

Service and Maintenance Manual

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ZS0607HA/ZS0607AC/ZS0607HA-Li/ZS0607AC-Li/
ZS0607DCS/ZS0607ACW/ZS0607ACW-Li/
ZS0407DC/ZS0407DC-Li

Service and Maintenance Manual

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Foreword

The Service and Maintenance Manual applies to the scissor lift series.

This manual describes proper inspection, servicing and maintenance. Users must fully understand and apply the contents described in this manual to maximize the performance and ensure the long-term safe and efficient use.

The manual includes the structure and schematic diagram of the main components. If it is necessary to repair and replace the components, the material code of the required replacement parts can be found in Parts Manual.

This manual should be considered a permanent part of your machine and should remain the machine at all times.

⚠ CAUTION

Do not repair the parts marked with professional maintenance. Zoomlion AWP Machinery Company does not take the consequence for wrong maintenance.

⚠ WARNING

The highest criterion users must keep in mind is: Safety first! Pay special attention to the safety control device for regular inspection. Do not operate the machine when the safety device fails or working abnormally. Do not modify the structure or add additional parts for more functions. Otherwise, you will be responsible for any personal injury or damage caused by the unauthorized modification.

The warranty period for the aerial work platform is as specified in this Service and Maintenance Manual. When maintenance is required, our company provides on-site service or please go to our designated maintenance point for maintenance.

Our company reserves the right to continually revise the contents of this manual with technical improvements. Any changes are subject to change without notice. Some of the pictures in this manual may not match the actual product due to design improvement, etc., but it does not affect your use. The product status is subject to the actual product.

Foreword

Symbols and their description

⚠ DANGER

Danger indicates an imminently dangerous situation. If not avoided, will result in death or serious injury.

⚠ WARNING

Warning indicates a potential hazardous situation. If not avoided, will result in death or serious injury.

NOTICE

Caution indicates a potential hazardous situation. If not avoided, will result in minor or moderate injury.

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Service and Maintenance Manual

Section 1 Maintenance Safety Instruction



SECTION 1 MAINTENANCE SAFETY INSTRUCTION

Your proper maintenance is an important prerequisite for the use of the aerial work platform. Read and understand this manual before attempting to any maintenance procedure. Conduct daily and regular maintenance in accordance with the contents and requirements of this manual. Zoomlion's marketing network throughout the world will provide you with professional consulting, maintenance and repair services. This section introduces the scope of responsibility for maintenance.

1.1 Maintenance Cycle Instruction

Daily maintenance is conducted everyday or every week, and maintenance with a period of more than one week is called regular maintenance. Maintenance work must be cycled on a regular basis and strictly follow the technical requirements and techniques in this manual.

1.2 User Responsibility

Please conduct daily and regular maintenance in accordance with the contents and requirements of this manual for good performance and personal safety. The responsibilities you must perform include but are not limited to:

- a) Operate and use the machine in accordance with the Maintenance Manual.
- b) Conduct daily and regular maintenance in accordance with the contents and requirements of this manual, professional technical maintenance must be performed at an authorized Zoomlion dealer service center.
- c) Use formal Zoomlion accessories.
- d) When the aerial work platform fails, the information should be promptly and accurately fed back to the designated service center.
- e) Please provide workplace, equipment and tools for on-site service.
- f) When your equipment is transferred, you must promptly inform the service centers that are transferred to and from the place of departure.

1.3 Service Center Obligation

Service centers are dedicated to providing you with a full range of after-sales services, including:

- a) Professional product technical support.
- b) Provide formal Zoomlion accessories.
- c) Warranty service under warranty agreement.
- d) Perform major abnormal faults and incident handling.
- e) Provide equipment maintenance services.

1.4 Disclaimer

Zoomlion does not assume any responsibility for direct or indirect losses caused by the following actions:

- a) Wrong operations or applications.
- b) Unauthorized modification and parameter adjustment of the machine.
- c) Do not use Zoomlion's original accessories and dedicated oils.
- d) Maintenance is not performed in accordance with the contents and requirements of this manual.

Service and Maintenance Manual

Section 2 Maintenance Requirements



SECTION 2 MAINTENANCE REQUIREMENTS

2.1 General

- a) Perform necessary oil inspection and replacement. Conduct regular inspections to ensure that components are in good condition.
- b) Require appropriate equipment for maintenance and repair, and obey relevant rules and instructions in Operator's manual.
- c) If the safety equipment is removed during maintenance, reinstall the safety equipment and inspect it immediately after the maintenance work is completed.
- d) Ensure that fuel, lubricants, and replaced parts are safely disposed of in accordance with environmental regulations.

2.1.1 Maintenance purpose

- a) Prepare for operation.
- b) Maintain stable performance.
- c) Prevent downtime.
- d) Maintain use value.
- e) Reduce maintenance cost.

2.2 Precautions

2.2.1 General precautions

- a) Wear working clothes for maintenance work.
- b) Machine parked on a firm, level surface.
- c) Prevent dust and dirt from entering the system when inspecting or servicing the hydraulic system.
- d) If you find any items that require immediate repair and adjustment, perform maintenance immediately.
- e) Contact local Zoomlion service center for repairing.
- f) Please use the accessories and grease specified by our company for good performance.
- g) Timely replacement of consumables, such as filter element to prevent failures due to delays.
- h) Please contact our local office for any difficult problems identified during inspection or maintenance.

2.2.2 Safety precautions

- a) Perform all locks, turn the power switch to off position and remove the switch keys during machine inspection and maintenance.

If not comply with the rules, could result in serious injury or death.

⚠ DANGER

- a) Set the warning sign during maintenance.

Set DO NOT START, IN MAINTENANCE warning sign during maintenance.

- b) Use clean grease.

The room where grease is stored should be kept clean and no dust, water, etc. should enter the container. Ensure that the grease used does not contain water.

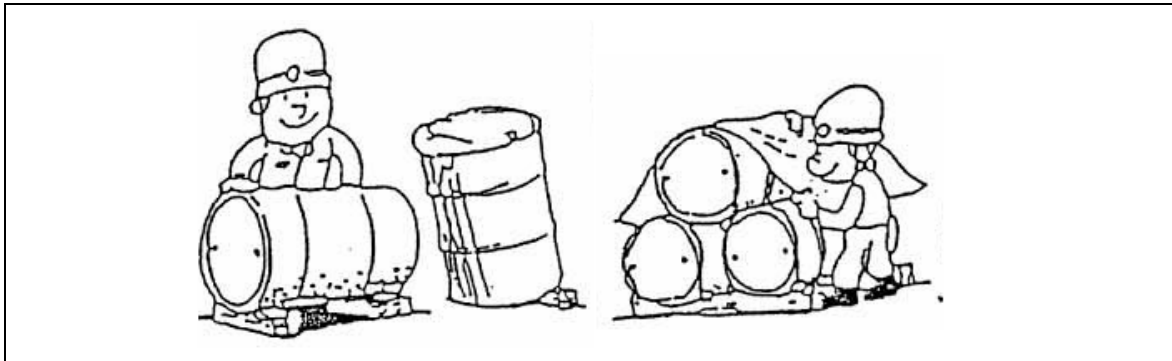


Figure 2-1 Clean grease check

- c) Keep the machine clean.

Clean the machine with clean water to find oil leaks, cracks, loose connections and other abnormalities. Keep grease nipples, vents and dipsticks clean to prevent dust.

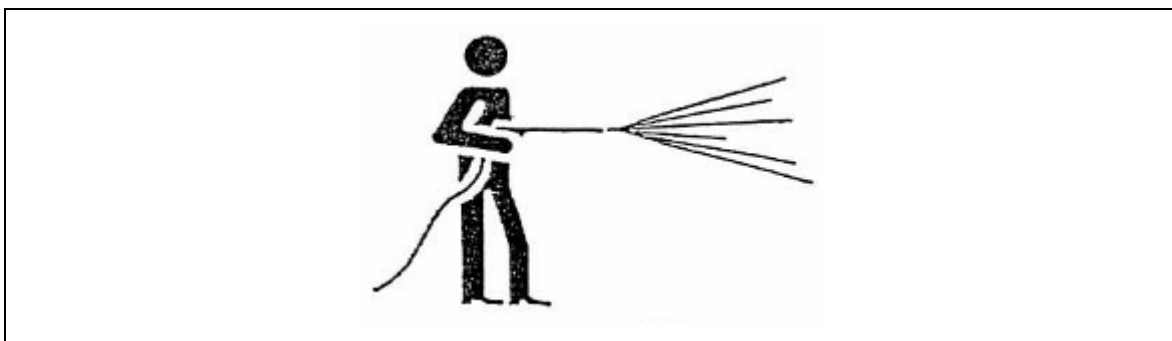


Figure 2-2 Clean the unit

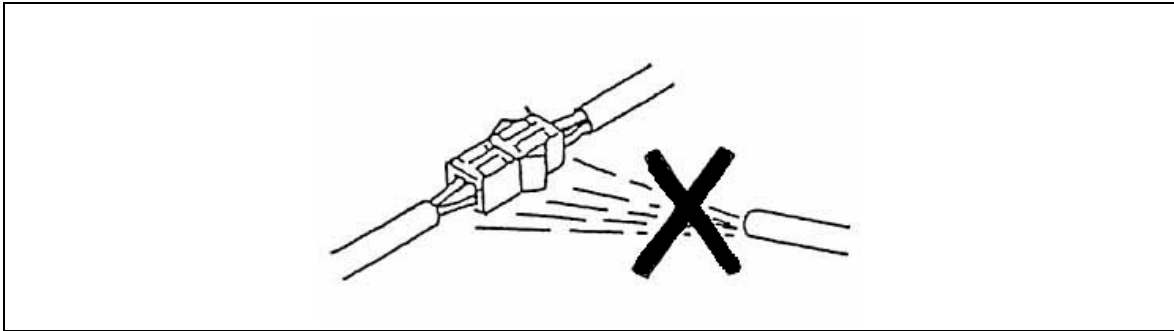


Figure 2-3 DO NOT spray water at the joint

CAUTION

- a) Do not spray water on electrical components and connectors while cleaning the machine.
- b) Lubricate the steering knuckles after cleaning.
- c) Clean the control panel with warm water containing detergent only. DO NOT use corrosive cleaning agent.
- d) Clean oil stain.

When filling or replacing fuel, hydraulic oil, grease, or replacing the filter element, oil may spill. Wipe the spilled oil in time to prevent fire.

- e) Check the discharged waste oil and old filter.

Check for metal chips or foreign objects when replacing the oil or filter element.

- f) Prevent dust intrusion.

The dismantled hydraulic tubing and hydraulics must be protected with a blockage or seal to prevent dust.



Figure 2-4 Dust prevention

- g) Clean joint surface.

Removing the O-ring or other gasket, clean the sealing surface and replace with a new seal. Apply a thin layer of oil to the seal when reassembling.

Pay attention to internal pressure. Remove the pressure before disassembling pipes, joints or other related components with internal pressure, such as hydraulic systems, compressed air systems, etc.



Figure 2-5 Notice internal pressure

- h) Clean waste oil.
 - 1) Place the waste oil in a container and treated as industrial waste.
 - 2) Maintenance and parts replacement must be implemented by trained professionals.
- i) Check the records.

Conduct and record regular inspections to learn the operation condition of the machine and components (Inspection should be conducted in machine's first use or initial use after long-term suspension or after repair).

2.3 Pre-delivery Inspection

It is the responsibility of the dealer to perform the Pre-delivery Preparation.

Pre-delivery Preparation is performed prior to each delivery. The inspection is designed to discover if anything is apparently wrong with a machine before it is put into service.

A damaged or modified machine must never be used. If damaged or any variation from factory delivered condition is discovered, the machine must be tagged and removed from service.

Repairs to the machine may only be made by a qualified service technician, according to the manufacturer's specification. Scheduled maintenance inspections shall be performed by qualified service technicians, according to the manufacturer's specifications and the requirements listed in the responsibilities manual.

2.4 Maintenance Intervals Instructions

All maintenance work is done intermittently that the Intermittent period is the maintenance period. Maintenance intervals are determined based on two aspects:

- a) Certain running time of functional components (hours).
- b) The Gregorian time (day, month, year) at which the machine is working and stored.

Maintenance intervals of Zoomlion Scissor Lifts are generally determined by the certain running time of functional components, and the special content needs to be determined in the latter way.

Table 2-1 Maintenance intervals

Maintenance Intervals	Running Time (hours)	Maintenance Intervals
Daily (D)	8	Before and after operation
Monthly (M1)	About 100	Once a month
Quarterly (M3)	About 250	Once every three months
Every 6 months (M6)	About 500	Once every six months
Annually (M12)	About 1,000	Once a year
Every two years (M24)	About 2,000	Once every 24 months

2.5 Maintenance Schedule

Table 2-2 Maintenance schedule

Items	Work Description	Maintenance					
		Daily	Monthly	Quarterly	Every 6 months	Annually	Every two years
		D	M1	M3	M6	M12	M24
2.6.1.1	Check manual and decals	★					
2.6.1.2	Pre-start Inspection	★					
2.6.1.3	Battery Inspection	★					
2.6.1.4	Check hydraulic oil level	★					
2.6.1.5	Functional test	★					
2.6.2.1	Maintenance after 30 days	▲ After using for the first time for 30 days or 50 hours					
2.6.2.2	Lubricating steering knuckles		★				
2.6.3.1	Battery maintenance			★			
2.6.3.2	Li-ion battery maintenance			★			
2.6.3.3	Inspect electrical wire			★			
2.6.3.4	Inspect the tires and wheels			★			

Table 2-2 Maintenance schedule

Items	Work Description	Maintenance					
		Daily	Monthly	Quarterly	Every 6 months	Annually	Every two years
		D	M1	M3	M6	M12	M24
2.6.3.5	Inspect emergency stop function			★			
2.6.3.6	Test key switch			★			
2.6.3.7	Test the Horn			★			
2.6.3.8	Test the drive brakes			★			
2.6.3.9	Test the top drive speed - stowed position			★			
2.6.3.10	Test the drive speed (raised)			★			
2.6.3.11	Test slow drive speed - stowed position			★			
2.6.3.12	Hydraulic oil analysis			★			
2.6.3.13	Inspect hydraulic oil tank cap venting system			★			
2.6.3.14	Inspect tray latch components			★			
2.6.3.15	Inspect down limit switch, level sensor and pothole limit switch			★			
2.6.3.16	Test up limit switch			★			
2.6.4.1	Test platform overload system				★		
2.6.4.2	Replace the hydraulic tank venting cap.				★		

Instruction: ★ Regular maintenance intervals ▲ Initial maintenance time

Table 2-2 Maintenance schedule

Items	Work Description	Maintenance					
		Daily	Monthly	Quarterly	Every 6 months	Annually	Every two years
		D	M1	M3	M6	M12	M24
2.6.4.3	Replace hydraulic filters				★		
2.6.5	Maintenance every year					★	
2.6.6	Maintenance every 24 months						★

Instruction: ★ Regular maintenance intervals ▲ Initial maintenance time

2.6 Maintenance Inspection

2.6.1 Daily inspection

2.6.1.1 Check manual and decals

Ensuring that the operation and maintenance manual is in good condition. Each unit is stored with operation and maintenance manuals. Manuals should be stored in the platform container. Manuals with illegible or missing pages do not provide sufficient information to ensure safe operation.

Ensure that all safety decals are intact. Decal alerts the operator to the safety hazard of using the machine. It also provides operational and maintenance information to the user. Blurred decals will not serve as a warning and may result in a dangerous operating environment.

- a) Check and ensure that the operation and maintenance manual is in the storage box of the platform.
- b) Ensure that there is no illegible or missing pages.
 - 1) Result: the manual matches the model, all manuals are legible and there are no missing pages.
 - 2) Result: the manual does not match the model, or the manual is illegible or there are missing pages.
 - 3) Stop using the machine before the manual is replaced.
- c) Check the Decal Inspection section in manual. Ensure the decal is legible and intact.
 - 1) Result: all decals are clear and complete.
 - 2) Result: decal is missing, illegible or damaged. Stop using the machine before the manual is replaced.
- d) Put it back in the storage box after using the manual.

- e) Reminder: if need to replace the manual or label, please contact Zoomlion or Zoomlion dealer.

2.6.1.2 Pre-start inspection

It is important to implement pre-start inspection for safety operation. The pre-operation check is done visually before the machine is running. This inspection is used to find out if there are obvious problems with the machine before the functional test. It could be used to decide whether to perform routine maintenance procedures.

2.6.1.3 Battery inspection

Proper battery condition is essential to good machine performance and safety operation. Improper fluid level or damaged cables and connections can result in component damage and hazardous conditions.

⚠ CAUTION

Machines with sealed or maintenance-free batteries are not required for this check.

⚠ WARNING

- a) Contact with electrically charged circuits could result in death or serious injury. Remove all rings, watches or other jewelry.
- b) Batteries fluid is highly corrosive. Avoid spilling or contacting battery acid. Neutralize battery acid spills with baking soda and water.

⚠ CAUTION

Fully charge the battery before performing the following inspections.

- a) Only qualified riggers should rig the machine.
- b) Only certified crane operators should lift the machine and only in accordance with the applicable crane regulations.
- c) Be sure that the battery retainers are tight.
- d) Remove the battery vent caps.
- e) Check the battery acid level. If needed, replenish with distilled water from the battery fill hole. Do not overfill.
- f) Install the vent caps.

2.6.1.4 Check hydraulic oil level

Proper hydraulic fluid level is very important for operating the machine. Improper hydraulic oil level could damage hydraulic components. Through the daily inspection, the inspector can determine the change of the hydraulic oil levels that can indicate problems with the hydraulic system.

⚠ CAUTION

Conduct the inspection in stowed position.

- a) Visually inspect the hydraulic oil level on the side of the hydraulic tank.
- b) Result: the hydraulic oil level should be at the mark of the fuel tank.
- c) Add oil as needed. Do not overfill.

2.6.1.5 Functional test

Completing the functional test is very important for the safe operation. The functional test is used to find out whether the machine has functional defects before the machine works, and the defective machine cannot be used. Once a functional defect is discovered, mark the machine immediately and stop using it.

A complete inspection procedure can be found in the Functional Test section of this manual.

2.6.2 Maintenance every month

2.6.2.1 Maintenance after 30 days

30-day maintenance is a one-time maintenance after the first 30 days or 50 hours of machine operation. Continue the scheduled maintenance after this one-time maintenance.

Perform the following maintenance:

- a) Tires and hubs.
- b) Replace the hydraulic filter.

2.6.2.2 Lubricate steering knuckles

Conduct this inspection every 100 hours.

- a) Regular lubrication of steering knuckle is essential for good machine performance and service life. Long-term use of knuckles that are not effectively lubricated will result in damage to the parts.
- b) Open the lid on the knuckle and find the greased hole at the top of the knuckle. Fill enough grease into the knuckle till the grease covering the bearing.
- c) Replace the cover and repeat the above process for the other steering knuckles. Grease specifications: use 3 # general lithium-based grease.

2.6.3 Maintenance every 3 months

2.6.3.1 Battery maintenance

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

Proper battery condition is essential for good machine performance and safety operation. Improper fluid levels or damaged cables and connections can result in component damage and hazardous conditions.

⚠WARNING

- a) Contact with electrically charged circuits could result in death or serious injury. Remove all rings, watches or other jewelry.
- b) Batteries fluid is highly corrosive. Avoid spilling or contacting battery acid. Neutralize battery acid spills with baking soda and water.
- c) Put on protective clothing and eye wear.
- d) Release the battery pack latch and rotate the battery pack out and away from the chassis.
- e) Be sure that the battery cable connections are free of corrosion.
- f) Add terminal protectors and a corrosion preventative sealant will help eliminate corrosion on the battery terminals and cables.
- g) Be sure that the battery retainers and cable connections are tight.
- h) Fully charge the batteries and allow the batteries to rest 24 hours.
- i) Remove the battery vent caps and check the specific gravity of each battery cell with a hydrometer.
- j) Check the ambient air temperature and adjust the specific gravity for each as follows:
 - 1) Add 0.004 from the reading of each cell for every 5.5°C/ 42°F above 26.7°C/ 80°F.
 - 2) Subtract 0.004 from the reading of each cell for every 5.5°C/ 42°F below 26.7°C/ 80°F.
 - 3) Result: all battery cells display an adjusted specific gravity of 1.277 or higher. The battery is fully charged. Proceed to step k.
 - 4) Result: one or more battery cells display a specific gravity of 1.217 or below. Proceed to dtep h.
- k) Perform a equalizing charge OR fully charge the battery(s). Allow the battery(s) to rest at least 6 hours.
- l) Remove the battery vent caps and check the specific gravity of each battery cell with a hydrometer.
- m) Check the ambient air temperature and adjust the specific gravity for each as follows:
 - 1) Add 0.004 from the reading of each cell for every 5.5°C/ 42°F above 26.7°C/ 80°F.
 - 2) Subtract 0.004 from the reading of each cell for every 5.5°C/ 42°F below 26.7°C/ 80°F.
 - 3) Result: all battery cells display an adjusted specific gravity of 1.277 or higher. The battery is fully
 - 4) charged. Proceed to step k).
 - 5) Result: the difference in specific gravity readings between cells is greater than 0.1 OR the specific
 - 6) gravity of one or more cells is less than 1.217. Replace the battery.
- n) Check the battery acid level.If needed, replenish with distilled water to 3mm/0.04in below the

bottom of the battery fill tube. Do not overfill.

- o) Install the vent caps and neutralize any electrolyte that may have spilled.
- p) Verify that the batteries are wired correctly.

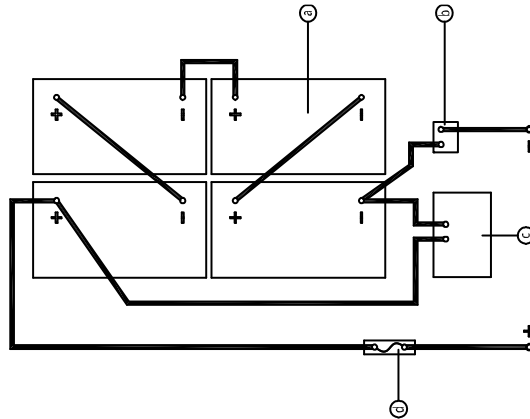


Figure 2-6 ZS1414/ZS1212/ZS1012/ZS0812/ZS0808/ZS0608/ZS0607 Series Battery connections

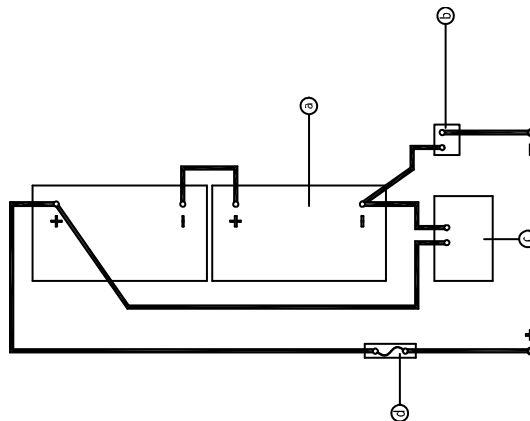


Figure 2-7 ZS0607DCS/ZS0407DC Battery connections

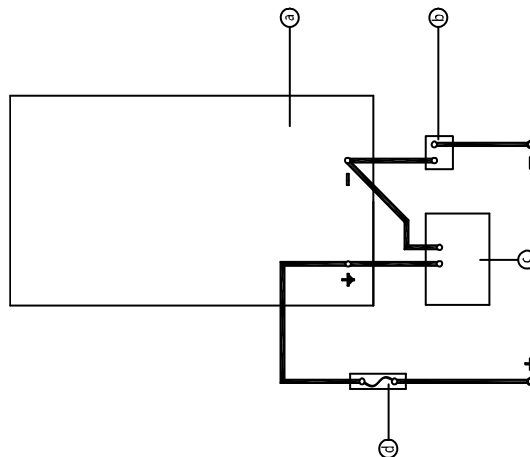


Figure 2-8 Li-ion Battery connections

Table 2-3 Code name

Code	Name	Code	Name
a	Battery/Li-ion battery	b	Main Switch
c	Charger	d	Fuse

- q) Inspect the battery charger plug and pigtail for damage or excessive insulation wear. Replace as required.
- r) Connect the battery charger to 110-240V 50/60 HZ AC power.
 - 1) Result: charger operates. Charge the batteries.
 - 2) Result: the charger's fault indicator flashes or displays a fault code. Check and correct the charger input cable, as well as the battery and charger connections, make sure the charger is operating properly and start charging the battery.

Consult Zoomlion after-sale service team for more relevant problems.

2.6.3.2 Li-ion battery maintenance

The battery system should not be used for a long time. It should be placed in a cool and dry environment (temperature below 30°C/ 86°F and humidity less than 90%), and it should be charged with a special charger at least every three months.

▲WARNING

The lithium battery should be charged in time when the voltage is too low, otherwise the battery will be over-discharged and the machine cannot move normally.

2.6.3.3 Inspect electrical wiring

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

Maintaining electrical wiring in good condition is essential to safe operation and good machine performance. Failure to find and replace burnt, chafed, corroded or pinched wires could result in unsafe operating conditions and may cause component damage.

▲WARNING

Contact with electrically charged circuits could result in death or serious injury. Remove all rings, watches and jewelry.

- a) Inspect that if the ground wire under the chassis is missing or damaged.
- b) Inspect the following areas for burnt, chafed, corroded pinched and loose wires:
 - 1) Ground control box interior.
 - 2) Hydraulic manifold wiring in hydraulic tray.

- 3) Battery wiring in battery tray.
- 4) Platform control box interior.
- c) Turn the key switch to Platform Control and pull out the red Emergency Stop button to the on position at both the ground and platform controls.
- d) Raise the platform approximately 2.5m/8ft 2in from the ground.
- e) Lift the safety arm, move the safety arm to the middle of the scissor bushing and rotate it down to the vertical position.
- f) Lower the platform until the safety arm is in full contact with the bushing.

⚠WARNING

Keep hands away from the safety arm when lowering the platform.

- a) Inspect the following areas for burnt, chafed, corroded pinched and loose wires:
 - 1) Scissor arm wiring.
 - 2) ECU to platform.
 - 3) All wire harness connectors to platform control box.
- b) Lift the platform, replace the safety arm to installation position.
- c) Lower the platform.

2.6.3.4 Inspect the tires and wheels

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

Maintaining the tires and wheels is essential to safe operation and good performance. Tire and/or wheel failure could result in a machine tip-over. Component damage may also result if problems are not discovered and repaired in a timely fashion.

- a) Check all tire treads and sidewalls for cuts, cracks, punctures and unusual wear.
- b) Check each wheel for damage, bends and cracked welds.
- c) Remove the cotter pin and check the castle nut for proper torque.

Always replace the cotter pin with a new one when reinstalling.

- d) Install and fasten the new cotter pin.

2.6.3.5 Inspect emergency stop function

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

Proper emergency stop function is essential to safe operation. Invalid emergency stop cannot shut off the power supply and cannot stop all functions of the machine, resulting in a dangerous situation.

When selecting and operating a ground controller, its safety functions take precedence over the platform controller.

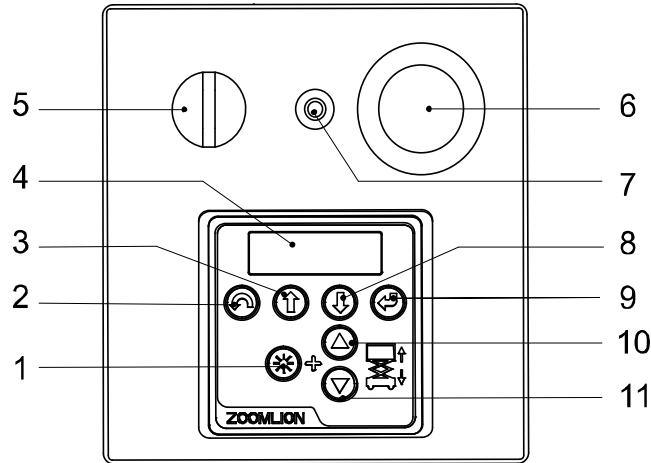


Figure 2-9 Ground control panel

Table 2-4 Ground control panel instruction

No.	Name	No.	Name
1	Lifting enable button	2	Menu escape button
3	Menu up button	4	LCD diagnostic
5	Key switch	6	Emergency stop
7	10A breaker	8	Menu down button
9	Menu enter button	10	Platform up button
11	Platform down button		

- a) Turn the key switch to Ground Control and pull out the red Emergency Stop button to the on position at both the ground and platform controls,
- b) Press the red Emergency Stop button to the off position at ground control.
Result: the machine has no movements.
- c) Turn the key switch to Platform Control and pull out the red Emergency Stop button to the on position at both the ground and platform controls,
- d) Press the red Emergency Stop button to the off position at platform control.
Result: the machine has no movements.

The red Emergency Stop button can stop all operations of the machine.

2.6.3.6 Test key switch

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

Proper key switch action and response are essential to the safe operation. The key switch can be switched

by the ground controller or platform controller. Invalid key switch could result in dangerous operation.

Operator must use the platform controller on the ground when performing this step.

- a) Pull out the red Emergency Stop button to the on position at both the ground and platform controls.
- b) Turn the key switch to platform control.
- c) Inspect the raising and lowering functions at ground control.

Result: the machine has no movements.

- d) Turn the key switch to ground control.
- e) Inspect the raising and lowering functions at platform control.

Result: the machine has no movements.

- f) Turn the key switch to off position.

Result: the machine has no movements.

2.6.3.7 Test the horn

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

Horn is used to alert operators and ground personnel of machine proximity and motion. A malfunctioning horn cannot alert the ground personnel to a dangerous or unsafe condition.

- a) Turn the key switch to Platform Control and pull out the red Emergency Stop button to the on position at both the ground and platform controls,

Press the horn button at the platform control.

- b) Result: the horn should sound.

2.6.3.8 Test the drive brakes

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

Proper brake action is essential to safe machine operation. The drive brake should operate smoothly, free of hesitation, jerking and unusual noise. There is no difference in the appearance of the tire before and after the release of the brakes.

Select a test area that is firm, level and free of obstructions. Be sure the platform extension deck is fully retracted and the platform is in the stowed position.

- a) Mark a test line on the ground for reference.
- b) Turn the key switch to Platform Control and pull out the red Emergency Stop button to the on position at both the ground and platform controls.
- c) Lower the platform to stowed position.

d) Press the drive function selection button.

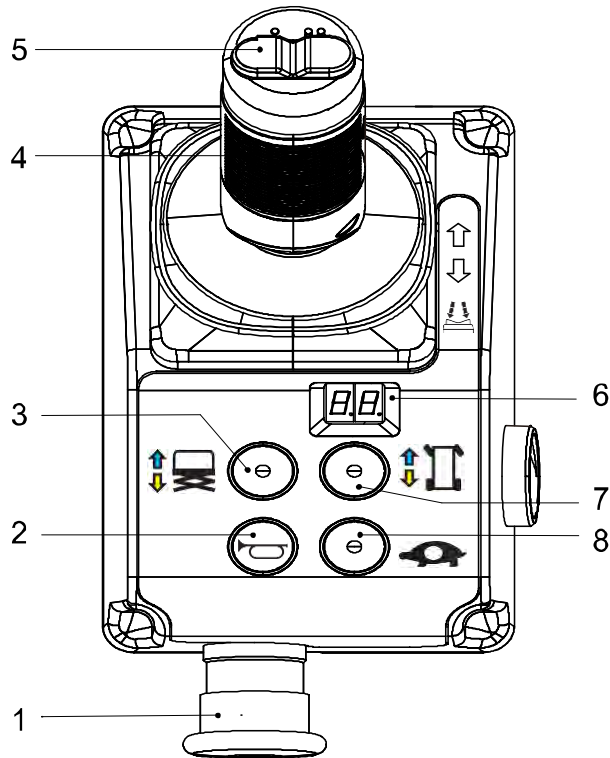


Figure 2-10 Platform control panel

Table 2-5 Platform control panel instruction

No.	Name	No.	Name
1	Emergency stop switch	2	Horn Button
3	Lift function button	4	Control handle
5	Steering thumb button	6	LED Readout
7	Drive function button	8	Drive speed button

- a) Choose a point on the machine (i.e., contact patch of a tire) as a visual reference for use when crossing the test line.
- b) Bring the machine to top drive speed before reaching the test line. Release the drive joystick when your reference point on the machine crosses the test line.
- c) Measure the distance between the test line and your machine reference point. The maximum braking distance on flat ground is $50\text{cm} \pm 10\text{cm}/20\text{in} \pm 4\text{in}$, the maximum braking distance on slope braking is $100\text{cm} \pm 10\text{cm}/40\text{in} \pm 4\text{in}$.
 - 1) Result: the machine will stop within the specified braking distance, passing the test.
 - 2) Result: the machine will not stop within the specified braking distance.
 - 3) The brakes must be able to hold the machine on any slope it is able to climb.
 - 4) Replace the brake. Repeat the above process from the step a until the test qualified.

2.6.3.9 Test the top drive speed - stowed position

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

Proper drive function is essential to safe operation. The drive function should respond quickly and smoothly to operator control. Drive performance should also free of hesitation, jerking and unusual noise over the entire speed range.

Select a test area that is firm, level and free of obstructions.

- a) Create start and finish lines by marking two lines on the ground $10\text{m}/32\text{ft}10\text{in}$ apart.
- b) Turn the key switch to Platform Control and pull out the red Emergency Stop button to the on position at both the ground and platform controls.
- c) Lower the platform to stowed position.
- d) Press the drive function selection button.
- e) Choose a point on the machine (i.e., contact patch of a tire) as a visual reference for use when crossing the test line.
- f) Continue at full speed and begin to recording the time when your reference point crosses the start line.
- g) Record the time when the machine reference point crosses the finish line. The time is between 10.6 ~ 12 s.

2.6.3.10 Test the drive speed - raised position

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

Proper drive function is essential to safe operation. The drive function should respond quickly and smoothly to operator control. Drive performance should also free of hesitation, jerking and unusual noise

over the entire speed range.

Select a test area that is firm, level and free of obstructions.

- a) Create start and finish lines by marking two lines on the ground 10m/32ft 10in apart.
- b) Turn the key switch to Platform Control and pull out the red Emergency Stop button to the on position at both the ground and platform controls.
- c) Press the lifting function selection button.
- d) Press and hold the function enable button on the control handle, and push the handle to raise the platform to a safe height (the bottom of the platform is about 2.4 m/7ft 10in above the ground).
- e) Press the drive function selection button.
- f) Choose a point on the machine (i.e., contact patch of a tire) as a visual reference for use when crossing the test line.
- g) Continue at full speed and beginning timing when your reference point crosses the start line.
- h) Continue at full speed and note the time when the machine reference point crosses the finish line. The time is between 75-120s.

2.6.3.11 Test slow drive speed - stowed position

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

Proper drive function is essential to safe operation. The drive function should respond quickly and smoothly to operator control. Drive performance should also free of hesitation, jerking and unusual noise over the entire speed range.

Select a test area that is firm, level and free of obstructions.

- a) Create start and finish lines by marking two lines on the ground 10m/32ft 10in apart.
- b) Turn the key switch to Platform Control and pull out the red Emergency Stop button to the on position at both the ground and platform controls.
- c) Lower the platform to stowed position.
- d) Press the drive function selection button.
- e) Choose a point on the machine (i.e., contact patch of a tire) as a visual reference for use when crossing the test line.
- f) Continue at full speed and beginning timing when your reference point crosses the start line.
- g) Continue at full speed and note the time when the machine reference point crosses the finish line, the time is between 20s and 24s.

2.6.3.12 Hydraulic oil analysis

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

Replace or test hydraulic oil is essential to good machine performance and service life. Dirty hydraulic oil and suction filters can affect machine performance, and continuous use can damage components. This operation should be performed more frequently under severe working conditions.

See 2.6.6.1 Test or Replace Hydraulic Oil.

2.6.3.13 Inspect hydraulic oil tank cap venting system

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

Free-breathing tank is essential to good machine performance and service life. Unclean or clogged venting caps can cause poor machine performance. Extremely dirty conditions may require more often inspection.

- a) Remove the venting cap from the tank.
- b) Venting inspection.
 - 1) Result: air passes through the venting cap.
 - 2) Result: if air does not pass the venting cap, clean or replace the venting cap. Proceed to step c.
 - 3) When checking for positive venting, air should pass freely through the venting cap.
- c) Carefully clean the tank vent cap with a mild solvent. Dry with low pressure compressed air. Repeat step b.
- d) Install the venting cap.

2.6.3.14 Inspect tray latch components

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

Maintaining the module tray latch components in good condition is essential to good performance and service life. Damaged latch components may result in module trays opening unexpectedly, creating an unsafe operating condition.

- a) Inspect each module tray latch and related components for wear.
- b) Using light oil, apply a few drops to each of springs and to the sides of the latch mechanism.

2.6.3.15 Inspect down limit switch, level sensor and pothole limit switch

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

Proper limit switch is essential to good performance and safe operation. A faulty limit switch could cause result in reduced machine performance and a potential unsafe operating condition.

Select a test area that is firm, level and free of obstructions.

- a) Down limit switch

- 1) Turn the key switch to ground control.
- 2) Raise the platform above safe working height greater than 2.4m/7ft 10in.
- 3) Lower the platform.
- 4) Result: platform will stop raising at the height of 2.4m/7ft 10in. Press the down button again to lower the platform. Proper down limit switch.
- 5) Result: platform does not stop raising at the height of 2.4m/7ft 10in. Check if the down limit switch and metal activates on the fixed shaft are loose. OR replace down limit switch.

⚠WARNING

Keep hands away from the safety arm when lowering the platform.

- a) Tilt switch
 - 1) Move the machine onto a grade which exceeds the rating of the level sensor. Refer to the serial label on the machine.
 - 2) Press the lift function button, attempt to raise the platform to approximately 2.4m/7ft 10in.
 - 3) Result: the ground controls LCD displays "LL", the alarm sounds. The machine is functioning properly.
 - 4) Result: diagnostic display does not shows "LL", the alarm does not sound. Adjust or replace the level sensor.
- b) Pothole limit switch
 - 1) Lower the platform to stowed position. Move the machine to a level ground.
 - 2) Place a wooden block approximately 5cm/2in tall under the right pothole guard.
 - 3) Attempt to raise the platform to approximately 2.4m/7ft 10in.
 - 4) Result: the pothole guard contacts the block and does not fully deploy. The diagnostic display shows code 18, alarm sounds. Machine functions normally:
 - 5) Result: the pothole guard contacts the block and does not fully deploy. The diagnostic display does not show code 18, alarm does not sound. The machine can continue to rise. Adjust or replace the pothole limit switch.

2.6.3.16 Inspect up limit switch

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

Proper limit switch is essential to good performance and safe operation. A faulty limit switch could cause result in reduced machine performance and a potential unsafe operating condition.

Select a test area that is firm, level and free of obstructions.

- a) Turn the key switch to Ground Control, and attempt to raise the platform to approximately 2.4m/7ft 10in.
- b) Lift the safety arm, move the safety arm to the middle of the scissor bushing and rotate it down to the vertical position.
- c) Lower the platform until the safety arm is in full contact with the bushing.

⚠WARNING

Keep hands away from the safety arm when lowering the platform.

- a) Open the limit switch cover on the chassis.
- b) Slightly raise the platform, restore the safety arm.
- c) Use the ground controller to lift the platform while pressing the up limit switch arm to activate the up limit switch.
 - 1) Result: platform stops raising. The machine is functioning properly.
 - 2) Result: platform continues to raise. Adjust or replace up limit switch.

2.6.4 Maintenance every 6 months

2.6.4.1 Inspect platform overload system

This inspection is conducted every 500 hours or 6 months, whichever comes first. Check immediately when the machine has an overload fault.

Testing the platform overload system regularly is essential to safe machine operation. Continued use of an improperly operating platform overload system result in the system not sensing an overload platform condition. Machine stability could be compromised resulting in the machine tipping over.

The platform overload system is designed to prevent machine operation in the event the platform is overloaded. Platform overload system is composed of two electrical components: overload pressure transducer and the angel sensor.

The overload pressure transducer is used to determine the pressure for feedback to the platform overload system. When the pressure is too high, the pressure sensor will send a signal to ECU and all functions of the machine will stop until the excess load is removed from the platform.

Angle sensor, located at the fork 1 of scissor arm, is used to measure the tilt angle of the scissor to determine the height of the platform.

- a) Move the machine to a firm and level ground.
- b) Place heavy objects on the platform (286kg/630lbs for ZS1414, 385kg/850lbs for ZS1212 / ZS1012, 495kg/990lbs for ZS0812, 253kg/560lbs for ZS0808, 418kg/920lbs for ZS0608, 253kg/560lbs for ZS0607, and 264kg/580lbs for ZS0407).

- c) Turn the key switch to Ground Control, and attempt to raise the platform to approximately 2.4m/7ft 10in.
 - 1) Result: alarm will sound, display shows OL.
 - 2) Result: alarm does not sound, and display does not show OL. Platform continues to raising
 - 3) Perform load calibration again or contact professional service personnel.

2.6.4.2 Replace the hydraulic tank venting cap

This inspection is conducted every 500 hours or 6 months, whichever comes first. Check immediately when the machine has an overload fault.

The hydraulic tank is a vented tank. There is an air filter inside the venting cap that may become clogged over time. If the vent cover fails or is improperly installed, once the impurities enter the hydraulic system, it may cause damage to the components. Extremely dirty conditions may require more often inspection.

- a) Remove the venting cap.
- b) Replace a new hydraulic tank venting cap.

2.6.4.3 Replace hydraulic filters

This inspection is conducted every 1,000 hours or year, whichever comes first.

Proper filter condition is essential to good machine performance and service life. Dirty or clogged filters will affect machine performance and damage components. Under hostile environment and bad operating conditions, the filter should be checked and replaced more frequently.

▲WARNING

Contact with hot oil can cause serious burns.

- a) Clean the hydraulic fluid that is spilled around the filter. Use a wrench to remove the filter.
- b) Apply a layer of hydraulic oil to the seal of the new filter.
- c) Install a new filter and tighten it by hand.
- d) Use the marker to mark the replacement time and date on the filter replacement form.
- e) Turn the key switch to Ground Control and pull out the red Emergency Stop button to the on position at both the ground and platform controls,
- f) Press and hold down the lift function selection button.
- g) Check the leak of filter.
- h) Clean the hydraulic fluid that is spilled around the filter.

2.6.5 Maintenance every year

The scissor wear-resistant slider inspection is performed every 1000 hours or every 12 months, whichever

comes first.

Maintaining the condition of the scissor wear pads is essential to safe machine operation. Continued use of worn out wear pads may result in component damage and unsafe operating conditions.

Check the wear-resistant slider with the platform stowed.

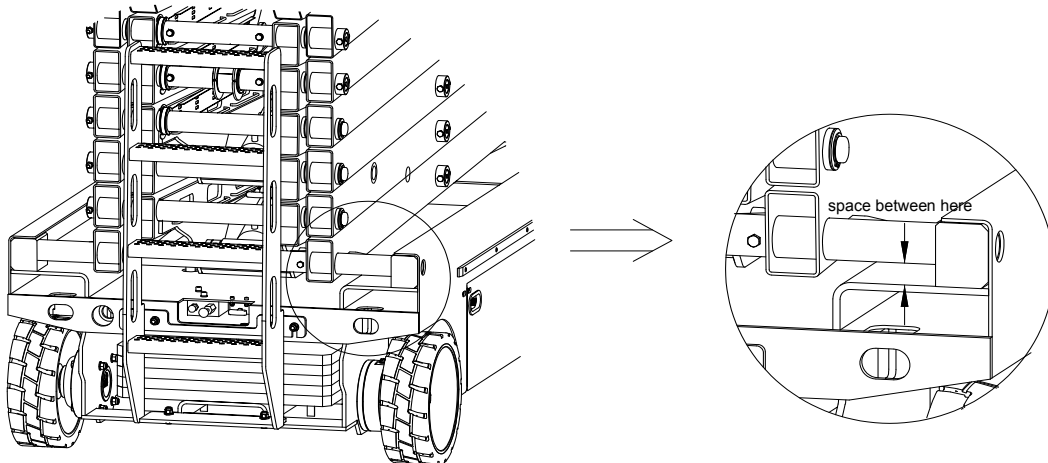


Figure 2-11 Inspection of wear pad

- a) Measure the distance between the number one inner arm across tube and the chassis deck at the ground control side of the non-steer end of the machine.
 - 1) For ZS1414 Series machines.

Result: the measurement is 49 mm/2in or more. Proceed to step b.

Result: the measurement is less than 49mm/2in. Replace wear pads.
 - 2) For ZS1212/ZS1012/ZS0812/ZS0808/ZS0608 Series machines.

Result: the measurement is 24mm/1in or more. Proceed to step b.

Result: the measurement is less than 24mm/1in. Replace wear pads.
 - 3) For ZS0607 Series machines.

Result: the measurement is 39 mm/2 in or more. Proceed to step b.

Result: the measurement is less than 39mm/2 in. Replace wear pads.
 - 4) For ZS0407 Series machines.

Result: the measurement is 36 mm/1 in or more. Proceed to step b.

Result: the measurement is less than 36mm/1 in. Replace wear pads.
- b) Apply a thin layer of dry film lubrication to the area of the chassis where the scissor wear pads make contact.

2.6.6 Maintenance every 24 months

Good quality hydraulic oil is essential to good machine performance and service life. Dirty hydraulic oil and suction filters can affect machine performance, and continuous use can damage components. This operation should be performed more frequently in harsh working conditions.

If the hydraulic oil has not been replaced for two years, it should be tested once every quarter, and the hydraulic oil should be replaced if the test fails.

This procedure should be conducted once every quarter. The hydraulic oil should be replaced if the test fails.

We suggest that changing time of the hydraulic oil is as follows:

- a) First changing: operating for 500 hrs after commissioning.
- b) Second and subsequent changing: run for 2000 hours or once every two years.

The above recommended intervals are suitable for most applications. Higher temperatures, pressures and adverse working conditions will accelerate oil failure, so hydraulic oil should be replaced earlier. For small load work, the oil change time can be extended.

For hydraulic oil types and models, please refer to Table 2-6 Hydraulic oil technical parameters (not used to specify the type and parameters of hydraulic oil). Please select the hydraulic oil of the appropriate brand and technical parameters according to the specific use environment of the equipment. For special environments or users with special requirements, please contact ZOOMLION or hydraulic oil manufacturers.

DO NOT mix oils of different brands or types, as they contain different additives which may cause negative effects. If mixing of hydraulic oils is unavoidable, permission must be obtained from the hydraulic oil manufacturer. After-sales service of ZOOMLION does not cover machine malfunction caused by hydraulic oil mixing.

Table 2-6 Technical parameters of hydraulic oil

Technical Parameters Brand & Type	ISO Viscosity Grade	Pour Point °C/°F	Flash Point °C/°F	Kinematic viscosity cSt(40°C /104°F)	Viscosity index
Great Wall 4632 grease non-flammable hydraulic oil N32 (Eco-Friendly)	32	-20/-4	270/518	28.8-35.2	180
Great Wall Ground 10 aviation hydraulic fluid	—	-55/-67	107/225	10.53(50°C /122°F)	120
Great Wall ZhuoLi L-HS 15 Ultra-low temperature hydraulic	15	-57/-71	164/327	15.35	172
Great Wall ZhuoLi L-HS 32 Ultra-low temperature hydraulic	32	-48/-54	224/435	31.35	166
Great Wall ZhuoLi L-HS 46 Ultra-low temperature hydraulic	46	-43/-45	238/460	45.81	170
Great Wall ZhuoLi L-HV 15 Low temperature hydraulic oil	15	-45/-49	173/343	15.51	140
Great Wall ZhuoLi L-HV 32 Low temperature hydraulic oil	32	-39/-38	231/448	33.4	150
Great Wall ZhuoLi L-HV 46 Low temperature hydraulic oil	46	-37/-35	240/464	48.7	150
Great Wall ZhuoLi L-HV 68 Low temperature hydraulic	68	-35/-31	238/460	70.47	150
Great Wall ZhuoLi L-HM 46 Anti-wear hydraulic oil (high pressure)	46	-15/5	240/464	45.8	97
Great Wall ZhuoLi L-HM 68 Anti-wear hydraulic oil (high pressure)	68	-13/9	245/473	67.4	98
Mobil SHC Aware H 32 (Eco-Friendly)	32	-30/-22	185/365	32	140

Table 2-6 Technical parameters of hydraulic oil

Technical Parameters Brand & Type	ISO Viscosity Grade	Pour Point °C	Flash Point °C	Kinematic viscosity cSt(40°C)	Viscosity index
Clarity Synthetic EA Hydraulic Oil	46	-44/-47	221/430	46	180
Mobil DTE 10 Ultra 22	22	-54/-65	224/435	22.4	164
Mobil DTE 10 Ultra 32	32	-54/-65	250/482	32.7	164
Mobil DTE 10 Ultra 46	46	-45/-49	232/450	45.6	164
CaltexRando Rando HDZ 15	15	-60/-76	150/302	15.7	144
CaltexRando Rando HDZ 32	32	-49/-56	204/399	33	150
CaltexRando Rando HDZ 46	46	-47/-53	216/421	46.7	153
CaltexRando Rando MV 15	15	-42/-44	154/309	15.8	155
CaltexRando Rando MV 32	32	-36/-33	210/410	33.5	154
CaltexRando Rando MV 46	46	-33/-27	214/417	44	154

Proper use of hydraulic oil: please note the corresponding oil viscosity and temperature limit. Under normal operating conditions, the recommended oil temperature should be controlled between 30 °C/86°F and 60 °C/140°F and the maximum is not more than 90 °C/194°F. The oil temperature affects the oil viscosity and the thickness of the oil film. High temperatures also shorten the service life of oil seals and other rubber components, and the oil also evaporates and oxidizes.

Add the corresponding type of hydraulic oil according to the customer's requirements before ex-factory. When the working environment temperature changes beyond the working range of the hydraulic oil, please replace other suitable types of hydraulic oil according to the actual situation. Considering the safety of the components and the efficiency of the work, it is recommended that the starting temperature of the equipment is higher than the selected hydraulic oil pour point temperature of 25°C/77°F or more.

Cleanliness of the hydraulic oil upon delivery is NAS9 (ISO4406 18/15), and for normal operation, the cleanliness should not be lower than NAS10 (ISO4406 19/16). We suggest that the hydraulic oil should be checked every 6 months, and the oil should be sampled at least once upon the time for oil changing.

The oil sample can be sent to the hydraulic oil manufacturer or qualified third-party testing agency for analysis and to determine whether it is still usable.

This procedure should be conducted once every quarter. The hydraulic oil should be replaced if the test fails.

- a) Disconnect the battery pack from the machine.

⚠WARNING

Operation in a live circuit can result in serious injury or death. Remove rings, watches and other jewelry.

- a) Open the hydraulic tray.
- b) Mark and disconnect the oil return tube from hydraulic filter to the hydraulic tank and remove the line from the tank. Cover the pipe joint to protect it from dust.
- c) Loosen the hydraulic tank fastener and remove the hydraulic tank.
- d) Remove the drain plug from the bottom of the hydraulic tank.
- e) Put the oil in a suitable container.

⚠WARNING

The jetted hydraulic oil can burn the skin. Slowly loosen the hydraulic joint to allow the oil pressure to gradually weaken. Do not let the oil spray out.

- a) Clean up and properly dispose any oil that may have spilled.
- b) Clean the hydraulic tank with a mild solvent and thoroughly air dry.
- c) Tighten the drain plug.
- d) Replace the hydraulic tank and install the fasteners that tighten the hydraulic tank.
- e) Oil the hydraulic pump and connect it to the tank.
- f) Connect the hydraulic pump tubing to the return filter.
- g) Start the oil pump and fill the entire hydraulic system with hydraulic oil to remove the air from the hydraulic system.

⚠WARNING

Operation without oil may result in damage to the hydraulic pump. When filling the hydraulic system, carefully evacuate the tank. Do not expose the hydraulic pump to cavitation.

Service and Maintenance Manual

Section 3 Electrical System Maintenance



SECTION 3 ELECTRICAL SYSTEM MAINTENANCE

3.1 Electrical System Trouble shooting

If the platform controls LED or ground controls LCD diagnostic readout displays following codes, the fault condition must repaired or removed before resuming machine operation.

3.1.1 Fault code

Table 3-1 Fault code list

Code	Condition	Machine Reaction
01	System initialization Fault	Disable All Motion
02	System communication Fault	Disable All Motion
03	Invalid option setting Fault	Disable All Motion
04	Calibration Fault	Disable All Motion
09	GPS communication Fault	Disable All Motion
10	CAN communication Fault	Disable All Motion
12	Chassis Up or Down Switch ON	Disable Chassis Control
14	CAN communication Fault (Pump motor controller)	Disable All Motion
15	CAN communication Fault (Drive motor controller)	Disable All Motion
18	Pothole Guard Fault	Disable Lifting and Driving
20	BMS Comm Fault	Disable Lifting and Driving
21	Disch Temp Fault I	Warning Only
22	Disch Current High Fault I	Warning Only
23	Total Voltage Low Fault I	Disable Lifting, and Driving Lift Slow to Drive Speed

Table 3-1 Fault code list

Code	Condition	Machine Reaction
24	Cell Voltage Low Fault I	Disable Lifting, and Driving Lift Slow to Drive Speed
25	Cell Voltage Low Fault II	Disables All Motion
26	Sharp Diff in Voltage	Disable All Motion
27	Sharp Diff in Temp	Disable All Motion
28	Disch Current High Fault II	Disable All Motion
29	Disch Temp Fault II	Disable All Motion
31	Pressure Sensor Fault	Disable All Motion
32	Angle Sensor Fault	Disable All Motion
35	Pressure Sensor 2 Fault	Disables All Motion
36	Battery Drain Alarm	Lift Slow to Drive Speed
37	Battery Drain Shutdown	Disable All Motion
38	SPI communication Fault	Disable All Motion
42	Platform Left Button ON	Diagnostic Message Only
43	Platform Right Button ON	Diagnostic Message Only
46	Platform Enable Button ON	Disable Platform Control
47	Joystick Not In Neutral	Lift Slow to Drive Speed

Table 3-1 Fault code list

Code	Condition	Machine Reaction
48	Horn Coil Fault	Disable All Motion
52	Forward Coil Fault	Disable Lifting and Driving
53	Reverse Coil Fault	Disable Lifting and Driving
54	Lift Up Coil Fault	Disable Lifting and Driving
55	Lift Down1 Coil fault	Disable Lifting and Driving
56	Right Turn Coil Fault	Disable Lifting and Driving
57	Left Turn Coil Fault	Disable Lifting and Driving
58	General Brake Coil Fault	Disable Lifting and Driving
59	Parallel Coil Fault	Disable Lifting and Driving
60	Motor Controller Fault	Disable All Motion
61	Motor Controller Current Sensor Fault	Disable All Motion
62	Motor Controller Hardware Failsafe Fault	Disable All Motion
63	Motor Controller Motor Short Fault	Disable All Motion
64	Motor Controller SRO Fault	Disable All Motion
65	Motor Controller Throttle Fault	Disable All Motion
66	Motor Controller Emergency Reverse Fault	Disable All Motion
67	Motor Controller HPD Fault	Disable All Motion
68	Total Voltage Low Fault II	Disable All Motion

Table 3-1 Fault code list

Code	Condition	Machine Reaction
69	High Neutral Current Fault (Zapi Only)	Disable All Motion
70	Steer Input Out of Range (Zapi Only)	Disable All Motion
71	Motor Controller Main Contractor Fault	Disable All Motion
72	Motor Controller Over Voltage Fault	Disable All Motion
73	Motor Controller Thermal Cutback Fault	Disable All Motion
74	Motor Controller Over Heat Fault	Disable All Motion
75	Motor Controller Pump Motor Fault	Disable All Motion
76	Motor Controller Left Drive Motor Fault(for DC or DC-Li series) Motor Controller Master Node Fault(for AC or AC-Li series)	Disable All Motion
77	Motor Controller Right Drive Motor Fault(for DC or DC-Li series) Motor Controller Master Node Fault(for AC or AC-Li series)	Disable All Motion
78	MC Pump Motor Short	Disable Lifting and Driving
79	Left Drive Motor Short Fault	Disable All Motion
80	Over 80% Load Warning	Diagnostic Message Only
81	Right Drive Motor Short Fault	Disable All Motion
82	Left Brake Coil Fault	Disable Lifting and Driving
83	Right Brake Coil Fault	Disable Lifting and Driving
84	Motor Post Shorted	Disable Lifting and Driving
85	Brake Release Switch On	Diagnostic Message Only

Table 3-1 Fault code list

Code	Condition	Machine Reaction
86	Brake Release Not Showed	Diagnostic Message Only
87	Brake Release	Diagnostic Message Only
89	Motor Field Open	Disable Lifting and Driving
90	Platform Load is over 90%	Diagnostic Message Only
91	Left Motor Field Short	Disable Lifting and Driving
92	Right Motor Field Short	Disable Lifting and Driving
93	Lift Down2 Coil fault	Disable Lifting and Driving
99	Over 99% Load Warning	Warning Only
0L	Overloaded Platform Fault	Disable All Motion
LL	Machine Tiled	Disable Lifting and Driving

3.1.2 Troubles shooting method

Table 3-2 Trouble shooting method

Code	Trouble shooting Method
01	System Initialization Fault: ECU may be malfunctioning, replace it.
02	System Communication Fault: Check communications cable connections and other wiring. If that does not resolve the problem, try replacing the PCU or ECU.
03	Invalid Option setting Fault: Set appropriate option for this lift.
04	Calibration Fault: Re-calibration the system, or check the angle and pressure sensor.
09	GPS communication Fault: Check communications cable connections and other wiring. If that does not resolve the problem, try replacing the GPS module or ECU.
10	CAN communication Fault: Check communications cable connections and other wiring. If that does not resolve the problem, try replacing the CAN application or ECU.
12	Chassis Up or Down Fault: Check communications cable connections and other wiring. If that does not resolve the problem, try replacing the ECU.
14	CAN communication Fault (Pump motor controller): Check communications cable connections between pump motor controller and ECU. If that does not resolve the problem, try replacing the Pump motor controller or ECU.
15	CAN communication Fault (Drive motor controller): Check communications cable connections between drive motor controller and ECU. If that does not resolve the problem, try replacing the drive motor controller or ECU.
18	Pothole Guard Fault: Check that the pothole guards are extended, check the pothole limit switches. Check wires to the switches, check the down limit switch and connections.
20	BMS Communication Fault: Check communications cable connections and other wiring between ECU and BMS. If that does not resolve the problem, try replacing the BMS or ECU.
21	Disch Temp Fault I: Lower capacity or travel slowly.
22	Disch Current High Fault I: Lower capacity or travel slowly.

Table 3-2 Trouble shooting method

Code	Trouble shooting Method
23	Total Voltage Low Fault I: Restart the key, charge immediately.
24	Cell Voltage Low Fault I: Restart the key, charge immediately.
25	Cell Voltage Low Fault II: Switch off the key, charge immediately.
26	Sharp Diff in Voltage: Rest for a while, then power on to see if the fault disappears. If not, charge timely.
27	Sharp Diff in Temp: Rest for a while, then power on. If the fault disappears, the device could proper function.
28	Disch Current High Fault II: Stop operation, and power on again. If the fault disappears, lower capacity or travel slowly.
29	Disch Temp Fault II: Stop operation, and power on again after a period of rest. If the fault disappears, lower capacity or travel slowly.
31	Pressure Sensor Fault: Check the wiring to the sensor and then the sensor it self. Also check to make sure that the correct option is properly selected (or not) for load sensing.
32	Angle Sensor Fault: Check the wiring to the sensor and then the sensor itself. Also check to make sure that the correct option is properly selected (or not) for load sensing.
35	Pressure Sensor 2 Fault: Check the wiring to the sensor and then the sensor itself. Also check to make sure that the correct option is properly selected (or not) for load sensing.
36	Limp Mode: Battery voltage is low, charge the battery.
37	Battery Drain Shutdown: Recharge.
38	SPI Communication Fault: Re-power, then check whether the fault still exists. If it is, please contact us.
42	Platform Left Turn Switch ON at power-up Message: Ensure that nothing is holding the Joystick Toggle Switches down. If OK, consider replacing the Joystick or PCU.
43	Platform Right Turn Switch ON at power-up Message: Ensure that nothing is holding the Joystick Toggle Switches down. If OK, consider replacing the Joystick or PCU.

Table 3-2 Trouble shooting method

Code	Trouble shooting Method
46	Platform Joystick Enable Switch ON at power-up Fault: Ensure that nothing is holding the Enable switch closed. Also check the neutral zone parameters. If OK, consider replacing the Joystick or PCU.
47	Platform Joystick not in neutral at power-up Message: Make sure that the Joystick is in the neutral (upright) position. Check the neutral zone parameter setting in the Labview Programmer. If it's OK, consider replacing the Joystick or the PCU.
52	Forward Coil Fault: Check the connections to the Coil's terminals and make sure they are tight. If so, check the coil itself to see if it is open or shorted.
53	Reverse Coil Fault: Check the connections to the Coil's terminals and make sure they are tight. If so, check the coil itself to see if it is open or shorted.
54	Lift Up Coil Fault: Check the connections to the Coil's terminals and make sure they are tight. If so, check the coil itself to see if it is open or shorted.
55	Lift Down1 Coil Fault: Check the connections to the Coil's terminals and make sure they are tight. If so, check the coil itself to see if it is open or shorted.
56	Right Turn Coil Fault: Check the connections to the Coil's terminals and make sure they are tight. If so, check the coil itself to see if it is open or shorted.
57	Left Turn Coil Fault: Check the connections to the Coil's terminals and make sure they are tight. If so, check the coil itself to see if it is open or shorted.
58	General Brake Coil Fault: Check the connections to the Coil's terminals and make sure they are tight. If so, check the coil itself to see if it is open or shorted.
59	Low Speed Coil Fault: Check the connections to the Coil's terminals and make sure they are tight. If so, check the coil itself to see if it is open or shorted.
60	Motor Controller Fault: Check the connections to motor and make sure they are tight. If so, check there are other detail faults.
61	Motor Controller Current Sensor Fault: Drive or Lift Motor may be overheating. Let the lift cool down. If that does not help, cycle power to reset the Motor controller. If the problem persists, check the wiring and if OK, try replacing the Motor Controller.
62	Motor Controller Hardware Failsafe Fault: Cycle power. If that does not resolve the issue check for noise sources. If still needed, try replacing the Motor Controller.

Table 3-2 Trouble shooting method

Code	Trouble shooting Method
63	Motor Controller Motor Short Fault: Check wiring first then cycle power. If needed replace controller.
64	Motor Controller SRO Fault: Look at motor enable delay with the Scissor Programmer, it may be too short. Make sure other Motor Controller parameters are properly selected.
65	Motor Controller Throttle Fault: Check wiring. Make sure the correct throttle type is selected in the Motor Controller.
66	Motor Controller Emergency Reverse Fault: Ensure that the Emergency Reverse Check parameter is off in the Motor Controller.
67	Motor Controller HPD Fault: Look at motor enable delay with the Scissor Programmer, it may be too short. Make sure other Motor Controller parameters are properly selected.
68	Total Voltage Low Fault II: Check battery voltage and charge if necessary. Check the battery connections and tight or clean. Check the voltage to the ECU and PCU.
69	High Neutral Current: The MC is sensing current in the motors when there should not be. This could occur anytime the MC thinks the brakes are on and the motors are still turning. This message sometimes comes just before other faults but should be ignored in those cases.
70	Steering Input Out of Range: There is an inappropriate voltage at the steering input of the ZAPI motor controller. The ZAPI may need to be “trained” for the three steering voltages (on Differential Steered machines). Or the steering voltage from the ECU was at some point outside of the range that was recorded during the “training” session. Re- train the ZAPI and/or check for fluctuating voltages due to lose wires, etc.
71	Motor Controller Main Contactor Fault: Check the connections to the main contactor. Replace the contactor if necessary. Replace the Motor Controller if necessary.
72	Motor Controller Over Voltage Fault. Check battery voltage and make sure the battery charger is not on. Then cycle power to the lift. If that does not resolve the issue, try replacing the Motor Controller.

Table 3-2 Trouble shooting method

Code	Trouble shooting Method
73	Motor Controller Thermal Cutback Fault: Drive or Lift Motor may be overheating. Let the lift cool down. If that does not help cycle power to reset the Motor controller. If that doesn't resolve the issue, replace the Motor Controller.
74	Motor Controller Motor Fault: Check connections to the motors. Cycle power to the lift and if that does not resolve the issue, replace the Motor Controller.
75	Motor Controller Pump Motor Fault: Check connections to the Pump Motor. Cycle power to the lift and if that does not resolve the issue, replace the Motor Controller.
76	Motor Controller Master Node Fault: Check connections to the motors, motor controller and contactor. In case the problem is not solved, contact a Zoomlion technician.
77	Motor Controller Master Node Fault(244 WARNING SLAVE): Check connections to the motors, motor controller and contactor. In case the problem is not solved, contact a Zoomlion technician.
78	Pump Motor Short Fault: Check connections to the pump motor. Cycle power to the lift and if that does not resolve the issue, replace the Motor Controller.
79	Left Drive Motor Short Fault: Check the Motor connections and make sure they are tight. Check the Motor for a short.
80	Over 80% Load Warning: Platform is getting close to its limit of weight. Consider not adding more load.
81	Right Drive Motor Short Fault: Check the Motor connections and make sure they are tight. Check the Motor for a short.
82	Left Brake Coil Fault: Check the connections to the Coil's terminals and make sure they are tight. If so, check the coil itself to see if it is open or shorted.
83	Right Brake Coil Fault: Check the connections to the Coil's terminals and make sure they are tight. If so, check the coil itself to see if it is open or shorted.

Table 3-2 Trouble shooting method

Code	Trouble shooting Method
84	Motor Post shorted: Check the connections of the controller and motor. Make sure the wiring is not shorted.
85	Brake Release Switch On: Check the wires to brake release switch or look for a stuck switch.
86	Brake Release Not Stowed: Check if the platform is below down limit height. Check the down limit switch and connections.
87	Brake Release Need Switch On: Check the wires to brake release switch or look for a stuck switch. Check the wires to the Toggle Switch or look for a stuck Toggle Switch.
89	Motor Field Open: The field voltage is different from 1/2 Vbatt. Check connections of the field wires or leakage to the vehicle frame.
90	Over 90% Load Warning: Platform is getting close to its limit of weight. Consider not adding more load.
91	Left Motor Field Short: Check connections of the field wires or leakage to the vehicle frame.
92	Right Motor Field Short: Check connections of the field wires or leakage to the vehicle frame.
93	Lift Down Coil 2 Fault: Check the connections to the Coil's terminals and make sure they are tight. If so, check the coil itself to see if it is open or shorted.
99	Over 99% Load Warning: Platform has reached its limit of weight. Do not add more load.
0L	Overloaded Platform Fault: Remove the excess load immediately.
LL	Machine Tilted Beyond Safe Limits Fault: If the machine is tilted, find a way to make it level. If the machine is level, check the wiring to the tilt sensor and then the sensor itself.

3.1.3 ECU pin definition

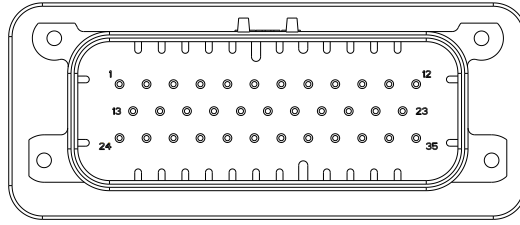


Figure 3-1 35 pin interface

Table 3-3 ECU 35 pin interface definition

Pin	Type	Function	Pin	Type	Function
1	Input	Chassis elevating control switch	2	Input	Reserve
3	Output	Reserve	4	Power	Valve-driven power
5	Power	Valve-driven power	6	Output	Lifting valve control
7	Output	Forward control	8	Output	Pump motor enable
9	Output	Pump motor speed control	10	Input	Left brake condition check
11	Input	Reserve	12	Input	Chassis lowering control switch
13	Communication	PCU communication +	14	Input	Chassis key switch
15	Power	GND	16	Input	Angle sensor
17	Input	Brake condition	18	Output	Lowering valve 1 control
19	Output	Left turn valve control	20	Output	Horn control

Table 3-3 ECU 35 pin interface definition

Pin	Type	Function	Pin	Type	Function
21	Output	Buzzer control	22	Input	Pothole switch
23	Input	Up limit switch	24	Communication	PCU communication -
25	Power	Working power	26	Input	Reserve
27	Output	Drive motor speed control	28	Input	Driver fault code
29	Output	Backward control	30	Output	Right turn valve control
31	Output	Parallel valve control/ Drive motor enable	32	Output	Brake valve control
33	Input	Right brake condition check	34	Input	Tilt switch
35	Input	Down limit switch			

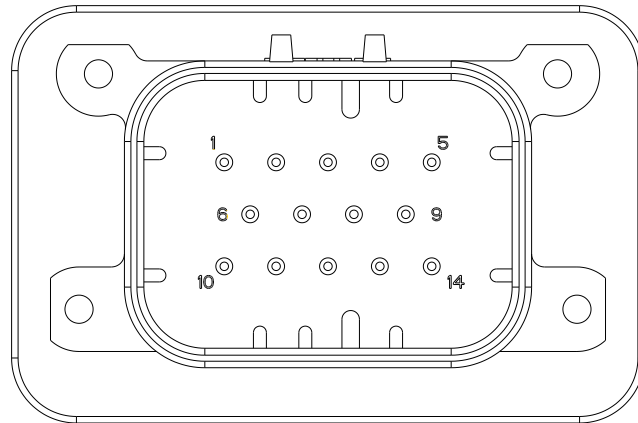


Figure 3-2 14 pin interface

Table 3-4 ECU 14 pin interface definition

Pin	Type	Function
1	Output	Alarm control
2	Input	Reserve
3	Output	Reserve
4	Communication	GPS Communication CANH
5	Communication	GPS Communication CANL
6	Input	Pressure sensor signal 1
7	Input	Pressure sensor signal 2
8	Output	Reserve
9	Output	Reserve
10	Output	Reserve
11	Input	Reserve
12	Input	Reserve
13	Input	Reserve
14	Output	Lowering valve 2 control

3.1.4 Electrical schematic

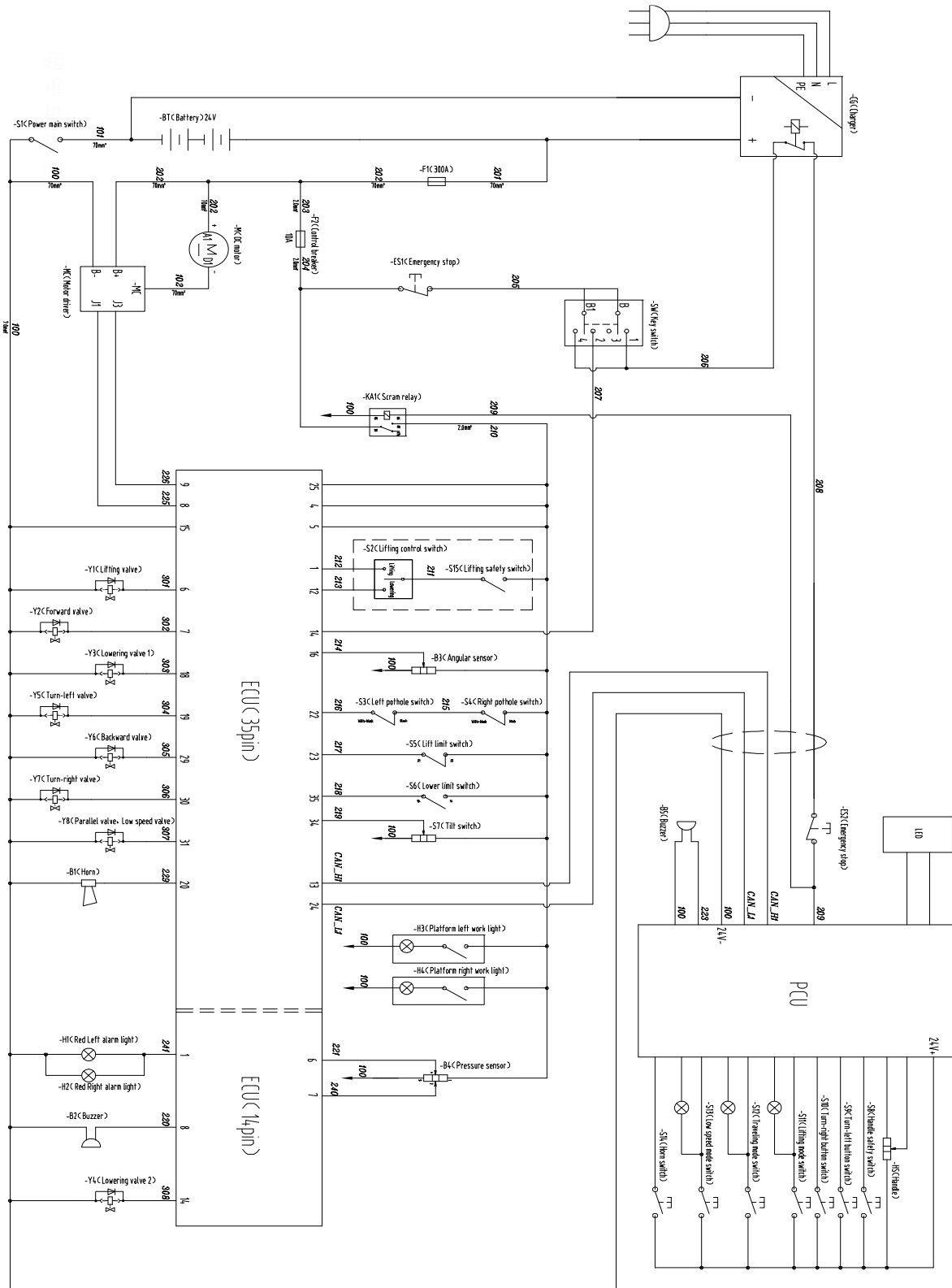


Figure 3-3 ZS1414HD/ZS1212HD/ZS1012HD Electrical schematic

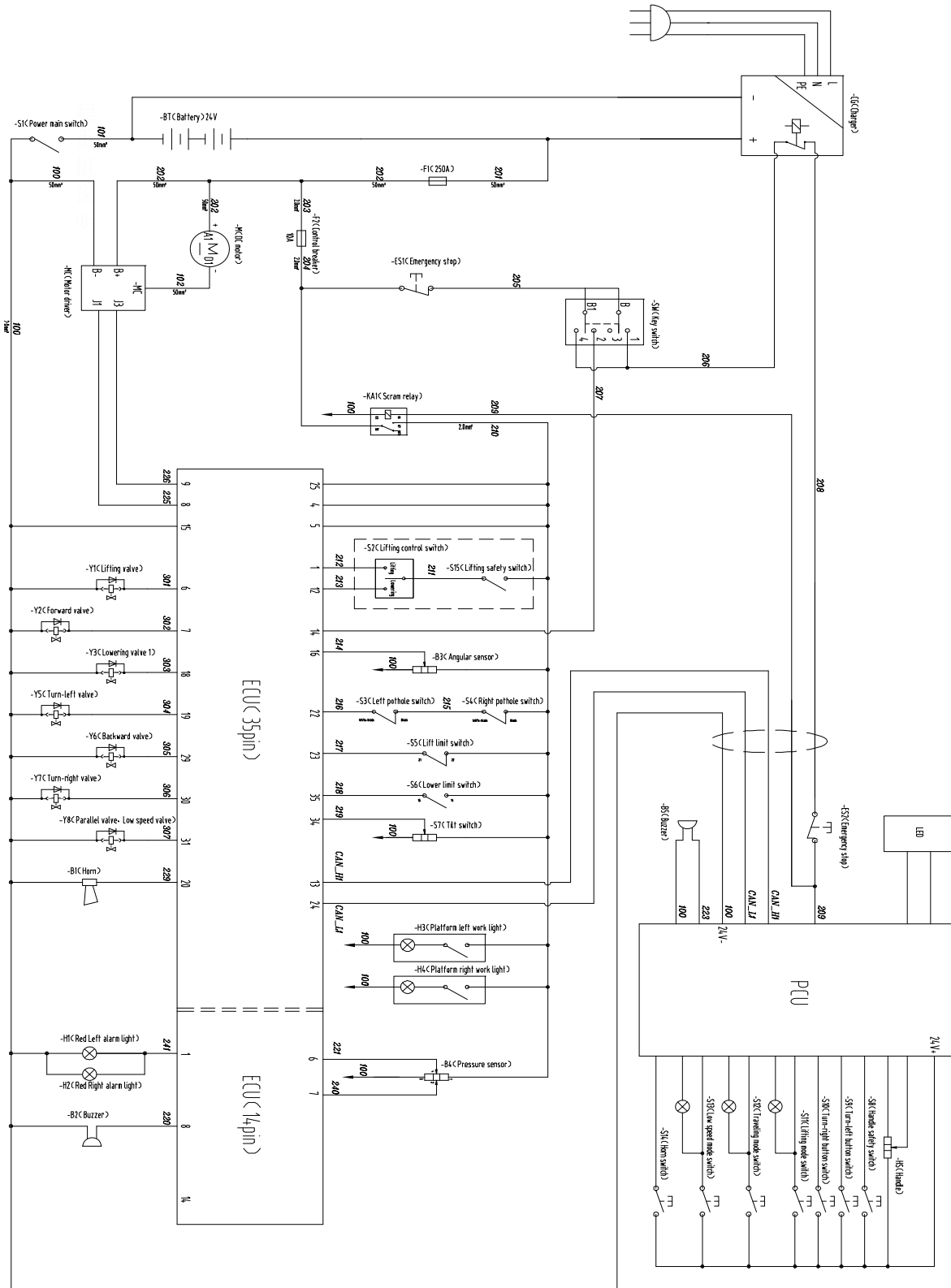


Figure 3-4 ZS0812HD/ZS0808HD/ZS0608HD Electrical schematic

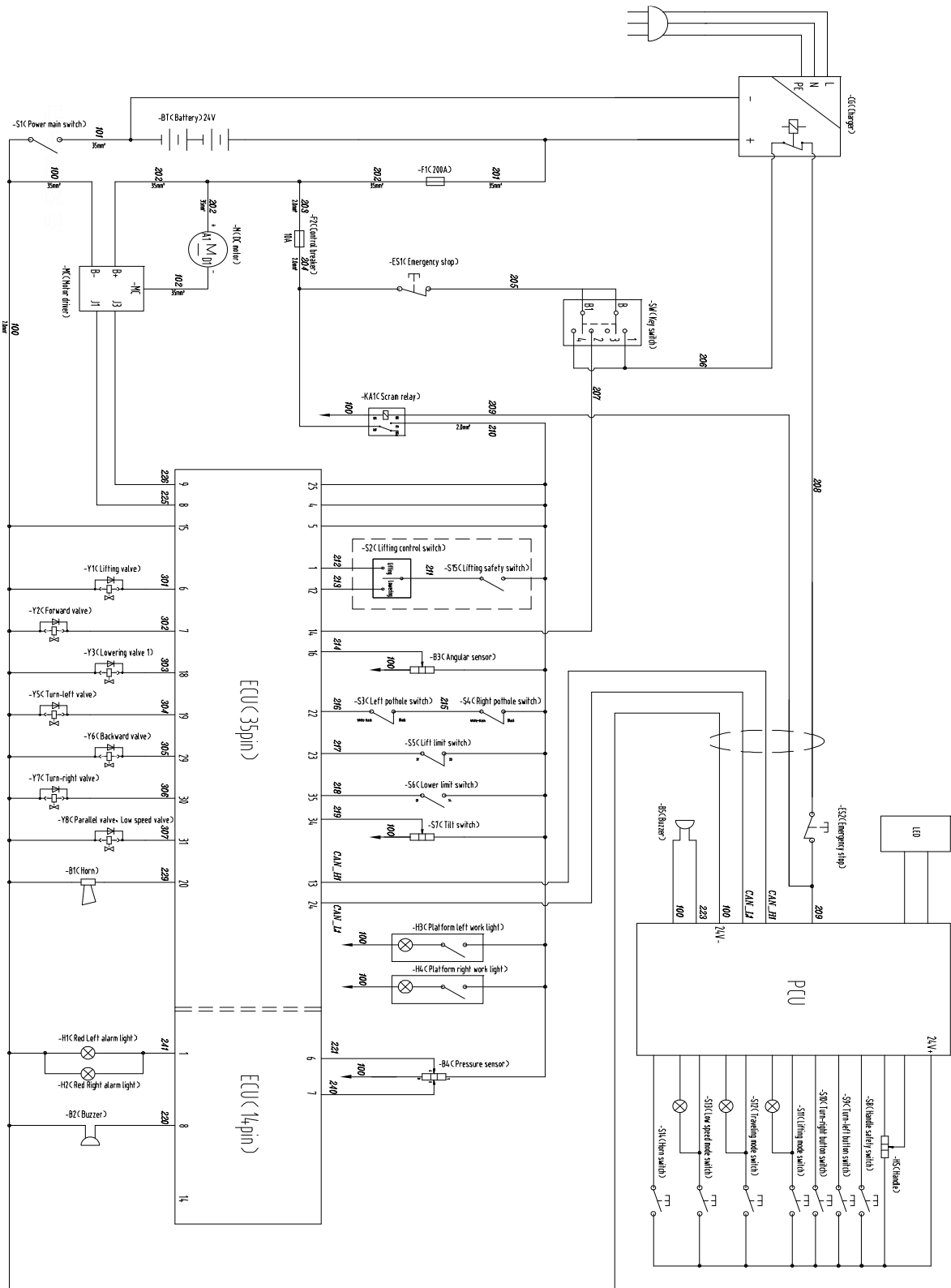


Figure 3-5 ZS0607HD Electrical schematic

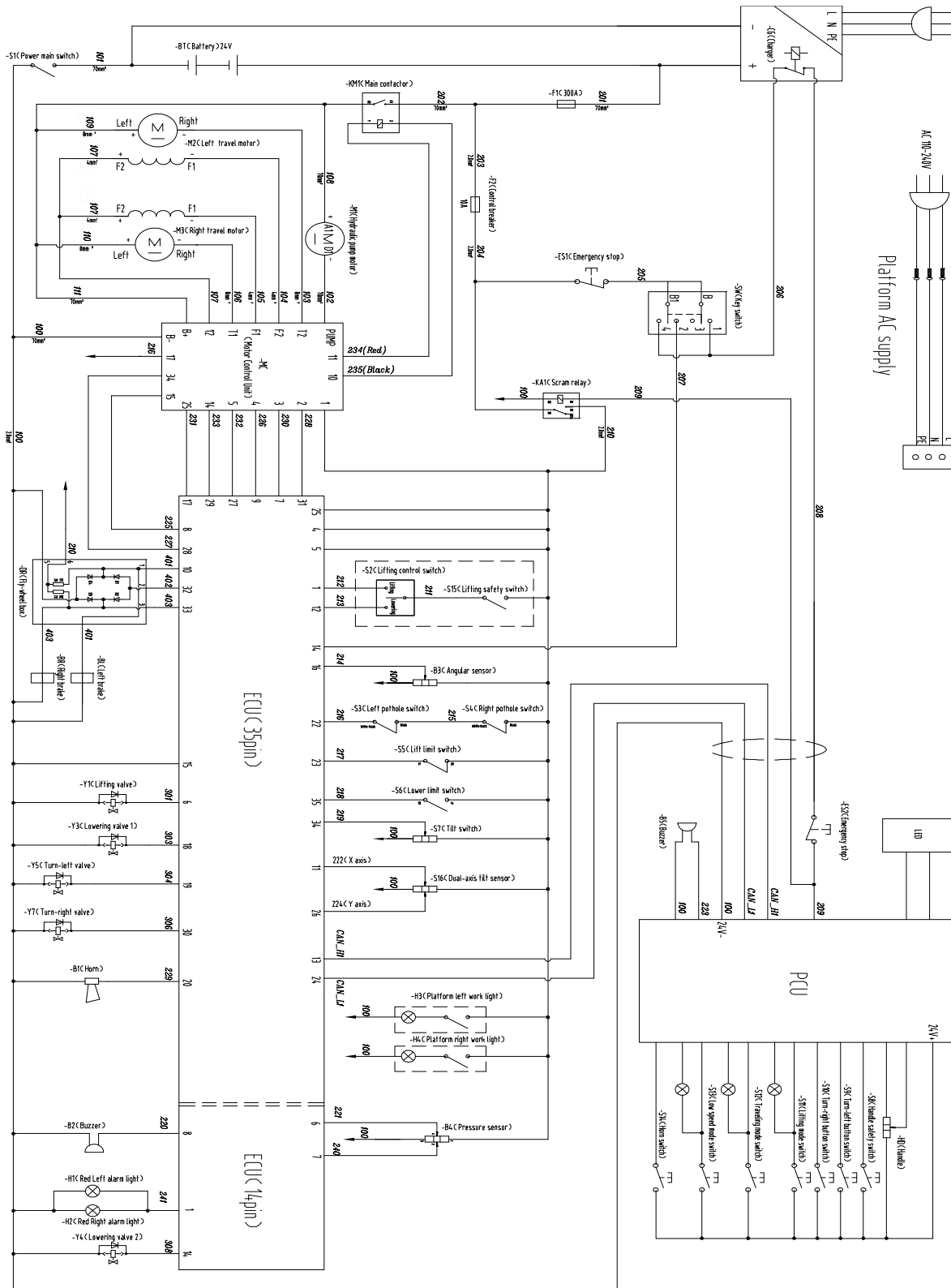


Figure 3-6 ZS1414DC/ZS1212DC/ZS1012DC Electrical schematic

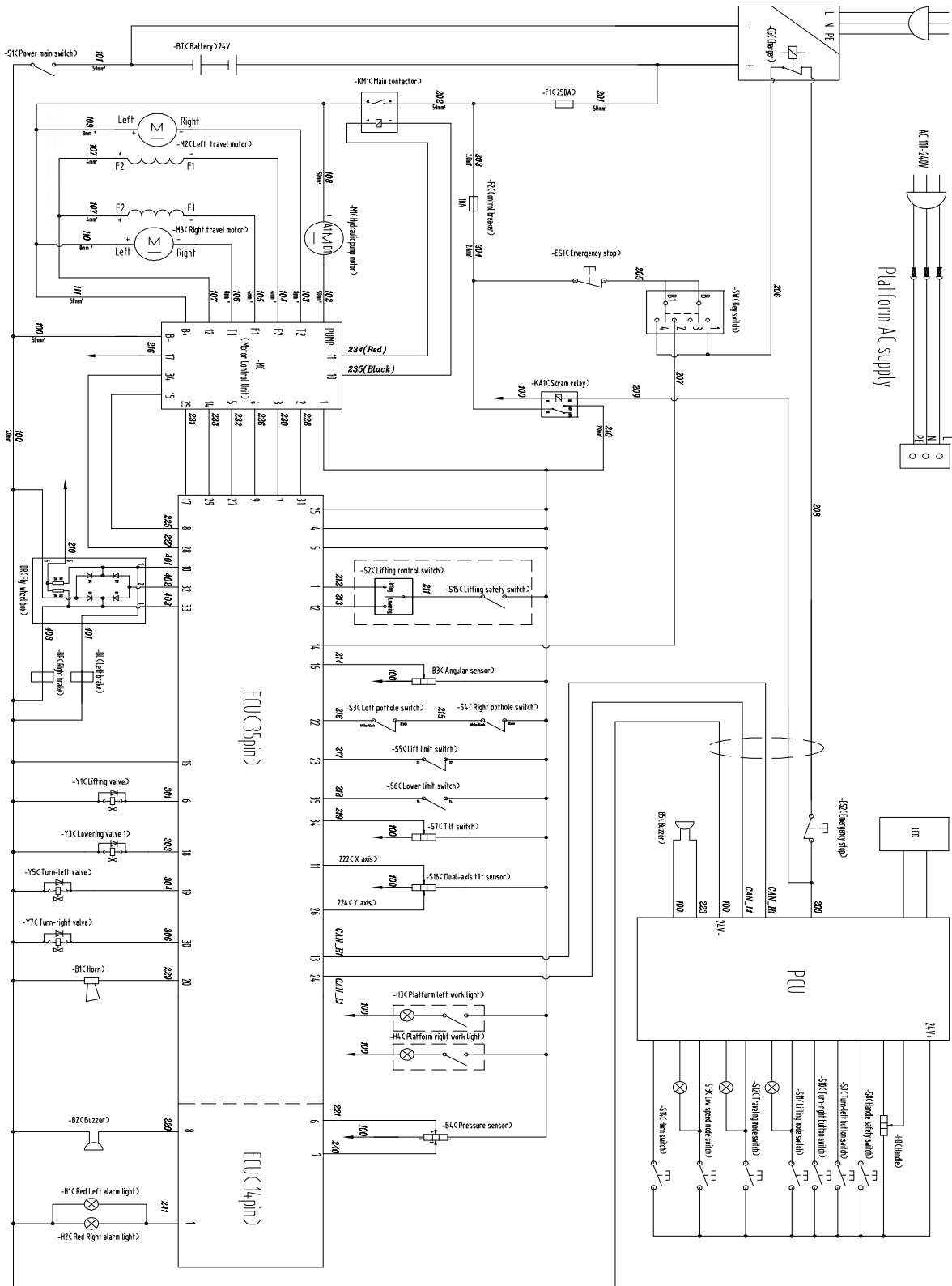


Figure 3-7 ZS0812DC/ZS0808DC/ZS0608DC Electrical schematic

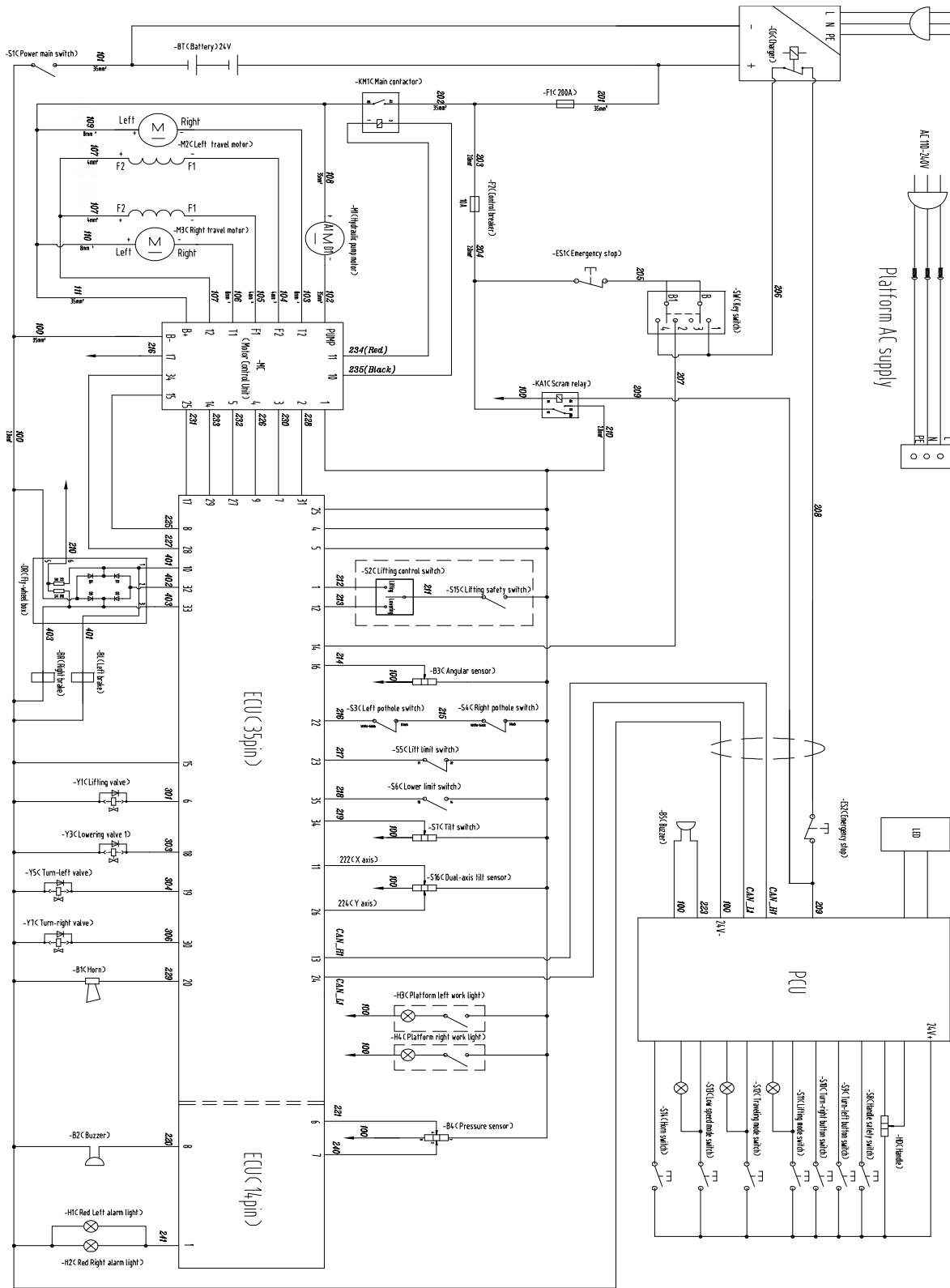


Figure 3-8 ZS0607DC Electrical schematic

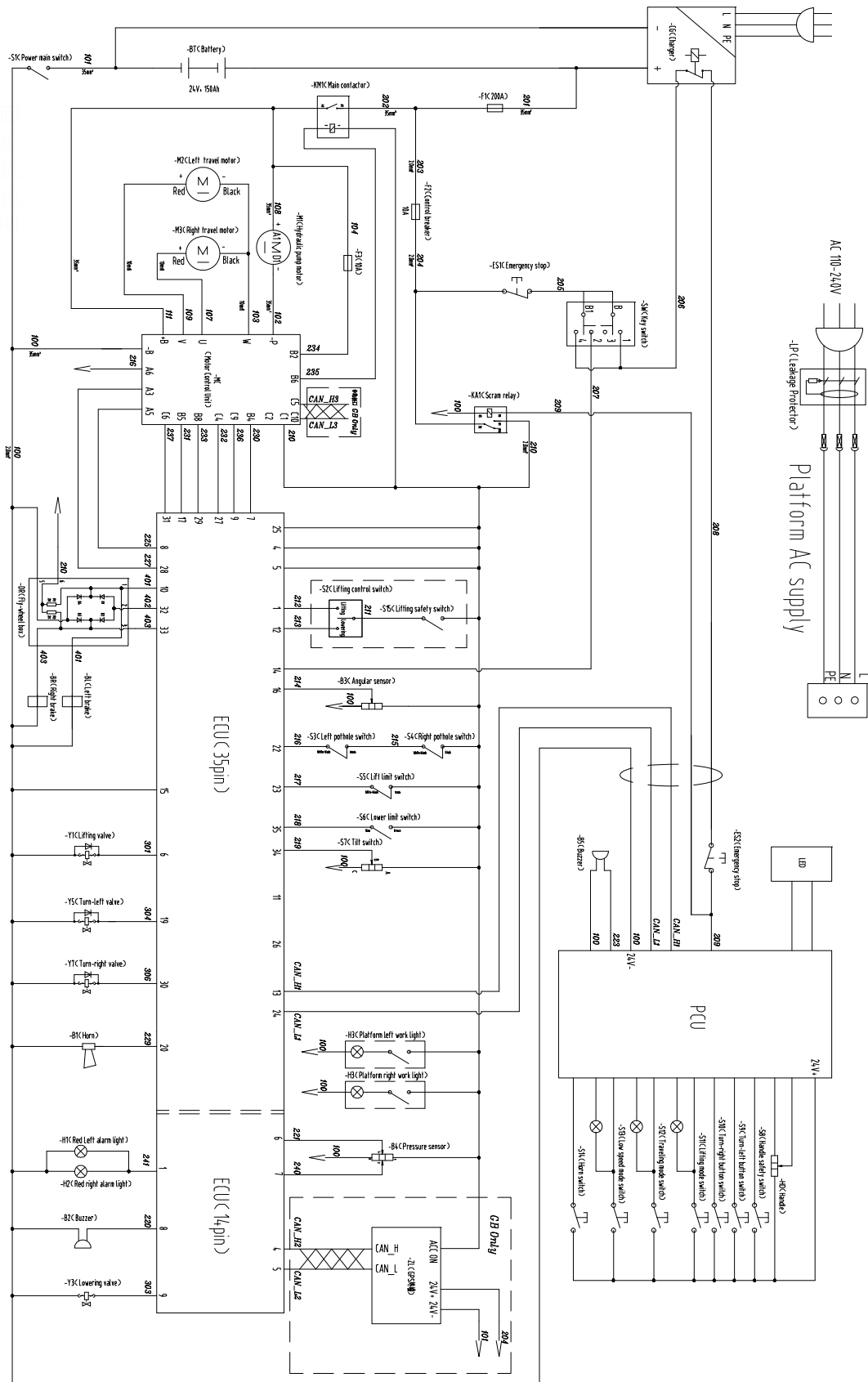


Figure 3-9 ZS0607DCS Electrical schematic

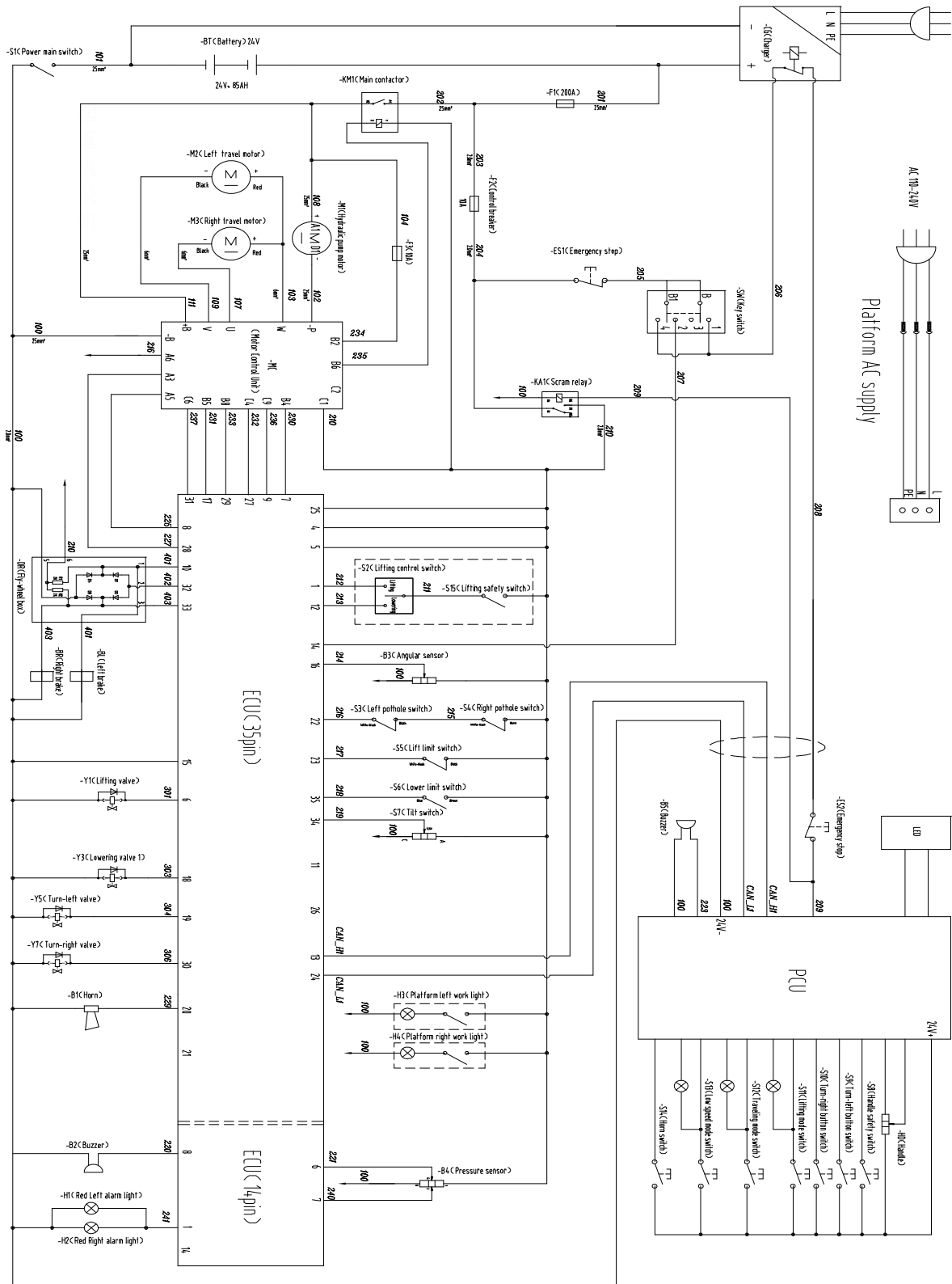


Figure 3-10 ZS0407DC Electrical schematic

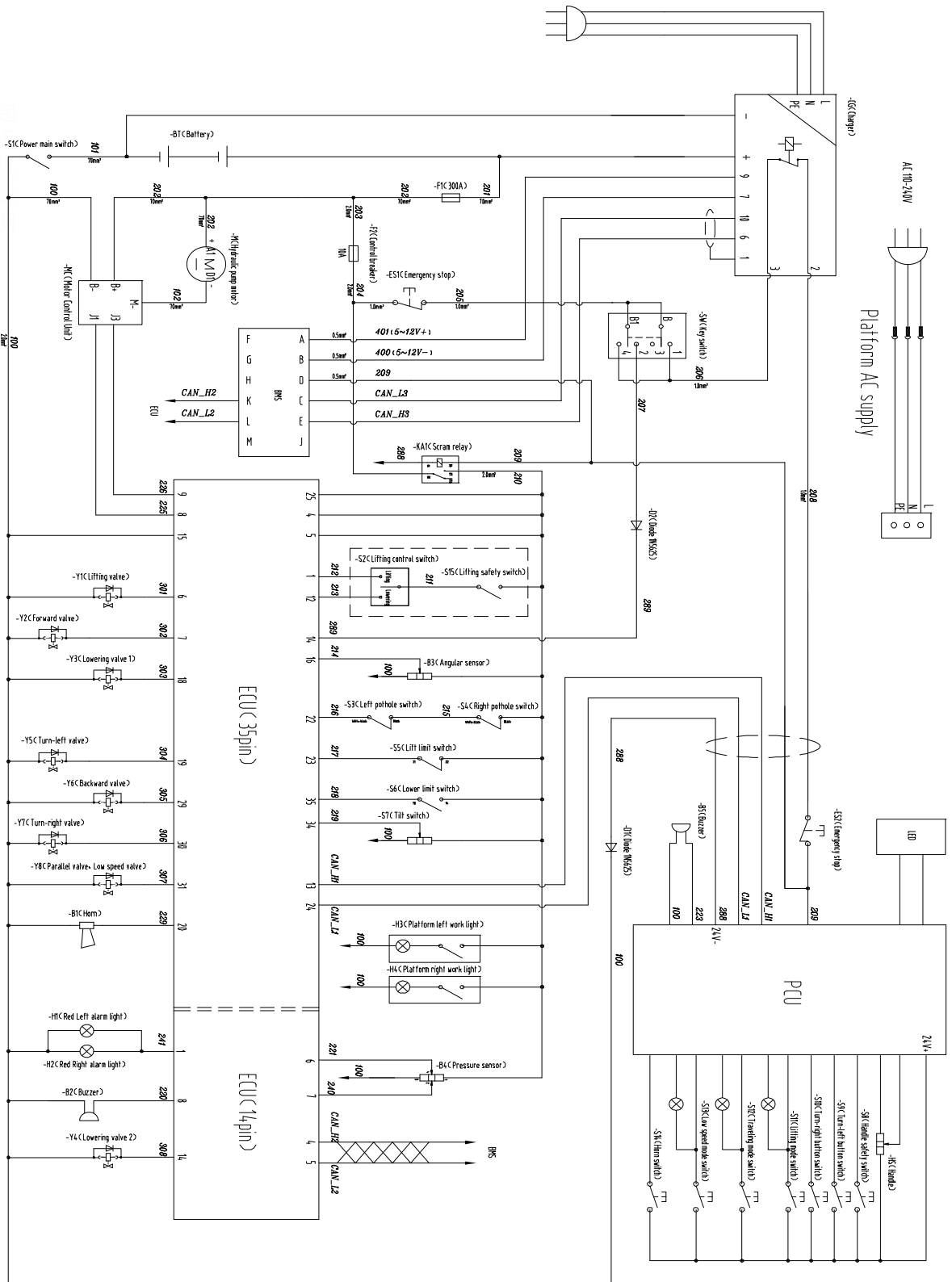


Figure 3-11 ZS1414HD-Li/ZS1212HD-Li/ZS1012HD-Li Electrical schematic

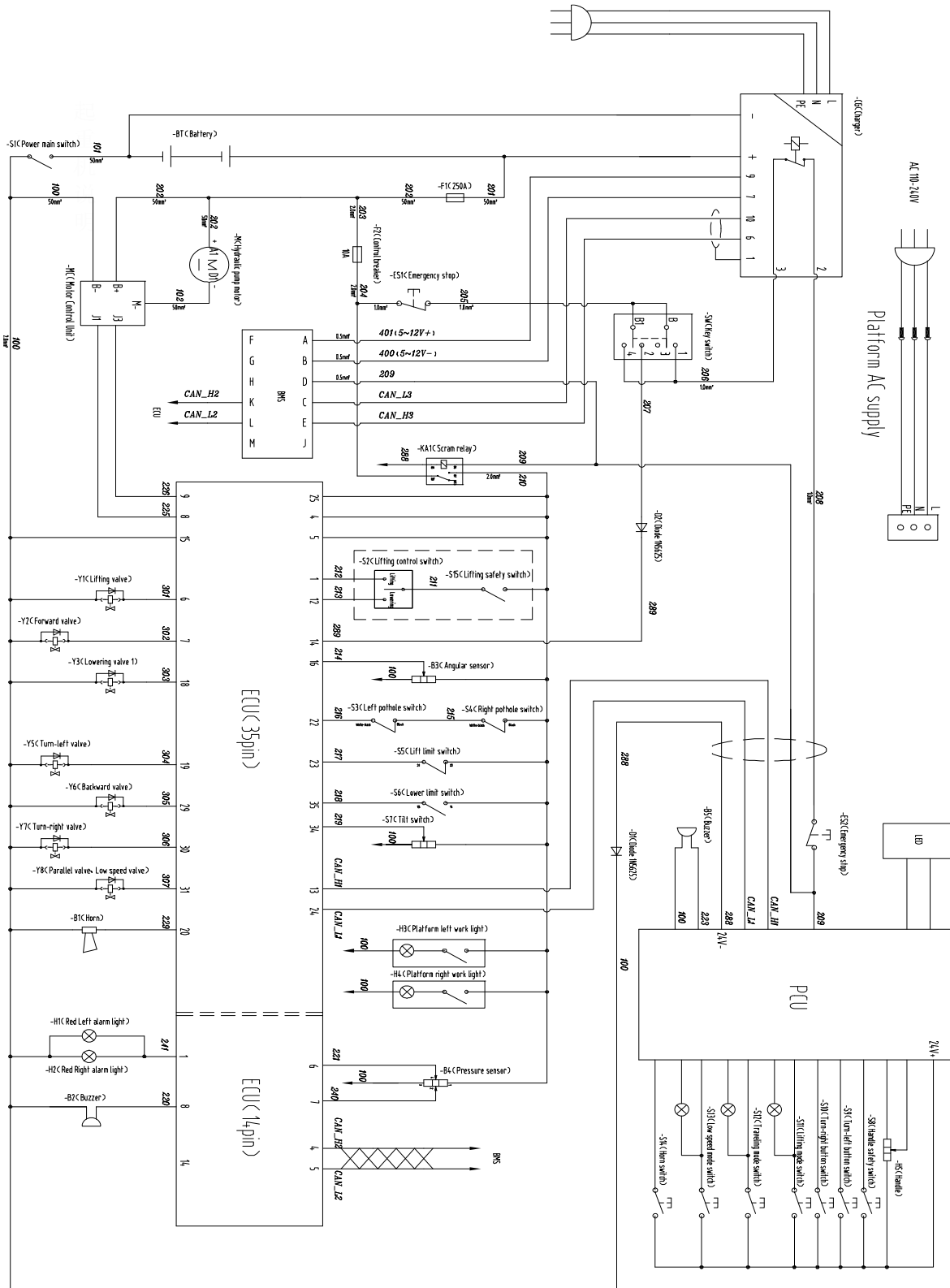


Figure 3-12 ZS0812HD-Li/ZS0808HD-Li/ZS0608HD-Li Electrical schematic

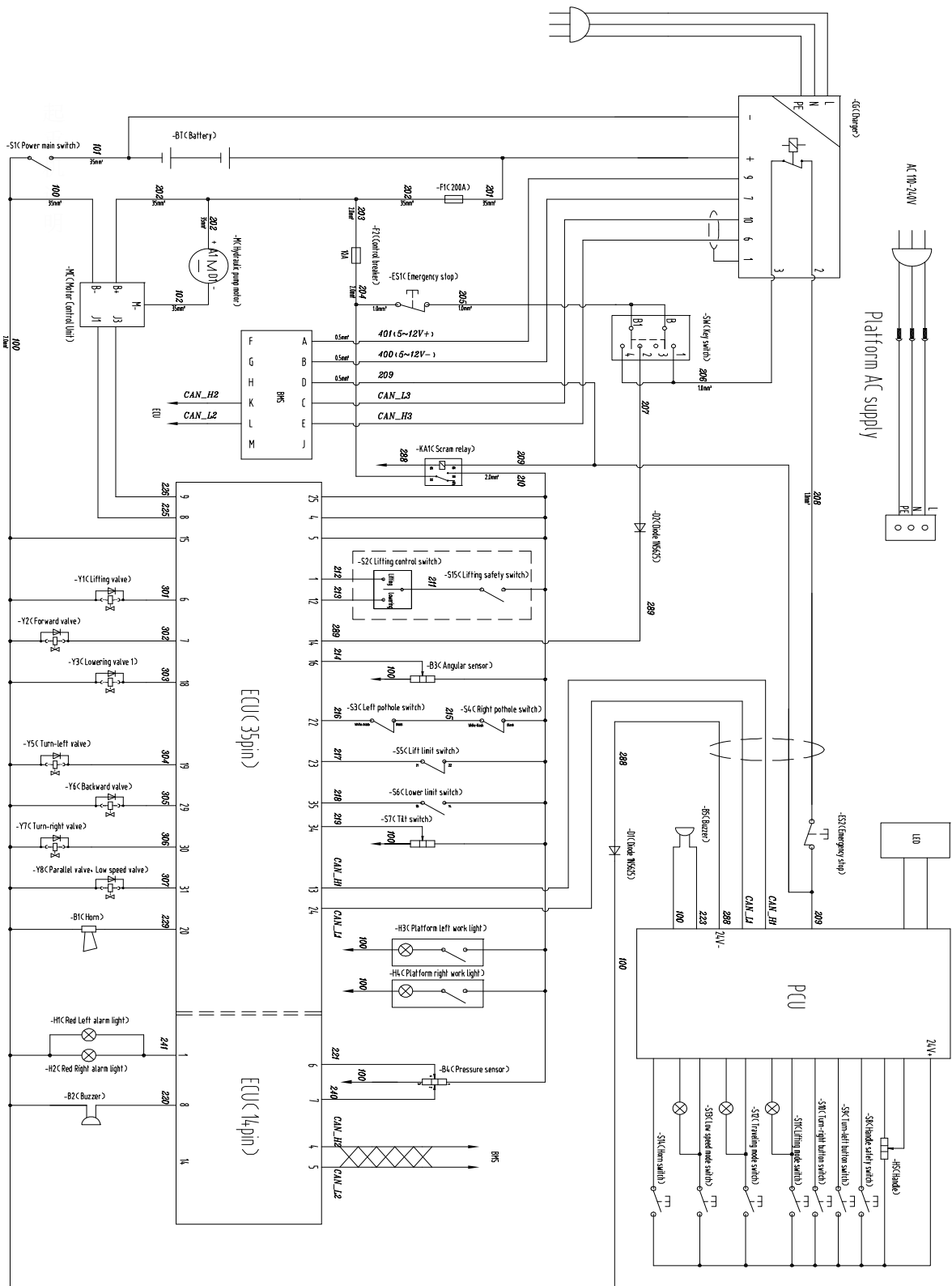


Figure 3-13 ZS0607HD-Li Electrical schematic

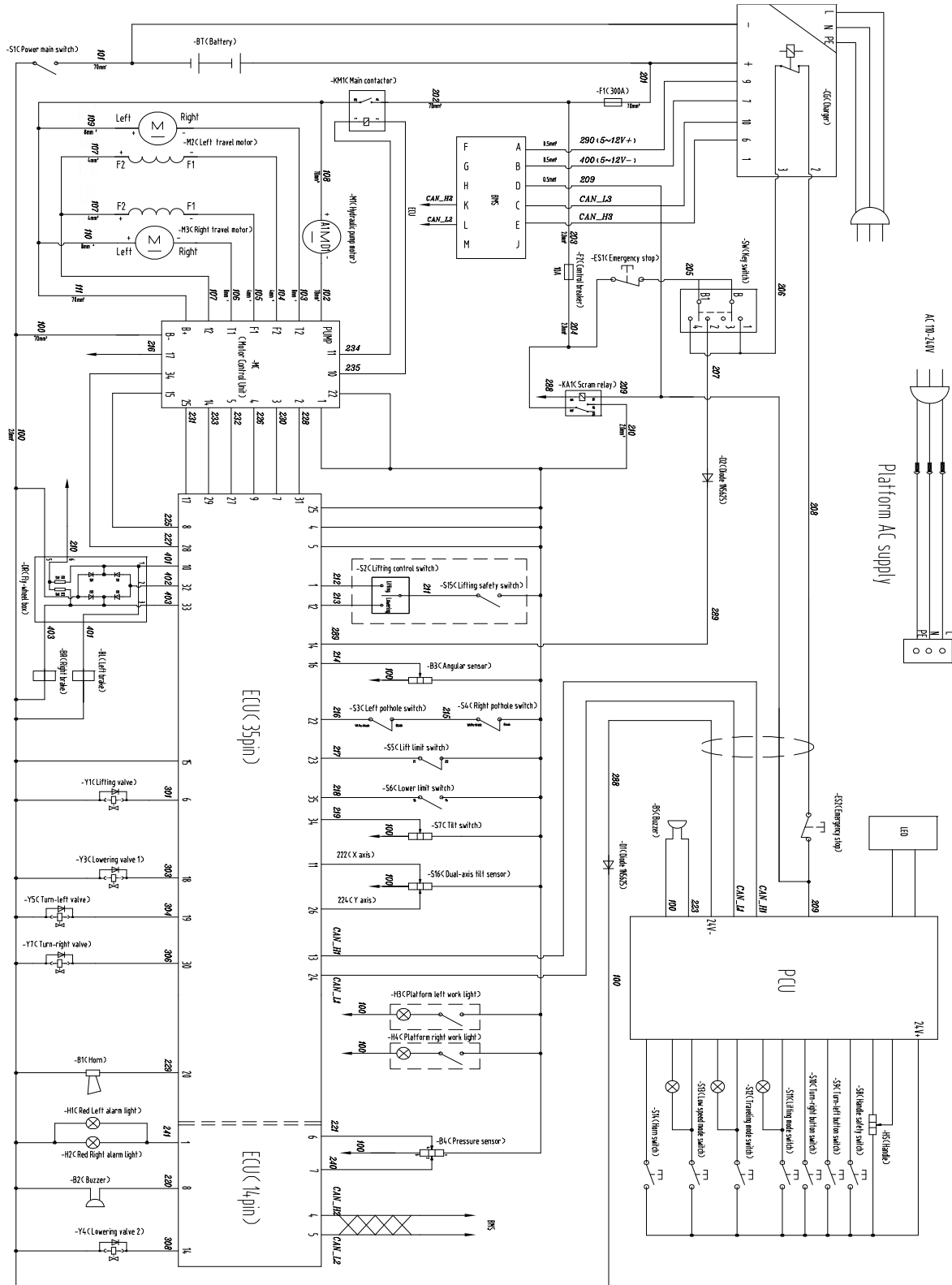


Figure 3-14 ZS1414DC-Li/ZS1212DC-Li/ZS1012DC-Li Electrical schematic

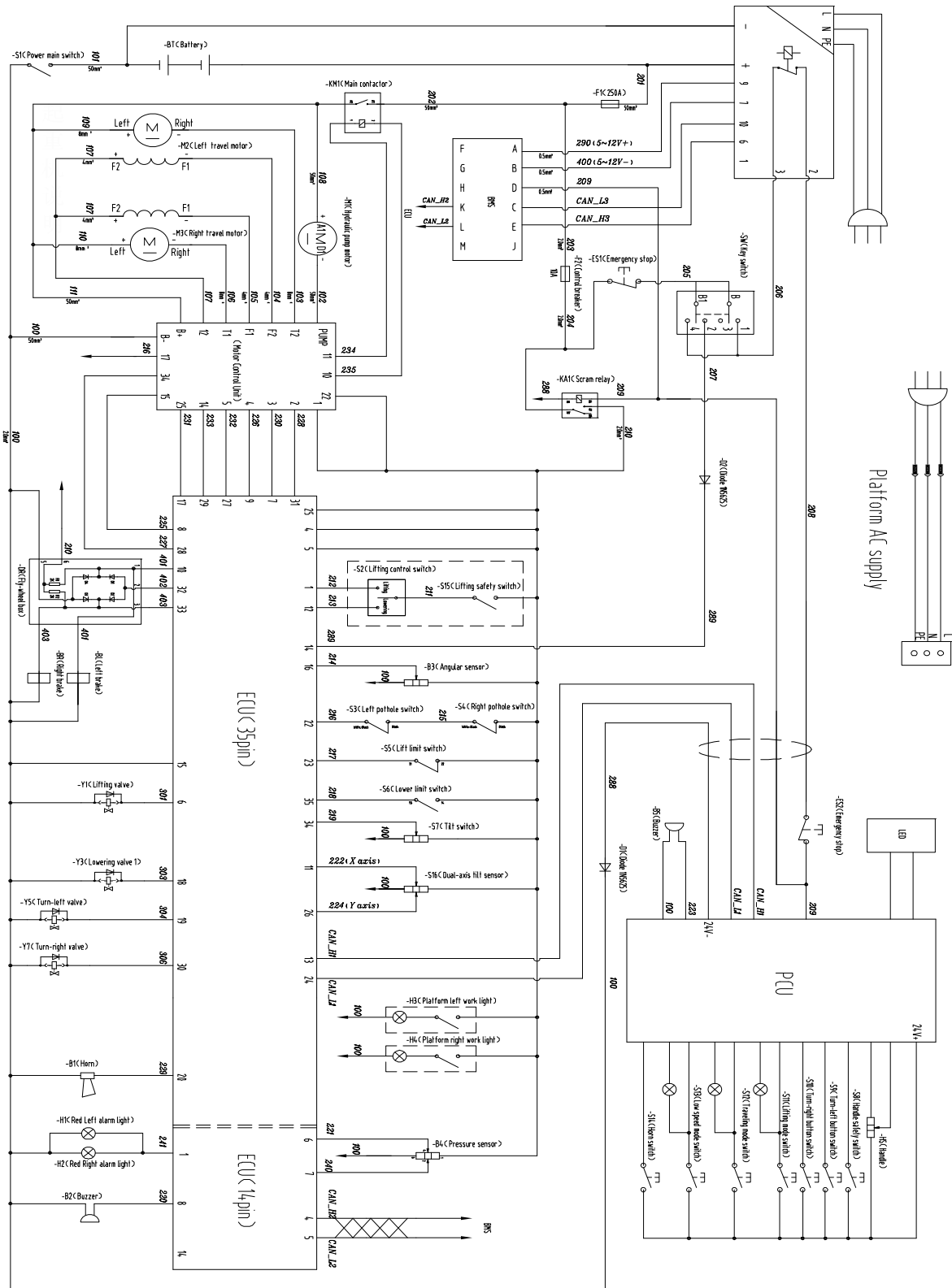


Figure 3-15 ZS0812DC-Li/ZS0808DC-Li/ZS0608DC-Li Electrical schematic

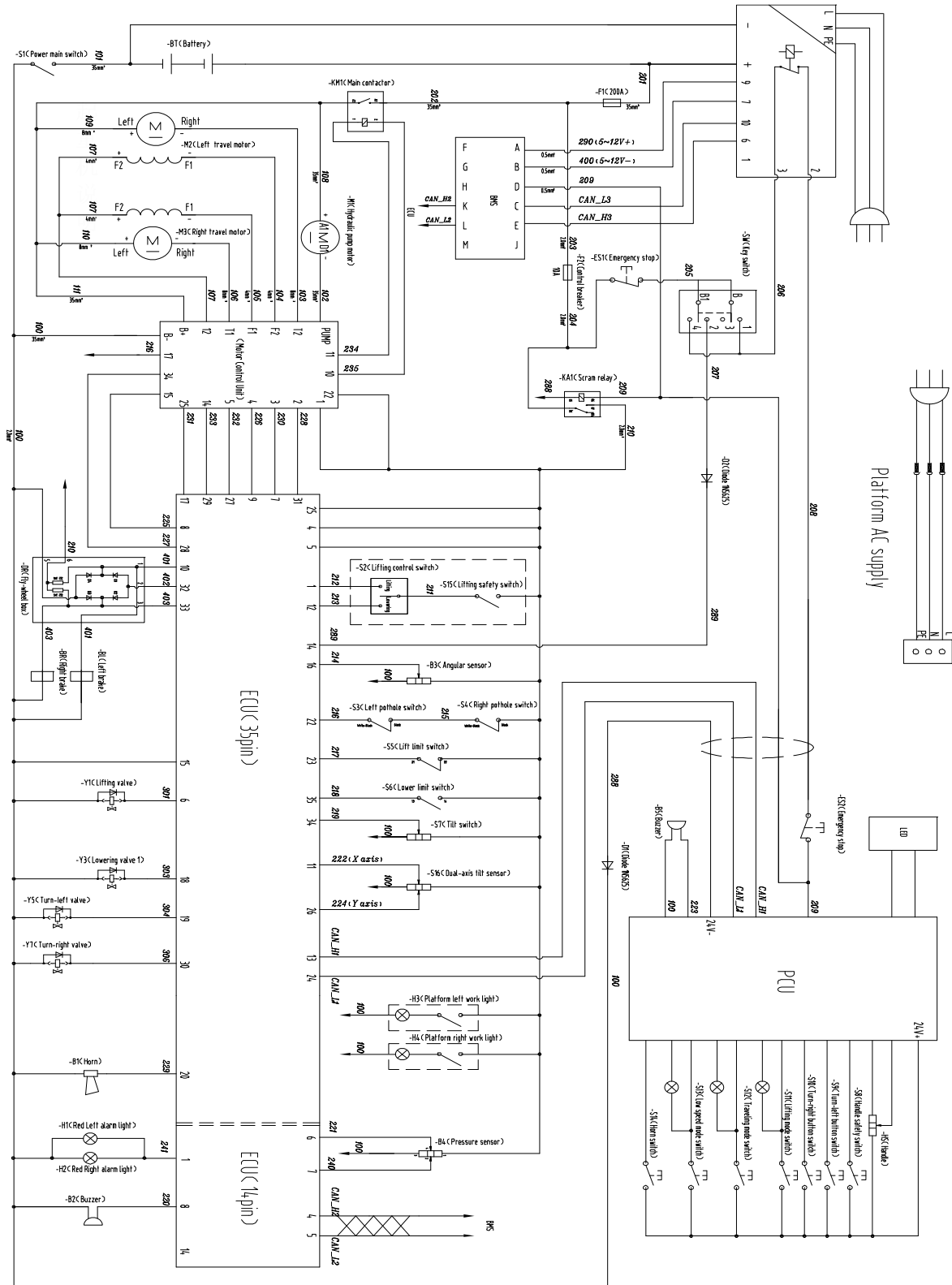


Figure 3-16 ZS0607DC-Li Electrical schematic

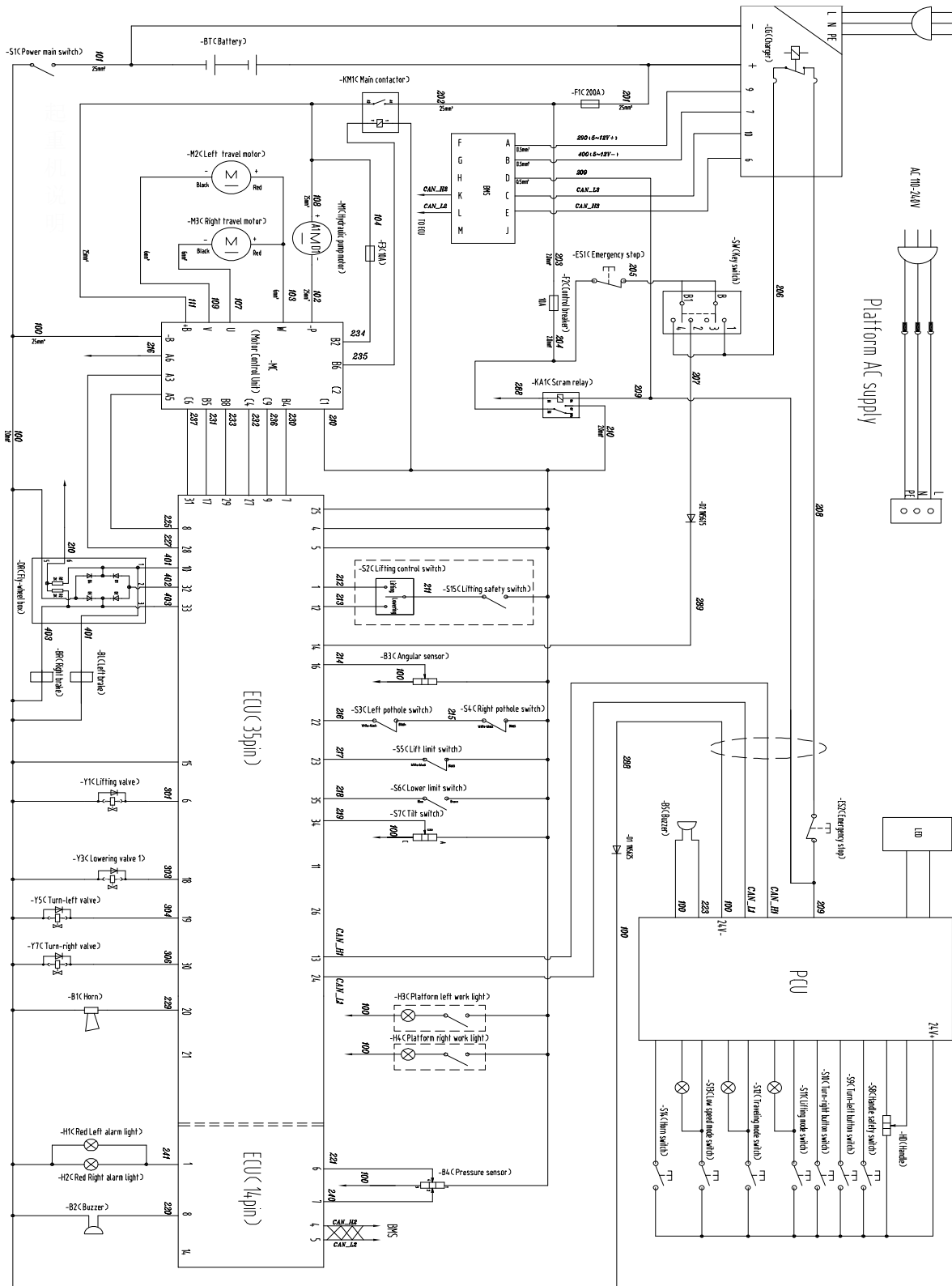


Figure 3-17 ZS0407DC-Li Electrical schematic

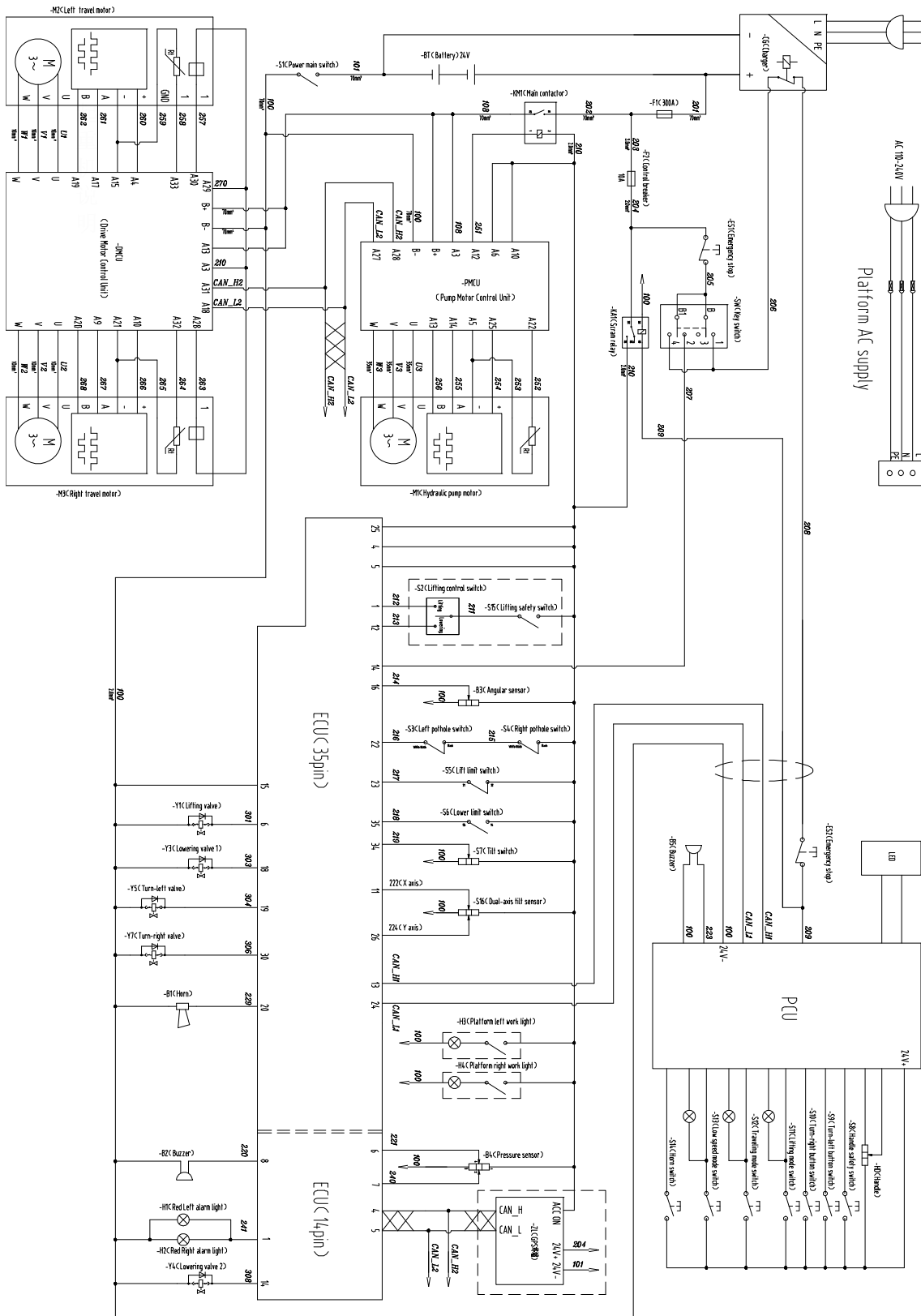


Figure 3-18 ZS1414AC/ZS1212AC /ZS1012AC/ZS0808AC Electrical schematic

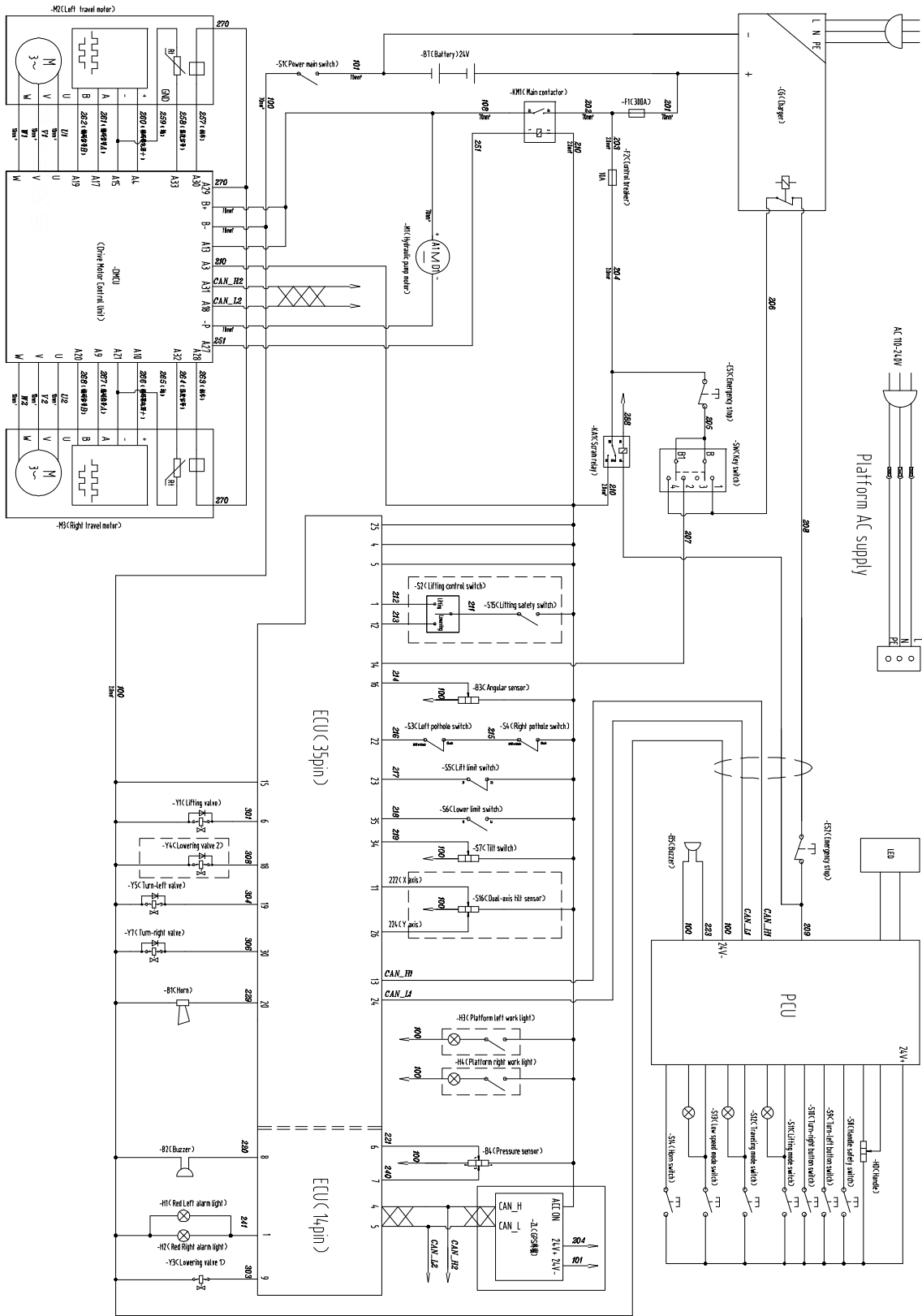


Figure 3-19 ZS0607AC/ZS0607ACW Electrical schematic

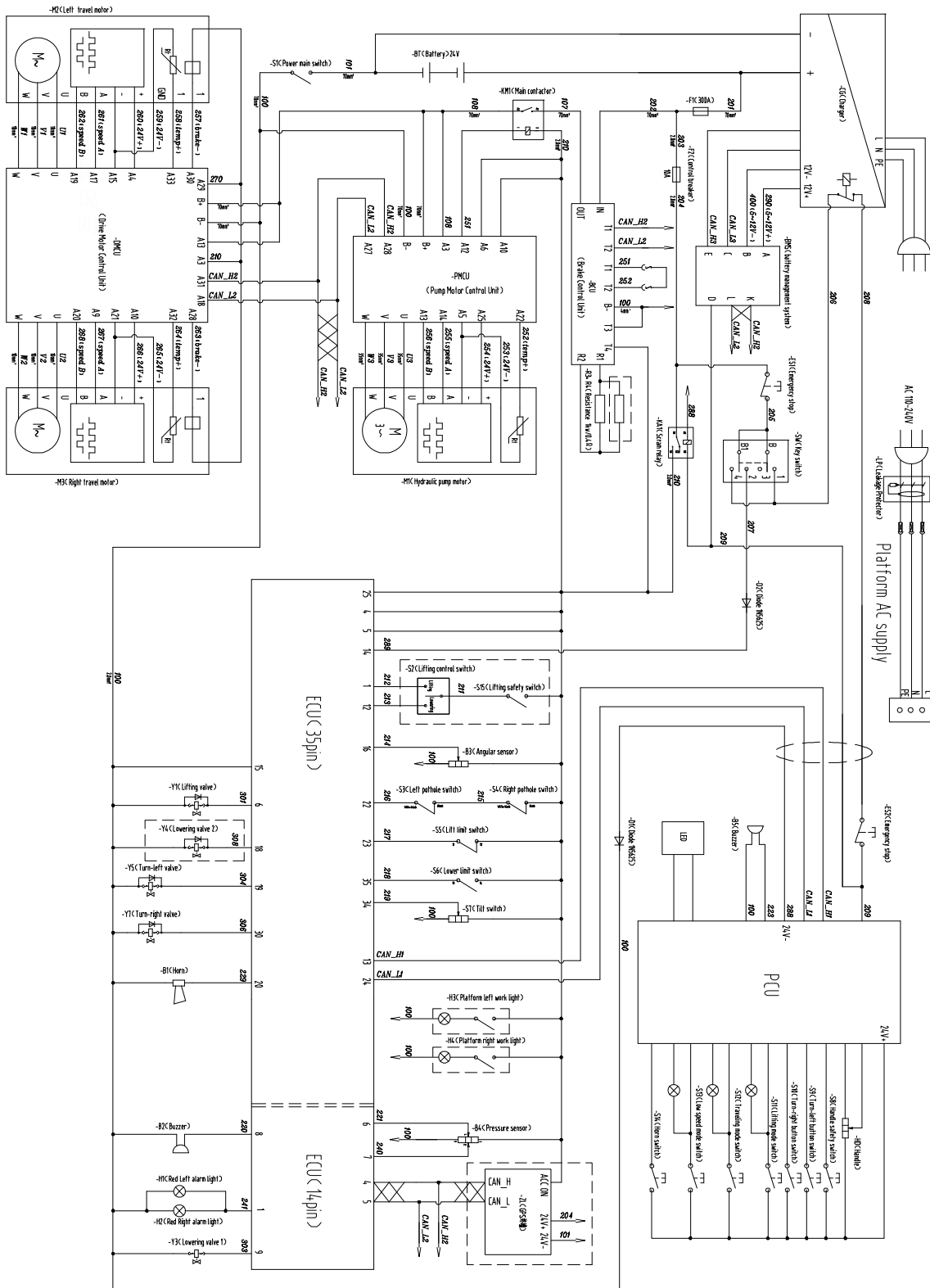


Figure 3-20 ZS1414AC-Li / ZS1212AC-Li / ZS1012AC-Li / ZS0808AC-Li Electrical schematic

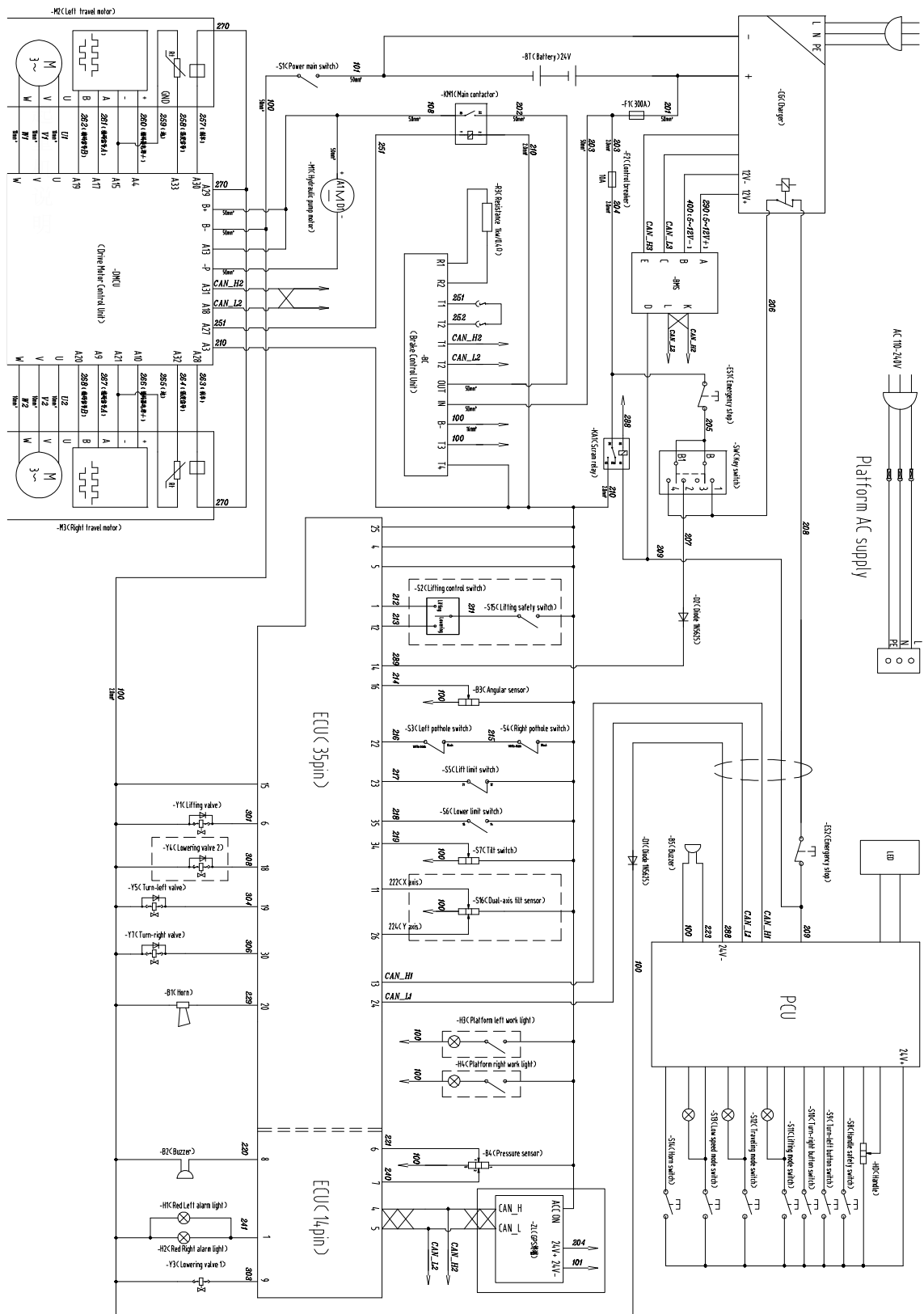


Figure 3-21 ZS0607AC-Li/ZS0607ACW-Li Electrical schematic

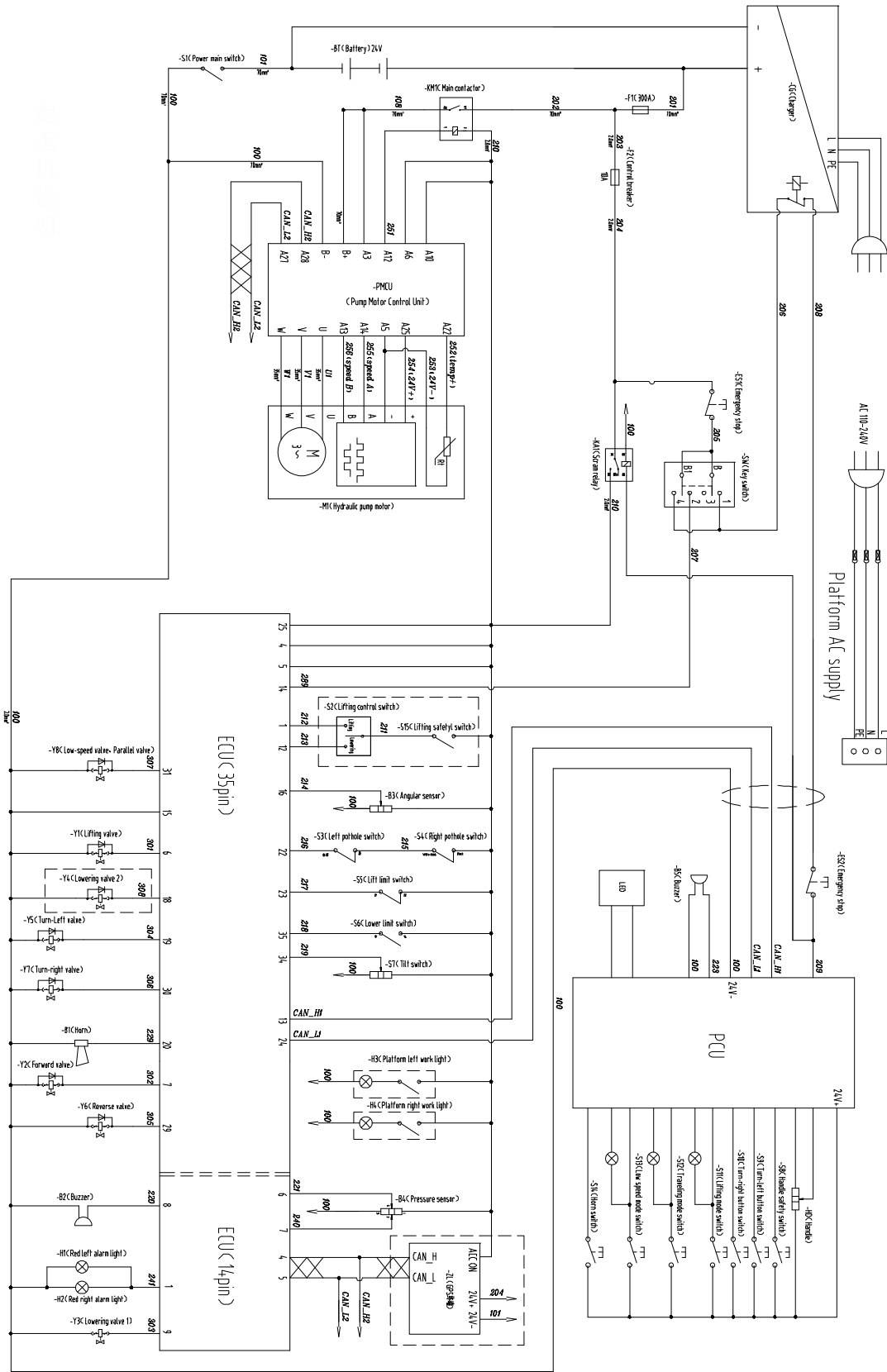


Figure 3-22 ZS1414HA/ZS1212HA/ZS1012HA/ZS0812HA/ZS0808HA/Z0607HA Electrical schematic

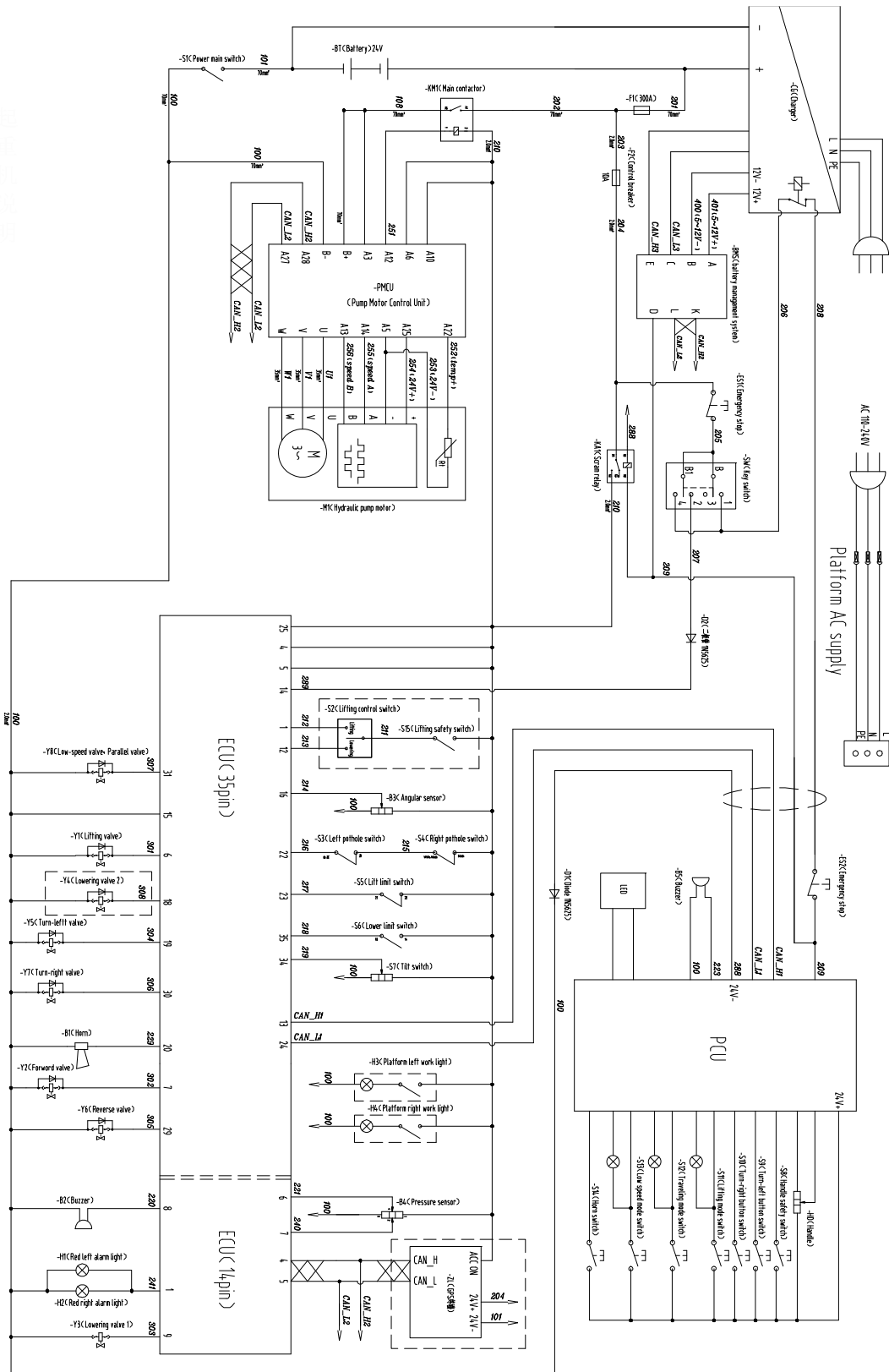


Figure 3-23 ZS1414HA-Li/ZS1212HA-Li/ZS1012HA-Li/ZS0812HA-Li/
ZS0808HA-Li/ZS0607HA-Li Electrical schematic

Service and Maintenance Manual

Section 4 Hydraulic System Maintenance



SECTION 4 HYDRAULIC SYSTEM MAINTENANCE

4.1 Inspection and Maintenance of Hydraulic System

4.1.1 Routine inspection of hydraulic system

In order to keep the hydraulic system in good working condition for a long time, the hydraulic system needs to be maintained and maintained on time. The following are some routine inspections and maintenance:

Table 4-1 Hydraulic System Maintenance Intervals

No.	Inspection & maintenance items	Inspection Intervals (Working hours)							Remark
		5	25	100	250	500	1000	2000	
1	Hydraulic Oil Quantity Inspection	★							
2	Hydraulic oil sediment inspection				★				
3	Check for Clogging of Exhaust Cap of Hydraulic Oil Tank	★							
4	Oil leakage from hydraulic motor and pump, abnormal sound inspection	★							
5	Oil leakage inspection of hydraulic valve	★							

Table 4-2 Schedule replacement of hydraulic system parts

No.	Replacement parts	Replacement Intervals				Mounting position
		First time 50 H/30 D	500H /6 Months	Every 1000H /12 M	Once every 24 months (not working)	
1	Filter Element for Oil Return Filter	★ (First time)	★			Oil circuit control
2	Filter Element for Exhaust Cover of Hydraulic Oil Tank		★ (First time)	★		Hydraulic tank
3	Replace Hydraulic Oil				Mandatory replacement	

In the routine maintenance of the hydraulic system, the following points should be noted:

- a) The functions of hydraulic oil in hydraulic system is transferring pressure, lubrication, cooling and sealing. The improper selection of hydraulic oil is the main reason for the early failure and durability decline of the hydraulic system. The hydraulic oil should be selected according to per requirements.

When the use of substitute oil is needed in special circumstances, the property of the hydraulic oil should be as good as that of the original one. Different specifications of hydraulic oil cannot be mixed up, in case the hydraulic oil produced chemical reaction, or property change. If the hydraulic oil is dark brown, creamy or smelly, it cannot be used.

- b) To prevent solid impurities from mixing into the hydraulic system, the cleanness of hydraulic oil is the lifeblood of the hydraulic system. There are many precision couplings in the hydraulic system, some of them are provided with damping holes or gaps, etc. If the solid impurity intrudes, it will cause the precision couplings parts strain, block, oil duct jam and so on, which will endanger the safe operation of the hydraulic system. The invasion routes of common solid impurities are:
- 1) Dirty hydraulic oils.
 - 2) Dirty oil charging tool.
 - 3) Carelessness during oil charge or maintenance.
 - 4) Hydraulic elements debris.
- c) Prevent air and water intrusion into hydraulic systems. At normal temperature and pressure, the air will come out from the oil when the volume ratio of air in hydraulic oil is 6%~ 8% as the pressure is lowered. The bubble rupture causes "cavitation" to the hydraulic element which produces noise. On the one hand, air also oxidizes the hydraulic oil and accelerates its deterioration. On the other hand, a large amount of air into the oil will make the "cavitation" phenomenon worse, and the compression of hydraulic oil increases, which give rise to unstable operation, low work efficiency, "crawling" actuating element and other adverse consequences. The following points should therefore be noted in preventing air intrusion:
- 1) After maintenance and oil change, the air in the system is excluded as required.
 - 2) The seal of the pump driving shaft shall be good. When replacing the oil seal, use the "two-lip" quality oil seal, and "one-lip" oil seal is not allowed, because the "one-lip" oil seal can only one-way sealing oil, and do not have the function of sealing gas.
 - 3) The suction pipe of the hydraulic oil pump must not come out from the oil surface, and the suction pipe must be well sealed.
 - 4) Tighten the lid when oil storage barrel not in use and preferably place it upside down.
 - 5) Hydraulic oil with high water content should have multi-filtration, and dried filter paper should be used for each filtration.
 - 6) Oil charging tools should be clean and hydraulic oil must be filtered before charging. Do not remove the filter at the port of the hydraulic oil tank for faster filling up.
 - 7) Oil supplier shall wear clean gloves and work clothes.
 - 8) The cleaning oil of the hydraulic system must use the same hydraulic oil as that used in the

system and the cleaning oil temperature should be between 45 °C/113°F and 80 °C/176°F and the impurity in the system is carried away with the large flow as far as possible. The hydraulic system should be cleaned more than three times, and all cleaning oil should be let out from the system after each cleaning. Clean the filter after system cleaning, replace the filter element and fill up new oil.

- d) Clean the dirt around the hydraulic oil tank lid before removing the lid, then loosen the lid and remove any debris remaining in the joint position. When remove the hydraulic oil tank lid, inspection hole, hydraulic oil hoses, the exposure of hydraulic system oil pipe to dust should be avoided. Parts must be cleaned thoroughly before opening. When scrubbing materials and hammers are used, it is advisable to use special hammers with rubber on strike side and scrubbing materials with no losses particle. Clean the hydraulic components and hoses carefully and wind-dry them with high pressure. Choose the original filter element with good packing. Clean the inside of filter case carefully before installing the filter element, and filling up new oil and cleaning the filter at one time.

4.1.2 Hydraulic oil tank

4.1.2.1 Inspection of hydraulic oil tank

The side of the hydraulic oil tank is with scale, and the corresponding scale has the corresponding capacity value. Be sure to check the oil level of the hydraulic oil tank before the motor is started. When scissor structure in retracted position, the oil level of the tank should not be lower than the required level and also not higher than the maximum level. When the work platform is placed horizontally, if the oil level is lower than the minimum level, which indicates there is not enough oil in the hydraulic system, please fill up enough hydraulic oil before starting the machine.

If the amount of oil in the tank is found to be decreased too fast, it indicates that there is a leak in the pipeline or hydraulic components, check the hydraulic lines and components, find the leak point and prevent it from leaking before starting the engine.

When hydraulic oil is at low temperature of (below 20 °C/68°F), fluidity of hydraulic oil is poor, and hydraulic components will be damaged due to over-urgent operation under this condition. the hydraulic oil will deteriorate more quickly if the temperature is too high (above 80°C/176°F), and the service life of the hydraulic components will be shortened. Therefore, after starting the engine in cold temperature environment, full preheating should be carried out to make the hydraulic oil temperature reach 20°C/68 °F or so.

▲ CAUTION

- a) If hydraulic oil is found to be abnormal during inspection, no matter how long the machine runs, the hydraulic oil must be replaced. If the hydraulic oil contamination or deterioration time is too short, the cause should be identified first, and then change the oil.
- b) In the course of maintenance, it is found that the amount of hydraulic oil is not enough, the oil to be replenished must be the same as that in the original tank, and the quantity specified in the oil leveler

should be replenished.

4.1.2.2 Replace return oil filter

In order to replace the filter element, the filter must be removed. The replacement steps are as follows:

- a) The cross arms are fully closed, the hydraulic system depressurizes and the motor is powered off.
- b) Remove the screw of the oil return filter, remove the oil return filter and replace the filter element. (as shown in Figure 4-1).

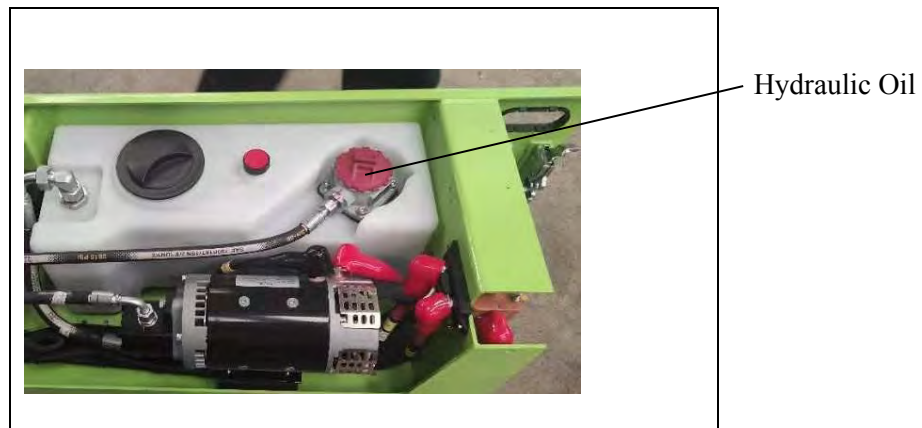


Figure 4-1 Filter position

Replace the return oil filter after 50 working hours after the first maintenance of the hydraulic system. Then the filter element of the return oil filter should be replaced every 500 working hours.

CAUTION

When replacing the filter element, please be careful not to reverse the filter inlet and outlet ports, otherwise it will cause serious consequences.

4.1.2.3 Replace exhaust hydraulic oil

In the hydraulic system, the exhaust cap of the tank should be checked on time. The inspection should be done after adding hydraulic oil every time. The contamination should be cleaned up in time, and the damaged part should be replaced.

4.1.2.4 Replace hydraulic oil

When delivery, the hydraulic oil tank has been filled up with hydraulic oil (oil type) according to customer or environment requirement.

Before changing the hydraulic oil, the work platform must be in horizontal position. Oil change steps are as follows:

- a) Switch off the motor and depressurize the hydraulic system.
- b) Install the oil exit pipe on the plug of the hydraulic tank and pump the oil into a suitable container. Take care to dispose of waste oil in an environmental friendly manner.

- c) To clean the tank with a chemical cleaning agent with pollution grade of solid particle no more than 18/15, and after cleaning and drying, rinse with a new hydraulic oil of pollution grade of solid particles no more than 18/15, then release the cleaning oil and charge new hydraulic oil into the hydraulic tank.
- d) Start the motor to run at low speed, and oil pump start working, then operate each mechanism. The new hydraulic oil discharges the old oil of each circuit of the system gradually, and the old oil discharged is not allowed to flow back to the hydraulic oil tank. When changing oil in each circuit, new oil should be added constantly into the hydraulic oil to prevent the oil pump from emptying.
- e) Install the oil plug, and prepare all the components in the initial working condition, then replenish the hydraulic oil to the specified oil level.
- f) Ensure all stop valves and quick couplings are open. All stop valves and quick couplings must be opened to keep the whole oil line open.

CAUTION

- a) Hydraulic oil should not be used for more than 24 months, and after 24 months, the oil is not allowed to be used even after filtration.
- b) Filter or replace hydraulic oil whenever it is found to be seriously contaminated.
- c) Select appropriate hydraulic oil according to ambient temperature.
- d) Hydraulic oil of different brands cannot be mixed with each other.
- e) When changing oil, wash off all the old oil and take care not to mix the sand, dust, etc. with the oil tank.
- f) When changing the oil in each circuit, pay attention to constantly replenishing the hydraulic fluid with new oil to prevent the pump from emptying.
- g) When use the machine at cold area, it is important to have no-load start-up after reaching minimum start-up temperature. After the no-load operation, the system has reached its lowest operating temperature and then slowly increase the load and keep the system running above the lowest operating temperature.
- h) Be environmentally friendly when dealing with hydraulic fluids.

4.1.3 Hydraulic system air exhaust

Usually, the hydraulic system will have air exhaust automatically. Hence, the motor runs at low speed and low pressure and slowly operate individual cylinders several times back and forth until the air is completely exhausted.

4.1.4 Check hydraulic system line breakage

The rubber pipe placed in the bend of the hydraulic tray is prone to friction damage. Check and ensure it

is in good condition. Replace it if it is damaged. Make sure that all pipelines and hoses are kept at a sufficient distance in transitions (such as the corners of hydraulic pallets) so that there is no friction in laying.

4.1.5 Hydraulic cylinder inspection

The cylinder of each auxiliary device should be inspected periodically. The inspection items shall include:

- a) Check for scratches on the piston rod.
- b) Check the seal between the piston rod and the cylinder for oil leakage, while doing corresponding auxiliary action.
- c) Check whether the piston rod of the longer stroke cylinder is bent.
- d) If there are oil leaks between the piston rod and the cylinder, the manufacturer or professional maintenance personnel should be called to perform the repair. Every effort should be made to prevent the piston rod from being scratched.
- e) When the piston rod is severely scratched and caused oil leakage, the manufacturer or professional maintenance personnel should be repaired. If it cannot be repaired, it should be replaced. When the piston rod is bent and cannot work properly, the manufacturer or professional maintenance personnel should be contacted to replace the cylinder.
- f) When using and transporting hydraulic cylinders, the following aspects should be noted:
- g) The hydraulic cylinder should be packed during storage and transportation, and protection shall be added to the oil-joint face and the exposed part of the piston rod.
- h) Collision should be avoided during storage and transport..
- i) The lifting shall be secured so as not to drop and scratch.
- j) Before removing the hydraulic cylinder, the pressure in the hydraulic cylinder circuit shall be reduced to zero.
- k) When disassembling, prevent damage to the components of the hydraulic cylinder.
- l) Protect the outer surface of the piston rod, prevent bumps and scratches on the seal, and regularly clean the oil cylinder and the exposed piston rod of the dust-proof ring area. Prevent the non-easy-to-clean dirt on the piston rod surface from getting into the cylinder which could damage the piston, cylinder or seal.
- m) Regular inspection of the connection parts such as threads, bolts and immediately fastening if found loose.
- n) Frequent lubrication of the joint to prevent corrosion or abnormal wear without lubricant.

4.1.6 Hydraulic hose inspection

All hydraulic hoses need to be checked periodically for damage. During these visual inspection, all

damaged hoses should be replaced immediately, even if very minor damage is found.

Possible problems with hydraulic hoses:

- a) Damage to the outer layer, e.g. abrasion, notches, cracks, etc..
- b) Ageing of the outer layer material and the formation of cracks.
- c) Deformations that do not correspond to the natural shape of the hose, such as surface relaxation, severe extrusion, distortion, etc..
- d) Leakage.
- e) Failure to comply with installation and positioning requirements (refer to the below matters needed attention of installation of hydraulic hoses).
- f) Damage to the fixtures of the hose unit.
- g) Corrosion, deformation or damage of hose unit.
- h) Exceeding storage time or service life.

Even if no damage is found, the hoses must be replaced every six years (including a maximum of two years of storage time) at the latest. For use or storage life, it should be based on the manufacturing date on the hydraulic hose.

When installing hydraulic hose, the following should be noted:

- 1) Avoid hose distortion:
 - ① The bearing pressure of the hose is lowered when it is twisted.
 - ② The twisted hose also loosens the connection to the connector.
 - ③ 7° twist to hose reduces hose life by 10%.

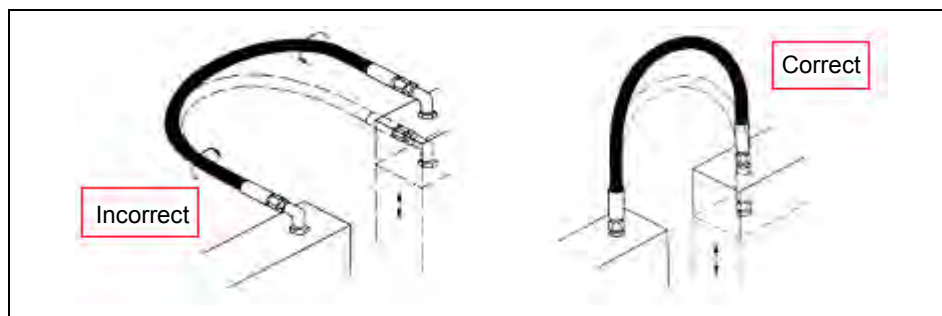


Figure 4-2 Prevent hose twisting

- 2) To increase the bending radius sufficiently:
 - ① To ensure smooth flow of fluid, effectively avoid hose damage.
 - ② Too small bending radius will greatly reduce the life of the hose assembly.

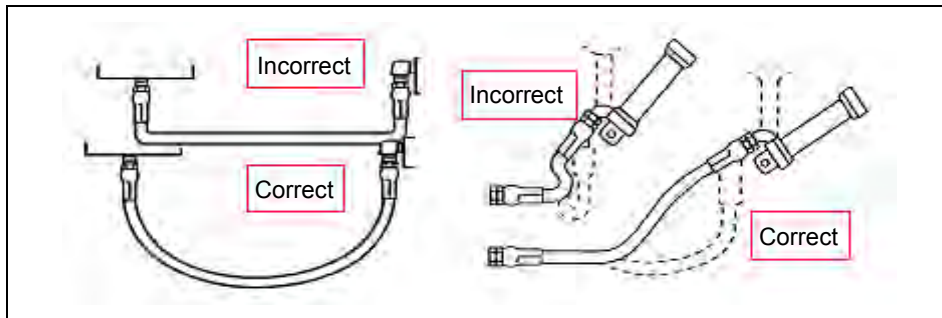


Figure 4-3 Proper bending radius

3) Use elbow and other connectors if necessary:

- ① Too long hose assembly can be avoided.
- ② To ensure that the installation is tidy and the maintenance is convenient in the future.

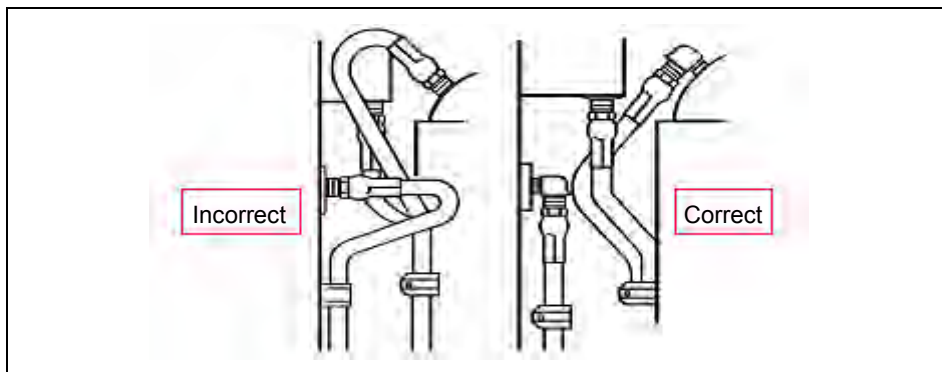


Figure 4-4 Use connectors

4) Certain relaxation compensates for the contraction of the hose during compression:

Hoses typically have a -4% to +2% length change rate at compression.

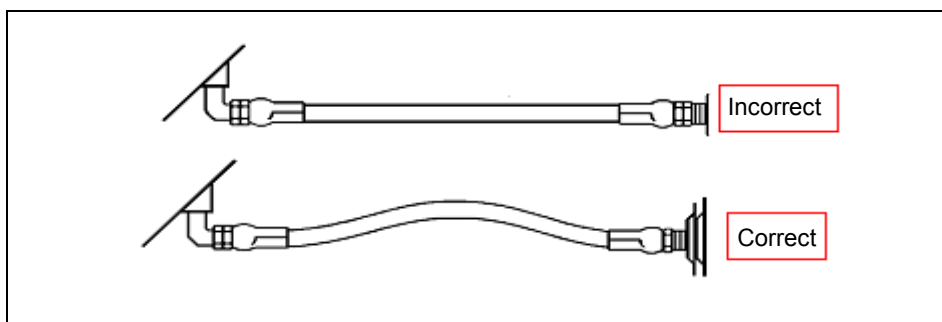


Figure 4-5 Proper loose variable

5) Use the clamp to ensure the hose is positioned:

Effectively reduces abrasion between hoses and associated components.

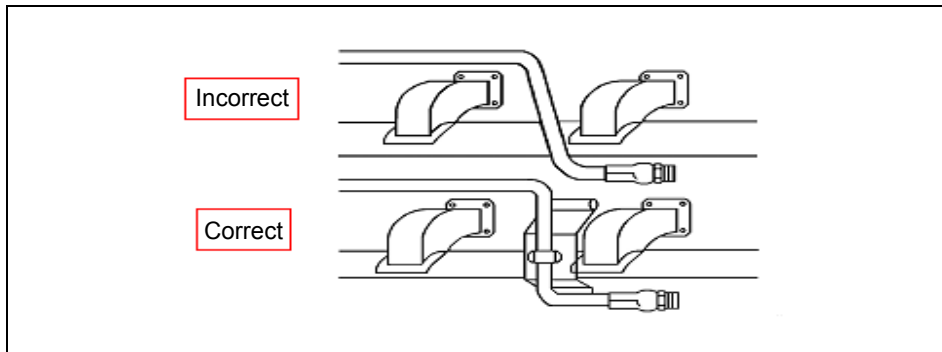


Figure 4-6 Fix with clip

6) Arrangement of Hose

- ① Avoid overheating surfaces and sharp edges.
- ② Avoid friction with parts.
- ③ There should be enough free length for flexion.

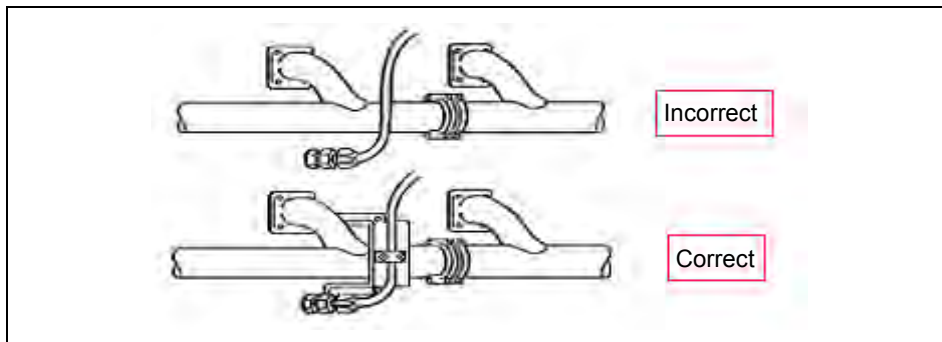


Figure 4-7 Prevent friction between parts

4.1.7 Hydraulic valves

a) ZS1414/ZS1212/ZS1012/ZS0812/ZS0808/ZS0608/ZS0607(HD/HA) Series Platform control valves.

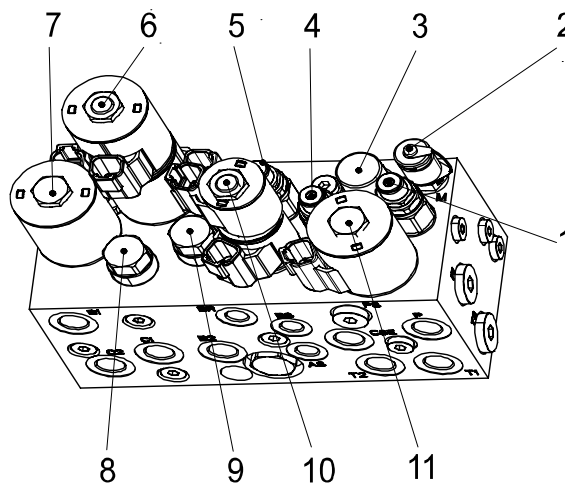


Figure 4-8 Hydraulic driven platform control valves

Table 4-3 Hydraulic driven platform control valves

No.	Item	Function	Torque
1	Overflow valve	System main pressure	42Nm/31 ft-lbs
2	Pressure test joint	Measuring pressure	35Nm/26ft-lbs
3	Compensation valve	priority flow dividing	40Nm/29ft-lbs
4	Overflow valve	Lifting pressure	42Nm/31 ft-lbs
5	Overflow valve	Steering pressure	42Nm/31 ft-lbs
6	Solenoid coil nuts	Locking electromagnet	4Nm/3ft-lbs
7	Solenoid valve	Forward/Backward	40Nm/29ft-lbs
8	Balance valve	Stable driving	72Nm/53ft-lbs
9	Balance valve	Stable driving	72Nm/53ft-lbs
10	Solenoid valve	Fast/Slow speed	40Nm/29ft-lbs
11	Solenoid valve	Steering left/right	40Nm/29ft-lbs
12	Solenoid valve	Lifting/Lowering	40Nm/29ft-lbs

b) ZS1414/ZS1212/ZS1012/ZS0812/ZS0808/ZS0608/ZS0607(DC/AC/ACW/DCS) Series Platform control valves.

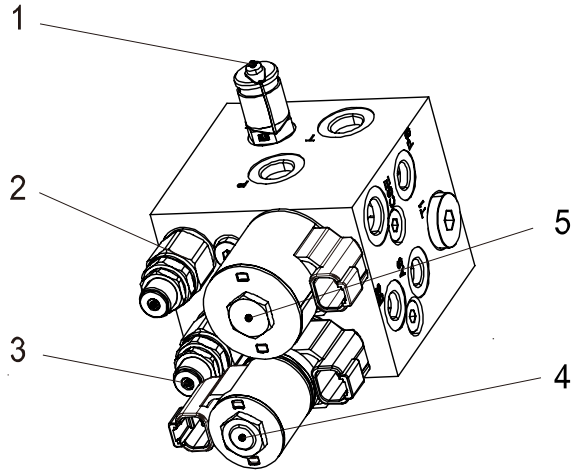


Figure 4-9 Electric driven platform control valves

Table 4-4 Electric driven platform control valves

No.	Item	Function	Torque
1	Pressure test joint	Measuring pressure	35Nm/26ft-lbs
2	Overflow valve	System main pressure	42Nm/31 ft-lbs
3	Overflow valve	Steering pressure	42Nm/31 ft-lbs
4	Solenoid valve	Steering left/right	40Nm/29ft-lbs
5	Solenoid valve	Lifting/Lowering	40Nm/29ft-lbs

c) ZS0407DC/ZS0407DC-Li power unit.

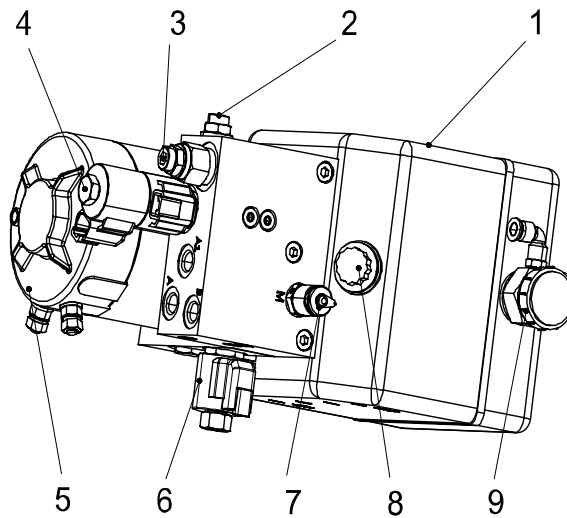


Figure 4-10 ZS0407DC/ZS0407DC-Li power unit

Table 4-5 ZS0407DC/ZS0407DC-Li power unit

No.	Item	Function	Torque
1	Oil tank	Precipitation of impurities, storage, cooling oil	—
2	Overflow valve	Lifting pressure	29Nm/22ft-lbs
3	Overflow valve	Steering pressure	29Nm/22ft-lbs
4	Solenoid valve	Steering left/right	29Nm/22ft-lbs
5	Motor	Power source	—
6	Solenoid valve	Lifting/Lowering	29Nm/22ft-lbs
7	Pressure test joint	Measuring pressure	35Nm/26ft-lbs
8	Tank cap	Prevent/refuel	—
9	Exhaust cover	Ventilation	—

d) ZS1414/ZS1212/ZS1012 Series upper lifting cylinder control valves.

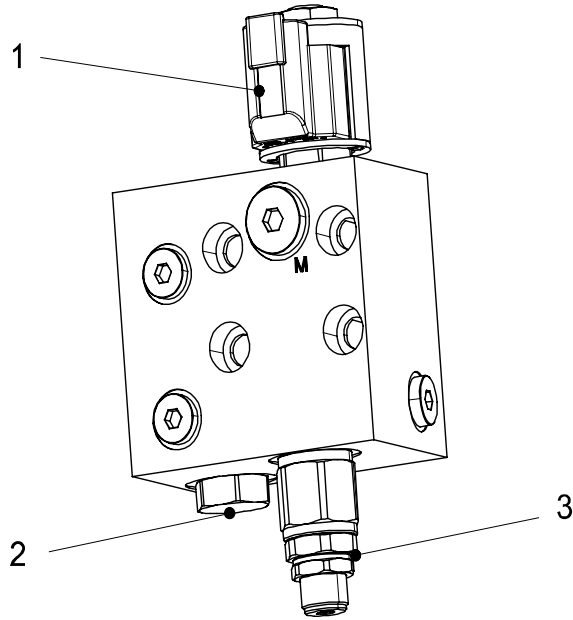


Figure 4-11 Upper lifting cylinder control valves

Table 4-6 Upper lifting cylinder control valves

No.	Item	Function	Torque
1	Solenoid valve	Lifting/Lowering	40Nm/29ft-lbs
2	Non-return valve	Oil one-way flow	40Nm/29ft-lbs
3	Overflow valve	Emergency pull-down pressure	42Nm/31ft-lbs

e) Lower lifting cylinder control valves (all series).

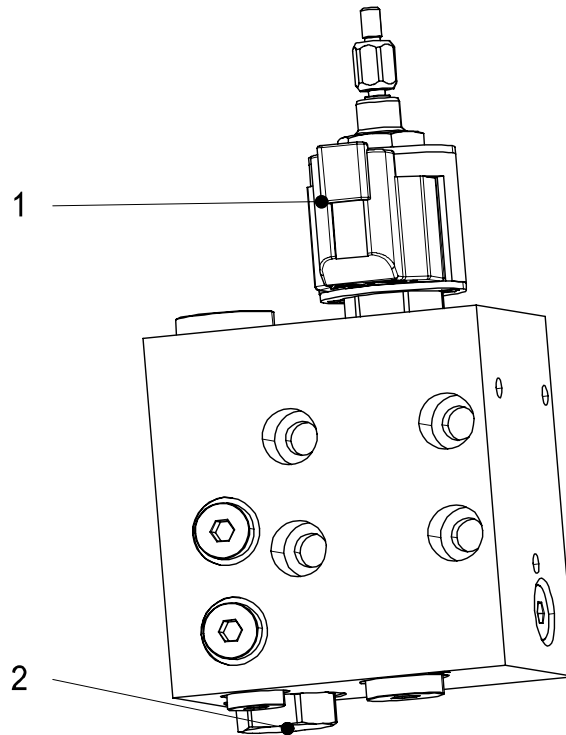


Figure 4-12 Lower lifting cylinder control valves

Table 4-7 Lower lifting cylinder control valves

No.	Item	Function	Torque
1	Solenoid valve	Lifting/Lowering	40Nm/29ft-lbs
2	Non-return valve	Oil one-way flow	40Nm/29ft-lbs

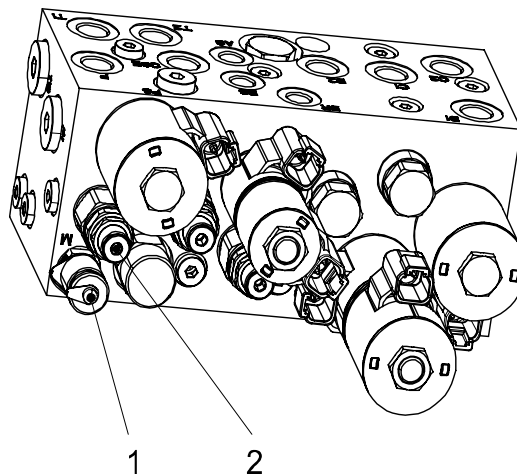
4.1.8 Hydraulic system pressure adjusting

When adjusting the pressure, the operation handle is connected to the lower control system, and the pressure regulator operates on the ground. Before adjusting the pressure, make sure that the oil in the tank is within the specified range.

4.1.8.1 Main pressure adjusting

For ZS1414/ZS1212/ZS1012/ZS0812/ZS0808/ZS0608/ZS0607(HD/HA) series, overflow valve is shown in 4-13, see the pressure adjusting steps as follows:

- a) Remove the operating handle from the platform and open the hydraulic tray, and connect the operating handle to the lower control line.
- b) Connect a pressure gauge with a measuring range of 0 to 5000 psi or 0 to 350 bar to the pressure measuring connector.
- c) Loosen the relief valve lock nut.
- d) Insert the key to open the lower control system.
- e) Hold down the function switch, move the joystick forward or backward while observing the reading on the pressure gauge, and record the pressure value.
- f) When adjusting the pressure, insert an Allen wrench into the adjusting nut, and turn clockwise to increase the pressure, and turn it counterclockwise to decrease the pressure.
- g) After the pressure adjustment is completed, tighten the relief valve lock nut, remove the pressure gauge, and connect the operating handle to the upper control system.



1. Pressure measuring joint 2. System main overflow valve

Figure 4-13 Main overflow valve diagram

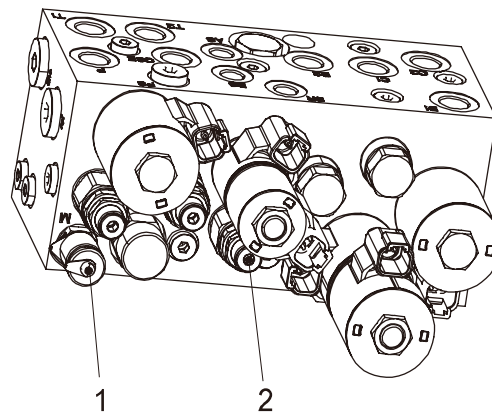
CAUTION

- a) The set pressure must not be higher than the specified pressure, otherwise the components will be damaged and even personal safety will be endangered.
- b) The setting pressure cannot be less than the specified pressure, otherwise it will cause difficulty in climbing.
- c) Do not change the set pressure at will, otherwise it will affect the normal operation of the equipment.

4.1.8.2 Steering pressure adjusting

Adjusting steps:

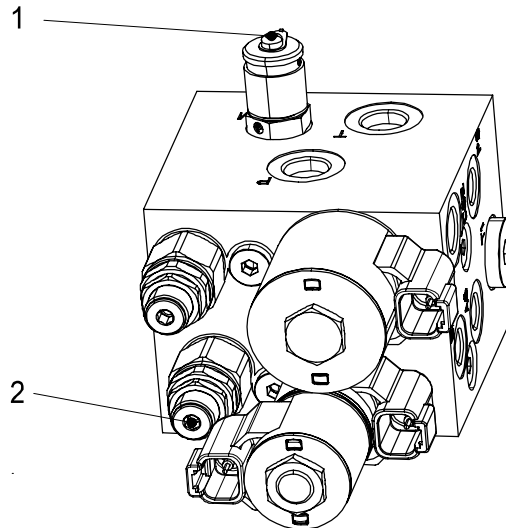
- a) Remove the operating handle from the platform and open the hydraulic tray, and connect the operating handle to the lower control line.
 - b) Connect a pressure gauge with a measuring range of 0 to 5000 psi or 0 to 350 bar to the pressure measuring connector.
 - c) Loosen the relief valve lock nut.
 - d) Insert the key to open the lower control system.
 - e) Hold down the function switch to make the tire turn left or right to the maximum angle while observing the reading on the pressure gauge and recording the pressure value.
 - f) When adjusting the pressure, insert an Allen wrench into the adjusting nut, and turn clockwise to increase the pressure, and turn it counterclockwise to decrease the pressure.
 - g) After the pressure adjustment is completed, tighten the relief valve lock nut, remove the pressure gauge, and connect the operating handle to the upper control system.
- 1) For ZS1414/ZS1212/ZS1012/ZS0812/ZS0808/ZS0608/ZS0607(HD/HA) series, steering relief valve is shown in fig.4-14.



1. Pressure measuring joint 2. steering relief valve

Figure 4-14 Steering relief valve diagram

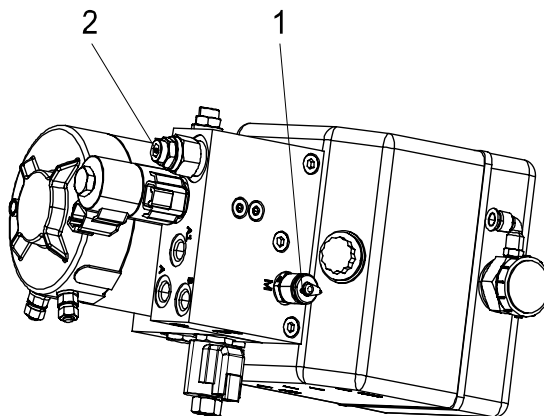
- 2) For ZS1414/ZS1212/ZS1012/ZS0812/ZS0808/ZS0608/ZS0607(DC/AC/ACW/DCS) series, steering relief valve is shown Fig. 4-15.



1. Pressure measuring joint 2. steering relief valve

Figure 4-15 Steering relief valve diagram

- 3) For ZS0407DC/ZS0407DC-Li, steering relief valve is shown in Fig.4-16.



1. Pressure measuring joint 2. steering relief valve

Figure 4-16 Steering relief valve diagram

CAUTION

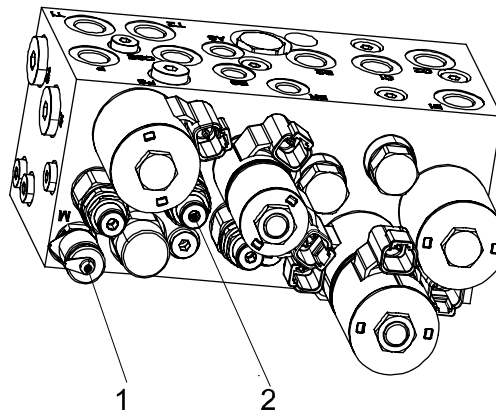
- a) The set pressure must not be higher than the specified pressure, otherwise the components will be damaged and even personal safety will be endangered.
- b) The setting pressure cannot be less than the specified pressure, otherwise it will cause difficulty in climbing. .

- c) Do not change the set pressure at will, otherwise it will affect the normal operation of the equipment

4.1.8.3 Lifting pressure adjusting

Adjusting steps:

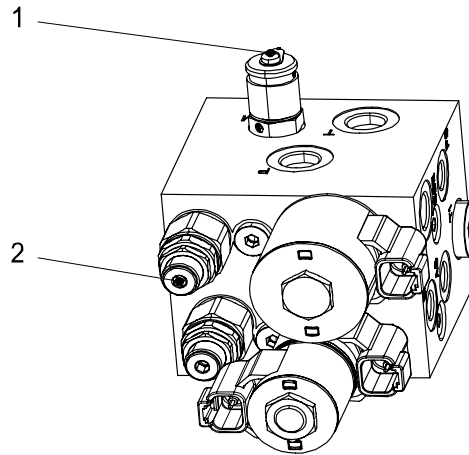
- a) Remove the operating handle from the platform and open the hydraulic tray, and connect the operating handle to the lower control line.
 - b) Connect a pressure gauge with a measuring range of 0 to 5000 psi/0 to 350 bar to the pressure measuring connector.
 - c) Loosen the relief valve lock nut.
 - d) Insert the key to open the lower control system.
 - e) Hold down the function switch, move the joystick forward or backward while observing the reading on the pressure gauge, and record the pressure value.
 - f) When adjusting the pressure, insert an Allen wrench into the adjusting nut, and turn clockwise to increase the pressure, and turn it counterclockwise to decrease the pressure.
 - g) After the pressure adjustment is completed, tighten the relief valve lock nut, remove the pressure gauge, and connect the operating handle to the upper control system.
- 1) For ZS1414/ZS1212/ZS1012/ZS0812/ZS0808/ZS0608/ZS0607(HD/HA) series, lifting relief valve is shown in Fig.4-17.



1. Pressure measuring joint 2. lifting relief valve

Fig 4-17 Lifting relief valve diagram

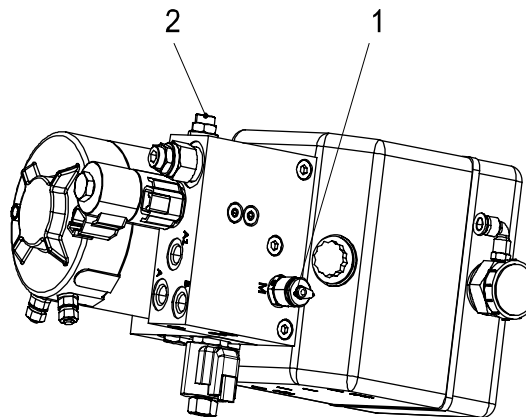
- 2) For ZS1414/ZS1212/ZS1012/ZS0812/ZS0808/ZS0608/ZS0607(DC/AC/ACW/DCS) series lifting relief valve is shown Fig. 4-18.



1. Pressure measuring joint 2. lifting relief valve

Fig 4-18 Lifting relief valve diagram

3) For ZS0407DC/ZS0407DC-Li, lifting relief valve is shown in Fig.4-19.



1. Pressure measuring joint 2. lifting relief valve

Fig 4-19 Lifting relief valve diagram

CAUTION

- a) The set pressure must not be higher than the specified pressure, otherwise the components will be damaged and even personal safety will be endangered.
- b) The setting pressure cannot be less than the specified pressure, otherwise it will cause difficulty in climbing.
- c) Do not change the set pressure at will, otherwise it will affect the normal operation of the equipment.

4.1.9 Hydraulic schematics

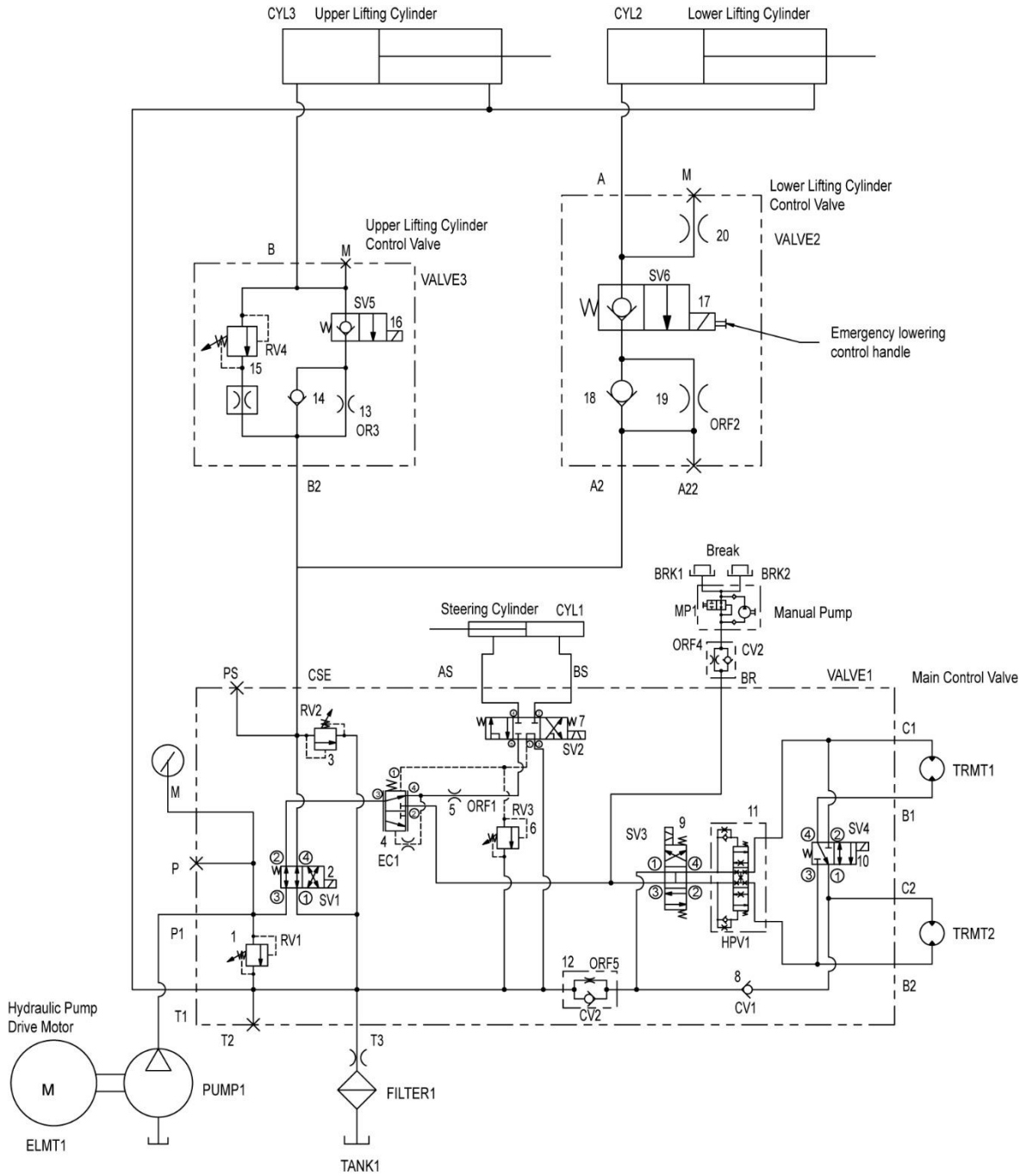


Fig. 4-20 ZS1414/ZS1212/ZS1012(HD/HA) Series Hydraulic schematics

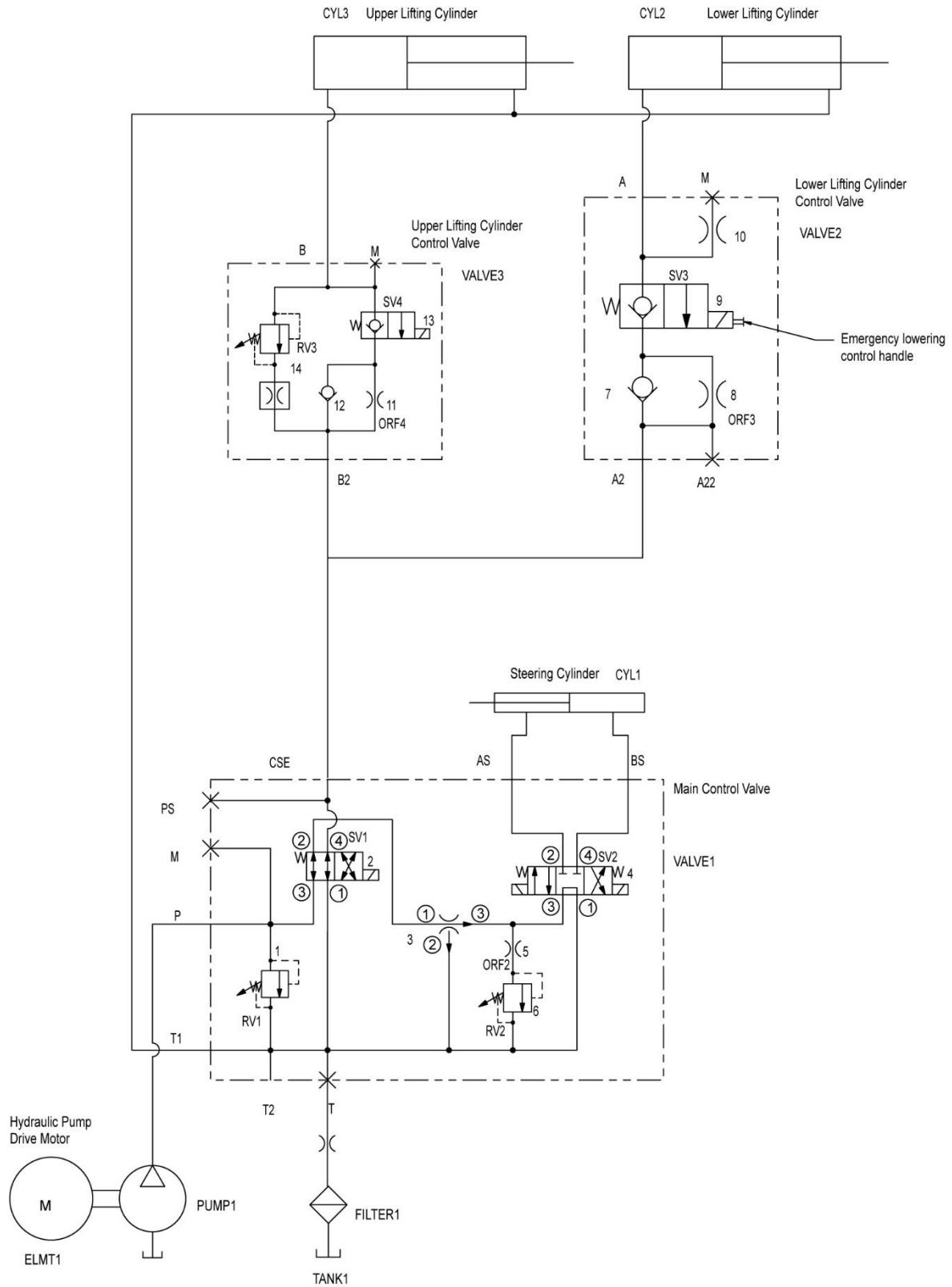


Fig. 4-21 ZS1414/ZS1212/ZS1012(DC/AC) Series Hydraulic schematics

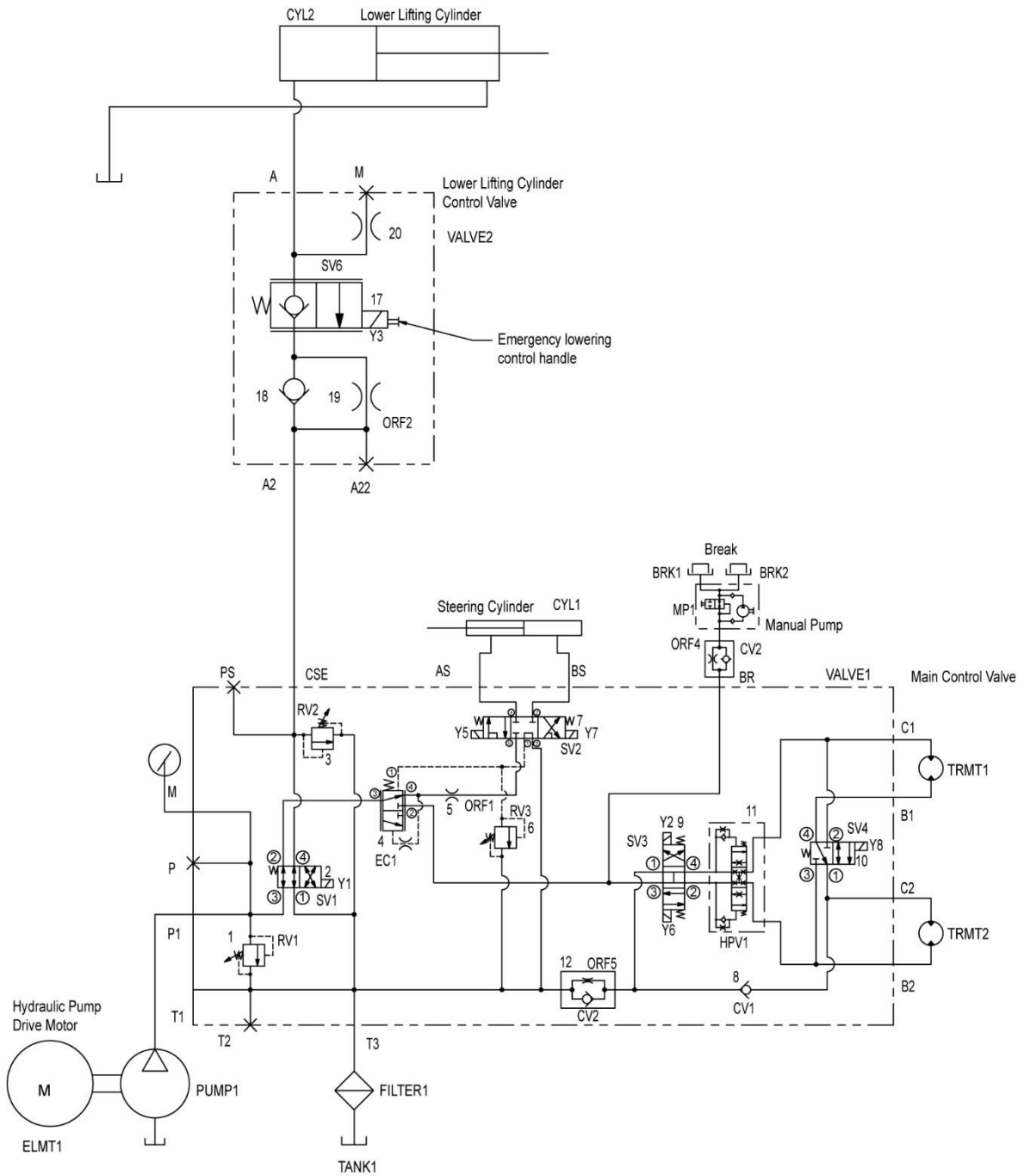


Fig. 4-22 ZS0812/ZS0808/ZS0608/ZS0607(HD/HA) Series Hydraulic schematics

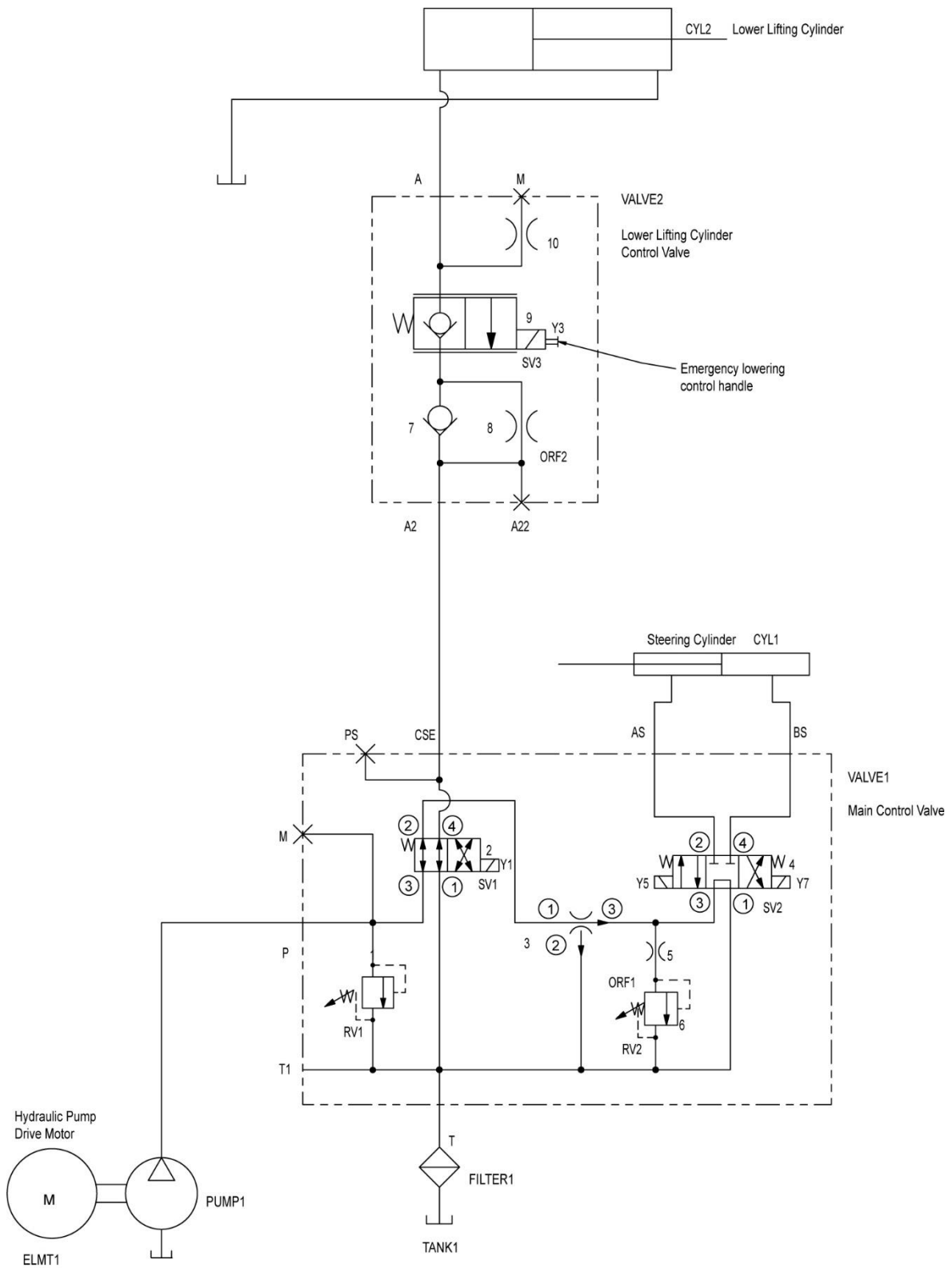


Fig.4-23 ZS0812/ZS0808/ZS0608/ZS0607(DC/DCS/AC/ACW) Series Hydraulic schematics

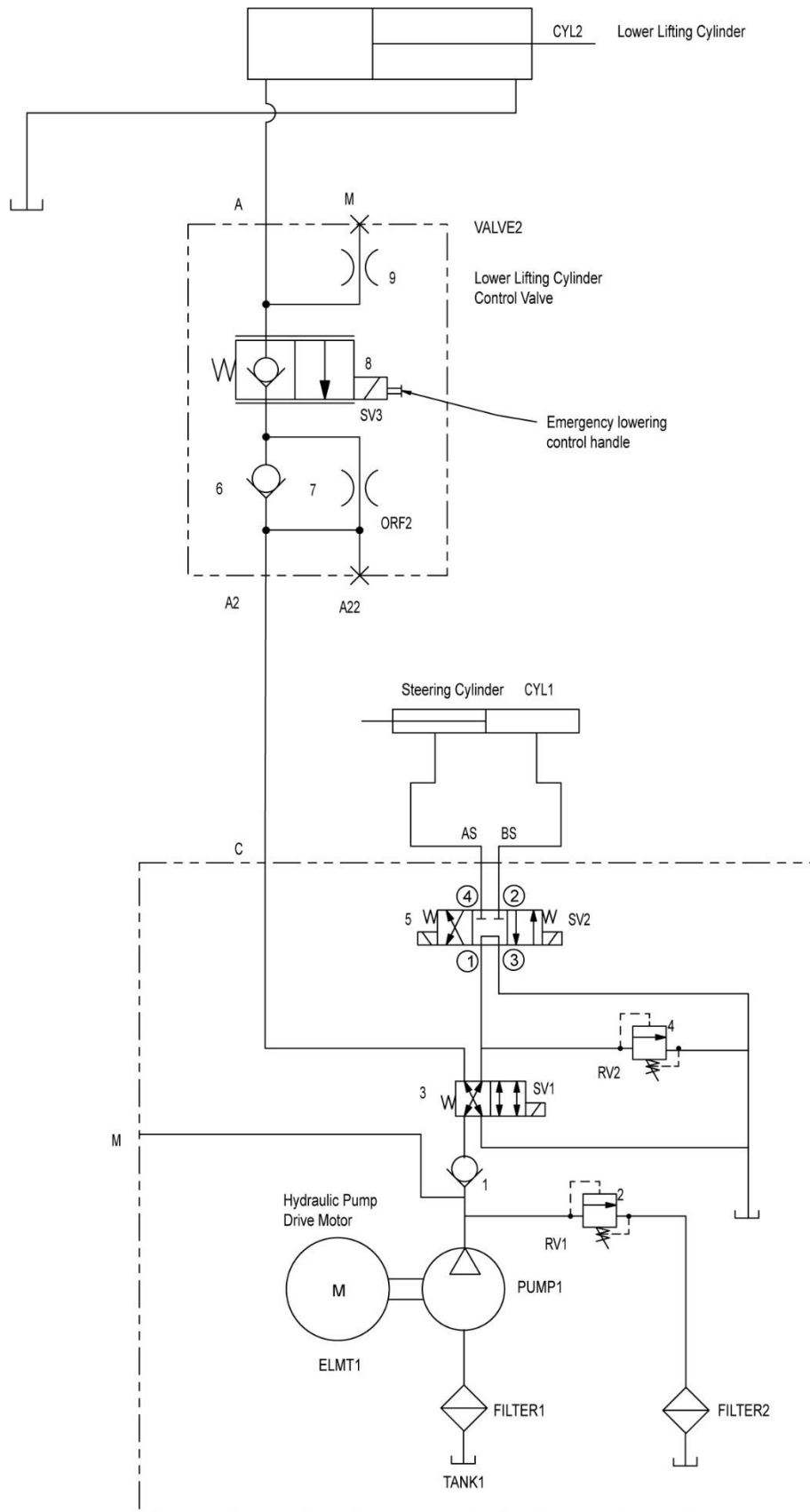


Fig.4-24 ZS0407DC Series Hydraulic schematics

Service and Maintenance Manual

Section 5 Common Faults Analysis



SECTION 5 COMMON FAULTS ANALYSIS

When the work platform is in use, it is necessary to inspect it in time and to repair it when necessary. The purpose of maintenance is as follows:

- a) Ensuring the reliability of operations.
- b) Maintaining the efficiency of the work platform.
- c) Prevent downtime.
- d) Maintain the value of the work platform.
- e) Reduced maintenance costs.

5.1 Hydraulic System Failure

Table 5-1 Fault List of hydraulic system

No.	Fault phenomenon	Cause	Solution
1	Work Platform fails to elevate.	<ul style="list-style-type: none"> 1. Motor reversal. 2. Unloading valve not closed. 3. The hydraulic oil is not clean, due to rubber debris or other sundries, which cause one-way valve of the manual oil pump to close incompletely. 4. Hydraulic oil freezes. 5. Solenoid valve for lifting not open. 	<ul style="list-style-type: none"> 1. Replace phase line of power line. 2. Close unloading valve. 3. Filter or replace hydraulic oil and thoroughly clean the inside of the hydraulic system. 4. Replace with antifreeze hydraulic oil. 5. Check the solenoid valve for Lifting. If no electricity, try to troubles hoot. If there is electricity, it is the fault with solenoid valve itself, then replace the solenoid valve for lifting. Lift solenoid valve should be kept clean and lubricated.

Table 5-1 Fault List of hydraulic system

No.	Fault phenomenon	Cause	Solution
2	The platform does not lower.	<ol style="list-style-type: none"> 1. Manual pump unloading valve not fully open. 2. The scissor structure gets stuck, or there are foreign matters in the slot for roller. 3. Hydraulic oil freezes. 4. Valve for lowering fails to work. 	<ol style="list-style-type: none"> 1. Open manual unloading valves. 2. Repair the stuck position to remove the foreign matters in the slot. 3. Replace with N32 low pour point hydraulic oil. 4. Press the button for lowering to see if the valve is with electricity. If no electricity, try to troubleshoot; If electricity is available, replace the valve with a new one. The valve for lowering should be kept clean and lubricated.※
3	Work platform self-lowering	<ol style="list-style-type: none"> 1. One-way valve discharge. 2. The valve for lowering is not tightly closed. 3. Oil tank leakage. 	<ol style="list-style-type: none"> 1. Check the valve in group valve. If the seal surface of one-way valve is found to be dirty, clean the valve.※ 2. Check if the valve for lowering has electricity, if there is no electricity, try to troubleshoot; if there is electricity with valve, then replace the valve for lowering. The slide valve of the valve for lowering must be kept clean and mobile.※ 3. Replace cylinder sealing elements.
4	Oil leakage from pipe and joint	<ol style="list-style-type: none"> 1. Loose coupling nuts. 2. O-ring sealing failure. 3. Worn-out pipes. 	<ol style="list-style-type: none"> 1. Tighten the coupling nuts. 2. Replace the O-ring sealing. 3. Replace the old pipes.
5	Slow lifting, or vibration of hydraulic system	<ol style="list-style-type: none"> 1. Insufficient hydraulic oil, and air suction. 2. Air leakage of oil suction pipe. 	<ol style="list-style-type: none"> 1. Add enough hydraulic oil. 2. Repair the suction pipe.
6	Speed control problem for travelling (hydraulic driving)	<ol style="list-style-type: none"> 1. High and low speed switching valve fault. 2. Switch fault high and low speed control. 3. Motor fault. 	<ol style="list-style-type: none"> 1. Repair high and low speed switch valves.※ 2. Repair high and low speed switch of controller.※ 3. Repair traveling motors.※

Table 5-1 Fault List of hydraulic system

No.	Fault phenomenon	Cause	Solution
7	Brake problem (hydraulic driving)	<ol style="list-style-type: none"> 1. Fault of brake manual pump. 2. Clogged brake lines. 3. Brake fault. 	<ol style="list-style-type: none"> 1. Repair or replacement of manual pump.※ 2. Clean the pipelines. 3. Repair of brakes.※
8	Slow climbing (hydraulic driving)	<ol style="list-style-type: none"> 1. Gear pump fault. 2. Safety valve fault. 3. Motor fault. 4. Brake fault. 5. Overloading. 	<ol style="list-style-type: none"> 1. Repair or replacement of gear pumps.※ 2. Inspect and adjust the pressure of the relief valve.※ 3. Repair or replacement of hydraulic motors.※ 4. Repair or replacement of brakes.※ 5. Unloading.
9	Hydraulic system noise	<ol style="list-style-type: none"> 1. Low viscosity of oil. 2. Low temperature of hydraulic oil. 3. The backflow pressure of oil return pipe is too high. 	<ol style="list-style-type: none"> 1. Replacement of hydraulic oil. 2. Hydraulic system preheating. 3. Change the hydraulic pipeline.
10	High temperature of hydraulic oil	<ol style="list-style-type: none"> 1. Clogging of radiators or pipeline. 2. Wrong type of hydraulic oil. 3. Deterioration of hydraulic oil. 4. Insufficient oil in the tank. 	<ol style="list-style-type: none"> 1. Clean the radiator or pipeline. 2. Replacement of hydraulic oil. 3. Replacement of hydraulic oil. 4. Refuel to the oil level.
11	Severe vibration of hydraulic pipelines	<ol style="list-style-type: none"> 1. Air in hydraulic systems. 2. Loose pipe clamps. 3. Clogging of overflow or relief valves. 4. Fault of pump, motor, or valve. 	<ol style="list-style-type: none"> 1. Air exhaust. 2. Adjust and fix the pipeline. 3. Clean the valves.※ 4. Repair or replacement of pumps, motors or valves.※
12	Oil leakage at hydraulic pipe joints	<ol style="list-style-type: none"> 1. Joint not tightened. 2. Damage to sealing elements. 	<ol style="list-style-type: none"> 1. Fasten joint. 2. Replacement of sealing elements.

Table 5-1 Fault List of hydraulic system

No.	Fault phenomenon	Cause	Solution
13	Hose burst	<ol style="list-style-type: none"> 1. The hose is inconsistent with the service pressure. 2. Aging and scratches of hose. 3. Clogging at hose joints. 	<ol style="list-style-type: none"> 1. Use proper hose. 2. Replace the hose. 3. Clean the hoses and joints.
14	Oil leakage of hydraulic pump and motor joint	Hydraulic oil leakage from hydraulic pump and motor.	Test pump and motor outlet pressure, if lower than standard pressure, then the system has leakage. Check the leak point, replace sealing element, and tighten the sealing according to standard torque.※

▲ CAUTION

Do not disassemble or adjust when components with ※ break down. Contact the manufacturer.

5.2 Electrical System Fault

Table 5-2 Electrical System Fault List

No.	Fault phenomenon	Cause	Solution
1	Fault of angle sensor	<ol style="list-style-type: none"> 1. Plug and connection of the angle sensor are loose. 2. Shift of installation position. 3. Damaged sensor. 	<ol style="list-style-type: none"> 1. Restore plug and connection. 2. Re-fixing of angle sensor. 3. Replacement of sensor.
2	Fault of pressure sensor	<ol style="list-style-type: none"> 1. Plug and connection of the pressure sensor are loose. 2. Damaged sensor. 	<ol style="list-style-type: none"> 1. Restore plug and connection. 2. Replacement of sensor.
3	Switch fault of pothole	<ol style="list-style-type: none"> 1. Loose connection of left and right pothole limit switch. 2. Shift of left and right pothole protection limit switch. 3. Pothole slab cannot unfold properly. 	<ol style="list-style-type: none"> 1. Restore the connection. 2. Re-fix the left and right pothole limit switch. 3. Check the structure of the pothole slab whether it is normal or not and check whether there are any foreign matters under the pothole slab blocking the opening of the slab.
4	The work platform is elevated to the highest position and cannot be limited	<ol style="list-style-type: none"> 1. Loose connection of upper limit switch. 2. The position of upper limit switch is shifted and cannot be triggered properly. 3. Shift of upper limit switch trigger metal plate position. 4. Upper limit switch fault. 	<ol style="list-style-type: none"> 1. Check and restore upper limit switch connection. 2. Recalibration and re-fixing installation position of upper limit switch. 3. Recalibration and re-fixing installation position of upper limit switch trigger metal plate. 4. Replace upper limit switch.

Table 5-2 Electrical System Fault List

No.	Fault phenomenon	Cause	Solution
5	Safe height limit anomaly or position shifting	<ol style="list-style-type: none"> 1. Lower limit switch connection is loose. 2. The lower limit switch position is shifted and cannot be triggered properly. 3. Lower limit switch trigger metal plate is shifted. 4. Fault of lower limit switch. 	<ol style="list-style-type: none"> 1. Check and restore the lower limit switch connection. 2. Recalibration and re-fixing the lower limit switch installation position. 3. Recalibration and re-fixing trigger the installation position metal plate of the lower limit switch. 4. Replace the lower limit switch.
6	System communication error	<ol style="list-style-type: none"> 1. Fault of communication lines between platform controller and ground controller. 2. Fault of work platform controller. 3. Fault of ground controller. 	<ol style="list-style-type: none"> 1. Whether CAN_H1 and CAN_L2 line on the platform and ground controller are properly connected. 2. Or replacement of the platform controller.※ 3. Or replacement of the ground controller.※
7	UP and DOWN control can't start normally.	<ol style="list-style-type: none"> 1. 300A main fuse burned down. 2. 10A breaker tripping. 3. Abnormal cable connection between platform and ground controller. 4. Fault of platform controller. 5. Fault of ground controller. 	<ol style="list-style-type: none"> 1. Replacement of the 300A main fuse. 2. Press 10A circuit breaker to restore connection. 3. Replace connection cable or plug-in of platform and ground controller. 4. Replacement of platform controller.※ 5. Replacement of ground controller.※

CAUTION

Do not disassemble or adjust when components with ※ break down. Contact the manufacturer.

ELECTRIC SCISSOR LIFTS

Service and Maintenance Manual



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