



LGMG North America Inc.

Maintenance Manual

T65J-H/T72J-H/T85J-H/T92J-H

Telescopic Boom

Mobile Elevating Work Platform



WARNING

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

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

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Foreword

Thank you for choosing to use this Mobile Elevating Work Platform from LGMG North America. This machine is designed according to A92.20-2021. The information specified in this manual is intended for the safe and proper operation of this machine for its' intended purpose.

For maximum performance and utilization of this machine, thoroughly read and understand all the information in this manual before starting, operating, or performing maintenance on this machine.

Due to continuous product improvements, LGMG North America reserves the right to make specification changes without any prior notifications. For any updated information, contact LGMG North America.

Ensure all preventive maintenance to the machine is performed according to the interval specified in the maintenance schedule.

Keep this manual with this machine for reference at all times. When the ownership of this machine is transferred, this manual shall be transferred with this machine. This manual must be replaced immediately if it is lost, damaged, or becomes illegible.

This manual is copyrighted material. The reproduction or copy of this manual is not allowed without the written approval of LGMG North America.

The information, technical specifications and drawings in this manual are the latest available when this manual is issued. Due to continuous improvement, LGMG North America reserves the right to change the technical specifications and machine design without notice. If any specifications and information in the manual are not consistent with your machine, please contact the service department of LGMG North America.

 **WARNING**

Only personnel who have been properly trained and qualified to operate or maintain this machine can operate, repair and maintain this machine.

Improper operation, maintenance, and repair are dangerous and can cause personal injury and death.

Before any operation or maintenance, the operator shall thoroughly read this manual. Do not operate, perform any maintenance or make any repairs on this machine before reading and understanding this manual.

The user shall load the platform strictly according to the load rating of the platform. Do not overload the platform or make any modifications to the platform without permission from LGMG.

The operation regulations and preventions in this manual are only applicable for the specified use of this machine.

Safety Precautions

The operator of this machine shall understand and follow the existing safety regulations of state and local governments. If these are unavailable, the safety instructions in this manual shall be followed.

To help prevent accidents, read and understand all warnings and precautions in this manual before operation or performing maintenance.

It is impossible to foresee every possible hazard and the safety instructions in this manual may not cover all safety prevention measures. Always ensure the safety of all personnel and protect the machine against any damage. If unable to confirm the safety of some operations, contact LGMG North America.

The operation & maintenance prevention measures listed in this manual are only applicable to the specified uses of this machine. LGMG North America assumes no responsibility if this machine is used beyond the range of this manual. The user and the operator shall be responsible for the safety of such operations.

Do not perform any operation forbidden in this manual in any situation.

The following signal words are applicable for identifying the level of safety information in this manual.



An imminent situation, that if not avoided, will result in severe injuries or death. This is also applicable to situations that will cause serious machine damage, if not avoided.



A potentially dangerous situation, that if not avoided, may result in severe injuries or death. This is also applicable to situations that may cause serious machine damage, if not avoided.



A situation, that if not avoided, may result in minor or intermediate injury. This is also applicable to situations that may cause machine damage or shorten machine service life.

Chapter 1 Maintenance

1.1 Compliance and Obedience

- 1) You accept the proper training of safety operation and machine maintenance, and have corresponding aptitudes.
- 2) It is necessary to read, understand and adhere to all safety regulations of this manual, safety regulations of workplace and applicable laws and regulations of government.
- 3) Protective articles, such as safety helmet, safety belt, work shoes, goggles and protective clothing, have been equipped all over the body, and the physical state is excellent.
- 4) Operators can only conduct conventional inspection and maintenance items as specified in this manual.
- 5) Only technical maintenance personnel who are trained and get corresponding certificates may complete scheduled maintenance.
- 6) Waste and old materials shall be disposed according to government regulations and work site rules.
- 7) Only LGMG approved parts and consumables can be used.
- 8) Function test shall be always conducted upon maintenance.

1.2 Check the Safety Manual

It is necessary for safe equipment operation to keep the Operator and Safety Manual in good condition. The manual shall be stored in a container in the working platform provided by each machine. An illegible or missing manual will not provide the necessary safety and operation information for safe operation.

- 1) Check that the storage container is on site and in good condition.
- 2) Check that the Operator and Safety Manual is complete in the storage container on the work platform.
- 3) Check that each page of the manual is identifiable and in good condition.

- 4) Put the manual in the storage file box after use.



CAUTION: If the manual need to be replaced, please contact the service staff of LGMG.

1.3 Check for Labels and Signs

It is required to keep all safety and description labels and signs in a good condition for safe operation of the platform. Labels warn operators and staff of many possible hazards in using the platform. They also provide users with operation and maintenance information. Illegible labels cannot warn staff of steps or hazards and may lead to unsafe operating conditions.

Refer to the label section in this operation manual and use the label menu and instructions to check that all labels are in place.

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



CAUTION: If the labels need to be replaced, please contact the service staff of LGMG.

1.4 Every Day or Every 8 Hours

1.4.1 Check for Damaged, Loose or Missing Parts

This step is performed every 8 hours or every day, whichever comes first.

Carrying out daily equipment status check is necessary for ensuring safe equipment operation and maintaining good equipment performance. Incorrect positioning, repairing damaged equipment, and loose or missing parts may result in unsafe operating conditions.

- 1) Check for damaged parts for the whole platform, and check for incorrect installation

or missing parts and components, including:

- Electrical components, wirings and cables
 - Hydraulic hoses, connectors, valve blocks and hydraulic cylinders
 - Fuel and hydraulic tanks
 - Wear-resistant pads
 - Tires and wheels
 - Engine and related components
 - Limit switch and horn
 - Nuts, bolts and other fasteners
 - Platform entrance door
 - Indicators and alarms
 - Platform controller
- 2) Check the entire machine for:
- Cracks in welds or structural components
 - Whether the platform, boom and chassis are deformed or have cracked weld joints
 - Indentation or damage to the machine
 - Ensure that all structural components and other key components are complete and all relevant fasteners and pins are in the correct position and tightened

1.4.2 Check for Hydraulic Oil Level

This step is performed every 8 hours or every day, whichever comes first.

Proper hydraulic oil level is crucial in operating the machine. If the hydraulic oil is at an improper level, the hydraulic components will be damaged. Through a daily inspection, the inspector can determine the hydraulic oil level change which indicates that the hydraulic system is faulty.

 **CAUTION: Perform this step**

when the boom is in the retracted position.

- Park the vehicle on the flat site. Fully retract the boom.

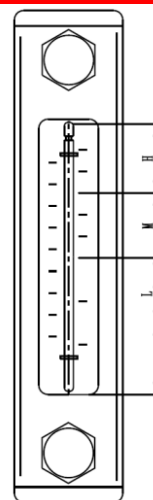


Figure 1-1 Oil Level Sight Gauge

- Examine the oil level on the hydraulic oil tank, i.e., level shall fall within the M range shown as Figure 1-1, and in the case of level within the L range, it is necessary to add hydraulic oil

Use temperature	Oil type
The lowest temperature > -25°C	L-HV 32 low temperature hydraulic oil
-40°C < The lowest temperature ≤ -25°C	L-HS32 ultra low temperature hydraulic oil
The lowest temperature ≤ -40°C	10# aviation hydraulic oil

1.4.3 Check for Hydraulic Oil Leakage

This step is performed every 8 hours or every day, whichever comes first.

 **CAUTION: Personal injury danger,**

i.e., leaking hydraulic oil can penetrate or burn skin. Wear goggles and protective gloves.

- Leakage of high-pressure oil may be invisible to eyes, use cardboard or wooden boards as a search tool for hydraulic oil leakage. Hands shall be prohibited from being used for leakage confirmation. Inspect

oil drops or residual oil on the following components:

- Hydraulic oil tank, filter, pump, hydraulic oil cylinder, motor, reduction gear, valve block and hydraulic tubing.
- Rear of boom, fly jib, upper side of turntable, upper and lower sides of chassis, and ground underneath equipment.

1.4.4 Check for Engine Oil Level



⚠ Do not operate on running engines!

No smoking and open fires!

Be careful when contacting with high temperature engine oil. Danger of scalding!

⚠ When operating on the oil system,

pay attention to the surface cleaning. Carefully clean all areas involved. Blow wet parts with compressed air.

⚠ Please observe the safety

regulations for engine oil and relevant local regulations. Dispose of spilled engine oil and filter elements as required. Waste oil cannot penetrate into the ground.

⚠ Test run shall be carried out after

each operation. At the same time, pay attention to the sealing and lubricating oil pressure, and then check the

engine oil level.

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

Insufficient or excessive engine oil may cause damage to the engine. The engine oil level can only be checked when the engine is placed horizontally and closed. If the engine is hot, close the engine and check the engine oil level 5 minutes later. Check it immediately if the engine is cooled.

Kubota-V2403:

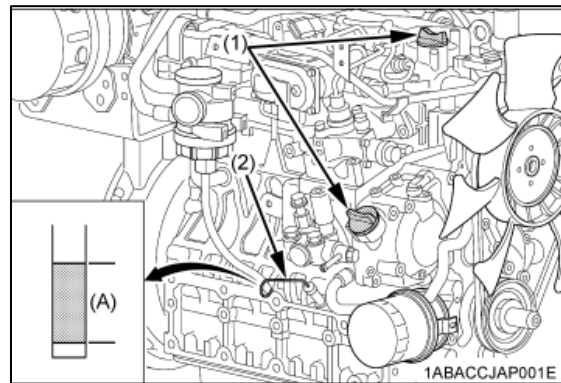


Figure 1-2

1. Oil filler plug
2. Oil measuring rod
3. Engine oil level within this range is proper.

Kubota-V3307

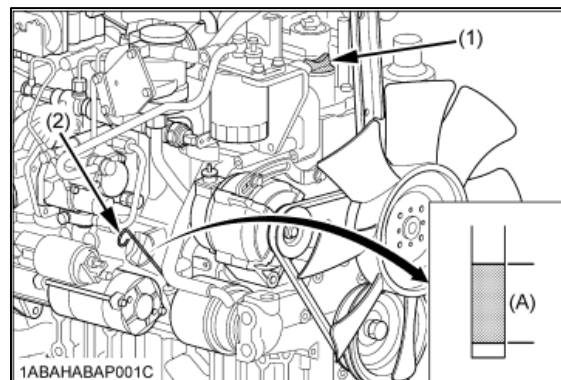


Figure 1-3

1. Oil filler plug
2. Oil measuring rod
3. Engine oil level within this range is proper.

Deutz-TD2.9L4

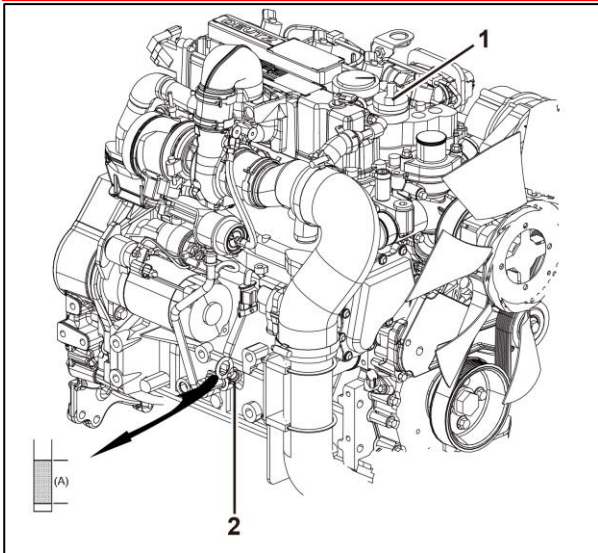


Figure 1-4

1. Oil filler plug
2. Oil measuring rod
3. Engine oil level within this range is proper.
 - 1) Insert the oil measuring rod and clean it with a piece of clean and fiber-free cloth.
 - 2) Insert the oil measuring rod into the bottom.
 - 3) Pull out the oil measuring rod and read the value of engine oil level.
 - 4) The engine oil level shall always be between MIN and MAX!
 - 5) Fill up to the maximum liquid level if necessary.


1.4.5 Check for Fuel Leakage


 **The engine must be shut down!**

No smoking and open fires!

Be careful when contacting high temperature fuel!

Please observe the safety regulations for fuel and relevant local regulations. Dispose of spilled fuel and filter elements in accordance with national regulations. The fuel cannot seep into the ground.

 **There is danger of explosion and fire. The fuel of the engine is combustible. Check the position of the machine. When this step is performed, the machine shall be away from the heater, spark, flame, and open and well-ventilated areas with burning tobacco. A qualified fire extinguisher shall be placed in an easily accessible place.**

 **There is danger of explosion and fire. If fuel leaks, prevent any additional person from entering the area or operating the equipment. Repair the leakage immediately.**

Visually check for fuel leakage every 8 hours or every day.

1.4.6 Check for Engine Air Filter

Check the maintenance indicator for the air filter every 8 hours or every day. (If equipped)

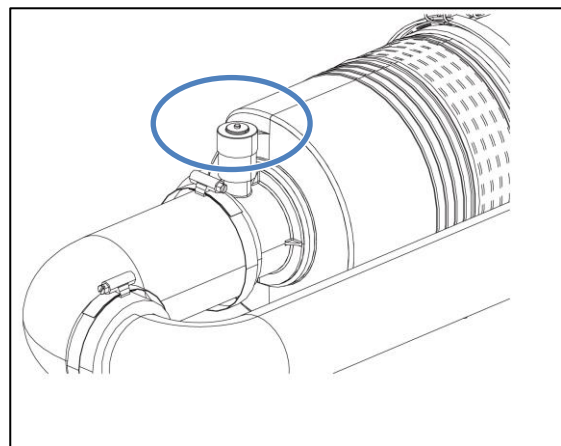



Figure 1-5

 **Perform this step when the engine is turned off.**

Check the maintenance indicator of the air filter.

When the transparency of the indicator turns red, filter element needs to be maintained and cleaned or replaced.

When the primary filter element is cleaned more than 5 times or the filter element has been damaged, the primary filter element needs to be replaced.

Under ordinary conditions, open the dust discharge valve once a week; When used in dusty places, open it once a day, which can remove large particles of dust and something dirty.

1.4.7 Check for Coolant Liquid Level

Check the coolant liquid level every 8 hours or every day.

! The coolant at high temperature has the risk of scald.

The cooling system is under pressure! The cover can only be opened in the cooling state.

Coolant must have a specified concentration of cooling system protectant!

Please observe the safety regulations for coolant and relevant local regulations.

Dispose of the spilled coolant as specified, without leaving it on the ground.

Never run the engine without coolant, even if it's a very short time.

- 1) Carefully open the cover for the cooling system.
- 2) The coolant liquid level shall always be between min and max! Fill up to the maximum liquid level if necessary.

1.4.8 Check for Engine Belt

Check it every 8 hours or every day.

! Only when the engine is

stationary can the belt drive operation be carried out.

! There is danger of burn. Be

cautious of high-temperature engine components. Contact with them may cause serious burn.

Belt Check

- 1) Visually inspect whether all belt drives for damage.
- 2) Replace damaged components.
- 3) Reinstall the protector if necessary.
- 4) When it is a new belt, check whether the position is correct. After running for 15 minutes, check the tension.

1.5 Every 100 Hours

1.5.1 Slewing Bearing and Slewing Gear Lubrication

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

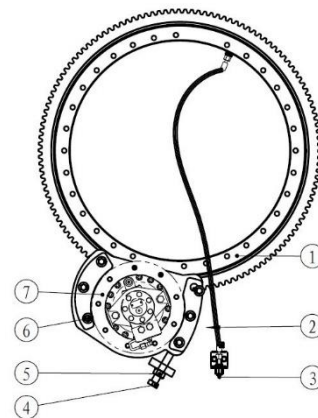


Figure 1-6 Slewing mechanism

1. Slewing bearing
2. Oil pipe
3. Grease nipple
4. Adjusting bolt
5. Lock nut
6. Fixing bolt
7. Slewing reducer

- As shown in Fig. 1-6, find the grease port 3 on the side of the bearing, swing the turntable multiple times while filling grease until grease overflows from the upper and lower fixed surfaces of the bearing. Lubricating grease must be: Lubrication EP2 or equivalent.
- Inspect the lubrication of the turntable bearing and the swing gearbox, if necessary, clean the gear surface, and recoat with grease.

CAUTION: If there is too much

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

1.6 Every 250 Hours

1.6.1 Check the Air filter of Hydraulic Tank

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

An unobstructed hydraulic oil tank cap is essential for good mechanical performance and long service life of the platform. A dirty or clogged exhaust cover may result in poor platform performance. Given harsh working environment, more frequent check is required.

- ① Remove the exhaust cover from the hydraulic oil tank cap.
- ② Check for ventilation.

Result: Air can pass through the exhaust cover.

Result: If air does not pass through the exhaust cover, continue with Step 3.

NOTICE: Air is supposed to pass

freely while checking ventilation of the oil tank cap.

- ③ Carefully clean the tank exhaust cover with mild solvent and dry it with low pressure compressed air. Repeat Step 2.

Install the exhaust cover of the hydraulic oil tank.

1.6.2 Check for Batteries

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

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

Good battery condition is essential for machine performance and safe operation. Improper voltage or damaged cables and wiring may cause component damage and dangerous situations.

Maintenance-free lead-acid battery inspection:

- Check that the battery locking lever is secure
- Check the wiring of the battery cable. The wiring is firm and free from corrosion.
- Check whether the battery fluid leaks and whether the battery is dry and clean.
- Check the color of the battery hydrometer as shown in the figure:



Hydrometer

Figure 1-7

Battery hydrometer

Hydrometer color	Meaning and treatment
White	Lack of battery fluid. Please shut down the machine and stop using it
Black	Power loss or damage
Green	Measure the voltage of each battery. If the voltage is lower than 11V, it indicates that the

	battery is damaged; The voltage is between 12.4v-12.7, indicating that the battery is in good condition
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- If the color of the battery hydrometer is green and the voltage is above 12V, but the starter cannot be driven, please ask the personnel trained and qualified for the maintenance of the machine to further test the battery.

Battery recharge:

- Before charging, disconnect the negative connection of the battery first, and then the positive connection of the battery.
- Before replenishing electricity, clean the end column and remove the oxide scale on the surface.

 **NOTE: If an external power**

supply is required to charge the battery, only the charger approved by the LGMG can be used.

- Do not replenish the battery with white eyes. Replace the battery.
- When wiring after charging, connect the positive wire first and then the negative wire.

 **NOTICE: Adding a terminal**

protector and an anti-corrosion sealant will help remove corrosion caused to battery terminals and cables.

1.6.3 Check the Wires

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

It is important for safe operation and good machine performance to keep the wires in good conditions. Failure to find and replace the burn-out, scratched, corroded or bent wires will result in unsafe operating conditions and damage to the parts.

Risk of electric shock/explosion

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

- 1) Check the following areas for burn-out, scratched, corroded, bent or loose wires:
 - Engine wiring harness
 - All wire harness connectors to ground control box
 - All wire harness connectors to platform control box
 - Hydraulic manifold wiring
 - Battery harness
 - Cables on the primary, secondary and jib booms
- 2) Check whether all wire harness connectors are coated with insulating grease:
 - Ground control unit
 - Platform control unit
 - Harness connectors
 - Sensor

1.6.4 Check for Tires and Hubs

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

Keeping tires and hubs in a good condition is critical for safe operation and good performance. Failure of the tires and hubs may cause the platform to tilt. If such failure is not found and repaired in time, it will also cause damage to platform parts.

- 1) Check treads and sides of tires for scratches, cracks, punctures, and other abnormal wear.
- 2) Check if the hubs are damaged, bent or cracked.
- 3) Check whether or not the technological screws for tires are detached. Upon the detaching of screws, if there is slight or no leakage of fillers, and no significant deformation is found for the tire body, and users can knock in screws which are slightly larger than the diameter (about

5mm) of the vent hole with a hammer. If leakage of a large quantity of fillers is found, and the tire body deforms significantly, it is necessary to reduce the height of the working platform and replace the tires timely.

4) Check for nut torque of tires:

305 ± 25N.m (T65J-H/T72J-H);

440 ± 44N.m (T85J-H/T92J-H).

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

The turntable shall rotate smoothly without jamming, and meshing play between the turntable bearing and the swing gearbox is measured using a feeler gauge, which shall be between 0.2mm and 0.3mm. Measurement is conducted every 250 hours or quarterly.

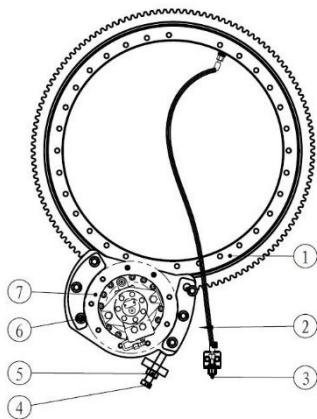


Figure 1-8

- Unscrew bolt 6 and locking nut 5
- Turn adjusting bolt 4 to adjust the position of the swing gearbox
- Measure play between the turntable bearing and the swing gearbox using a feeler gauge
- If the play ranges from 0.2mm to 0.3mm, tighten lock nut 5 and bolt 6
- Measure play between the turntable bearing and the swing gearbox again to verify the measurement
- Tighten bolt 6, and torque to (595 ± 55)N•m.

1.6.6 Check the Drive Hub Oil Level

Inspect the oil level of the drive hubs every 250 hours or quarterly. Improper oil level will result in reduced performance. Continuous use will result in damage to components.

1) Inspect oil level of traveling gearbox

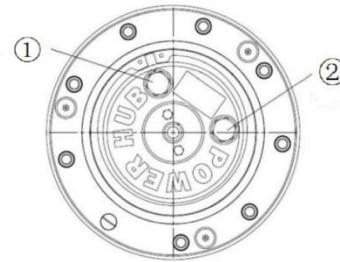


Figure 1-9 Traveling Gearbox

1. Oil filler 2. Viewing port

- Drive the machine until one plug is located at the horizontal position as shown as shown in Figure 1-9.
- Remove the viewing port plug at the horizontal position, and inspect oil level.
- Result: Oil level shall be flush with the bottom of the viewing port.
- If necessary, add oil at the oil filler until the oil level is flush with the bottom of the viewing port, select gear oil by referring to Machine Specifications section.
- Coat the plugs with pipe thread sealant and install the plugs.
- Repeat this step for every drive hub.

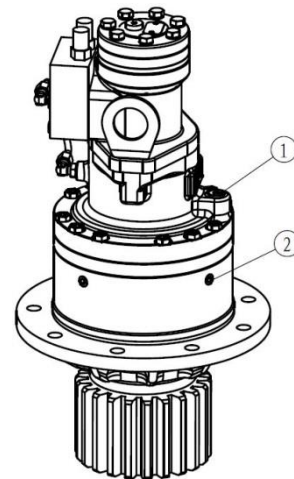


Figure 1-10 Swing Gearbox

1. Oil filler 2. Viewing port

- 2) Inspect oil level of swing gearbox
 - Remove the plug on the side and inspect the oil level, as shown in Figure 1-10.

Result: Oil level shall be flush with viewing port (2).

- If necessary, add gear oil at the oil filler plug until the oil level is flush with the bottom of the viewing port, select gear oil by referring to the Machine Specifications section.
 - Coat the plugs with pipe thread sealant and install the plugs.
- 3) Replace lubricant after the first 50h of use, then every 1,000 h or yearly, whichever comes first.

Condition	Grade (API GL-5)
30° C < The lowest temperature	85W/140
-10° C < The lowest temperature < 30° C	85W/90
-30° C < The lowest temperature < -10° C	80W/90
The lowest temperature < -30° C	75W

1.6.7 Visual Inspection of the Hydraulic Oil

This check item shall be conducted every 250 hours or quarterly, whichever comes first.

Collect a sample of hydraulic oil and place in a clear container. Visually inspect the hydraulic oil for the following:

- Color: oil should be a clear, light-honey colored.
- Appearance: oil should be clear and not cloudy or visibly distorts the view through the sight glass or container.
- Contains no particles, foreign objects, or other contamination.
- The hydraulic oil can be inspected by smell (can smell “hot” but not “burnt”) or rubbing between fingers (should feel viscous and free of any rough feel due to particles) If the hydraulic oil passes all of the above inspections, continue the scheduled maintenance intervals. If the hydraulic oil fails any of the above inspections, the

hydraulic oil must be tested by an oil distributor or replaced.

! Note: If the hydraulic oil has not been replaced for two years, the oil must be tested every quarter by an oil distributor until the oil fails the test and is replaced. After the oil has been replaced, continue the scheduled quarterly maintenance inspection.

! Note: When replacing the hydraulic oil, it is recommended that all hydraulic filters be replaced at the same time.

1.6.8 Check the Wire Rope

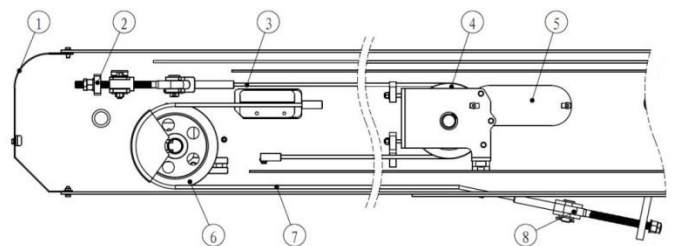


Figure 1-11 Boom Telescope System

1. Cover Plate
2. Extend Rope Anchor
3. Extend Rope
4. Extension Pulley Block
5. Cover Plate
6. Retract Pulley Block
7. Retract Rope
8. Retract Rope Anchor

After long-term operation of equipment, the wire rope will stretch, resulting in boom sections not synchronized, separation of wire rope from pulley, boom shaking during extension, contact of wire rope to inner wall of boom sections or rubbing between wire rope and inner wall of the boom and other problems. It is necessary to conduct periodic checks on the condition of the wire rope. Inspect the stretching wire rope for stretching every 250 hours or quarterly.

- 1) Raise the boom to horizontal, extend the boom, and inspect if the second-section and third-section booms are synchronized in the extension process of the boom. If the third-section boom lags behind the second-section boom, this means the wire rope is loose.
- 2) Raise the boom to horizontal, extend the boom, and inspect whether or not the third-section boom shakes or if there is “flap” sound from the wire rope whipping the inside of the boom section during extension. If this happens, it indicates the wire rope is loose.
- 3) Remove the rear cover plate (1) of the boom, and see if the extend rope anchor (2) deflects to one side. See if the retract rope anchor (8) deflects to one side. If deflection exists, it means the wire rope is loose.
- 4) Raise the boom to horizontal, extend the boom completely, remove the rear cover plate (1) and the side cover plate (5), and visually inspect for wear on the extension pulley block (4,) the retract pulley block (6), the extend rope (3) and the retract rope (7). The pulley shall be fixed firmly secured without play, non-uniform wear of the pulley groove shall be less than 3mm, and the wear of the pulley flange shall be smaller than 10% of the original wall thickness. There must be no loosening, breaks, and serious corrosion in the wire rope. During extension and retracting, there must be no flapping in the pulley. In the case of any abnormalities, stop using the machine immediately and tag out the machine.

Replacement of the Wire Rope

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

More frequent inspection or replacement (if necessary) is required when:

- The machine is operated in harsh environment;
- The boom involves seizure or unusual noise during operation;
- The machine is out of service for a long time;

- The boom is overloaded or subject to continuous impact load;
- The boom is exposed to electric arc, by which the strands in the rope may be fused together.

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

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

1.6.9 Inspection of Engine Emission System

This inspection shall be performed every 250h or every quarter, whichever comes first.

A normal exhaust system is very important to the performance and service life of the engine, and if the exhaust system is damaged, component damage or other safety hazards may be caused.



CAUTION: Do not perform the inspection when the engine is running, and instead, remove the key to prevent misoperation.



CAUTION: Do not perform the inspection until the engine is cooled down.

- 1) Ensure that all fasteners are well tightened;
- 2) Check all welds;
- 3) Check for exhaust leakage;
- 4) Check the welds and connections for carbon deposit.

1.6.10 Cleaning or Replacement of air filter

Clean it every 250 hours or quarterly and replaced it for every 1000 hours or every year, whichever comes first.

⚠ Do not operate on running

engines!

⚠ Be sure to pay attention to the

cleanliness of the external surface when operating on the engine suction system, and close the suction inlet when necessary. The old filter elements are handled in an environmentally friendly manner.

Cleaning of air filter

⚠ Do not clean the filter element (4)

with gasoline or high temperature liquid.

If the primary element is stained heavily, replace it soon. At this time, replace the secondary element too.

The secondary element should be removed only if it is to be replaced.

To protect the engine, do not remove the secondary element in servicing the primary element.

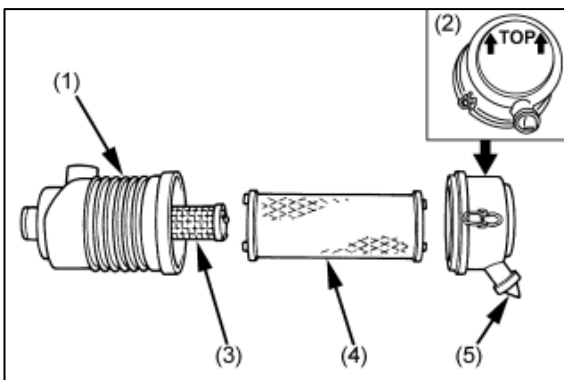


Figure 1-12

- 1. Air cleaner body
- 2. Dust cup
- 3. Secondary element (If equipped)

- 4. Primary element
- 5. Evacuator valve

Make sure the hooking clip for the element is tight enough. If it is loose, dust and dirt may be sucked in wearing down the cylinder liner and piston ring earlier and thereby resulting in poor power output.

Do not overservice the air cleaner element. Overservicing may cause dirt to enter the engine causing premature wear. Use the dust indicator as a guide on when to service.

- 1) Open the hooking clip.
- 2) Remove the filter cover (2) and screw off the filter element (4).
- 3) Filter element (4): For slight contamination, purge with dry compressed air (maximum 205 Kpa) from inside to outside for cleaning (general cleaning times are no more than 5 times);
- 4) Replace it in case of serious contamination.

Replacement of the Safety Filter Tube of the Air Filter

⚠ Never clean the safety filter tube (3).

- 1) Screw off the Primary element (4) and the Secondary element (3).
- 2) Install the new Secondary element.
- 3) Install the filter element (4), place the outer cover (2) and fix it with the hooking clip.

1.6.11 Adjustment of belt tension-Kubota

V2403

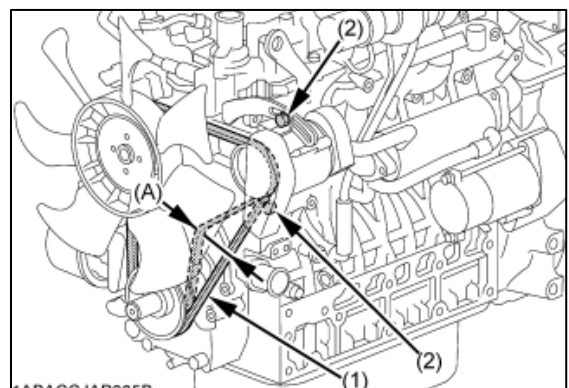


Figure 1-13

1. Fan belt
2. Bolt and nut

V3307

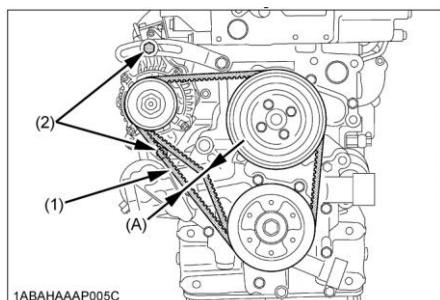


Figure 1-14

1. Fan belt
2. Bolt and nut

Apply moderate thumb pressure to belt between the pulleys.

If tension is incorrect, loosen the alternator mounting bolts and, using a lever placed between the alternator and the engine block, pull the alternator out until the deflection of the belt falls within acceptable limits.

Replace fan belt if it is damaged.

Proper fan belt tension	A deflection when the belt is pressed in the middle of span.
V2403: 7 to 9 mm	under load of 10 kg
V3307: 10 to 12mm	

1.7 Every 500 Hours

1.7.1 Replacing the Return Filter of Hydraulic Tank

Risk of personal injury. Be careful

of hot oil. The contact with hot oil will cause severe burns.

This step shall be performed

when the engine is shut down.

In a dusty working environment, this step should be performed more frequently.

Perform this step once every 500 hours or every six months, whichever comes first.

Replacing the return filter is crucial for superior performance and service life of the machine. Dirty or clogged filter may affect the performance of the machine, and if not replaced, may cause damage to the parts. The filter shall be replaced frequently in a harsh working environment.

Park the machine on a solid and level ground. Lower the arm rod and make the machine retracted.

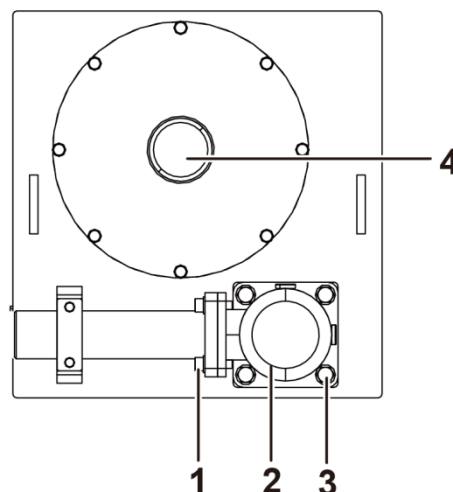


Figure 1-15 Hydraulic oil tank

No.	Description	Tightening torque
1	Connecting bolt between oil return pipe and filter	52±5N.m
2	Return filter	-
3	Connecting bolt between filter and tank	90±9N.m
4	Air cleaner	-


① Disconnect the main oil return pipe from the return filter.

② Remove the plug on the return filter.

③ Disconnect the return filter from the hydraulic tank.

- ④ Remove the old filter and install a new one.
- ⑤ Refit the main oil return pipe and the plug.
- ⑥ Use a marker to write down the replacement date on the filter replacement record.
- ⑦ Implement any arm rod function with the GCU.
- ⑧ Check the filter components for oil leakage.

1.7.2 Replacing the High-Pressure Filter Element

 **Risk of personal injury. Be careful**

of hot oil. The contact with hot oil will cause severe burns.

 **This step shall be performed**

when the engine is shut down.

 **In a dusty working environment,**

this step should be performed more frequently.

Perform this step once every 500 h or every six months, whichever comes first.

Replacing the high-pressure filter element is crucial for superior performance and service life of the machine. Dirty or clogged filter may affect the performance of the machine, and if not replaced, may cause damage to the parts. The filter element shall be replaced more frequently in a harsh working environment.

Park the machine on a solid and level ground. Lower the arm rod and make the machine retracted.

- 1) Place a suitable container under the filter.
- 2) Remove the nut at the bottom of the filter cover with a wrench, and remove the filter

cover.

- 3) Take out the filter element from the filter cover.
- 4) Check the seal of the filter cover, and replace it when necessary.
- 5) Install a new high-pressure filter element, and tighten it.
- 6) Wipe off any oil droplets splashed during installation.
- 7) Use a marker to write down the replacement date on the filter replacement record.
- 8) Implement any arm rod function with the GCU.
- 9) Check the filter components for oil leakage.

1.7.3 Inspection of Fixing Bolts and Adjusting Bolts of Slewing Reducer

This inspection shall be performed every 500 hours or every six months, whichever comes first.

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

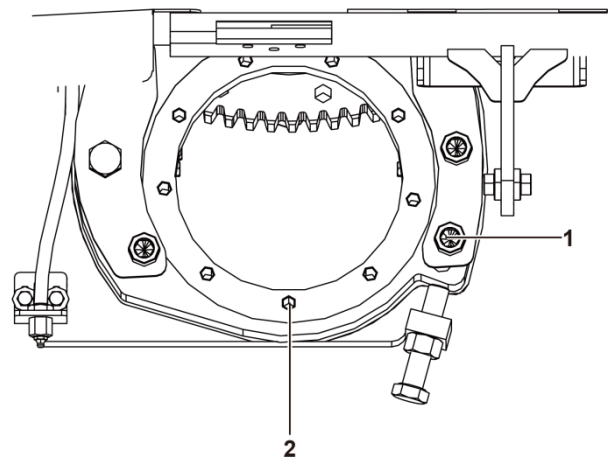


Figure 1-16 slewing structure

Tightening torque of bolt 1: 595±55N.m

Tightening torque of bolt 2: 190±19N.m

1.7.4 Platform Weighing Structure Lubrication

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

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

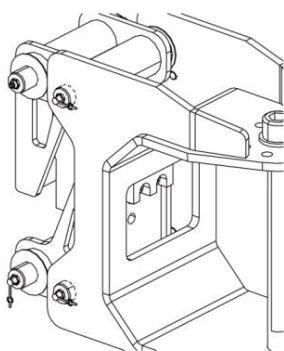


Figure 1-17 Platform weighing structure

- Locate the pin grease nipple at the triangle bracket assembly.
- Fill grease until grease spills on both sides of the triangle bracket assembly. (Lithium base grease)
- Wipe off spilled grease.

1.7.5 Replacement of Engine Oil and Filter

! Do not operate on running engines!

No smoking and open fires!

Be careful when contacting with high temperature engine oil. Danger of scalding!

! When operating on the oil system,

pay attention to the surface cleaning.

! Carefully clean all areas involved.

Blow wet parts with compressed air.

Please observe the safety regulations for engine oil and relevant local regulations. Dispose of spilled engine oil and filter elements as required. Waste oil cannot penetrate into the ground.

! Test run shall be carried out after

each operation. At the same time, pay attention to the sealing and lubrication oil pressure, and then check the engine oil level.

It is available in the first 50 hours, and the engine oil and filter shall be replaced every 500 hours or half a year. (If the ambient temperature continues to be below -10°C (14 °F) or the temperature of engine oil is below 60°C (84 °F), the oil change period is reduced by a half; if the engine oil does not reach the replacement interval period within a year, the oil shall be replaced at least once a year.)

! Danger of burn, be careful of

high-temperature engine parts and oil, contacting with high temperature engine oil and/or engine parts will cause severe burns.

! Perform the function after engine

warm up to normal operation temperature.

Kubota-V2403:

Condition	Grade (API CJ-4)
Working temperature:-20°C~40°C	15W-40

Working temperature: -25°C ~ 30°C	10W-30
Working temperature: -30°C ~ 30°C	5W-30
Working temperature: -35°C ~ 20°C	0W-20

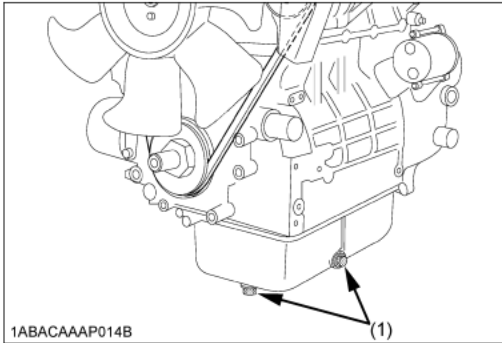


Figure 1-18

1. Oil drain plug

Kubota-V3307:

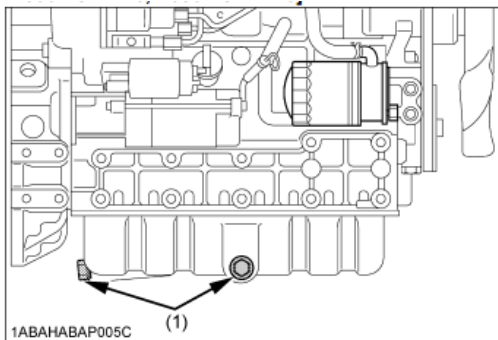


Figure 1-19

1. Oil drain plug

Deutz-TD2.9L4:

Condition	Grade (API CH-4)
Working temperature: -20°C ~ 40°C	15W-40
Working temperature: -25°C ~ 30°C	10W-30
Working temperature: -30°C ~ 30°C	5W-30
Working temperature: -35°C ~ 20°C	0W-20

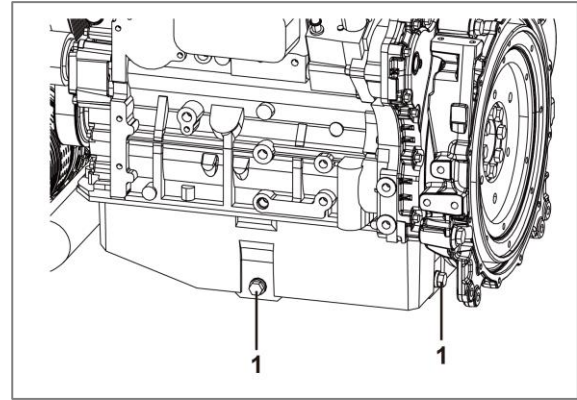


Figure 1-20

1. Oil drain plug

- 1) Warm up and run the engine.
- 2) Place the engine horizontally.
- 3) Shut down the engine.
- 4) Place the container under the engine oil drain plug.
- 5) Screw off the engine oil drain plug to drain the old engine oil.
- 6) Install the new seal ring for the engine oil drain plug and screw in and tighten it.
- 7) Add engine oil at the engine oil filler.
- 8) Warm up and run the engine.
- 9) Place the engine horizontally.
- 10) Wait for more than five minutes after filling the oil. Check the engine oil level and fill it if necessary.

Replacement of the Engine Oil Filter

Kubota-V2403:

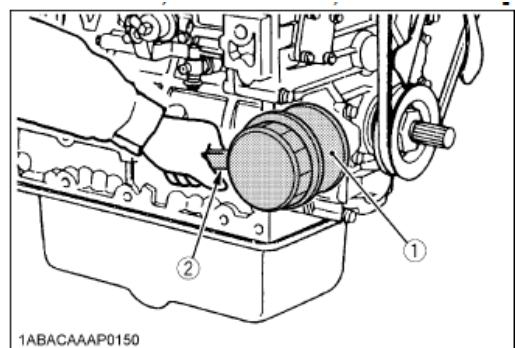


Figure 1-21

1. Oil filter
2. Remove with a filter wrench (Tighten with

your hand)

Kubota-V3307:

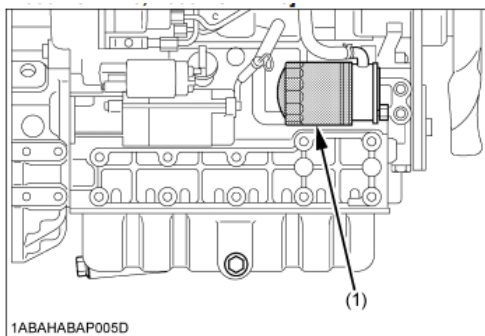


Figure 1-22

1. Oil filter
2. Remove with a filter wrench (Tighten with your hand)

Deutz-TD2.9L4:

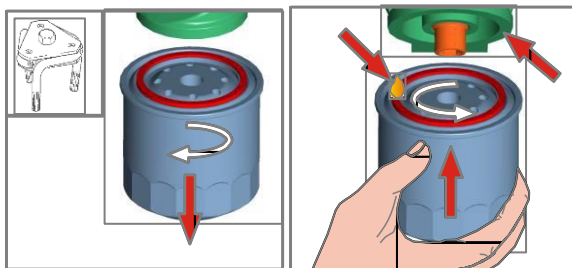
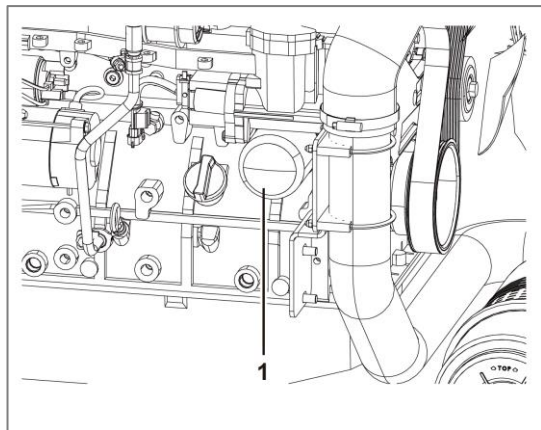


Figure 1-23

1. Oil filter
2. Remove with a filter wrench (Tighten with your hand)

The engine oil filter element must also be replaced every time the engine oil is replaced.

- 1) Release and unscrew the filter element with a wrench.
- 2) Contain the oil that was drained.

- 3) Clean the sealing surface of the filter holder with a clean fiber-free wiper.
- 4) Apply a thin layer of engine oil to the seal ring of the new filter.
- 5) Screw in the cartridge by hand. When the seal ring contacts the seal surface, tighten the cartridge enough by hand. Because, if you tighten the cartridge with a wrench, it will be tightened too much.
- 6) After the new cartridge has been replaced, the engine oil level normally decreases a little. Thus, run the engine for a while and check for oil leaks through the seal before checking the engine oil level. Add oil if necessary.

1.7.6 Clean or Replace the Fuel Filter

⚠ The engine must be shut down!

No smoking and open fires!

Be careful when contacting high temperature fuel!

⚠ Do not release the injection

pipeline or the high-pressure oil pipeline when the engine is running.

⚠ Carefully clean all areas involved

in cleaning. Blow wet parts with compressed air.

⚠ Please observe the safety

regulations for fuel and relevant local regulations. Dispose of spilled fuel and filter elements in accordance with national regulations. The fuel cannot seep into the ground.

! After completing the operation on

the fuel system, exhaust the system, perform the trial operation and check the seal performance.

! There is danger of explosion and

fire. The fuel of the engine is combustible. Check the position of the machine. When the step is executed, equipment shall be located in an open and well-ventilated area that keeps away from the heater, spark, flame and burning tobacco.

A qualified fire extinguisher shall be placed in an easily accessible place.

Draining of water separator

! Risk of explosion and fire.

Engine fuel is combustible. The position where the equipment is located shall be inspected. When the step is executed, equipment shall be located in an open and well-ventilated area that keeps away from the heater, spark, flame and burning tobacco. A qualified fire extinguisher shall be placed at the location that is easily accessible.

! Risk of explosion and fire. Where

there is fuel leakage, prevent any irrelevant personnel from entering the area and strictly prohibit operating the equipment. Repair the leak immediately.

! Perform the step when the engine

flames out.

Check and drain the water separator every 50 hours.

Kubota-V2403/V3307:

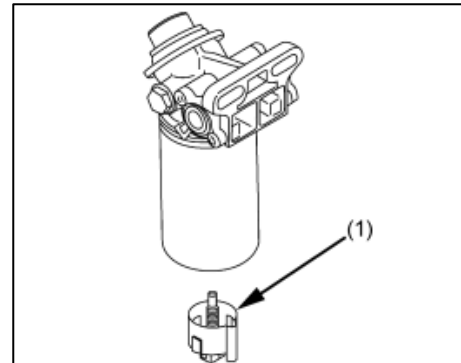


Figure 1-24

1. Drain plug

- 1) Shut down the engine, and find the water separator.
- 2) Disconnect cable connection.
- 3) Loosen the drainage plug located at the bottom of the filter cartridge, allowing the water drained to an appropriate container.
- 4) Finally be sure to air-bleed the fuel system before getting the engine restarted.
- 5) Wipe up any fuel that may be splashed.
- 6) Start the engine from the ground control and inspect whether or not there is leakage in the fuel filter.

Deutz-TD2.9L4:

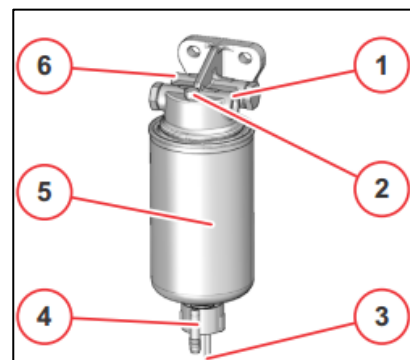


Figure 1-25

1. Fuel supply flow to the pump
2. Venting screw
3. Electrical connection for water level sensor
4. Drain plug

5. Filter insert
6. Fuel inlet from the fuel tank
 - 1) Shut down the engine, and find the fuel filter.
 - 2) Disconnect cable connection.
 - 3) Loosen the drainage plug located at the bottom of the filter cartridge, allowing the water drained to an appropriate container. Once any fuel starts to flow out, screw down the drainage plug immediately.
 - 4) Wipe up any fuel that may be splashed.
 - 5) Start the engine from the ground control and inspect whether or not there is leakage in the fuel filter.

Replacement of water separator filter

Kubota-V2403/V3307:

Replace the water separator filter with a new one every 500 hours or every six months, whichever comes first.

- 1) Remove the old water separator filter with a filter wrench.
- 2) Apply a film of oil to the gasket for the new water separator filter.
- 3) Screw in the water separator filter by hand. Because, if you tighten the water separator filter with a wrench, it will be tightened too much.
- 4) Replace the water separator filter periodically to prevent wear of the supply pump or the injector, due to dirt in the fuel.

Replacement of the Fuel filter

 **The engine must be shut down!**

No smoking and open fires!

Be careful when contacting high temperature fuel!

 **Do not release the injection**

pipeline or the high-pressure oil pipeline when the engine is running.

 **Carefully clean all areas involved**

in cleaning. Blow wet parts with compressed air.

 **Please observe the safety**

regulations for fuel and relevant local regulations. Dispose of spilled fuel and filter elements in accordance with national regulations. The fuel cannot seep into the ground.

 **After completing the operation on**

the fuel system, exhaust the system, perform the trial operation and check the seal performance.

Replace the fuel filter cartridge with a new one every 500 operating hours, or half a year, but an increase in the number of replacement filters is required for the extremely dirty work environment.

 **There is danger of explosion and**

fire. The fuel of the engine is combustible. Check the position of the machine. When the step is executed, equipment shall be located in an open and well-ventilated area that keeps away from the heater, spark, flame and burning tobacco.

A qualified fire extinguisher shall be placed in an easily accessible place.

Kubota-V2403/V3307:

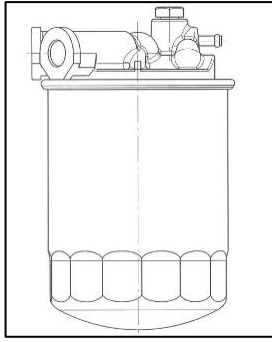


Figure 1-26

- 1) Release and unscrew the filter element with a wrench.
- 2) Contain the diesel fuel drained.
- 3) Clean the sealing surface of the filter holder with a clean fiber-free wiper.
- 4) Apply a thin layer of diesel to the seal ring of the new filter.
- 5) Screw in a new filter manually until seal fit and tighten it.
- 6) Exhaust the fuel system.

Deutz-TD2.9L4:

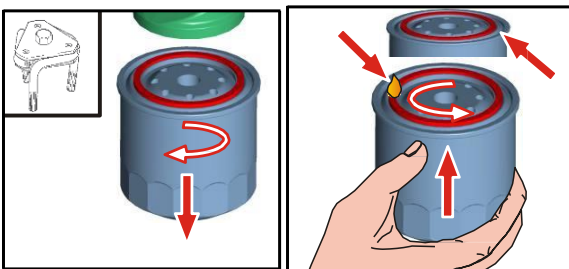


Figure 1-27

- 1) If a torsion stopper is installed, remove the clamping clamp (optional).
- 2) Release and unscrew the filter element with a wrench.
- 3) Contain the diesel fuel drained.
- 4) Clean the sealing surface of the filter holder with a clean fiber-free wiper.
- 5) Apply a thin layer of diesel to the seal ring of the new filter.
- 6) Screw in a new filter manually until seal fit and tighten it.
- 7) Fix the clamping clamp of a torsion stopper (optional).
- 8) Exhaust the fuel system.

1.8 Every 1000 Hours

1.8.1 Replacing the Air Cleaner

Perform this step once every 1000 h or every year, whichever comes first.

In a dusty working environment, this step should be performed more frequently.

⚠ This step shall be performed when the engine is shut down.

- 1) Remove the old air cleaner.
- 2) Install a new air cleaner.

1.8.2 Replacement of fuel pre-filter insert-Deutz

⚠ The engine must be shut down!

No smoking and open fires!

Be careful when contacting high temperature fuel!

⚠ Do not release the injection

pipeline or the high-pressure oil pipeline when the engine is running.

⚠ Carefully clean all areas involved

in cleaning. Blow wet parts with compressed air.

⚠ Please observe the safety

regulations for fuel and relevant local regulations. Dispose of spilled fuel and filter elements in accordance with national regulations. The fuel cannot seep into the ground.

⚠ After completing the operation on the fuel system, exhaust the system, perform the trial operation and check the seal performance.

⚠ There is danger of explosion and fire. The fuel of the engine is combustible. Check the position of the machine. When the step is executed, equipment shall be located in an open and well-ventilated area that keeps away from the heater, spark, flame and burning tobacco.

A qualified fire extinguisher shall be placed in an easily accessible place.

Perform this step once every 1000 h or every year, whichever comes first.

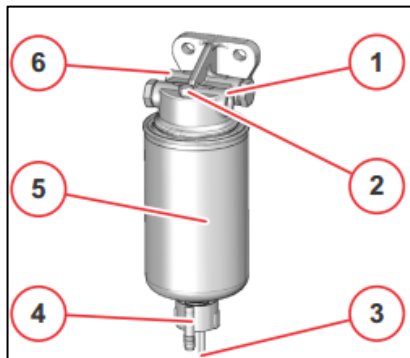


Figure 1-28

1. Fuel supply flow to the pump
2. Venting screw
3. Electrical connection for water level sensor
4. Drain plug
5. Filter insert
6. Fuel inlet from the fuel tank
 - 1) Switch off the engine.
 - 2) Shut off the fuel supply to the engine (with high-level tank).
 - 3) Place suitable collecting containers underneath.
 - 4) Disconnect cable connections.

- 5) Loosen drain plug and drain liquid.
- 6) Disassemble filter insert.
- 7) Clean any dirt of the opposite side of filter head.
- 8) Wet the sealing surfaces of the filter cartridge slightly with fuel and screw back on to the filter head, clockwise (17-18 Nm).
- 9) Mount drain plug.
- 10) Open the fuel shutoff tap and vent the system, see venting the fuel system.

Vent the fuel system

The fuel system is vented via the electric fuel supply pump.

In order to ensure that no error messages are generated, no attempt should be made to start the system up whilst venting.

This process is carried out as follows:

- Ignition "ON"

The electronic fuel supply pump switches on for 20 seconds in order to vent the fuel system and build up the required fuel pressure.

Wait until the electric fuel supply pump is disconnected from the control unit.

- Ignition "OFF"

Repeat the process at least 2 times until the fuel system is vented

⚠ Risk of explosion and fire. Where there is fuel leakage, prevent any irrelevant personnel from entering the area and strictly prohibit operating the equipment. Repair the leak immediately.

1.8.3 Check the Boom Wear Pad

Perform this step once every 1000 h or every year, whichever comes first.

- 1) The wear pad is located on the housing surface and inner wall of the boom to

reduce friction. It is necessary for safe operation of the machine to maintain the wear pad in good condition. Continuous use of wear pads that are extremely worn will result in damage to components and unsafe operating conditions.

- 2) Extend the boom to check if the wear pad loosens, if the wear pad loosens, torque the securing bolt. Inspect play between the wear pad and the boom, if the play is more than 1mm, arrange shims to achieve zero play and zero drag. Replace the wear pad if necessary. Part numbers of shims, please refer to the Parts Manual, and select the correct parts. Upon installation of the shims, it is necessary to extend the boom multiple times to eliminate potential binding.

1.9 Every 1500 Hours

1.9.1 Replacement of Oil Separator Element

Replace it every 1500 hours.

V2403:

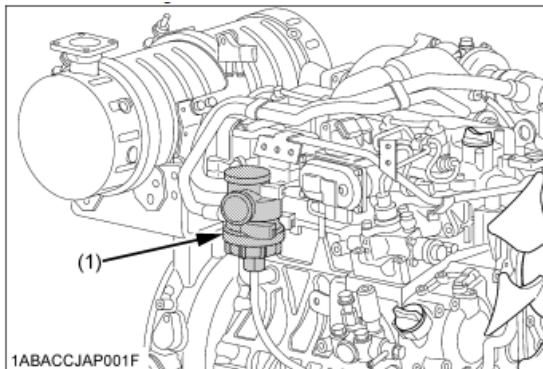


Figure 1-29

1. Oil separator

V3307:

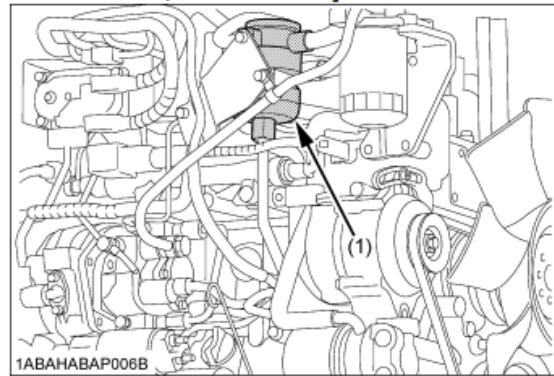


Figure 1-30

1. Oil separator



To avoid personal injury or death:

Be sure to stop the engine before changing the oil separator element.

1. Remove the cover and take out the oil separator element and gasket. Then wipe oil and grease off the zone in question.
2. Fit a new oil separator element and gasket into position.

1.10 Every 2000 Hours

1.10.1 Changing Hydraulic Oil and Replacing the Suction Filter



of hot oil. The contact with hot oil will cause severe burns.



when the engine is shut down.

! In a dusty working environment, this step should be performed more frequently.

Perform this step once every 2,000 h or every two years, whichever comes first.

Changing hydraulic oil and replacing the filter are crucial for superior performance and service life of the machine. Dirty hydraulic oil and filter may affect the performance of the machine, and if not replaced, may cause damage to the parts. Hydraulic oil and filter shall be replaced more frequently in a harsh working environment.

Before changing the hydraulic oil, check the hydraulic oil to verify if oil change is necessary. If the hydraulic oil has passed the inspection conducted at an interval of 2000 h or two years, and thus not been changed, it shall be checked on a quarterly basis. Change the hydraulic oil if it does not pass the inspection.

! **CAUTION: The hydraulic oil suction filter should be replaced during change of the hydraulic oil.**

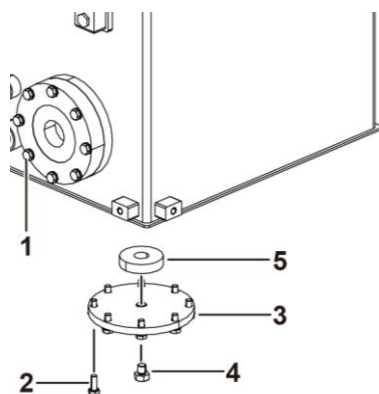


Figure 1-31

No.	Description	Tightening torque
1	Oil suction flange bolt	28±3N.m

2	Oil drain flange bolt	28±3N.m
3	Oil drain flange	-
4	Screw plug	-
5	Ring magnet	-

Park the machine on a solid and level ground. Lower the arm rod and make the machine retracted.

- 1) Close all the ball valves (if any) on the hydraulic tank.

! **Risk of part damage. Do not start the engine when the ball valves of the hydraulic tank are closed; otherwise the parts will be damaged. If the ball valves are closed, it is required to remove the key from the key switch and hang a warning sign on the equipment.**

! **Risk of personal injury. Splashed hot oil can penetrate and burn the skin.**

- 2) Place a proper container under the hydraulic tank.
- 3) Remove the oil drain plug from the hydraulic tank.
- 4) Drain the hydraulic oil from the hydraulic tank completely into a suitable container.
- 5) Remove the oil drain flange and the ring magnet.
- 6) Remove the suction filter from the hydraulic tank.
- 7) Flush the inside of the hydraulic tank with a mild solvent. (Clean it with chemical cleaning agent at first. After drying, flush with clean hydraulic oil and drain the oil.)
- 8) Remove the foreign objects adsorbed by the ring magnet.
- 9) Install a new suction filter.
- 10) Refit the ring magnet, oil drain flange and oil

drain plug.

- 11) Add the hydraulic oil to the hydraulic tank until the oil level is at specified position of the level gauge (refer to the section about inspection of hydraulic oil level). Ensure that the hydraulic oil doesn't overflow.
- 12) Remove the possibly splashed hydraulic oil.
- 13) Open the ball valves on the hydraulic tank.

! Risk of part damage. After

installing the hydraulic tank, be sure to open the two ball valves of the hydraulic tank and inject oil to the pump.

! CAUTION: When installing the

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

- 14) Check all functions of the machine in a full cycle, and check for oil leakage.
- 15) After a working cycle is finished, recheck the oil level of the hydraulic tank, and add oil until specified oil level is reached. Ensure that the hydraulic oil doesn't overflow.

Use temperature	Oil type
The lowest temperature > -25°C	L-HV 32 low temperature hydraulic oil
-40°C < The lowest temperature ≤ -25°C	L-HS32 ultra low temperature hydraulic oil
The lowest temperature ≤ -40°C	10# aviation hydraulic oil

1.10.2 Filling or Replacement of Engine Coolant

Replace it every 2,000 hours or two years.

! The coolant at high temperature

has the risk of scald.

The cooling system is under pressure! The cover can only be opened in the cooling state.

Coolant must have a specified concentration of cooling system protectant!

Please observe the safety regulations for coolant and relevant local regulations.

Dispose of the spilled coolant as specified, without leaving it on the ground.

Never run the engine without coolant, even if it's a very short time.

Draining of the Cooling System

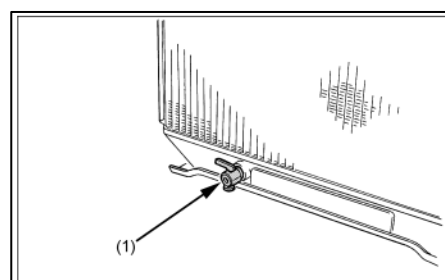


Figure 1-32

1. Coolant drain plug
 - 1) Carefully open the cooler cover.
 - 2) Place the receiving container under the coolant interface.
 - 3) Drain the coolant.
 - 4) Reconnect and tighten the coolant interface.
 - 5) Close the cooler cover.

Filling of the Coolant

- 1) Carefully open the cover for the cooling system.
- 2) Loosen the cooler exhaust bolts that may be present.
- 3) Fill the coolant to max or the filling limit position.
- 4) Close the cooler exhaust bolts.
- 5) Close the cooler cover.
- 6) Run the engine to the running temperature.
- 7) Shut down the engine.
- 8) Check the coolant liquid level when the engine is cooled, and fill it to max if

necessary.



Note: The coolant with different

freezing point should be selected according to the local ambient temperature, the principle is that the freezing point of coolant is 10°C-15°C lower than the local minimum temperature.

1.11 Regular Maintenance

Maintenance items with period of a quarter, a year, and two years must be completed by qualified staff upon training in maintenance of the machine in accordance with procedures in the machine maintenance manual. For machines that are idle for more than three months, quarterly check must be performed before they can be re-used.

1.12 Engine Fault Table

KUBOTA

Fault	Cause	Measures
When it is difficult to start the engine	Fuel is thick and doesn't flow.	Check the fuel tank, and remove water, dirt and other impurities. Check the fuel filter cartridge and replace it if necessary.
	Engine oil becomes thick in cold weather and engine cranks slow	Use oils of different viscosities, depending on ambient temperatures. (Use 10W-30 in winter season.)
	Battery is discharged and the engine will not crank	Charge the battery
When output is insufficient	Fuel is insufficient	Refuel. Check the fuel system. (Bleed the fuel system if necessary.)
	Overheating of moving parts	Consult your KUBOTA Dealer
	Air cleaner is dirty.	Clean the element
	The output is limited because of a trouble	Check the engine warning lamp. (If a trouble occurs, it means that the ECU might be in the output limiting mode.)
When engine suddenly stops	Lack of fuel	Refuel. Check the fuel system. (Bleed the fuel system if necessary.)
	Overheating of moving parts	Consult your KUBOTA Dealer
	Air cleaner is dirty	Clean the element
	Forced stop due to a trouble	Check the engine warning lamp. (If a serious trouble occurs, it means that the ECU might have forced the engine to a stop.)
When engine must be stopped immediately	Engine revolution suddenly decreases or increases.	Check the adjustments and the fuel system
	Unusual sound is heard	Check all moving parts carefully
	Color of exhaust suddenly turns dark	Check the DPF itself
	Oil lamp lights up during operation	Check the lubricating system. Check to see if the engine bearing clearances are within factory specs. Check the function of the relieve valve in the lubricating system. Check pressure switch. Check filter base gasket
	Engine warning lamp lights up.	Consult your KUBOTA Dealer
	DPF service lamps light up	Consult your KUBOTA Dealer
When engine overheats	Engine oil insufficient	Check oil level. Replenish oil as required
	Fan belt broken or elongated	Change belt or adjust belt tension
	Coolant insufficient	Replenish coolant
	Excessive concentration of antifreeze	Add water only or change to coolant with the specified mixing ratio
	Radiator net or radiator fin clogged with	Clean net or fin carefully

	dust	
	Inside of radiator or coolant flow route corroded	Clean or replace radiator and parts
	Fan or radiator or radiator cap defective	Replace defective parts
	Thermostat defective	Check thermostat and replace if necessary
	Temperature gauge or sensor defective	Check temperature with thermometer and replace if necessary
	Overload running	Reduce load
	Head gasket defective or water leakage	Replace parts

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Faults	Cause	Measures
Engine does not start or is difficult to start	Not disconnected (if possible)	Check coupling
	Fuel tank empty	Tanks
	Fuel suction pipe blocked	Check
	Below starting limit temperature	Check
	Cold starting device	Check/replace
	Wrong SAE viscosity class of the engine lubricating oil	Change the lubricating oil
	Fuel quality does not comply with operating manual	Change the fuel
	Battery defective or discharged	Check battery
	Cable connection to starter loose or oxidized	Check cable connections
	Starter defective or pinion does not engage	Check starter
	Air filter clogged / turbocharger defective	Check/replace
	Air in fuel system	Vent fuel system
	Compression pressure too low	Check compression pressure
	Exhaust gas backpressure too high	Check
	Injection line leaks	Check injection line
High-pressure pump defective	Check/replace	
Engine does not start and diagnostic lamp flashes	Engine electronics prevents starting	Check error according to error code and eliminate error if necessary
Engine starts, but runs irregularly or fails	Exhaust gas backpressure too high	Check
	Compression pressure too low	Check compression pressure
	Cold starting device	Check/replace
	Air in fuel system	Vent
	Fuel filter contaminated	Clean
	Fuel quality does not comply with operating manual	Change the fuel
	Injector defective	Change
	Injection line leaks	Check injection line
	Engine cable harness defective	Check/replace

Speed changes are possible and diagnostic lamp lights up	Engine electronics has detected a system error and activates an equivalent speed	Check error according to error code and eliminate error if necessary
Engine becomes excessively hot. Temperature warning system activates	Vent line blocked	Clean
	Lube oil cooler defective	Check/replace
	Lube oil filter contaminated on the air or lube oil side	Change
	Lube oil level too high	Check lube oil level, if necessary drain off.
	Lubricating oil level too low	Fill up lube oil
	Injector defective	Change
	Coolant heat exchanger soiled	Clean
	Defective cooling water pump (torn or loose V-belt)	Check whether torn or loose
	Low coolant	Fill up
	Resistance in cooling system is too high / flow volume too low	Check the cooling system
	Fan / viscous coupling defective, V-belt torn or loose	Check/replace/tension
	Charge air line leaking	Check charge air line
	Charge air cooler soiled	Check/clean
	Air filter clogged / turbocharger defective	Check/replace
	Air filter maintenance switch / maintenance indicator defective	Check/replace
	Fan defective/V-rib belt torn or loose	Check fan/V-belt, change if necessary
	Exhaust gas backpressure too high	Check
	Throttle valve defective	Check/replace
Coolant temperature transmitter	Check/replace	
Coolant thermostat defective	Check/replace	
Coolant cover defective	Check/replace	
Engine output is deficient	Lube oil level too high	Check lube oil level, if necessary drain off.
	Fuel suction temperature too high	Check the system
	Fuel quality does not comply with operating manual	Change the fuel
	Air filter clogged / turbocharger defective	Check/replace
	Air filter maintenance switch / maintenance indicator defective	Check/replace
	Fan defective/V-rib belt torn or loose	Check fan/V-belt, change if necessary
	Charge air line leaking	Check charge air line
	Charge air cooler soiled	Clean
	Injection line leaks	Check injection line
	Injector defective	Change
	Throttle valve defective	Check/replace
Exhaust gas recirculation, actuator	Check/replace	

	defective	
	Exhaust gas backpressure too high	Check/clean
	Exhaust gas turbocharger defective	Change
Engine performs poorly and diagnostic lamp lights	Engine electronics reduce performance	Please contact your LGMG partner
Engine does not run on all cylinders	Injection line leaks	Check injection line
	Injector defective	Change
	Compression pressure too low	Check compression pressure
	Engine cable harness defective	Check/replace
Engine lubricating oil pressure is nonexistent or excessively low	Lubricating oil level too low	Fill up lube oil
	Excessive inclination of engine	Check engine mounting / reduce inclination
	Wrong SAE viscosity class of the engine lubricating oil	Change the lubricating oil
	Lubricating oil pressure sensor defective	Check/replace
	Lubricating oil control valve jammed	Check/clean
	Lubricating oil suction pipe blocked	Check/clean
Engine lubricating oil consumption excessive	Lube oil level too high	Check lube oil level, if necessary drain off
	Excessive inclination of engine	Check engine mounting / reduce inclination
	Crankcase breather	Check/replace
Lubricating oil in the exhaust system	Engine operated continuously with too low a load (< 20-30%)	Check load factor
	Valve shaft seals defective	Check/replace
	Exhaust gas turbocharger defective	Check/replace
Engine producing blue smoke	Lube oil level too high	Check lube oil level, if necessary drain off
	Excessive inclination of engine	Check engine mounting / reduce inclination
Engine producing white smoke	Fuel quality does not comply with operating manual	Change the fuel
	Injector defective	Change
	Condensation	Warm up engine so that water residues evaporate
Engine producing black smoke	Air filter clogged / turbocharger defective	Check/replace
	Air filter maintenance switch / maintenance indicator defective	Check/replace
	Charge air line leaking	Check charge air line
	Injector defective	Change
Engine shutdown frequently	Air filter clogged / turbocharger defective	Check/replace
	Charge air line leaking	Check charge air line
	Injector defective	Change
	Differential pressure of flow meter defective	Change

	Nox sensor defective	Change
	Differential pressure sensor of diesel particulate filter is issuing an implausible signal	Change
	Differential pressure line added	Clean

1.13 Engine Fault Codes

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DTC Description	SPN	FMI	Inspection Item	DTC Set Parameter
NE-G Phase Shift	636	7	Large phase shift between NE (crankshaft position sensor) pulse and G (camshaft position sensor) pulse	Phase difference between NE pulse and G pulse within +30 ~-20°
IAT Sensor Integrated MAF Sensor: Low	171	4	Sensor / harness shorted to ground	IAT sensor integrated MAF sensor voltage: Below 0.2 V
IAT Sensor Integrated MAF Sensor: High	171	3	Sensor/harness open or shorted to +B	IAT sensor integrated MAF sensor voltage: Above 4.85 V
PLV Emergency Open	633	7	PLV emergency open	PLV is opened in emergency; Engine speed is greater than 700 min-1 (rpm)
High Rail Pressure	157	0	Actual pressure above the command pressure	Rail pressure sensor is normal; Sensor supply voltage VCC # is normal
SCV (MPROP) Stuck	1347	7	SCV stuck in the open position (the actual rail pressure stays higher than the command pressure)	The drain request of the fuel supply pump drops below -730 mm ³ /st, and the actual rail pressure is 20 MPa (100 kgf/cm ² , 1400 psi) higher than the command pressure
Fuel Leak (in High Pressure Fuel System)	1239	1	Fuel leak in high pressure fuel system (This fault will be detected when the fuel consumption is too high, which is calculated from the fuel pressure difference before and after the fuel injection)	The pump fully supplies fuel; The deviation between the actual rail pressure and the target pressure is greater than 20 MPa
Intake Air Flow: Low	132	1	Low engine intake air mass flow (with turbo-blower intake hose disconnected)	Engine intake air mass flow: Below 50% of the target value
MAF Sensor: Low	132	4	Sensor/harness open or shorted to ground	MAF sensor voltage: Below 0.1 V
MAF Sensor: High	132	3	Sensor/harness shorted to +B	MAF sensor voltage: Above 4.9 V under normal operating conditions
Intake Air Temperature Error: Low	172	4	Sensor/harness shorted to ground	IAT sensor voltage: Below 0.2 V
Intake Air Temperature Error: High	172	3	Sensor/harness open or shorted to +B	IAT sensor voltage: Above 4.95 V
Coolant Temperature Sensor: Low	110	4	Sensor/harness shorted to ground	Coolant temperature sensor voltage: Below 0.176 V
Coolant Temperature Sensor: High	110	3	Sensor/harness open or shorted to +B	Coolant temperature sensor voltage: Above 4.870 V
Rail Pressure Sensor: Low	157	4	Sensor/harness shorted to ground; Sensor failure	Rail pressure sensor voltage: Below 0.065 V
Rail Pressure Sensor: High	157	3	Sensor/harness open or shorted to +B; Sensor failure	Rail pressure sensor voltage: Above 3.235 V
Injector Charge Voltage: High	523535	0	Injector Charge Voltage: High	Injector Charge Voltage: High

No.1 Cylinder Injector Harness/Coil Open Circuit	651	3	Harness open circuit; Injector coil open circuit	Harness or injector coil open circuit
No.3 Cylinder Injector Harness/Coil Open Circuit	653	3	Harness open circuit; Injector coil open circuit	Harness or injector coil open circuit
No.4 Cylinder Injector Harness/Coil Open Circuit	654	3	Harness open circuit; Injector coil open circuit	Harness open circuit; Injector coil open circuit
No.2 Cylinder Injector Harness/Coil Open Circuit	652	3	Harness or injector coil open circuit	Harness or injector coil open circuit
Engine Overheat	110	0	Engine coolant overtemperature	Engine coolant temperature $\geq 120^{\circ}\text{C}$ (248°F)
Engine Overrun	190	0	Engine speed above threshold	Engine speed $\geq 3500 \text{ min}^{-1}$ (rpm)
Boost Pressure Sensor: Low	102	4	Sensor/harness shorted to ground; Sensor failure	Boost pressure sensor voltage below 0.2 V
Boost Pressure Sensor: High	102	3	Sensor/harness open or shorted to +B; Sensor failure	Boost pressure sensor voltage above 4.9 V
No Pulse Input from NE Sensor (Crankshaft Position Sensor)	636	8	Sensor/harness open circuit or short circuit; Sensor failure	Failure to recognize NE sensor pulse
NE Sensor (Crankshaft Position Sensor) Pulse Number Error	636	2	Sensor/harness open circuit or short circuit; Sensor failure	Pulse count per revolution is not 58 teeth
No Pulse Input from G Sensor (Camshaft Position Sensor)	723	8	Sensor/harness open circuit or short circuit; Sensor failure	Sensor/harness open circuit or short circuit; Sensor failure
G Sensor (Camshaft Position Sensor) Pulse Number Error	723	2	Failure to recognize G sensor pulse	Pulse count per revolution is not 3 teeth
Glow Plug Relay Drive Circuit Open	676	5	Intake air glow plug relay open circuit	Harness open circuit, or relay coil open circuit
Drive Circuit Shorted to +B	523544	3	Drive circuit shorted to +B	Harness shorted to +B
Glow Plug Relay Drive Circuit Shorted to Ground	523544	4	Intake air glow plug relay drive circuit shorted to ground	Harness shorted to ground
Glow Heater Relay Drive Circuit Overheat	676	0	Glow plug drive circuit overheat	Glow plug relay coil resistance or load above the specified value in ECU
EGR Actuator Open Circuit	523574	3	EGR actuator open circuit	EGR actuator open-circuit error signal received via CAN
EGR Actuator Coil Short Circuit	523574	4	EGR actuator coil short circuit	EGR actuator coil short-circuit error received via CAN
EGR Position Sensor Failure	523572	4	EGR position sensor failure	EGR position sensor error signal received via CAN
Oil Pressure Error	100	1	Oil pressure switch	Oil pressure switch ON: $> 1 \text{ s}$
Exhaust Gas Temperature Sensor 1: Low	3242	4	Sensor/harness shorted to ground	Diesel particulate filter (hereinafter referred to as the "DPF") inlet temperature sensor (T1) voltage: Below 0.08 V
Exhaust Gas Temperature Sensor 1: High	3242	3	Sensor/harness open or shorted to +B	DPF inlet temperature sensor (T1) voltage: Above 4.92 V
Exhaust Gas Temperature Sensor 0: Low	4765	4	Sensor/harness shorted to ground	DOC inlet temperature sensor (T0) voltage: Below 0.08 V
Exhaust Gas Temperature Sensor	4765	3	Sensor/harness open or shorted	DOC inlet temperature

0: High			to +B	sensor (T0) voltage: Above 4.92 V
Battery Voltage: Low	168	4	Harness open circuit, short circuit or damage; Battery failure	The battery voltage identified by the ECU in the 12 V system is below 8 V, and is not monitored during startup.
Battery Voltage: High	168	3	Harness open circuit, short circuit or damage; Battery failure	The battery voltage identified by ECU in the 12 V system is above 16 V.
QR (IQA) Data Error	523538	2	QR Data Read Error	Read error of QR data from EEPROM
No QR (IQA) Data	523538	7	QR data not written	Area of QR data on EEPROM is vacant
ECU Flash-ROM Error	628	2	Flash ROM error	<ul style="list-style-type: none"> ● Checksum error ● Delete error ● Write error ● Read error
ECU CPU (Master IC) Error	1077	2	CPF and/or IC failure	Critical CPU and/or IC errors
ECU CPU (Monitoring IC) Error	523527	2	CPU Monitor IC Failure	CPU monitor IC failure
Injector Charge Voltage: Low	523525	1	Injector charge voltage: Low ECU charge circuit failure	Injector charge voltage: Low ECU charge circuit failure
SCV (MPROP) Open Circuit	1347	5	SCV open circuit	SCV open circuit
SCV (MPROP) Drive System Failure	1347	4	SCV open or shorted to ground	SCV open or shorted to ground
SCV (MPROP) Shorted to +B	1347	3	SCV shorted to +B	SCV shorted to +B
Injector Driver IC Error or Open Circuit	1077	12	Injector driver IC error, or No. 1 & No. 4 cylinder injector open circuit, or No. 2 & No.3 cylinder injector open circuit	Injector driver IC error, or No. 1 & No. 4 cylinder injector open circuit, or No. 2 & No.3 cylinder injector open circuit
Injector Driver IC Short Circuit	523605	6	Intake air glow plug relay open circuit	Injector IC error reported
Sensor Supply Voltage 1: Low	3509	4	Sensor supply voltage 1 error or recognition error	Sensor supply voltage below 4.75 V
Sensor Supply Voltage 1: High	3509	3	Sensor supply voltage 1 error or recognition error	Sensor supply voltage above 5.25 V
Sensor Supply Voltage 2: Low	3510	4	Sensor supply voltage 2 error or recognition error	Sensor supply voltage below 4.75 V
Sensor Supply Voltage 2: High	3510	3	Sensor supply voltage 2 error or recognition error	Sensor supply voltage above 5.25 V
Sensor Supply Voltage 3: Low	3511	4	Sensor supply voltage 3 error or recognition error	Sensor supply voltage below 4.75 V
Sensor Supply Voltage 3: High	3511	3	Sensor supply voltage 3 error or recognition error	Sensor supply voltage above 5.25 V
Main Relay Locked in Closed Position	1485	2	Main relay failure	The main relay stays on for more than 1 s with no command given
Starter Motor Relay Drive Circuit Shorted to Ground	677	4	Starter motor relay drive circuit shorted to ground	Harness shorted to ground
EEPROM Checksum Error	523700	13	KBT-EEPROM checksum error	EEPROM checksum error
Intake Throttle Feedback Error	523580	2	Intake throttle feedback error	Throttle position deviation is not corrected after 20 load error recovery operations
Accelerator Position Sensor 1: Low	91	4	Sensor/harness shorted to ground or open	Accelerator position sensor 1 voltage below 0.3 V
Accelerator Position Sensor 1: High	91	3	Short circuit to ground outside sensor/harness	Accelerator position sensor 1 voltage below 4.8 V

Accelerator Position Sensor 2: Low	29	4	Sensor/harness shorted to ground or open	Accelerator position sensor 2 voltage below 0.3V
Accelerator Position Sensor 2: High	29	3	Short circuit to ground outside sensor/harness	Accelerator position sensor 2 voltage below 4.8V
Accelerator Position Sensor Error (CAN)	523543	2	Accelerator position sensor error signal (sensor/harness open or shorted to ground, etc.)	Accelerator position sensor error signal received via CAN
Accelerator Position Sensor Association Error	91	2	Deviation with two designed sensor associations	Deviation with two designed sensor associations
No.1 & No.4 Cylinder Injector Shorted to Ground, or All Cylinder Injectors Shorted to Ground	523523	3	Harness shorted to ground	Harness shorted to ground
No.1 & No.4 Cylinder Injector Shorted to +B, or All Cylinder Injectors Shorted to +B	523523	3	Harness shorted to +B	Harness shorted to +B
No.2 & No.3 Cylinder Injector Shorted to Ground, or All Cylinder Injectors Shorted to Ground	523524	3	Harness shorted to ground	Harness shorted to ground
No.2 & No.3 Cylinder Injector Shorted to +B, or All Cylinder Injectors Shorted to +B	108	4	Harness shorted to +B	Harness shorted to +B
Barometric Pressure Sensor Failure (Low Side)	108	3	Sensor/ECU internal circuit shorted to ground	Barometric pressure sensor voltage: Below 0.2 V
Barometric Pressure Sensor Failure (High Side)	679	7	Sensor/ECU internal circuit shorted to +B	Barometric pressure sensor voltage: Above 4.850 V
PLV Not Opened	679	16	PLV not opened as the rail pressure remains unchanged or the engine power is not high enough	The opened PLV responds, but the rail pressure is still too high or too low
Rail Pressure Error After PLV Opening	523575	7	Rail pressure above 160 MPa after PLV is opened by error	PLV is opened (with open response detected); The rail pressure is within 50 MPa ~ 120 MPa
EGR (DC Motor) Overheat	523576	2	EGR (DC Motor) overheat	EGR (DC motor) temperature error signal (thermistor: 125°C) received via CAN
EGR (DC Motor) Temperature Sensor Failure	523577	2	EGR (DC Motor) temperature sensor failure	EGR (DC motor) temperature sensor error signal received via CAN
Exhaust Gas Temperature Sensor 2: Low	3246	4	Sensor/harness shorted to ground	DPF outlet temperature sensor (T2) voltage: Below 0.08 V
Exhaust Gas Temperature Sensor 2: High	3246	3	Sensor/harness open or shorted to +B	DPF outlet temperature sensor (T2) voltage: Above 4.92 V
Differential Pressure Sensor 1: Low	3251	4	Sensor/harness shorted to ground	DPF differential pressure sensor voltage: Below 0.2 V
Differential Pressure Sensor 1: High	3251	3	Sensor/harness open or shorted to +B	DPF differential pressure sensor voltage: Above 4.8 V
Intake Throttle Lift Sensor: Low	523582	4	Intake throttle lift sensor low	Intake throttle lift sensor voltage: Below 0.151 V
Intake Throttle Lift Sensor: High	523582	3	Intake throttle lift sensor high	Intake throttle lift sensor voltage: Above 4.848 V
Emission Deterioration	3252	0	DOC is heated up due to	T1 - T0 ≥ 250°C (482°F)

			unburned fuel	
Exhaust Gas Temperature Sensor 0: Emergency High	4765	0	DOC inlet temperature (T0) high	DOC inlet temperature (T0): Above 700°C (1292°F)
Exhaust Gas Temperature Sensor 1: Emergency High	3242	0	DPF inlet temperature (T1) high	DPF inlet temperature (T1): Above 715°C (1319°F)
Exhaust Gas Temperature Sensor 2: Emergency High	3246	0	DPF outlet temperature (T2) high	DPF outlet temperature (T2): Above 820°C (1508°F)
Excessive PM3	3701	15	PM accumulation level 3	PM accumulation above trigger level Regeneration level = 3
Excessive PM4	3701	16	PM accumulation level 4	PM accumulation above trigger level Regeneration level = 4
Excessive PM5	3701	0	PM accumulation level 5	PM accumulation above trigger level Regeneration level = 5
Low Boost Pressure	132	15	Hose between turbo-blower outlet and inlet flanges disconnected Boost pressure sensor failure	Boost pressure sensor output below the target in high air flow operating condition
Low Coolant Temperature During Shutdown Regeneration	523589	17	Engine warm-up conditions not met during regeneration mode (Low coolant temperature)	Engine coolant temperature stays below 65°C (149°F) for more than 1500 s during shutdown regeneration
Shutdown Regeneration Timeout	523590	16	Timeout error: Incomplete regeneration due to low DPF temperature	Regeneration not completed in 2700 s
All Exhaust Temperature Sensors Failure	523599	0	Simultaneous failure of all exhaust temperature sensors	Simultaneous failure of all exhaust temperature sensors (sensor low)
Emergency High Temperature: DTC Downstream Exhaust Gas Temperature High	523601	0	Outputs of exhaust temperature sensors 0, 1, 2	All exhaust gas temperatures (T0, T1 and T2) reduced to 300°C (572°F)
High Regeneration Frequency	523602	0	Time interval from the end time to the start time of the regeneration	The regeneration time interval occurs three times continuously within 30 min
Overheat Prevention	523603	15	Coolant temperature	Engine coolant temperature ≥ 110°C (230°F)
CAN2 Bus Off	523547	2	CAN2 shorted to +B/GND, or high traffic error	CAN2 Bus Off
No Communication with EGR	523578	2	No communication with EGR	CAN off
CAN1 Bus Off	523604	2	CAN1 shorted to +B/GND, or high traffic error	CAN1 Bus Off
CAN-KBT Frame Error	523548	2	CAN-KBT original frame open circuit	CAN2 KBT frame open circuit
CAN CCVS (Stop Switch and Vehicle Speed) Frame Error	523591	2	CAN_CCVS communication interruption	CAN CCVS frame timeout
CAN CM1 (Regeneration Switch) Frame Error	523592	2	CAN_CM1 communication interruption	CAN CM1 frame timeout
CAN ETC5 (Neutral Switch) Frame Error	523595	2	CAN_ETC5 communication interruption	CAN ETC 5 frame timeout
CAN TSC1 Frame Error	523596	2	CAN_TSC1 communication interruption	No "C1 cache" request initiated for 3 consecutive times after the override control request (non-0x00) is

CAN EBC1 Frame Error	523598	2	CAN_EBC1 communication interruption	issued CAN EBC1 frame timeout
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KWP-Code	SPN	FMI	Error Identification
45	168	3	Battery voltage: The voltage measured by ECU is out of the target range, system reaction is initiated.
46	168	4	Battery voltage: The voltage measured by ECU is out of the target range, system reaction is initiated.
47	168	2	Battery voltage: The voltage measured by ECU is out of the target range, system reaction is initiated.
84	639	14	CAN bus 0: The ECU is not allowed to send messages because the status "BusOff" is detected.
85	1231	14	CAN-Bus 1: The ECU is not allowed to send messages, because the status "BusOff" is detected. Warning, no diagnostic with SERDIA2010 is possible.
88	102	2	Charge air pressure measured by sensor is above the warning threshold.
89	102	2	Charge air pressure measured by sensor is above shut off threshold.
92	110	0	Coolant temperature sensor: The voltage of the sensor measured by ECU is out of the target range
93	110	1	Coolant temperature sensor: The voltage of the sensor measured by ECU is out of the target range.
96	110	3	Coolant temperature sensor: The voltage of the sensor measured by ECU is out of the target range (Signal range check high).
97	110	4	Coolant temperature sensor: The voltage of the sensor measured by ECU is out of the target range (signal range check low).
98	110	0	Coolant temperature: The coolant temperature calculated by ECU is above the target range; The ECU activates a system reaction.
99	110	0	Coolant temperature: The coolant temperature calculated by ECU is above the target range. The ECU activates a system reaction.
101	111	1	Coolant level: The coolant level calculated by ECU is below the allowed minimum
126	523603	9	Timeout Error of CAN-receive-frame AMB; Ambient temperature sensor
171	523212	9	Timeout error of CAN-Receive-Frame ComEngPrt. Engine Protection.
179	523240	9	Timeout CAN-message FunModCtl. Function Mode Control.
291	523776	9	Timeout error of CAN-Receive-Frame TSC1TE - active
292	523777	9	Passive timeout error of CAN-Receive-Frame TSC1TE. Setpoint
305	898	9	Timeout error of CAN-Receive-Frame TSC1TE. Setpoint
360	523982	0	Powerstage diagnosis disabled. High battery voltage.
361	523982	1	Powerstage diagnosis disabled. Low battery voltage
362	523090	2	When any of the switch inputs is not active for a period of time.
376	630	12	Internal hardware monitoring, the ECU finds an error during the access to its EEPROM memory or works with an alternative value
377	630	12	Internal hardware monitoring: The ECU finds an error during the access to its EEPROM memory or works with an alternative value

378	630	12	Internal hardware monitoring: The ECU finds an error during the access to it's EEPROM memory or works with an alternative value
387	523612	12	Internal hardware monitoring: The CPU of the ECU is set to RESET and the cause is logged internally. No item will be created in error memory
388	190	0	Engine speed: The engine speed calculated by ECU is above the target range.
389	190	0	Engine speed: The engine speed calculated by ECU is above the target range. The ECU activates a system reaction.
390	190	11	Engine speed: The engine speed calculated by ECU is above the target range. The ECU activates a system reaction
391	190	14	Engine speed: The engine speed calculated by ECU is above the target range. The ECU activates a system reaction.
419	190	8	Camshaft speed sensor: The ECU receives no signal and uses the signal from crankshaft speed sensor as alternative to calculate the engine speed.
420	190	12	Camshaft speed sensor: The ECU receives no signal and uses the signal from camshaft speed sensor as alternative to calculate the engine speed.
420	190	2	Offset angle between crank- and camshaft-sensor is too large
422	190	8	Sensor crankshaft detection. Out of range, signal disrupted or no signal
423	190	12	Crankshaft speed sensor: The ECU receives no signal and uses the signal from camshaft speed sensor as alternative to calculate the engine speed
457	975	3	PWM-Signal fan, short-circuit to battery.
464	97	3	Fuel filter water level sensor: The sensor voltage measured by ECU is out of the target range
465	97	4	Fuel filter water level sensor: The voltage of sensor measured by ECU is out of the target range
472	94	3	Low fuel pressure sensor: The voltage of sensor measured by ECU is out of the target range
473	94	4	Low fuel pressure sensor: The voltage of sensor measured by ECU is out of the target range
474	94	1	Low fuel pressure: The low fuel pressure calculated by ECU is underneath the target range. The ECU activates a system reaction
475	94	1	Low fuel pressure, shut off threshold exceeded.
547	729	12	The cold start aid relay is overheated.
559	523895	13	Check of missing injector adjustment value programming (IMA) injector 1.
560	523896	13	Check of missing injector adjustment value programming (IMA) injector 2.
561	523897	13	Check of missing injector adjustment value programming (IMA) injector 3
564	523900	13	Check of missing injector adjustment value programming (IMA) injector 6
565	523350	4	Injector cylinder bank 1: The current drop measured by ECU is above the target range
566	523352	4	Injector cylinder bank 2: The current drop measured by ECU is above the target range.
567	523354	12	Internal hardware monitoring: The ECU detects an error of its injector high current output
568	651	5	Injector cylinder 1: Interruption of electrical connection
569	652	5	Injector cylinder 2: Interruption of electrical connection
570	653	5	Injector cylinder 3: interruption of electrical connection

571	654	5	Injector cylinder 4: Interruption of electrical connection
572	655	5	Injector cylinder 5: interruption of electrical connection
573	656	5	Injector cylinder 6: Interruption of electrical connection.
580	651	3	Injector cylinder 1: The current drop measured by ECU is above the target range
581	652	3	Injector cylinder 2: The current drop measured by ECU is above the target range
582	653	3	Injector cylinder 3: The current drop measured by ECU is above the target range
583	654	3	Injector cylinder 4: The current drop measured by ECU is above the target range
584	655	3	Injector cylinder 5: The current drop measured by ECU is above the target range
585	656	6	Injector cylinder 6: The current drop measured by ECU is above the target range.
592	523615	5	Detecting an open load fault in the metering unit of the fuel system
594	523615	3	Fuel metering unit: The current drain measured by ECU is above the target range
595	523615	4	Fuel metering unit: The current drain measured by ECU is above the target range
596	523615	3	Fuel metering unit: The current drain measured by ECU is above the target range
597	523615	4	Fuel metering unit: The current drain measured by ECU is above the target range
612	523612	12	Internal hardware monitoring: the CPU of the ECU is reset and the cause is logged internally; no item will be created in error memory
613	523612	12	ECU reported internal software error Internal ECU monitoring detection reported error
614	523612	12	Internal hardware monitoring: the CPU of the ECU is reset and the cause is logged internally; no item will be created in error memory
619	523612	12	Internal hardware monitoring: the CPU of the ECU is reset and the cause is logged internally; no item will be created in error memory
625	523612	12	Internal hardware monitoring: the CPU of the ECU is reset and the cause is logged internally; no item will be created in error memory
637	523612	12	Engine speed: the engine speed calculated by ECU is above the target range; the ECU activates a system reaction
732	100	3	Oil pressure sensor: the voltage of sensor measured by ECU is out of the target range
733	100	4	Oil pressure sensor: the voltage of sensor measured by ECU is out of the target range
734	100	0	High oil pressure; warning threshold exceeded
735	100	0	High oil pressure; shut off threshold exceeded
736	100	1	Oil pressure is below the target range (warning threshold)
737	100	1	Oil pressure is below the target range (shut off threshold)
746	175	0	High oil temperature; shut off threshold exceeded
747	1237	2	Override switch: the ECU receives a permanent signal.
752	107	0	Air filter differential pressure: the pressure difference of the intake air between the filter inlet and outlet calculated by ECU is above the target range and the ECU activates a system reaction
776	102	3	Charge air pressure sensor: the measured voltage of sensor by ECU is out of the target range

777	102	4	Charge air pressure sensor: the measured voltage of sensor by ECU is out of the target range
825	523009	9	The pressure relief valve (PRV) has reached the number of allowed activations.
826	523470	2	Pressure relief valve is forced to open, perform pressure increase
827	523470	2	Pressure Relief Valve (PRV) forced to open. Performed by pressure increase.
828	523470	12	Pressure Relief Valve (PRV) forced to open. Shutoff conditions.
829	523470	12	Pressure Relief Valve (PRV) forced to open. Warning conditions.
830	523470	14	Open Pressure Relief Valve (PRV)
831	523470	11	Rail pressure relief valve can not be opened due to the railpressure.
832	523470	11	Rail pressure out of tolerance range. The PRV can not be opened at this operating point with a pressure shock.
833	523009	10	The pressure relief valve (PRV) has reached the allowed opening time
834	523906	5	ECU detects open load on the electric fuel feed pump output
835	523906	12	ECU detects too high temperature in powerstage of fuel pump circuit.
836	523906	3	ECU detects shortcut to battery in fuel feed pump circuit.
837	523906	4	Electrical fuel pre - supply pump. Short circuit to ground.
856	523613	0	Rail pressure below setpoint, speed-dependent threshold exceeded. The rail pressure is below the target range, which is determined as a function of the engine speed.
857	523613	0	Rail pressure below setpoint, threshold exceeded
858	523613	0	Rail pressure: the fuel pressure in rail calculated by ECU is above the target range which is dependant on the engine speed
859	523613	0	Rail pressure: the fuel pressure in rail calculated by ECU is below the target range which is dependant on the engine speed.
861	523613	1	Rail pressure: the fuel pressure in rail calculated by ECU is below the target range which is dependant on the engine speed
862	523613	0	Rail pressure: the fuel pressure in rail calculated by ECU is above the target range.
864	523613	2	Rail pressure metering unit, Setpoint of metering unit in overrun mode not plausible.
876	523470	7	Rail pressure is out of the expected average range.
877	157	3	Rail pressure sensor: the voltage of sensor measured by ECU is out of the target range
878	157	4	Rail pressure sensor: the voltage of sensor measured by ECU is out of the target range
932	29	3	Analog accelerator pedal 2 (hand pedal): the voltage measured by ECU is out of the target range.
935	91	3	Analog accelerator pedal sensor 1 or double accelerator pedal sensor: the voltage measured by ECU is out of the target range or the calculated pedal position is implausible compared with the position of the second pedal
937	29	4	Handthrottle; short circuit to ground
940	91	4	Sensor error accelerator pedal. Signal is below the range
946	1079	13	Internal hardware monitoring: the ECU detects a deviation of the target range of the power supply voltage of sensor output 1
947	1080	13	Internal hardware monitoring: the ECU detects a deviation of the target range of the power supply voltage of sensor output 2
948	523601	13	Internal hardware monitoring: the ECU detects a deviation of the target

			range of the power supply voltage of sensor output 3
956	677	3	Start relay (high side power stage): the current drop measured by ECU is above the target range.
957	677	4	Start relay (high side power stage): the current drain measured by ECU is above the target range
958	677	5	Start relay (low side power stage): the current drop measured by ECU is above the target range
959	677	12	Start relay (low side power stage): the current drop measured by ECU is above the target range
960	677	3	Start relay (low side power stage): the current drain measured by ECU is above the target range
961	677	4	Starter relay low side short circuit to ground
973	523612	14	Internal hardware monitoring: the CPU of the ECU is reset and the cause is logged internally; no item will be created in error memory
974	523612	14	Internal hardware monitoring: the CPU of the ECU is reset and the cause is logged internally; no item will be created in error memory.
975	523612	14	Internal hardware monitoring: the CPU of the ECU is reset and the cause is logged internally; no item will be created in error memory
976	91	11	Diagnostic fault check of synchronism of single potentiometer and Low idle switch(LIS).
978	29	2	Plausibility error between sensor and idle switch, Acceleration Pedal Detection. In case of Hand Throttle with Low Idle Switch, it is the plausibility check between hand throttle and idle switch
980	523550	12	Terminal 50 was operated for more than 2 minutes. This may happen due to short to battery or wrong usage of Terminal 50. Starter control is disabled until this error is healed.
994	105	3	Electrical error charged air temperature. Signal range check high.(SRC)
995	105	4	Electrical error charged air temperature. Signal range check low
996	105	0	Charged air cooler temperature. System reaction initiated. High charged air cooler temperature. Warning threshold exceeded.
997	105	0	Charge air temperature downstream calculated by ECU is over the shut off threshold. The ECU activates a system reaction.
1016	51	7	Actuator position for EGR valve is not plausible, internal error, angular misalignment of the flap
1024	51	3	Actuator of the external EGR valve: the ECU detects a short circuit to battery or open load
1025	51	4	Actuator of the external EGR valve: the ECU detects a short circuit to ground
1157	97	12	Water in fuel level prefilter; maximum value exceeded
1170	523612	12	Internal hardware monitoring: the CPU of the ECU is reset and the cause is logged internally; no item will be created in error memory
1180	168	0	Physical range check high for battery voltage
1181	168	1	Physical range check low for battery voltage
1223	51	5	Actuator EGR-Valve: Open load on ECU output is detected
1224	51	6	Actuator EGR-valve: too high current is going into the actuator. Output is switched off
1226	51	3	Actuator EGR-valve: short cut to battery is detected

1227	51	3	Actuator EGR-valve: short cut to battery on ECU pin is detected
1228	51	4	Actuator EGR-valve: short cut to ground on ECU pin is detected
1229	51	4	EGR-Valve (2.9;3.6) or Throttle-Valve (4.1;6.1;7.8); short circuit to ground
1230	51	6	Actuator error EGR-Valve (2.9;3.6) or Throttle-Valve (4.1;6.1;7.8); Overload by short-circuit
1231	51	11	Power stage overtemperature due to high current.
1232	51	4	actuator AGR valve (2.9;3.6) throttle valve (4.1;6.1;7.8); Voltage below threshold
1505	524057	2	Fuel low pressure pump; error pressure build up
1668	524105	9	Timeout error of CAN-Transmit-Frame ComEGRMsFlw (EGR Steller)
1669	524108	9	Timeout error of CAN-Transmit-Frame ComEGRTVActr (EGR actuator)
1670	524110	9	Timeout error of CAN-Transmit-Frame ComETVActrTO.
1671	524112	9	Timeout ComIntake Throttle Valve Actr.
1677	524106	9	Timeout error of CAN-Receive-Frame ComRxEGRMsFlw1 (EGR actuator)
1678	524107	9	Timeout error of CAN-Receive-Frame ComRxEGRMsFlw2 (EGR actuator)
1679	524109	9	Timeout error of CAN-Receive-Frame ComRxEGRTVActr (EGR actuator)
1680	524111	9	Timeout error of CAN-Receive-Frame ComRxETVActr
1681	524113	9	Timeout error of CAN-Receive-Frame ComRxITVActr
1683	524121	9	Timeout error of CAN-Receive-Frame ComRxTrbChActr (wastegate actuator)
1687	524125	9	Timeout error of CAN-Receive-Frame ComTxTrbChActr (Wastegate actuator)

1.14 Maintenance Schedule

Routine Inspection and Maintenance Intervals



NOTE: The working hours are based on the engine working time, and the operation cycle is calculated from the date of production.

Maintenance period

Maintenance level	Routine inspection	Level 1	100h	Level 2 maintenance	Level 3 maintenance	Level 4 maintenance	Level 5 maintenance
Maintenance period	Daily	50h	100h	300h	500h	800h	1000h

List of maintenance items

System	Operation	Maintenance level							Remarks
		Routine inspection	Level 1 maintenance	100h maintenance	Level 2 maintenance	Level 3 maintenance	Level 4 maintenance	Level 5 maintenance	
Powertrain	Check the oil level	•							
	Check the fuel level	•							
	Check the fuel system pipeline for leaks	•							
	Check the radiator coolant level	•							
	Check if the cooling system pipeline leaks	•							
	Check the connection between the engine and the tray				•	•	•	•	
	Change engine oil	First 50h, thereafter every 500h or every six months, whichever comes first.							At least once a year
	Replace the engine oil filter element	First 50h, thereafter every 500h or every six months, whichever comes first.							At least once a year
	Check and adjust the tension of the fan belt		•	•	•	•	•	•	
	Use compressed air to clean the radiator			•	•	•	•	•	
	Clean the fuel tank filler filter			•	•	•	•	•	
	Drain deposits from the fuel tank			•	•	•	•	•	
	Replace the secondary fuel filter	Every 500h or every six months, whichever comes first.							
	Replace the primary fuel filter element	Kubota(V2403/V3307): Every 500h or every six months, whichever comes first. Deutz(TD2.9L4): Every 1000h or every year, whichever comes first.							
	Check the water level in the water separator and drain water regularly	Daily							
Clean the main	Clean the air cleaner outer element every 250h or when the indicator								

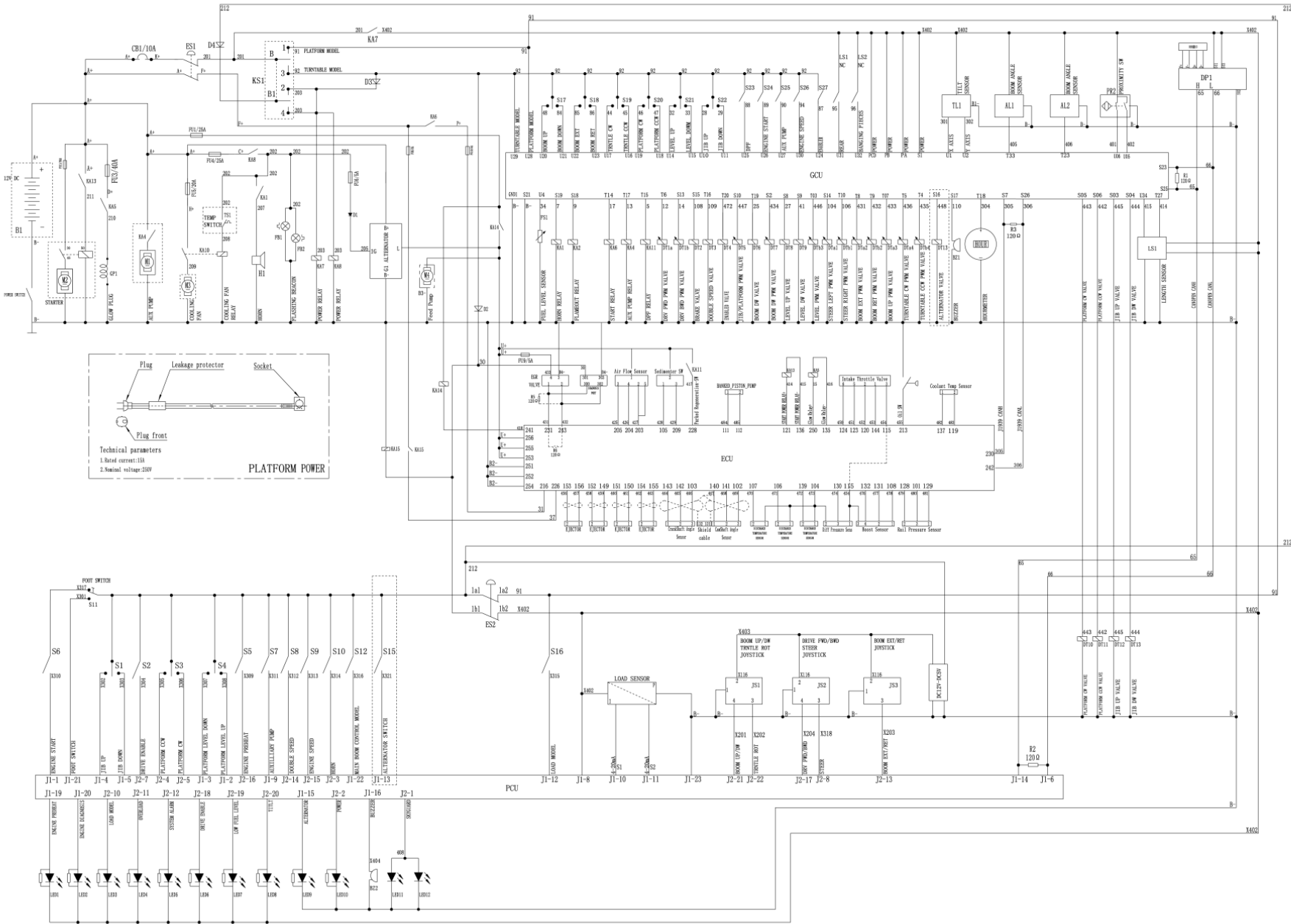
	element of the air filter	alarms, and it is forbidden to clean the air cleaner inner element.						
	Replace the oil separator element	Every 1500h						
	Change coolant	Every 2000h or every two years, whichever comes first.						
Electrical system	Check the battery for undervoltage	Daily						
	Check whether the buttons on the PCU panel are working properly	Daily						
	Whether the PCU harness connector is firm	Daily						
	Whether the PCU harness connector is dirty	Daily						
	Whether the PCU harness is squeezed or broken	Daily						
	Is the wiring of the angle sensor and proximity switch, angle sensor and pull-wire sensor, inclination sensor, and angle/length sensor secure	Daily						
	Check the position of the rocker of the rope break limit switch and the turntable rotation limit switch, and check whether the wiring is loose	Daily						
	Whether the solenoid valve connection of the travel pump is loose and the wiring is normal	Daily						
	Whether the buttons on the ground control panel are working properly	Daily						
	Whether the warning lamps and horn function are normal	Daily						
	Is the wiring of the solenoid valve coils of the main valve block normal or loose	Daily						
	Check whether the starter motor terminal is loose or broken	Daily						
Electrical system	Check if the battery terminals are loose or rusted	Daily						
	Check the color of the battery sight hole				•	•	•	•
	Zero calibration of load				•	•	•	•

	cell								
	Whether the battery terminals are loose or corroded	Daily							
Hydraulic system	Monitor whether the system pressure is normal			•	•	•	•	•	
	Check whether the steering system pressure is normal			•	•	•	•	•	
	Check whether the travel system pressure is normal			•	•	•	•	•	
	Check each oil pipe or joint for looseness	Daily							
	Check whether the oil cylinder is leaking	Daily							
	Check each valve spool for leakage	Daily							
	Check whether the two ball valves at the suction port at the bottom of the hydraulic reservoir are open	Daily							
	Check whether the fixing clip of the travel tubing is loose	Daily							
	Check the oil level of the hydraulic reservoir	Daily							Add hydraulic oil L-HV32 when the oil level is below MIN
	Change hydraulic oil and suction filter	Every 2000h or every two years, whichever comes first.							Hydraulic oil: L-HV32
	Replace the high-pressure filter element	Every 500h or every six months, whichever comes first.							
	Check the hydraulic reservoir bleed cover for leaks	Daily							
	Replace the air filter	Every 1000h or every year, whichever comes first.							
	Check whether the drive is leaking	Daily							
	Check whether the travel motor is leaking	Daily							
Change gear oil	First maintenance: 50 h, with an interval of 1,000 h or every year, whichever comes first.								
Replace the oil return filter element	Every 500h or every six months, whichever comes first.								
Machine	Check whether the accompanying documents are complete, easy to read, and whether they are in the tray	Daily							
	Check if the safety	Daily							

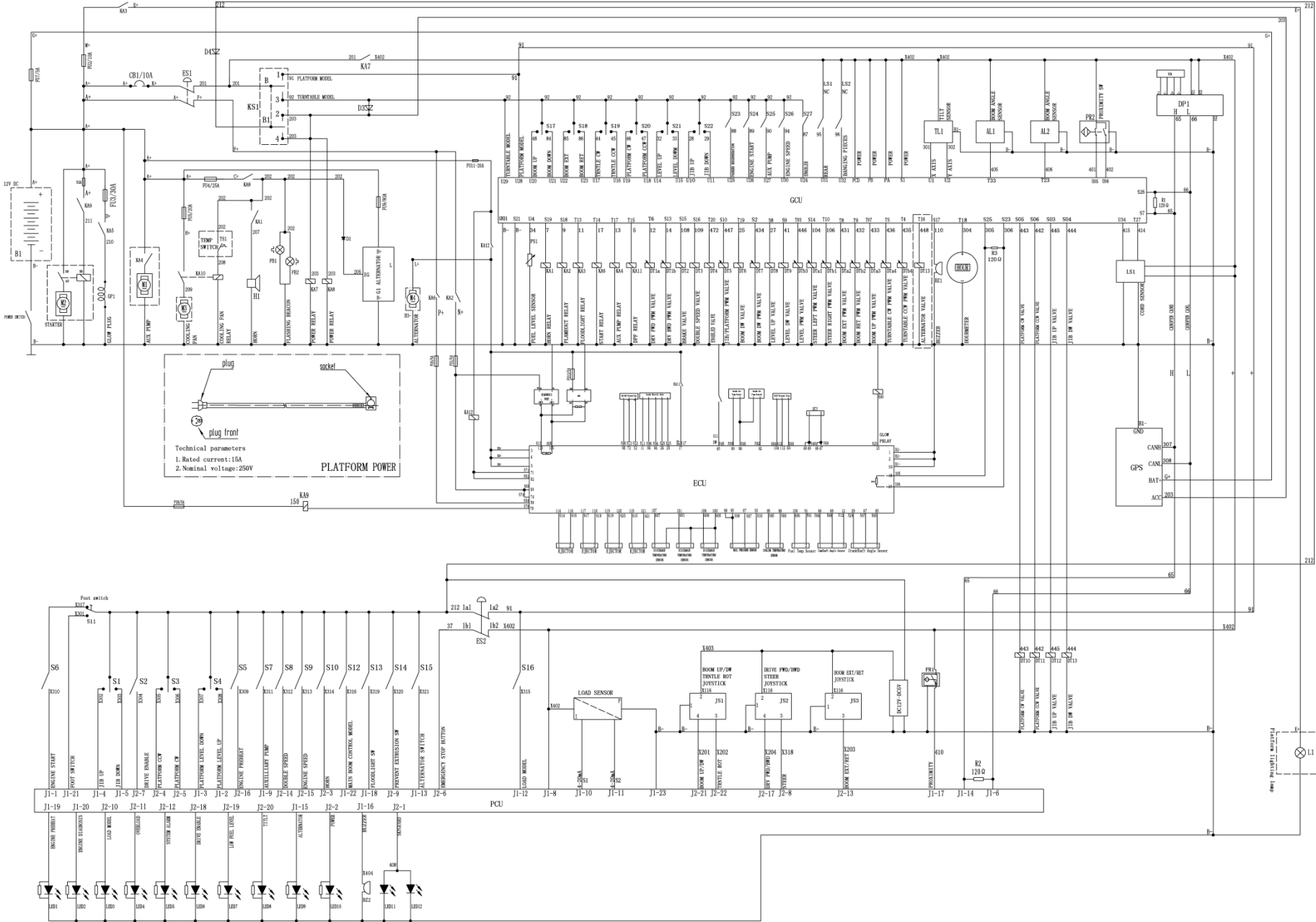
	signs are correct or defaced								
	Check the bolts, nuts and other fasteners of the machine for looseness and noise					Daily			
	Check whether the structural parts of the machine have cracks and whether the welds are open					Daily			
	Check whether the paint of the machine is peeled off, and whether there is serious rust, corrosion or oxidation					Daily			
	Check whether the wire rope is loose				•	•	•	•	
	Check the wear degree of wire rope, whether it is broken or rusted, and replace it if necessary				•	•	•	•	
	Replace the wire rope	Every 7000h or every 12 years, whichever comes first.							
	Check whether the slider is loose and whether there is zero clearance with the boom						•	•	
	Measure the backlash between the slewing bearing gear and the slewing drive gear				•	•	•	•	0.2-0.3mm
	Check the turntable rotation bearing bolts							•	T65J-H/T72 J-H:Torque:595±55N.m T85J-H/T92 J-H:Torque:305±25N.m
Lubrication	Grease the slewing bearing			•	•	•	•	•	Lithium base grease 2#
	Grease the slewing bearing gear and the slewing drive gear			•	•	•	•	•	Lithium base grease 2#
	Grease the platform load cell mechanism					•		•	Lithium base grease

Chapter 2 Schematic

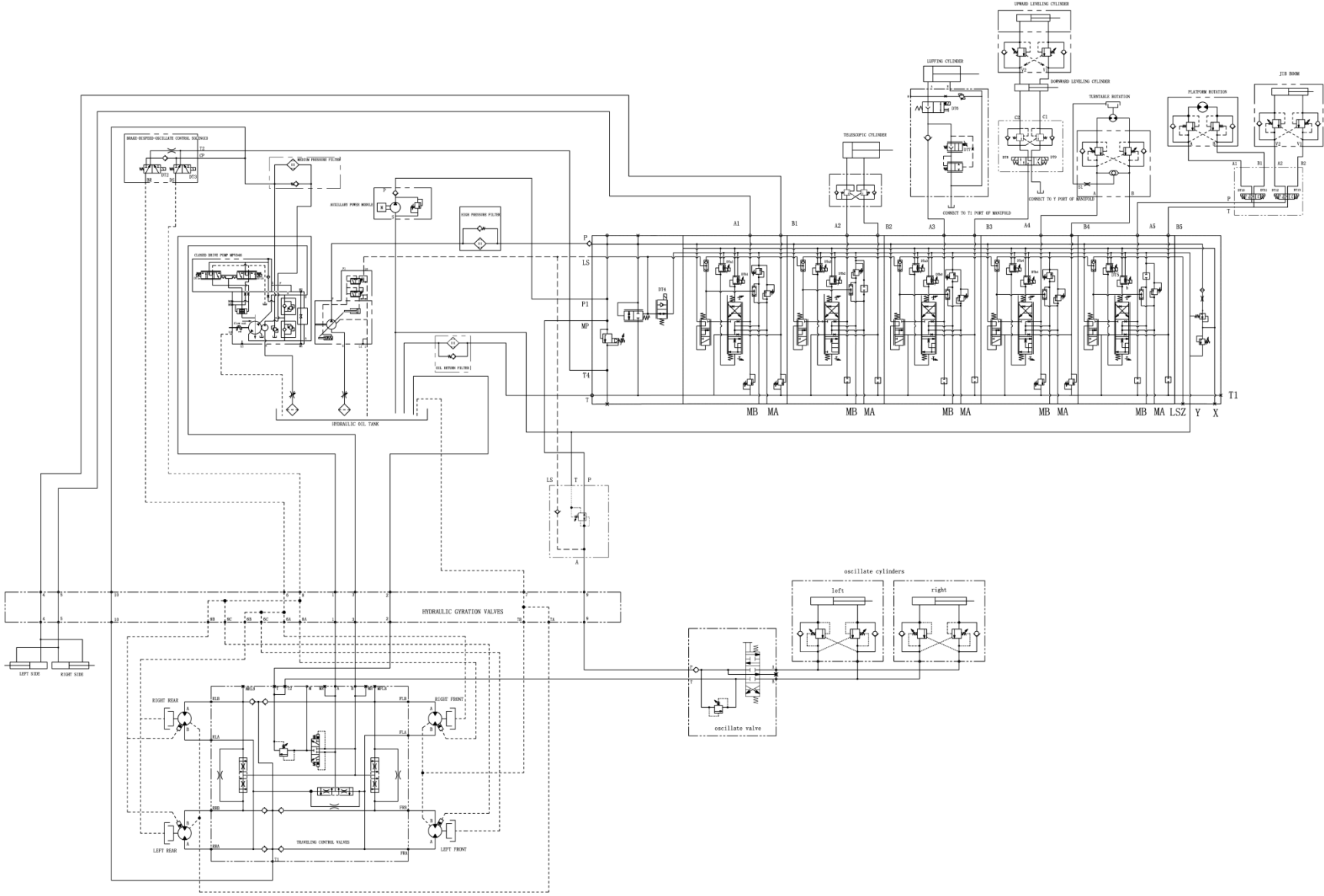
Electric schematic –T65J-H/T72J-H



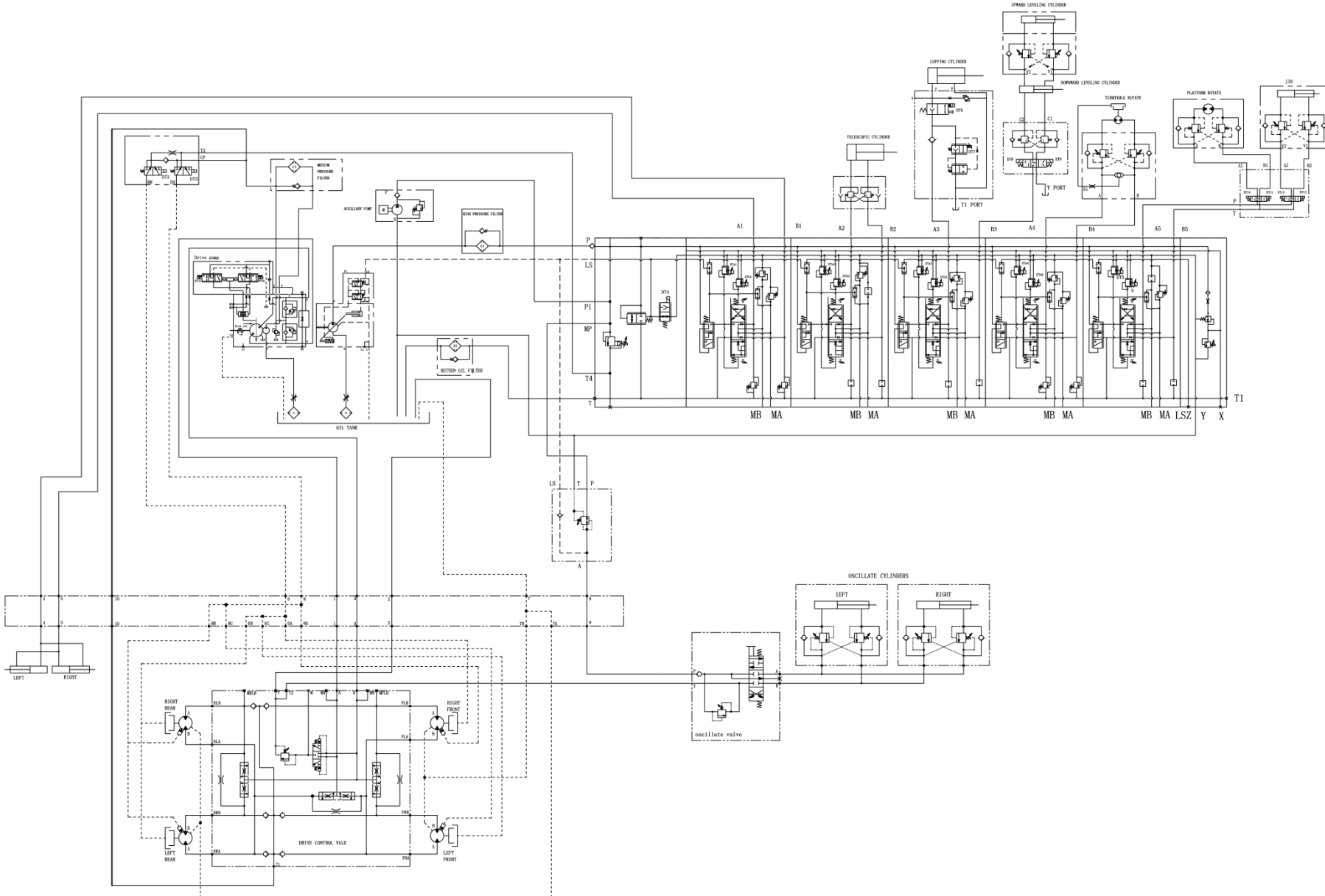
Electric schematic –T85J-H/T95J-H



Hydraulic schematic- T65J-H/T72J-H



Hydraulic schematic-T85J-H/T95J-H



California Proposition 65



WARNING

Operating, servicing and maintaining this equipment can expose you to chemicals including engine exhaust, carbon monoxide, phthalates, and lead, which are known to the State of California to cause cancer and birth defects or other reproductive harm. These chemicals can be emitted from or contained in other various parts and systems, fluids and some component wear by-products. To minimize exposure, avoid breathing exhaust, do not idle the engine except as necessary, service your equipment and vehicle in a well-ventilated area and wear gloves or wash your hands frequently when servicing your equipment or vehicle and after operation. For more information go to www.P65Warnings.ca.gov/passenger-vehicle.

Breathing diesel engine exhaust exposes you to chemicals known to the State of California to cause cancer and birth defects or other reproductive harm.

- Always start and operate the engine in a well-ventilated area.
 - If in an enclosed area, vent the exhaust to the outside.
 - Do not modify or tamper with the exhaust system.
 - Do not idle the engine except as necessary.
- For more information go to www.P65warnings.ca.gov/diesel.

T65J-H/T72J-H/T85J-H/T92J-H
Telescopic boom Mobile Elevating Work Platform
Maintenance Manual

First Edition –October 2022



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