



Maintenance manual

T20JE/T22JE/T26JE/T28JE Telescopic Boom Mobile Elevating Work Platform



Before operation and maintenance, the drivers and service personnel shall always read and thoroughly understand all information in this manual. Failure to do so may result in, fatal accidents or personal injury.

This manual must be kept with this machine at all times.

T20JE/T22JE/T26JE/T28JE

**Telescopic Boom Mobile Elevating Work Platform
Maintenance Manual**

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Foreword

You are welcome to purchase and use the lifting platform produced by LINGONG HEAVY MACHINERY CO., LTD. This machine is designed according to BS EN280-1:2022. This manual introduces the maintenance and other aspects of the lifting platform.

Getting the best out of your machine is a goal that we pursue together with you, depending on how familiar you are with it and how carefully and thoroughly it is maintained.

We sincerely hope that you can read through this manual before starting, performing operation and maintenance for the first time, and be handy about the operation and maintenance introduced therein.

The illustrations and instructions in this manual are correct at the time of publication, but the structure and performance of our products are constantly improved and perfected. The design, operation and maintenance instructions are subject to change without notice. Please understand.

For the latest information about the machine and questions about this manual, please consult our company.

This manual is suitable for telescopic boom lifting platform. Under no circumstances shall any act or operation prohibited in this manual be performed. Users shall strictly follow the maintenance interval specified in this manual and other materials delivered with the product.

This manual should always be kept in the specified location for easy reference. This manual is part of the machine and should be handed over with it when ownership or use of the machine is transferred. If the manual is missing, damaged or illegible, please replace it in time!

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WARNING

Operators and maintenance personnel must read, understand and abide by the safety regulations and operating instructions specified in this manual before operating and maintaining this machine, otherwise, it may lead to casualties!

Only specially trained and qualified personnel can operate, maintain and repair the machine.

Improper operation, maintenance and repair are dangerous and may result in injury or death.

Users shall be familiar with the rated load, and overloading is strictly prohibited. The users shall be responsible for all the consequences caused by overloading or unauthorized modification.

The operating procedures and precautions provided in this manual are only applicable to the specified purposes of this machine. If it is used for operations other than those specified but not prohibited, make sure that there is no potential safety hazard.

Safety Notices

Operators should understand and follow the current national and local safety regulations, and use the safety instructions in this manual if there are no corresponding regulations.

Most accidents are caused by the user's violation of the regulations on machine operation and maintenance. To avoid accidents, please read, understand and comply with all requirements, precautions and warnings in this manual and machine labels before operation and maintenance.

This manual is not a training manual for lifting platform operators! All operating instructions are for professionals who have received lifting platform relevant training.


Since it is impossible to foresee all possible hazards and accidents, the safety instructions in this manual cannot include all safety precautions, and other existing safety risks must be taken into account in the actual operation. If a procedure or operation not recommended in this manual is used, the operator must carry out a risk assessment and must ensure the safety of himself and others and that no damage is done to the machine. If the safety of some operations is not certain, please contact our company or dealer.


If the content of this manual is inconsistent with the standards or laws and regulations issued by the local government or authorities, please enforce the stricter policy.


The operation and maintenance precautions given in this manual are only applicable to the specified use of this machine. If the machine is used outside the specified purpose, our company will not assume any responsibility, and all responsibilities shall be borne by the user and the operator.

In any instance, the prohibited operations in the manual can not be carried out.

The following markers are used to identify safety information in this manual:

 **DANGER** - Indicating any dangers that, if not avoided, will cause serious injury or even death, and also serious machine damage.

 **WARNING** - Indicating any dangers that, if not avoided, may cause injury, serious injury or even death, and also serious machine damage.

 **CAUTION** - Indicating dangers that, if not avoided, may cause minor or moderate injury, and also machine damage or shortened machine service life.

Chapter 1 Maintenance


1.1 Observing the Regulations

- 1) You are properly trained and qualified to operate and maintain the machine safely.
- 2) All safety regulations in this manual, workplace safety regulations and applicable government laws and regulations must be read, understood and complied.
- 3) Equipped with PPE, such as helmet, seat belt, safety shoes, goggles, protective clothing, insulating gloves, insulating shoes, etc., and in good physical condition.
- 4) When maintenance and repair procedures are being performed, many dangers indicated in the Operation Manual will also become potential safety hazards.
- 5) Scheduled maintenance and repair can only be completed by trained and qualified maintenance technician.
- 6) Dispose of waste materials in accordance with government regulations and workplace regulations.
- 7) Only parts and consumables approved by the LGMG can be used.
- 8) Always perform functional tests after maintenance.

1.2 Inspection Manual

It's necessary for safe equipment operation to keep operation manual and maintenance manual in good condition. An illegible or missing manual will not provide the necessary safety and operational information for the safe operation.

- 1) Make sure that the operation manual and maintenance manual are complete in the file box.
- 2) Check each page of the inspection manual to ensure that it is legible and in good condition.
- 3) Put the manual into the file box after use.


 **CAUTION: If the manual needs to be replaced, please contact the LGMG service personnel.**

1.3 Check Labels and Decals

It is necessary for safe operation of equipment to keep all safety and description labels and decals in good condition. The label warns the operator and staff of many possible hazards during use of this equipment. It also provides the user with operation and maintenance information. The illegible label cannot warn the staff of steps or dangers, which may also lead to unsafe operation.

Refer to the label section of this operation manual to check whether all label are where they shall be.

Check the clarity and damage of all label and immediately replace any damaged or illegible label.

 **CAUTION: If you need to replace the label, please contact the LGMG service personnel.**

1.4 Every day or Every 8 Hours

1.4.1 Check for Damaged and Loose or Missing Part

Perform this step every 8 hours or every day.

Daily equipment status checks will be necessary for safe equipment operation and good equipment performance. Incorrect positioning and repair damage, and loose or missing parts may lead to unsafe operating conditions.

- 1) Check the damage of the whole equipment and incorrect installation or loss of parts, including:
 - Electrical components, wiring and cable
 - Hydraulic hose, joint, valve block, hydraulic

cylinder

- Hydraulic tank
- Boom cable carriers and sliders
- Tires and hubs
- Limit switches, horns
- Nuts, bolts and other fasteners
- Indicator lamps and alarms
- Drive shafts

Check the entire machine to find:

- Cracks in weld or structural parts
- Whether the chassis is deformed or open weld
- Dent or damage to the machine
- Ensure that all structural parts and other key components are complete and all relevant fastener and pin are in the correct position and tightened

Scheduled maintenance

In extremely cold, dusty or humid working environment, more frequent lubrication and maintenance than specified in "scheduled maintenance" is required. During maintenance, the maintenance items listed in the original requirements shall be repeated.

For example, when proceeding the maintenance item for 500 working hours, the maintenance items listed for every 250 working hours and every 100 working hours shall be carried out at the same time.

1.4.2 Check the Hydraulic Oil Level and Hydraulic Oil Leaks

Check the hydraulic oil level every 8 hours or every day.

 **CAUTION: Perform this step**

when the arm rod is in the stowed position.

- Park the telescopic boom lift on a flat ground. The arm rod shall retract to the stowed position.

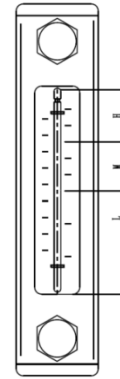


Figure 1-1 Hydraulic oil dipstick

- Check the oil dipstick on the hydraulic oil tank. The liquid level shall be within the M range as shown in Figure 1-1. If the liquid level is lower than M, the hydraulic oil shall be filled. Select the hydraulic oil grade according to the temperature.

Grade	Brand
Rando MV32	Chevron

 **CAUTION: Do not top off with**

incompatible hydraulic fluids. Hydraulic fluids may be incompatible due to the differences in base additive chemistry. When incompatible fluids are mixed, insoluble materials may form and deposit in the hydraulic system, plugging hydraulic lines, filters, control valves and may result in component damage.

Check for hydraulic oil leaks every 8 hours or every day.

 **CAUTION: Danger of personal**

injury: Spilled hydraulic oil can penetrate and burn the skin, Goggles and protective gloves must be worn.

- The leakage of high-pressure oil may not

be visible to eyes. Cardboard or wood chip shall be used as a tool to check for hydraulic oil leakage. It is forbidden to confirm it by hand. Check oil droplets or oil residues on the following components:

- Hydraulic tank, filter, pump, hydraulic cylinder, motor, reducer, valve block, hydraulic pipe
- Check oil droplets or oil residues in the following areas:
- Rear of arm rod, fly jib, upper of rotary table, upper and lower of drive chassis, ground area under equipment

1.5 Every 100 Hours

1.5.1 Slewing Bearing and Slewing Gear Lubrication

Fill the slewing bearing and slewing gear with grease every 100 hours. Regular lubrication of slewing bearings is necessary to maintain good equipment performance and service life. Incorrect lubrication can lead to component damage.

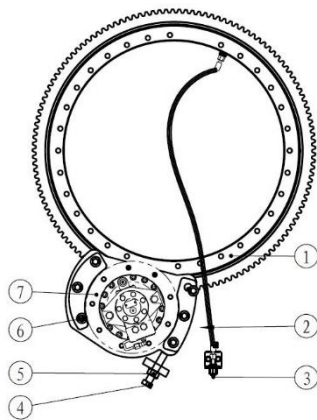


Figure 1-2 Slewing mechanism

1. Slewing bearing 2. Oil pipe
 3. Grease nipple 4. Adjusting bolt
 5. Lock nut 6. Fixing bolt
 7. Slewing reducer
- As shown in Fig. 1-2, find the grease filler 3 next to the slewing reducer, connect the greaser, and rotate the rotary table several times while filling grease until the grease

overflows from the upper and lower fixing surfaces of the slewing bearing. Grease grade: lithium base grease 2#.

- Check the lubrication of slewing bearing gear and slewing reducer gears, clean the gear surface if necessary, and apply the grease again.

⚠ CAUTION: If there is too much

dust in the working environment, increase the frequency of filling grease.

1.6 Every 250 Hours

1.6.1 Check the Air filter of Hydraulic Tank

This check is performed every 250 hours or quarterly, whichever comes first.

A hydraulic tank cap with smooth ventilation is essential for achieving good mechanical performance and service life. Dirty or clogged vent caps may lead to poor performance of the machine. Inspection shall be carried out frequently in the harsh working environment.

- ① Remove the vent cap from the hydraulic tank cover.
- ② Ventilation check.

Result: air can pass through the vent cap.

Result: if the air cannot pass through the vent cap, clean or replace the vent cap. Continue with Step 3.

Note: when checking the ventilation of the fuel tank cap, the air shall be able to pass freely.

- ③ Clean the tank vent cap carefully with a mild solvent and dry it with low pressure compressed air. Repeat step 2.
- ④ Install the hydraulic tank vent cap.

1.6.2 Check the Battery

Check the battery once every 250 hours or every quarter, whichever comes first.

! DANGER: Explosion hazard!

Danger of electric shock! Burn danger!

When operating, keep away from fireworks and remove all rings, watches and other accessories. Wear goggles, protective gloves and protective clothing if necessary. Avoid touching the spilled electrolyte with hands or other parts of the body, and neutralize spilled electrolyte with baking soda.

Good battery condition is critical to machine performance and safe operation. Unsuitable voltage or damaged cable and wiring may cause damage to components and create dangerous conditions.

Check maintenance-free lead-acid battery:

- Check whether the battery lock lever is stable.
- Check the wiring of the battery cable, which shall be secure and uncorrosive.
- Check whether the electrolyte is leaking and whether the battery is dry and clean.

Check electric eye status every three months (maintenance-free lead-acid battery)

As shown in Figure 1-3, check the battery hydrometer color:



Hydrometer

Figure 1-3 Battery Hydrometer

Color of electric eye	Meaning and processing method
White	Insufficient electrolyte. Please shut down the machine and stop using it.
Black	Under voltage or damage

Green	<p>Measure the voltage of each battery. If the voltage is lower than 11 V, it indicates that the battery is damaged (open circuit or short circuit);</p> <p>The voltage is between 12.4 V-12.7 V, indicating that the battery is in good condition</p>
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Table 1-1 Color and description of battery hydrometer

- If the battery hydrometer color is green and the voltage is above 12V, but it cannot work normally, please ask the trained maintenance personnel who have obtained the corresponding qualifications to further test the battery.
- This machine supports the DC-DC power supply function, where the lithium battery pack automatically detects and supplements the lead-acid battery voltage. When the lead-acid battery voltage is low, power replenishment is started.

! NOTE: When the lithium battery

soc is lower than 10%, or the lithium battery level 1 fault alarm is triggered, stop the power replenishment.

1.6.3 Check the Tire and Nut Torque

This inspection is carried out every 250 hours or every quarter, whichever comes first.

Maintaining the tire and hub in good condition is essential for the safe operation and good performance. Failure of tire and hub may cause the machine to roll over. If not find the failure and repair it in time, it will also cause damage to the machine parts.

Filled tire and solid tire do not need inflation.

- 1) Check the tire tread and sides for scratches, cracks, piercing and other abnormal wear.
- 2) Check the hub for damage, bending and

cracking.

Check tire nut torque

Type	Torque
T20JE/T22JE/T26JE/T28JE	600±60N.m

1.6.4 Check the Clearance between the Slewing Bearing and the Slewing Reducer

Measured every 250 hours or quarterly, whichever comes first.

The rotary table shall rotate smoothly without jam and pause. Measure the backlash between slewing bearing gear and slewing reducer with feeler gauge. The backlash shall be between 0.2-0.3mm. If it is out of the range, please adjust it.

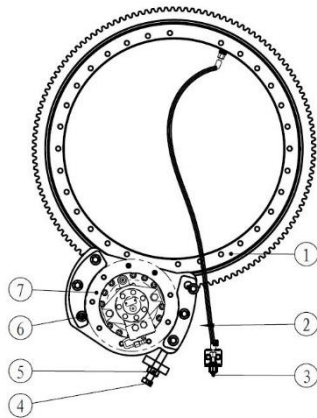


Figure 1-4 slewing mechanism

1. Slewing bearing
 2. Oil pipe
 3. Grease nipple
 4. Adjusting bolt
 5. Lock nut
 6. Fixing bolt
 7. Slewing reducer
- Loosening fixing bolt 6 and lock nut 5
 - Turn adjusting bolt 4 to adjust reducer position
 - Measure slewing bearing gear and slewing reducer gear backlash with feeler gauge
 - If the clearance is between 0.2-0.3 mm, tighten lock nut 5 and tighten fixing bolt 6
 - Measure the backlash between slewing

bearing gear and slewing reducer gear again to verify that requirements are met.

- Tighten the fixing bolt 6, torque: 595±55N•m.

1.6.5 Visual Inspection of Hydraulic Oil

This inspection is carried out every 250 hours or every quarter, whichever comes first.

Collect a hydraulic oil sample and place it in a transparent container. The operation of the visual inspection of hydraulic oil is as follows:

- Color: the oil color should be transparent and light honey.
- Appearance: the oil should be clear and not cloudy, and the viewing angle should not be visibly distorted when viewing through the sight glass or container. Without particles, foreign matter or other contaminants.
- The hydraulic oil can be checked by smell (the smell of "hot" can be smelled, but not "burnt" smell) or friction between fingers (It should be sticky without any graininess).

If all the hydraulic oil passes the above inspection, continue maintenance at predetermined intervals. If the hydraulic oil fails in any of the above checks, the hydraulic oil must be tested.

1.6.6 Check the Oil Level of the Drive Axle Main Reducer and Close-to-wheel Reducer

This inspection is carried out every 250 hours or every quarter, whichever comes first.

CAUTION: The vehicle must be parked on a level, solid ground before operation. Place a cushion block under the tire to prevent the machine from moving.

CAUTION: To drain or fill oil and check the oil level, the drive axle must

be level and installed on the vehicle.

Check main reducer oil level

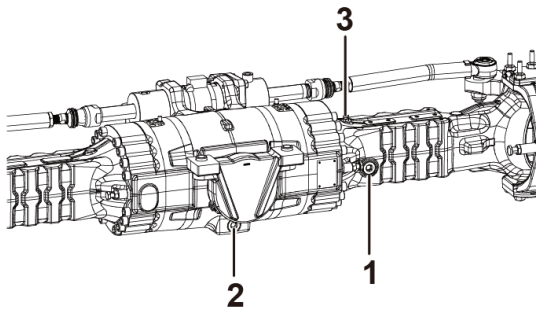


Figure 1-5

1. Filler port/sight port
2. Drain port
3. Breather

- Carefully clean breather 3 and the surrounding area.
- Remove plug 1 and check if the oil level is at the lower edge of the filler port, otherwise add oil.
- Tighten the plug.
- Act on each main reducer in the same way.

Check close-to-wheel reducer oil

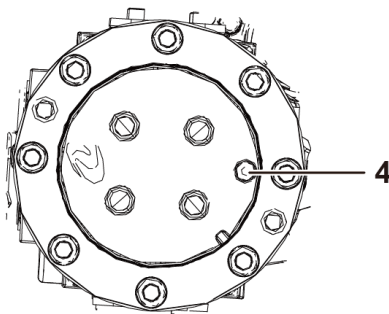


Figure 1-6

4. Filler port/sight port/drain port

- Turn the wheel so that the plug 4 is in the highest position, and partially loosen it to release the pressure that may exist.
- Turn the wheel so that the plug 4 is in a horizontal position, remove the plug to

check whether the oil level is at the lower edge of the filler port, otherwise add oil and tighten the plug.

- Work on each close-to-wheel reducer in the same way.

1.6.7 Check the Transfer Case Oil Level

This inspection is carried out every 250 hours or every quarter, whichever comes first.

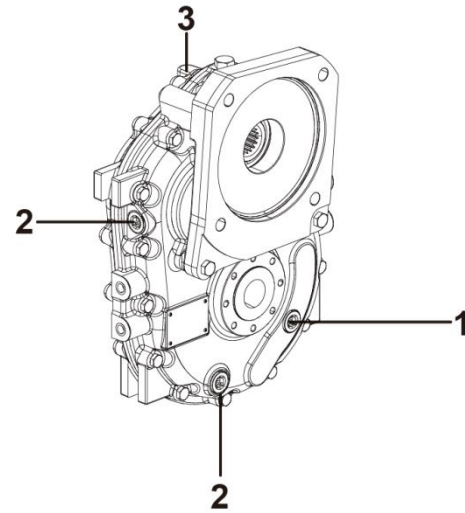


Figure 1-7

1. Filler port/sight port
2. Drain port
3. Breather

- Carefully clean breather 3 and the surrounding area.
- Remove plug 1 and check if the oil level is at the lower edge of the filler port, otherwise add oil.
- Tighten the plug.

1.6.8 Check the Oil Level of the Slewing Reducer

This inspection is carried out every 250 hours or every quarter, whichever comes first.

Improper oil level in the reducer will reduce the performance of the equipment, and continuous use will lead to component damage.

- 1) Slewing reducer oil level inspection

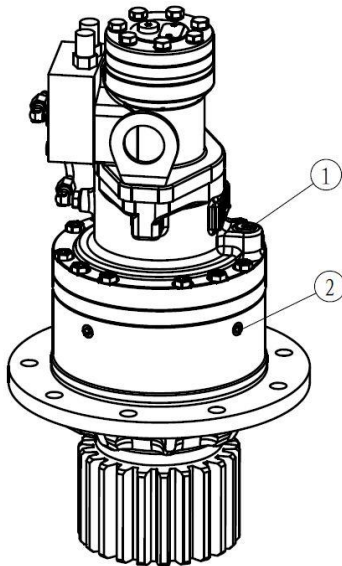


Figure 1-8 Slewing reducer

1. Filler port 2. Sight port

- Remove the plug 2 on the reducer side and check the oil level, as shown in Figure 1-8.

Result: the oil level should be the same as sight port 2 height.

- When it is needed, please add gear oil through filler port 1 until the oil level is the same as the bottom height of sight port 2.
- Apply pipe thread sealant to the plug and install the plug into the reducer.

The gear oil recommended is as the following table

Item	Condition	Grade
Gear oil	30°C < Minimum temperature	85W/140
	-10°C < Minimum temperature < 30°C	85W/90
	-30°C < Minimum temperature < -10°C	80W/90
	Minimum temperature < -30°C	75W

1.6.9 Check the Wires

This check should be performed every 250 h or quarterly, whichever comes first.

It is important for safe operation and good machine performance to keep the wires in good

conditions. Failure to find and replace the burn-out, scratched, corroded or bent wires will result in unsafe operating conditions and damage to the parts.

Risk of electric shock/explosion

Contact with live circuits may cause serious injury or death. Do not wear rings, watches or other jewelry.

Please wear insulating gloves, insulating shoes, etc., and in good physical condition.

- 1) Check the following areas for burn-out, scratched, corroded, bent or loose wires:

- Motor wiring harness
- All wire harness connectors to ground control box
- All wire harness connectors to platform control box
- Hydraulic manifold wiring
- Battery harness
- Cables on the primary, secondary and jib booms

- 2) Check whether all wire harness connectors are coated with insulating grease:

- Ground control unit
- Platform control unit
- Harness connectors
- Sensor

1.6.10 Check the Electrical Contactor

This inspection is carried out every 250 hours or every quarter, whichever comes first.

Maintaining the electrical contactor in good condition is essential for the safe operation of the machine. Failure to detect worn or damaged contactors in time may endanger the safety of working conditions and cause component damage.

- 1) Open the battery side cover.
- 2) Visually inspect the contact points of the

contactors from the following aspects:

- Transition burning
- Transition bending
- Transition pitting

! WARNING: Danger of motor

burning. Contact with electrical circuits may cause death or serious physical injury. Remove all rings, watches and other accessories.

! NOTE: If any damage is found,

the contactor needs to be replaced.

1.6.11 Wire Rope Inspection

This inspection is carried out every 250 hours or every quarter, whichever comes first.

After the equipment works for a long time, the telescopic wire rope will extend, which will cause problems such as the 2nd boom section failing to extend and retract into place, the wire rope falling out of the pulley, the 2nd boom section jittering during extension and retraction, and the wire rope whipping or rubbing with the arm rod inner wall during extension and retraction. Therefore, the condition of the wire rope should be checked regularly.

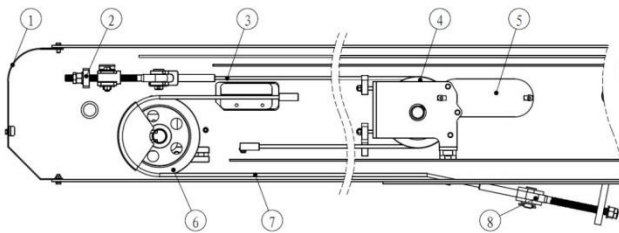


Fig. 1-9 Assembly Diagram of Telescopic System

1. Arm rod rear enclosure plate
2. Extension wire rope counterweight
3. Extension wire rope
4. Extension pulley block
5. Second boom section side enclosure plate

6. Retraction pulley block
7. Retraction wire rope
8. Retraction wire rope counterweight

- 1) Luff the arm rod to a horizontal position, extend and retract the arm rod, and check whether the 1st and 2nd boom sections start to operate at the same time during arm rod extension and retraction. If the 2nd boom section lags behind the 1st section arm, the wire rope is loose.
- 2) Luff the arm rod to a horizontal position, extend and retract the arm rod, and check whether the 2nd boom section jitters or whether there is a sound of wire rope whipping on the inner wall of the arm rod during expansion and retraction. If the above phenomenon exists, the wire rope is loose.
- 3) As shown in Fig. 1-9, open the arm rod rear enclosure plate 1, check whether the extension wire rope counterweight 2 is skewed to one side, and check whether the retraction wire rope counterweight 8 is skewed to one side. If there is skewing, the wire rope is loose.
- 4) Luff the arm rod to the horizontal position, fully extend the arm rod, and open the rear enclosure plate 1 of the arm rod and the side enclosure plate 5 of the 1st boom section. Visually inspect the working state and wear of extension pulley block 4, retraction pulley block 6, extension wire rope 3, and retraction wire rope 7. The pulley shall be fixed firmly without shaking, the uneven wear of the pulley groove shall be less than 3 mm, and the wear of the rim shall be less than 10% of the original wall thickness. The wire rope is free from looseness, broken wires and serious rust. There is no obvious swing of the pulley during extension and retraction. If any abnormality is found, please stop using it immediately and hang the fault sign.

Replacement of the Wire Rope

It is required that this procedure should be performed each 7000 hours or 12 years, whichever comes first.

More frequent inspection or replacement (if

necessary) is required when:

- The machine is operated in harsh environment;
- The boom involves seizure or unusual noise during operation;
- The machine is out of service for a long time;
- The boom is overloaded or subject to continuous impact load;
- The boom is exposed to electric arc, by which the strands in the rope may be fused together.

Regular replacement of wire rope is essential for machine to maintain good performance and safe operation.

Please refer to the **Service manual** for steps for replacement of boom extend and retract cables: *How to replace the wire rope.*

1.7 Every 500 Hours

1.7.1 Replace Hydraulic Filter

Replace return filter

Replace the hydraulic return filter and high pressure filter element every 500 hours or half a year, whichever comes first.

The replacement of the hydraulic filter is necessary to maintain good machine performance and longevity. Dirty or clogged filters may cause performance degradation of hydraulic components, and continuous use may result in component damage. Extreme operating conditions require increased filter replacement times.

Park the vehicle on a solid level ground. Lower the arm rod so that the vehicle is in the stowed position.

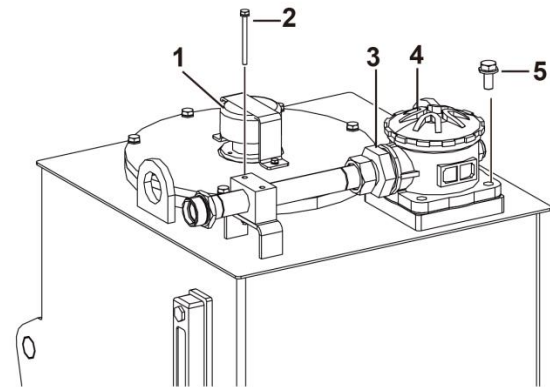


Figure 1-10

No.	Name
1	Air filter
2	Bolt
3	Joint
4	Return filter
5	Bolt

- ① Disconnect the connection between main return pipe and return filter.
- ② Remove the plug on the return filter.
- ③ Disconnect the connection between the return filter and the hydraulic tank.
- ④ Remove the old filter and install the new filter.
- ⑤ Install the main return pipe and plug.
- ⑥ Use the marker pen to note the replacement date on the Filter Replacement Record.
- ⑦ Use GCU to operate any arm rod function.
- ⑧ Check filter components for oil leakage.

Replace high pressure filter

 **Danger of personal injury. Be**

careful with hot oil, and contact with hot oil can cause severe burns.



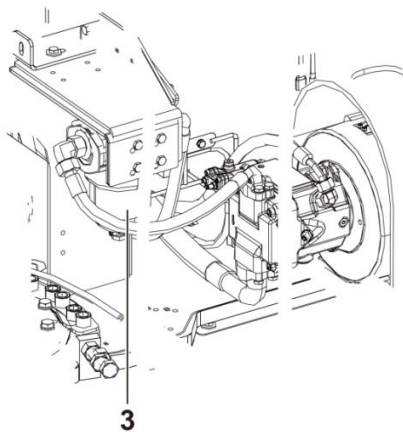
If the working environment is

dusty, increase the number of times to perform this step.

Replace the hydraulic return filter and high pressure filter element every 500 hours or half a year, whichever comes first.

Replacing the high pressure filter element is essential for the good performance and service life of the machine. Dirty or blocked filter may affect the performance of the machine, and continuous use will lead to part damage. Filter element should be replaced more frequently in harsh working environment.

Park the vehicle on a solid level ground. Lower the arm rod so that the vehicle is in the stowed position.



3.High pressure filter

Figure 1-11

- 1) Place a suitable container under the filter.
- 2) Remove the nut at the bottom of the filter cover with the wrench and remove the filter cover.
- 3) Remove the filter element from the filter cover.
- 4) Check the seal of the filter cover and replace it if necessary.
- 5) Install new high pressure filter element and tighten it.
- 6) Scrub off any oil droplets splashed during

installation.

- 7) Use the marker pen to note the replacement date on the Filter Replacement Record.
- 8) Use GCU to operate any arm rod function.

Check filter components for oil leakage.

1.7.2 Platform Weighing Structure Lubrication

This operation is performed every 500 hours or every six months, whichever comes first. Shorten the maintenance interval in harsh working environments.

Regular lubrication of the platform weighing structure is necessary to maintain good equipment performance and safe operation. Incorrect lubrication will lead to component damage.

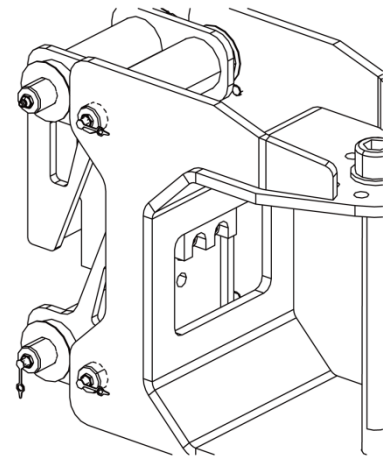


Figure 1-13

Locate the pin grease nipple at the triangle bracket assembly.

Fill grease until grease spills on both sides of the triangle bracket assembly. (Lithium base grease 2#)

Wipe off spilled grease.

1.7.3 Inspection of Fixing Bolts and Adjusting Bolts of Slewing Reducer

This inspection shall be performed every 500h or every 6 months, whichever comes first.

An appropriate tightening of fasteners is essential for the safe operation of the machine, and if any fastener is loose, machine damage or other safety hazards may be caused.

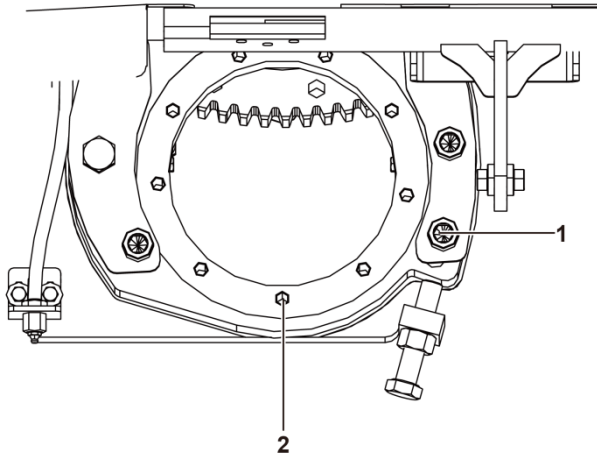


Figure 1-14

Tightening torque of bolt 1: $595 \pm 55 \text{ N.m}$

Tightening torque of bolt 2: $190 \pm 19 \text{ N.m}$

1.8 Every 1000 Hours

1.8.1 Replacement of Hydraulic Tank Air Filter

Replace the hydraulic tank air filter every 1000 hours or every year, whichever comes first.

Park the machine on a level ground.

Remove the old air filter and replace it with a new air filter.

1.8.2 Check Arm Rod Wear-resistant Slider

Check the fixing and wearing of the wear-resistant slider once every 1000 hours or every year, whichever comes first.

- 1) The slider is located on the surface and inner wall of the arm rod housing to reduce friction and keep the arm rod slider in good condition, which is necessary for safe machine operation. Improper padding or continuous use of extremely worn wear gaskets could lead to component damage and unsafe operating conditions.

- 2) Extend the arm rod to check whether the slider is loose. If the slider is loose, please tighten the fixing bolt. Check the clearance between the slider and the arm rod. If the clearance between the slider and the arm rod is greater than 1 mm, increase the gasket to obtain zero clearance and zero resistance, and replace the slider if necessary. As for the part number of the slider gasket, please refer to the Parts Catalog and select the slider gasket according to the actual situation. After adding gaskets, extend and retract the arm rod several times to eliminate potential dead points.

1.8.3 Change Drive Axle Reducer Oil and Gear box Oil

First 500 hours or one year, whichever comes first, thereafter every 1000 hours.

Change drive axle main reducer oil

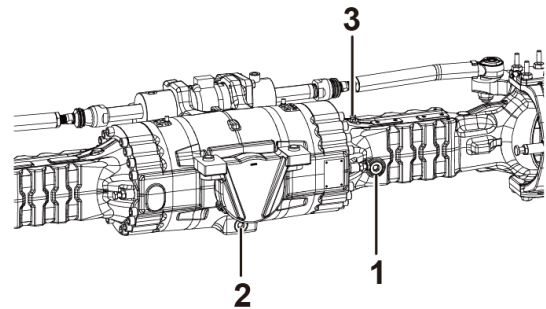


Figure 1-15

1. Filler port/sight port
2. Drain port
3. Breather

1. Place a suitable container under the plug 2, first remove the plug 1, and then remove the drain plug 2. Drain all oil. Install and tighten drain plug 2.
2. Fill the specified oil for drive axle to the lower edge of plug 1. Wait for 5 minutes before checking the oil level, and fill the oil to the specified position if necessary. Install and tighten filler plug 1.
3. Act on each main reducer in the same way.

Change the oil of close-to-wheel reducer of drive axle

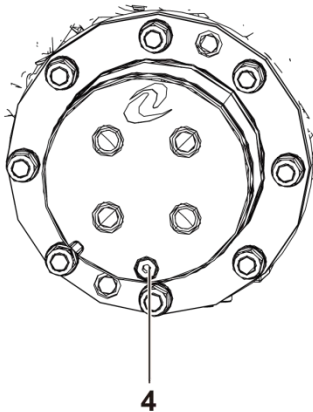


Figure 1-16

1. Turn the wheel so that the plug 4 is in the highest position and partially unscrew the plug to release the possible pressure.
2. Rotate the wheel so that the drain plug 4 is in the lowest position and place a suitable container underneath. Remove the screw plug and drain oil.

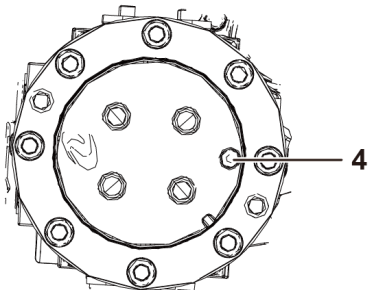


Figure 1-17

3. Turn the wheel so that the plug 4 is in the horizontal position. Fill the lower edge of the filler port with the specified oil.
4. Tighten the plug.
5. Work on each close-to-wheel reducer in the same way.

Change gear box oil

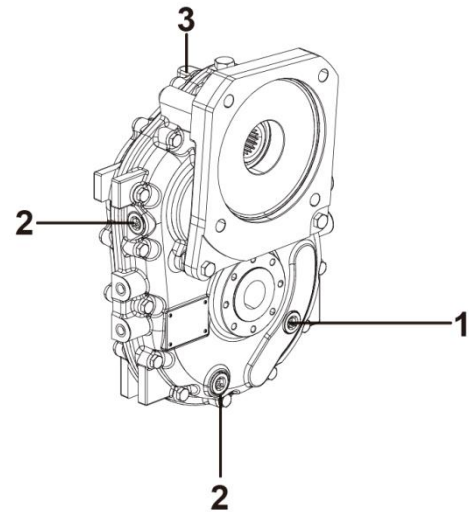


Figure 1-18

1. Filler port/sight port

2. Drain port

3. Breather

- Place a suitable container under the transfer box.
- Remove the plug 1、2 and drain oil.
- Tighten the plug 2, and fill the lower edge of the filler port 1 with the specified oil.
- Carefully clean breather 3 and the surrounding area.
- Tighten the plug 1.

1.9 Every 2000 Hours

1.9.1 Test or Change of Hydraulic Oil

The hydraulic oil is tested or changed every 2000 hours or every two years, whichever comes first.

Specification

Grade	Brand
Rando MV32	Chevron

⚠ CAUTION: If the hydraulic oil is not changed during the two-year test, it shall be tested quarterly and changed

when it fails the test.

! CAUTION: The hydraulic suction

filter should be replaced when the hydraulic oil is changed.

Replace hydraulic oil and suction filter

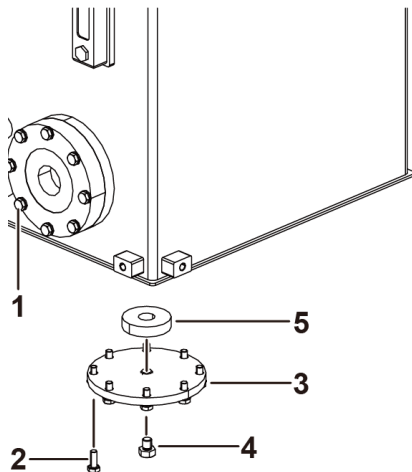


Figure 1-19

No.	Name	Torque
1	Suction flange bolt	28±3N.m
2	Drain flange bolt	28±3N.m
3	Drain flange	-
4	Screw plug	-
5	Ring magnet	-

Park the vehicle on a level ground so that the vehicle is in the stowed position.

- 1) Close the ball valve located on the hydraulic tank (if equipped with ball valve).

! Risk of component damage. Do

not use the machine when the ball valve of the hydraulic tank is closed, otherwise it will cause damage to the components. If the ball valve is closed, take the key from the Ignition switch and hang the warning sign on the

device.

! WARNING: Danger of physical

injury. The sprayed hydraulic oil may penetrate and burn the skin. Slowly loosen the hydraulic connectors to gradually reduce the oil pressure. Do not spray or splash oil.

- 2) Remove the drain plug from the hydraulic tank.
- 3) Completely drain the hydraulic oil from the hydraulic tank into a suitable container. To speed up the oil drain, remove the tank vent cap.
- 4) Remove the suction filter from the hydraulic tank.
- 5) Flush the inside of the hydraulic tank with a mild solvent. (Clean one side with a chemical cleaner first. After drying, rinse with clean hydraulic oil, and then drain the cleaning oil.)
- 6) Clean foreign matter adsorbed by the ring magnet.
- 7) Install a new suction filter.
- 8) Install the drain plug.
- 9) Add the hydraulic oil into the hydraulic tank until the liquid level is at the specified position of the sight gauge, and it is strictly prohibited to overflow.
- 10) Scrub off hydraulic oil that may be splashed out.
- 11) Open the ball valve on the hydraulic tank.

! Danger of component damage.

make sure to open the hydraulic tank ball valve and fill the pump with oil after installing the hydraulic tank.

! CAUTION: When installing drain

plug and filter, be sure to apply pipe thread sealant.

- 12) Check the function of all machines and check for oil leakage through one full cycle.
- 13) After a working cycle, recheck the tank level and add oil to the specified position.

1.10 Scheduled Maintenance

- 1) Quarterly, annual and biannual maintenance items must be performed by personnel who have been trained in the maintenance of this machine and have obtained corresponding qualifications.
- 2) Machines that have been idle for more than three months must be checked and maintained quarterly before they can be put into use again.

1.11 Maintenance Point

1.11.1 Routine Inspection and Maintenance Intervals

Maintenance level	Routine inspection	Level 1 maintenance	100h	Level 2 maintenance	Level 3 maintenance	Level 4 maintenance	Level 5 maintenance
Maintenance interval	Every day	50h	100h	250h	500h	1000h	2000h

1.11.2 Maintenance and Inspection Schedule

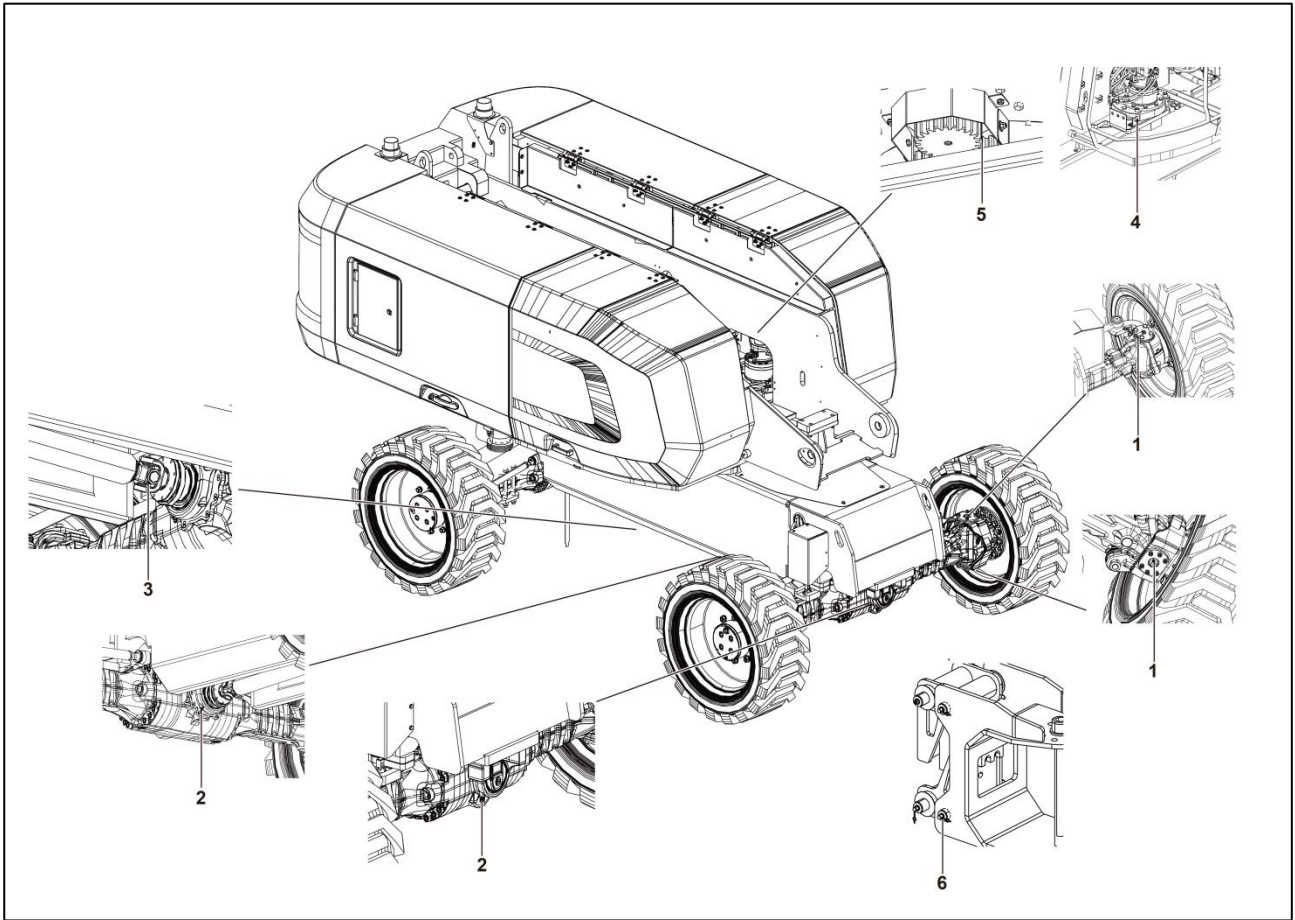
System	Operation content	Maintenance level							Remarks
		Routine inspection	Level 1 maintenance	100h maintenance	Level 2 maintenance	Level 3 maintenance	Level 4 maintenance	Level 5 maintenance	
Powertrain	Check the fixing of the battery terminals and apply grease to the electrodes (if necessary)				•	•	•	•	
	Re-tighten the drive shaft bolt			•	•	•	•	•	
	Check the connection and wear of the drive shaft			•	•	•	•	•	
	Universal joint lubrication			•	•	•	•	•	
	Check the oil level of the main reducer and the close-to-wheel reducer				•	•	•	•	
	Change the lubricating oil of the main reducer (at least once a year)	First 500h or one year, whichever comes first, thereafter every 1000h							
	Change close-to-wheel reducer lubricating oil (at least once a year)	First 500h or one year, whichever comes first, thereafter every 1000h							
	Check fixing of wheel nut				•	•	•	•	
	Check transfer case oil level				•	•	•	•	
	Change transfer case lubricating oil (at least once a year)	First 500h or one year, whichever comes first, thereafter every 1000h							
Electrical system	Check whether the battery is under-voltage.	Every day							
	Check whether the buttons on the PCU	Every day							

	panel are in normal operation.								
	Check if the PCU harness connector is in firm connection.	Every day							
	Check if the PCU harness connector is contaminated and damaged.	Every day							
	Check if the PCU wire harness is extruded or broken.	Every day							
	Check whether the wiring of angle sensor and proximity switch, angle sensor and cable-actuated sensor, tilt sensor and length & angle sensor are firm	Every day							
	Check the position of the broken rope detection limit switch and rotary table slewing limit switch rocker arm and if they are wired loosely	Every day							
	Check whether the buttons of ground control panel are operated normally.	Every day							
	Check whether the warning lamp and horn function are normal	Every day							
	Check whether the wiring of each solenoid valve coil of the main valve block is normal or loose	Every day							
	Load cell calibration				•	•	•	•	
	Check electrical contactor				•	•	•	•	
	Whether the battery terminal is loose or rusted	Every day							
Hydraulic system	Check whether the system pressure is normal			•	•	•	•	•	
	Check whether the steering system pressure is normal			•	•	•	•	•	
	Whether the oil pipes	Every day							

	and joints are loose							
	Check cylinder for oil leakage	Every day						
	Check each spool for oil leakage	Every day						
	Check if the ball valve at the suction port at the bottom of the hydraulic tank is open	Every day						
	Check whether the walking oil pipe fixing clip is loose	Every day						
	Check the oil level of hydraulic tank	Every day						Add hydraulic oil Rando MV32 when oil level is below "M" position
	Visual inspection of hydraulic oil	Check quarterly						
	Change hydraulic oil	Every 2000 h or every two years, whichever comes first						Hydraulic oil Rando MV32
	Replace suction filter	Every 2000 h or every two years, whichever comes first						Replace when replacing hydraulic oil
	Check hydraulic tank air filter			•	•	•	•	
	Replace air filter					•	•	
	Check reducer for oil leakage	Every day						
	Check motor for oil leakage	Every day						
	Check slewing reducer oil level and fill oil			•	•	•	•	
	Replace return filter element and high pressure filter element				•	•	•	
Complete machine	Check whether the attached documents are complete, easy to read, and in the file box.	Every day						
	Check whether the safety sign is correct and not defaced	Every day						

	Whether the bolts, nuts and other fasteners of the whole machine are loose and make abnormal noise	Every day							
	Check whether the structural parts of the whole machine have cracks and whether the weld is open weld	Every day							
	Check whether the paint of the whole vehicle falls off and whether there is serious rust, corrosion or oxidation	Every day							
	Whether the wire rope is loose				•	•	•	•	
	Whether the sliding block is loose and whether there is zero clearance with the arm rod						•	•	
	Measure the backlash between the slewing bearing gear and the slewing reducer gear				•	•	•	•	0.2-0.3m m
	Replace the wire rope	7000h or 12 years, whichever comes first.							
	Check the turntable rotation bearing bolts	Every 1000 h or every year, whichever comes first						Torque:T20J E/T22JE:595 ±55N.m;T26J E/T28JE380± 40N.m	
Lubri catio n	Slewing bearing lubrication			•	•	•	•	•	Lithium base grease 2#
	Lubrication of slewing bearing and slewing reducer gear			•	•	•	•	•	Lithium base grease 2#
	Tire steering lubrication			•	•	•	•	•	
	Front and rear axle slewing lubrication			•	•	•	•	•	
	Drive shaft lubrication			•	•	•	•	•	
	Platform weighing structure lubrication					•	•	•	

1.11.3 Machine Lubrication



No.	Location	Qty.
1	The lubricating point for tire steering	8
2	The slewing lubrication points of the front and rear axles	4
3	The lubricating point of the drive shaft	6
4	The lubricating point for slewing bearing	1
5	Slewing bearing and slewing gear contact surface	1
6	Platform weighing structure lubrication	4

1.12 Introduction to Thermal Management Strategy of Lithium-ion Battery

1.12.1 Introduction

The working principle of lithium-ion battery is that, the battery electrolyte produces a potential difference between the positive and negative electrodes through the change of chemical reaction to generate current. The electrolyte moves quite slowly in a low temperature environment, which will affect the transfer activity of lithium ions between the positive and negative electrodes, and thereafter result in a decrease in the battery charging/discharging performance.

Factors restricting the low temperature performance of lithium-ion battery are as follows:

- The lithium-ion battery electrolyte incurs viscosity increase and may even solidify partially in a low temperature environment, resulting in a decrease in the conductivity of the lithium-ion battery.
- The compatibility between the electrolyte, the negative electrode and the diaphragm is degraded in a low temperature environment.
- The precipitation of lithium ions at the negative electrode will become serious in a low temperature environment, and the precipitated metal lithium will react with the

electrolyte and produce deposits, causing an increase in the thickness of the solid electrolyte interface (SEI).

- The diffusion of lithium ions in the active material will decrease systematically and the charge transfer resistance (R_{ct}) will increase significantly in a low temperature environment.

When the temperature is low, the activity of the electrolyte will be such decreased that the transmission of lithium ions will be affected (i.e., the charging and discharging ability of the battery will be affected), and the battery capacity will be reduced. Generally speaking, the allowed working temperature of lithium-ion battery is $-20\text{--}60^{\circ}\text{C}$, and if the battery is used in a temperature out of this range, its performance will degrade substantially.

1.12.2 Thermal Management Strategy

Working temperature: $-30^{\circ}\text{C--}60^{\circ}\text{C}$

Storage temperature: $-30^{\circ}\text{C--}60^{\circ}\text{C}$

1.12.2.1 Introduction of Heating Strategy

The running state of the vehicle will be detected, and if charging is required, the charging & heating mode will be activated; or the driving & heating mode will be activated if the vehicle is in driving (discharging) state.

1.12.2.2 Charging & Heating Mode

1. In case of T_{\min} (minimum cell temperature) $\leq -30^{\circ}\text{C}$, the heating & charging mode will

- be disabled, and a low temperature fault will be reported.
2. In case of $T_{min} \geq 16\text{ }^{\circ}\text{C}$, the charging will be started directly.
 3. In case of $-30 < T_{min} < 16\text{ }^{\circ}\text{C}$, the heating film will be turned on for heating. In case of $T_{min} < 2\text{ }^{\circ}\text{C}$, heating-only mode will be activated, and in case of $T_{min} \geq 2\text{ }^{\circ}\text{C}$, charging & heating mode will be activated. When T_{min} stays $\geq 18\text{ }^{\circ}\text{C}$ for 1min, the heating function will be turned off, and the charging-only mode will be activated.
 4. When T_{min} drops below $0\text{ }^{\circ}\text{C}$, the heating-only mode will be activated again, and when T_{min} becomes $\geq 2\text{ }^{\circ}\text{C}$ after heating, the charging & heating mode will be activated.

1.12.2.3 Driving (Discharging) & Heating

Mode

1. When T_{min} stays within $-30\text{ }^{\circ}\text{C} \sim 2\text{ }^{\circ}\text{C}$ for 10s during driving (discharging), the heating will be activated, and will be turned off when T_{min} stays $\geq 7\text{ }^{\circ}\text{C}$ for 1min.
2. Requirement in the process of driving (discharging) & heating: when the battery SOC drops below 25%, the discharging & heating mode will be disabled.

1.12.2.4 Exception Handling and Warning

1. If T_{max} (maximum cell temperature) stays $\geq 40\text{ }^{\circ}\text{C}$ for 10s in the process of charging & heating, a high cell temperature warning will be activated, the heating will be stopped, and the charging mode will be activated.
2. If T_{max} (maximum cell temperature) stays $\geq 40\text{ }^{\circ}\text{C}$ for 10s in the process of driving & heating, a high cell temperature warning will be activated, and the heating will be stopped.
3. When the temperature rise is too slow, a heating fault will be determined and reported, and the heating will be stopped.
4. Requirement in the process of driving (discharging) & heating: when the battery SOC drops below 25%, the discharging & heating mode will be disabled.

Parameter description:

- Maximum cell temperature: T_{max}
- Minimum cell temperature: T_{min}
- Initial cell temperature: $T_{initial}$
- Total system heating time: $t(\text{min})$

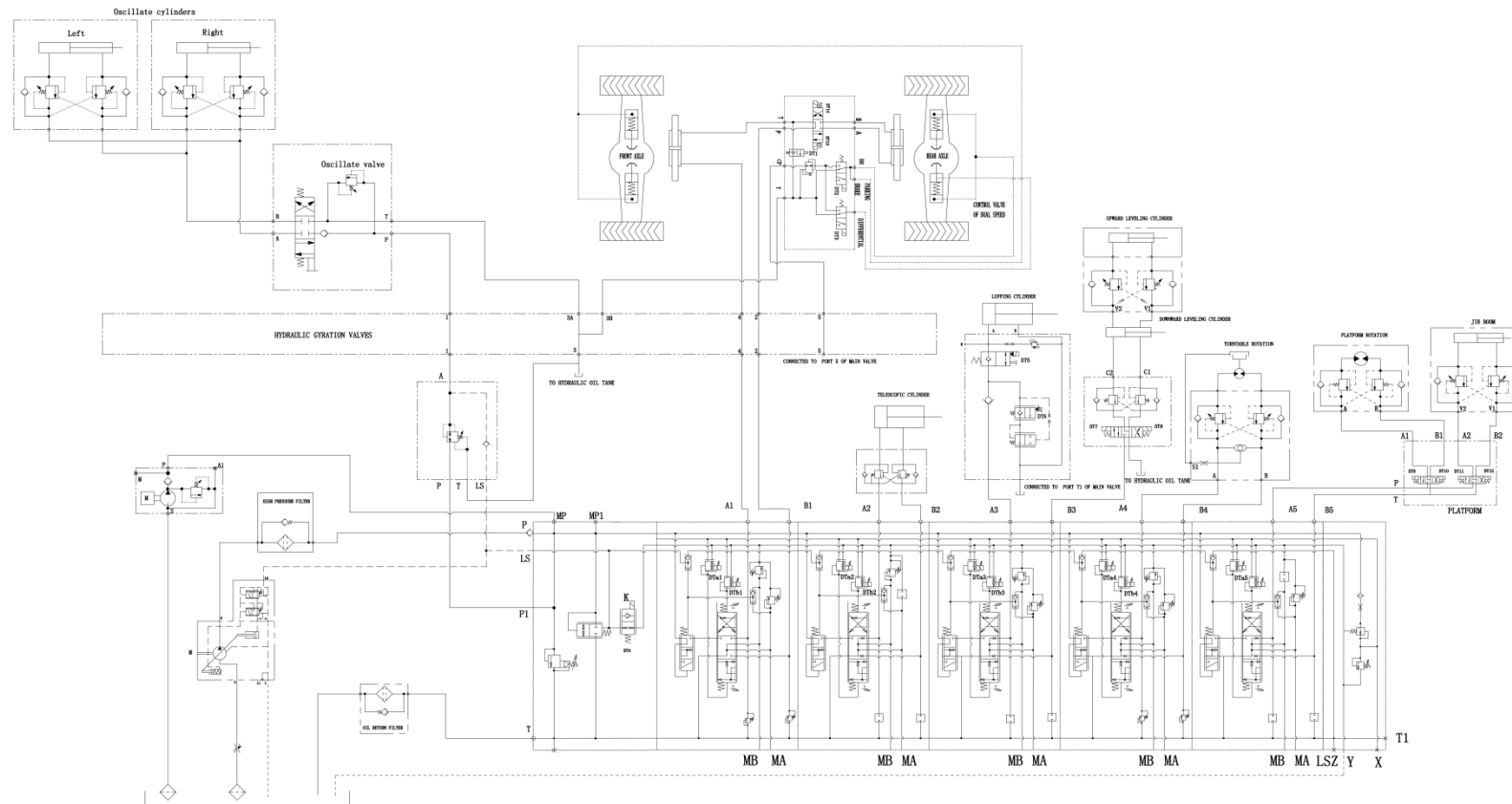
NOTE:

1. Start condition: The main control starts the heating test after detecting a 24V high level signal that lasts for 5s.

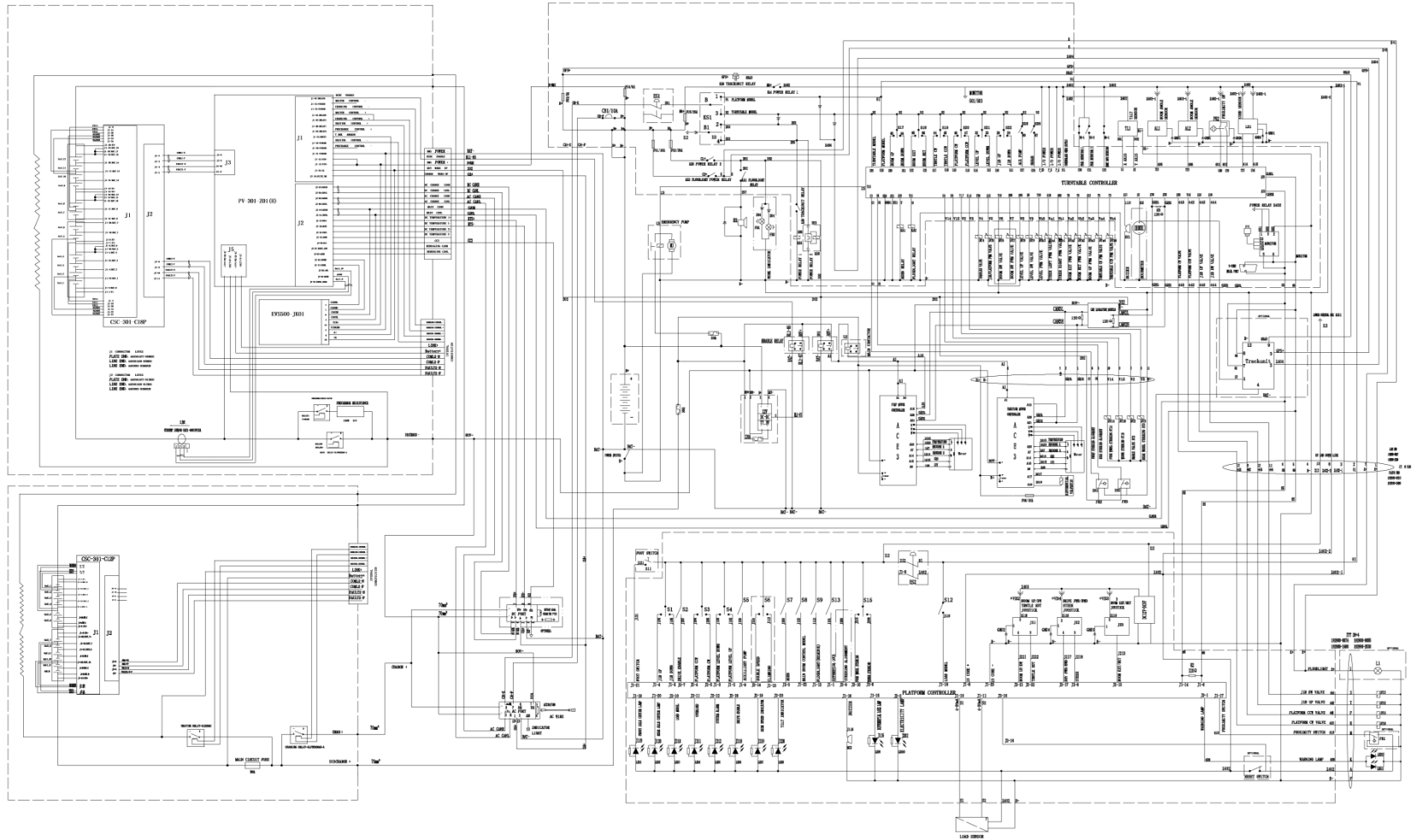
2. T_{initial} is the minimum cell temperature at the initial stage of heating, and in case of $t=0$, $T_{\text{initial}} = T_{\text{min}}$.
3. If T_{max} is $\geq 45^{\circ}\text{C}$ during the preparation for heating test, the heating test will be stopped, the heating function test will be disabled, and a high initial temperature warning will be reported.
4. If T_{max} is $>50^{\circ}\text{C}$ during the heating test, the test will be stopped, the heating relay will be disconnected, and a heating fault will be reported.
5. When t is > 15 min and in any battery pack, $(T_{\text{min}} - T_{\text{initial}})$ is $< 2^{\circ}\text{C}$, the test will be stopped, and a heating function fault will be reported.
6. If for all battery packs, $(T_{\text{min}} - T_{\text{initial}})$ is $< 2^{\circ}\text{C}$ during the heating test, the test will be stopped, and a message for normal heating function will be reported.
7. If no enable signal is detected after bms power-on, but the condition for starting low temperature heating is met, the heating process will be interrupted forcibly and the heating test process will be started when the enable signal is detected during the heating process; if low temperature heating is not started after bms power-on, the heating test process will be started when the enable signal is detected.
8. The thermal management strategy threshold of the battery pack depends on its brand and model.

Chapter 2 Schematic Diagram

T20JE/T22JE/T26JE/T28JE Hydraulic schematic diagram



T20JE/T22JE Electrical schematic diagram (Trackunit)



T26JE/T28JE Electrical schematic diagram

