engine starting;

2. Disconnect the gearbox with engine to stop the transmission during shifting.

The four-speed gearbox consists of two sets of retarding mechanism, one set with three parallel shafts and another set with planet-gear. Shifting is achieved by sliding the engage sleeve. The function of the gearbox is as follows:

1. With different ratio of transmission, the engine's torque and rotating speed is allocated ,then input into the mud pump.

2. Change the pressure and flow of the pumping set under different working condition by manual shifting, thereby reducing the replacement of cylinder sleeve.

General appearance



Figure 2. NT-1041 Transmission—Right View



Figure 3. Air control device (optional)

Sump

The bottom of the transmission housing serves as the sump for all oil used in the transmission system. The volume of the sump is 15.9gal (60L).

Pump

The external gear pump in the transmission is used to circulate the hydraulic oil from the sump, lubricate and cool the system.

Oil Filter

The oil filter located at the outlet of the oil pump, is used to filter the gear oil and prevent debris from running into the transmission causing tube blocking, scratch and bearing sticking. The thread size of oil filter outlet is:1 5/8-12UNF.

Oil Inlet

The oil inlet for cycling oil into the transmission, is connected with the outlet of the cooler. The thread size of the oil inlet is: M27X2

Clutch

There is an air control clutch in the front of the gearbox, aimed to engage or disengage with the engine. 0.264gal(1L) of 87~116psi (0.6~0.8Mpa) compressed air is needed during the process of controlling clutch.

The gearbox come with a clutch operation box which is used to control the clutch. The clutch's specification depends on the engine's.

Rotating Joint

The rotating joint mounted at the end of the first shaft in the gearbox, connect the clutch with its air input port. The thread size of the rotating joint is: G3/8.

View Port

There is a view port for installation and troubleshooting on the left side of the gearbox, generally it's covered with a plate mounted with a gear selector. The nameplate on the cover plate illustrates the relationship "Engine speed–gear–mud pump stroke" and indicates the operation notes of the transmission.



Gear Selector

There is a gear selector for shifting on the left side of the gearbox. Gear selector consists of a handle for shifting and a handle head for gear identification.



Shift Locking Handle

There is a shift-locking handle on the left side in order to lockup the gear and avoid losing gear. Shifting operation instructions is above the handle.



Filler Inlet

There is a filler inlet on the right side of the transmission box. The thread size of filler inlet is: M33X2.

Oil Level Indicator With Thermometer

There is an oil level indicator with thermometer for observing oil level and temperature in the back of the gearbox. The left scale $32\sim212^{\circ}$ F ($0\sim100^{\circ}$ C) of the gauge indicates the Fahrenheit temperature. The right scale $40\sim200$ of the gauge indicates the oil level.



Breather

There is a breather mounted at the housing. When the oil temperature increases or falls, exhausting or suctioning air happens through the breather .And it can filter the air ,which prevents grains running into the box.

Drain Plug

Below the filter screen at the rear of the transmission there is a magnetic drain plug for draining the oil within the transmission. The thread size of the drain plug is: M33X2.

In addition, below the housing of planet wheel there is also a magnetic drain plug for draining the oil within the housing. The thread size of the drain plug is: M22X1.5.

Eyebolt Hole

On the top of the transmission there are four eyebolt holes (M16) for mounting the bolts.

CAUTION:

These lifting points must not be used to lift the complete power unit. Lifting excessive loads at these points could cause failure at the lift point (or points) and result in damage or personal injury.

CAUTION:

Select lifting eyebolts to obtain maximum thread engagement with bolt shoulder tight against housing. Bolts should be close to but shouldn't contact with the bottom of the bolt hole.

Supports

Shoulder pole supports are used to support the transmission. There are eight M24 thread holes on the right and left side of box for connecting the supports.

Heat Exchanger

The heat exchanger is connected with the output of the oil filter, it is used to lower oil temperature for transmission normal working. The parameters of the heat exchanger are as

follows:

Power	40-60 Hp
Pressure	362.5psi (2.5Mpa)
Flow	21.14gal/min (80L/min)
Normal Temperature	140~176° F (60~80°C)
Max Temperature	221°F(105℃)

The heat exchanger is an optional component, and be provided by customer.

Control Device (Optional)

A brief introduction of the control device

It's an optional accessory product of the transmission which has the following function:

- Control the clutch: According to your operation, by judging the current system pressure to decide whether to combine the clutch, so as to protect the clutch friction plates, to avoid excessive wearing of the friction plates caused by a too high rotating speed or unsuccessful combination caused by a too low pressure.
- 2. Monitoring system information: The device can be real-time monitoring the system's air supply pressure, transmission oil temperature, oil pressure, transmission output speed, pump flow and pressure, pumping speed and other signals. When the signal exceeds the set value ,the device can give an alarm and emergency treatment.

The composition of the control device

The device consists of a control box, some cables and some peripheral accessories.

1. control box

the control box looks like the following picture, its features include information display, clutch control and alarm handling.



The control box mainly consists of the following hardware

MPC100 controller: the MPC100 controller can control the control device. Its functions include input signal processing, logic judgment based on the input signal, output control signals, control the solenoid valve action, alarm lights flashing and so on. It can display some of the system's information through its own display, such as transmission output speed, system pressure, transmission oil temperature, oil pressure and other information. At the same time also has set system parameters, local / remote switching function.



Control box accessories:

Switch: Control system power on and off, and the control box has been connected with an 10A insurance device.

Clutch on / off switch: Control the clutch to be engaged or disengaged.

Alarm light: When the system alarm, the alarm light flashes to remind

Emergency stop switch: In emergency, you can press the emergency stop switch to disconnect the clutch

2. Pneumatic components



As the clutch pneumatic control, in order to control the gas circuit to connect and disconnect, and improve the degree of integration of the system, We designed the pneumatic control unit inside the control box. Internal gas circuit components include a variety of gas connections, check valves, pressure sensors, 24Vsolenoid valves, mufflers and so on. At the bottom of the control box, there are an air inlet, an air outlet and an air vent.

3. System cable



The system cable is mainly used to connect the control box and the peripheral accessories of the system. The connectors and connectors with good sealing are adopted. The connection of the pins is soldered so it's solid and reliable.

4. Peripheral accessories

Peripheral accessories include oil temperature sensor, oil pressure sensor, gearbox output speed sensor and a 24V DC power (Customer-owned).

The requirements of the air source :

- **1.** Air source, components(including air filter, reducing valve and atomized lubricator), gas tank and air pipelines are needed during controlling clutch;
- 2. The compressed air should be cooling below 140° F (60° C) through metal pipeline longer than 39.37 in(2m), before entering the components;
- 3. The pressure of air source should be 87~116psi(0.6~0.8Mpa), and at least0.264gal (1L) compressed air is necessary for clutch engaged; the volume of the air storage tank should be more than 2.64gal (10L).

Parameters of NT-1041

Max output torque:	7380.5ft-lbs	Max output spee	ed:	2100 RPM
	10000N M			
Number of gear:	4	Trans. ratio:	Refer	to the following
		table		
Cooling: Heat Ex	changer(Optional)	Direction of in	put/ou	tput rotation:
		clockwise(look fi	rom the	input side)
Clutch controlling:	Air control	Shift mode: Ma	inual	
Working cycle:	24 hours per day	Dry weight:	2204.8	8lbs(1000 Kg)

Selection table of Trans. Ratio (Matching for different engine speed)

NT series transmission has kinds of gear ratio configuration matching for different engine speed. Customers may select required ratio to satisfy the stroke range of mud pump, and insure the engine working in stable speed.

Engine speed (RPM)	lst ratio	2nd ratio	3rd ratio	4th ratio	Stroke of mud pump (s/m)
2100	8.058	6.132	4.509	3.338	40-150
1800	6.904	5.254	3.863	2.860	40-150
1500	5.919	4.505	3.312	2.452	40-150
1300	5.068	3.857	2.836	2.100	40-150

Oil selection

Lubricating oil selection

Please choose the lubricant according to the standard as follows:

- Heavy load gear oil should be used, and the quality grade of oil should satisfy GL-5 class of API SAEJ308 or L-CKD class of GB 5903-1995;
- Please choose the viscosity grade of the gear oil according to the ambient temperature.

Range of ambient temperature	1 2		3	4
SAE viscosity grade	75W	80W	90	90
ISO viscosity grade	68	68	150	320
Viscosity grade @ 104 F (40 °C) (cSt)	61.2-74.8	61.2-74.8	135-165	288-352



WARNING:

- Use of oil additives in a Reastar gearbox is strictly prohibited except by prior written authorization by Reastar transmission Co., Ltd.
- Some extreme pressure (EP) additives are corrosive to copper, brass, bronze, and/or aluminum. If the oil will come into contact with these metals (e.g. heat exchangers), consult your oil manufacturer to verify that the EP additives will not damage the system components.

Lubricants (Recommended)

Range of ambient temperature	1	2	3	4
Manufacturer	Lubricant			
Mobil	SHC 626	SHC 627	SHC 630	SHC 632
Shall	Omala S4 GX	Omala S4 GX	Omala S4 GX	Omala S4 GX
Shen	68	100	220	320

A NOTES:

- In the table, Maximum sump temperature for synthetic oils is 224.6 F (107 °C).
 If the unit's sump exceeds this temperature, an oil cooler will need to be added to the system.
- If the ambient temperature approaches the pour point, oil sump heaters may be required to facilitate starting and ensure proper lubrication

Installation

The transmission's clutch housings meets SAE standard, and can be directly connected with the standard engine. Make sure the engine matches the transmission before installation. The transmission must be used in the situation that corresponds with technical requirements.

CAUTION:

- The transmission can't be used in the conditions of power, torque and applied load beyond the design requirements.
- The transmission must be installed and debugged by professionals. Turn off the engine power before installation.
- The correct maintenance and repair is very important for operator's safety and stable running of the transmission.

Checking before installation

Check as the following items before connecting the engine with the transmission:

Item	Checking Standard
	There is no collision trace;
Appearance	The seals of input shaft, output shaft and air shaft have no leakage.
	Shift flexibly;
Shift	The locking handle can be locked at each gear.
	The gear selector should not come off at each gear.
	The clutch rotates smoothly at each gear.
Rotation	There is no abnormal sound when rotating the clutch.
	Make sure the engine flywheel and flywheel house is clean and free of
Cleaning	grease;
	Make sure the driving ring of the clutch is clean and free of grease;

End face run-out checking of flywheel housing

Attach the dial indicator to the engine flywheel. The pointer hits the end face of the flywheel

housing. Then turn the flywheel for a circle and read the dial indicator

The run-out value must not exceed:

reading.

SAE #0 Housing. 0.016 inch (0.41 mm)

SAE #1 Housing. 0.012 inch (0.30 mm)

Circular run-out checking of flywheel housing

Attach the dial indicator to the engine flywheel. The pointer hits the inside diameter of the

flywheel housing. Then turn the flywheel for a circle and read the dial indicator reading.

The circular run-out value must not exceed:

SAE #0 Housing. 0.016 inch (0.41 mm)

SAE #1 Housing. 0.012 inch (0.30 mm)

End face run-out checking of flywheel

Attach the dial indicator to the engine flywheel. The pointer hits front edge of the flywheel

housing. Then turn the flywheel for a circle and read the dial indicator reading.

The run-out value must not exceed:

0.005 inch (0.01mm) per 1 inch (25.4mm) of flywheel's diameter.

Circular run-out checking of Flywheel

Attach the dial indicator to the engine flywheel. The pointer hits front edge of the flywheel housing. Then turn the flywheel for a circle and read the dial





indicator reading.

The circular run-out value must not exceed: 0.005 in.(0.13mm.)

Circular run-out checking of transmission clutch Housing

Attach the dial indicator to transmission clutch Housing' end face. The pointer hits the front edge's outer diameter of the clutch housing. Then turn the clutch for a circle and read the dial indicator reading.

The circular run-out must not exceed:

SAE #0 Housing. 0.016 inch (0.41 mm)

SAE #1 Housing. 0.012 inch (0.30 mm)



Connecting With Engine

Connect engine with transmission after examination.

Disassembling the Oil Drain Plug

Take down the oil drain plug from the engine flywheel

Making the Driving Ring and Clutch Housing concentric

Install the clutch driving ring of the transmission onto the clutch, adjust and make the driving ring and clutch housing concentric.

Inflating air chamber of the clutch by using inflating device, to make the clutch engaged, then close the globe valve to make sure the clutch doesn't leak.





Installing Driving Ring

Remove the clutch driving ring, and install it onto the engine flywheel.

A CAUTION:

The strength grade of the mounting bolts should be above 10.9. Apply screw fastening adhesive (Loctite 242 recommended) before installing, and screw down the bolts with standard torque as follows.



		Thread Grade					
Thread Size		8.8		10.9		12.9	
			1	fightening	g Torque		
METRIC	INCH	N•m Ft-lbs N•m Ft-lbs N•m					Ft-lbs
M8	5/16"	23	11	33	16	40	29
M10	3/8"	45	30	65	45	70	
	7/16"	60	45	90	65		
M12		80	41	115	62	125	95
	1/2"	96	70	130	135		
M14		125	70	180	110	195	140
	9/16"	135	100	190	140		
	5/8"	180	135	255	190		
M16		189	141	274	201	319	
M18		280	150	390	236	400	
	3/4"	325	240	460	340		
M20		400	215	550	345	630	393

Installing Transmission

Lifting the transmission smoothly by four eyebolts on the top of the transmission. Rotate the clutch and make the teeth of the friction plate and the teeth of the driving ring concentric. Push the transmission and make sure the teeth mesh totally, then connecting the flywheel housing of





engine and the clutch housing of transmission with bolts.

A CAUTION:

- According to the depth of the screw holes to select the bolt, bolts can be completely screwed into the screw hole, and the bolt shoulder and screw boss in close contact. The bolts should be as long as possible, but do not touch the bottom of the screw holes
- During installation make sure the air chamber of the clutch without leakage.
- Make sure the torque on the face of the transmission clutch housing should not exceed 4428 ft-lbs (6000N.m)
- Strictly prohibit knocking vigorously to avoid damage the parts of the transmission.

Installing Transimission supports

Connect the transmission and the support with 16 bolts (Specification M24).



The support mode of the transmission should refer to the attached drawing, and avoid damaging the engine and transmission.



Installing Output flange

Connect the output flange with the shaft.



- \succ The angle of shaft inclination should not exceed 3 $^\circ\,$.
- The bolts' strength grade should be above 10.9, and the length should not exceed 39inch (100mm).


Installing air Control Device

Fixing the air control device.

Wire to the "+" "-" of the engine power.



Installing the air and hydraulic pipeline

Install the air and hydraulic pipeline.(Refer to air control and lubrication system

drawings)



- ▶ Make sure all pipelines have no leaking.
- Fix the pipeline firmly with a band to avoid abrasion resulted from vibration.



Operation instruction

Checking before running

Check as follows before starting the engine.

Item	Checking Standard	
	Shift flexibly;	
Shift	The locking handle can be locked at each gear.	
	The gear selector should not come off at each gear.	
Gauges	Air and oil pressure gauge indicates normally.	
Oil level	Oil level should be visual in the oil level indicators with thermometer.	

A CAUTION:

The pointer of air and oil pressure gauge should return to 0 when not working.

Checking After Starting

Checking the leak of air pipeline

Start the engine, keep idle, and check leak of pipeline from air source to the air inlet. With the air pressure up to 87psi (0.6Mpa), engage the clutch, then check leak of pipeline from the air outlet to the clutch.



- Engaging clutch is prohibited when the air pressure isn't up to the lowest 87psi (0.6Mpa), otherwise the friction plates wear easily.
- The set pressure of the pressure regulating valve is 116psi (0.8Mpa), and any change is not allowed.

Checking the leak of oil pipeline

Check the leak of hydraulic system, especially the joints of pipeline and seals.



Checking oil pressure gauge

Check the indicators. Machine stopped and inspection are required when the oil pressure is below 217psi (1.5Mpa).

Checking oil filter

Check the indicators: Filter should be replaced as long as the indicator pass the red line, which indicates the filter





has been blocked.

Checking oil level

With the engine and transmission running for 5 minutes, check the oil level, and the right sight glass should show 40 to 100.



Normal working

After confirming with the above inspections, normal working is allowed.

Warming

- Start the engine and keep it idle;
- ➤ Keep the transmission in neutral gear;
- Engage the clutch with the air pressure up to 87psi (0.6Mpa);
- > Keep the warming time for $5 \sim 10$ minutes in summer, and for $10 \sim 20$ minutes in

winter.

CAUTION:

If the gearbox isn't warmed before working, system will not be lubricated sufficiently, which may result in bearing burned.

Gear Selection

Select proper gear and engine speed according to the stroke of mud pump as the follow formula.

Pump stroke=engine speed/speed ratio/speed ratio in pump



When the engine speed exceeds its rated speed, the failure rate of the system will increase 15%, meanwhile fuel consumption of engine would adds, and the wear of gearbox may aggravates. The suggestion is that meet the pump stroke requirement by shifting prior, if stroke isn't realized, consider increasing the engine speed.

Clutch engagement/disengagement

Make sure the engine is idling, then release the clutch





- ➤ Keep the clutch released before shifting, otherwise gears will be damaged easily.
- ▶ Keep the engine idling while engage or release the clutch, otherwise the frication

plates will wear easily and service life of clutch will reduce.

> Adjusting engine's speed smoothly to avoid impact to the gears;

Confirming clutch stopped

Shifting is allowed only if the clutch stopped completely to avoid the impact to gears.







Shifting operation

As shown on the right picture, turn the locking handle to unlock position;

Locking hangdle



When the locking handle turned to unlock position, turn the gear selector to the right gear;

The gear selector



Turn the locking handle to lock-up position after shifting.



CAUTION:

Ensure the locking handle in lock-up position expect shifting;

Machine halt

Adjust the engine to idle slowly, then release the clutch; Keep the transmission in neutral gear and locking with an extended machine halt.

CAUTION:

For changing drill stem, machine halt for short time is allowed with releasing the clutch and keeping the transmission in current gear. After changing, engage the clutch directly.

Notes

Notes in operation are as follows:

CAUTION:

- Suggest that engine speed should not exceed 85% of rated speed at first running for 200 hours;
- > The normal temperature of transmission is 60 to 80 $^{\circ}C$; the maximum temperature within one hour can't be more than 105 $^{\circ}C$
- ➢ If smoking or oil spillage happens at the breather, stop and check the transmission immediately.
- > When the transmission make abnormal sound, stop and check it immediately;

Control Box Operation (Optional)

Before operating the buttons on the control box, ensure that the system cable connector has been connected and fixed on the transmission, power supply, air supply and gas line are ready:

Please operate in the following orders:

Press the power switch, waiting for MPC100 controller start and display the first user interface that shows the current clutch status, fault condition and the current time.

- After press the clutch on / off switch, the system will judge the pressure value, when the pressure is greater than 87psi (0.6MPa) and less than 116psi (0.8MPa) (upper and lower limits can be set) and the system oil temperature is normal, the clutch should be normal, otherwise it can't work properly.
- ➤ During equipment running, press the clutch engaged/disengaged switch at any time to disengage the clutch, but when you need to engage the clutch, still need to meet the pressure more than 0.6MPa and less than 0.8MPa.
- During equipment running, if an emergency happens, you can press the emergency stop button to make the clutch disengaged;
- ➤When shutting down the system, make sure that the clutch is disengaged, and reset all switches
- Remote/close switch, during equipment running you can only be remote or close single-ended operation. in the bottom of the control box, remote/close switch can switch the equipment to remote/close operation.

[1]Note: The condition of making the clutch engaged successfully is that the air pressure should be more than 0.6MPa and less than 0.8MPa, And the transmission oil temperature is below 248 °F (120 °C) ,so as to avoid unsuccessful engagement and friction plate wear too fast caused by lacking of pressure

MPC100 controller operating instructions

AS shown in the following figure, the controller panel consists of a 128x64 dot matrix LCD, Indicator, and keys.



• LCD Display

Show all parameters and status during normal operation. Each time you press "Set" button, the display will switch to the next screen.

Menu	Description	
Screen1	Clutch disengagement /engagement Alarm / fault display	
~	<u>13-08-06/15:12:15</u>	
	Rotating speed : 0000 RPM	
	Oil temperature: 000 °C	
Screen2	Oil pressure : 0.00 MPa	
	Air pressure : 0.00 MPa	
	Pump pressure : 0.00 MPa	
A A	battery: 24.0 V	
Screen 3	Filter timing: 200:00	
	Oil timing : 2000:00	

Note: If the "Display switching mode" is settled to "Auto" switch mode, every 10 seconds, the LCD display will switch to the next screen, it equals to push the 'set' button; if the "backlight control" is set to 'auto', and without operate any button in more than three minutes, the LCD screen will automatically turn off the backlight, until you press any key or a failure occurs. During the backlight off, the LCD screen may not see the display, do not mistakenly think it is the controller fault. If "Backlight Select" is set to "Always" state, the LCD backlight will not turn off.

Screen1 shows the status of the transmission. The first line indicates the clutch engagement state; the second line shows the warning or fault information. The warning information include low oil temperature, high oil temperature, and the fault information include excessive oil temperature, low oil pressure, high oil pressure, high air pressure and emergency shutdown. When a fault occurs, the controller will control the clutch disengaged, the third line shows the current time.

Name	Function description
O fault	Fault indicator lamp, the fault shows on the LCD screen.
O alarm	Warning indicator lamp, transmission still work, warning shows on the LCD screen.
O remote	Remote control Indicator lamp, the controller has been switched to the remote mode.

• Status indicator

Fault alarm description

System failure is divided into alarm and fault tips, fault information will be displayed in the first screen.

Alarm: low oil pressure alarm, high oil pressure alarm, low air pressure alarm, high air pressure alarm, low oil temperature alarm, high oil temperature alarm;

Fault: low oil pressure fault, high oil pressure fault, low air pressure fault, high air pressure fault, low oil temperature fault, high oil temperature fault;

When alarm occurs, disconnect the clutch and check the relevant parameters according to the fault prompt. The system will automatically disconnect the clutch when the fault occurs. Check the relevant parameters according to the fault prompt.

Maintenance

Daily maintenance

Items	Standard	Measures for abnormal	
Oil level	the right sight glass show 40 to 80	Add oil	
Air pressure	87~116psi (0.6~0.8Mpa)	Check air source	
shift	Shift flexibly		
Leaking of oil pipeline	No leakage	tighten	
Leaking of air pipeline	No leakage	tighten	
Bolts for output shaft	tight	tighten	
Bolts for engine	tight	tighten	
Oil pressure	Below 217psi (1.5Mpa)	Regulate relief valve	
Filter differential	Not reach the red line	Change oil filter	

Maintenance for run-in period

After the run-in period of 200 hours, operate as follows:

- 1. Change oil;
- 2. Change oil filter;
- 3. Change the pipes of air inlet of the clutch if there are leakage or wear;

Normal maintenance

After working for 2000 hours or 12 months (the time of arrival first), operate as follows:

- 1. Change oil;
- 2. Change oil filter;
- 3. Check or Change

- the pipes of air inlet;
- swivel coupling
- friction plates

Maintenance after 4000 hours

After working for 4000 hours, check or change:

- 1. Input oil seal;
- 2. Output oil seal;
- 3. Shifting block;
- 4. Gear selector;
- 5. Swivel coupling;
- 6. Friction plates

Filling oil

Fill oil from the oil inlet after installing the pipelines:

≻ Fill oil until the oil level is visual;

- Start the engine, keep idling, and wait for the air pressure up to 87psi (0.6Mpa);
- > Engage the clutch, keep engine idling, and observe the oil pressure;

> Add oil until the oil level up to the place 40~100 of right scale.



A CAUTION:

When the oil level reach to the lowest level, wait for a moment (for oil ropy and flowing slowly) to avoid the oil level being too high.

Changing oil

Change oil when the transmission is running and the oil is hot, steps as follows:

Remove the drain plug at the bottom of the box, then let oil out;

Remove the drain plug on the planet wheel housing , then let oil out;

Remove the oil inlet pipe, then let oil of cooler out;

> Remove all pipes, then let all oil out;

➢IF the oil that dumped out is dirty, change oil after cleaning the internal parts of transmission thoroughly with new oil;

≻ Fill new oil again by above steps.



Be careful not scalded by hot oil during oil out;

Changing oil filter

Change oil filter every 500 hours or when the indicator passing the red line, steps as follows:

- Remove the oil filter with oil filter wrench;
- > Fill new oil into the filter through the round holes;
- Daub the seal with oil;
- Tighten the filter onto the filter underplate; The way of tightening: when the O-ring contact with the underplate, screw down 3/4 turn.



Don't fill new oil through the centre hole.





Notes

- The damage and wearing of gears may be caused by lack of oil, too little oil, or oil mixed with water, debris or grain;
- 2. Please check the seal, bolts, and other places possibly leaking. If bolts are loosing, tighten them.
- 3. Don't dump oil onto the floor while changing oil, filling oil, dumping oil or sampling oil, to avoid environment pollution caused by oil infiltrating into ground and sewer.
- 4. Please clear the transmission housing periodically in order to make the gearbox dissipates heat well.
- 5. Keep periodic maintenance. If abnormal situation (e.g. high temperature, vibrating violently, abnormal noise and smell) occurs, stopping system and troubleshooting are required to avoid causing personnel injury and property damage.
- 6. Because the temperature of box and oil is too high after running a longtime, maintain system while cooling thoroughly with protective article.

Wearing parts list

Convenient to choose and purchase, Reastar provides the wearing parts according to the service time of transmission. (See "Wearing parts list VI ")

Troubleshooting

Common failure as follows:

- ➢ Failure of air-pressure
- ➢ Failure of oil-pressure
- ➢ Failure of oil-temperature
- ➢ Failure of range
- Failure of noise

Failure of air-pressure

Clutch and air-supply device cause air-pressure failure.

Air-pressure reflects tighten degree of clutch engagement, and is the important parameter of clutch and engine protection.

Air-pressure checking

Check air-pressure through with the pressure gauge on the air supply device $_{\circ}$



Air-pressure failure cause

Failure causes as follows:

- Clutch air tubes abrade;
- ➢ Air tube leakage;
- Clutch friction plate slip;

Approaches

With different kinds of failures, solution as follows:

Abrasive wear of clutch air tubes

Stop engine and remove cover plate from clutch shell, if the tube abraded, replace it.

Air tube leakage

Check barometer on the air-supply device, pressure should exceed 87psi(0.6Mpa), if pressure is less then 87psi(0.6Mpa), stop engine and engage clutch, check where leakage happens, then tighten.



Clutch friction plate slipping

Stop engine and remove cover plate from clutch shell, check bottom of clutch shell, if oil is leaking, remove drain plug from engine, let oil out.



Failure of oil pressure

Oil pressure, related to the cooling and lubricating, is an important parameter of transmission box. Oil pressure should be below 217psi(1.5Mpa) when the box is running, check the box when pressure is out of range.

Oil pressure checking

Check oil pressure through with the oil pressure gauge or the controller monitors. When pressure exceeds the prescribed scope, the control box will remind by alarm and automatic release.



Oil-pressure failure causes

Failure causes as follows:

- Oil-way blocked;
- Oil filter blocked;
- Breakage of Oil pipeline.

Approaches

Approaches for different failures as follows:

Oil-way blocked

Check each oil pipeline, replace the aging pipeline and remove the blocking.

Oil filter blocked

The oil filter located at the relief valve outlet, which is used to filter the gear oil and prevent debris into the transmission causing tube blocking, scratch and bearing sticking.





- Change filter after using 200 hours by first time, then every 500 hours change it;
- When the indicator reaches to the red line, change it ...

Failure of oil-temperature

Oil-temperature, related to the cooling and lubricating , is an important parameter of transmission box $_{\circ}$

Temperature check

Check every point's temperature through with temperature measuring gun.



Oil- temperature check

Check oil temperature by oil level indicators with thermometer .





Stop using when breather appears leaking or smoking caused by high temperature, check where the point is_{\circ}

High temperature causes

Failure causes as follows:

- Lack of oil or cooling and lubricating insufficiently;
- Gear or bearing wears or gets stucked.

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Approaches

Approaches for different failures as follows:

Lack of oil, cooling or lubricating insufficiently

With the engine and transmission running for 5 minutes, check the oil level, and the right sight glass should show 40 to 100.

Fill oil up to the required line if oil is not enough.

Check the pressure of the gauge. The pressure must be below 217psi (1.5Mpa);

If the pressure is too high, check:

- If the pipes and the external cooler of the transmission are blocked, clean or change them.
- If the gear oil is muddy and leading to the pipe blocked, change oil.

Gear or bearings wear or getting stuck

There will be high temperature and abnormal sound when the bearings are blocked or wearing.

Open the observation plate, use temperature measuring gun to check temperature of the gear and the bearings, confirm the fever position.

Disassemble the transmission and change the bearings if the bearings are blocked or wearing.







Failure of gear

Proper gear makes the transmission work normally, and it reflects engine speed and stroke of mud pump directly.

Check the gear

When shifting unsuccessfully, check as follows:

- The locking handle is vertically downward;
- The gear selector is in right position;

The left limit position

The left limit position of the handle (refer to the right figure);



The right limit position

The right limit position of the handle (refer to the right figure);



The reason of gear failure

Reason as follows :

If the locking handle is placed upward, declutch shift shaft moving and gear disordering will be caused by vibration of the engine.

Approaches

Approaches for different failures as follows:

Gear chaos

- Open the observation plate, the fork and the block should be on neutral position; (refer to the right figure)
- 2, If not, adjust them to the neutral position;
- 3. Install the observation plate and try to shift.





Failure of noise

If the gearbox makes abnormal noise, please stop and check it immediately.

Check noise source

Check the gear box according to the following method.

The reasons of making noise

Reasons as follows:

- Impact of gears;
- Bearings wear;

Approaches

Approaches for different failures as follows:

Impact of gears

Impact of gears will make noise, cause gear wear and fracture, and even result in locking the sliding sleeve and gears.

Open the observation plate and check the bolts on the fork. Loose bolts will cause the position of the engage sleeve to run out of position and it may mesh with the gear .



Adjust the sliding sleeve to neutral position, glue the bolts (Loctite 242) and screw them tightly.

Bearings wear

The wearing bearings will make continuous and sharp sound, and violently vibrate. The oil temperature would rise sharply, and cause oil leakage and smoking at the breather. So if the bearings wear, disassemble the transmission and change them.

Maintenance, Storage and Transportation

Notice

Change Oil according to the manual regularly. Inspect the possible oil leakage and tighten the loose bolt every time of oil change.

The premature wear or damage of gears occurs when the transmission works with lack of oil, little oil, or oil mixed water and impurities.



- > During the maintenance, disconnect power to avoid the accidental activation.
- > Dismount the breather after stopping the engine.
- Avoid oil contaminates the ground and foul sewer during oil change, adding oil, draining oil or oil sampling.
- Maintenance and service should be made until the transmission and oil cool down sufficiently. Work with protective articles.
- The transmission should be maintained regularly. When an abnormal situation happens (such as high temperature, violent vibration, abnormal noise and smell), please stop the unit immediately and troubleshoot to avoid personal injury and property damage.
- The replacement parts should meet the technology demands of the product inspection and repair. Reastar Co., Ltd are not responsible for the damage with the improper repairs and replacement parts.



Clean the dirt and mud periodically for better heat dissipation of the transmission.

Storage

Drain the oil for long-term nonuse.

Store the transmission in an environment of dry, little dirt and no vibration. Long-term non-use should be the gearbox of the lubricating oil release. In a standard storage environment, the effectively preserve time of gear shaft, spline housing and other parts is one year. Clean the parts and paint the proof oil again after one year for those parts. Don't place them outside.

Transportation

Transport the transmission with eyebolts for safety consideration. The eyebolts only take the weight of the transmission without other parts during lifting. The lifting device should have sufficient carrying capacity. Avoid collisions during lifting.



Don't stand ahead of or under the unit during lifting.

Appendix

I 、 Outline drawing



II 、Installation drawing



Installation instructions:

- 1. During the installation, use part A and B (on both sides) to support.
- 2. During the installation, fix position A first. Second, join gearbox with engine. At last, fix position B.
- 3. There are some steps designed on the stents of the side close to the gearbox, aimed to support the box with the convex platform on the box.
- 4. In the bottom of the stents, use a rubber mat to adjust the height.







IV V WIX X XIXI Air control System



V control system wiring diagram

VI Wearing parts list

(Some parts choose different specifications according to different configurations)

Item	Part Number	Part Name	Qt y	Run-in :200 hours	Spare:200 0 hours	Spare:4000 hours	Spare:6000 hours
1	3619323	0il Filter	1	1	4	8	12
2	3619433	314 Air Pipeline	2	/	2	4	6
3	3606403	Air Pipeline	2	/	2	4	6
4	3607563	18" Friction plate of clutch	3	/	/	3	3
5	3607163	14"Friction plate of clutch	3	/	/	3	3
6	3608914	0il glass	1	/	/	1	1
7	3602253	Rotating joint	1	/	1	2	3
8	3606603	Pressure gauge	1	/	1	2	3
9	3614763	Breather	1	/	/	1	1
10	R70034651	0-ring	1	1	1	1	1
11	R70018722	0-ring	2	/	/	2	2
12	R700154811	0-ring	1	1	1	1	1
13	R70048902	0-ring	1	1	1	1	1
14	R70018771	0-ring	2	2	2	2	2
15	R70033051	0-ring	1	/	/	2	2
16	R70SGP90120F	Oil seal	1	1	1	2	3
17	R70SGP120150F	Oil seal	1	1	1	2	3
18	R70SGP80100F	Oil seal	1	1	1	2	3
19	R70SGP2540	Oil seal	1	1	1	2	3
20	3610113	Fork	2	/	/	/	2
21	3301274	Shift parts	1	/	/	1	1
22	3614773	Gasket	1	/	/	1	1
23	3610823	Gasket	1	/	/	1	1
24	3610373	Gasket	1	/	/	1	1
25	3614643	Gasket	1	1	1	2	3
26	3614693	Gasket	1	/	/	1	1
27	R4ZH33	Combined sealing gasket	1	1	1	2	3
28	R4ZH22	Combined sealing gasket	1	1	1	2	3

W Engineering Drawings

The installation on each shaft system is selected according to the different speed ratio

HOUSING PARTS



HOUSING PARTS						
NO.	Part NO.	Name	Unit	Quantity		
1	3101603	SAE1 Clutch housing		1		
2	3614653	3rd shaft front cover		1		
3	3101583	transmission housing		1		
4	3614773	Housing Gasket		1		
5	3301236	3rd shaft parts		1		
6	3401686	2nd shaft parts		1		
7	3401696	1st shaft parts		1		
8	3301346	Planet wheel parts		1		
9	3401823	Gear		1		
10	3608914	0il level indicators		1		
11	3602253	Rotating joint		1		
12	3201873	Air source Flange		1		
13	3301294	Handle		1		
14	3614633	Eye port plate		1		
15	3301276	Shift mechanism parts		1		
16	3101593	housing		1		
17	3610074	Drip tray		1		
18	3618616	Lubrication pump parts		1		
19	3610143	0il-spraying pipe		1		
20	3301246	Shift mechanism parts		1		

1ST SHAFT PARTS



1ST SHAFT PARTS						
NO.	Part NO.	Name	Unit	Quantity		
1	R9LR1 1/8A	Screw	R 1 1/8	1		
2	R30Y75	Round Nut	M75x2	1		
3	R4YZ75	Check washer	75	1		
4	3610433	Flat Key		2		
5	3618735	314H clutch parts		1		
6	3610413	Spacer		1		
7	R70SGP80100F	Seal	80×100×10-FKM70 OSGP	1		
8	R63NJ2218	Cylindrical Roller Bearing		2		
9	3610263	lst shaft left spacer		1		
10	3610393	lst shaft spacer		1		
11	3301263	1st Shaft		1		
	3402003	1300 turn driving gear		1		
10	3402023	1500 turn driving gear		1		
12	3401693	1800 turn driving gear		1		
	3402033	2100 turn driving gear		1		
13	R5ZB100	Elastic washers	100	1		



2nd shaft parts						
NO.	Part NO.	Name	Unit	Quantity		
1	R30Y90	Round Nut	M90×2	1		
2	R4YZ90	Check washer	90	1		
3	R6523220CE4	Spherical roller bearing		1		
4	3401763	4th drive gear		1		
	3402013	1300 turn driven gear		1		
F	3400473	1500 turn driven gear				
Э	3401683	1800 turn driven gear				
	3400513	2100 turn driven gear				
6	3401743	3rd drive Gear		1		
7	3401723	2nd drive Gear		1		
8	3301253	2nd Shaft		1		
9	3401703	1st drive Gear		1		
10	3610443	2nd shaft right Spacer		1		
11	R63NJ2316	Cylindrical Roller Bearings		1		
12	R5ZB80	Elastic washers	80	1		



3rd Shaft Parts					
NO.	Part NO.	Name	Unit	Quantity	
1	R30Y85	Round Nut	M85×2	1	
2	R4YZ85	Check washer	85	1	
3	3610193	3rd shaft left Bearing Spacer		1	
4	R63NJ2218	Cylindrical Roller Bearing		2	
5	3610213	3rd shaft Spacer		2	
6	3610303	4 th gear bearing inside Spacer		1	
7	R65K11011830	Cylindrical needle roller bearings		8	
8	3401773	4th driven Gear		1	
9	3610183	4th gear Bearing inner ring		1	
10	3301233	3rd Shaft		1	
11	3401813	Engage outer sleeve		2	
12	3601493	Steel ball		6	
13	3614783	Spring		6	
14	3401803	Engage inner sleeve		2	
15	3610173	3rd gear Bearing inner ring		1	
16	3401753	3rd driven Gear		1	
17	3610293	3rd gear bearing inner Spacer		1	
18	3610203	Spacer		1	
19	3401733	2nd driven Gear		1	
20	3610283	1st 2nd Bearing inner Spacer		2	
21	3401713	1st driven Gear		1	
22	3610163	1st 2nd Bearing inner ring		2	
23	R5ZB90	Elastic washers	90	1	
24	3610733	3rd shaft right Oil retainer		1	
25	R5KA35	Elastic washers	35	1	



Planet wheel parts						
NO.	Part NO.	Name	Unit	Quantity		
1	3101373	Planet wheel housing		1		
2	R70SGP120150F	Seal	120×150×12-FKM70 OSGP	1		
3	3610823	Gasket		1		
4	3610083	Output Plate		1		
5	3201863	Output flange		1		
6	3610253	Output flange plate		1		
7	R616317	Deep groove ball bearing	6317	1		
8	3301343	Hub		1		
9	3610223	Wear-resistant sheet		12		
10	3401783	Solar wheel		1		
11	3401793	Planet Gear		6		
12	R64ZWV425755	Needle bearing	42.855×57.871×55ZWV	12		
13	3610653	Spacer		6		
14	3301283	Planet driven shaft		6		
15	3610743	Steel wire		1		
16	3602373	Screw	M10×20-12.9	1		
17	R6523026CE4	Spherical Roller Bearings	23026	1		


Lubrication pump parts						
NO.	Part NO.	Name	Unit	Quantity		
1	R5ZB18	Elastic washer	18	2		
2	3618443	Stand		1		
3	3618615	Lubrication pump		1		
4	R023. 1020	Screw	M10 ×2 0-8.8	2		
5	3618454	Inlet pipe		1		
6	3618463	Outlet pipe		1		
7	3401943	Gear		1		



Shift mechanism parts						
NO.	Part NO.	Name	Unit	Quantity		
1	3610113	Fork		2		
2	3301243	Fork Shaft		2		
3	3610123	Base		1		
4	3610153	Base		1		
5	3601493	Steel ball	Φ 10	4		
6	3602093	Spring		2		
7	R9J01215	Screw	M12×15	2		
8	3614633	Eye port plate		1		
9	3610133	Handle rest		1		
10	3610233	shifting block		1		
11	R5KA35	Elastic retaining ring	35	1		
12	3602423	Linear bearing	KH253540	1		
13	R70048902	0-Ring	48.90×2.62	1		
14	R70SGP2540	Seal	25×40×7 OSGP	1		
15	R5KA40	Elastic retaining ring	40	1		
16	3301273	Handle Shaft		1		
17	3602024	Handle		1		
18	3610403	Block shaft plate		1		
19	R70017171	0-Ring	17. 17 × 1. 18	2		

Elastic retaining ring

Locking shaft parts

R5ZB24

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