

# **LT20JE MOBILE ELEVATING WORK PLATFORM**

## **OPERATION AND MAINTENANCE MANUAL**



# Important Safety Information

Most accidents involving product operation, maintenance and repair are caused by failure to observe safety rules or precautions. An accident can often be avoided by recognizing potentially hazardous situations before an accident occurs. A person must be alert to potential hazards. This person should also have the necessary training, skills and tools to perform these functions properly.

Improper operation, lubrication, maintenance or repair on this product can be dangerous and could result in injury or death.

Do not operate or perform any lubrication, maintenance or repair on this product, until you have read and understood the operation, lubrication, maintain and repair information.

Safety precautions and warnings are provided in this manual and on the product. If these hazard warnings are not heeded, bodily injury or death could occur to you or other persons.

The hazards are identified by the "Safety Alert Symbol" and followed by a "Signal Word" such as "WARNING" as shown following.

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## **WARNING**

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The meaning of this safety alert symbol is as follows:

Attention. Be alert. Your safety is involved.

The message that appears under the warning, explaining the hazard, can be either written or pictorially presented.

Operations that may cause product damage are identified by NOTICE labels on the product and in this publication.

LiuGong cannot anticipate every possible circumstance that might involve a potential hazard. The warnings in this publication and on the product are therefore not all inclusive. If a tool, procedure, work method or operating technique not specifically recommended by LiuGong is used, you must satisfy yourself that it is safe for you and others. You should also ensure that the product will not be damaged or made unsafe by the operation, lubrication, maintenance or require procedures you choose.

The information, specification, and illustrations in this publication are on the basis of information available at the time when it was written. The specification, torques, pressures, measurements, adjustments, illustrations, and other items can change at any time. These changes can affect the service given to the product. Obtain the complete and most current information before starting any job. LiuGong has the most current information available.

### **CALIFORNIA PROPOSITION 65**

Diesel engine exhaust and some of its constituents are known to the state of California to cause cancer, birth defects and other reproductive harm.

Battery post, terminal and related accessories contain lead and lead compounds, Always wash hands after handling.

This product is designed according to ANSI A92.20-2021 and CSA 354.6-17.



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## Foreword

This manual includes important instructions concerning the operation, lubrication, maintenance, inspection and commissioning of the machine, and is a permanent integral part of the machine.

This manual should be stored in a safe and clean place that is convenient for operators to read and use. The manual should be kept intact and should not be separated from the machine even when the latter is resold or leased.

Please read the manual carefully and follow all instructions for proper operation and maintenance of this machine to avoid possible personal injury or damage to the machine. The operator should proficiently and correctly operate the machine to ensure safety.

Use this machine only for the purpose described in this manual. Contact your LiuGong dealer for approval before making any modifications or adding attachments to the machine. Guangxi LiuGong accepts no liability for any damage resulting from the use of unapproved attachments or working practices.

LiuGong provides a full warranty for users who operate and maintain the machine in accordance with the instructions in this manual. If the machine is misused or intentionally used to perform operations other than those specified by the manufacturer, the warranty will become invalid and requests for field maintenance may be rejected. Only personnel with training or operational experience are allowed to operate the machine, and only professionals are allowed to inspect or maintain the machine.

Record the type and serial number of the machine, and the serial number of all main components correctly for reference when ordering them or they are stolen. Record the correct number in the operation manual and in a safe place outside the machine.

## Safety

Basic safety precautions are listed in "Safety Information",. The text for warning symbols and signs are also indicated, along with their locations.

Please read and understand the basic precautions listed in "Safety Information", before operating the machine or performing lubrication, maintenance, or repairs on it.

## Operation

This chapter includes information on instruments, control devices operating on aerial work platform, transportation, and towing, which can be referred to by new operators, reviewed by experienced operators, and shall be kept besides them for continuous reading and learning.

The correct steps for checking, starting, operating and stopping the machine are graphically described to guide the operator.

The operating techniques listed in this manual are basic. The operator's skills and techniques will develop as his or her understanding of the machine and its capabilities grows.

## Maintenance

The maintenance section describes the instructions for the protection of the machine. The step-by-step illustrations are classified on the basis of maintenance period. Items without specific maintenance period are listed under "Others." For the items with "Scheduled Maintenance", refer to subsequent detailed instructions.

Parts of the same model and specification from the original manufacturer shall be used for maintenance. Otherwise, LiuGong will bear no legal responsibility for any consequences caused by the use of parts not approved.

## **Maintenance Period**

The maintenance cycle is determined based on a working time table which can be replaced by a calendar (day, week and month) if it is more convenient to make a maintenance plan and is similar to the working time table. The maintenance suggested shall always be conducted at the time when any one of these two periods is due first.

In extremely harsh, dusty, or humid working environments, more frequent maintenance and lubrication than that described in "Maintenance Interval Schedule" is required.


Repeat the maintenance items listed in the original requirements during maintenance. For example, in the process of performing the maintenance required for every 500 working hours, the maintenance specified for every 250 working hours, every 50 working hours and every 10 working hours or every day should be performed simultaneously.

All the information, figures, tables, and specifications in this manual are the latest product data available at the time of publication. Guangxi LiuGong reserves the right to make changes without notice.



## Safety Precautions

### Safety Warning Symbols

 Safety warning symbols can be found on machines operating on the aerial work platform, safety signs, manuals and anywhere else concerning important safety information. When you see this symbol, you should follow the indications in the safety message and be alert to the possibility of personal injury or death.

#### Do not operate unless:

1. You have mastered the safety operation rules in this operation manual
  - Understand all safety rules before proceeding with the next step in order to avoid danger.
  - Perform inspection before operation all the time.
  - Carry out functional test before use all the time.
  - Check the workplace.
  - Use the machine only according to its design intent.
2. You have read, understood and observed the manufacturer's instructions and safety rules, safety and operation manuals and decals on the machine.
3. You have read, understood and observed the users' safety rules and work site regulations.
4. You have read, understood and observed applicable government regulations.
5. You have received proper training on safe operation of the machine.

## Safety Signs

The words "Danger", "Warning" and "Caution" found on the aerial work platform are defined as follows:

 **DANGER**

Danger: This term indicates an immediate hazard that, if not avoided, will result in death or serious personal injury.

 **WARNING**

Warning: This term indicates a potential hazard that, if not avoided, will result in death or serious personal injury.

 **CAUTION**

Caution: This term indicates a potential hazard that, if not avoided, will result in minor or moderate personal injury.

"Caution", is also used to alert you to safety concerns regarding unsafe practices that may result in personal injury. "Danger" indicates the most severe safety hazards. The safety signs "Danger" or "Warning" are placed near particularly dangerous places. General notice information is included under the safety sign "Caution".

### Maintenance of Safety Signs

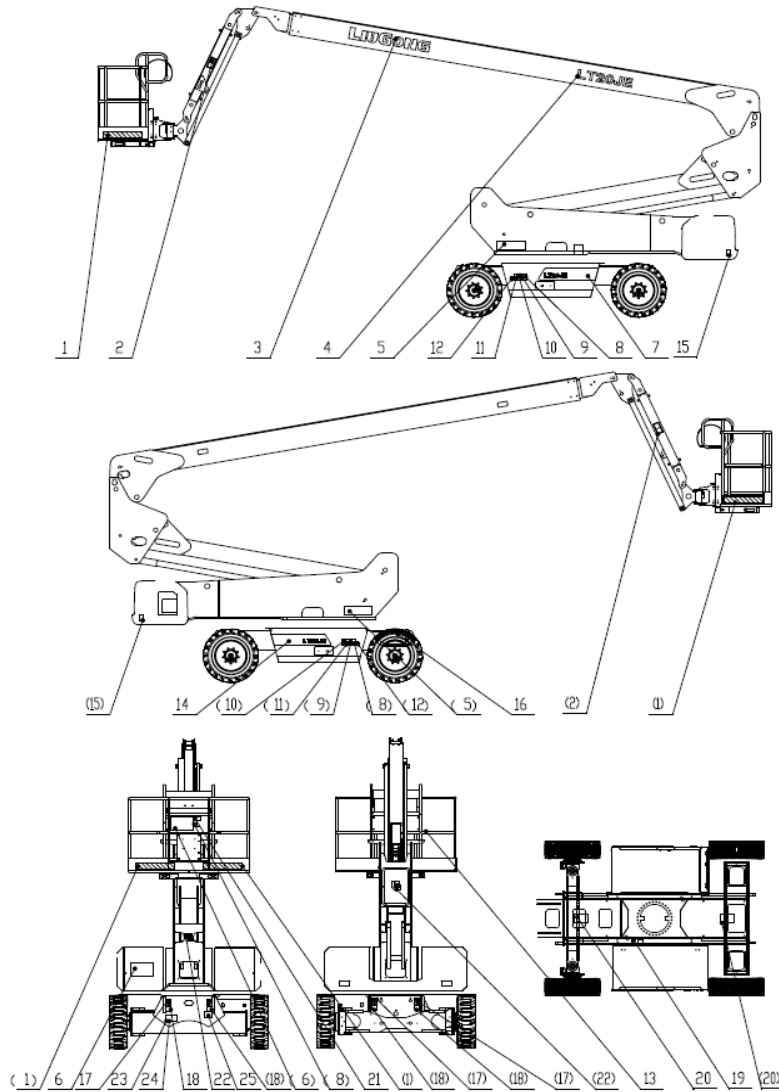
Replace any lost or damaged safety signs to keep safety in the mind of operators at all times.

Clean the safety signs with neutral soap and clean water.

Do not use solvent-based detergents since they may damage the materials of safety signs.

## Description of Decals and Symbols

### Location Plan of LT20JE Decals



- |                     |                      |                   |                                   |
|---------------------|----------------------|-------------------|-----------------------------------|
| 1. Reflective decal | 8. Warning decal     | 15. Warning decal | 22. Decorative decal              |
| 2. Warning decal    | 9. Hazard decal      | 16. Symbol decal  | 23. Rivet                         |
| 3. Decorative decal | 10. Warning decal    | 17. Symbol decal  | 24. Nameplate of Complete Machine |
| 4. Decorative decal | 11. Warning decal    | 18. Symbol decal  | 25. Combined decal                |
| 5. Decorative decal | 12. Warning decal    | 19. Warning decal |                                   |
| 6. Combined decal   | 13. Symbol decal     | 20. Symbol        |                                   |
| 7. Decorative decal | 14. Decorative decal | 21. Symbol        |                                   |

Table 1-1 Description of LT20JE Decals and Symbols



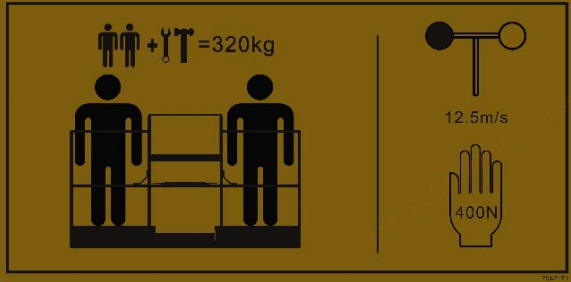

S/N	Material No.	Identification	Description of identification
2	74A5150		Keep a safe distance from the machine
6	16G1443		The decal assembly includes: 79A7171 instruction decal 79A8023 warning decal 16G1351 warning decal 79A8034 warning decal 79A8011 warning decal LT20JE performance curve
6-1	79A7171		Work platform load limit sign: load capacity: personnel ( 2 ) + tools 320 kg; Wind speed 12.5 m/s; Operating force 400N.
6-2	79A8023		No hanging load decal

Table 1-1 Description of LT20JE Decals and Symbols

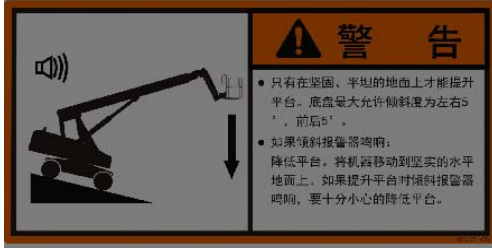

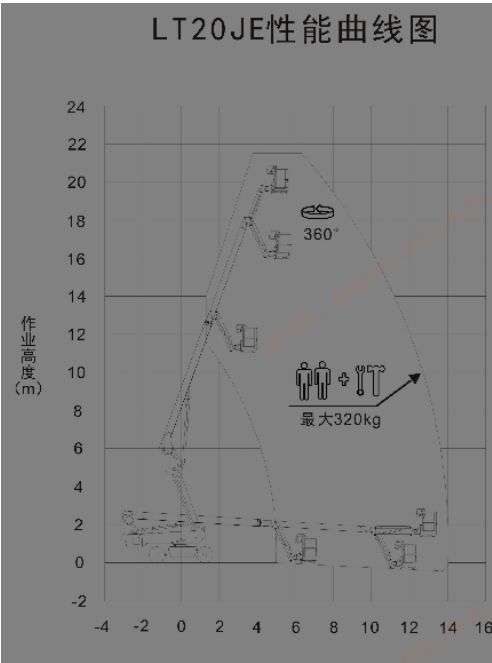
S/N	Material No.	Identification	Description of identification														
6-3	16G1351	 <p>警告</p> <ul style="list-style-type: none"> <li>只有在坚固、平坦的地面上才能提升平台。底盘最大允许倾角为左右5°，前后5°。</li> <li>如果倾斜报警器鸣响：降低平台。将机器移动到坚实的水平地面上。如果提升平台时倾斜报警器鸣响，要十分小心的降低平台。</li> </ul>	Tilt warning decal														
6-4	79A8034	 <p>警告</p> <ul style="list-style-type: none"> <li>未经过授权禁止操作机器。</li> <li>未经过授权操作，会导致严重的事故或者意外的伤害。</li> <li>操作机器前请仔细阅读操作说明书，并获得操作此机器的授权。</li> </ul>	Machine operation instruction														
6-5	79A8011	 <p>警告</p> <ul style="list-style-type: none"> <li>与电缆相触会造成严重事故或死伤。</li> <li>遵循下面指示，保持机器任何部件与电缆的距离。</li> </ul> <table border="1"> <thead> <tr> <th>电压 (V)</th> <th>安全距离</th> </tr> </thead> <tbody> <tr> <td>50k 以内</td> <td>3.0m</td> </tr> <tr> <td>50k -200k</td> <td>4.6m</td> </tr> <tr> <td>200k-350k</td> <td>6.1m</td> </tr> <tr> <td>350k-500k</td> <td>7.6m</td> </tr> <tr> <td>500k-750k</td> <td>10.6m</td> </tr> <tr> <td>750K 以上</td> <td>13.7m</td> </tr> </tbody> </table>	电压 (V)	安全距离	50k 以内	3.0m	50k -200k	4.6m	200k-350k	6.1m	350k-500k	7.6m	500k-750k	10.6m	750K 以上	13.7m	Warning decal
电压 (V)	安全距离																
50k 以内	3.0m																
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500k-750k	10.6m																
750K 以上	13.7m																
6-6		 <p>LT20JE性能曲线图</p> <p>作业高度 (m)</p> <p>360°</p> <p>最大320kg</p>	LT20JE performance curve														

Table 1-1 Description of LT20JE Decals and Symbols





S/N	Material No.	Identification	Description of identification
8	74A3080		<p>Read and understand the operation manual, responsibility manual and safety manual, as well as all safety signs before using or maintaining the machine.</p>
9	74A3241		<p>Description of battery explosion hazard</p>
10	16G1444		<p>It is forbidden to open the hatch to prevent damage when the turntable is not in the middle position or there are foreign matters above the hatch.</p>
11	74A3345		<p>"No stepping" warning decal</p>

Table 1-1 Description of LT20JE Decals and Symbols

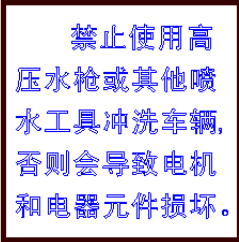
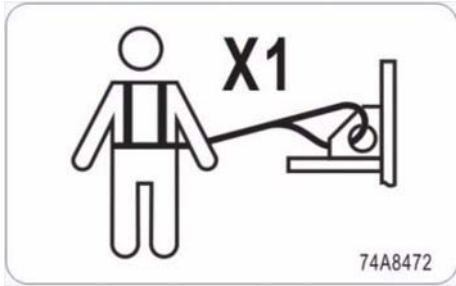
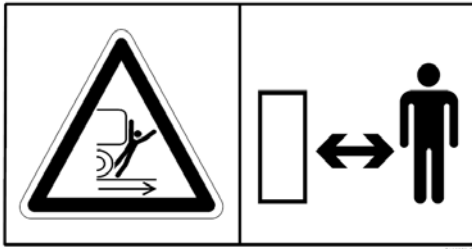




S/N	Material No.	Identification	Description of identification
12	74A2221	 <p>禁止使用高压水枪或其他喷水工具冲洗车辆, 否则会导致电机和电器元件损坏。</p>	Do not wash the vehicle with a high-pressure water gun or other water spraying tools to prevent damaging the motor and electrical components.
13	74A8472		Lanyard fixing point
15	74A3259		Keep a safe distance from the machine
16	16G1445		Wheel load

Table 1-1 Description of LT20JE Decals and Symbols

S/N	Material No.	Identification	Description of identification
19	79A8024		Precautions for operation of turntable lock pin
24	00G6485		Nameplate of complete machine
25	79A7403		The decal assembly includes: 74A3345 warning decal 79A7927 warning decal 79A5799 warning decal

## General Safety Precautions

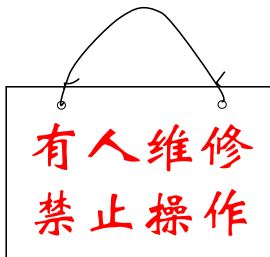
Please read these safety precautions carefully. Failure to do so could lead to severe injury or death.

Only trained and qualified personnel can operate and maintain the machine.

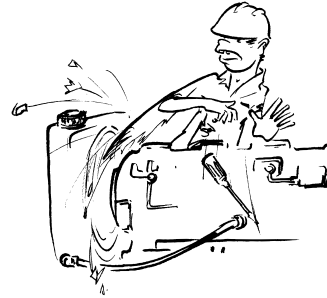


Do not operate the aerial work platform if you are ill, drowsy, taking medication, or after drinking alcohol. Operating the machine under these conditions can cause poor judgment and may lead to accidents.

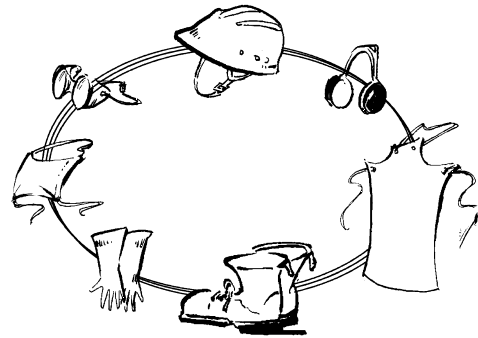
Hang a "Do Not Operate" or similar warning label on the workbench guardrail or in other conspicuous position before maintaining and repairing the aerial work platform.



Do not wear loose-fitting clothing, jewelry, or have unsecured long hair. They may get caught in control systems or moving parts, causing severe injury or death.



Use personal fall protection equipment (PFPE) when operating or maintaining the machine. Personnel on the platform must wear protective articles such as safety belts and safety helmets that comply with regulations, and tie the lanyard to the anchor of the platform.



Users must comply with user rules, workplace rules and government rules regarding the use of personal protective articles.

All PFPEs must comply with applicable government regulations and must be checked and used according to instructions of the PFPE manufacturer.



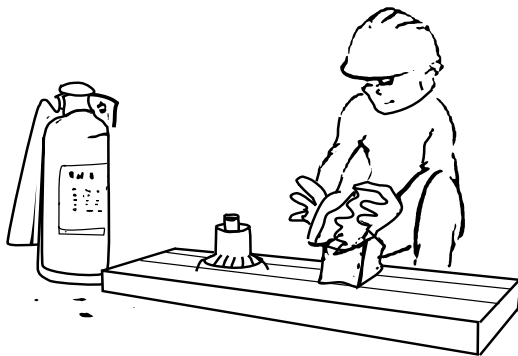
The machine can only be used to lift personnel, tools and materials to the high-altitude workplace. It is prohibited to modify the aerial work platform without LiuGong's permission, and LiuGong is not responsible for any consequences of such modifications. If the platform must be modified to meet use requirements, please contact the Company and obtain permission.

Make sure that all protective plates and cover plates on the machine are fixed on the aerial work platform firmly. Make sure that the passage and escalator of the aerial work platform are free of debris, oil stains, tools and sundries unrelated to the platform.

Understand the hand signals of the factory and their source and receive signals from only one person.

Follow relevant laws and regulations when handling hazardous substances such as lubricating oil, solvents and batteries.

Be careful when using detergent. Do not use inflammable material as the detergent to clean parts, such as diesel or gasoline, which may cause fire.



Promptly report all required repairs.

Unauthorized persons are not allowed on or around the machine.

It is prohibited to modify the machine without LiuGong's authorization, and LiuGong is not responsible for any consequences of such modifications.

## Compressed Air

Compressed air may lead to personal injury. Wear masks, safety clothing and safety shoes when cleaning with compressed air. The maximum pressure of air used for cleaning shall be less than 0.2 MPa.

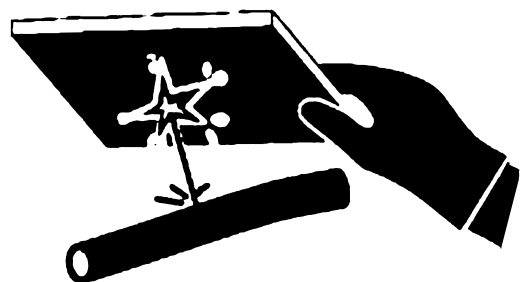
## High-pressure Fluid



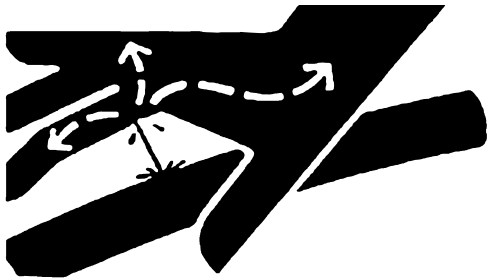
**Prevent from being scalded by high pressure oil. When repairing or replacing the pipes of the hydraulic system, check whether the system pressure has been released. Hydraulic oil under pressure contacting the skin could cause serious injury to skin.**

Take care when disassembling hydraulic pipes or joints. When the oil spouts, the released high-pressure oil may lead to the continuous movement of the hoses.

Please wear safety goggles and leather gloves when checking for leakages. Do not check the leakage with bare hands, but with plate or paper plate.



Even a leakage of pressure fluid with the size of a pinhole can penetrate the muscle, causing injury or death. If you are hit by the spouted high-pressure oil, immediately contact a doctor for treatment.



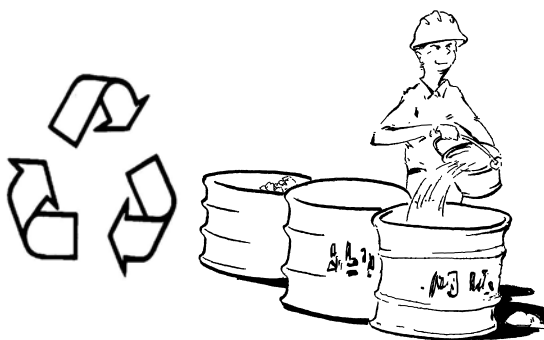
### Safe Disposal of Waste Liquids

Improper disposal of waste liquids can cause harm to the environment. The disposal shall follow local laws and regulations.

The liquid spilled from the aerial work platform during inspection, maintenance, test, adjustment and repair must be collected in containers.

Proper container shall be prepared well before opening any fluid cavity or disassembling the parts containing liquid.

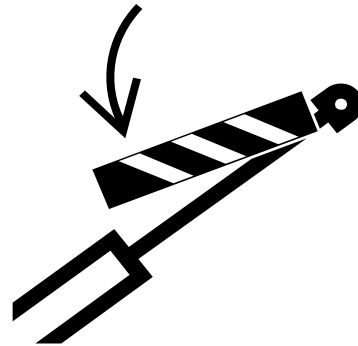
Use proper container when draining liquid. Never use food or beverage containers, as this might lead to someone consuming the liquid by accident.



### Prevention of Extrusion or Cutting

Do not place hands, arms or any other part of the body between movable parts, such as the components between the boom and oil cylinder, and between the machine and the working device.

Support the equipment properly when working under the machine. Prevent the control mechanism from moving or the hydraulic pipeline from leaking, which may cause the aerial cage boom or aerial work platform to fall.



Please keep normal judgment and make a plan when operating the machine with controller on the ground. Keep a safe distance between the operator, the machine and fixed objects.

### Pipelines, Hard Pipes and Hoses

Do not bend or hammer on high-pressure lines. Do not install abnormally bent or damaged hard pipes or hoses on the aerial work platform.

Repair any loose or damaged hard pipes and hoses of the hydraulic system in time. Leakage may cause fire. For repair or replacement, please contact the dealer designated by Guangxi LiuGong Machinery Co., Ltd.

If any of the following problems are found, replacement is necessary.

- Fittings are damaged or leaking.
- The hose outer sheath is worn or cut and the reinforcing wires are exposed.
- The hose has localized swelling.
- The hose is obviously twisted or flattened.

- The reinforcement steel of the hose is embedded into the outer layer.
- The end fittings are displaced.

## Battery Safety

### Burn Hazard

Wear protective clothing and goggles when maintaining ordinary batteries because they contain acidic substances.

Avoid spillage or contact with acidic substances of the battery.

Wear safety glasses and protective clothing, and remove rings, watches and other accessories when maintaining the battery. Once the electrolyte contacts skin and eyes, please rinse skin immediately with plenty of clear water, with the acidity neutralized by soda or lime, and rinse the eyes with water for 10 罫 15 minutes, and get treatment immediately.



### Explosion Hazard

Battery will produce combustible smoke or gas that may lead to explosion, so it should be kept away from sparks and open flames. Keep sparks, flames and ignited cigarettes away from the battery.

Do not put metal on the battery. Otherwise a short circuit may occur, leading to battery explosion.

Do not use tools that may cause sparks to contact the battery terminals or cable clamps.

When you start a power-deficient machine by using a normal machine with a negative grounding system, you must follow the following procedures for correct operation. Otherwise, it may cause an explosion, resulting in serious personal injury. Do not charge any frozen battery to avoid an explosion.

### Battery Hazard

Always read and follow the suggestions of the battery manufacturer on proper use and maintenance of the battery.

Always wear goggles and protective clothing, and remove rings, watches and other accessories when using the battery.

Make sure that only trained personnel permitted by the workplace may remove batteries from the machine.

Make sure to use the appropriate number of personnel and lifting method before replacing the battery.

Do not use the battery forcibly, or drop the battery when installing and removing it.

Do not short-circuit output of the battery pack directly with wires.

Neutralize the acid (if any) spilled from the battery with water mixed with sodium bicarbonate (baking soda).

Do not store the battery in a damp place or in water.

Check the wires for damage every day and replace any damaged parts before operation.

The addition of terminal protectors and anti-corrosion sealant helps to eliminate corrosion of battery terminals and cables.

**Influence of Wind on Working at Heights**

Do not use the machine only intended for indoor operation for outdoor operations.

Do not use the machine running outdoors to lift the platform when the wind speed is greater than 12.5 m/s (28 mph).

Lower the platform immediately and do not continue to operate the machine if the wind speed exceeds 12.5 m/s after lifting.

Table 1-2 Object Wind Speed

Wind scale	Wind description	Scenic features	Wind speed (m/s)	Wind Speed (mph)
0	Calm	Be motionless, and smoke rises vertically	0 ~ 0.2	0 ~ 0.5
1	Light wind	Smoke direction can indicate the wind direction, but the wind indicator does not move	0.3 ~ 1.5	0.7 ~ 3.4
2	Soft wind	People feel wind on face; leaves make a small sound; the wind indicator moves	1.6 ~ 3.3	3.5 ~ 7.4
3	Slight wind	Leaves and small branches sway continuously and flags are unfolded	3.4 ~ 5.4	7.6 ~ 12
4	Gentle breeze	Dust and papers can be blown off the ground and small branches sway	5.5 ~ 7.9	12.3 ~ 17.7
5	Cool breeze	The whole tree with leaves sway; there are ripples on inland waters	8.0 ~ 10.7	18 ~ 24
6	Strong wind	Large branches sway, it is difficult to hold umbrellas, and electric wires whistle.	10.8 ~ 13.8	24 ~ 30.8
7	High wind/ strong wind	The whole tree shakes, and it is difficult for people to move forward in the wind	13.9 ~ 17.1	31 ~ 38.3
8	Gale	Small branches are broken, and people have great resistance to move forward.	17.2 ~ 20.7	38.4 ~ 46.3
9	Strong gale	The top of the chimney moves and the log cabin is damaged	20.8 ~ 24.4	46.5 ~ 54.6
10	Fierce wind	Trees are uprooted and buildings are destroyed	24.5 ~ 28.4	54.8 ~ 63.5
11	Storm	It is rare on land, and buildings are generally damaged	28.5 ~ 32.5	63.7 ~ 72.7
12	Hurricanes	It is rare on land, and buildings are generally damaged seriously	≥ 32.6	≥ 72.9

## Work Area Safety

Lift the platform only on firm and flat ground.

Do not use the tilt alarm as a level indicator. The tilt alarm is only given when the machine is severely tilted. The platform shall be lowered very carefully if the tilt alarm sounds.

The operating speed of the platform shall not exceed 1 km/h during lifting.

### Risk of Tipping Over

The work platform shall not be overloaded.

The total weight of personnel, tools and materials on the platform shall not exceed the maximum bearing capacity of the platform.

#### Maximum Load of the Platform

Model	Working Load of Platform
LT20JE	320 kg

Lift the work platform only on firm and flat ground.

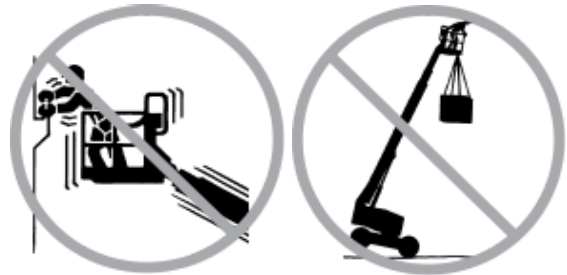


Do not rise the boom if the wind speed may exceed 12.5 m/s (28 mph) when using the platform outdoors. Lower the boom and do not continue to operate the machine if the wind speed exceeds 12.5 m/s (28 mph) after lifting the boom.

#### Maximum Number of Operators and Maximum Allowable Operating Force of the Machine

Model	Maximum Operating Force	Application	Maximum Number of Operators
LT20JE	400 N	Outdoor	2

Do not drive the machine on or near uneven ground or unstable surface or under other dangerous conditions after lifting the platform.



- Do not use the machine as a crane.
- Make sure that the platform complies with local traffic regulations when driving the machine.
- Do not increase the working height with additional equipment (e.g. ladder).
- Access the platform only through the platform door.

- Do not get on or off the work platform when lifting.
- User shall obtain guidance and approval from the manufacturer when the intended use of the platform changes.
- Do not push the machine or other objects with the platform.
- Do not tie the platform to adjacent members.
- Do not place the load outside the platform.
- Do not add load to the platform after lifting.
- Do not operate the machine in strong wind or gust. Do not increase the surface area of the platform or load. Increasing the area exposed to wind will reduce the stability of the machine.
- Be very careful and reduce the speed in the stowed position when the machine is running on uneven ground, the surface with gravel, unstable or smooth surface, close to holes and steep slopes, etc.
- Only transport the tools and materials that are distributed evenly and can be moved by people on the platform safely.
- Do not use the machine on mobile or moving surfaces or vehicles.
- Make sure that all tires are in good condition and the rim nuts are tightened.
- Do not use the platform controller to release the platform when it is caught, stuck, or other nearby objects hinder its normal movement. If it is intended to release the platform with a ground controller, please make sure that all people have left the platform in advance.

## Danger of Working on Slopes

Do not drive on the maximum allowable slope. The maximum slope only applies to the machine in stowed position.

### Maximum Slope

Model	Maximum longitudinal slope	Maximum lateral slope
LT20JE	45%	25%

**If the tilt alarm sounds when the boom is lowered:** Do not extend, rotate or rise the boom above the water level; move the machine to a solid and level ground before lifting the platform.

**If the tilt alarm sounds when the platform is raised:** Be very careful; determine the status of the upper arm on the slope, as shown below; lower the boom as follows before moving the machine to a solid and level ground; do not rotate the boom when lowering.

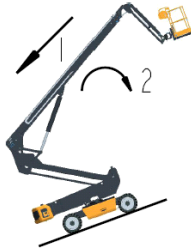
If the tilt alarm sounds when the platform is above the slope:



1. Lower the main boom;
2. Retract the main boom.

If the tilt alarm sounds when the platform is

below the slope:

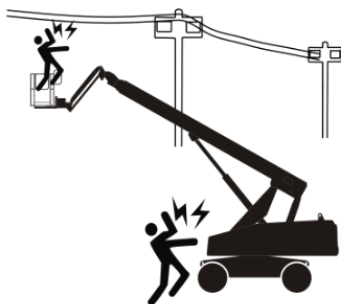


1. Retract the main boom;
2. Lower the main boom.

### Electric Shock Hazard

The machine is not insulated and does not provide protection against electric shock when in contact with or being close to wires.

Keep an adequate safe distance from power lines and electrical equipment according to applicable government laws and regulations and the instructions in the following table.



Keep a distance from power lines and electrical equipment according to applicable government regulations and the parameters in the following table.

Phase-to-phase voltage	Minimum safe distance	Minimum safe distance
0~300 V	Do not touch	Do not touch
300V~50 kV	3.05 m	10 ft
50kV~200 kV	4.6 m	15 ft
200kV~350 kV	6.1 m	20 ft

350kV~500 kV	7.62 m	25 ft
500kV~750 kV	10.67 m	35 ft
750kV~1000 kV	13.72 m	45 ft

The influence of strong wind or gust on platform movement, wire swing and slack shall be considered, and the platform shall be able to withstand strong wind or gust.

Keep away from the machine when it comes into contact with live wires. No people on the ground or platform shall touch or operate the machine before the power supply is cut off.

Do not operate the machine in case of lightning or storm.

Do not use the machine as a ground wire during welding.

### Falling Hazard

Personnel on the platform must wear safety shoes, safety helmets, safety belts, etc., and confirm that the safety belt hooks are fixed at the safety belt tie-down points, with one hook at one point.



Do not sit, stand or climb on the guardrail of the platform. Stand on the platform floor stably at all times.



Do not get off the platform when lifting it.



Beware of the danger of squeezing when grasping the platform guardrail.



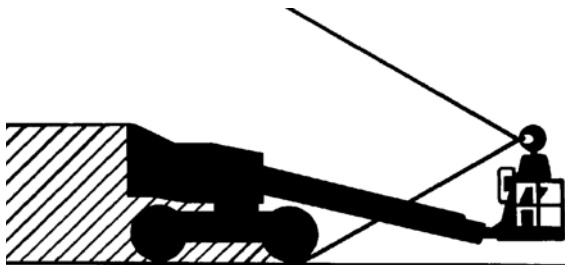
Keep the platform floor free of debris.

Lower the intermediate hurdles at platform entrance or close the entrance door before operation.

Do not enter or exit the platform unless the machine is in the stowed position and the platform is on the ground.

### Collision Risk

Pay attention to the sight range and blind spots when starting or operating the machine.



Pay attention to the boom position and the drift of turntable when rotating the turntable.

Check the work area to avoid obstacles or other possible dangers overhead.



Lower the platform only if there is no people or obstacle under the platform.



Limit travel speed based on ground conditions, degree of congestion, slope, location of personnel, and any other factors that may cause a collision.



Do not operate the boom on any crane route unless the crane controller has been locked or preventative measures have been taken to prevent any potential collision.

Do not drive or play when operating the machine.



## Risk of Physical Injury

Do not operate the machine when hydraulic oil or air leaks. Leaked air or hydraulic oil can penetrate into and/or burn the skin.

Improper contact with components under any cover can cause serious injury. Only trained maintenance personnel can enter the compartment. It is recommended that operators can access only at the time of pre-operation inspection. All compartments must remain closed and secured during operation.

## Explosion and Fire Hazards

Only refuel the machine and charge the battery in an open and well-ventilated place which is kept away from ignition sources such as sparks, flames and burning cigarettes.

Do not operate the machine or charge the battery in hazardous places or places with possible flammable or explosive gases or particles.

## Risk of Damage to Machine

Do not use damaged or faulty machines.

Perform a thorough pre-operation inspection and test all functions of the machine before each shift. Mark the damaged or faulty machine immediately and make it out of service.

Carry out all maintenance according to this manual and LiuGong's Service Manual.

Make sure that all decals are set in appropriate places, clear and legible.

Make sure that the operator's manual, safety manual and responsibility manual are complete, legible and located in the file storage box on the machine.

## Risk of Damage to Components

Connect the wires or cables for welding or grinding only after power off. Carry out operations such as welding and grinding only after connecting wires or cables correctly.

## Lock after Each Use

1. Choose a safe parking position, which can be a solid and level ground, or places free of obstacles and heavy traffic.
2. Retract and lower the boom to the stowed position.
3. Rotate the turntable to locate the boom between non-steering wheels.
4. Turn off the key switch and remove the key to avoid unauthorized use.
5. Turn off the red "Emergency Stop" button and disconnect the main power switch.
6. Chock wheels.

## Change of Product Purpose

The machine can only be used to lift personnel, tools and materials to the workplace. Changes are generally not allowed to the product purpose. If changes are necessary for use, please contact the manufacturer and obtain permission.

Any changes that may affect the stability, strength or performance must be approved by the manufacturer.

## Replacement of Service Parts

Please purchase the original parts of LiuGong in order to ensure the product performance and quality when the equipment needs to be replaced for maintenance.

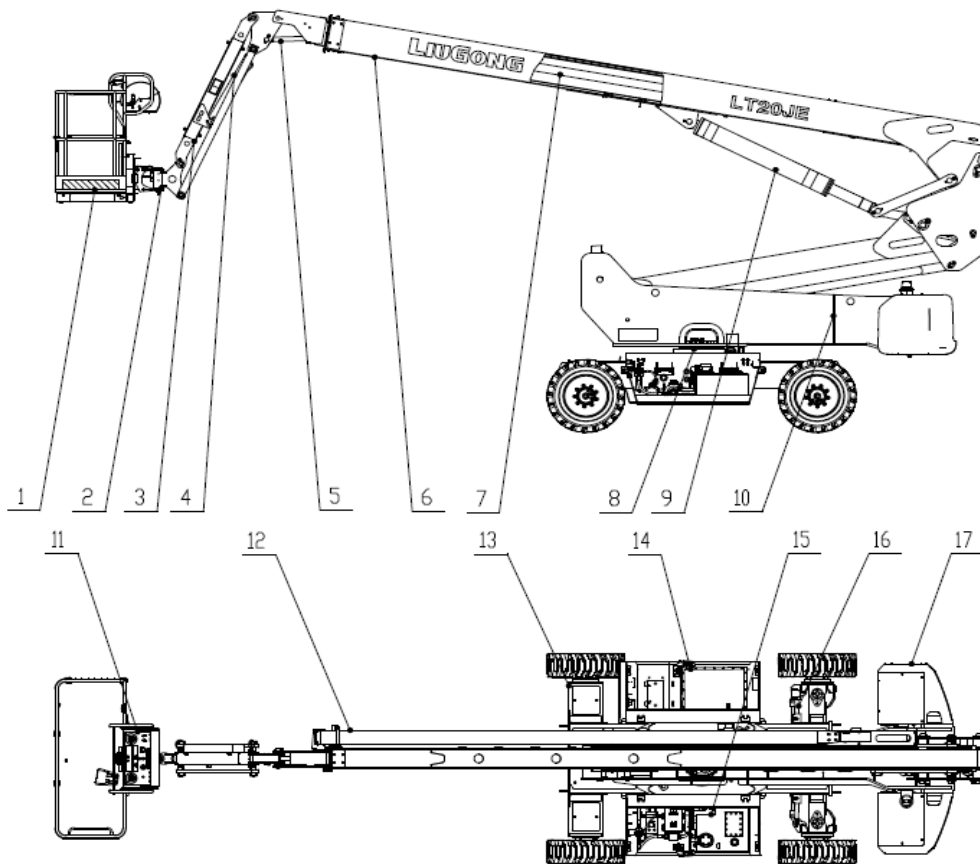
# Product Overview and Main Technical Parameters

## Product Overview

The machine can only be used to lift personnel, tools and materials to the workplace.

## Main Components

Fig. 2-1 Main Components



- |                             |                                  |                        |                       |
|-----------------------------|----------------------------------|------------------------|-----------------------|
| 1. Work platform            | 6. Main boom                     | 11. Control box        | 16. Steering cylinder |
| 2. Swing cylinder           | 7. Main boom telescopic cylinder | 12. Drag chain         | 17. Counterweight     |
| 3. Fly jib                  | 8. Swing reducer                 | 13. Chassis            |                       |
| 4. Fly jib luffing cylinder | 9. Main boom luffing cylinder    | 14. Battery            |                       |
| 5. Upper leveling cylinder  | 10. Turntable                    | 15. Hydraulic oil tank |                       |

## Main Technical Parameters

### List of LT20JE Main Technical Parameters

S/N	Item		Unit (s)	Design value
				LT20JE
1	Maximum working height		m	21.5
2	Maximum platform height		m	19.5
3	Platform amplitude at maximum platform height		m	5.1
4	Maximum platform amplitude		m	13.4
5	Platform height at maximum platform amplitude		m	2.5
6	Rated load (full amplitude)		kg	320
7	Number of people		/	2
8	Platform dimension (L × W × H)		m	1.8 × 0.76 × 1.1
9	Maximum working slope		/	X 5 ° /Y 5 °
10	Main boom elevation		/	-3 ° ~ +72 °
12	Fly jib elevation		/	-65 ° ~ +75 °
13	Turntable swing angle		/	360 ° continuously
14	Platform rotation angle		/	± 90 °
15	Swing speed		rpm	0.4
16	Maximum running speed	Retracted state	km/h	5
		Lifting state		1
17	Total length (fully retracted)		m	10.2
18	Total width		m	2.42
19	Total height		m	2.75
20	Wheel base		m	2.5
21	Tail pendulum		m	1.55
22	Minimum ground clearance		m	0.31
23	Maximum gradeability		/	45%
24	Minimum turning radius (inner wheel/outer wheel)		m	2.4/5.5
25	Tire		/	33 × 12-20
26	Driving and steering mode		/	4WD × 2WS
27	Curb weight of complete machine (operating state)		kg	9500
28	Capacity of hydraulic tank		L	93
29	Power source		/	48V/420Ah

## Vehicle Operation

### Workplace Inspection

#### Basic Principles of Inspection

Workplace inspection helps the operator decide whether the workplace can ensure safe operation of the machine. The operator shall perform such inspection before moving the machine to the workplace.

The operator shall be responsible for understanding and remembering the dangers in the workplace, and paying attention to and avoiding them when moving, installing and operating the machine.

#### Inspection Contents

Beware of and avoid the following dangers:

1. Steep slopes or caves
2. Protrusions, ground obstacles or debris
3. Sloping, unstable or smooth surfaces
4. Aerial obstacles and HV wires
5. Hazardous places
6. Surface supports that are not sufficient to withstand the full load applied by the machine
7. Wind and weather conditions
8. Unauthorized personnel
9. Other possible unsafe conditions

### Inspection before Operation

#### Basic Principles of Inspection

The operator shall be responsible for the pre-operation inspection and routine maintenance.

Pre-operation inspection refers to a visual inspection performed by the operator prior to each shift. The purpose of the inspection is to detect obvious problems with the machine before the operator carries out a functional test.

Pre-operation inspection can also be carried out to determine the necessity of routine maintenance procedures. The operator can only perform the routine maintenance items specified in this manual.

If damage or any unauthorized change different from the factory state is found, the machine shall be marked and shut down.

Only qualified service technicians can repair the machine as specified by the manufacturer. The operator must perform a pre-operation inspection again before proceeding with the functional test at the end of the repair.

The manufacturer's regulations and the requirements listed on the responsibility manual specify that regular maintenance inspection shall be performed by qualified service technicians.

#### Inspection Contents

Make sure that the operation manual, safety manual, and responsibility manual are complete and legible, and stored in the platform's storage box.

- Make sure that all decals are clear and legible, and located in appropriate places.
- Check the hydraulic oil for leakage and proper level. Please add oil as required.
- Check the battery for leakage.

**1. Check the following components or areas for damage, improper installation, missing parts and unauthorized changes:**

1. Electrical components, wiring and cables
2. Hydraulic hoses, joints, hydraulic cylinders and blocks
3. Hydraulic oil tank
4. Traveling motors, traveling reducers, swing motors and swing reducers

5. Wear-resistant sliding blocks
6. Tires and rims
7. Limit switches and horns
8. Alarms and indicators
9. Nuts, bolts and other fasteners
10. Intermediate hurdles or door at platform entrance

**2. Check the complete machine for:**

1. Cracks in welds or structural members
2. Dents or damage to the machine
3. Serious rust, corrosion or oxidation

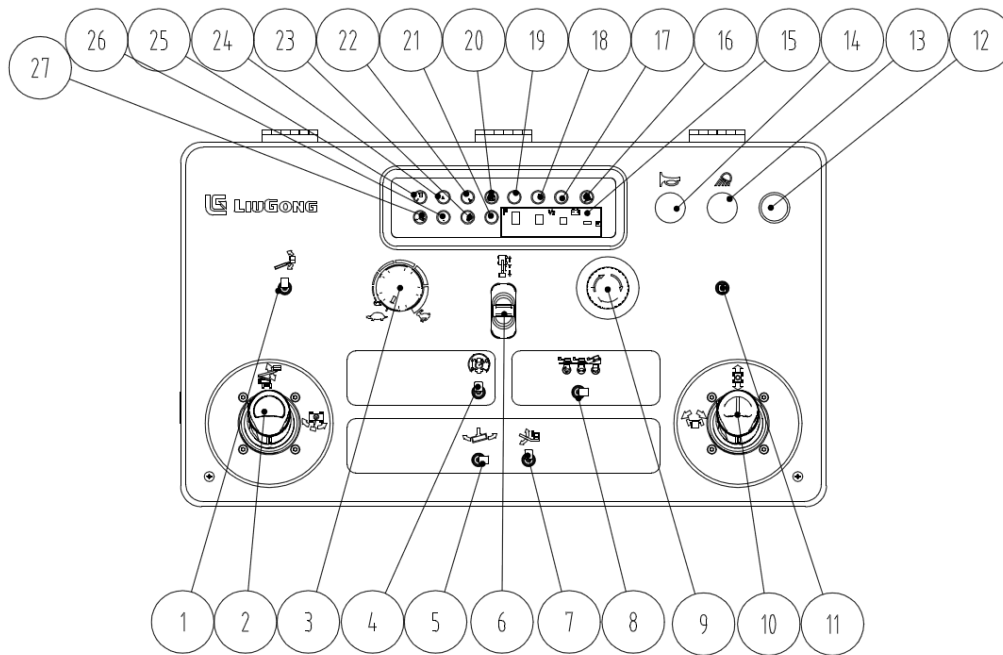
Make sure that no structural member or critical part is missing or loose, and all fasteners and pins for proper positioning and tightening are in the correct position and fully tightened.

Make sure that all covering parts are returned and locked after the inspection.

## Controller

### Platform Control Panel

Fig.3-3



- |  |                              |                                    |
|--|------------------------------|------------------------------------|
| 1. Work platform leveling switch           | 10. Driving/steering lever   | 19. Platform operation indicator   |
| 2. Main boom luffing/turntable swing lever | 11. Emergency power switch   | 20. Front area unlocking indicator |
| 3. High/low speed knob                     | 12. Audible and visual alarm | 21. Low speed indicator            |
| 4. Front area confirmation switch          | 13. Lighting switch          | 22. Over amplitude indicator       |
| 5. Platform swing switch                   | 14. Horn switch              | 23. Pedal indicator                |
| 6. Main boom telescopic switch             | 15. Battery level indicator  | 24. Overload indicator             |
| 7. Fly jib lifting/lowering switch         | 16. Machine tilt indicator   | 25. System fault indicator         |
| 8. Drive speed selector switch             | 17. Light load mode          | 26. Chain breakage indicator       |
| 9. Red "Emergency stop" switch             | 18. Heavy load mode          | 27. Platform tilt indicator        |

### 1. Work platform leveling switch

The platform level will rise when the platform leveling switch is pulled upward.

The platform level will descend when the platform leveling switch is pulled downward.

### 2. Main boom luffing/turntable swing lever

The main boom will rise when the control lever is moved upward, and descend when the control lever is moved downward.

The turntable will rotate rightward when the control lever is moved to the right, and rotate leftward when the control lever is moved to the left.

### 3. High/low speed knob

It is used to adjust the operating speed of boom and turntable.

鉸應 t "Turtle" position: Run at low speed;

鉸應 t "Rabbit" position: Run at high speed.

The motor will run at the minimum set speed when the knob is turned to the leftmost "Turtle" position. The motor will run at the maximum set speed when the knob is turned to the rightmost "Rabbit" position.

The speed is linear and increases from the minimum to the maximum when the knob turns from "Turtle" position to "Rabbit" position.

### 4. Front area confirmation switch

The front area restriction will be released by toggling the switch.

### 5. Platform swing switch

The platform will rotate rightward when the platform rotary switch is pulled to the right. The platform will rotate leftward when the platform rotary switch is pulled to the left.

### 6. Main boom telescopic switch

The main boom will retract when the switch is pulled upward.

The main boom will extend when the switch is pulled downward.

### 7. Fly jib lifting/lowering switch

The fly jib will rise when the switch is pulled upward. The fly jib will descend when the switch is pulled downward.

### 8. Drive speed selector switch

It is used to select the driving speed when the machine is running or climbing. Flat ground high speed ("Rabbit" icon), flat ground low speed ("Turtle" icon) and climbing speed ("Elephant" icon) can be selected.

Please operate in the low speed range when the platform is tilted.

### 9. Red "Emergency stop" button

All functions will be disabled when the red "Emergency stop" button is switched to the OFF position. The machine can be operated by pulling the red "Emergency stop" button to the ON position.

### 10. Driving/steering lever

The machine will be driven forward when the control lever is moved in the direction indicated by the green arrow on the control panel. The machine will be driven backward when the control lever is moved in the direction indicated by the yellow arrow. The machine will turn leftward when left side of the thumb rocker is pressed. The machine will turn rightward when right side of the thumb rocker is pressed.

### 11. Emergency power switch

Use the emergency power supply if the main power source (motor) fails.

## **12. Audible and visual alarm**

The action buzzer and alarm buzzer will warn the surroundings of the vehicle and the staff.

## **13. Lighting switch**

Light will be on when this switch is pulled.

## **14. Horn button**

The horn will sound when the horn button is pressed. The horn will stop sounding when the horn button is released.

## **15. Battery level indicator**

It is used to indicate the battery level, and the light area indicates the remaining battery level.

## **16. Machine tilt indicator**

The non-horizontal indicator of the machine will be on when the tilt alarm sounds.

## **17. Light load mode**

The machine is in light load mode when the indicator is on.

## **18. Heavy load mode**

The machine is in heavy load mode when the indicator is on.

## **19. Platform operation indicator**

The machine has been started when the indicator is on.

## **20. Front area unlocking indicator**

The boom has moved to more than one of the two non-steering wheels, and the drive function has been turned off when the indicator is on.

## **21. Low speed indicator**

When the function speed control is turned to the slow position, this indicator is used to remind that all functions have been set to the minimum speed. The indicator flashes when the control system switches the machine to low speed and stays lit if the operator selects low speed.

## **22. Over amplitude indicator**

The indicator is on when the work platform runs beyond the rated working area.

## **23. Pedal indicator**

The indicator is on when the pedal switch is depressed.

## **24. Overload indicator**

The platform is overloaded, the motor will stop working, and all functions will be disabled when the indicator flashes. You shall remove the load until the indicator is off, and then restart.

## **25. Machine fault indicator**

All functions have been disabled when the indicator is on. Refer to the instructions in the "Operation Instructions" section.

## **26. Chain breakage indicator**

The indicator is on when the chain rope on the boom is broken.

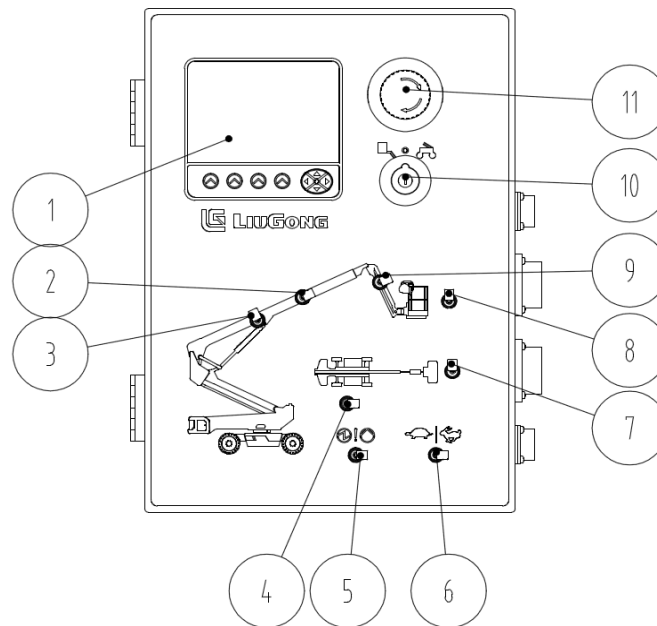
## **27. Platform tilt indicator**

The indicator is on when the work platform is tilted by more than 10 ° , and the work platform can be leveled by the manual leveling system.



## Ground Control Panel

Fig.3-4



- |                                      |                                |                                    |   |
|--------------------------------------|--------------------------------|------------------------------------|---|
| 1. LCD screen                        | 4. Turntable swing switch      | 7. Platform swing switch           | 10. Platform/off/ground selector switch |
| 2. Main boom telescopic switch       | 5. Emergency power switch      | 8. Platform leveling switch        | 11. Red "Emergency stop" switch         |
| 3. Main boom lifting/lowering switch | 6. Turtle/rabbit enable switch | 9. Fly jib lifting/lowering switch |   |

### 1. LCD screen

It is used to display the vehicle status, working hours, battery level and fault, and to inquire historical fault.

### 2. Main boom extension/retraction switch

The main boom will retract when the switch is pulled upward.

The main boom will extend when the switch is pulled downward.

### 3. Main boom lifting/lowering switch

The main boom will rise when the switch is pulled upward.

The main boom will descend when the switch is pulled downward.

### 4. Turntable swing switch

The turntable will rotate rightward when the turntable rotary switch is pulled to the right.

The turntable will rotate leftward when the turntable rotary switch is pulled to the left.

### 5. Emergency power switch

It is used to indicate working state of the emergency pump, and the pump is working when the light is on.

## **6. Turtle/rabbit enable switch**

The low-speed mode is applied when the enable switch is turned to the "Turtle" position.

The high-speed mode is applied when the enable switch is turned to the "Rabbit" position.

## **7. Platform swing switch**

The platform will rotate rightward when the platform swing switch is pulled to the right.

The platform will rotate leftward when the platform swing switch is pulled to the left.

## **8. Platform leveling switch**

The platform level will rise when the platform leveling switch is pulled upward.

The platform level will descend when the platform leveling switch is pulled downward.

## **9. Fly jib lifting/lowering switch**

The fly jib will rise when the switch is pulled upward. The fly jib will descend when the switch is pulled downward.

## **10. Platform/off/ground selector key switch**

The platform controller will run when the switch is turned to the "Platform" position.

The ground controller will run when the switch is turned to the "Ground" position.

## **11. Red "Emergency stop" button**

All functions will be disabled when the red "Emergency stop" button is switched to the OFF position. The machine can be operated by pulling the red "Emergency stop" button to the ON position.

## Functional Test

### Basic Principles of Functional Test

The functional test is carried out to check the machine for faults before use. The operator shall test all functions of the machine in accordance with the following instructions.

It is forbidden to use faulty machines. Faulty machines shall be stopped and marked once being found.

At repair, the operator must perform the pre-operation inspection and functional test again before using the machine.

### Functional Test - Operation on the Ground

1. Select a solid and flat test area without obstacle.
2. Make sure that the main power switch is always on.
3. Turn the key switch to the ground controller.
4. Pull out the red "Emergency stop" button on the ground control panel and the platform control panel. At this time, the ground control panel display lights up and the warning light flashes.

#### Test of Emergency Stop

1. Press the red button on the ground control panel to the OFF position. Result: The motor will be turned off and all functions will be disabled.
2. Pull out the red "Emergency stop" button to the ON position and restart the motor.

#### Test of Machine Function

1. Do not press the function enable button. Try to turn on the toggle switch for each boom and platform function. Result: All boom and platform functions shall be disabled.

2. Press and hold the function enable button and turn on the toggle switch for each boom and platform function. Result: All boom and platform functions shall work properly. The lowering alarm (if equipped) shall sound when the boom is lowered.

#### Test of Tilt Sensor

1. Pull the red "Emergency stop" button on the platform to the ON position. Turn the key switch towards the platform controller.
2. When the machine is not working, place two wooden blocks under the two front (or rear) wheels of the machine, and then drive the machine onto these two wooden blocks. The size of the wooden blocks is  $750 \times 250 \times 218$  mm. At this time, a tilt alarm is given, the "non-horizontal indicator" flashes, and no action is limited.
3. When the machine is working, put two wooden blocks under the two front (or rear) wheels of the machine, and then drive the machine onto these two wooden blocks. The size of the wooden blocks is  $750 \times 250 \times 218$  mm. At this time, a tilt alarm is given, the "non-horizontal indicator" flashes, some actions are limited, boom retraction and partial luffing are allowed, and the turntable can rotate slowly.

#### Test of Emergency Descent

1. Turn the key switch to the ground controller.
2. Pull the red "Emergency stop" button to the ON position.
3. Turn on the toggle switch for each boom function while keeping the emergency power switch on. Result: All boom functions shall be enabled.

Note: To save battery power, please test each function in some cycles.

**Test of Manual Emergency Descent**

1. Remove the right counterweight cover plate of the machine and take out the emergency pump pressure lever.
2. Turn the "Manual emergency knob" clockwise after confirming that there is no danger under the main boom.
3. Insert the emergency pump pressure lever, which has been taken out, into the "manual emergency pump socket" on the main control valve, so that the main boom will lower automatically after continuous pressing.

Turn the "Manual emergency knob" counterclockwise to its original position to stop automatic lowering of the main boom.

**Functional Test - Operation on the Platform****Test of Emergency Stop**

1. Press the stop switch to turn off the power supply, stop and power off the travel motor and pump motor, and stop all operations.
2. Pull out the red "Emergency stop" switch to restore the stop switch, and take all actions.

**Test of Horn**

The horn shall sound when the "Horn" button is pressed. It is used to remind the personnel around the platform to keep safe. The horn stops sounding after the switch is released.

**Test of Pedal Switch**

1. Push the red "Emergency stop" button of the platform to the OFF position.
2. Depress the pedal switch and try to operate the toggle button for boom lifting or any other action. Result: The machine function shall be disabled.
3. Pull the red "Emergency stop" button of the platform to the ON position.

4. Do not depress the pedal switch. Test each function of the machine. Result: The machine function shall be disabled.

**Test of Machine Function**

1. Depress the pedal switch.
2. Start each function control lever or toggle switch of the machine.

Result: All boom/platform functions shall be normal in a complete cycle.

**Test of Emergency Descent**

1. Turn the key switch to the platform controller.
2. Pull the red "Emergency stop" button to the ON position.
3. Turn on the toggle switch for each boom function while keeping the emergency power switch on.

Result: All boom functions shall be enabled.

**Test of Steering**

1. Depress the pedal switch.
2. Press the thumb rocker switch on top of the drive control lever in the direction indicated by the green triangle on the control panel, or move the driving/steering control lever slowly in the direction indicated by the blue triangle. Result: The steering wheel shall rotate in the direction indicated by the blue triangle on the drive chassis.
3. Press the thumb rocker switch in the direction indicated by the yellow triangle on the control panel, or move the driving/steering lever slowly in the direction indicated by the yellow triangle. Result: The steering wheel shall rotate in the direction indicated by the yellow triangle on the drive chassis.

**Test of Drive and Brake Functions**

1. Depress the pedal switch.

2. Move the drive control lever slowly in the direction indicated by the green arrow on the control panel until the machine starts to move, and then return the lever to the central position. Result: The machine shall move in the direction indicated by the blue arrow on the drive chassis and then stop suddenly.
3. Move the drive control lever slowly in the direction indicated by the yellow arrow on the control panel until the machine starts to move, and then return the lever to the central position. Result: The machine shall move in the direction indicated by the yellow arrow on the drive chassis and then stop suddenly.

## ⚠ CAUTION

**The brake must be able to stop the machine stably on any slope it can climb.**

### Test of Front Area Detection Function

1. Depress the pedal switch and lower the boom to the stowed position.
2. Rotate the turntable until the boom moves to more than one non-steering wheel. Result: The drive enable indicator shall be on when the boom is located at any position shown in the figure.



3. Move the drive control lever away from the central position. Result: The drive function shall be disabled.

4. Move and pull the drive enable toggle switch to either side and move the drive controller lever slowly to make it deviate from the central position. Result: The drive function shall be enabled.

## ⚠ CAUTION

**1. The machine can run in the direction opposite to the movement direction of the driving and steering control lever when the drive enable system is adopted.**

**2. Determine the movement direction based on the color-coded direction arrows on the platform controller and drive chassis.**

### Test of Limited Drive Speed

1. Depress the pedal switch.
2. The maximum driving speed that can be reached when the main boom luffing exceeds  $10^\circ$  or the main boom is extended by 0.2m shall not exceed 1 km/h.

The machine shall be marked immediately and stopped when the driving speed of the boom in the raised or extended state exceeds 1 km/h.

## Emergency Stop

Push the red "Emergency stop" button on the ground or platform inward to the OFF position to disable all functions.

If there is still a function enabled when the red "Emergency stop" button is pressed, the function shall be repaired.

Selecting and operating the ground controller will turn off the red "Emergency stop" button of the platform.

## Auxiliary Controller



Use the auxiliary power if the main power source (drive motor) fails.

1. Turn the key switch to the ground or platform controller.
2. Pull the red "Emergency stop" button to the ON position.
3. Depress the pedal switch while operating the auxiliary controller from the platform.
4. Start the required function while keeping the auxiliary power switch turned on.

The drive function shall not work with the auxiliary power supply.

### Operation from Ground

1. Turn the key switch to the ground controller.
2. Pull the red "Emergency stop" button to the ON position.

#### Adjustment of Platform Position

Move the appropriate toggle switch according to the marks on the control panel.

The driving and steering functions cannot be enabled with the ground controller.

### Operation from Platform

1. Turn the key switch towards the platform controller.
2. Pull the red "Emergency stop" buttons on the ground and on the platform to the ON position.

#### Adjustment of Platform Position

1. Depress the pedal switch.

2. Move the corresponding function control lever or toggle switch slowly according to the marks on the control panel.

#### Steering

1. Depress the pedal switch.
2. Turn the steering wheel with the thumb rocker switch located at the top of the drive control lever.

Identify the rotation direction of wheel with the color-coded direction triangle on the platform controller and the drive chassis.

#### Drive




1. Depress the pedal switch.
2. Increase speed: Move the drive controller lever slowly to make it deviate from the central position.
3. Reduce speed: Move the drive controller lever slowly to make it point the central position.
4. Stop: Return the drive control lever to the central position or release the pedal switch.

Determine traveling direction of the machine based on the color-coded direction arrows on the platform controller and drive chassis.

The traveling speed of the machine is limited when the main boom is raised, extended or the auxiliary boom is raised.

## Driving on a Slope

Determine the machine's uphill, downhill, and sidehill ratings and the slope.

S/N	Illustration	Maximum Rating
1		Maximum slope rating Platform downhill (gradeability): 4WD: 45% (24 ° )
2		Maximum slope rating Platform uphill (gradeability): 4WD: 30% (17 ° )
3		Maximum sidehill rating 25% (14 ° )

### **⚠ CAUTION**

The slope rating is limited by ground conditions and adequate traction. The term "gradeability" is used only in counterweight uphill configurations.

Make sure that the boom is below the horizontal position and the platform is between non-steering wheels.

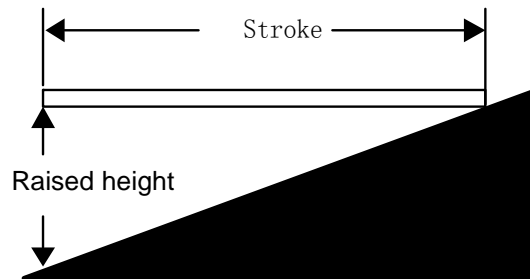
Turn the drive speed selector switch until the machine reaches high speed on a slope.

## Determination of Slope

Measure the slope with a digital inclinometer or as follows. You need the following tools:

- Carpenters' rule
  - Straight wooden blocks, with a length of at least 1m
  - Tape
1. Place the wooden block on a slope.
  2. Place the carpenters' rule on the upper edge of the wooden block at the end of the slope, and rise the end of the block until the block is level.
  3. Keep the wooden block level and measure the vertical distance from the bottom of the block to the ground.
  4. Divide the distance of the tape (raised height) by the length of the wooden block (stroke), and multiply by 100.

For example:



Wooden block = 3.6m

Stroke = 3.6m

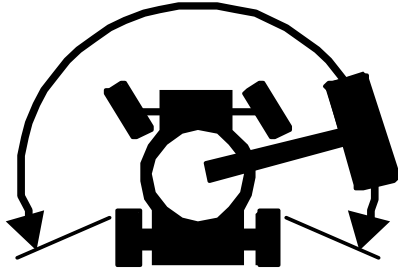
Raised height = 0.3m

$0.3m \div 3.6m = 0.083 \times 100 = 8.3\%$  Grade

The machine must be lifted or moved up and down the slope if the slope exceeds the maximum uphill, downhill or sidehill rating.

## Front Area Detection

The boom has moved to more than one of the two non-steering wheels, and the drive function has been turned off when the indicator is on.



To drive, pull the drive enable switch to either side and move the drive control lever slowly to make it deviate from the central position.

Note that the machine may move in the direction opposite to that of the driving and steering control levers.

Always determine traveling direction of the machine based on the color-coded direction arrows on the platform controller and drive chassis.

## Drive Speed Selection

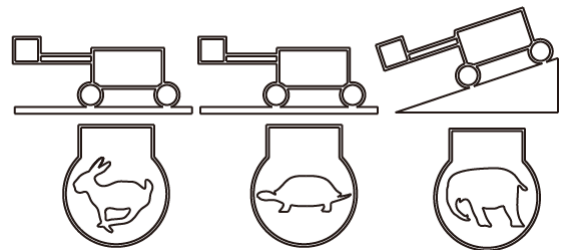


The motor will run at the minimum set speed when the knob is turned to the leftmost "Turtle" position. The motor will run at the maximum set speed when the knob is turned to the

rightmost "Rabbit" position.

Operate in the low-speed range in the climbing ("Elephant" icon) gear when the machine is tilted.

The machine can be operated in the flat ground high speed ("Rabbit" icon) and flat ground low speed ("Turtle" icon) gears when it is on flat ground.





## Machine Tilt Indicator



The machine is not in a horizontal state if the indicator is on. A tilt alarm will be given when this indicator is on. Move the machine to a solid and level ground.

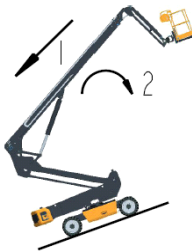
Please refer to "Danger of Working on Slopes" on page 16 of this manual.

If the tilt alarm sounds when the platform is above the slope:



1. Lower the main boom;
2. Retract the main boom.

If the tilt alarm sounds when the platform is below the slope:



1. Retract the main boom;
2. Lower the main boom.

## Machine Fault Indicator



All functions have been disabled when the indicator is on.

1. Press the red "Emergency stop" button and pull it out.
2. Lower and retract the main boom.
3. Mark and stop the machine. The function is disabled.

## Platform Overload Indicator



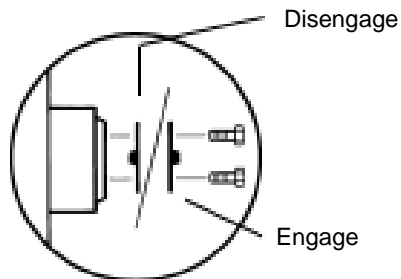
The platform is overloaded if the indicator flashes.

Remove load from the platform until the indicator is off, and then re-operate.

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## Active Release of Brake

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Chock wheels to prevent the machine from rolling.

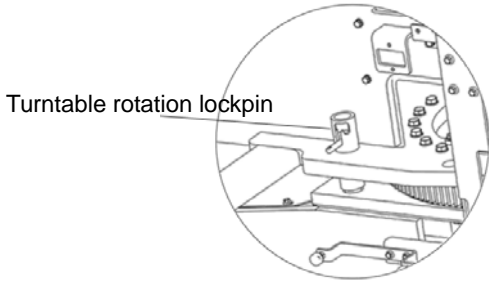
Type 2WD: Turn over the drive hub release cover to release the non-steering wheel brake.

Type 4WD: Turn over the four drive hub release covers to release the wheel brakes.

Perform the above procedures in reverse order to re-engage the brake.

## Guarantee of Truck or Trailer Transportation Safety

Use the turntable rotation lockpins when transporting the machine each time.



Turn the key switch to OFF position and remove it before transportation.

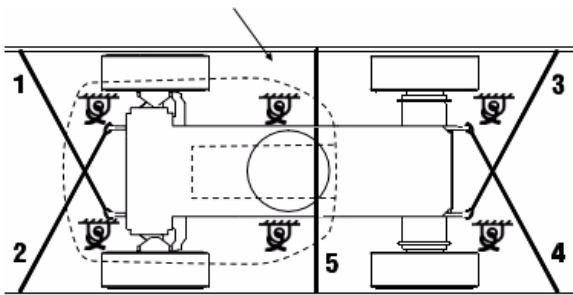
Check the machine thoroughly to prevent loose or unsecured parts.

### Fixed Chassis

Make sure that the rope or belt has sufficient load strength.

Use at least 5 ropes or belts.

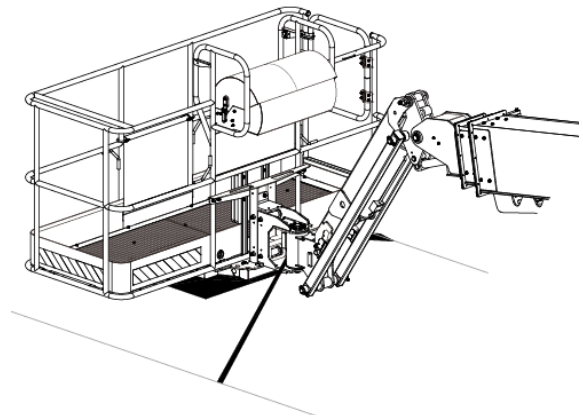
Adjust rigging to prevent damaging the ropes or belts.



### Fixed Platform

Put a cushion block under the rotary cylinder of the platform without any contact between them.

Pass a nylon tape through the platform support to fix the platform. Do not apply excessive downward force when protecting boom components.

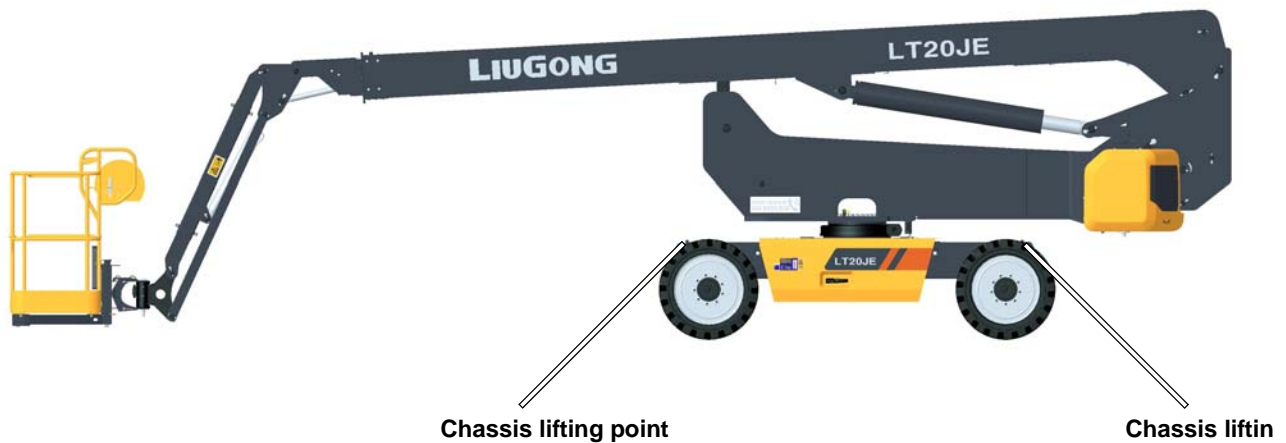


## Lifting Instructions

Pay attention to the following requirements when lifting and transferring the machine with a crane: Make sure that the boom is in the retracted state during lifting, the direction of the boom coincides with traveling direction of the chassis, and the controller and chassis components are safe and reliable; remove all loose components from the machine.

Model	Overall Weight (kg)	Distance X between the Center of Gravity and Rear Axle (mm)	Height Y from the Center of Gravity to Ground (mm)
LT20JE	9500	1756	1166

*Position of Lifting Point*



Fix the turntable with the turntable rotation lock. Attach the rigging only to the designated lifting point on the machine. Adjust the rigging to avoid damaging the machine and keep the machine level.

Note: To protect the machine, please select the sling with appropriate length.

# Maintenance

## **WARNING**

- 1. The operator can only perform the routine maintenance items specified in this manual.**
- 2. Regular maintenance and inspection shall be completed by qualified service technicians according to the manufacturer's specifications and the requirements specified in the responsibility manual.**
- 3. Materials shall be handled according to government regulations.**
- 4. Only approved replacement parts can be used.**
- 5. Incorrect maintenance may result in death, serious injury or damage to the machine.**

### Daily Inspection

1. Keep the surface of the machine clean.
2. Keep the identification labels complete, clear and legible.
3. Make sure that the platform door rotates flexibly and can close automatically after being opened.

### Annual Inspection

The interval between two annual inspections of the aerial work platform shall not exceed 13 months. The annual inspection personnel shall be qualified to check the machine of this type, and the annual inspection content shall include all items.

### Maintenance Symbol Legend

The following symbols are used in this manual to help express relevant meanings in the operation instructions. The symbols (one or more) before the maintenance procedures have the following meanings.



It indicates that a tool is required to perform this procedure.



It indicates that a new part is required to perform this procedure.



It indicates that the engine must be cooled before this procedure is performed.

### The following rules shall be followed for regular maintenance and inspection:

1. The maintenance and inspection must be carried out by professionally trained and qualified personnel.
2. Routine maintenance and inspection cover the inspection items during normal daily operation of the machine. Maintenance and inspection personnel must work according to the Maintenance and Inspection Report, and fill in the report in detail.
3. Regular maintenance and inspection shall be carried out quarterly, semi-annually and annually. Maintenance and inspection personnel must work according to the Maintenance and Inspection Report, and fill in the report in detail.
4. The damaged or faulty machine shall be removed and marked in time, and shut down at the same time.
5. The damaged or faulty machine must be repaired before operation.

- 
6. All inspection records shall be kept for at least 10 years or until the machine is taken out of service or as required by the machine owner/company/custodian.
  7. Machines that have not been maintained for more than three months must be inspected quarterly.
  8. Parts and components replaced during maintenance shall be identical or equivalent to those of the original machine.
  9. Unless otherwise specified, maintenance procedures shall be carried out in accordance with the following clauses:
    - a) Place the machine on a flat, level and solid ground.
    - b) Set the machine to non-working state.
    - c) Turn the "key switch" of the ground controller to "OFF" and remove the key so that the equipment cannot be started.
    - d) Turn the red "emergency stop switch" on the platform controller and the ground controller to "OFF" to avoid damaging the system, thus leading to accidental startup.
    - e) Turn off the main power switch.
    - f) Disconnect all DC power supplies on the machine.
    - g) Lock all tires to prevent the machine from moving.
    - h) Release pressure inside the hydraulic components, especially the balance valve on the oil cylinder, before loosening or removing them.

## Pre-delivery Inspection

When the machine owner/company changes, in addition to the pre-delivery inspection, other inspections shall be carried out according to the requirements for maintenance and inspection time and the inspection procedures. The pre-delivery inspection shall meet the following requirements:

1. The pre-delivery inspection shall be performed by the machine owner/company.
2. This step must be carried out before each delivery in order to find obvious errors before the machine is put into service.
3. It is forbidden to use the damaged or faulty machines. The damaged or abnormal machine must be labeled and removed once being found.
4. The machine must be maintained by qualified technicians in strict accordance with this manual.
5. Routine maintenance must be performed by qualified technicians in accordance with this manual.

Before delivery of the machine, the following records shall be filled out according to the following instructions:

1. Preparations before delivery include pre-operation inspection, maintenance and functional test.
2. Results shall be recorded in a table. After completion of each section, the appropriate box shall be checked.
3. If any inspection result is "NO", the machine must be shut down and re-inspected after repair, and the box marked "REPAIRED" shall be checked.

<b>Record of Preparations before Delivery</b>			
<b>Model</b>			
<b>Factory No.</b>			
<b>Inspection items</b>	<b>YES / Machine in good condition</b>	<b>NO/ Machine damaged or failed</b>	<b>REPAIRED / Machine repaired</b>
Inspection before Operation			
Maintenance procedures			
Function inspection			
Machine buyer/leaser			
Signature of inspector			
Inspection date			
Post of inspector			
Unit of inspector			

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## Maintenance and Inspection Report

1. The Maintenance and Inspection Report is divided into four stages (daily or every 8 hours, quarterly or every 250 hours, semi-annually or every 500 hours, annually or every 1000 hours) according to the maintenance procedure, time requirements of the maintenance plan, and the requirements of the maintenance procedure.
2. The Maintenance and Inspection Report contains a checklist for each type of regular inspection.
3. The Maintenance and Inspection Report shall be copied in order to perform each inspection. The completed forms shall be kept for at least 10 years or until the machine is taken out of service or as required by the machine owner/company.
4. Results shall be recorded the following table. After completion of each section, the appropriate box shall be checked.
5. If any inspection result is "NO", the machine must be shut down and re-inspected after repair, and the box marked "REPAIRED" shall be checked.



<b>Maintenance and Inspection Report</b>				
<b>Model</b>				
<b>Factory No.</b>				
<b>Inspection items every day or every 8 hours</b>				
<b>Inspection Items</b>	<b>YES / Machine in good condition</b>	<b>NO/ Machine damaged or failed</b>	<b>REPAIRED / Machine repaired</b>	<b>Problem</b>
Inspection of each manual				
Inspection of each decal				
Inspection of damaged, loose or missing parts and components				
Inspection of hydraulic oil level				
Inspection of hydraulic oil leakage				
Function inspection				
Test of running speed				
Inspection of emergency lowering function				
Inspection of tilt protection function				
Inspection of weighing system				
Inspection of platform protection device				

<b>Inspection items every quarter or every 250 hours</b>				
<b>Inspection Items</b>	<b>YES / Machine in good condition</b>	<b>NO/ Machine damaged or failed</b>	<b>REPAIRED / Machine repaired</b>	<b>Problem</b>
Inspection and replacement of oil return filter of hydraulic tank				
Inspection of rim, tire and their fasteners				
Inspection of hydraulic oil				
Inspection of air filter of hydraulic tank				
Inspection of angle sensor				
Replacement of high-pressure filter				
Inspection of oil level in traveling reducer				
Inspection of bolt of swing reducer				
Inspection of bolt of swing cylinder				
Inspection of cylinder offset				
Inspection of the exhaust of floating cylinder and the locking of balance valve				
Inspection of wire				
Inspection of battery				

<b>Inspection items every half a year or every 500 hours</b>				
<b>Inspection items</b>	<b>YES / Machine in good condition</b>	<b>NO/ Machine damaged or failed</b>	<b>REPAIRED / Machine repaired</b>	<b>Problem</b>
Replacement of the lubricating oil of swing reducer				

<b>Inspection items every year or every 1000 hours</b>				
<b>Inspection Items</b>	<b>YES / Machine in good condition</b>	<b>NO/ Machine damaged or failed</b>	<b>REPAIRED / Machine repaired</b>	<b>Problem</b>
Replacement of oil filter element				
Replacement of hydraulic oil				
Replacement of the gear oil of traveling reducer				
Inspection of boom sliding block				
User				
Signature of inspector				
Inspection date				
Post of inspector				
Unit of inspector				

## Inspection Items

### Inspection of Each Manual

Keeping the operation and maintenance manuals in place is essential for safe operation of the machine. They shall be placed in a special file box used for storing manuals on the platform. Necessary information for safe operation cannot be provided if the manuals are lost or illegible.

- Check and confirm that the file box is placed in the appropriate place on the platform.
- Check and confirm that the operation and maintenance manuals are placed in the file box on the platform in good condition.
- Check the pages of each manual to confirm that they are clear and intact.
- Return the manuals to the file box after use.

Note: If you need to replace or update the manuals, please contact LiuGong Machinery Co., Ltd.

### Inspection of Each Decal

Ensuring that all decals are in good condition is essential for safe operation of the machine. The decals remind operators of the hazards that may be encountered during operation, and also provide users with information about operation and maintenance. Illegible decals cannot properly guide the operators, which may cause unsafe operation.

Refer to the "Decal/Nameplate Inspection" section in the operation manual, and use the decal list and chart to determine the correct position of the decal.

Check all decals for legibility and damage, and replace the damaged and illegible decals in time.

Note: If you need to replace or update the decal, please contact LiuGong Machinery Co., Ltd.

## Inspection of Damaged, Loose or Missing Parts and Components

Check the following components or areas for damage, and check for improper installation, loose or missing parts, and unauthorized changes:

1. Electrical components, wiring and cables
2. Hydraulic hose, pipe joint, hydraulic cylinder and valve block group
3. Hydraulic oil tank
4. Battery pack and its connection
5. Traveling motor, traveling reducer and swing reducer
6. Boom sliding block
7. Limit switches and horns
8. Tires and rims
9. Alarm and lamp (if equipped)
10. Platform guardrail and door
11. Cracking of structural members and welds
12. Nuts, bolts and other fasteners

Note: In case of any damaged, improperly installed or missing part, replace it with a new one immediately and install it correctly. In case of any falling-off or loose fastener, tighten it immediately.

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## Inspection of Hydraulic Oil Level

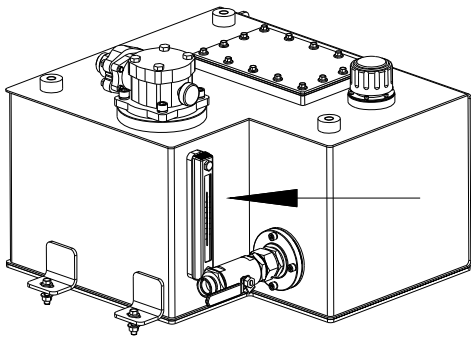
Maintaining the hydraulic oil at proper level is essential for operation of the machine. If the hydraulic oil level is too high, the oil will overflow from the tank during operation of the equipment. If the hydraulic oil level is too low, the oil pump will be sucked empty during operation of the equipment, thus damaging hydraulic components. The inspector can determine changes in the hydraulic oil level that may indicate potential problems with the hydraulic system by routine inspections.

Following steps shall be taken when the boom is retracted:

1. Open the left hood and visually check the side of the hydraulic tank (as shown in the figure below). The hydraulic oil level shall be within the scale area of the oil tank level gauge.

### *Hydraulic Tank Level Gauge*

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- 
2. Make sure that the hydraulic tank body and the joint do not leak.
  3. Add an appropriate amount of hydraulic oil.

## Selection of Hydraulic Oil

The following table lists the characteristics and grades of hydraulic oil required according to ambient temperature (seasons of different regions), which shall be read carefully during the selection of hydraulic oil.

Item	Ambient temperature > 40 °C	-20 °C ≤ Ambient temperature ≤ 40 °C	Ambient temperature < -30 °C
Reference standards	GB11118.1-94	GB11118.1-94	SH0358-95
Type	L-HV	L-HV	Aviation hydraulic oil
Viscosity grade	64	32	10
Flash point change (opening)	180	160	92
Kinematic viscosity (40 °C) mm <sup>2</sup>	61.2 ~ 74.8	28.8 ~ 35.2	Not less than 10 (at 50 °C)
Maximum temperature (°C) when the kinematic viscosity reaches 1500 mm <sup>2</sup> /s	/	-18	-50
Minimum viscosity index	95	130	/
Maximum pour point (°C)	-9	-33	/

### Comparison between Hydraulic Oil at Home and Abroad

Name	Anti-wear hydraulic oil
CNPC	L-HV22, L-HM32
	L-HM46
MOBILE	MobileDTE11M
	13M, 15M
SHELL	Tellus22, Tellus32, Tellus46
CALTEX	Rando oil HD32, Rando oil HD46
CASTROL	Hyspin AWS15, Hyspin AWS32, Hyspin AWS46
	Hyspin AWH15, Hyspin AWH32, Hyspin AWH46
TOTAL	AZOLLAZS32, AZOLLAZS46
BP	Bartran HV22, Energol
	HLP-HM32, HLP-HM46

## Inspection of Hydraulic Oil Leakage

Preventing hydraulic oil leakage is essential for safe and normal operation of the machine. If leakage is not found, a danger will be caused, the performance of the machine will be weakened, and the components will be damaged.

Observe whether the hydraulic oil spills, drips, or residues on or around the following components:

1. Hydraulic tank, filter, pipe joint, oil pipe, auxiliary power unit
2. All hydraulic cylinders, hydraulic valve groups, pumps
3. Boom
4. Turntable
5. Slewing mechanism
6. Chassis
7. Area around the machine

## Inspection of Hydraulic Oil

Checking the hydraulic oil is essential for proper operation and for prolonging service life of the machine. The dirty hydraulic oil may cause abnormal operation of the machine, and continued use may result in damage to hydraulic parts and components. The hydraulic oil shall be replaced frequently in a particularly dirty working environment.

Note: There may be metal particles in the hydraulic oil or filters of new machines due to the wear of hydraulic components. .

### **WARNING**

**Danger of high temperature: Cool the hydraulic oil to room temperature before maintaining the hydraulic system.**

The hydraulic oil shall be replaced in time in case of any of the following circumstances:

- The hydraulic oil is milky white and turbid.
- The hydraulic oil is black.
- Metal luminous points can be found when some hydraulic oil is taken out and checked in the sun, or there is obvious particle feeling if you dip two fingers in the hydraulic oil and rub it.
- The hydraulic oil is smelly.

## Replacement of Hydraulic Oil

Regular replacement of hydraulic oil is essential for normal operation and for prolonging service life of the machine. The dirty hydraulic oil may cause abnormal operation of the machine, and continued use may result in damage to hydraulic parts and components. The hydraulic oil shall be replaced frequently in a particularly dirty working environment. .

### ⚠ WARNING

**Burn hazard: Cool the hydraulic oil to room temperature before maintaining the hydraulic system.**

### ⚠ CAUTION

**Replace the O-ring on the hose and pipe joint when removing the hose and pipe joint.**

1. Open the battery box cover on the right side of the chassis and find the hydraulic tank.
2. Close the hydraulic stop valve on the side of the tank.
3. Remove the oil drain plug at the bottom of the oil tank and drain all the oil into a suitable container. Refer to "Main Technical Parameters" on page 21 for the volume of the hydraulic tank. .

### ⚠ WARNING

**Danger of high pressure: Remove the hydraulic components slowly to reduce the hydraulic oil pressure. The hydraulic oil may penetrate skin if its pressure is too high. If injured, seek medical attention immediately.**

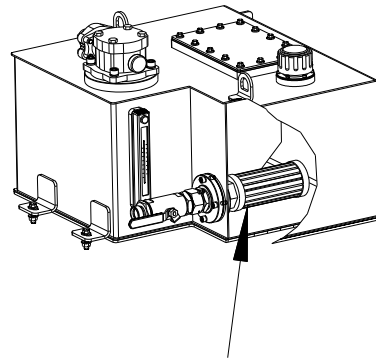
4. Disconnect and plug the oil suction pipe.
5. Disconnect and plug the oil return pipe.
6. Remove the hydraulic tank from the machine after removing the fastening bolts of the tank.
7. Clean the inside of the hydraulic tank with neutral solvent and dry the tank.

8. Install the hydraulic tank onto the machine.
9. Connect the oil suction pipe and oil return pipe to the hydraulic tank.

## Replacement of Oil Suction Filter of Hydraulic Tank

Replacing oil suction filter of the hydraulic tank regularly is essential for normal operation and for prolonging service life of the machine. The dirty hydraulic oil may cause abnormal operation of the machine, and continued use may result in damage to hydraulic parts and components. The hydraulic oil shall be replaced frequently in a particularly dirty working environment.

The oil suction filter of the hydraulic tank shall be replaced simultaneously with the replacement of the hydraulic oil. .





## Inspection and Replacement of Oil Return Filter of Hydraulic Tank

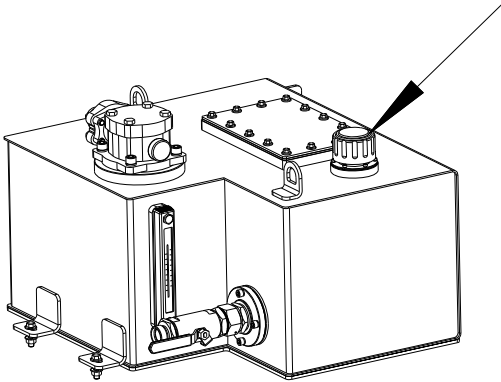
Regular replacement of the oil return filter of the hydraulic tank is essential for normal operation and for prolonging service life of the hydraulic system. A dirty or blocked filter may cause abnormal operation of the machine, and continued use may result in damage to components. The oil return filter shall be replaced frequently if it works in a particularly dirty working environment.

5. Install a new oil return filter and tighten it.
6. Remove the hydraulic oil spilled during replacement.
7. Operate the boom from the ground control panel.
8. Check the filter and related components to make sure that they are not leaked.

### **! WARNING**

**Burn hazard: Cool the hydraulic oil to room temperature before maintaining the hydraulic system.**

1. Open left hood of the machine turntable.
2. Locate oil return filter of the hydraulic tank.



3. Remove the oil return filter with a wrench.

### **! WARNING**

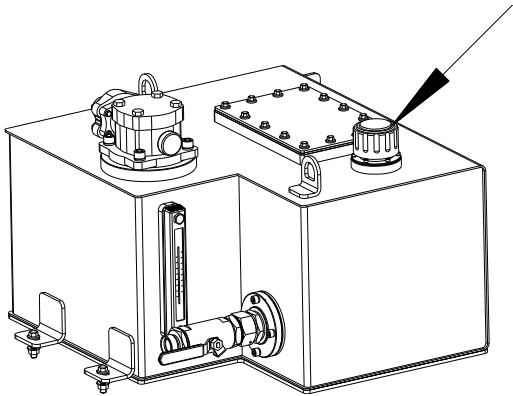
**Danger of high pressure: Remove the hydraulic components slowly to reduce the hydraulic oil pressure. The hydraulic oil may penetrate skin if its pressure is too high. If injured, seek medical attention immediately.**

4. Apply a thin film of oil to the new oil return filter gasket.

## Inspection of Air Filter of Hydraulic Tank

Good ventilation of the hydraulic tank cover is essential for normal operation and for prolonging service life of the hydraulic pump. The dirty or blocked air filter of the hydraulic tank may cause unsmooth oil suction of the hydraulic pump, and continued use may result in damage to components. The air filter of the hydraulic tank shall be checked frequently in a particularly dirty working environment.

1. Remove air filter of the hydraulic tank.



2. Check air filter element of the hydraulic tank.
3. Make sure that air can pass through the air filter smoothly.
4. Clean the air filter as follows if air cannot pass through it smoothly.
5. Clean the air filter with neutral solvent and then dry it with an air gun. Repeat step 2.
6. Install the air filter on the hydraulic tank.

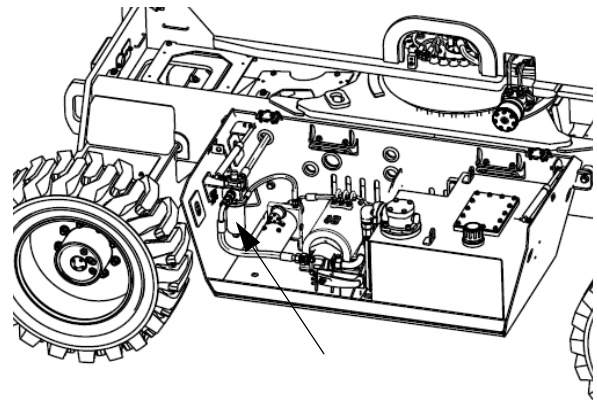
## Replacement of High-pressure Filter

Regular replacement of the high-pressure filter is essential for proper operation and for prolonging service life of the machine. A dirty or blocked filter may cause abnormal operation of the machine, and continued use may result in damage to components. The high-pressure filter shall be replaced frequently in a particularly dirty working environment. .

### **! WARNING**

**Danger of high temperature: Be careful of high-temperature hydraulic oil. People may be burnt severely if he contacts with hot hydraulic oil.**

1. Open the battery box cover on the right side of the chassis and find the high-pressure filter.



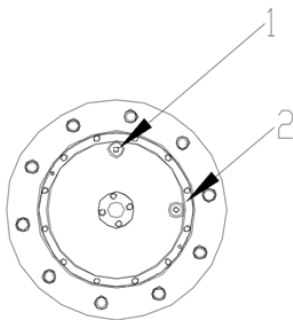
2. Place a suitable container under the filter.
3. Remove the high-pressure filter from the mounting bracket.
4. Replace the filter element as required.
5. Remove the hydraulic oil spilled during operation.
6. Operate the boom from the ground control box.
7. Check the high-pressure filter and related components for leakage.

---

## Inspection of the Oil Level of Traveling Reducer

Operating performance of the machine may be reduced due to incorrect gear oil level in the traveling reducer, and continued use of such reducer may result in damage to components.

1. Drive the machine to rotate the traveling reducer to the position shown in the figure below, so that one oil port plug is located at the top and the other is 90° with it.

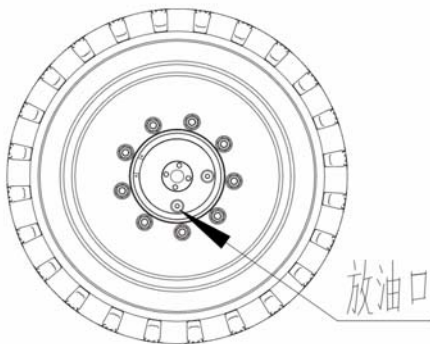


2. Remove the No. 2 oil port plug and check the oil level.
3. The oil level shall be flush with the oil port.
4. Add oil if the oil level is lower than the bolt port.
5. Remove No. 1 bolt, and fill gear oil from No. 1 port until the oil level is flush with No. 2 bolt port.
6. Install the removed bolts.
7. Remove the gear oil spilled during inspection.
8. Perform such inspection to all traveling reducers of the machine.

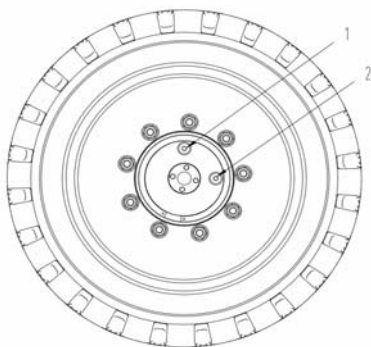
## Replacement of the Gear Oil of Traveling Reducer

LiuGong specifications require that the gear oil shall be replaced after 150 hours of first use, and then replaced every 1000 hours or annually.

1. Operate the machine to place the traveling reducer to the position shown in the figure below, so that the drain port is at the bottom..



2. Place a suitable container under the drain port.
3. Remove the drain plug.
4. Wait until all gear oil in the traveling reducer flows out into the designated container.
5. Install the removed drain plug.
6. Operate the machine to rotate the traveling reducer to the position shown in the figure below, so that one oil port plug is at the top and the other is 90 ° with it.



7. Remove the No. 2 oil port plug and check the oil level.
8. Make sure that the oil level is flush with the oil port.
9. Add gear oil if the oil level is lower than the oil port.
10. Remove No. 1 oil port plug, and fill gear oil from the No. 1 oil port until the oil level is flush with No. 2 oil port.
11. Install the removed plug.
12. Remove the gear oil spilled during inspection.
13. Perform such inspection to all traveling reducers of the machine.

## Inspection of Bolt of Swing Reducer

Application of correct torque to slewing mechanism mounting bolts is essential for safe operation of the machine. Incorrect bolt torque can create unsafe operating conditions and cause damage to components.

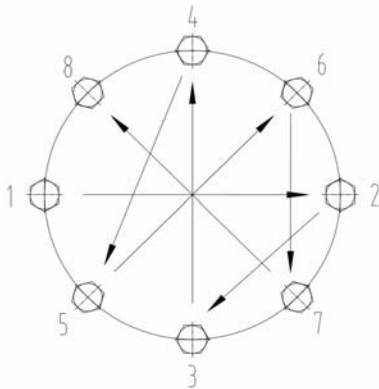
Note: The methods of accessing upper and lower mounting bolts of the slewing mechanism are different due to structural limitations.

1. Lift the main boom and place a safety wedge on the luffing cylinder piston rod. Lower the boom onto the lift cylinder safety wedge carefully, or support the boom assembly with a suitable lifting device. .

### **⚠ WARNING**

**Danger of smashing: Keep both hands away from the hydraulic cylinder and all moving parts when lowering the boom.**

2. Turn the key switch to OFF.
3. Confirm that the upper mounting bolts of each slewing mechanism have been tightened with the correct torque in sequence according to the star pattern as specified in relevant specifications.



4. Lift the boom, and remove the safety wedge or lifting equipment.
5. Lower the boom to the retracted position.

6. Confirm that the lower mounting bolts of each slewing mechanism have been tightened with the correct torque in sequence according to the star pattern as specified in relevant specifications. Tighten all bolts diagonally to 30% of the tightening torque, then to 50% of the tightening torque, and finally to 100% of the tightening torque.

### **Tightening Torque of Swing Reducer**

Model	Torque
LT20JE	280 ± 30Nm

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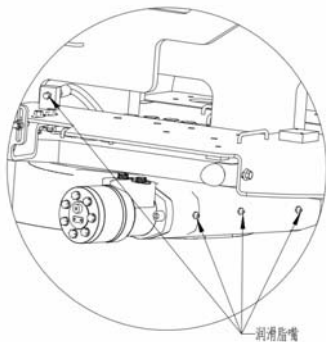
## Replacement of the Lubricating Oil of Swing Reducer

This work shall be done semi-annually according to LiuGong's specifications.

This work needs to be performed more frequently when the machine runs in dusty conditions or high-temperature environment.

Filling the slewing mechanism with grease frequently is essential to maintain the good performance and long service life of the machine.

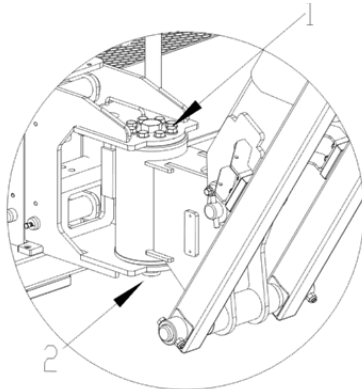
1. Locate grease nozzle of the slewing mechanism.



- 
2. Pump grease into the gear until it can be seen that the grease overflows from one side of the gear housing.

## Inspection of Fasteners of Platform Swing Cylinder

Regular inspection of fasteners of platform swing cylinder is essential for proper and safe operation of the machine.



1. Set the machine to the retracted state.
2. Find the swing motor on the platform.
3. Check whether the bolts at position 1 in the above figure have been tightened with the correct torque.
4. Tighten the bolt to be replaced with the specified torque and apply thread locker.
5. Check whether the nut at position 2 in the above figure has been tightened.
6. Tighten the bolt to be replaced with the specified torque.

### **Tightening Torque of Swing Cylinder Bolt**

Model	Torque
LT20JE	72 ± 6Nm

## Inspection of Cylinder Offset

### Platform Offset

Measure the settlement from platform to ground. The maximum allowable settlement within 10 minutes is 50 mm when the main boom is fully extended, at rated load of the platform, and in case of power off. If the machine settlement exceeds the maximum allowable value, please perform following operations.

### Oil Cylinder Settlement

Cylinder Diameter (mm)	Maximum Allowable Settlement (in 10 minutes) (mm)
Φ 63	0.96
Φ 80	0.63
Φ 100	0.39
Φ 125	0.23
Φ 160	0.14
Φ 180	0.13
Φ 200	0.10
Φ 220	0.08

The offset at the oil cylinder piston rod shall be measured with a calibrated dial indicator.

The oil in the oil cylinder must be at a stable ambient temperature.

The oil cylinder must be loaded normally by the platform.

The oil cylinder can be accepted if it passes the test.

Note: This information is based on the oil cylinder leakage of 6 drops per minute. Due to the physical characteristics of thermal expansion and contraction of hydraulic oil, there may be an error of 7/10000 in the test offset.

## Inspection of the Exhaust of Floating Cylinder and the Locking of Balance Valve

### Exhaust of Floating Cylinder



**During exhaust of the floating cylinder, please make sure that the platform is in the retracted state.**

1. Loosen the plug above the floating balance valve on the left side of the machine until oil flows out.
2. Place a 120 mm beveled wooden block in front of the front left wheel of the machine.
3. Drive the machine so that the front left tire is located on the wooden block.
4. Make sure that hydraulic oil and air flow out of the loose plug in this process.
5. Drive the machine repeatedly onto the beveled wooden block and drive it off the wooden block; tighten the loose plug when only hydraulic oil flows out of the plug.
6. At this time, the left floating cylinder exhausts successfully.
7. Drive the machine off the cushion block.
8. Exhaust the right floating cylinder according to the above steps.
9. Check the locking of balance valve.

### Inspection of Balance Valve Locking



**The floating system shall be checked quarterly, or after any system components have been replaced, or when the system is found to be working abnormally.**

1. Place a 120 mm beveled wooden block in front of the front left wheel of the machine.
2. Extend the main boom by more than 0.2m to make the machine in working state.
3. Drive the machine so that the front left tire is located on the wooden block.
4. Rotate the turntable rightward slowly by about 90°.
5. At this time, the rear inspection indicator is on. Operate the corresponding function to make the main boom level and fully extended.
6. Observe the floating cylinder. The floating cylinder on the stressed side is not allowed to retract. Retract the main boom.
7. Toggle the "front area confirmation toggle" to drive the machine off the cushion block.
8. The auxiliary personnel on the ground shall check whether the front left wheel or the rear right wheel is still off the ground and keep it up.
9. Operate the turntable slowly to make it return to the central position (between the two driving wheels of the rear axle).
10. When driving the machine forward or backward, the front left wheel floating cylinder shall be released to make the wheels fall to the ground and fit closely with the ground.
11. Repeat the above steps to check the front right wheel floating cylinder.



12. If the floating cylinder works abnormally, the fault shall be eliminated by qualified maintenance personnel before further operation.

## Inspection of Angle Sensor

Regular inspection of angle sensor is essential for safe operation of the machine. There will be a danger if the sensor cannot work normally.

### Inspection of Angle Sensor

1. Turn the "Platform/off/ground selector key switch" on the ground control panel to the right "Ground" control position.
2. Turn the "emergency stop switch" on the ground control panel to "ON".
3. Use the main boom luffing function to adjust and operate it to rise.
4. Lift the boom to the maximum angle - stop luffing after the display screen of the ground control panel shows that the main boom angle is 72°.
5. Lower the boom to the maximum angle - stop luffing after the display screen of the ground control panel shows that the main boom angle is -3°.

## Inspection of Tilt Protection System

1. When the machine is not working, put two wooden blocks under the two left (or right) wheels of the machine, and then drive the machine onto these two wooden blocks. The size of the wooden blocks (length × width × height) is 750 × 250 × 218mm.
2. At this time, a tilt alarm is given, the "body tilt indicator" flashes, and no action is limited.
3. The machine shall be driven down and the wooden blocks shall be removed.
4. When the machine is working, put two wooden blocks under the two front (or rear) wheels of the machine, and then drive the machine onto these two wooden blocks. The size of the wooden blocks (length × width × height) is 750 × 250 × 262mm.
5. At this time, a tilt alarm is given, the "body tilt indicator" flashes, some actions are limited, main boom retraction and lowering are allowed, and the turntable can rotate slowly.
6. The main boom is lowered after retracting. The machine is driven down after being stopped, and wooden blocks are removed.

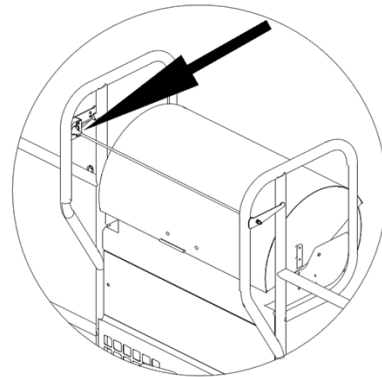
## Inspection of Weighing System

Before this test, it is necessary to completely luff the boom up and down and retract it twice to ensure that the pulley and track are lubricated normally.

- The platform can be lifted to the highest position if the weight does not exceed 320kg.
- If the platform is loaded for more than 320kg when the boom is in non-working state, the buzzer will sound for a long time, the overload indicator will flash, the display screen will show overload, and all actions will be limited. All actions of the machine can be resumed only after the overload is removed.
- If the platform is loaded for more than 320kg when the boom is in working state, the buzzer will sound for a long time, the overload indicator will flash, the display screen will show overload, and all actions will be limited. All actions of the machine can be resumed only after the overload is removed.

## Inspection of Platform Protection Device

When the safety protection device is disengaged from the proximity switch, the buzzer will sound for a long time, the display screen will show that the safety protection device of the platform fails, all actions of the platform control panel will be limited, but the ground control panel can operate normally. After the safety protection device is reset, the alarm is released and all actions of the machine are resumed.



## Inspection of Rim, Tire and Their Fasteners

Maintaining rims and tires and their fasteners is essential for proper and safe operation of the machine. Problems with rims or tires may result in machine tipping. Any problems with rims and tires shall be repaired before operation of the machine.

This machine is equipped with solid tires or foam tires which do not need to be inflated.

1. Check the tires every day. In case of any of the following circumstances, take immediate measures to shut down the machine and replace the tires or tire assemblies (including rims) at the same time.
  - Tire delamination, i.e. circumferential cracks or delamination between rubbers.
  - Coil slippage, i.e. the rubber is separated from the steel ring.
  - The rubber surface falls off locally in blocks.
  - Rubber cracks in the diameter direction.
  - The rubber is worn to the wear line.
2. Check whether the tire fastening nut is tightened according to the specified torque.

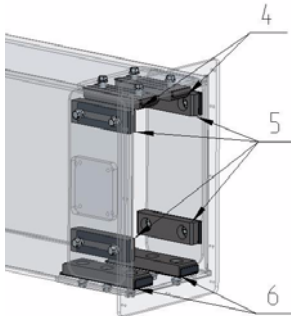
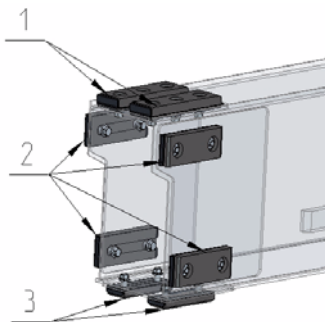
Model	Torque
LT20JE	335 ± 35 Nm

### CAUTION

**Tighten the tire nuts before the first use and after each tire is removed. Check and adjust the torque every 3 months or 150 hours of operation.**

## Inspection of Boom Sliding Block

Checking the boom sliding block regularly is essential for safe operation of the machine. There is a friction pair between each sliding block and the surface of the telescopic boom. Improper sliding block gaskets or continuous use of old sliding blocks may cause damage to components and result in unsafe operation.



1. Remove the cover plates at both ends of the boom.
2. Measure the thickness of each sliding block in the above figure. The following table shows the specified thickness of each sliding block.

S/N	LT20JE
	Thickness of sliding block (mm)
1	20
2	19
3	15
4	19
5	25
6	22

3. Replace the sliding block assembly in time when the sliding block is worn by 3 mm or more.

### **! CAUTION**

**The removed sliding block shall not be reused and must be replaced with a new sliding block assembly.**

## Inspection of Wire

The maintenance of electrical equipment is essential for proper and safe operation of the machine. Continuous operation of the machine in a damaged and corrosive environment may lead to unsafe operation or serious injury. The damaged or corroded wires shall be replaced or repaired before operation.

### **⚠ WARNING**

**Motor danger: Before checking the wires, be sure to disconnect the battery on the machine because contacting with live wires may result in death or serious damage.**

1. Check the wires in the following areas for damage or corrosion:
  - Chassis harness
  - Turntable valve group harness
  - Ground controller junction box
  - Platform controller junction box
2. Operate the boom from the ground control box to lift the main boom to an elevation angle of about 5 ° .
3. Check the drag chain system for damaged or corroded wires.
4. Lower the main boom to the retracted position.

## Inspection of Battery

Battery in good condition is essential for good performance and safe operation of the machine. Improper electrolyte level or damaged cables and wiring may cause damage to components and result in a danger.

### **⚠ CAUTION**

**Be sure to wear protective gloves for inspection.**

### **⚠ WARNING**

**Risk of physical injury: Lead-acid batteries and maintenance-free lead-acid batteries contain acidic substances. Avoid spillage or contact with acidic substances in lead-acid batteries and maintenance-free lead-acid batteries. In case of spillage, neutralize the spilled acidic substances with soda water.**

Check the acid liquid level of the lead-acid battery, and refill distilled water through the filling pipe at the upper part of the lead-acid battery, if necessary, until the pole plate is covered, and excessive distilled water is not allowed.

- Make sure that the wiring of the battery cables is not corroded.
- Make sure that the battery is firmly fixed and the cable wiring is tight.

Note: The addition of terminal protectors and anti-corrosion sealant will help eliminate corrosion on battery terminals and cables.

## Function Inspection

Checking functions of the machine is essential for safe operation of the machine. A danger will be caused if any function fails. All functions shall be stable and reliable, and there shall be no shake or violent and abnormal noise.

### **WARNING**

**Danger of unsafe operation: Be sure to follow the instructions and safety rules in this manual and the operation manual, otherwise death or serious injury may be caused.**

Refer to "Functional Test" on page 29 of the manual for complete functional test steps of the machine. Be sure to fully read and understand the safety rules in the operation manual before performing the functional test.

## Test of Running Speed

1. Turn the "Platform/off/ground selector key switch" on the ground control panel to the left "Platform" control position.
2. Turn the "emergency stop switch" on the ground control panel and the platform control panel to "ON".
3. Turn the "drive speed selection toggle" on the platform control panel to switch to a high running speed.
4. Depress the "pedal switch".
5. Push the "forward and backward driving/steering lever" forward slowly to the full drive position.
6. The test results are shown in the following table:

Model	Test Result
LT20JE	The maximum running speed is 5 km/h when the boom is in non-working state; The maximum running speed is 1 km/h when the boom is in working state.

### **CAUTION**

**The machine shall be shut down immediately and marked if it runs at a speed higher than the test results in the table above.**

## **Inspection of Emergency Lowering Function**

When the motor pump fails, the emergency power unit or manual pump on the turntable control box or platform control box can be used as appropriate. Any emergency power unit switch can be operated to start the hydraulic pump on the power motor, and then relevant action switch can be toggled to lower and retract the main boom.

### **⚠CAUTION**

**The "emergency power unit switch" can only be used for a short time when the motor pump fails to work (by lowering the work platform in place from the maximum angle and height).**

**The emergency power unit switch is only used when the motor pump fails.**

**The emergency power unit is only used for emergency retraction, and shall not be used for other purposes.**

**The manual pump can only be used to start the main boom lowering.**

**When operating the emergency power unit, do not enable two or more action functions at the same time, which will result in overload of the emergency power unit.**

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# Tightening Torque

## Tightening Torque of Bolt (Nut)

Table 5-1 Tightening Torque of Common Bolts (Nuts)

Materials and thermal treatment		Low or medium carbon steel			Quenching and tempering of carbon steel in low-carbon alloy steel		
Bolt performance rating		4.6 ~ 4.8	5.6 ~ 5.8	6.8	8.8	10.9	12.9
Nominal diameter of bolt (mm)	6	4.5 ± 0.5	6 ± 1	7 ± 1	10.5 ± 1.5	14 ± 1.5	18 ± 2
	8	11 ± 1	13 ± 1.5	16 ± 3	26 ± 3	33 ± 3	45 ± 5
	10	22 ± 2	28 ± 3	34 ± 6	52 ± 6	72 ± 6	90 ± 10
	12	40 ± 4	50 ± 5	57 ± 10	90 ± 10	120 ± 10	150 ± 14
	14	62 ± 7	80 ± 10	90 ± 14	145 ± 15	195 ± 15	245 ± 30
	16	100 ± 10	125 ± 15	140 ± 20	225 ± 25	305 ± 25	380 ± 50
	18	135 ± 15	170 ± 20	200 ± 30	310 ± 35	415 ± 35	520 ± 70
	20	190 ± 20	240 ± 30	280 ± 45	430 ± 50	600 ± 55	750 ± 100
	22	260 ± 30	320 ± 30	390 ± 60	585 ± 70	800 ± 70	1000 ± 140
	24	340 ± 35	410 ± 40	490 ± 80	760 ± 90	1020 ± 90	1280 ± 180
	27	490 ± 40	630 ± 70	710 ± 120	1100 ± 130	1500 ± 130	1850 ± 250
	30	610 ± 70	800 ± 50	900 ± 150	1470 ± 170	1850 ± 170	2500 ± 300
	33	780 ± 100	960 ± 140	1260 ± 200	2050 ± 230	2500 ± 230	3450 ± 350
	36	1000 ± 100	1260 ± 140	1500 ± 200	2580 ± 280	3100 ± 280	4500 ± 500
	39	1100 ± 130	1300 ± 240	1800 ± 240	3350 ± 350	3800 ± 350	5700 ± 800
42	1520 ± 140	1900 ± 200	2300 ± 300	4130 ± 420	4600 ± 420	7000 ± 900	
48	2200 ± 200	2900 ± 350	3450 ± 390	6200 ± 640	7100 ± 640	10400 ± 1400	

1. The tightening torque in the table is the value for the non-lubricating state which refers to a state in which no auxiliary materials are added on the threads.
2. The tightening torque for ordinary fine-thread bolts (nuts) is raised by 10% on the basis of Table.

Table 5-2 Tightening Torque of Common Bolts (Nuts)

Materials and thermal treatment		Low or medium carbon steel			Quenching and tempering of carbon steel in low-carbon alloy steel		
		4.6 ~ 4.8	5.6 ~ 5.8	6.8	8.8	10.9	12.9
Nominal diameter of bolt (m)	6	3.4 ± 0.4	4.5 ± 0.8	5.2 ± 0.8	7.8 ± 1.2	10.4 ± 1.2	13.3 ± 1.5
	8	8.2 ± 0.8	9.6 ± 1.2	11.9 ± 2.3	19.2 ± 2.3	24.4 ± 2.3	33.2 ± 3.7
	10	16.3 ± 1.5	20.7 ± 2.3	25.1 ± 4.5	38.4 ± 4.5	53.2 ± 4.5	66.4 ± 7.4
	12	29.6 ± 3	36.9 ± 3.7	42.1 ± 7.4	66.4 ± 7.4	88.6 ± 7.4	110.7 ± 10.4
	14	45.8 ± 5.2	59.1 ± 7.4	66.4 ± 10.4	107 ± 11.1	143.9 ± 11.1	180.8 ± 22.2
	16	73.8 ± 7.4	92.2 ± 11.1	103.3 ± 14.8	166 ± 18.5	225 ± 18.5	280.3 ± 36.9
	18	99.6 ± 11.1	125.4 ± 14.8	147.6 ± 22.2	228.7 ± 25.9	306.2 ± 25.9	383.6 ± 51.7
	20	140.2 ± 11.1	177.1 ± 22.2	206.6 ± 33.2	317.2 ± 36.9	442.6 ± 40.6	553.2 ± 73.8
	22	191.8 ± 22.2	236.1 ± 22.2	287.7 ± 44.3	431.5 ± 51.7	590.1 ± 51.7	737.6 ± 103.3
	24	250.8 ± 25.9	302.5 ± 29.6	361.5 ± 59.1	560.6 ± 66.4	752.4 ± 66.4	944.2 ± 132.8
	27	361.5 ± 29.6	464.7 ± 51.7	523.7 ± 88.6	811.4 ± 95.9	1106.4 ± 95.9	1364.6 ± 184.4
	30	450 ± 51.7	590.1 ± 36.9	663.9 ± 110.7	1084.3 ± 125.4	1364.6 ± 125.4	1844 ± 221.3
	33	575.4 ± 73.8	708.1 ± 103.3	929.4 ± 147.6	1512.1 ± 169.7	1844 ± 169.7	2544.8 ± 258.2
	36	737.6 ± 73.8	929.4 ± 103.3	1106.4 ± 147.6	1903.1 ± 206.6	2286.6 ± 206.6	3319.2 ± 368.8
	39	811.4 ± 95.9	958.9 ± 177.1	1327.7 ± 177.1	2471 ± 258.2	2802.9 ± 258.2	4204.4 ± 590.1
42	1121.2 ± 103.3	1401.5 ± 147.6	1696.5 ± 221.3	3046.3 ± 309.8	3393 ± 309.8	5163.2 ± 663.9	
48	1622.8 ± 147.6	2139.1 ± 258.2	2544.8 ± 287.7	4573.2 ± 472.1	5237 ± 472.1	7671.1 ± 1032.7	

1. The tightening torque in the table is the value for the non-lubricating state which refers to a state in which no auxiliary materials are added on the threads.
2. The tightening torque for ordinary fine-thread bolts (nuts) is raised by 10% on the basis of Table.

Table 5-3 Tightening Torque of Hexagon Flange Bolt (Nut)

Bolt specifications	Bolt grade 8.8		Bolt grade 10.9	
	Tightening torque	Tightening torque	Tightening torque	Tightening torque
	Nm	ft-lbs	Nm	ft-lbs
M5	7 ± 1	5.2 ± 0.8	10 ± 1	7.4 ± 0.8
M6	12 ± 1.5	8.9 ± 1.2	15 ± 1.5	11.1 ± 1.2
M8	29 ± 3	21.4 ± 2.3	36 ± 3	26.6 ± 2.3
M10	57 ± 6	42.1 ± 4.5	79 ± 6	58.3 ± 4.5
M12	99 ± 10	73.1 ± 7.4	132 ± 10	97.4 ± 7.4
M14	160 ± 15	118.1 ± 11.1	215 ± 15	158.6 ± 11.1
M16	248 ± 25	183 ± 18.5	336 ± 25	247.9 ± 18.5
M18	341 ± 35	251.6 ± 25.9	457 ± 35	337.1 ± 25.9
M20	473 ± 50	348.9 ± 36.9	660 ± 50	486.9 ± 36.9

1. The tightening torque in the table is the value for the non-lubricating state which refers to a state in which no auxiliary materials are added on the threads;
2. On the basis of this table, the tightening torque of hexagon flange fine bolt (nut) is increased by 10%.

Table 5-4 Tightening Torque of Nylon Lock Nut

Bolt performance rating			6	8	10	12
Nominal diameter of bolt (mm)	6	Tightening torque (Nm)	12 ± 1	15 ± 2	18 ± 3	22 ± 2
	8		26 ± 3	32 ± 4	39 ± 3	51 ± 6
	10		47 ± 6	60 ± 5	80 ± 6	98 ± 10
	12		78 ± 10	100 ± 12	130 ± 10	160 ± 20
	14		125 ± 14	160 ± 20	210 ± 15	260 ± 30
	16		195 ± 20	250 ± 30	330 ± 25	405 ± 50
	18		260 ± 30	340 ± 40	445 ± 35	550 ± 70
	20		360 ± 45	440 ± 40	635 ± 50	785 ± 100
	22		485 ± 60	635 ± 70	840 ± 70	1040 ± 140
	24		610 ± 100	800 ± 80	1065 ± 100	1325 ± 180
	27		880 ± 120	1150 ± 140	1550 ± 100	1900 ± 250
	30		1180 ± 150	1560 ± 200	1900 ± 150	2560 ± 300
	33		1600 ± 200	2010 ± 300	2960 ± 400	3510 ± 500
	36		2000 ± 250	2710 ± 350	3160 ± 250	4560 ± 500
	39		1880 ± 240	3480 ± 470	4880 ± 650	5780 ± 800
42	2740 ± 250	3600 ± 300	4700 ± 300	/		
48	3500 ± 350	4800 ± 250	7200 ± 600	/		

Note: The tightening torque in the table is the value for the non-lubricating state which refers to a state in which no auxiliary materials are added on the threads.

Table 5-5 Tightening Torque of Nylon Lock Nut

Bolt performance rating		6	8	10	12
Nominal diameter of bolt (mm)	6	8.9 ± 0.8	11.1 ± 1.5	13.3 ± 2.3	16.3 ± 1.5
	8	19.2 ± 2.3	23.7 ± 3	28.8 ± 2.3	37.7 ± 4.5
	10	34.7 ± 4.5	44.3 ± 3.7	59.1 ± 4.5	72.3 ± 7.4
	12	57.6 ± 7.4	73.8 ± 8.9	95.9 ± 7.4	118.1 ± 14.8
	14	92.2 ± 10.4	118.1 ± 14.8	154.9 ± 11.1	191.8 ± 22.2
	16	143.9 ± 14.8	184.4 ± 22.2	243.5 ± 18.5	298.8 ± 36.9
	18	191.8 ± 22.2	250.8 ± 29.6	328.3 ± 25.9	405.7 ± 51.7
	20	265.6 ± 33.2	324.6 ± 29.6	468.4 ± 36.9	579.1 ± 73.8
	22	357.8 ± 44.3	468.4 ± 51.7	619.6 ± 51.7	767.2 ± 103.3
	24	450 ± 73.8	590.1 ± 59.1	785.6 ± 73.8	977.4 ± 132.8
	27	649.1 ± 88.6	848.3 ± 103.3	1143.3 ± 73.8	1401.5 ± 184.4
	30	870.4 ± 110.7	870.4 ± 110.7	870.4 ± 110.7	1888.3 ± 221.3
	33	1180.2 ± 147.6	1482.6 ± 221.3	2183.3 ± 295.1	2589 ± 368.8
	36	1475.2 ± 184.4	1998.9 ± 258.2	2330.9 ± 184.4	3363.5 ± 368.8
	39	1386.7 ± 177.1	2566.9 ± 346.7	3599.5 ± 479.5	4263.4 ± 590.1
42	2021.1 ± 184.4	2655.4 ± 221.3	3466.8 ± 221.3	/	
48	2581.6 ± 258.2	3540.5 ± 184.4	5310.8 ± 442.6	/	

Note: The tightening torque in the table is the value for the non-lubricating state which refers to a state in which no auxiliary materials are added on the threads.

## Tightening Torque of Hydraulic Pipe Joint

Table 5-6 Tightening Torque of 24 ° Tapered O-ring Sealed Pipe Joint

Series	Bolt specifications	Inner diameter of hose (mm)	Tightening torque		
			Nm	kgf.m	ft-lbs
Light-duty	M12 × 1.5	5	16 ± 1	1.6 ± 0.1	11.9 ± 0.8
	M14 × 1.5	6.3	16 ± 1	1.6 ± 0.1	11.9 ± 0.8
	M16 × 1.5	8	26 ± 2	2.6 ± 0.2	19.2 ± 1.5
	M18 × 1.5	10	37 ± 2	3.8 ± 0.2	27.3 ± 1.5
	M22 × 1.5	12.5	47 ± 2	4.8 ± 0.2	34.7 ± 1.5
	M26 × 1.5	16	89 ± 4	9.0 ± 0.4	65.7 ± 3
	M30 × 2	19	116 ± 5	11.8 ± 0.5	85.6 ± 3.7
	M36 × 2	25	137 ± 6	14.0 ± 0.6	101.1 ± 4.5
	M45 × 2	31.5	226 ± 11	23.0 ± 1.1	166.7 ± 8.2
	M52 × 2	38	347 ± 16	35.4 ± 1.6	256 ± 11.9
Heavy-duty	M14 × 1.5	5	26 ± 2	2.6 ± 0.2	19.2 ± 1.5
	M16 × 1.5	6.3	42 ± 2	4.2 ± 0.2	31 ± 1.5
	M18 × 1.5	6.3	53 ± 2	5.4 ± 0.2	39.1 ± 1.5
	M20 × 1.5	8	63 ± 3	6.4 ± 0.3	46.5 ± 2.3
	M22 × 1.5	10	79 ± 4	8.0 ± 0.4	58.3 ± 3
	M24 × 1.5	12.5	84 ± 4	8.6 ± 0.4	62 ± 3
	M30 × 2	16	126 ± 6	12.8 ± 0.6	93 ± 4.5
	M36 × 2	19	179 ± 8	18.0 ± 0.8	132.1 ± 6
	M42 × 2	25	263 ± 12	26.8 ± 1.2	194 ± 8.9
	M52 × 2	31.5	368 ± 17	37.6 ± 1.7	271.5 ± 12.6

1. The tightening torque in the table is the value for the non-lubricating state which refers to a state in which no auxiliary materials are added on the threads;
2. On the basis of this table, the tightening torque of hexagon flange fine bolt (nut) is increased by 10%.

Table 5-7 Tightening Torque of Split Flange Pressing Plate Bolt

Series	Bolt specifications	Bolt performance rating	Tightening torque (Nm)	Tightening torque (ft-lbs)
Light-duty	M8	8.8	25 ± 1	18.5 ± 0.8
	M10		52 ± 2	38.4 ± 1.5
	M12		96 ± 4	70.9 ± 3
	M16		220 ± 10	162.3 ± 7.4
	M8	10.9	33 ± 1	24.4 ± 0.8
	M10		73 ± 3	53.9 ± 2.3
	M12		136 ± 6	100.4 ± 4.5
	M16		310 ± 15	228.7 ± 11.1
Heavy-duty	M8	8.8	25 ± 1	18.5 ± 0.8
	M10		52 ± 2	38.4 ± 1.5
	M12		96 ± 4	70.9 ± 3
	M16		220 ± 10	162.3 ± 7.4
	M20		420 ± 20	309.8 ± 14.8
	M8	10.9	33 ± 1	24.4 ± 0.8
	M10		73 ± 3	53.9 ± 2.3
	M12		136 ± 6	100.4 ± 4.5
	M16		310 ± 15	228.7 ± 11.1
	M20		577 ± 27	425.6 ± 20

1. The tightening torque in the table is the value for the non-lubricating state which refers to a state in which no auxiliary materials are added on the threads;
2. On the basis of this table, the tightening torque of hexagon flange fine bolt (nut) is increased by 10%.

Table 5-8 Tightening Torque of Thread Angle Sealed Transition Joint

Series	Thread size	Tightening torque (Nm)	Tightening torque (ft-lbs)
Light-duty	M8	8.5 ± 0.5	6.3 ± 0.4
	M10	16 ± 0.5	11.9 ± 0.4
	M12	26 ± 1	19.2 ± 0.8
	M14	36 ± 1	26.6 ± 0.8
	M16	42 ± 2	31 ± 1.5
	M18	47 ± 2	34.7 ± 1.5
	M22	63 ± 3	46.5 ± 2.3
	M27	105 ± 5	77.5 ± 3.7
	M30	136 ± 6	100.4 ± 4.5
	M33	168 ± 8	124 ± 6
	M42	220 ± 10	162.3 ± 7.4
	M48	273 ± 13	201.4 ± 9.6
	M60	330 ± 15	243.5 ± 11.1
Heavy-duty	M8	10.5 ± 0.5	7.8 ± 0.4
	M10	21 ± 1	15.5 ± 0.8
	M12	36 ± 1.5	26.6 ± 1.2
	M14	47 ± 2	34.7 ± 1.5
	M16	57 ± 2	42.1 ± 1.5
	M18	73 ± 3	53.9 ± 2.3
	M20	84 ± 4	62 ± 3
	M22	105 ± 5	77.5 ± 3.7
	M27	178 ± 8	131.3 ± 6
	M30	225 ± 10	166 ± 7.4
	M33	325 ± 15	239.8 ± 11.1
	M42	345 ± 15	254.5 ± 11.1
	M48	440 ± 20	324.6 ± 14.8
M60	525 ± 25	387.3 ± 18.5	

1. The tightening torque in the table is the value for the non-lubricating state which refers to a state in which no auxiliary materials are added on the threads;
2. On the basis of this table, the tightening torque of hexagon flange fine bolt (nut) is increased by 10%.



Table 5-9 Tightening Torque of Thread Angle Sealed Transition Joint

Series	Thread size	Tightening torque (Nm)	Tightening torque (ft-lbs)
Light-duty	M8	8.5 ± 0.5	6.3 ± 0.4
	M10	16 ± 0.5	11.9 ± 0.4
	M12	26 ± 1	19.2 ± 0.8
	M14	36 ± 1	26.6 ± 0.8
	M16	42 ± 2	31 ± 1.5
	M18	47 ± 2	34.7 ± 1.5
	M22	63 ± 3	46.5 ± 2.3
	M27	105 ± 5	77.5 ± 3.7
	M30	136 ± 6	100.4 ± 4.5
	M33	168 ± 8	124 ± 6
	M42	220 ± 10	162.3 ± 7.4
	M48	273 ± 13	201.4 ± 9.6
	M60	330 ± 15	243.5 ± 11.1
Heavy-duty	M8	10.5 ± 0.5	7.8 ± 0.4
	M10	21 ± 1	15.5 ± 0.8
	M12	36 ± 1.5	26.6 ± 1.2
	M14	47 ± 2	34.7 ± 1.5
	M16	57 ± 2	42.1 ± 1.5
	M18	73 ± 3	53.9 ± 2.3
	M20	84 ± 4	62 ± 3
	M22	105 ± 5	77.5 ± 3.7
	M27	178 ± 8	131.3 ± 6
	M30	225 ± 10	166 ± 7.4
	M33	325 ± 15	239.8 ± 11.1
	M42	345 ± 15	254.5 ± 11.1
	M48	440 ± 20	324.6 ± 14.8
M60	525 ± 25	387.3 ± 18.5	

1. The tightening torque in the table is the value for the non-lubricating state which refers to a state in which no auxiliary materials are added on the threads;
2. On the basis of this table, the tightening torque of hexagon flange fine bolt (nut) is increased by 10%.

Table 5-10 Tightening Torque of Thread Angle Sealed Transition Joint

Series	Thread size	Tightening torque (Nm)	Tightening torque (ft-lbs)
Light-duty	3/8-24 UNF	10.5 ± 0.5	7.8 ± 0.4
	7/16-20 UNF	19 ± 1	14.1 ± 0.8
	1/2-20 UNF	26 ± 1	19.2 ± 0.8
	9/16-18 UNF	31 ± 1	22.9 ± 0.8
	3/4-16 UNF	52 ± 2	38.4 ± 1.5
	7/8-14 UNF	63 ± 3	46.5 ± 2.3
	1 1/16-12 UNF	100 ± 5	73.8 ± 3.7
	1 3/16-12 UNF	131 ± 6	96.7 ± 4.5
	1 5/16-12 UNF	157 ± 7	115.9 ± 5.2
	1 5/8-12 UNF	210 ± 10	154.9 ± 7.4
	1 7/8-12 UNF	220 ± 10	162.3 ± 7.4
	2 1/2-12 UNF	315 ± 15	232.4 ± 11.1
Heavy-duty	3/8-24 UNF	10.5 ± 0.5	7.8 ± 0.4
	7/16-20 UNF	21 ± 1	15.5 ± 0.8
	1/2-20 UNF	26 ± 1	19.2 ± 0.8
	9/16-18 UNF	36 ± 1	26.6 ± 0.8
	3/4-16 UNF	73 ± 3	53.9 ± 2.3
	7/8-14 UNF	105 ± 5	77.5 ± 3.7
	1 1/16-12 UNF	178 ± 8	131.3 ± 6
	1 3/16-12 UNF	225 ± 10	166 ± 7.4
	1 5/16-12 UNF	283 ± 13	208.8 ± 9.6
	1 5/8-12 UNF	300 ± 15	221.3 ± 11.1
	1 7/8-12 UNF	390 ± 20	287.7 ± 14.8

1. The tightening torque in the table is the value for the non-lubricating state which refers to a state in which no auxiliary materials are added on the threads;
2. On the basis of this table, the tightening torque of hexagon flange fine bolt (nut) is increased by 10%.

Table 5-11 Tightening Torque of ED Gasket Sealed Transition Joint

Series	Thread size	Tightening torque (Nm)	Tightening torque (ft-lbs)
Light-duty	M10	21 ± 1	15.5 ± 0.8
	M12	31 ± 1	22.9 ± 0.8
	M14	52 ± 2	38.4 ± 1.5
	M16	63 ± 3	46.5 ± 2.3
	M18	84 ± 4	62 ± 3
	M22	147 ± 7	108.5 ± 5.2
	M26	210 ± 10	154.9 ± 7.4
	M33	390 ± 10	287.7 ± 7.4
	M42	525 ± 25	387.3 ± 18.5
	M48	630 ± 30	464.7 ± 22.2
Heavy-duty	M12	47 ± 2	34.7 ± 1.5
	M14	63 ± 3	46.5 ± 2.3
	M16	84 ± 4	62 ± 3
	M18	105 ± 5	77.5 ± 3.7
	M20	147 ± 7	108.5 ± 5.2
	M22	157 ± 7	115.9 ± 5.2
	M27	210 ± 10	154.9 ± 7.4
	M33	390 ± 10	287.7 ± 7.4
	M42	525 ± 25	387.3 ± 18.5
	M48	630 ± 30	464.7 ± 22.2

Note:

1. Reference standards:

(1)ISO 9974-2 Connections for general use and fluid power – Ports and stud ends with ISO 261 threads with elastomeric or metal-to-metal sealing – Part 2: Stud ends with elastomeric sealing;

(2)ISO 1179-2 Heavy-duty (S series) and light-duty (L series) stud ends with elastomeric sealing (type E).

2. The tightening torque in the table is the value for the non-lubricating state which refers to a state in which no auxiliary materials are added on the threads.

Table 5-12 Tightening Torque of Thread Angle Sealed Transition Joint

Series	Thread size	Tightening torque (Nm)	Tightening torque (ft-lbs)
Light-duty	G 1/8	21 ± 1	15.5 ± 0.8
	G 1/4	52 ± 2	38.4 ± 1.5
	G 3/8	84 ± 4	62 ± 3
	G 1/2	105 ± 5	77.5 ± 3.7
	G 3/4	210 ± 10	154.9 ± 7.4
	G 1	390 ± 10	287.7 ± 7.4
	G 1-1/4	525 ± 25	387.3 ± 18.5
Heavy-duty	G 1-1/2	630 ± 30	464.7 ± 22.2
	G 1/4	63 ± 3	46.5 ± 2.3
	G 3/8	95 ± 5	70.1 ± 3.7
	G 1/2	136 ± 6	100.4 ± 4.5
	G 3/4	210 ± 10	154.9 ± 7.4
	G 1	390 ± 10	287.7 ± 7.4
	G 1-1/4	525 ± 25	387.3 ± 18.5
G 1-1/2	630 ± 30	464.7 ± 22.2	

Note:

1. Reference standards:

(1) ISO 9974-2 Connections for fluid power and general use; ports and stud ends with ISO 261 threads and O-ring sealing -Part 2: Stud ends with rubber seals;

(2) ISO 1179-2 Heavy-duty (S series) and light-duty (L series) stud ends with elastomeric sealing (type E).

2. The tightening torque in the table is the value for the non-lubricating state which refers to a state in which no auxiliary materials are added on the threads.

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