



Service Manual

SR3390D/SR4390D/SR5390D

Rough terrain Mobile
Elevating Work Platform

⚠ WARNING

Operators and maintenance personnel must read and understand this manual before operating and maintaining this machine, otherwise it may lead to casualties! This manual shall be properly kept for reference and check by relevant personnel.

LINGONG HEAVY MACHINERY CO., LTD.

Rough terrain Mobile Elevating Work Platform Service Manual

880*1230 mm Sextodecimo 8 sheets
1st edition in June 2022 1st print in June 2022

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Foreword

You are welcome to purchase and use the products produced by Lingong Heavy Machinery Co., Ltd. This manual introduces the technical parameter and maintenance adjustment data of Rough terrain mobile elevating work platform, and explains the troubleshooting and maintenance process for qualified professional maintenance personnel. The information contained in this manual are correct at the time of publication, but due to the continuous improvement of the structure and performance of our products, the design as well as operation and maintenance instructions of the product may be subject to change without notice. For the latest information about the machine and questions about this manual, please contact our company. At the same time, we encourage readers to feedback errors to Lingong Heavy Machinery Co., Ltd. and put forward suggestions for improvement. All suggestions will be carefully considered in the future publication and printing of this manual.

The copyright of this manual belongs to Lingong Heavy Machinery Co., Ltd., and it is not allowed to be copied or reprinted without the written permission of our company.

WARNING

- Only the personnel who have professionally trained and qualified are allowed to operate and maintain the machine.
- Incorrect operation, maintenance and repair are dangerous and can lead to personal injury or death.
- Before operating or maintaining the machine, the operator should read this manual carefully. Do not operate, maintain or repair the platform without reading and understanding this manual.
- Please load the machine in strict accordance with the rating, otherwise all the consequences arising from overloading or unauthorized modification will be borne by the user.
- The operation instructions and precautions in this manual apply only to the intended use of the machine. If the machine is used for an operation that is out of the specification herein but not prohibited, always make sure that this operation will not cause personal injury to yourself or others.

Safety matters

The operator shall understand and abide by the current national and local safety regulations. If such regulations are not available, the safety instructions in this manual shall prevail.


Most of the accidents are caused by failure to comply with the regulations on the operation and maintenance of the machine. In order to avoid accidents, please read, understand and observe all warning requirements and precautions in this manual and on the machine before operation and maintenance. Failure to comply with the instructions and safety rules in this manual and the corresponding manual on the machine may result in serious injury or even death.


Considering the fact that not all possible hazards are foreseeable, it is impossible for safety notices in this manual and on the machine to cover all safety precautions. If it is necessary to take steps and operations not recommended herein, always protect the safety of yourself and others, and keep the machine from any damage. If the safety of some operations remains uncertain, please consult us or dealers.


Not only basic mechanical, hydraulic and electrical skills are required to perform most operations. Specialized skills, tools, lifting equipment and suitable workshops are also required for some maintenance processes. Considering this, it is strongly recommended for you to get the machine maintained and repaired in the service center authorized by LINGONG HEAVY MACHINERY CO., LTD.

The operation and maintenance precautions referred to herein apply only to the intended use of this machine. If the machine is to be used for other purposes than those listed herein, it is the user or operator instead of us that shall take the safety liabilities therefrom. In no case shall any operations expressly prohibited herein be performed.

For the purpose of this manual, the following signal words are applied to identify safety instructions:

 **DANGER** - Indicating any existing dangers that, if not avoided, will cause serious injury or even death. This term is also used for the danger that, if not avoided, may cause serious damage to the machine.

 **WARNING** - Indicating any potential dangers that, if not avoided, may cause serious injury or even death. This term is also used for the danger that, if not avoided, may cause serious damage to the machine.

 **CAUTION** - Indicating situations that, if not avoided, may cause minor or moderate injury. This term is also used for the danger that, if not avoided, may cause damage to the machine or shorten the life of the machine.

Chapter I Safety and environment

1.1 Terms and definitions

Administrator:

The entity unit or individual who directly controls the use and application of the lifting platform, usually the owner, the lessor or the owner's trustee who obtains the control rights.

Operator:

The personnel who have received relevant training, possess qualified knowledge and practical experience, and can manipulate lifting platform.

Qualified personnel:

Those have recognized academic qualifications, certificates and professional identity, or have been trained and experienced with relevant professional knowledge, can effectively prove their ability to solve difficulties met in relevant matters, works and projects.

Safety notice:

Safety information issued by the LINGONG HEAVY MACHINERY CO., LTD.

1.2 Compliance

1. Maintenance procedure shall be completed by qualified personnel trained in this maintenance of the machine.
2. Immediately mark the damaged or fault machine and withdraw it out of the service.
3. Repair any faulty or damaged machine before operating it.

1.3 Before starting the repair

1. Read, understand and observe the safety rules and maintenance instructions in the corresponding operating manual on the machine.
2. Ensure that all the necessary tools and parts are ready.
3. This manual is only applicable to the machine and parts manufactured and sold by Lingong Heavy Machinery Co., Ltd.
4. Please read each step completely and carefully and follow them strictly. Try to use a shortcut to repair may cause danger.
5. Be sure to use the goggles and other PPEs when necessary.
6. When lifting or placing a load, be sure to pay attention to the potential risk of pinch injury caused by moving parts, free swinging or unstable components and parts, etc. Always wear qualified steel protective shoes.

1.4 Requirements for work site

The machine shall be able to work under the following safety conditions:

1. The environment humidity shall be less than 90%(+25 °C).
2. The machine shall be able to work normally under the following safety conditions:
 - The ambient temperature shall be -20 °C ~ +40 °C;
 - The wind speed shall not be greater than 12.5 m/s/28mph;
 - The vehicle shall never be used in corrosiveness environment with such materials as inflammable and

explosive or acid and alkali.

3. During normal operation or repair, the movement of the mechanism and components and parts may cause danger to the human body, and protective device shall be set.
4. Measures shall be taken to prevent danger caused by components and parts falling on the platform.
5. When repairing, place a qualified fire extinguisher in a readily available position.
6. Keep the work site clean and tidy to prevent dirt from entering the machine and causing damage to the components and parts.
7. Please ensure that the forklift, crane or other lifting or supporting equipment are strong enough to support and stabilize the weight to be lifted.
8. During repair, please do not reuse disposal fastener (such as cotter pin and self-locking nut), so as to avoid abnormal functioning due to reuse of such parts.
9. Please dispose of the discarded fluid correctly in an environmentally friendly way.
10. Make sure the work site is well ventilated and well lit.

1.5 Maintenance and repair safety specification

1. The following precautions shall be taken before the adjustment and repair of the machine:

- Park the machine on a solid and level ground;
- Block the front and rear of the wheel to ensure that the wheel will not rotate or move;
- Cut off the power supply and ensure that the machine is in a non-start status;
- Set all control devices in the "off" status to avoid unexpected start of operating system;
- If possible, lower the platform to the lowest position, otherwise, ensure that it will not fall;
- Before loosening or removing the hydraulic component, release the hydraulic oil pressure of the hydraulic pipeline;
- Place the safety support as required.

2. Maintenance personnel training:

Maintenance personnel must be trained by qualified personnel to inspect and maintain the machine in accordance with the requirements of this manual.

3. Replacement of parts

The parts for replacement shall be genuine parts of our company, otherwise we will refuse to maintain or repair the product.

4. Service Bulletin

The machine maintenance and repair by users shall be in strict accordance with the service bulletin issued by the Lingong Heavy Machinery Co., Ltd.

5. Vehicle welding repair

- 1) First, shut down the engine and cut off the low-voltage power supply;
- 2) The worker shall have special operation certificate;
- 3) Clean up the surrounding flammables and apply for welding permit;
- 4) Protect the vehicle body to prevent splashing and fire;
- 5) Operate in strict accordance with the welding process;

6. Precautions of the battery maintenance

- 1) Battery run-out is strictly prohibited during storage. It is strictly prohibited to keep the battery in the

run-out status during storage. Please charge the battery immediately after the battery runs out.

- 2) Correctly control the charging time. In the process of use, accurately control the charging time according to the actual situation, and control the charging frequency with reference to the usual use frequency and driving mileage.
- 3) Prevent exposure to the sun. Environment with too high temperature will increase the internal pressure and electrolyte loss of the battery, causing battery activity reduction and accelerating polar plate aging. Therefore, the vehicle is strictly prohibited from being exposed to the sun and should be parked in a cool place.
- 4) Check regularly. If there is a problem with the battery during use, please promptly go to the sales center or maintenance department of the dealer for inspection and repair. This can relatively extend the servicing life of battery pack and maximize your maintenance cost.

7. Coolant

When the radiator is overheated, it is not allowed to open the radiator cap to prevent scalding by boiling water. Please wait until the water cools down before opening the radiator cap.

1.6 Intended purpose

This machine is only intended for lifting personnel and their tools and materials to the high-altitude work site.

1.7 Description

Most of the repair process can only be carried out by trained professional service personnel in properly equipped workshops. After the fault is eliminated, select the appropriate repair step.

Carry out the disassembly steps until the repair can be completed. Then reassemble in the order reverse to disassembly.

Maintenance and repair in authorized service center of the dealer of Lingong Heavy Machinery Co., Ltd. are strongly recommended.

Chapter II Product introduction

2.1 Machine parameters

2.1.1 SR3390D (S33900NDAH20) Specifications

Performance Specifications

Item	Parameters	Item	Parameters
Rated load (kg/lbs)	1100/2430	Ascending speed (s)	40±5
Load of extension platform (kg/lbs)	230/507	Descending speed (s)	45±5
Weight of whole machine (kg/lbs)	6880/15170	Theoretical climbing ability (no-load, stowed position)	40%
Maximum number of workers	7	Maximum Leveling angle-Outrigger (Front and rear)	7°
Maximum working height (m/ft)	12/39.4	Maximum Leveling angle-Outrigger (Left and right)	12°
Maximum platform height (m/ft)	10/32.8	Maximum allowable angle of operation (left and right)	2°
Running height (m/ft)	10/32.8	Maximum allowable angle of operation (front and rear)	3°
Minimum turning radius (m/ft)	5.33/17.45	Maximum wind speed (m/s/mpH)	12.5/28
Running speed of machine (Stowed) (km/h/mpH)	6.1/3.78	Driving type	Four-wheel drive
Running speed of machine (Platform raised) (km/h/mpH)	1.1/0.628		Front wheel steer
Max. braking distance (no-load, stowed) (m/ft)	1.8/5.9	Max. inner wheel turning angle	45°

Main Dimensions

Item	Parameters	Item	Parameters
Length of whole machine (m/ft)	4.9/16.1	Platform extension dimension (m/ft)	1.45/1.14 4.76/3.74
Width of whole machine (m/ft)	2.3/7.55	Wheel base (mm/in)	2850/111.2
Height of whole machine - unfolded guard railing (m/ft)	2.74/8.99	Wheel tread (mm/in)	1993/78.4
Height of whole machine - folded guard railing (m/ft)	2.06/6.76	Min. ground clearance (mm/in)	210/8.27
Dimension of main platform (length x width) (m/ft)	3.98x1.83/13.06x6	Tire specification (diameter x width)(mm/in)	φ835x290/φ33x12

Engine System

Item	Parameters	Item	Parameters
Model	DEUTZ D2.9L4	Rated speed (r/min)	2600
Displacement (L)	2.925	Maximum torque (N.m)	150
Rated power (Kw)	36.4	Emission standard	EPA Tire4f

Transmission system

Item	Parameters	
Walking reducer	Rated output torque (N·m)	7000
	Speed ratio	57.49: 1

Hydraulic System

Item	Parameters		
Walking system	Type	Closed	
	Pump displacement (ml/r)	46	
	Max. working pressure (MPa/psi)	28/4060	
	Front motor displacement (ml/r)	38/5511	
	Rear motor displacement (ml/r)	38/5511	
Functional system	Type	Open	
	Pump displacement (ml/r)	16	
	Lifting system	Max. working pressure (MPa/psi)	20/2900
	Steering system	Max. working pressure (MPa/psi)	13.8/2001
	Floating system	Max. working pressure (MPa/psi)	24.1/3480
	Outrigger system	Max. working pressure (MPa/psi)	13.8/2001

Electrical system

Item	Parameters	
Battery	Output voltage (V)	12
	Capacity (Ah)	120

Control system	Voltage (V)	12
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Fueling Capacity

Item	Parameters	Item	Parameters
Hydraulic oil (L)	140	Engine oil CH-4/15W-40 (L)	8.5
Travel reducer gear oil (L)	0.68×4	Fuel tank capacity (L)	100
Engine oil (L)	8		

2.1.2 SR3390D (S339000WNK4AH2000) Specifications

Performance Specifications

Item	Parameters	Item	Parameters
Rated load (kg/lbs)	1100/2430	Ascending speed (s)	40±5
Load of extension platform (kg/lbs)	230/507	Descending speed (s)	45±5
Load of extension platform (kg/lbs)	6880/15170	Theoretical climbing ability (no-load, stowed position)	40%
Maximum number of workers	7	Maximum Leveling angle-Outrigger (Front and rear)	7°
Maximum working height (m/ft)	12/39.4	Maximum Leveling angle-Outrigger (Front and rear)	12°
Maximum platform height (m/ft)	10/32.8	Maximum allowable angle of operation (front and rear)	3°
Maximum platform height (m/ft)	10/32.8	Maximum allowable angle of operation (left and right)	2°
Maximum platform height (m/ft)	5.33/17.45	Maximum inner wheel angle	45°
Running speed of machine (Stowed) (km/h/mph)	6.1/3.78	Maximum wind speed (m/s/mph)	12.5/28
Running speed of machine (Platform raised) (km/h/mph)	1.1/0.628	Driving type	Four-wheel drive
Maximum braking distance (no-load, stowed position) (m/ft)	1.8/5.9		Front wheel steer

Main Dimensions

Item	Parameters	Item	Parameters
Length of whole machine (m/ft)	4.9/16.1	Extending size of platform(m/ft)	1.45/1.14/ 4.75/3.74
Width of whole machine (m/ft)	2.3/7.55	Wheel base (mm/in)	2850/112.2
Height of whole machine - unfolded guard railing (m/ft)	2.74/8.99	Wheel tread (mm/in)	1993/78.4
Height of whole machine - unfolded guard railing (m/ft)	2.06/6.76	Ground clearance (mm/in)	230/9
Dimension of main platform (length x width) (m/ft)	3.98×1.83/13.06×6	Tire specification (diameter x width)(mm/in)	φ835×290/φ33×12

Engine System

Item	Parameters	Item	Parameters
Model	V2403-CR-EW02	Rated speed (r/min)	2600
Displacement (L)	2.4	Maximum torque (N.m)	159.8
Rated power (kW)	36	Emission standard	EPA Tire4f

Drive system

Item	Parameters	
Driving reducer	Output torque (N·m)	7000
	Velocity ratio	58:1

Hydraulic System

Item	Parameters		
Driving system	Model	Closed	
	Pump displacement (ml/r)	46	
	Max working Pressure (Mpa/psi)	28/4060	
	Motor displacement (ml/r) (Front/Rear)	38	
Functional system	Model	Open	
	Pump displacement (ml/r)	16	
	Lifting system	Max working Pressure (Mpa/psi)	20/2900
	Steering system	Max working Pressure (Mpa/psi)	13.8/2001

	Floating system	Max working Pressure (Mpa/psi)	24/3480
	Leg system	Max working Pressure (Mpa/psi)	13.8/2001

Electrical System

Item	Parameters	
Battery	Output voltage (V)	12
	Capacity (Ah)	120
Control system	Voltage (V)	12

Fueling Capacity

Item	Parameters	Item	Parameters
Hydraulic oil (L)	140	Engine antifreeze (L)	8.5
Gear oil for traveling reducer (L)	0.68x4	Diesel (L)	100
Engine oil(L)	8.5		

2.1.3 SR4390D (S43900NDAH20) Specifications

Performance Specifications

Item	Parameters	Item	Parameters
Rated load (kg/lbs)	910/2010	Fork lifting time (s)	55±2
Load of extension platform (kg/lbs)	230/507	Fork lowering time (s)	55±2
Weight of whole machine (kg/lbs)	7360/16230	Theoretical max. gradeability (no-load, stowed)	45%
Maximum number of workers	7	Maximum Leveling angle-Outrigger (Front and rear)	7°
Maximum working height (m/ft)	15/49.2	Maximum Leveling angle-Outrigger (Left and right)	12°
Maximum platform height (m/ft)	13/42.65	Maximum allowable angle of operation (left and right)	2°
Max. travel height (m/ft)	10.5/34.4	Maximum allowable angle of operation (front and rear)	3°
Min. turning radius (m/ft)	5.33/17.45	Max. inner wheel turning angle	45°
Running speed of machine (Stowed) (km/h/mpH)	6.1/3.78	Maximum wind speed (m/s/mpH)	12.5/28
Running speed of machine (Platform raised) (km/h/mpH)	1.1/0.628	Driving type	Four-wheel drive
Max. braking distance (no-load, stowed) (m/ft)	1.8/5.9		Front wheel steer

Main Dimensions

Item	Parameters	Item	Parameters
Length of whole machine (m/ft)	4.9/16.1	Platform extension dimension (m/ft)	1.45/1.14 4.79/3.74
Width of whole machine (m/ft)	2.3/7.55	Wheel base (mm/in)	2850/111.2
Height of whole machine - unfolded guard railing (m/ft)	2.96/9.71	Wheel tread (mm/in)	1993/78.4
Height of whole machine - unfolded guard railing (m/ft)	2.28/7.48	Min. ground clearance (mm/in)	210/8.27
Dimension of main platform (length x width) (m/ft)	3.98x1.83/13.06x6	Tire specification (diameter x width)(mm/in)	φ835x290/φ33x12

Engine System

Item	Parameters	Item	Parameters
Model	DEUTZ D2.9 L4	Rated speed (r/min)	2600
Displacement (L)	2.925	Maximum torque (N.m)	150
Rated power (kW)	36.4	Emission standard	EPA Tire4f

Transmission system

Item	Parameters	
Walking reducer	Rated output torque (N·m)	7000
	Speed ratio	57.49: 1

Hydraulic System

Item	Parameters	
Walking system	Type	Closed
	Pump displacement (ml/r)	46
	Max. working pressure (MPa/psi)	28/4060
	Front motor displacement (ml/r)	38/5511

Functional system	Rear motor displacement (ml/r)		38/5511
	Type		Open
	Pump displacement (ml/r)		16
	Lifting system	Max. working pressure (MPa/psi)	20/2900
	Steering system	Max. working pressure (MPa/psi)	13.8/2001
	Floating system	Max. working pressure (MPa/psi)	24.1/3480
	Outrigger system	Max. working pressure (MPa/psi)	13.8/2001

Electrical system

Item	Parameters	
Battery	Output voltage (V)	12
	Capacity (Ah)	120
Control system	Voltage (V)	12

Fueling Capacity

Item	Parameters	Item	Parameters
Hydraulic oil (L)	140	Engine oil CH-4/15W-40 (L)	8.5
Travel reducer gear oil (L)	0.68x4	Fuel tank capacity (L)	100
Engine oil (L)	8		

2.1.4 SR4390D (S439000Wnk4AH2000) Specifications

Performance Specifications

Item	Parameters	Item	Parameters
Rated load (kg/lbs)	910/2010	Ascending speed (s)	55±2
Load of extension platform (kg/lbs)	230/507	Descending speed (s)	55±2
Weight of whole machine (kg/lbs)	7360/16230	Theoretical climbing ability (no-load, stowed position)	40%
Maximum number of workers	7	Maximum Leveling angle-Outrigger (Front and rear)	7°
Maximum working height (m/ft)	15/49.2	Maximum Leveling angle-Outrigger (Left and right)	12°
Maximum platform height (m/ft)	13/42.65	Maximum allowable angle of operation (left and right)	2°
Running height (m/ft)	8.5/27.9	Maximum allowable angle of operation (front and rear)	3°
Minimum turning radius (m/ft)	5.33/17.45	Maximum inner wheel angle	45°
Running speed of machine (Stowed) (km/h/mpH)	6.1/3.78	Maximum wind speed (m/s/mpH)	12.5/28
Running speed of machine (Platform raised) (km/h/mpH)	1.1/0.628	Driving type	Four-wheel drive
Maximum braking distance (no-load, stowed position) (m/ft)	1.8/5.9		Front wheel steer

Main Dimensions

Item	Parameters	Item	Parameters
Length of whole machine (m/ft)	4.9/16.1	Extending size of platform(m/ft)	1.45/1.14 4.75/3.74
Width of whole machine (m/ft)	2.3/7.55	Wheel base (mm/in)	2850/112.2
Height of whole machine - unfolded guard railing (m/ft)	2.96/9.71	Wheel tread (mm/in)	1993/78.4
Height of whole machine - folded guard railing (m/ft)	2.28/7.48	Ground clearance (mm/in)	230/9
Dimension of main platform (length x width) (m/ft)	3.98x1.83/13.06x6	Tire specification (diameter x width)(mm/in)	φ835x290/φ33x12

Engine System

Item	Parameters	Item	Parameters
Model	V2403-CR-EW02	Rated speed (r/min)	2600
Displacement (L)	2.4	Maximum torque (N.m)	159.8
Rated power (Kw)	36	Emission standard	EPA Tire4f

Drive system

Item	Parameters	
Driving reducer	Output torque (N*m)	7000
	Velocity ratio	58:1

Hydraulic System

Item	Parameters
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Driving system	Model		Closed
	Pump displacement (ml/r)		46
	Max working Pressure (Mpa/psi)		28/4060
	Motor displacement (ml/r) (Front/Rear)		38
Functional system	Model		Open
	Pump displacement (ml/r)		16
	Lifting system	Max working Pressure (Mpa/psi)	20/2900
	Steering system	Max working Pressure (Mpa/psi)	13.8/2001
	Floating system	Max working Pressure (Mpa/psi)	24/3480
	Leg system	Max working Pressure (Mpa/psi)	13.8/2001

Electrical System

Item	Parameters	
Battery	Output voltage (V)	12
	Capacity (Ah)	120
Control system	Voltage (V)	12

Fueling Capacity

Item	Parameters	Item	Parameters
Hydraulic oil (L)	140	Engine antifreeze (L)	8.5
Gear oil for traveling reducer (L)	0.68x4	Diesel (L)	100
Engine oil(L)	8.5		

2.1.5 SR5390D (S53900NDAH20) Specifications

Performance Specifications

Item	Parameters	Item	Parameters
Rated load (kg/lbs)	680/1500	Ascending speed (s)	55±2
Load of extension platform (kg/lbs)	230/507	Descending speed (s)	55±2
Weight of whole machine (kg/lbs)	8100/17860	Theoretical maximum gradeability (retracted under no load)	45%
Maximum number of workers	4	Maximum Leveling angle-Outrigger (Front and rear)	7°
Maximum working height (m/ft)	17.9/58.7	Maximum Leveling angle-Outrigger (Left and right)	12°
Maximum platform height (m/ft)	15.9/52.2	Maximum allowable angle of operation (left and right)	2°
Running height (m/ft)	8.5/27.9	Maximum allowable angle of operation (front and rear)	3°
Minimum turning radius (m/ft)	5.33/17.45	Maximum turning angle of inner wheel	45°
Running speed of machine (Stowed) (km/h/mpH)	6.1/3.78	Maximum wind speed (m/s/mpH)	12.5/28
Running speed of machine (Platform raised) (km/h/mpH)	1.1/0.628	Driving type	Four-wheel drive
Maximum braking distance (retracted under no load) (m/ft)	1.8/5.9		Front wheel steer

Main Dimensions

Item	Parameters	Item	Parameters
Length of whole machine (m/ft)	4.9/16.1	Platform extension dimension (m/ft)	1.45/1.14
Width of whole machine (m/ft)	2.3/7.55	Wheel base (mm/in)	4760/3.74
Height of whole machine - unfolded guard railing (m/ft)	3.18/10.43	Wheel tread (mm/in)	1993/78.4
Height of whole machine - folded guard railing (m/ft)	2.5/8.2	Min. ground clearance (mm/in)	210/8.27
Dimension of main platform (length x width) (m/ft)	3.98x1.83/13.06x6	Tire specification (diameter x width)(mm/in)	φ835×290/φ33×12

Engine System

Item	Parameters	Item	Parameters
Model	DEUTZ D2.9L4	Rated speed (r/min)	2600
Displacement (L)	2.925	Maximum torque (N.m)	150
Rated power (kW)	36.4	Emission standard	EPA Tire4f

Transmission system

Item	Parameters	
Walking reducer	Rated output torque (N·m)	7000

	Speed ratio	57.49: 1
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Hydraulic System

Item		Parameters	
Walking system	Type	Closed	
	Pump displacement (ml/r)	46	
	Max. working pressure (MPa/psi)	28/4060	
	Front motor displacement (ml/r)	38/5511	
	Rear motor displacement (ml/r)	38/5511	
Functional system	Type	Open	
	Pump displacement (ml/r)	16	
	Lifting system	Max. working pressure (MPa/psi)	21/2900
	Steering system	Max. working pressure (MPa/psi)	13.8/2001
	Floating system	Max. working pressure (MPa/psi)	24/3480
	Outtrigger system	Max. working pressure (MPa/psi)	13.8/2001

Electrical system

Item		Parameters
Battery	Output voltage (V)	12
	Capacity (Ah)	120
Control system	Voltage (V)	12

Fueling Capacity

Item	Parameters	Item	Parameters
Hydraulic oil (L)	140	Engine antifreeze (L)	8.5
Walking reducer gear oil (L)	0.68×4	Fuel tank capacity (L)	100
Engine oil (L)	8		

2.1.6 SR5390D (S539000WNK4AH2000) Specifications

Performance Specifications

Item	Parameters	Item	Parameters
Rated load (kg/lbs)	680/1500	Ascending speed (s)	55±2
Load of extension platform (kg/lbs)	230/507	Ascending speed (s)	55±2
Weight of whole machine (kg/lbs)	8100/17860	Theoretical climbing ability (no-load, stowed position)	40%
Maximum number of workers	4	Maximum Leveling angle-Outtrigger (Front and rear)	7°
Maximum working height (m/ft)	17.9/58.7	Maximum Leveling angle-Outtrigger (Left and right)	12°
Maximum platform height (m/ft)	15.9/52.2	Maximum allowable angle of operation (left and right)	2°
Running height (m/ft)	8.5/27.9	Maximum allowable angle of operation (front and rear)	3°
Minimum turning radius (m/ft)	5.33/17.45	Maximum inner wheel angle	45°
Running speed of machine (Stowed) (km/h/mpH)	6.1/3.78	Maximum wind speed (m/s/mpH)	12.5/28
Running speed of machine (Platform raised) (km/h/mpH)	1.1/0.628	Driving type	Four-wheel drive
Maximum braking distance (no-load, stowed position) (m/ft)	1.8/5.9		Front wheel steer

Main Dimensions

Item	Parameters	Item	Parameters
Length of whole machine (m/ft)	4.9/16.1	Extending size of platform(m/ft)	1.45/1.14 4.75/3.74
Width of whole machine (m/ft)	2.3/7.55	Wheel base (front/rear) (mm/in)	2850/112.2
Height of whole machine - unfolded guard railing (m/ft)	3.18/10.43	Wheel tread (mm/in)	1993/78.4
Height of whole machine - folded guard railing (m/ft)	2.5/8.2	Ground clearance (mm/in)	230/9
Dimension of main platform (length x width) (m/ft)	3.98×1.83/13.06×6	Tire specification (diameter x width)(mm/in)	φ835×290/φ33×12

Engine System

Item	Parameters	Item	Parameters
Model	V2403-CR-EW02	Rated speed (r/min)	2600
Displacement (L)	2.4	Maximum torque (N.m)	159.8

Rated power (kW)	36	Emission standard	EPA Tire4f
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Drive system

Item	Parameters
Driving reducer	Output torque (N*m)
	7000
	Velocity ratio
	58:1

Hydraulic System

Item	Parameters	
Driving system	Model	
	Closed	
	Pump displacement (ml/r)	
	46	
Functional system	Max working Pressure (Mpa/psi)	
	28/4060	
	Motor displacement (ml/r) (Front/Rear)	
	38	
Functional system	Model	
	Open	
	Pump displacement (ml/r)	
	16	
	Lifting system	Max working Pressure (Mpa/psi)
	20/2900	
	Steering system	Max working Pressure (Mpa/psi)
13.8/2001		
Floating system	Max working Pressure (Mpa/psi)	
24/3480		
Leg system	Max working Pressure (Mpa/psi)	
13.8/2001		

Electrical System

Item	Parameters
Battery	Output voltage (V)
	12
Control system	Capacity (Ah)
	120
	Voltage (V)
	12

Fueling Capacity

Item	Parameters	Item	Parameters
Hydraulic oil (L)	140	Engine antifreeze (L)	8.5
Gear oil for traveling reducer (L)	0.68x4	Diesel (L)	100
Engine oil(L)	8.5		

2.2Lift platform torque specification

The tightening torque tolerance range is 10% for all hydraulic seals, important transmission connectors and key processes with defined torque tightening requirements, and 20% for non-essential reference torques, which is to be rounded to the nearest integer when necessary;

Table 1: Tightening torques of metric and English joint bodies and plugs (N•m)

Tightening torque of metric-threaded oil ports					Tightening torque of inch-threaded oil port				
Pipe diameter	Thread specification (mm)	Connector model		Plug	Pipe diameter	Thread specification (Inch)	Connector model		Plug
		Type E	Type F	VSTI-E			Type E	Type F	VSTI-ED
6L	M10X1.0	27	22	16	6L	G1/8A	22	16	16
8L	M12X1.5	37	32	27	8L	G1/4A	37	32	32
10L	M14X1.5	58	48	37	10L	G1/4A	37	32	/
12L	M16X1.5	75	58	58	12L	G3/8A	75	58	63
15L	M18X1.5	95	75	70	15L	G1/2A	120	95	85
18L	M22X1.5	140	115	95	18L	G1/2A	120	95	/
22L	M28X2.0	190	160	140	22L	G3/4A	190	160	140
28L	M33X2.0	325	220	235	28L	G1A	325	220	210
35L	M42X2.0	470	295	380	35L	G11/4A	470	315	470
42L	M48X2.0	565	380	/	42L	G11/4A	565	380	470
6S	M12X1.5	42	37	/	6S	G1/4A	42	37	/
8S	M14X1.5	53	48	/	8S	G1/4A	42	37	/
10S	M16X1.5	75	58	/	10S	G3/8A	85	63	/
12S	M18X1.5	95	75	/	12S	G3/8A	85	63	/

14S	M20X1.5	130	85	/	14S	G1/2A	120	95	/
16S	M22X1.5	140	105	/	16S	G1/2A	120	95	/
20S	M27X2.0	190	180	/	20S	G3/4A	190	160	/
25S	M33X2.0	325	325	/	25S	G1A	325	220	/
30S	M42X2.0	470	345	/	30S	G11/4A	470	315	/
38S	M48X2.0	565	440	/	38S	G11/2A	565	380	/

Table 2: Tightening torque of American joint body and plug (N•m)

Product series	Thread UN/UNF	Non-adjustable assembly torque N•m	Adjustable assembly torque N•m
EO-L	7/16-20 UN(F)	23	18
	1/2-20 UN(F)	28	28
	9/16-18 UN(F)	34	34
	3/4-16 UN(F)	60	55
	7/8-14 UN(F)	115	80
	1-1/16-12 UN(F)	140	100
	1-5/16-12 UN(F)	210	150
	1-5/8-12 UN(F)	290	290
EO-S	1-7/8-12 UN(F)	325	325
	7/16-20 UN(F)	20	20
	1/2-20 UN(F)	40	40
	9/16-18 UN(F)	46	46
	3/4-16 UN(F)	80	80
	7/8-14 UN(F)	135	135
	1-1/16-12 UN(F)	185	185
	1-5/16-12 UN(F)	270	270
	1-5/16-12 UN(F)	270	270
	1-5/8-12 UN(F)	340	340
1-7/8-12 UN(F)	415	415	

Description:

- 1、 Table 1 gives the torques for metric-threaded joints and inch-threaded joints, and Table 2 gives the torques for UN-threaded joints, and for those torques, an error of 10% is allowed;
- 2、 The torque values given in Table 1 and Table 2 are based on the condition that the connected part is made of steel, and for connected part made of aluminum, the tightening torque equal to 60% of the corresponding torque in Table 2 and Table 3 shall apply and shall be rounded to the nearest integer after calculation;
- 3、 For Parker joints, the torque is to be selected according to the name and specification, and for ordinary joints, the torque is to be selected according to the thread specification.

Specific examples are as follows:

- 1) GE for straight-through joint, 28 for pipe diameter, L for normal pressure, M for metric thread, ED for E-type elastic seal, OMD for no nut sleeve, A3C for galvanizing; According to 28L MED, the torque selected from Table 1 is 325N•m
- 2) GE O 22L R 3/4 OMDA3C: O for F-type O-ring, R for inch thread, and 3/4 for thread specification G3/4; According to O 22L R3/4, the torque selected from Table 2 is 160N•m;
- 3) GE O 20S R OMDCF: S represents the heavy pressure, and the torque value selected according to O 20S R is 160 N•m;

Table 3: Metric thread rotating nut torque (N•m)

Pipe diameter	Thread specification	Tightening torque	Pipe diameter	Thread specification	Tightening torque N•m
06L	M12X1.5	16	06S	M14X1.5	27
08L	M14X1.5	22	08S	M16X1.5	42
10L	M16X1.5	32	10S	M18X1.5	53
12L	M18X1.5	42	12S	M20X1.5	63
15L	M22X1.5	58	14S	M22X1.5	80
18L	M26X1.5	90	16S	M24X1.5	85
22L	M30X2	115	20S	M30X2	125
28L	M36X2	135	25S	M36X2	180
35L	M45X2	220	30S	M45X2	260
42L	M52X2	345	38S	M52X2	370

Description:

- 1、 For torques given in Table 3, an error of 10% is allowed;
- 2、 The torque values given in Table 4 are based on the condition that the connected part is made of steel, and for connected part made of aluminum, the tightening torque equal to 60% of the corresponding torque in Table 3 shall apply and shall be rounded to the nearest integer after calculation;
- 3、 For Parker rubber hoses, right-angle joints and tee joints, the torque is to be selected according to the name and specification, and for ordinary rubber hoses, right-angle joints and tee joints, the torque is to be selected according to the thread specification.

Specific examples are as follows:

- 1) F481 CACF 2815 16: F481 for crimping form and hose type, CACF for joint type at both ends, CA for 24° conical swivel nut with O-ring, CF for 90° elbow of 24° conical swivel nut with O-ring, and 2815 for connection specification of joint at both ends of hose. According to this, the torque selected for end 28 is 135N•m, and the torque selected for end 15 is 58N•m;
- 2) SN for heavy pressure hose. According to this, the torque selected for end 12 is 63N•m, and the torque selected for end 10 is 53N•m;
- 3) SN for heavy pressure hose. According to this, the torque selected for end 12 is 63N•m, and the torque selected for end 10 is 53N•m;

Table 4: Tightening torque of ordinary bolts (N•m)

Bolt strength grade	Yield strength N/MM2	Nominal diameter of bolt, mm				
		6	8	10	12	14
		Tightening torque N · m				
4.6	240	4~5	10~12	20~25	36~45	55~70
5.6	300	5~7	12~15	25~32	45~55	70~90
6.8	480	7~9	17~23	33~45	58~78	93~124
8.8	640	9~12	22~30	45~59	78~104	124~165
10.9	900	13~16	30~36	65~78	110~130	180~210
12.9	1080	16~21	38~51	75~100	131~175	209~278
Bolt strength grade	Yield strength N/MM2	Nominal diameter of bolt, mm				
		16	18	20	22	24

		Tightening torque N · m				
4.6	240	90~110	120~150	170~210	230~290	300~377
5.6	300	110~140	150~190	210~270	290~350	370~450
6.8	480	145~193	199~264	282~376	384~512	488~650
8.8	640	193~257	264~354	376~502	521~683	651~868
10.9	900	280~330	380~450	540~650	740~880	940~1120
12.9	1080	326~434	448~597	635~847	864~1152	1098~1464
Bolt strength grade	Yield strength N/MM2	Nominal diameter of bolt, mm				
		27	30	33	36	39
		Tightening torque N · m				
4.6	240	450~530	540~680	670~880	900~1100	928~1237
5.6	300	550~700	680~850	825~1100	1120~1400	1160~1546
6.8	480	714~952	969~1293	1319~1759	1694~2259	1559~2079
8.8	640	952~1269	1293~1723	1759~2345	2259~3012	2923~3898
10.9	900	1400~1650	1700~2000	2473~3298	2800~3350	4111~5481
12.9	1080	1606~2142	2181~2908	2968~3958	3812~5082	4933~6577

2.3 Key component moment table

Deutz engine

No.	Part	Torque Valve		Interval Hours (h)
		Ft. lbs	Nm	
1	Mount the left and right pull rod and guard plate assembly onto chassis	38±4	52±5	100
2	Forklift assembly hoisting	67±7	91±9	100
3	Assembling of wheel	225±18	305±25	100
4	Engine assembly (Coupler, Bump cover plate)	38±4	52±5	First re-tightening at 50h, and thereafter every 100h
5	Engine assembly (Suspension assembly)	38±4	52±5	First re-tightening at 50h, and thereafter every 100h

Kubota Engine

No.	Part	Torque Valve		Interval Hours (h)
		Ft. lbs	Nm	
1	Mount the left and right pull rod and guard plate assembly onto chassis	38±4	52±5	100
2	Forklift assembly hoisting	67±7	91±9	100
3	Assembling of wheel	225±18	305±25	100
4	Engine assembly (Coupler, Bump cover plate)	38±4	52±5	First re-tightening at 50h, and thereafter every 100h
5	Engine assembly (Suspension assembly)	166±17	225±23	First re-tightening at 50h, and thereafter every 100h

Chapter 3 Maintenance

3.1 Removing and installing the platform

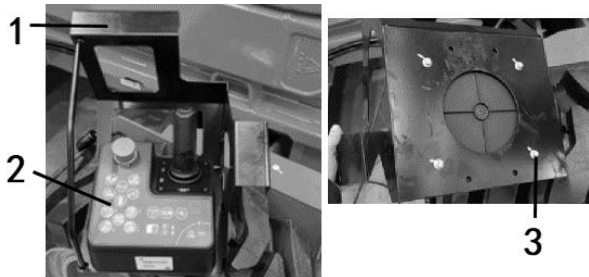
Platform controls refer to any devices used to activate machine functions from the platform or on the ground. They can be used to control the operation of various machine functions once the function button is activated.

The platform controls include emergency stop button, circuit board, joystick, touch screen, function button, etc.

3.1.1 Removing the platform control unit



- 1) Turn off the power supply of the machine and disconnect the harness connector of the PCU.



1. PCU bracket weldment 2. PCU 3. Bolt
- 2) Loosen the fastener (3) of part 2 and carefully remove part 2 from part 1.

3.1.2 Removing the working platform

⚠ WARNING: Risk of personal injury.

This procedure requires special maintenance skills, lifting equipment and a suitable workshop. Without these skills and tools, serious personal injury or death and damage of important parts may occur. The service by the dealer is highly

recommended.

CAUTION: Perform this procedure with the platform stowed and the extension platform fully retracted and locked in place.

- 1) Start the engine by the GCU, and lift the platform.
- 2) Lift the safety arm and move it to the middle position, and then rotate it upward to the vertical position.
- 3) Lower the platform until it contacts the safety arm, and shut down the engine.
- 4) Disconnect the tie that fixes the platform power cable at the bottom of the platform.

⚠ CAUTION: Risk of part damage

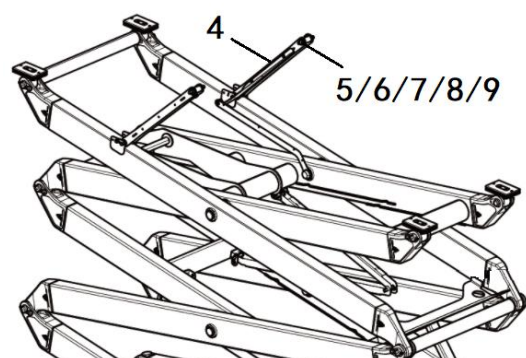
Prevent the platform power wire from being cut off.

- 5) Start the engine by the GCU.
- 6) Lift the platform slightly, and put the safety arm to the stowed position.
- 7) Lower the platform to the stowed position. Shut down the engine.
- 8) Disconnect the PCU spring harness and the PCU harness, and make a mark.

⚠ WARNING: Risk of electric shock/burning.

Contact with live circuits may cause death or serious injury. Take off all rings, watches and other decorations.

- 9) Remove the PCU from the platform, and set it aside.
- 10) Put aside the PCU wires.

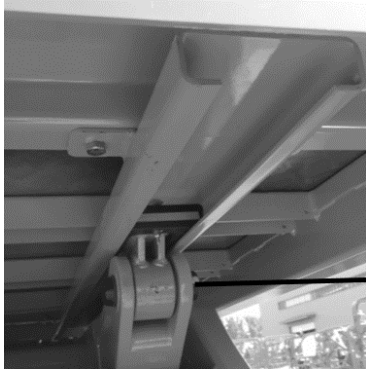


4. Pull rod assembly 5. Pin 6. Safety pin 7. Bolt
8. Washer 9. Nut

- 11) Remove the parts 6/7/8/9 from the part 4 under the platform on both sides of the machine.
- 12) Remove the part 5 with an appropriate tool, put the part 4 on the scissor arm, and remove the pull rod assembly on the other side in the same way.
- 13) Attach the sling of the crane under the platform at the steering end for support. Do not apply any lifting force.
- 14) Attach the sling of the crane to the lifting point of platform guardrail at the non-steering end of the machine for support. Do not apply any lifting force.

⚠ CAUTION: Risk of part damage.

If used to lift the platform, it may damage the platform guardrail. Do not attach the sling to the platform guardrail.



1/2/3/4

1. Pin 2. Safety pin 3. Bolt 4. Nut

- 15) Remove the fasteners 1/2/3/4 from the pivot of each platform slider.

⚠ WARNING: Risk of crushing

If not properly supported with the crane when the platform slider pivot is removed, the platform will fall.

- 16) Fix the platform slider to the platform to prevent the slider from sliding out of the sideway after the platform is removed from

the machine.

⚠ Risk of personal injury.

If not fixed on the platform, the platform slider may fall off from the bottom of the platform.

- 17) Lift the platform away from the machine with care, and place it on a structure with appropriate bearing capacity.

⚠ WARNING: Risk of crushing

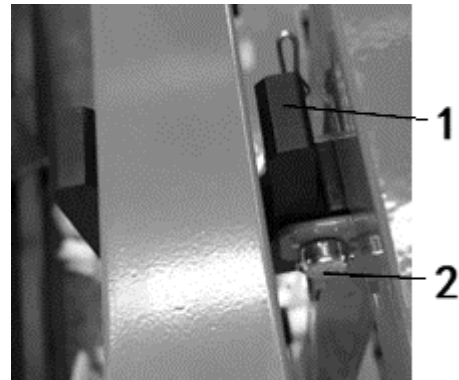
If not properly supported with the overhead crane during removal from the machine, the platform may become unbalanced and fall.

3.1.3 Removing the extension platform

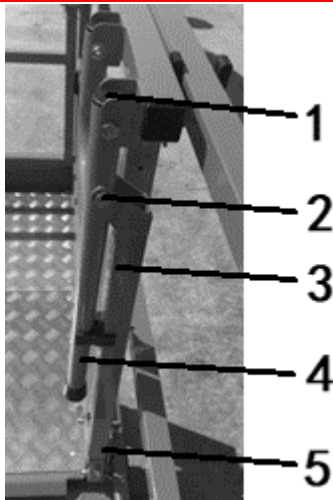
⚠ CAUTION: Only when the platform is in the stowed position and the extension platform is fully retracted and locked in place can this operation be performed.

⚠ CAUTION: If the machine is equipped with double extension platforms, repeat this step.

- 1) For front extension platform (i.e. the extension platform at the steering end):
Remove the PCU from the platform and set it aside.

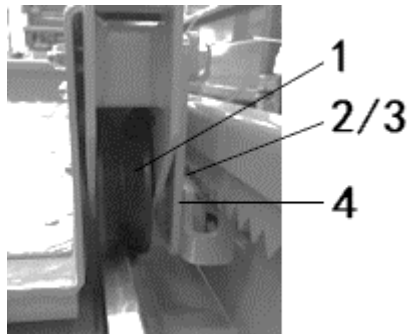


1. Guide block 2. D-pin
2) Remove the fasteners 2 that fix the guide block and turn the guide block downward.



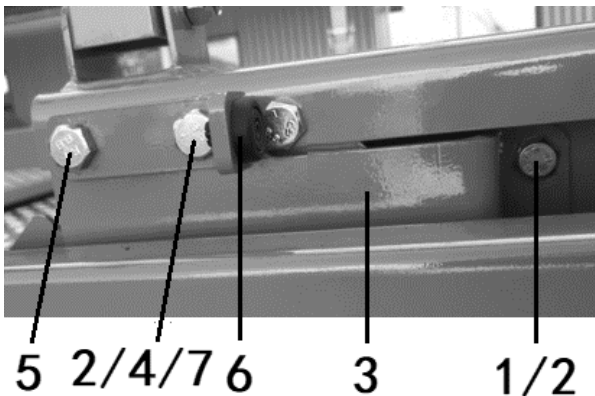
1. Pipe plug 2. Bolt and nut 3. Pull rod 4. Joystick 5. Link

- 3) Undo the fasteners that fix parts 3/4/5 of the front extension platform, remove parts 3/4/5 and keep them well.



1. V-grooved wheel 2. Sleeve 3. Screw 4. Wheel Frame

- 4) Undo the fasteners that fix the V-belt pulley holder, fixing plate and limit plate on the side with pull rod, and then remove the pulley holder, fixing plate and limit plate.



1. Bolt 2. Nut 3. Fixing plate 4. Bolt
5. Limit plate 6. Rivet pin


- 5) Undo the fasteners that fix the mounting

plate and limit plate on the side without pull rod, and then remove the mounting plate and limit plate.

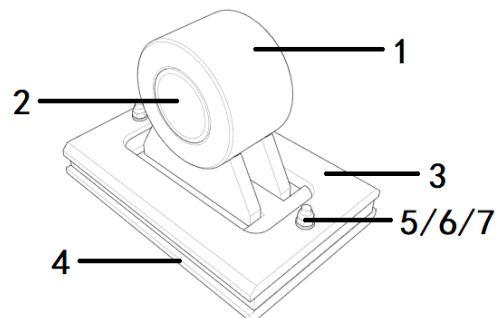
- 6) Hoist the front extension platform diagonally with two slings, and ensure that the hoisting is firm enough.
7) Carefully push the front extension platform out of the main platform, and place the front extension platform on a structure with sufficient bearing capacity.

 **CAUTION: Risk of crushing.**

If not properly supported and secured during removal, the extension platform may be out of balance and fall off.

 **CAUTION: If the machine is equipped with double extension platforms, repeat this step.**

3.1.4 Assembling the platform



1. Support 2. Shaft sleeve 3. Upper wear washer 4. Lower wear washer
5. Screw 6. Nut 7. Washer

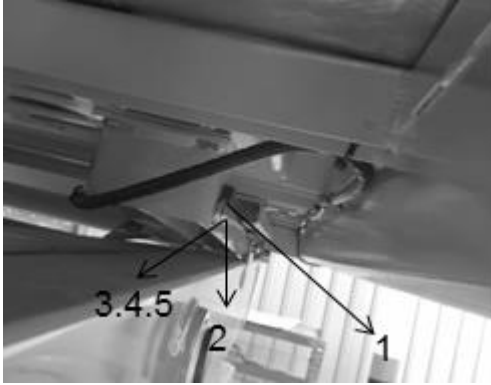
- 1) Attach the sling to the four hoisting points of main platform guardrail, and lift the main platform above the fork.
2) First, press the part 2 into part 1 in place without protrusion and damage of shaft sleeve.
3) Assemble part 3 above the support and the part 4 below the support, tighten them with parts 5/6/7. After assembly, push the sliders into the slideway below the platform, and coat the slideway with lithium-based

grease.

Reference tightening torque of part 5:
 $3.5 \pm 0.3 \text{ N m}$;

Tools: torque wrench 10

NOTE: Be careful during hoisting, and ensure that the hoisting is firm without fall-off

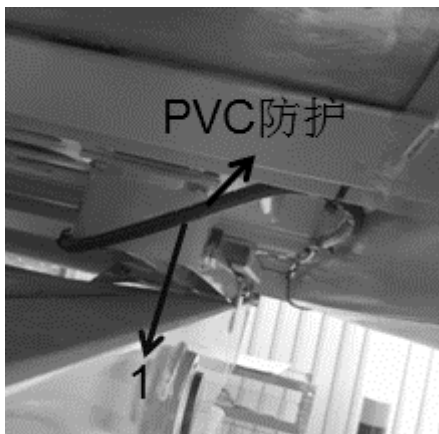


1. Fork pull rod pin 2. Bolt 3. Nut 4. Washer 5. Safety pin

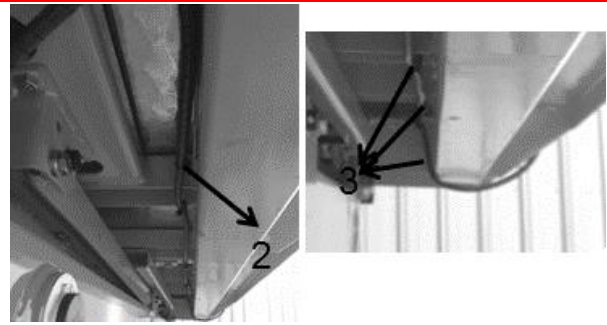
4) Connect the fork pull rod assembly to the platform fork mount with part 1, and tighten it with parts 2/3/4/5.

Reference tightening torque of part 2:
 $52 \pm 5 \text{ N.m}$;

Tools: torque wrench 16



5) Lead the PCU harness out from the inner side of the pull rod, and tie it firmly at the fixing point 1 on the platform base plate.



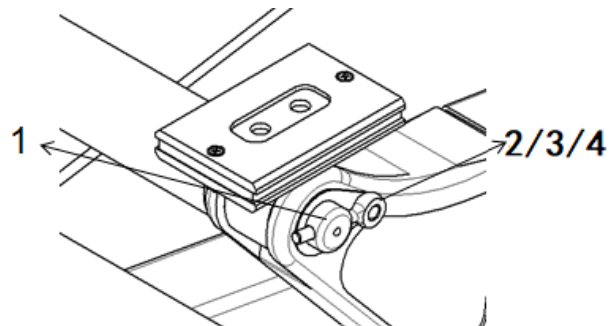
6) Secure the PCU harness with ties at points 2 and 3.

7) After installing the PCU on the platform, secure it to the guardrail with ties as shown.

NOTE: PVC masking tape is only required at the connection of link, and not required at other positions without relative movement.



8) Position the PCU harness shown in the figure on the left side of the bolt, that is, the side far away from the extension platform. and tie it securely.

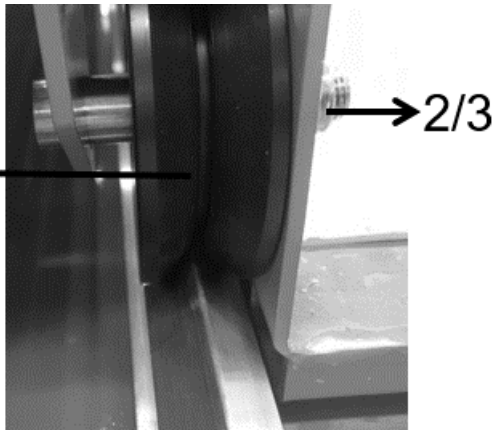


1. Pin 2. Safety pin 3. Bolt 4. Washer
9) Connect the slider to the fork with part 1, and tighten it with parts 2/3/4.

Reference tightening torque of part 3:
 $90 \pm 9 \text{ N.m}$;

Tools: torque wrench 18

3.1.5 Assembling the extension platform



1. V-belt pulley 2. Nut 3. Shaft

- 1) Before installing the front extension platform to the main platform, assemble part 1 on the non-pull rod side, and tighten it with parts 2/3.

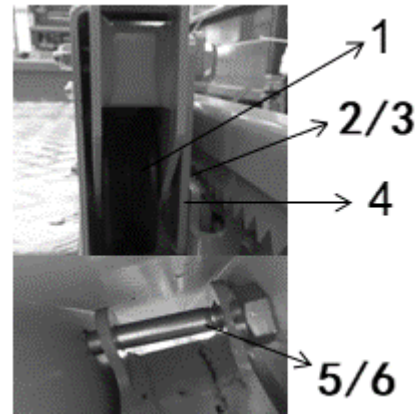
Reference tightening torque of part 2:
 $150 \pm 15 \text{ N.m}$;

Tools: torque wrench 24

- 2) Attach the sling to the two opposite angles of the extension platform, and lift and push the front extension platform into the main platform. Ensure that the two lower wheels slide smoothly into the slideway below the main platform, and pay attention to the safety during hoisting.



NOTE: Apply a layer of lithium-based grease to the two lower wheels before pushing the extension platform, with the wheel of pull rod side located at the right guardrail behind the upper door.



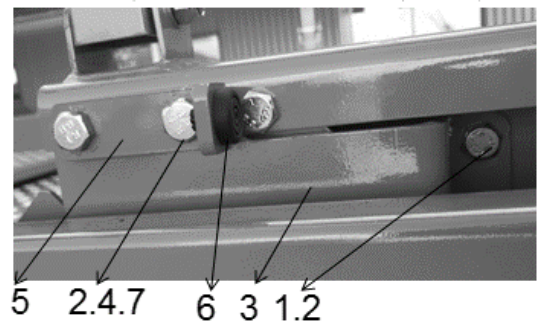
1. V-grooved wheel 2. Sleeve 3. Screw 4. Wheel carrier 5. Nut 6. Bolt

- 3) After installing the front extension platform into the main platform with a sling, assemble parts 1/4 to the pull-rod side with part 2, and tighten it with part 3 (coated with adhesive).

Reference tightening torque of parts 3 and 5:
 $52 \pm 5 \text{ N.m}$

Tools: Allen wrench 8, torque wrench 16

NOTE: Part 3 is to be coated with adhesive before assembling.

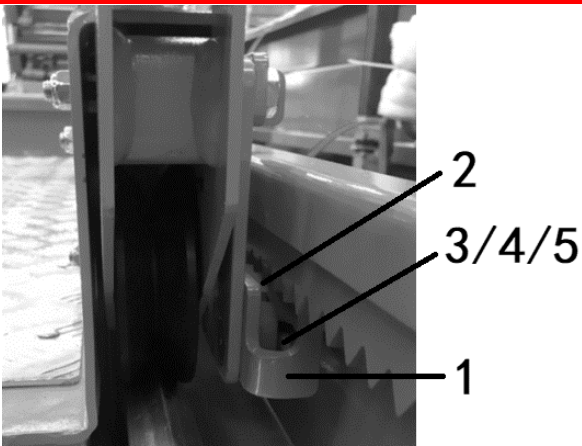


1. Bolt 2. Nut 3. Fixing plate 4. Bolt
 5. Limit plate 6. Rivet pin 7. Washer

- 4) Put part 3 in the position as shown and tighten it with parts 1/2.
- 5) Install part 5 to part 3 with parts 2/4/7, with the bent side of the limit plate on the pull-out side of platform.
- 6) Install part 6 in the hole of limit plate, and press it in from the pull-out side.

Reference tightening torque of parts 1 and 4:
 $52 \pm 5 \text{ N.m}$

Tools: torque wrench 16



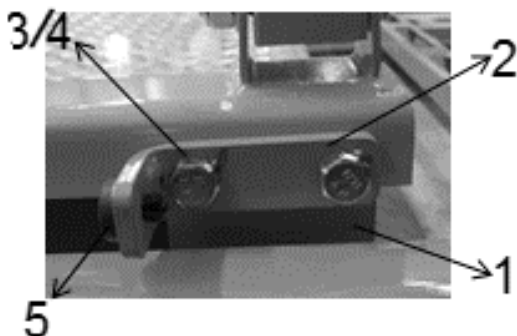
1. Guide plate 2. Toothed plate 3. Screw 4. Nut
5. Washer

7) Install parts 1 and 2 to the position as shown and tighten them with parts 3/4/5.

Reference tightening torque of part 3: 52±5N.m;

Tools: Allen wrench 8.

NOTE: After installing the part 2, pull the platform to check the two toothed plates for mutual interference, and if any interference is found, contact a professional technician for inspection, and if no interference is found, extend and retract the platform to the two limit positions, checking whether the toothed plates can mesh completely to ensure that the extension platform can be locked effectively. Such verification process is required for both front extension platform and rear extension platform.



1. Mounting plate 2. Limit plate 3.

Bolt

4. Nut 5. Rivet pin

8) Install part 2 to part 1 with parts 3/4.

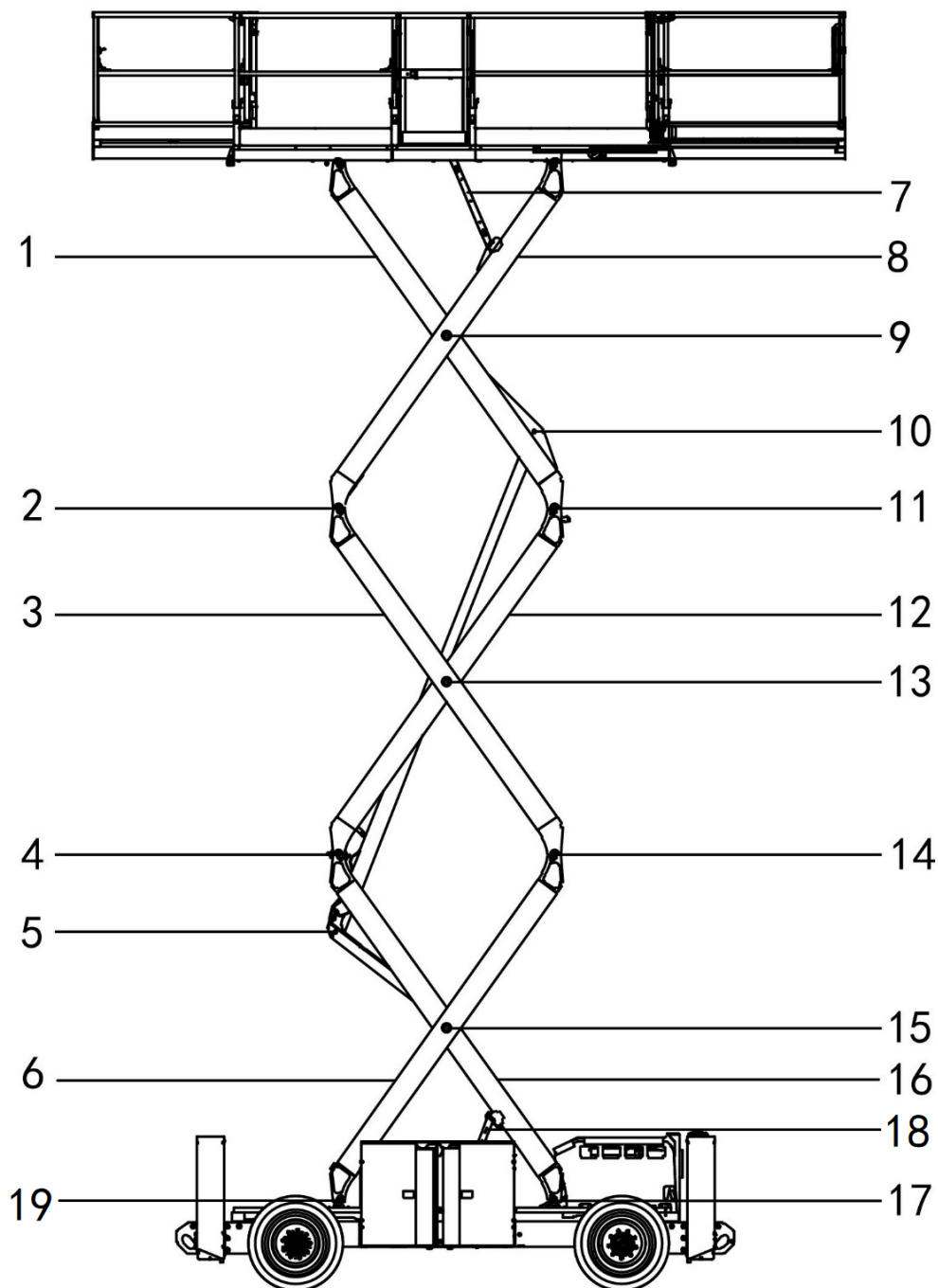
9) Install the part 5 on the limit plate and press it in from the pull-out side.

Reference tightening torque of part 3: 52±5N.m

Tools: torque wrench 8

3.2 Removing and installing the fork

3.2.1 Removing the fork (SR3390D)



- 1 Third inner arm assembly
- 2 3# pin (non-steering end)
- 3 Second outer arm assembly
- 4 2# pin (non-steering end)
- 5 Lift cylinder tube end shaft
- 6 First outer arm assembly
- 7 Pull rod assembly
- 8 Fifth outer arm assembly
- 9 3# center pin
- 10 Lift cylinder rod end shaft

- 11 3# pin (steering end)
- 12 Second inner arm assembly
- 13 2# center pin
- 14 2# pin (steering end)
- 15 1# center pin
- 16 First inner arm assembly
- 17 1# pin (steering end)
- 18 Chassis tie bar assembly
- 19 1# pin (non-steering end)

 **CAUTION: Risk of personal injury.**

This procedure requires specific service skills, lifting equipment and a suitable workshop. Otherwise, performing this procedure may lead to death or serious injury and damage to important parts. Therefore, it is strongly recommended that this service is performed by dealers.

 **CAUTION:**

Before refitting, the O-ring of the removed fitting and/or hose assembly must be replaced and then tightened to the specified torque. Please refer to hydraulic hose and fitting torque specifications.

- 1) Remove the platform.
- 2) Attach the access ladder to an appropriate lifting equipment, remove the fasteners from the access ladder, and then remove the access ladder from the machine.
- 3) Remove the cables and harnesses from the third outer arm.

 **CAUTION: Risk of part damage**

If being kinked or squeezed, the cables may be damaged.

- 4) Remove the cables and harnesses from the second to third forks.
- 5) Attach the sling of the traveling crane to the third outer arm.
- 6) Undo the fasteners that fix the 3# center pin, and remove the 3# center pins on left and right sides using a soft metal hammer.
- 7) Remove the wiring boards of second to third forks.
- 8) Undo the fasteners that fix the 3# pin from the non-steering end of the machine, and knock out the 3# pins on the left and right sides using a soft metal hammer.

- 9) Remove the fifth outer arm assembly from the machine.

 **WARNING: Risk of crushing**

If not properly supported during removal, the third outer arms on the left and right sides may be out of balance and fall off.

- 10) Mark, disconnect and plug the hydraulic hose of upper lift cylinder, Cover the fittings on the cylinder.
- 11) Mark and disconnect the harness of the cylinder valve block.
- 12) Attach the sling of the traveling crane to lift cylinder rod end.

 **WARNING: Risk of personal injury.**

If not properly supported during removal of cylinder rod end shaft, the cylinder may fall off.

- 13) Remove the fasteners that fix the lift cylinder rod end pin.
- 14) Remove the upper lift cylinder rod end pin from the machine using a soft metal hammer.

 **WARNING: Risk of crushing**

If not properly supported during removal of cylinder rod end pin, the cylinder may fall off.

- 15) Attach the sling of the traveling crane to the third inner arm.
- 16) Remove the fasteners that fix the 3# pin from the steering end of the machine.
- 17) Remove the 3# pin from the steering end of the machine using a soft metal hammer. Remove the third inner arm from the machine.
- 18) Attach the sling of the traveling crane to the second outer arms on the left and right sides of the machine.

- 19) Remove the fasteners that fix the 2# center pins on left and right sides of the machine.
- 20) Remove the 2# center pins on the left and right sides of the machine using a soft metal hammer. and remove the wiring boards of first to second forks.
- 21) Remove the fasteners that fix the 2# pins on the left and right sides from the non-steering end of the machine. Remove the second outer arms on the left and right sides from the machine.

 **WARNING: Risk of crushing.**

If not properly supported during removal, the second outer arms on the left and right sides may be out of balance and fall off.

- 22) Attach the sling of the traveling crane to the second inner arm.
- 23) Remove the fasteners that fix the 2# pins on the left and right sides from the steering end of the machine.
- 24) Remove the 2# pins on the left and right sides of the machine using a soft metal hammer. Remove the second inner arm from the machine.

 **WARNING: Risk of crushing.**

If not properly supported during removal, the second inner arm may be out of balance and fall off.

- 25) Attach the sling of the traveling crane to the first inner arm.

 **WARNING: Risk of personal injury**

When the fork is being lowered to the safety arm, keep your hand away from the moving parts.

- 26) Attach the sling of the traveling crane to the lift cylinder rod end.

 **WARNING: Risk of personal injury**

Splashed hydraulic oil will penetrate and burn the skin. Therefore, please loosen hydraulic connectors very slowly to reduce the oil pressure gradually. Prevent the oil from spraying or ejection.

- 27) Lift the lift cylinder to a vertical position.
- 28) Remove the fasteners that fix the pin from the lift cylinder tube end shaft. Remove the pin using a soft metal hammer. Remove the lift cylinder from the machine.

 **WARNING: Risk of crushing.**

If not properly supported and fixed to the lifting equipment, the lift cylinder may be out of balance and fall off.

 **CAUTION: Risk of part damage**

When removing the cylinder from the machine, be careful not to damage the valve or joint on the cylinder.

- 29) Remove the cable from the wiring ring of the first arm and set it aside.

 **CAUTION: Risk of part damage**

If being kinked or squeezed, the cables may be damaged.

- 30) Attach the sling of the traveling crane to the first outer arm. Do not apply any lifting force.
- 31) Undo the fasteners that fix the 1# center pin, and remove the 1# center pins on the left and right sides using a soft metal hammer.

 **WARNING: Risk of personal injury**

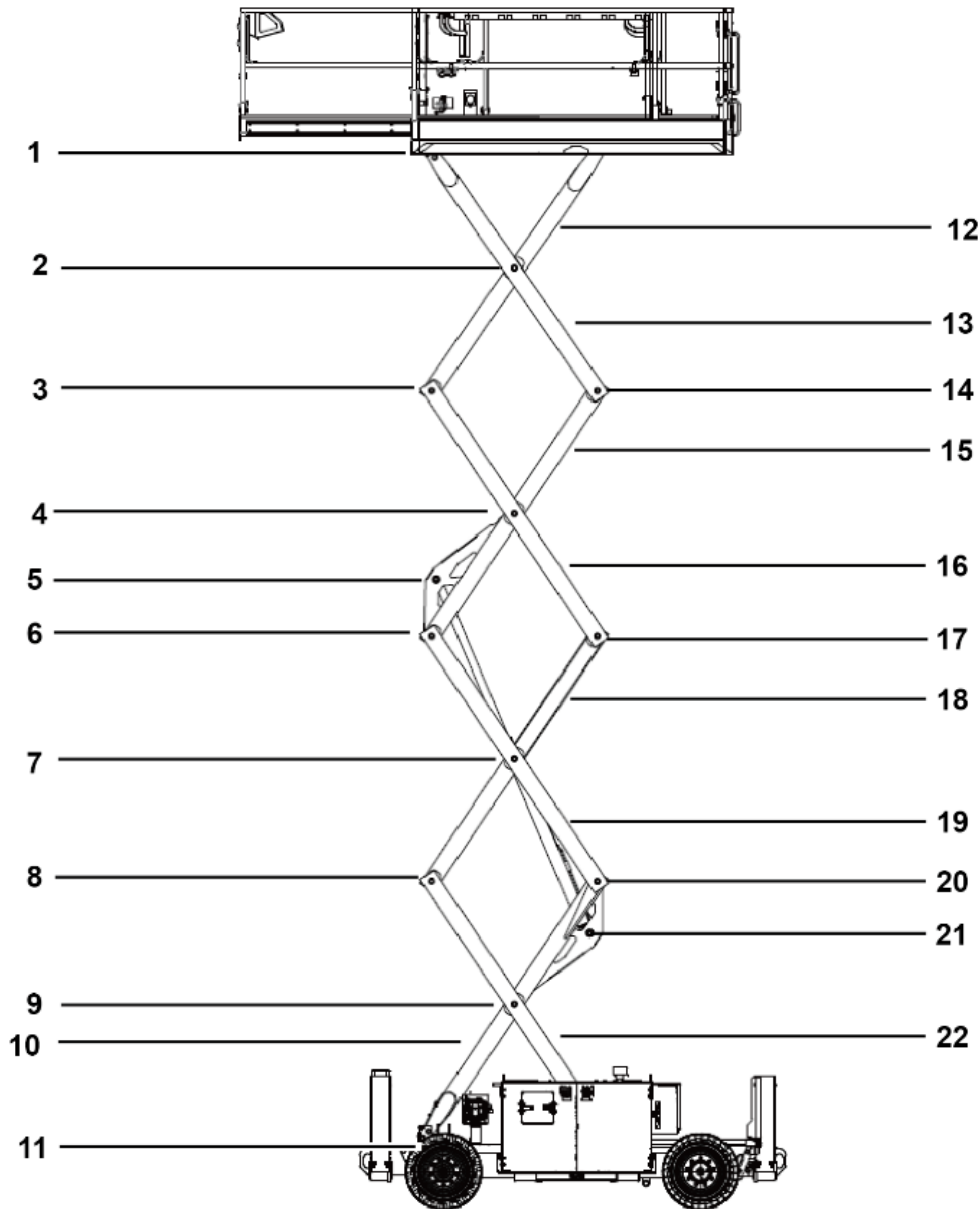
If not properly supported during removal of pin, the first outer arm may be out of balance and fall off.

- 32) Slide the first outer arm to the non-steering end and remove it from the machine.
- 33) Attach the sling of the traveling crane to the

first inner arm. Do not lift it.

- 34) Remove the fasteners that fix the pin for connecting the first inner arm to the end of the chassis. Remove the pin.
- 35) Remove the first inner arm from the machine.

3.2.2 Removing the fork (SR4390D)



1. 5# pin
2. 4# center pin
3. 4# pin (steering end)
4. 3# center pin
5. Lift cylinder rod end pin
6. 3# pin (steering end)
7. 2# center pin
8. 2# pin (steering end)
9. 1# center pin
10. First inner arm assembly
11. 1# pin (steering end)

12. Fourth inner arm assembly
13. Fourth outer arm assembly
14. 4# pin (non-steering end)
15. Third inner arm assembly
16. Third outer arm assembly
17. 3# pin (non-steering end)
18. Second inner arm assembly
19. Second outer arm assembly
20. 2# pin (non-steering end)
21. Lower lift cylinder tube end shaft
22. First outer arm assembly

 **WARNING: Risk of personal injury**

This procedure requires specific maintenance skills, lifting equipment and a suitable workshop. Carrying out this process without these skills and tools may result in death or serious injury, as well as serious component damage. Therefore, it is strongly recommended that this service is performed by dealers.

 **CAUTION:**

The O-ring (if any) of the removed fitting and hose assembly must be replaced. During installation, all connections must be tightened to specified torque. Please refer to the specification for selection of tightening torque of the lifting platform.

- 1) Removing the platform
- 2) Support and attach the access ladder to an appropriate lifting equipment, remove the fasteners from the access ladder, and then remove the access ladder from the machine.
- 3) Remove the cables and harnesses from the fourth inner arm and set them aside.
- 4) Attach the sling of the traveling crane to the fourth outer arms on the left and right sides of the machine.
- 5) Undo the fasteners that fix the 4# center pin, and remove the 4# center pins on left and right sides using a soft metal hammer.
- 6) Undo the fasteners that fix the 4# pin at the non-steering end of the machine, and remove the 4# pin using a soft metal hammer.
- 7) Remove the fourth outer arm from the machine.

 **WARNING: Risk of crushing**

If not properly supported during

removal, the fourth outer arm may be out of balance and fall off.

- 8) Attach the sling of the traveling crane to the fourth inner arm.
- 9) Undo the fasteners that fix the 4# pin, and remove the 4# pin using a soft metal hammer. Remove the fourth inner arm from the machine.
- 10) Remove the cables and harnesses from the third inner arm and set them aside.

 **CAUTION: Risk of part damage**

If being kinked or squeezed, the cables may be damaged.

- 11) Attach the sling of the traveling crane to the third outer arm.
- 12) Remove the fasteners that fix the 3# center pin.
- 13) Remove the wiring board assembly between the third arm and the second arm, and take it down from the machine.
- 14) Knock out the 3# pin at the non-steering end of the machine using a soft metal hammer, and then remove the third outer arm.

 **WARNING: Risk of crushing**

If not properly supported during removal, the third outer arm may be out of balance and fall off.

- 15) Attach the sling of the traveling crane to the lift cylinder rod end without applying any lifting pressure.
- 16) Remove the fasteners that fix the lift cylinder rod end shaft from the machine. Remove the pin using a soft metal hammer.

 **WARNING: Risk of personal injury**

If not properly supported during

removal of cylinder rod end shaft, the cylinder may fall off.

- 17) Lower the cylinder to the first inner arm.
- 18) Attach the sling of the traveling crane to the third inner arm.
- 19) Remove the fasteners that fix the 3# pin at the steering end.
- 20) Remove the 3# pin using a soft metal hammer.
- 21) Remove the third inner arm from the machine.

 **WARNING: Risk of crushing**

If not properly supported during removal, the third inner arm may be out of balance and fall off.

- 22) Remove the fasteners that fix the 2# center pin.
- 23) Remove the cables and harnesses from the second arm and set them aside.
- 24) Attach the sling of the traveling crane to the second outer arm.
- 25) Remove the 2# center pin on the fuel tank side using a soft metal hammer.
- 26) Undo the fasteners that fix the 2# pin at the non-steering end of the machine, knock out the 2# pin using a soft metal hammer, and remove the second outer arm.

 **WARNING: Risk of personal injury.**

If not properly supported during removal, the second outer arm on the ground control unit side may be out of balance and fall off.

- 27) Attach the sling of the traveling crane to the second inner arm.
- 28) Remove the fasteners that fix the 2# pin from the steering end of the machine.
- 29) Remove the 2# pin using a soft metal hammer. Remove the second inner arm

from the machine.

 **WARNING: Risk of crushing**

If not properly supported during removal, the second inner arm may be out of balance and fall off.

- 30) Remove the protective arm from the first inner arm.
- 31) Attach the sling of the traveling crane to the lift cylinder rod end; mark, disconnect and plug the hydraulic hose on the lift cylinder. Cover the fittings on the cylinder.
- 32) Mark and disconnect the harness on the cylinder valve.
- 33) Lift the lift cylinder to a vertical position.
- 34) Remove the fasteners that fix the pin from the lift cylinder tube end shaft. Remove the pin using a soft metal hammer.
- 35) Remove the lift cylinder from the machine.

 **WARNING: Risk of crushing.**

If not properly supported and fixed to the lifting equipment, the lift cylinder may be out of balance and fall off.

 **CAUTION: Risk of part damage**

When removing the cylinder from the machine, be careful not to damage the valve or joint on the cylinder.

- 36) Place a 10cm×10cm×1.2m block under the 1# center pin across both sides of the chassis.
- 37) Remove the cable from the first arm and set it aside.
- 38) Attach the sling of the traveling crane to the first outer arm. Do not apply any lifting force.
- 39) Remove the fasteners that fix the 1# center pin.
- 40) Remove the 1# center pins on both sides

using a soft metal hammer.

- 41) Slide the first outer arm to the non-steering end and remove it from the machine.
- 42) Attach the sling of the traveling crane to the first inner arm. Do not lift it.
- 43) Remove the fasteners that fix the travel switch cover on the first inner arm, and remove the cover.
- 44) Disconnect the upper and lower limit travel switch connecting wires, and remove the travel switch and the travel switch mounting plate.
- 45) Remove the fasteners that fix the pin for connecting the first inner arm to the end of the chassis. Remove the pin.
- 46) Remove the first inner arm from the machine.



CAUTION: Risk of part damage

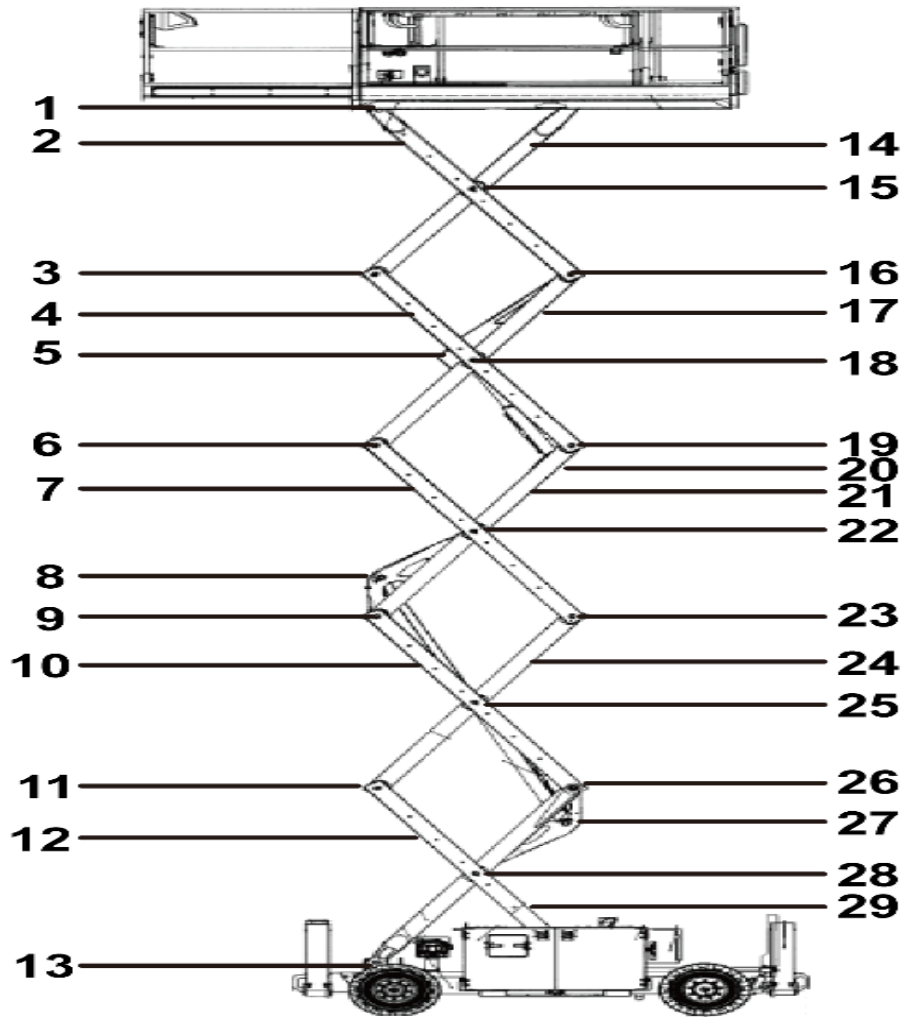
Be careful not to damage the limit switch when removing the first inner arm from the machine.



WARNING: Risk of personal injury.

If not properly supported during removal of first inner arm from the machine, the first outer arm may be out of balance and fall off.

3.2.3 Removing the fork (SR5390D)



- | | | | |
|-----|---------------------------------|-----|----------------------------------|
| 1. | 6# pin | 16. | 5# pin (non-steering end) |
| 2. | Fifth outer arm | 17. | Fourth inner arm |
| 3. | 5# pin (steering end) | 18. | 4# center pin |
| 4. | Fourth outer arm | 19. | 4# pin (non-steering end) |
| 5. | Upper lift cylinder rod end pin | 20. | Upper lift cylinder tube end pin |
| 6. | 4# pin (steering end) | 21. | Third inner arm |
| 7. | Third outer arm | 22. | 3# center pin |
| 8. | Lower lift cylinder rod end pin | 23. | 3# pin (non-steering end) |
| 9. | 3# pin (steering end) | 24. | Second inner arm |
| 10. | Second outer arm | 25. | 2# center pin |
| 11. | 2# pin (steering end) | 26. | 2# pin (non-steering end) |
| 12. | First inner arm | 27. | Lower lift cylinder tube end pin |
| 13. | 1# pin (steering end) | 28. | 1# center pin |
| 14. | Fifth inner arm | 29. | First outer arm |
| 15. | 5# center pin | | |

 **WARNING: Risk of personal injury**

This procedure requires specific maintenance skills, lifting equipment and a suitable workshop. Carrying out this process without these skills and tools may result in death or serious injury, as well as serious component damage. Therefore, it is strongly recommended that this service is performed by dealers.

 **CAUTION:**

The O-ring (if any) of the removed fitting and hose assembly must be replaced. During installation, all connections must be tightened to specified torque. Please refer to the specification for selection of tightening torque of the lifting platform.

- 1) Removing the platform
- 2) Attach the access ladder to an appropriate lifting equipment, remove the fasteners from the access ladder, and then remove the access ladder from the machine.
- 3) Remove the cables and harnesses from the wiring board of the fifth inner arm, and set them aside.
- 4) Remove the wiring board of the fifth arm from the machine.
- 5) Attach the sling of the traveling crane to the fifth outer arm.
- 6) Undo the fasteners that fix the 5# center pin, and remove the 5# center pin using a soft metal hammer.
- 7) Undo the fasteners that fix the 5# pin at the non-steering end, and knock out the 5# pin using a soft metal hammer.
- 8) Remove the fifth outer arm from the machine.

 **WARNING: Risk of personal injury.**

If not properly supported during removal, the fifth outer arm may be out of balance and fall off.

 **WARNING: Risk of crushing**

If not properly supported during removal of cylinder rod end pin, the cylinder may fall off.

- 9) Attach the sling of the traveling crane to the fifth inner arm.
- 10) Undo the fasteners that fix the 5# pin at the steering end, and knock out the 5# pin using a soft metal hammer.
- 11) Remove the fifth inner arm from the machine.
- 12) Mark, disconnect and plug the hydraulic hose of upper lift cylinder, Cover the fittings on the cylinder.
- 13) Mark and disconnect the harness of the cylinder valve block.
- 14) Attach the sling of the traveling crane to upper lift cylinder rod end.
- 15) Remove the fasteners that fix the upper lift cylinder rod end pin.
- 16) Remove the upper lift cylinder rod end pin from the machine using a soft metal hammer.
- 17) Attach the sling of the traveling crane to the lug of the upper lift cylinder rod end.
- 18) Lift the lift cylinder to a vertical position.
- 19) Remove the fasteners that fix the lift cylinder tube end pin. Remove the upper lift cylinder from the machine.

 **WARNING: Risk of crushing.**

If not properly supported during removal of cylinder tube end pin, the cylinder may fall off.

 **CAUTION: Risk of part damage**

When removing the cylinder from the machine, be careful not to damage the valve or joint on the cylinder.

- 20) Remove the cables and harnesses from the fourth inner arm, and set them aside.
- 21) Undo the fasteners that fix the 4# center pin, and knock out the 4# center pin using a soft metal hammer.
- 22) Undo the fasteners that fix the 4# pin at the non-steering end, and knock out the 4# pin using a soft metal hammer.
- 23) Remove the fourth outer arm from the machine.

 **WARNING: Risk of crushing.**

If not properly supported during removal, the fourth outer arm may be out of balance and fall off.

- 24) Attach the sling of the traveling crane to the fourth inner arm.
- 25) Undo the fasteners that fix the 4# pin at the steering end, and knock out the 4# pin using a soft metal hammer.
- 26) Remove the fourth inner arm from the machine.
- 27) Attach the sling of the traveling crane to the third outer arm.
- 28) Undo the fasteners that fix the 3# center pin, and knock out the 3# center pin using a soft metal hammer.
- 29) Undo the fasteners that fix the 3# pin at the non-steering end, and knock out the 3# pin using a soft metal hammer.
- 30) Remove the third outer arm from the machine.

 **WARNING: Risk of personal injury.**

If not properly supported during removal, the third outer arm may be out of balance and fall off.

- 31) Remove the cables, harnesses and hoses of the third inner arm, and set them aside.
- 32) Remove the fasteners that fix the pipe support plate assembly of second to third arms, and remove the pipe support plate assembly.
- 33) Attach the sling of the traveling crane to lower lift cylinder rod end.
- 34) Remove the fasteners that fix the lower lift cylinder rod end pin, and knock out the lower lift cylinder rod end pin using a soft metal hammer.
- 35) Place a 10 x 10 x 25 cm cushion block on the first inner arm cylinder plate.
- 36) Lower the cylinder to the cushion block.
- 37) Attach the sling of the traveling crane to the third inner arm.
- 38) Undo the fasteners that fix the 3# pin at the steering end, and knock out the 3# pin using a soft metal hammer.
- 39) Remove the third inner arm from the machine.
- 40) Attach the sling of the traveling crane to the second outer arm.
- 41) Undo the fasteners that fix the 2# center pin, and remove the 2# center pins on left and right sides using a soft metal hammer.
- 42) Undo the fasteners that fix the 2# pin at the non-steering end, and knock out the 2# pin using a soft metal hammer.
- 43) Remove the second outer arm from the machine.

 **WARNING: Risk of crushing**

If not properly supported during removal, the second outer arm may be out of balance and fall off.

- 44) Remove the cables, harnesses and hoses, and set them aside.
- 45) Attach the sling of the traveling crane to the

second inner arm. Lift the arm to a vertical position.

- 46) Remove the fasteners that fix the 2# pin from the steering end of the machine.
- 47) Remove the 2# pin from the steering end of the machine using a soft metal hammer. Remove the second inner arm from the machine.
- 48) Remove the cables and harnesses and hydraulic hoses from the wiring ring of the first inner arm.
- 49) Attach the sling of the traveling crane to the first inner arm.
- 50) Lift the first inner arm by 60cm and remove the safety arm.
- 51) Place a 10cm (0.33ft) × 10cm (0.33ft) × 1.2m (3.94ft) cushion block under the 1# center pin across both sides of the chassis.
- 52) Lower the fork onto the cushion block placed on the chassis.

 **WARNING: Risk of personal injury.**

When lowering the cylinder, do not touch the moving parts with hands.

- 53) Attach the sling of the traveling crane to the lower lift cylinder.
- 54) Mark, disconnect and plug the hydraulic hose of the lower lift cylinder. Cover the fittings on the cylinder.

 **WARNING: Risk of personal injury.**

Splashed hydraulic oil will penetrate and burn the skin. Therefore, please loosen hydraulic connectors very slowly to reduce the oil pressure gradually. Prevent the oil from spraying or ejection.

- 55) Mark and disconnect the harnesses and hoses of the cylinder valve.
- 56) Mark and disconnect the harnesses of the pressure sensor.

57) Lift the lift cylinder to a vertical position.

- 58) Remove the fasteners that fix the lift cylinder tube end pin. Remove the pin using a soft metal hammer. Remove the lower lift cylinder from the machine.
- 59) Attach the sling of the traveling crane to the first inner arm, lift it as appropriate and remove the cushion block.
- 60) Attach the sling of the traveling crane to the first outer arm. Do not apply any lifting force.
- 61) Undo the fasteners that fix the 1# center pin, and remove the 1# center pin using a soft metal hammer.
- 62) Slide the first outer arm to the non-steering end and remove it from the machine.
- 63) Attach the sling of the traveling crane to the first inner arm. Do not lift it.
- 64) Undo the fasteners that fix the travel switch protection plate at the first inner arm, and remove the travel switch protection plate.
- 65) Remove the fasteners that fix the upper/lower limit switch mounting plate, disconnect the limit switch connection line, and remove the upper/lower limit switch and the mounting plate from the machine.
- 66) Remove the fasteners that fix the pin for connecting the first inner arm to the chassis. Remove the pin.
- 67) Remove the first inner arm from the machine.

 **CAUTION: Risk of part damage**

Be careful not to damage the limit switch when removing the first inner arm from the machine.

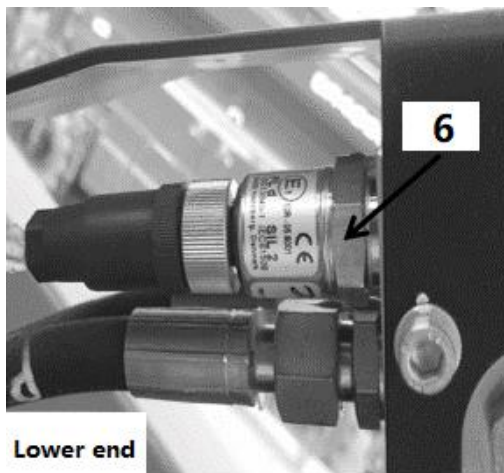
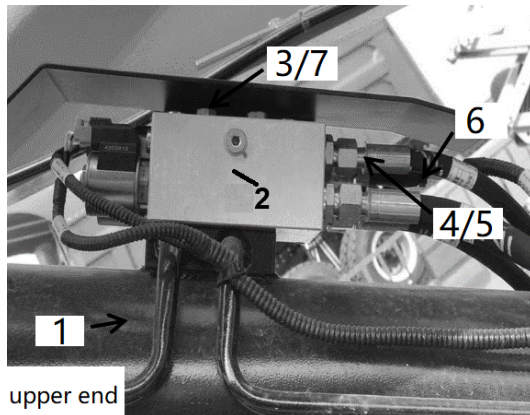
 **WARNING: Risk of personal injury.**

If not properly supported during removal of first inner arm from the machine,

the first outer arm may be out of balance and fall off.

3.2.4 Assembling the fork

1) Assembling the lower lift cylinder assembly



1. Lower lift cylinder 2. Lower lift cylinder control valve 3. Bolt
4. Fitting 5. Fitting 6. Pressure sensor assembly
7. Gasket

- a) Unpack the cylinder with special tools instead of by dangerous operation. And put the removed packaging in the safety area;
- b) Hoist the cylinder (1) to the cylinder subassembly trolley with the special lifting equipment, with the lower end inserted through the tooling stationary shaft and the upper end placed in the tooling slot (ensuring the cylinder will not fall during subsequent operation);
- c) Remove the protective plate which is provided at the mounting position of

the cylinder valve block, clean up the paint slag on the mounting surface of the valve block, etc., use parts 3/7 to install part 2 as shown above.

CAUTION: Before installation, make sure that the supplied O-ring on the mounting surface of the balance valve (2) is not dislodged or damaged.

- d) Install parts 4/5 to part 2 respectively;

CAUTION: Before installing the part 3, apply AT262 thread locker for 3-5 threads starting from the second thread at the threaded end.

Reference tightening torque of part 3: 38~51N.m;

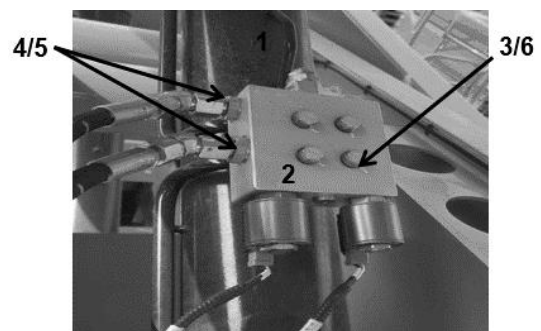
Reference tightening torque of parts 4 and 5: 75±8N.m;

Tools: ratchet torque QSP100, socket wrench 1/2-22, socket wrench 1/2-13;

- e) Install the pressure sensor (6) to PS port of valve block;
- f) Lift the lower lift cylinder assembly to the designated area, taking care to keep the cylinder balanced (stand at the side rather than the end of the cylinder for operation) and prevent it from falling, and keep the paintwork undamaged;

Tools: torque wrench SP67NX19;

2) Assembling the upper lift cylinder assembly



1. Upper lift cylinder 2. Upper lift cylinder control valve 3. Bolt 4. Fitting 5. Fitting 6. Gasket

- a) Unpack the cylinder with special tools instead of by dangerous operation.

And put the removed packaging in the safety area;

- b) Hoist the cylinder (1) to the cylinder subassembly trolley with the special lifting equipment, with the lower end inserted through the tooling stationary shaft and the upper end placed in the tooling slot (ensuring the cylinder will not fall during subsequent operation);
- c) Remove the protective plate which is provided at the mounting position of the cylinder valve block, clean up the paint slag on the mounting surface of the valve block, etc., use parts 3/6 to install part 2 to part 1;

CAUTION: Before installation, make sure that the supplied O-ring on the mounting surface of the balance valve (2) is not dislodged or damaged.

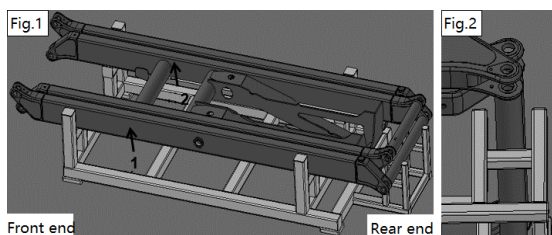
- d) Assemble parts 4/5 to part 1;
- e) Lift the upper lift cylinder assembly to the designated area.

CAUTION: Before installing the part 3, apply AT262 thread locker for 3-5 threads starting from the second thread at the threaded end. Reference tightening torque of part 3: 38~51N.m;

Reference tightening torque of part 4: 75±8N m;

Tools: ratchet torque QSP100, socket wrench 1/2-22, socket wrench 1/2-13;

- 3) Assembling the first and second forks



1. First outer arm assembly 2. First inner arm assembly

- a) Hoist the first outer arm and the first

inner arm to the fork subassembling tooling;

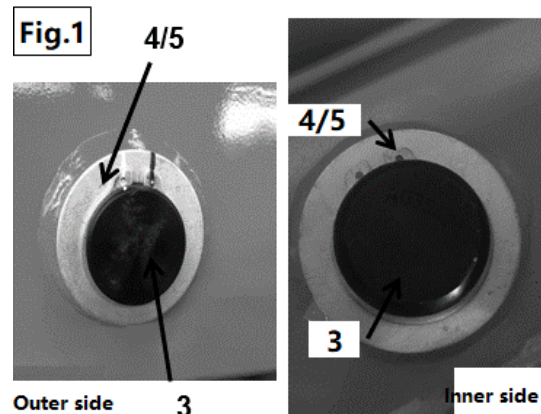
CAUTION: 1. Place the first outer arm first, and keep it centered and its rear end placed securely in the locating frame of tooling as shown in Fig. 2;

2. Pay attention to the direction of the upper, lower and front and rear ends of the inner and outer arms;

3. Prevent the part from being lifted above any personnel, and during the lifting, keep the part in balance. The operator shall stay at a certain distance from the part, and hold the part at its outer side or other places where crushing is impossible;

4. Follow the requirements herein for hoisting of forks of subsequent layers.

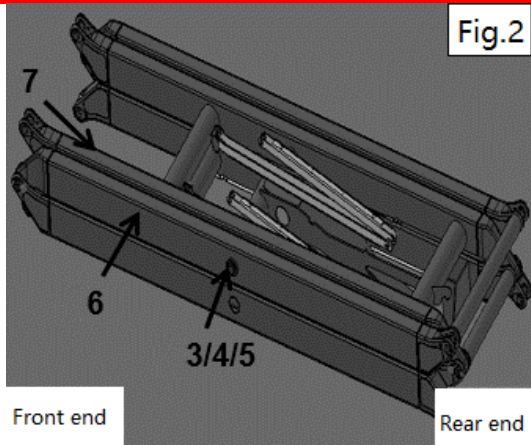
Tools: fork subassembling tooling;



3. Shaft 4. Washer 5. Snap ring

- b) Connect the middle positions of the first inner arm and first outer arm with shaft (3) as shown in Fig. 1;

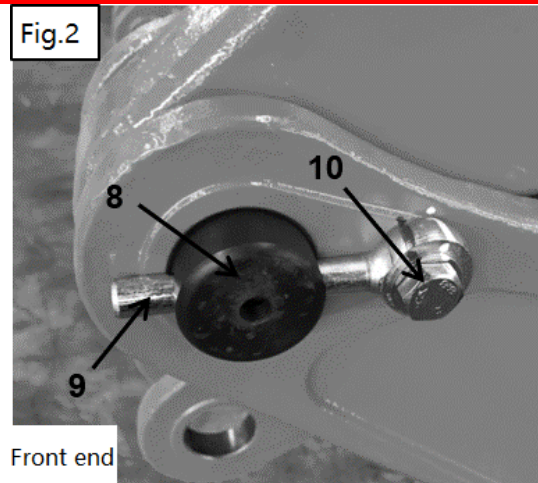
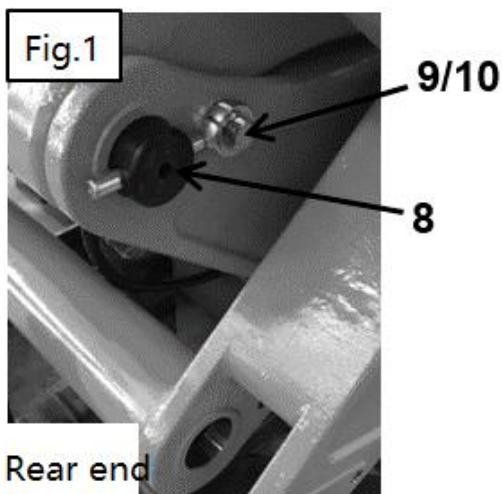
CAUTION: For each layer, direct the large chamfered end of the shaft inward, and insert both ends of shaft from outside to inside.



3. Shaft 4. Washer 5. Retaining ring 6. Second outer arm assembly
7. Second inner arm assembly
- c) Install parts 4/5 to both ends of part 3 and check that the retaining ring is clamped in place;
- d) Hoist the second outer arm and the second inner arm above the first inner arm and first outer arm;

CAUTION: 1. Place the front and rear ends of the second outer arm and the second inner arm as shown in Fig. 2, and when placing the outer arm, please use the anti-falling tooling; 2. Place the inner and outer arms of each layer with the double-ear fork upward and the single-ear fork downward.

- e) Connect the middle positions of the second inner arm and second outer arm with shaft (3), and install parts 4/5 to both ends of shaft (3);



8. Shaft 9. Safety pin 10. Bolt
- f) Connect the single-ear fork at the rear end of the second inner arm with the double-ear fork of the first inner arm with part 8;

CAUTION: For each layer, direct the end of shaft with safety pin hole outward, and insert both ends of shaft from outside to inside.

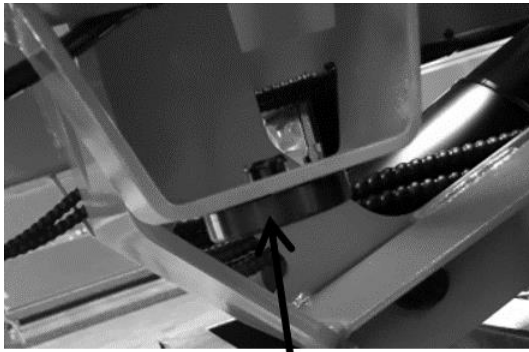
- g) Fix the part 8 with parts 9/10; Pay attention that there shall be no gap between the inner surface of the safety pin and the plate surface after tightening.
- h) Connect the single-ear fork at the front end of the second outer arm with the double-ear fork of the first outer arm with part 8;
- i) Fix the part 8 with parts 9/10; Pay attention that there shall be no gap between the inner surface of the safety pin and the plate surface after tightening.

CAUTION: Before installing the part 10, apply AT262 thread locker for 3-5 threads starting from the second thread at the threaded end.

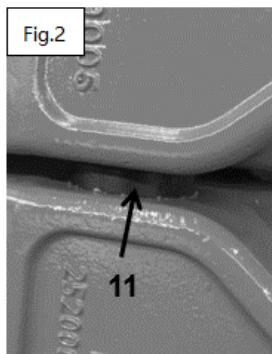
Reference tightening torque of part 10: 90±9N.m;

Tools: copper rod, ratchet torque wrench QSP100 socket wrench 1/2 18, open-end

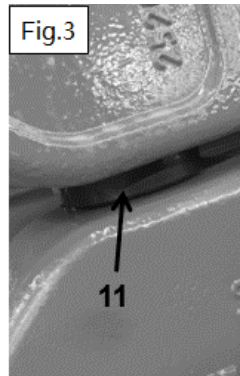
wrench 16-18;



11



Above rear end of first outer arm



Below mounting position of each layer of arm

11. Spacer

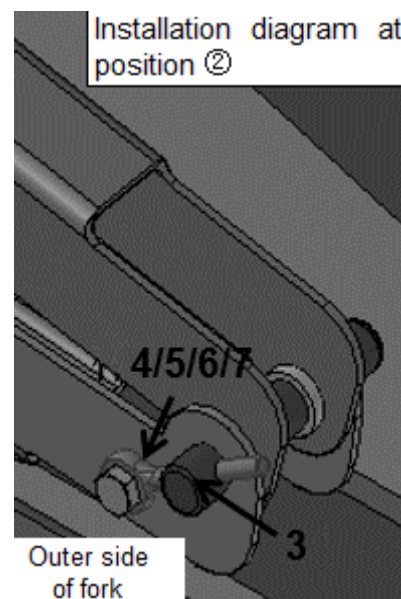
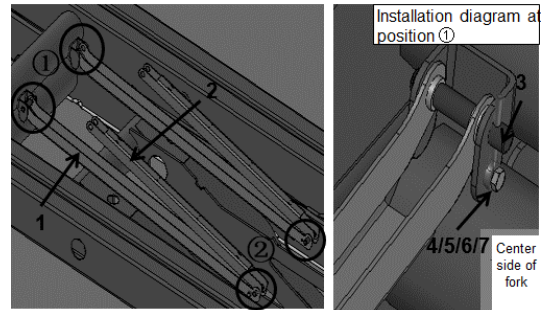
- j) Assemble part 11 to the U-shaped plate at the rear end of the first inner arm;
- k) Installation position of the outer arm spacer: above the rear end of the first outer arm, below the front end of the third outer arm, below the rear end of the fourth outer arm, and below the front end of the fifth outer arm;
- l) Installation position of the inner arm spacer: below the front end of the second inner arm, below the rear end of the third inner arm, below the front end of the fourth inner arm, and below the rear end of the fifth inner arm;

CAUTION: 1. Apply 801 strong resin adhesive on the mounting surface before installing all spacers;

2. Install spacers following the assembling sequence of forks;

3. Prevent crush injury for installation on each layer, and before lowering, check that there is no hand placed in the middle.

4) Assembling the pipe support plate assembly



1. Pipe support plate assembly 2. Pipe support plate assembly 3. Shaft

4. Safety pin 5. Bolt 6. Washer 7. Nut

- a) Install part 1 to the round pipe support plate mount in the middle of second inner arm;

CAUTION: 1. Install part 3 from the center of the fork to both sides, keeping the end with safety pin hole in the center of the fork;

2. Fix the part 4 with parts 5/6/7, with the bolt installed from the safety pin end, and the nut and washer installed at the inner side of the support plate mount;

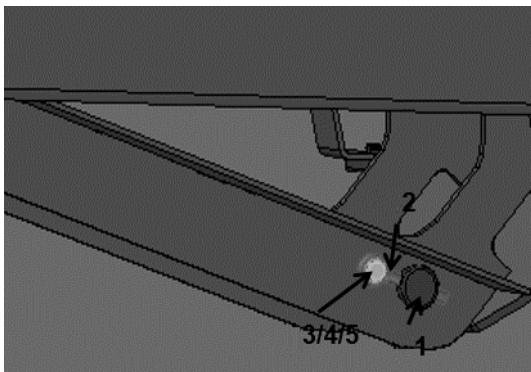
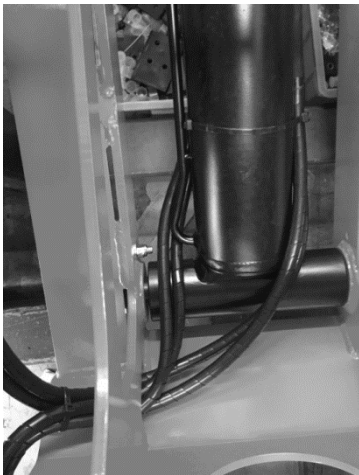
- b) Install part 2 to the rear end of part 1, and fix it with parts 3/4/5/6/7;

- CAUTION:** 1. Connect the right-angle end of part 2 to the rear end of part 1;
2. Install part 3 from both sides of the fork to the center, keeping the end with safety pin hole at the outer side;
3. Fix the safety pin (4) with parts 5/6/7, with the nut and washer installed at the inner side.

Reference tightening torque of part 5:
 $52 \pm 5 \text{N.m}$;

Tools: copper rod, open-end wrench 16-18, ratchet torque wrench QSP100, socket wrench 1/2-16mm;

- 5) Assembling the lower lift cylinder



1. Shaft 2. Safety pin 3. Bolt 4. Washer 5. Nut

- a) Hoist the lower lift cylinder, and fix the lower mount to the rear end of the first inner arm with the shaft (1);

CAUTION: 1. No one is allowed to stay below the hoisting part. The sling is to be attached to the 2 welded round tubes on the cylinder, and the hook shall be designed with an

anti-looseness lock;

2. Keep the end with safety pin mounting hole on the left side, and insert the shaft from left to right;

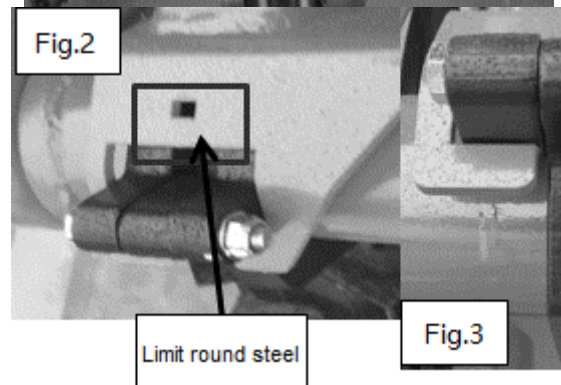
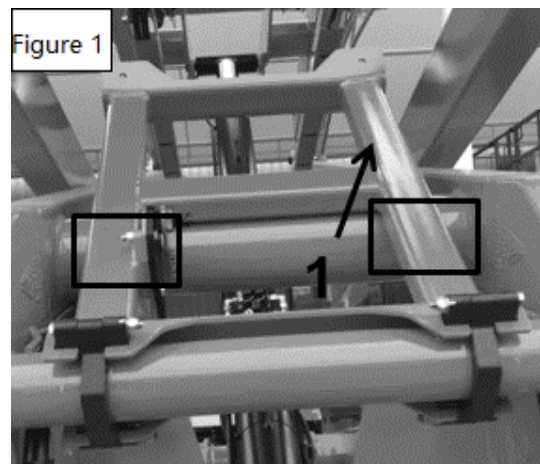
3. Place a polyurethane plate at the contact position between the cylinder hole and the round tube at the front end of the second inner arm to avoid scratching the paint.

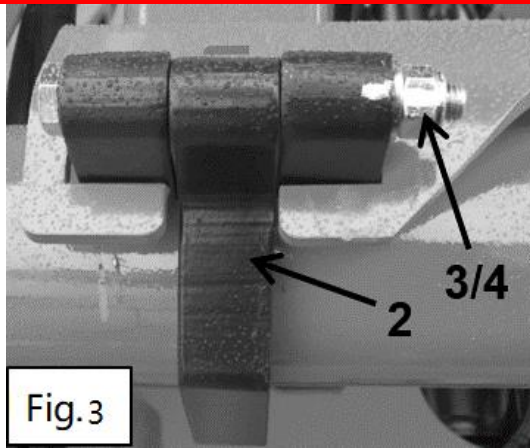
- b) Fix the safety pin (2) with parts 3/4/5; Pay attention that there shall be no gap between the inner surface of the safety pin and the plate surface after tightening.

Reference tightening torque of part 3:
 $90 \pm 9 \text{N.m}$;

Tools: copper rod, ratchet torque wrench QSP100 socket wrench 1/2 18, open-end wrench 16-18;

- 6) Assembling the safety support




Fig. 3

1. Protective arm 2. Lug sleeve 3. Bolt 4. Nut 5. Washer

- a) Assemble part 1 to the rear end of the first inner arm as shown in Fig. 1;

CAUTION: Place a polyurethane plate at the contact position between the protective arm and the round tube of the second inner arm to avoid scratching the paint.

- b) Install the protective arm to the round tube at the rear end of the first inner arm with part 2 as shown in Fig. 3;

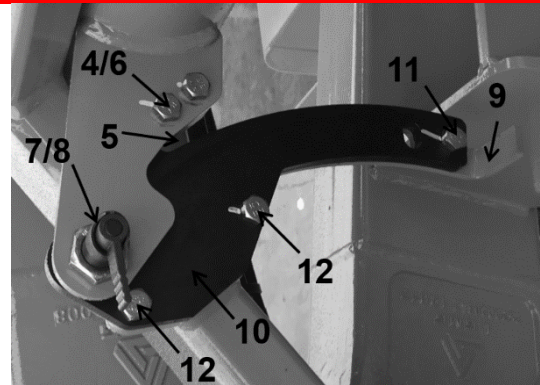
CAUTION: Clamp the left side of the protective arm at the limit round steel welded on the round tube, as shown in Fig. 2.

- c) Fix the lug sleeve (2) with parts 3/4, as shown in Fig. 3.

CAUTION: When fixing the lug sleeves on both sides of the protective arm, insert the bolts from outside to inside;

Reference tightening torque of part 3: $12 \pm 1 \text{ N.m}$;

Tools: open-end wrench 16-18, ratchet torque wrench QSP50, socket wrench 1/2-16mm; adapter 3/8-1/2.



5. Spacer block 6. Bolt 7. Lock pin 8. Nut 9. Limit plate 10. Pin plate 11. Bolt 12. Bolt

- d) Install part 5 on the welded plate of the round tube at the rear end of the second inner arm with parts 4/6 as shown;

CAUTION: Insert the bolt from the spacer block side, and keep the nut on the welded plate side.

- e) Fix the part 7 with part 8;
 f) Fix the parts 9/10 with parts 11/12;

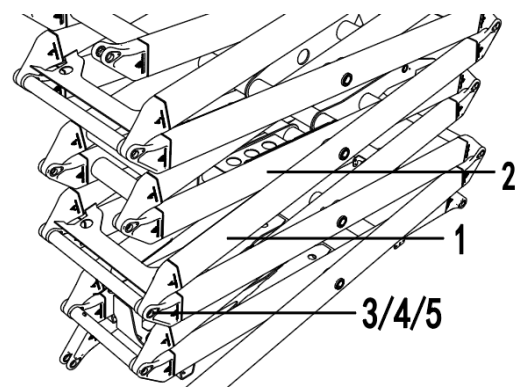
CAUTION: Keep the pin plate (10) on the inner side (the side near the center of the fork), and the insert the bolt from the pin plate side;

Reference tightening torque of part 6: $52 \pm 5 \text{ N.m}$;

Reference tightening torque of parts 11 and 12: $10 \pm 1 \text{ N.m}$;

Tools: open-end wrench 16-18; ratchet torque wrench QSP100; socket wrench 1/2-16mm; open-end wrench 13-16; open-end wrench 27-30.

- 7) Assembling the third fork



1. Third outer arm weldment 2. Third inner arm assembly

3. Shaft 4. Safety pin 5. Bolt

- a) Hoist the third outer arm and the third inner arm above the second inner arm and second outer arm;
- b) Connect the single-ear fork at the front end of the third inner arm to the double-ear fork of the second inner arm with the shaft (3);

CAUTION: For each layer, direct the end of shaft with safety pin hole outward, and insert both ends of shaft from outside to inside.

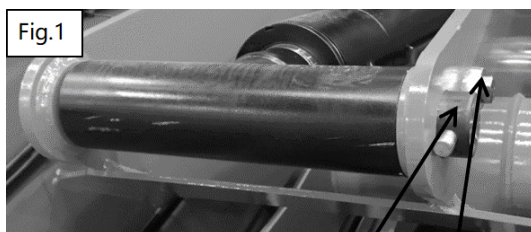
- c) Fix the part 3 with parts 4/5; Pay attention that there shall be no gap between the inner surface of the safety pin and the plate surface after tightening.

CAUTION: Before installing the part 5, Apply AT262 thread locker for 3-5 threads starting from the second thread at the threaded end.

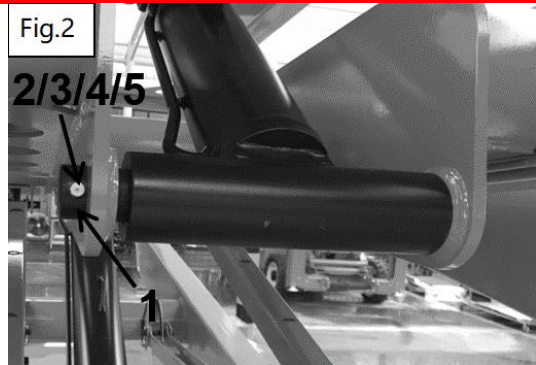
Reference tightening torque of part 5: $90 \pm 9 \text{ N.m}$;

Tools: copper rod, ratchet torque wrench QSP100, socket wrench 1/2 18, open-end wrench 16-18.

- 8) Connect the lower cylinder and install the upper oil cylinder.



1 2/3/4/5



1. Shaft 2. Safety pin 3. Bolt 4. Washer 5. Nut

- a) Lift the front end of the lower cylinder, align the mounting hole with the hole on the cylinder mounting plate at the front end of the third inner arm, and connect with the shaft (1);

CAUTION: Keep the end with safety pin mounting hole on the left side, and insert the shaft from left to right (this requirement shall be followed for assembling of subsequent cylinder shafts);

- b) Fix the part 2 with parts 3/4/5; Pay attention that there shall be no gap between the inner surface of the safety pin and the plate surface after tightening (this requirement shall be followed for assembling of subsequent cylinder shafts).
- c) Lift the rear end of the third inner arm, and place the cushion block at the cylinder mounting plate (confirm that the cushion block will not fall off after placement);
- d) Hoist the upper cylinder assembly to the rear end of third inner arm, adjust the position of the lower mounting hole of the cylinder, and connect it with the shaft (1);
- e) Fix the part 2 with parts 3/4/5;

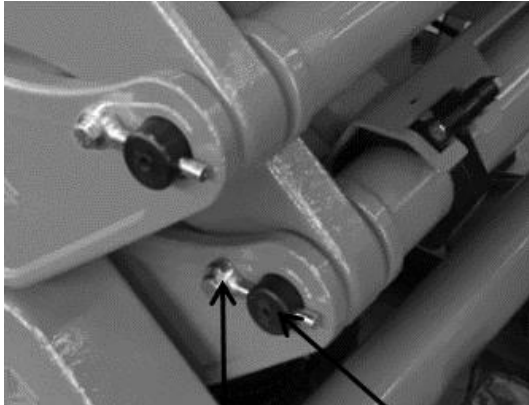
Reference tightening torque of part 3: $90 \pm 9 \text{ N.m}$;

Tools: copper rod, ratchet torque wrench

QSP100, socket wrench 1/2 18, open-end wrench 16-18; cushion block.

- f) Align the middle shaft holes of the third inner arm and the third outer arm, and connect the middle positions with the shaft, washer and retaining ring.

CAUTION: Direct the large chamfered end of the shaft inward, and insert both ends of shaft from outside to inside.



10/11 9

9. Shaft 10. Safety pin 11. Bolt

- g) Connect the single-ear fork at the rear end of the third outer arm to the double-ear fork of the second outer arm with the shaft (9), and fix the shaft (9) with parts 10/11; Pay attention that there shall be no gap between the inner surface of the safety pin and the plate surface after tightening.

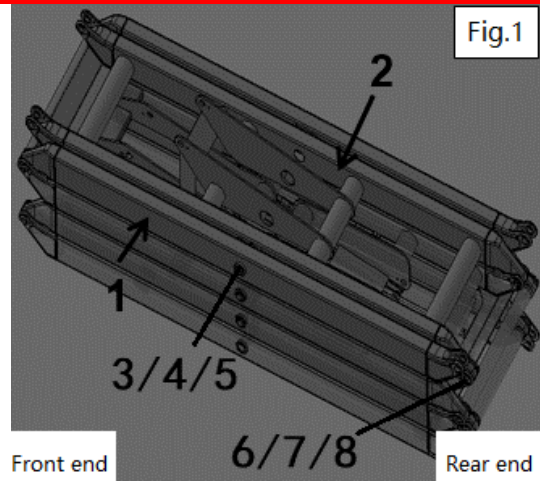
CAUTION: Direct the end of shaft with safety pin hole outward, and insert both ends of shaft from outside to inside.

CAUTION: Before installing the part 11, apply AT262 thread locker for 3-5 threads starting from the second thread at the threaded end.

Reference tightening torque of part 11: 90±9N.m;

Tools: copper rod, ratchet torque wrench QSP100, socket wrench 1/2 18, open-end wrench 16-18.

- 9) Assembling the fourth fork

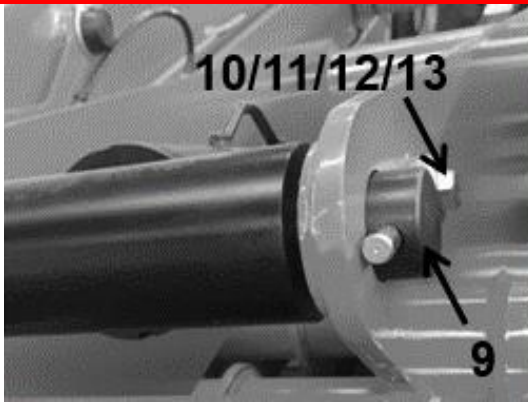


1. Third outer arm weldment 2. Fourth inner arm assembly

3. Shaft 4. Washer 5. Retaining ring 6. Shaft 7. Washer 8. Retaining ring

- a) Hoist the fourth outer arm (the third and fourth outer arms are the same) and the fourth inner arm above the third inner arm and third outer arm;
- b) Connect the middle positions of the fourth inner arm and fourth outer arm with part 3, and install parts 4/5 to both ends of part 3; confirm that the retaining ring is clamped in place.
- c) Tools: copper rod; circlip pliers.
- d) Connect the single-ear fork at the front end of the fourth outer arm to the double-ear fork of the third outer arm with the shaft (6); connect the single-ear fork at the rear end of the fourth inner arm to the double-ear fork of the third inner arm with the shaft (6); fix the shaft (6) with parts 7/8; Pay attention that there shall be no gap between the inner surface of the safety pin and the plate surface after tightening.

CAUTION: Before installing the part 8, apply AT262 thread locker for 3-5 threads starting from the second thread at the threaded end.



9. Shaft 10. Safety pin 11. Bolt 12. Washer 13.

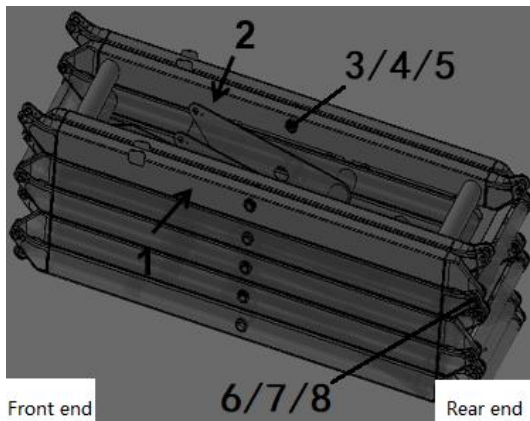
Nut

- e) Lift the front end of upper cylinder, align the mounting hole with the hole on the cylinder mounting plate at the front end of the fourth inner arm, connect with the part 9, and fix the parts 11/12/13 with part 10;

Reference tightening torque of parts 8 and 11: 90±9N.m

Tools: copper rod, ratchet torque wrench QSP100, socket wrench 1/2 18, open-end wrench 16-18.

10) Assembling the fourth fork



1. Fifth outer arm weldment 2. Fifth inner arm assembly 3. Shaft 4. Washer 5. Washer 6. Shaft 7. Safety pin 8. Bolt

- a) Hoist the fifth outer arm and the fifth inner arm above the fourth inner arm and the fourth outer arm;
- b) Connect the middle positions of the fifth inner arm and fifth outer arm with

part 3, and install parts 4/5 to both ends of part 3; confirm that the retaining ring is clamped in place;

CAUTION: Do not install the part 4 to the inner side of part 3 on the right side of fork, and install the part 5 when assembling the wire guard plate.

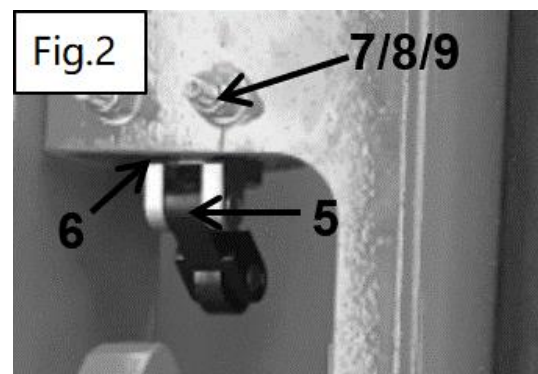
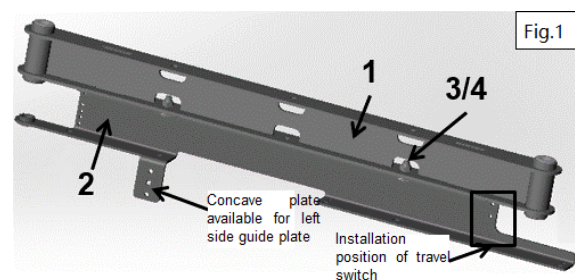
- c) Connect the single-ear fork at the front end of the fifth inner arm to the double-ear fork of the fourth inner arm with part 6; connect the single-ear fork at the rear end of the fifth outer arm to the double-ear fork of the fourth outer arm with part 6; fix the part 6 with parts 7/8; Pay attention that there shall be no gap between the inner surface of the

CAUTION: Before installing the part 8, apply AT262 thread locker for 3-5 threads starting from the second thread at the threaded end.

Reference tightening torque of part 8: 90±9N.m;

Tools: copper rod, ratchet torque wrench QSP100, socket wrench 1/2 18, open-end wrench 16-18.

11) Left pull rod & guard plate assembly



1) Pull rod assembly 2) Guard plate assembly 3)

Bolt 4) Nut 5. Travel switch 6. Plate 7. Screw 8.

Nut 9. Washer

- a) Assemble parts 1/2 with parts 3/4;
- b) Install parts 5/6 to the position inside the bend of the guard plate with parts 7/8/9, with shims installed on both sides;

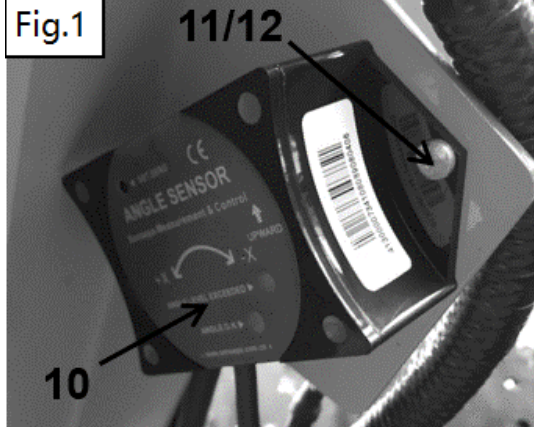
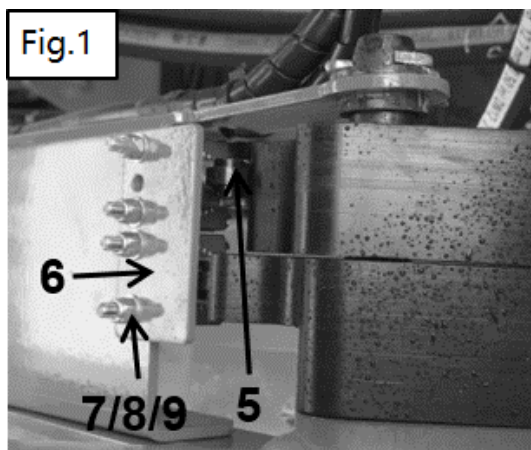
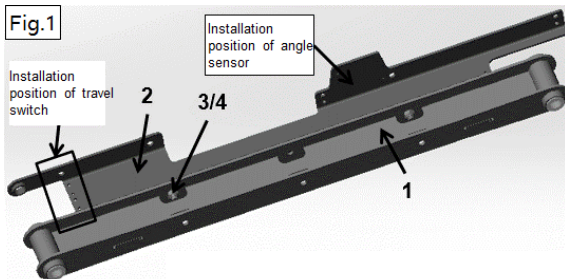
CAUTION: Part 6 is laterally placed between the travel switch and the guard plate.

Reference tightening torque of part 3:
 $52 \pm 5 \text{ N.m}$;

Reference tightening torque of part 7:
 $5 \pm 0.5 \text{ N.m}$;

Tools: open-end wrench 16-18; ratchet torque wrench QSP100; socket wrench 1/2-16mm; hex bit socket M4; torque wrench QSP12N4.

12) Right pull rod & guard plate assembly



- 1) Pull rod assembly 2) Guard plate assembly 3) Bolt 4) Nut 5. Travel switch 6. Plate 7. Screw 8. Nut 9. Washer

10. Angle sensor 11. Screw 12. Washer

- a) Assemble parts 1/2 with parts 3/4;
- b) Install parts 5/6 to the position inside the bend of the guard plate with parts 7/8/9, with shims installed on both sides;

CAUTION: When the travel switch roller is moved to the limit position, the gap between the travel switch roller and the limit plate is $\geq 0.5 \text{ mm}$.

Reference tightening torque of part 3:
 $52 \pm 5 \text{ N.m}$;

Reference tightening torque of part 7:
 $5 \pm 0.5 \text{ N.m}$;

- c) Tools: open-end wrench 16-18, ratchet torque wrench QSP100, socket wrench 1/2-16mm;
- d) Install the angle sensor (10) to the guard plate using parts 11/12 as shown in Figure 3.

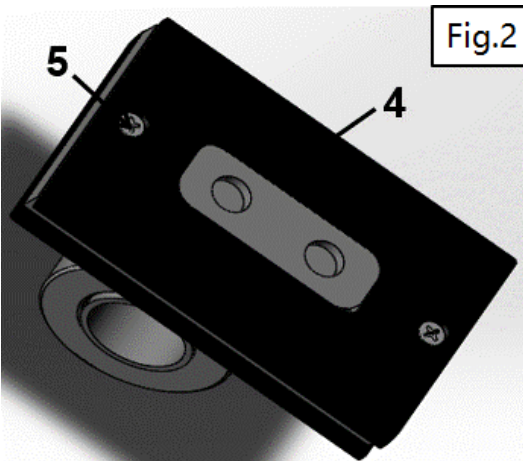
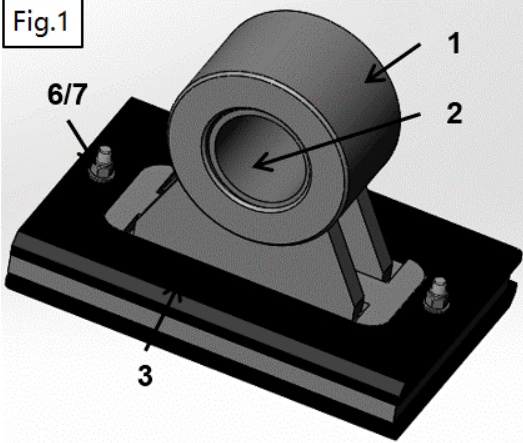
Tightening torque of part 3: $52 \pm 5 \text{ N.m}$;

Tightening torque of part 7: $5 \pm 0.5 \text{ N.m}$;

Reference tightening torque of part 11:
 $5 \pm 0.5 \text{ N.m}$;

Tools: hex bit socket M4; torque wrench QSP12N4.

13) Assembling the slider



1. Support 2. Shaft sleeve 3. Slider 4. Slider 5.
 Screw
 6. Nut 7. Washer

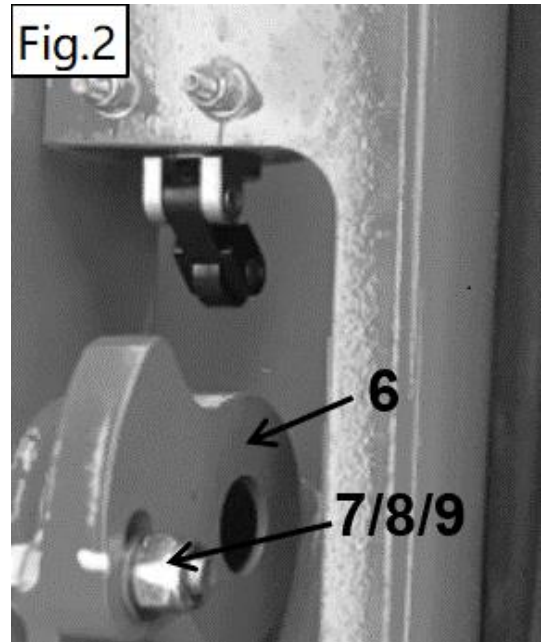
- Install the shaft sleeve (2) into the shaft hole of the support (1), as shown in Fig. 1;
- Fix parts 3/4 on the upper and lower parts of the support respectively with parts 5/6/7, and then manually tighten parts 5/6 after applying sealant;

CAUTION: Keep the part 3 on the upper part with the chamfer facing up and the part 4 on the lower part with the chamfer facing down.

- Place the slider assembly on the material rack instead of on the ground;

Tools: open-end ratchet wrench 10-10; Phillips screwdriver.

- Install the left/right pull rod & guard plate assembly to the chassis.



1. Shaft 2. Safety pin 3. Bolt 4. Nut 5. Washer
 6. Limit plate 7. Bolt 8. Nut 9. Washer

- Install the left pull rod & guard plate assembly to the left side of the chassis (for the purpose of installation, the engine end is defined as the front end); as shown in Fig.1, pass part 1 from the outside to the inside to fix the pull rod, and fix the pin (2) with parts 3/4/5;
- Install part 6 as shown in Fig. 2, with the lower hole inserted on the shaft, and the upper hole fixed to curved plate with parts 7/8/9;

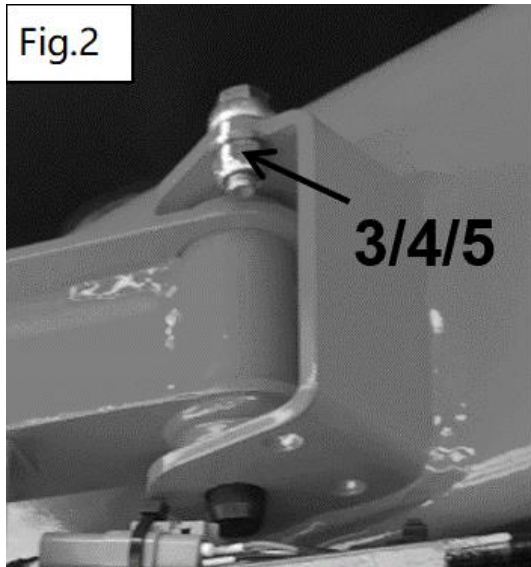
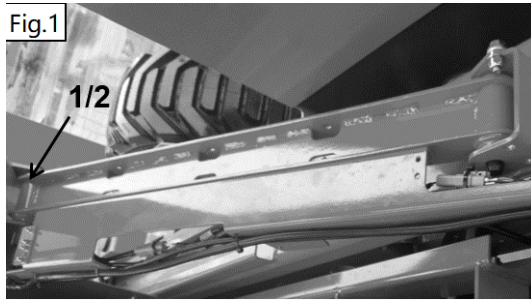
CAUTION: The nut and washer shall be installed at the inner side.

Tightening torque of part 3: $52 \pm 5 \text{ N.m}$;

Tightening torque of part 7: $28 \pm 3 \text{ N.m}$;

Tools: copper rod, open-end wrench 13-16, ratchet torque wrench QSP100, socket

wrench 1/2-16mm, socket wrench 1/2-13mm.



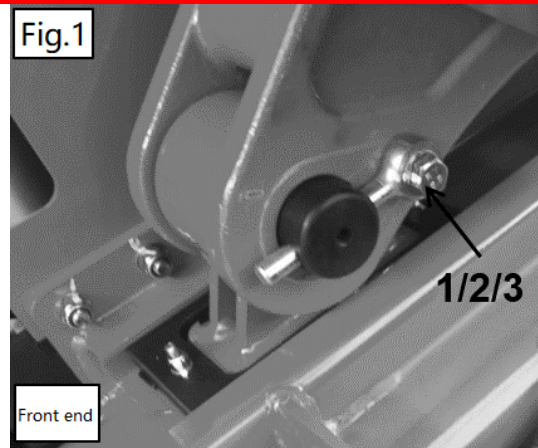
- c) Install the right pull rod & guard plate assembly to the right side of the chassis (for the purpose of installation, the engine end is defined as the front end); as shown in Fig.1, pass part 1 from the outside to the inside to fix the pull rod, and fix the pin (2) with parts 3/4/5;

CAUTION: The nut and washer shall be installed at the inner side.

Tightening torque of part 3: 52±5N.m

Tools: copper rod, open-end wrench 13-16, ratchet torque wrench QSP100, socket wrench 1/2-16mm.

- 15) Hoist the fork subassembly to the chassis for assembling



1. Shaft 2. Safety pin 3. Bolt

- a) Place the lower slider assemblies into the slideways at the front and rear ends of the chassis, and check that the slider moves smoothly without seizure;

CAUTION: Apply lithium-based grease to the bottom of the slider before placement.

- b) Hoist the fork subassembly to the chassis;

CAUTION: 1. Make sure that the sling is not damaged before lifting;

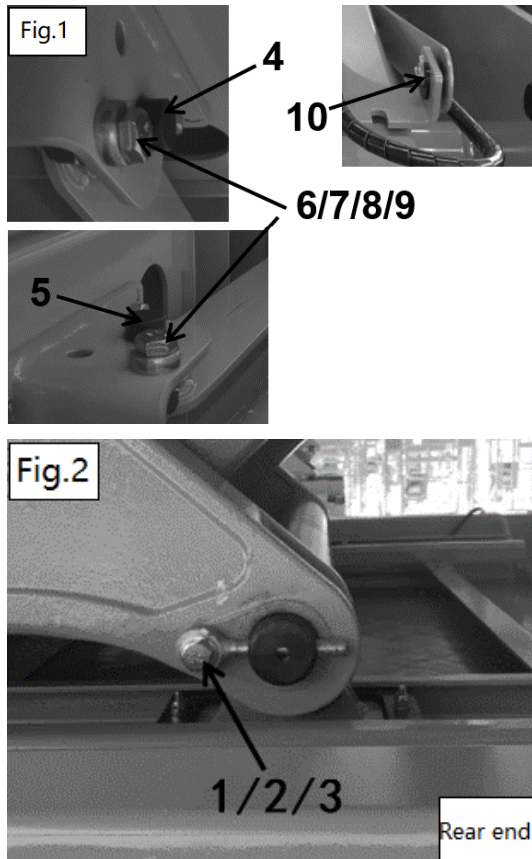
2. Do not stand at the front or rear end of the fork when lifting, and the front end of the fork should be slightly lower after lifting;

- c) Adjust the position of the slider assembly at the front end of the chassis, connect the front end of the fork to the slider (side operation, not in the front), fix the front end of the fork with the part 1, fix the part 1 with the parts 2/3, and ensure that there is no gap between the contact surfaces of pins and plate.

CAUTION: Before installing the part 3, apply AT262 thread locker for 3-5 threads starting from the second thread at the threaded end.

Reference tightening torque of part 3: 90±9N.m;

Tools: copper rod, ratchet torque wrench QSP100, socket wrench 1/2 18, open-end

wrench 16-18.


1. Shaft 2. Safety pin 3. Bolt 4. Shaft 5. Shaft 6.
 Safety pin
 7. Bolt 8. Nut 9. Washer 10. Pin

- d) Adjust the position of fork back and forth, and connect the left and right pull rod & guard plate assemblies to the mounting plate of fork, as shown in Fig. 1;

CAUTION: 1. The left and right shafts are different, and the short shaft shall be used on the left side, and shall be fixed with cotter pin (10) after installed in place;

2. The long shaft shall be used on the right side, and shall be inserted to the inner surface of the pull rod assembly, and fixed after the fork is pulled up and the limit plate is assembled;

3. The end with safety pin hole shall be directed outward, and the pin shall be inserted from outside to inside;

- e) Adjust the position of the slider

assembly at the rear end of the chassis, connect the rear end of the fork to the slider (side operation, not in the front) as shown in Fig. 2, and fix the rear end of the fork with the part 1; note that the end with the pin hole is on the outside, insert the pin from the outside to the inside, fix the shaft with parts 2/3, and ensure that there is no gap between the contact surfaces of pins and plate;

Reference tightening torque of part 3: $90 \pm 9 \text{N.m}$;

Reference tightening torque of part 7: $52 \pm 5 \text{N.m}$;

Tools: copper rod, open-end wrench 16-18, ratchet torque wrench QSP100, socket wrench 1/2-16mm, needle-nosed pliers.

3.4 Outrigger assembly

3.4.1 Removing the outrigger cylinder

 **CAUTION:**

Before refitting, the O-ring of the removed fitting and/or hose assembly must be replaced and then tightened to the specified torque. Please refer to hydraulic hose and joint torque specifications.

 **CAUTION:**

This procedure should be implemented when the platform is stowed and the outrigger are retracted.

- 1) Remove the outrigger cylinder support.
- 2) Remove the fasteners that fix the outrigger cover, and then remove the outrigger cover.
- 3) Mark and disconnect the wiring of the outrigger cylinder solenoid valve, as shown in the figure below:



- 4) Mark, disconnect and plug the hydraulic hose of the outrigger cylinder. Cover the fittings on the cylinder.


 **WARNING: Risk of personal injury.**

Splashed hydraulic oil may penetrate and burn the skin. Therefore, please loosen hydraulic connectors very slowly to reduce the oil pressure gradually. Prevent the oil from spraying or splashing.


- 5) Connect the sling of the crane to the barrel

end of the outrigger hydraulic cylinder, and do not apply any force.

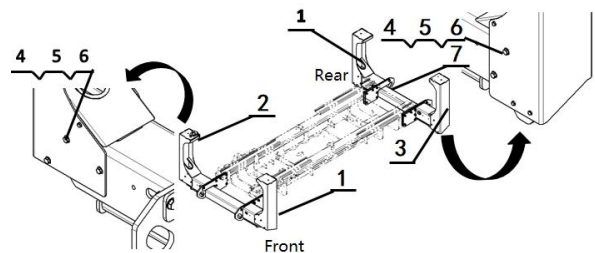
- 6) Remove the fasteners that fix the outrigger cylinder, and remove the outrigger cylinder from the machine.

 **WARNING: Risk of crushing.**

If not properly supported during removal, the outrigger cylinder may be out of balance or fall off.

 **CAUTION: To replace the outrigger cylinder, remove the outrigger cylinder guide stud from the barrel end of the outrigger cylinder and install it on the new cylinder.**

3.4.2 Assembling the outrigger weldment



1. Outrigger weldment 2. Outrigger weldment 3. Outrigger weldment

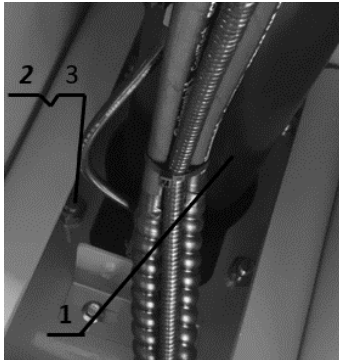
4. Bolt 5. Washer 6. Nut 7. Support beam

- 1) Use parts 4/5/6 to install the part 1 to the left front and right rear outriggers, the part 2 to the right front outrigger, and the part 3 to the left rear outrigger;

Reference tightening torque of part 3: 90±9N.m;

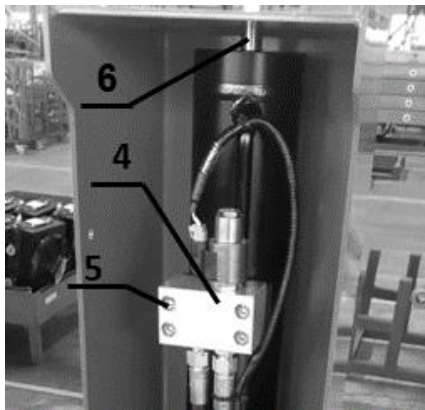
Tools: electric impact wrench 51073C, socket wrench 1/2-18mm, open-end wrench 16-18.

3.4.3 Assembling outrigger cylinder, control valve and guide stud



1. Outrigger cylinder 2. Outrigger cylinder mounting bolt 3. Nut

- 1) Assemble part 1 to the mounting places on both sides of the support beam with parts 2/3;



4. Outrigger cylinder control valve 5. Screw 6. Outrigger cylinder guide stud

- 2) Install the part 4 to the outrigger cylinder with the part 5, and apply AT262 thread locker on part 5 before installation;
- 3) Install part 6 to the mounting hole on the upper part of the outrigger cylinder;

Note that the figure above only shows the installation of one cylinder, and the installation method for other cylinders is the same and will not be described again;

Reference tightening torque of part 2:
125±13N.m;

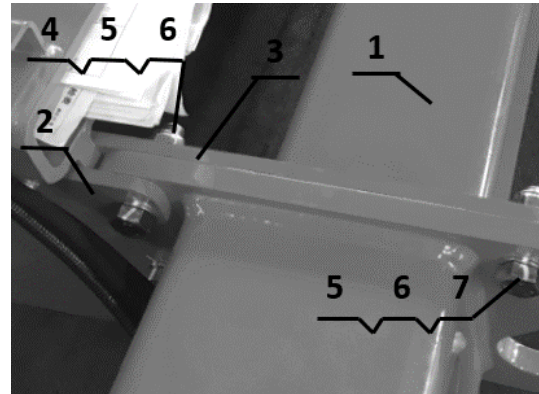
Reference tightening torque of part 5:
28±3N.m;

Reference tightening torque of part 6:

145±15N.m;

Tools: ratchet torque wrench QSP50N3, 3/8" S6 hex bit socket, 1/2" hexagon head socket wrench 12, torque wrench QSP200, open-end wrench 18-21

3.4.4 Assembling the front and rear support beams and fixing plate



1. Support beam 2. Fixing plate 3. Fixing plate 4. Bolt

5. Washer 6. Nut 7. Bolt

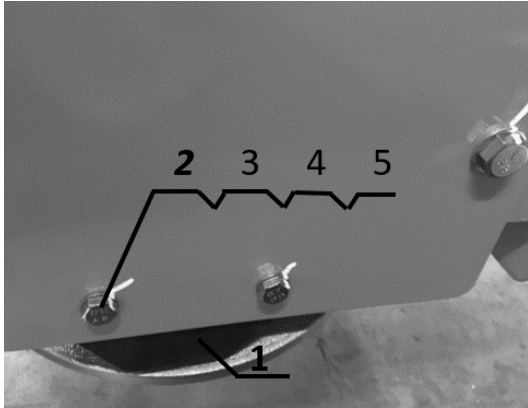
- 1) Fix part 1 between parts 2/3 with parts 4/5/6, with part 2 on the outside and part 3 on the inside;
- 2) Fix the support beam of part 1 to the fixing plate of part 3 with parts 5/6/7;

CAUTION: The assembly requirements for front and rear parts of the support beam are the same, only the assembly requirements for the rear part are shown, and those for the front part will not be described;

Reference tightening torque of parts 4 and 7:
595±55N.m

Tools: pneumatic wrench MI-20P, QLE750N, self-made long handle socket wrench 30, socket wrench 3/4-30.

3.4.5 Assembling the outrigger baffle



1. Baffle 2. Bolt 3. Washer 4. Washer 5. Nut

- 1) Assemble part 1 to the mounting holes on the inner side of the support beam (front of rear outrigger, rear of front outrigger) with parts 2 (coated with AT262 thread locking adhesive)/3;

Reference tightening torque of part 2:
 $10 \pm 1 \text{ N.m}$;

Tools: electric impact wrench 51073C,
socket wrench 1/2 -13mm.

CAUTION: The above is the assembly diagram of the left rear outrigger, and the assembly requirements for the other outriggers are the same and will not be described again.

3.5 Replacing the scissor arm slider wear washer

3.5.1 Replacing the scissor arm slider wear washer at platform

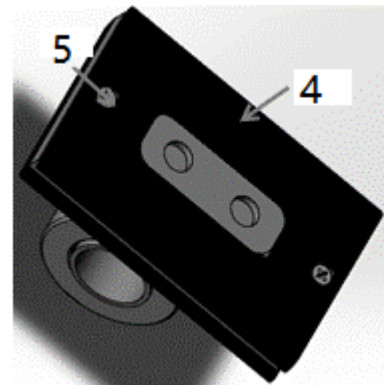
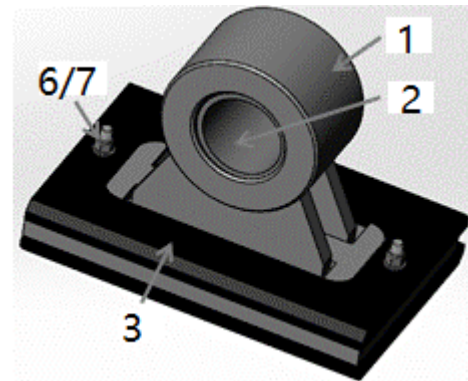
- 1) Attach the slings to two ends of the platform, and do not attach the sling to the railing of the platform.
- 2) Lift the platform slightly with lifting equipment until the stress on the slider is just relieved;
- 3) Undo fasteners that fix the shaft of the platform pull rod assembly, and remove the pin to keep the pull rod assembly on the fork;

- 4) Undo the fasteners that fix the slider shaft, and remove the shaft.

 **WARNING: Risk of crushing**

If not properly supported with lifting equipment during removal of platform slider pivot, the platform may fall.

- 5) Slide the slider assembly out of the platform slideway;
- 6) Remove the fastener that fix the wear pad from the slider assembly and take off the wear pad.
- 7) Replace with the new wear pad.



1. Support 2. Shaft sleeve 3. Slider 4. Upper wear washer 5. Screw 6. Nut 7. Washer
- 8) Install the slider assembly into the platform slideway;
- 9) Align the holes on the slider assembly with the holes on the fork;
- 10) Install the slider shaft and its fasteners;
- 11) Install the platform pull rod assembly on the platform.

3.5.2 Replacement of scissor arm slider wear pad at chassis

CAUTION: To remove the slider at the steering end of the machine, first remove the upper cover and side cover of the engine, and then proceed to Step 1.

Notice: To remove the slider at the non-steering end of the machine, go to Step 11 directly.

- 1) Start the engine by the GCU, and lift the platform about 5.5 m.
- 2) Lift the safety arm and move it to the middle position, and then rotate it upward until it is in a vertical position.

CAUTION: Ensure that the safety arm is locked in the vertical position.

- 3) Lower the platform until the safety arm contacts the scissor arm round tube, and shut down the machine.

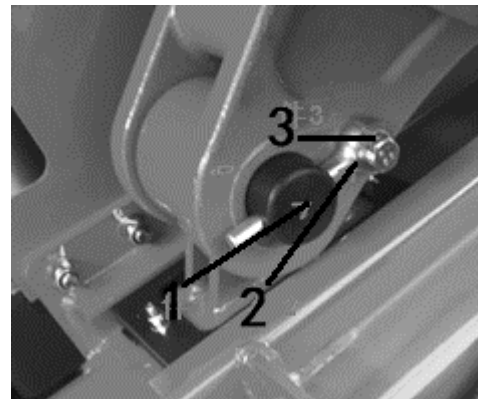
WARNING: Risk of crushing
Keep your hands away from the safety arm when lowering the platform.

CAUTION: Risk of component damage.
Stop lowering the platform when the stabilizer bar contacts the scissor arm round tube. If you continue to lower the platform, a pressure will be applied to the scissor arm round tube and cause damage to the round tube.

- 4) Unlock the latch on the engine tray, and slide the engine tray out completely.
- 5) Lock the engine tray to prevent the engine tray from moving.
- 6) Undo the retaining fasteners that fix the upper cover of the engine, and then remove the upper cover and set it aside.
- 7) Undo the retaining fasteners that fix the

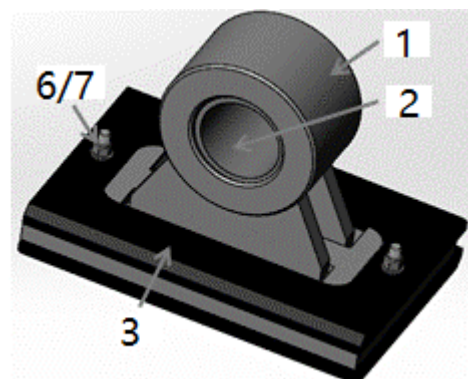
side cover of the engine, and set the two side covers aside.

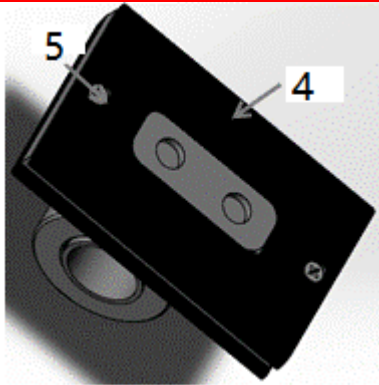
- 8) Start the engine by the GCU.
- 9) Lift the platform slightly. Place the safety arm in the stowed position.
- 10) Lower the platform to the stowed position.
- 11) Use sling or other suitable means to fix the two ends of the fork to the two ends of the machine.
- 12) Attach the sling of the lifting equipment to the end of the scissor arm for removal of slider.
- 13) Lift the fork slightly with lifting equipment until the stress on the slider is just relieved.
- 14) Remove the retaining fastener from the slider pivot and set it aside.



1. Shaft 2. Safety pin 3. Bolt

- 15) Remove the slider pivot and set it aside. Slide the slider out of the slideway, and remove it from the machine.
- 16) Remove the fasteners that fix the wear pad from the slider assembly, and remove the wear pad.





1. Support 2. Shaft sleeve 3. Slider 4. Upper wear washer 5. Screw 6. Nut 7. Washer
- 17) Install a new wear pad on the slider.
- 18) Install the slider assembly into the chassis slideway.
- 19) Align the holes on the slider assembly with the holes on the scissor arm.
- 20) Install the slider pivot and its fasteners.
- 21) For the replacement of the wear pads on the other side, repeat Step 12 to Step 20.
- 22) Install the engine cover.
- 23) Install the engine side cover and tighten it firmly.
- 24) Push the engine tray back to its original position, and lock it.
- 25) Lower the platform to the stowed position.

3.6 Lift cylinder

3.6.1 Removing the lift cylinder (SR3390D/SR4390D)

 **WARNING:** Risk of personal injury.

The balance valve on the lift cylinder has been set before delivery. Do not try to adjust the balance valve. Otherwise, death or serious injury may be caused. It is strongly recommended that this service should be performed by the dealer.

 **CAUTION:**

Before refitting, the O-ring of the removed joint and/or hose assembly (if

equipped) must be replaced. During installation, all connectors must be tightened to the set specifications. Please refer to hydraulic hose and fitting torque specifications.

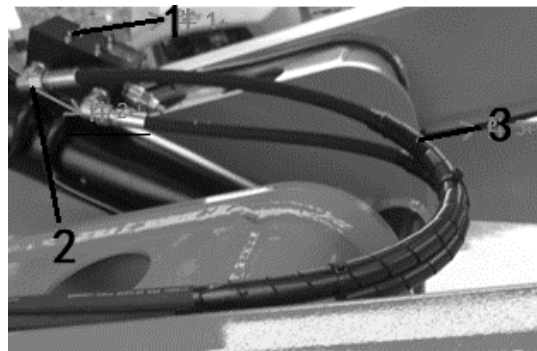
 **WARNING:** Risk of personal injury

This procedure requires specific service skills, lifting equipment and a suitable workshop. Carrying out this process without these skills and tools may result in death or serious injury, as well as serious component damage. Therefore, it is strongly recommended that this service is performed by dealers.

- 1) Start the engine by operating the switch on the ground control panel, lift the platform above the ground, and raise the safety arm and rotate it until it is in a vertical position. Lock the safety arm in place.

CAUTION: Ensure that the safety arm is locked in the vertical position.

- 2) Lower the platform onto the safety arm. Turn off the machine.
- 3) Support the platform with a crane. Do not apply lifting pressure.
- 4) Mark, disconnect and plug the hydraulic hose of lift cylinder. Cover the fittings on the cylinder.

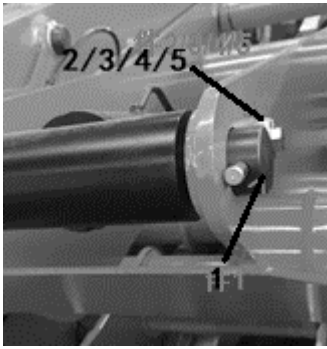


1. Counterbalance valve 2. Pipe joint 3. Pipe
- 5) Cut off the wire tie connecting the hydraulic hose to the lift cylinder. Set the hose aside.

⚠ CAUTION: Risk of part damage

If being kinked or squeezed, the hoses may be damaged.

- 6) Tie the sling of the bridge crane or similar lifting equipment to the lift cylinder connecting rod end for support.
- 7) Tie the sling on the second bridge crane or similar lifting equipment to the lift cylinder tube end for support.
- 8) Remove the fastener from the lift cylinder connecting rod end pivot. Remove the pin with a copper hammer.



1. Shaft 2. Safety pin 3. Bolt 4. Washer 5. Nut

⚠ WARNING: Risk of crushing

If not properly supported, the lift cylinder may fall.

- 9) Carefully lower the cylinder to the cross tube of the second inner arm. Protect the cylinder connecting rod from damage.

⚠ CAUTION: Risk of part damage

If the balance valve on the lift cylinder contacts the scissor fork, the balance valve may be damaged.

- 10) Remove the fasteners that fix the lift cylinder barrel end shaft. Use a copper hammer to remove the pivot.
- 11) Carefully pull the lift cylinder out of the non-steering end of the machine through the scissor fork. Remove the lift cylinder from the machine.

⚠ Warning: Risk of crushing

If not properly supported during removal from the machine, the lift cylinder may become unbalanced and fall off.

3.6.2 Removing the lift cylinder (SR5390D)

⚠ WARNING: Risk of personal injury.

1. The balance valve on the lift cylinder has been set before delivery. Do not try to adjust the balance valve. Otherwise, death or serious injury may be caused. It is strongly recommended that this service should be performed by the dealer.

2. This procedure requires specific service skills, lifting equipment and a suitable workshop. Without these tools or skills, performing this procedure may result in death or serious injury. It is strongly recommended that this service should be performed by the dealer.

⚠ CAUTION:

Before refitting, the O-ring of the removed joint and/or hose assembly (if equipped) must be replaced. During installation, all connectors must be tightened to the set specifications. Please refer to hydraulic hose and fitting torque specifications.

- 1) Start the engine by operating the switch on the ground control panel, lift the platform, lift the safety arm, move it to the middle position of the scissor arm, and rotate it upward until it is in a vertical position.

⚠ CAUTION: Ensure that the safety arm is locked in the vertical position.

- 2) Lower the platform until the safety arm is in full contact with the scissor arm circular

tube, and shut off the machine.

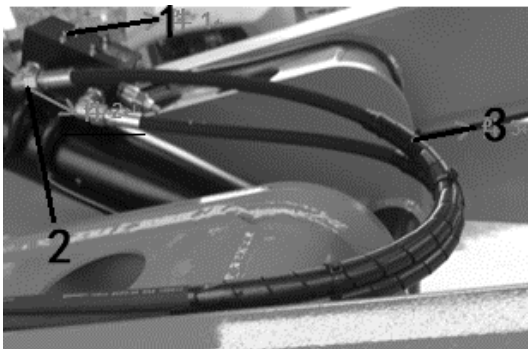
⚠ WARNING: Risk of crushing

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

⚠ CAUTION: Risk of component damage.

After the safety arm is in contact with the scissor arm round tube, do not continue to lower the platform. If you continue to lower the platform by applying pressure, the scissor arm circular tube may be damaged.

- 3) Support the platform with a suitable lifting equipment, during which do not apply lifting pressure.
- 4) Mark, disconnect and plug the hose of the lift cylinder, and then cover the cylinder cap.



- 1) Counterbalance valve 2) Pipe joint 3) Pipe
- 5) Remove the wire tie that fixes the hydraulic oil pipe on the lower lift cylinder, and put the hydraulic oil pipe aside.

⚠ CAUTION: Risk of component damage

If the hose is kinked or squeezed, it may be damaged.

- 6) Fix the sling of a crane or similar lifting equipment to the lug of the upper lift cylinder connecting rod end for support.
- 7) Fix the sling of another crane or similar lifting equipment to the lug of the lower lift cylinder tube end for support.
- 8) Remove fasteners that fix the pin at the lift

cylinder rod end. Remove the pin.

⚠ WARNING: If not properly supported, the lift cylinder pin may fall off during removal.

- 9) Carefully lower the cylinder to a horizontal position. Protect the cylinder piston rod from damage.

⚠ CAUTION: Risk of component damage.

If the scissor fork comes into contact with the balance valve, the balance valve may be damaged.

- 10) Remove the of fastener from the lift cylinder tube end pivot to remove the pivot.



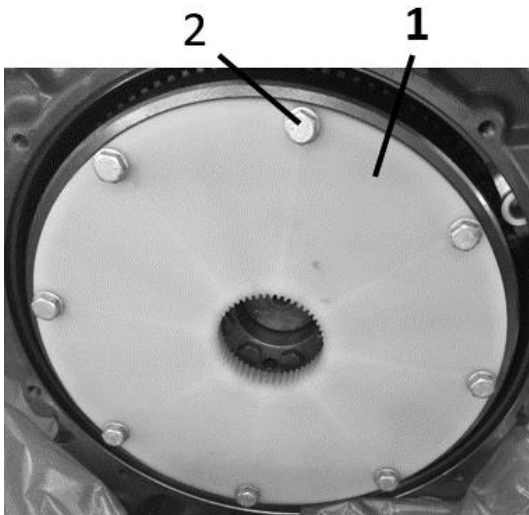
- 11) Carefully pull the lift cylinder out of the fork frame at the non-steering end of the machine through the scissor arm to remove it from the machine.

⚠ WARNING: Risk of crushing

If not properly supported by the crane during removal, the lift cylinder may be out of balance or fall off.

3.7 Engine assembly

3.7.1 Assembling coupling and pump cover



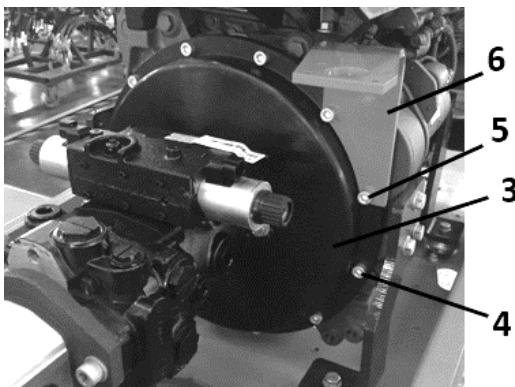
1. Flywheel coupling 2. Washer

- 1) Install the part 1 to the engine with the part 2 and coupling self-contained bolts.

CAUTION:

1. Fit the flat side of the flywheel with the engine, move the flywheel up and down, and when the flywheel disc cannot be moved, tighten it to the specified torque.

2. Coat the bolt with AT277 high-temperature threadlocker before screwing it in.



3. Pump cover 4. Screw 5. Screw 6. Lo pressure filter mounting plate

- 2) Assemble the parts 3/6 to the engine assembly with parts 4/5;

CAUTION: 1. Before installing the pump

cover, apply 596 plane sealant to the connection between the pump cover and the engine flywheel housing, making the pump cover surrounded by the sealant;

2. Apply AT262 thread locker on the parts 4/5 before installation.

Reference tightening torque of bolt provided together with part 1: $49 \pm 5 \text{N.m}$;

Reference tightening torque of part 5: $52 \pm 5 \text{N.m}$;

3.8 Pump

3.8.1 Removing the gear pump

CAUTION:

1. Before refitting, the O-ring of the removed fitting and/or hose assembly must be replaced and then tightened to the specified torque. Please refer to hydraulic hose and joint torque specifications.

2. Before installing the gear pump again, check the position of the O-ring to avoid crushing the O-ring.

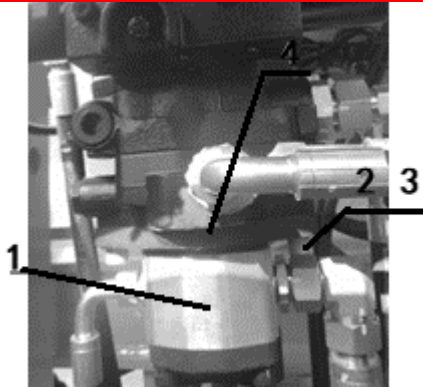
- 1) Find the valve at the hydraulic tank and close it.

CAUTION: Risk of part damage

The engine shall not be started when the valve of the hydraulic tank is closed, otherwise parts may be damaged. If the valve is closed, remove the key from the start switch and put a label on the machine to inform related personnel.

- 2) Push out the engine pallet and fix it to prevent it from sliding.

- 3) Mark, disconnect and plug the hydraulic hose of gear pump. Cover the joints of the pump.



1. Gear pump 2. Screw 3. Washer 4. O-ring

⚠ WARNING: Risk of personal injury.

Splashed hydraulic oil may penetrate and burn the skin. Therefore, please loosen hydraulic connectors very slowly to reduce the oil pressure gradually. Prevent the oil from spraying or splashing.

- 4) Remove the fasteners of gear pump to carefully remove it.

3.8.2 Removing the walking variable pump

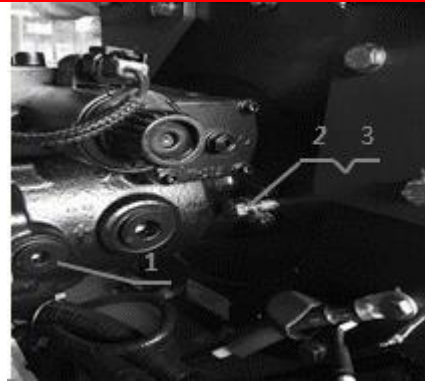
⚠ CAUTION: Risk of component damage.

The working area and surface for performing this procedure must be clean. If debris enters the hydraulic system, serious damage may be caused to the components. Therefore, it is recommended the dealer should perform this service.

⚠ CAUTION:

Before refitting, the O-ring of the removed fitting and/or hose assembly must be replaced and then tightened to the specified torque. Please refer to hydraulic hose and joint torque specifications.

- 1) Remove the gear pump. See Removal of Gear Pump.
- 2) Remove the electrical connector wire from the travel pump.



- 3) Mark, disconnect and plug the hydraulic hose of travel pump. Cover the joints of the pump.

⚠ WARNING: Risk of personal injury.

Splashed hydraulic oil may penetrate and burn the skin. Therefore, please loosen hydraulic connectors very slowly to reduce the oil pressure gradually. Prevent the oil from spraying or splashing.

- 4) Support the travel pump with a suitable equipment and remove the mounting fasteners of it.
- 5) Pull out the travel pump carefully until the pump is separated from the flywheel coupling.
- 6) Carefully remove the travel pump from the machine.

⚠ CAUTION: Risk of component damage.

1. If not properly supported by a crane, the travel pump may become unbalanced and fall off.

2. After installing the pump, make sure to open the valves of the hydraulic tank and fill the pump with oil.

3.9 Fuel tank and hydraulic oil tank

3.9.1 Removing the fuel tank

⚠ Warning: Risk of explosion and fire

1. Engine fuel is combustible. Perform this procedure in an open, well-ventilated area away from heaters, sparks, flames, and fireworks. Acceptable fire extinguishers should be always equipped in easily accessible places.

2. When delivering fuel, connect a ground wire between the machine and the pump or container.

3. Do not drain or store fuel in open containers due to possible fire.

- 1) Turn the start switch to "Ground Control", and then press the red emergency stop buttons on the ground and platform control panels to "ON".
- 2) Start the engine and lift the platform about 5.5 m above the ground.
- 3) Raise the safety arm slightly and rotate it to the vertical position. Lock the safety arm in place.

CAUTION: Ensure that the safety arm is locked in the vertical position.

- 4) Lower the platform onto the safety arm. Shut down the engine.

 **WARNING: Risk of crushing**

When lowering the platform, do not touch the safety arm with your hands.

- 5) Tie the sling of the bridge crane to the entry ladder on the hydraulic tank side.
- 6) Remove the mounting fasteners of entry ladder. Remove the entry ladder from the machine.

 **WARNING: Risk of crushing**

If not properly supported during removal from the machine, the entry ladder may become unbalanced and fall.

- 7) Mark, disconnect and plug the fuel supply and return hoses.

- 8) Remove the fuel filler cap from the fuel tank.

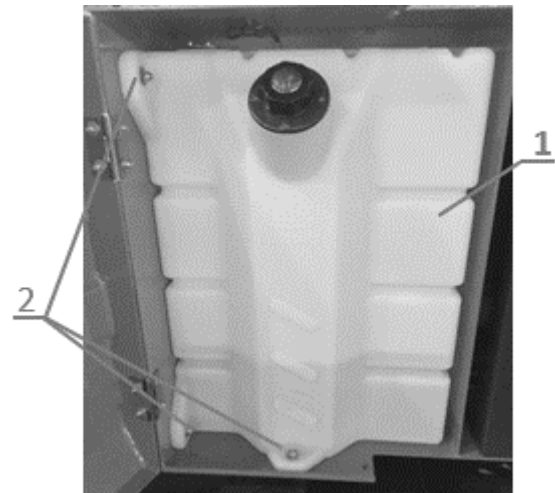
- 9) Remove the drain plug at the bottom of the fuel tank, and drain the fuel into a suitable container.

 **Warning: Risk of explosion and fire**

When delivering fuel, connect a ground wire between the machine and the pump or container.

Note: Ensure that only manual pumps suitable for gasoline and/or diesel are used.

- 10) Remove the fasteners that fix the fuel tank.



1. Hydraulic tank 2. Fastener

- 11) Support the fuel tank and fix it to an appropriate lifting equipment.

- 12) Remove the fuel tank from the machine.

 **Warning: Risk of part damage**

The fuel tank is made of plastics and may be damaged if dropped.

Note: Before installation, please clean the fuel tank and check for cracks and other damage.

3.9.2 Installing the fuel tank

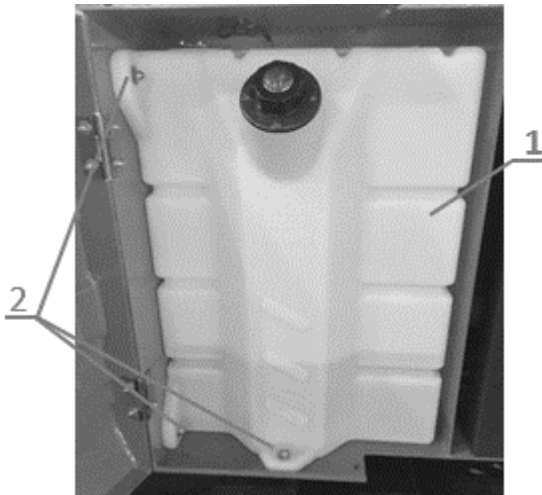
 **Warning: Risk of explosion and fire**

1. Engine fuel is combustible. Perform this procedure in an open, well-ventilated area away from heaters, sparks, flames, and

fireworks. Acceptable fire extinguishers should be always equipped in easily accessible places.

2. When delivering fuel, connect a ground wire between the machine and the pump or container.

3. Do not drain or store fuel in open containers due to possible fire.



1. Hydraulic tank 2. Fastener

- 1) Install the fuel tank assembly to the rear side of right cabinet with the fastener, and tighten it;
- 2) Install the nut in the cabinet and put the large washer at one side of the nut.

Reference tightening torque of fastener:
40±4 N.m;

Tools: open-end wrenches 13-16; socket wrench 3/8 16mm; electric impact wrench 51081.

3.9.3 Removing the hydraulic tank

 **Warning: Risk of part damage**

1. The working area and surface for performing this procedure must be clean. If debris enters the hydraulic system, serious damage may be caused to the components. Therefore, it is recommended the dealer should perform this service.

2. The O-rings (if any) of the fittings and/or hoses must be replaced. During

installation, all connections must be tightened to the specified torque. Please refer to torque specifications of hydraulic hoses and fittings.

- 1) Turn the start switch to “Ground Control”, and then press the red emergency stop buttons on the ground and platform control panels to “ON”.
- 2) Start the engine, lift the platform above the ground, and rotate it until it is in a vertical position. Lock the safety arm in place.

CAUTION: Ensure that the safety arm is locked in the vertical position.

- 3) Lower the platform onto the safety arm. Shut down the engine.
- 4) Tie the sling of the bridge crane to the entry ladder on the hydraulic tank side.
- 5) Remove the mounting fasteners of entry ladder. Remove the entry ladder from the machine.
- 6) Close the two hydraulic ball valves (if equipped) on the hydraulic tank.

 **CAUTION: Risk of part damage**

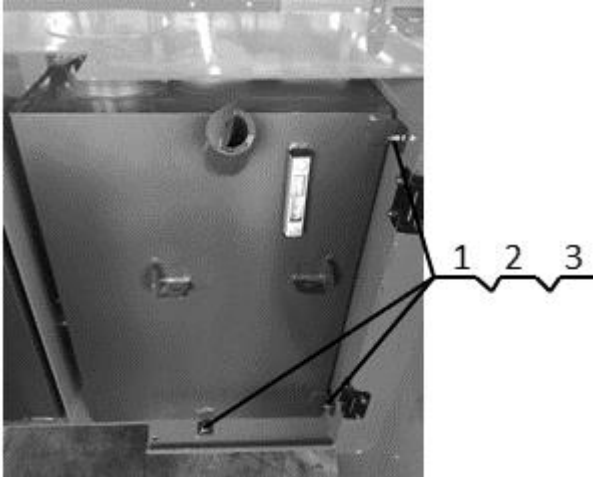
The engine shall not be started when the valve of the hydraulic tank is closed, otherwise parts may be damaged. If the valve is closed, remove the key from the start switch and put a label on the machine to inform related personnel.

- 7) Remove the drain plug from the hydraulic tank, and completely drain fuel into a suitable container.

 **WARNING: Risk of personal injury.**

Sprayed hydraulic oil will penetrate and burn the skin. Therefore, please loosen hydraulic connectors very slowly to reduce the oil pressure gradually. Do not spray or eject the oil.

- 8) Mark, disconnect and plug the suction pipes connected to the ball valves of hydraulic tank.
- 9) Mark, disconnect and plug the fuel return pipe at the fuel tank.
- 10) Disconnect the T-shaped joint and the two hoses connected to it on the tank.
- 11) Remove the fasteners that fix the hydraulic tank.



1. Bolt 2. Washer 3. Nut

- 12) Support the hydraulic tank and fix it to an appropriate lifting equipment.
- 13) Remove the hydraulic tank from the machine.

 **WARNING: Risk of crushing**

If not properly supported and fixed on the lifting equipment during removal from the machine, the hydraulic oil tank may become unbalanced and fall.

 **Warning: Risk of part damage**

After installing the pump, make sure to open the two valves of the hydraulic oil tank and fill the pump with oil.

CAUTION: When installing the drain plug and filter, be sure to use pipe thread sealant.

3.9.4 Installing the hydraulic oil tank

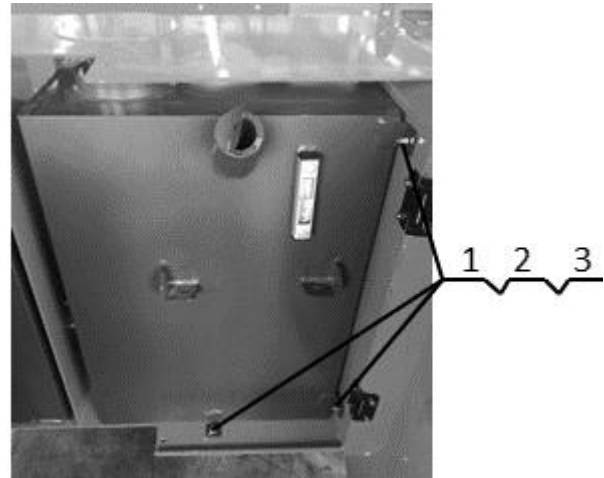
 **Warning: Risk of explosion and fire**

1. Engine fuel is flammable. Perform this

procedure in an open, well-ventilated area away from heaters, sparks, flames, and fireworks. Acceptable fire extinguishers should be always equipped in easily accessible places.

2. Explosion and fire hazard. When delivering fuel, connect a ground wire between the machine and the pump or container.

3. Do not drain or store fuel in open containers due to possible fire.

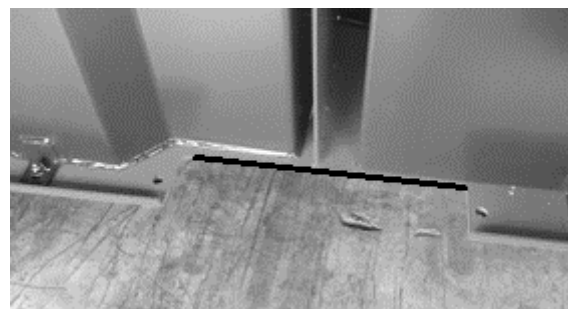


1. Bolt 2. Washer 3. Nut

- 1) Install the hydraulic tank assembly to the front side of right cabinet with parts 1/2/3;

Reference tightening torque of part 1: 52±5N.m;

Tools: electric impact wrench; socket wrench 16



- 2) The assembled hydraulic tank may not go beyond the marked position as shown.

3.10 Hydraulic valve

3.10.1 Travel control valve

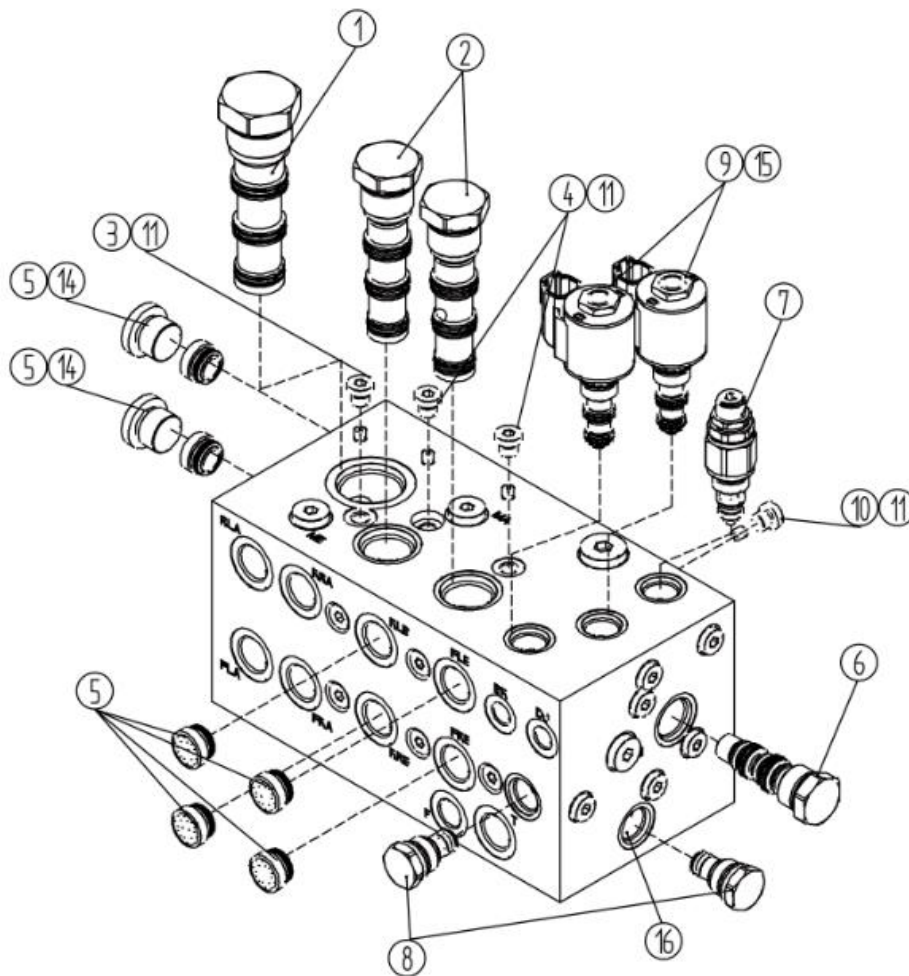


Table of travel control valve:

No,	Name	Function	Mounting torque (N.M)
1	Flow diverter/combiner valve	Oil distribution and collection	133-138
2	Flow diverter/combiner valve	Oil distribution and collection	99-104
3	Damper	Throttling	5
4	Damper	Throttling	5
5	Check valve	Controlling the direction of oil flow	10
6	Relief valve	Hydraulically controlling oil return	33-35
7	Solenoid valve	Controlling line pressure	40-45
8	Check valve	Controlling the direction of oil flow	40-45
9	Solenoid valve	Controlling oil line connection method	27.1
10	Damper	Throttling	5
11	Plug	Plugging oil port	11-12
12	Plug	Plugging oil port	25-28
13	Plug	Plugging oil port	41-48
14	Plug	Plugging oil port	72-82
15	Coil	Providing valve spool with movement power	4
16	Valve block	-	-

Table of travel control valve port:

No,	Name	Description
1	Port A	To port A of travel variable pump
2	Port B	To port B of travel variable pump
3	Port DS	To port X of driving motor
4	Port FRA	To port A of front right driving motor

5	Port FRB	To port B of front right driving motor
6	Port FLB	To port B of front left driving motor
7	Port FLA	To port A of front left driving motor
8	Port RLA	To port B of rear left driving motor
9	Port RLB	To port A of rear left driving motor
10	Port RRA	To port A of rear right driving motor
11	Port RRB	To port B of rear right driving motor
12	Port T	To port T3 of lift control valve
13	Port BR	To braking interface of driving motor
14	Port P	To port C1 of travel variable pump

3.10.2 Lift control valve

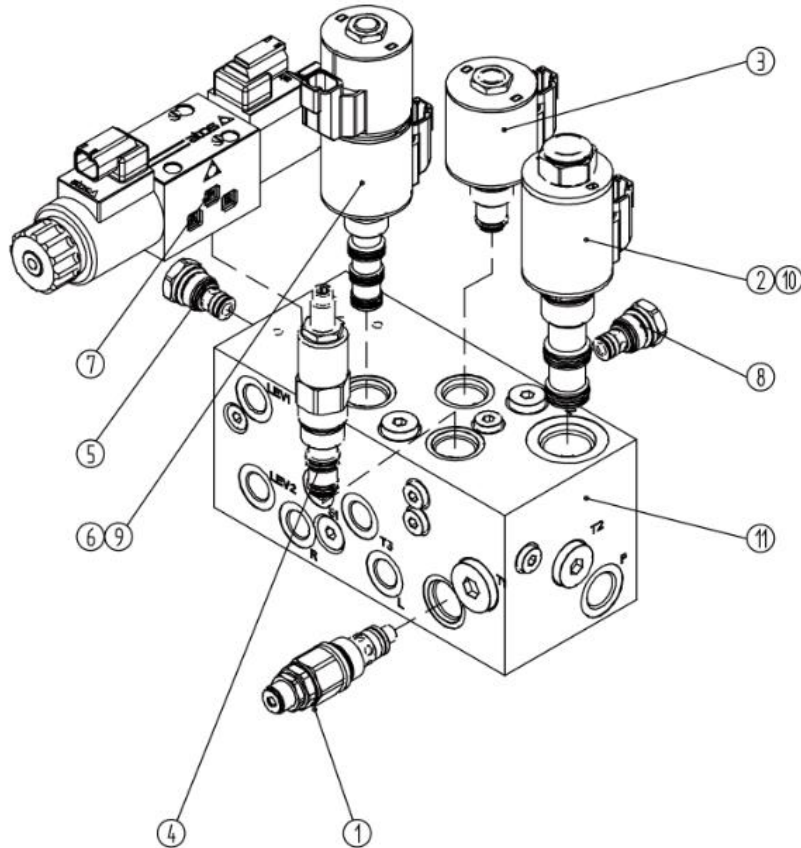


Table of lift control valve:

No,	Name	Function	Mounting torque (N.M)
1	Relief valve	Controlling line pressure	55-65
2	Solenoid valve	Controlling oil line connection method	47.4
3	Solenoid valve	Controlling oil line connection method	37-40
4	Pressure relief valve	Controlling line pressure	33.9
5	Flow valve	Control line flow	27.1
6	Solenoid valve	Controlling oil line connection method	33.9
7	NS6 O	Controlling oil line connection method	8
8	Check valve	Controlling the direction of oil flow	40-45
9	Coil	Providing valve spool with movement power	4
10	Coil	Providing valve spool with movement power	4
11	Valve block	/	/

Table of lift control valve port:

No,	Name	Function
1	Port LEV1	To port E of outrigger solenoid valve
2	Port LEV2	To port R of outrigger solenoid valve
3	Port S1	To left steering cylinder large chamber
4	Port S2	To right steering cylinder large chamber
5	Port R	To port T of lower lift cylinder valve
6	To port T of upper lift cylinder valve	To port P of lower lift cylinder valve
7	Port P	To port P1 of float control valve
8	Port T1	To port T of hydraulic alternator
9	Port T2	To port T of float control valve
10	Port T3	To port T of driving motor

3.10.3 Float control valve

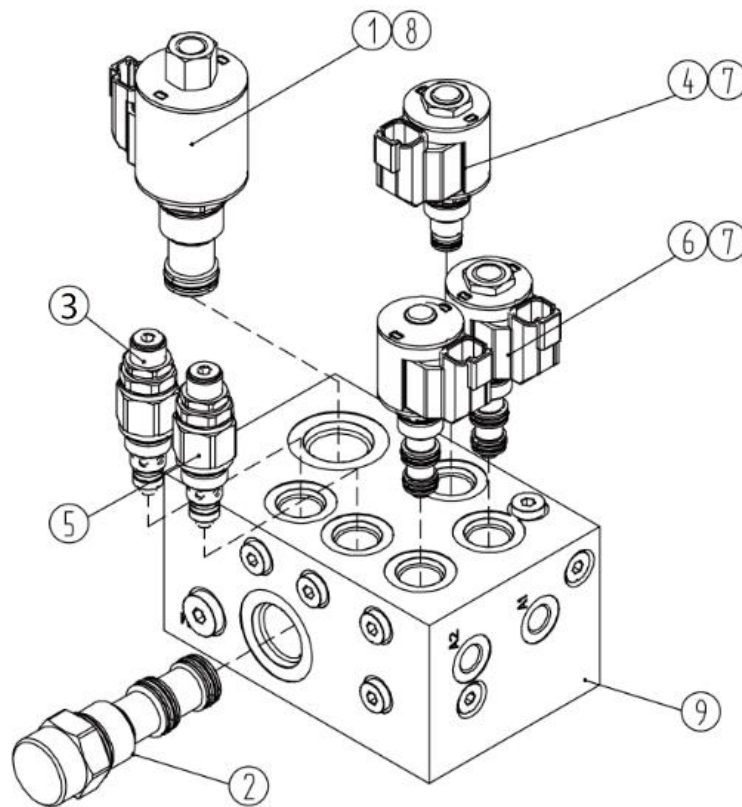


Table of float control valve:

No,	Name	Function	Mounting torque (N.M)
1	Solenoid valve	Controlling oil line connection method	47.4
2	Flow valve	Control line flow	40.6
3	Relief valve	Controlling line pressure	45
4	Solenoid valve	Controlling oil line connection method	27.1
5	Overflow valve assembly	Controlling line pressure	45
6	Solenoid valve	Controlling oil line connection method	27.1
7	Coil	Providing valve spool with movement power	4
8	Coil	Providing valve spool with movement power	4
9	Valve block	/	/

Table of float control valve ports:

No,	Name	Function
1	T	To port T2 of lift control valve
2	P	To high pressure filter
3	P1	To port P of lift control valve
4	A1	To port V1 of balance valve of left float cylinder and port V2 of balance valve of right float cylinder
5	A2	To port V2 of balance valve of left float cylinder and port V1 of balance valve of right float cylinder

Removal of hydraulic valve spool

- 1) Immerse the valve spool in clean oil to lubricate the O-ring.
- 2) Manually screw in the valve spool until it reaches the top of the O-ring, and then adjust the torque to meet the specification.
- 3) If necessary, wind the valve coil around the valve stem. Install the coil nut to the valve stem and adjust the torque to meet the specification.

3.11 Axle assembly

 **CAUTION:**

Before refitting, the O-ring of the removed fitting and/or hose assembly must be replaced and then tightened to the specified torque. Please refer to hydraulic hose and joint torque specifications.

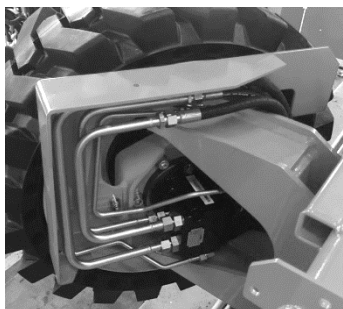
3.11.1 Removing the front axle assembly (driving motor, steering knuckle and reducer)

- 1) Fix the non-steered wheels and place the jack in the middle of the steering end (i.e., front axle) of the chassis.
- 2) Unscrew the wheel nuts, but do not remove them.
- 3) Raise the machine by 5 cm, and place the bracket under the chassis for the purpose of supporting.

 **CAUTION: Risk of crushing.**

If not supported properly, the chassis may fall.

- 4) Remove the wheel nuts to remove the tires.
- 5) Remove the fasteners that fix the pipe clamp of the driving motor, and then remove the pipe clamp.
- 6) Remove the mounting fasteners of the oil pipe bracket, and remove it from the steering knuckle as shown in the figure below.

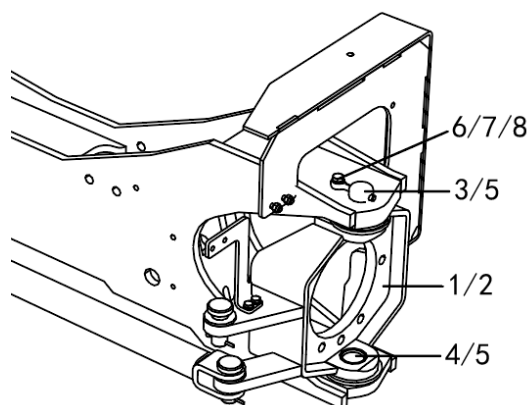


- 7) Mark, disconnect and plug the hoses of the driving motor and reducer. Cover the joints on the driving motor and drive.

 **WARNING: Risk of personal injury.**

Splashed hydraulic oil may penetrate and burn the skin. Therefore, please loosen hydraulic connectors very slowly to reduce the oil pressure gradually. Prevent the oil from spraying or splashing.

- 8) Use a jack to support and fix the steering knuckle, the driving motor and the reducer.
- 9) Remove the cotter pin on the steering linkage.
- 10) Remove the fasteners on the pull rod pin from the steering cylinder, and then remove the pin;



1. Left steering knuckle
 2. Right steering knuckle
 3. Upper king pin
 4. Lower king pin
 5. King pin bushing
 6. Bolt
 7. Pin
 8. Washer
- 11) Remove the fasteners of the lower king pin of the steering knuckle, and then remove the lower king pin.
 - 12) Remove the fasteners of the upper king pin of the steering knuckle, and then remove the upper king pin.
 - 13) Remove the driving motor, the steering knuckle and the reducer.

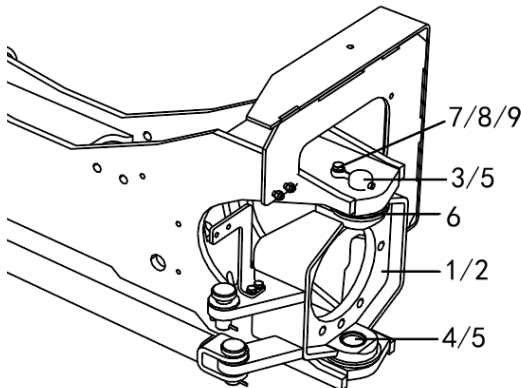
 **CAUTION: Risk of crushing.**

If not supported during removal, the steering knuckle, driving motor, and reducer may be out of balance or fall off.

3.11.2 Assembling the front axle assembly (driving motor, steering knuckle and reducer)

280±28N.m;

Tools: Allen wrench 12, ratchet torque wrench;



1. Right steering knuckle 2. Left steering knuckle 3. Upper king pin 4. Lower king pin 5. King pin bushing 6. Wear washer 7. Bolt 8. Pin 9. Washer

1) Install the parts 1/2 to the front axle housing with the parts 3/4 respectively; note that the part 6 shall be installed between the king pin hole on the steering knuckle and the front axle housing;

2) Tighten the parts 3/4 with the parts 7/8/9;

Reference tightening torque of part 7: 52±5N.m

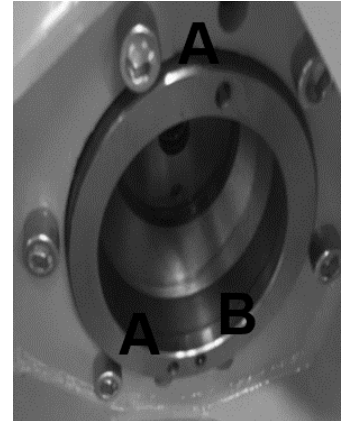
Tools: electric impact wrench; socket wrench 1/2-16mm;



1. Screw 2. Washer

3) Install the reducer to the left and right steering knuckles with parts 1/2 respectively, and coat the screw with AT262 threadlocker before installing it;

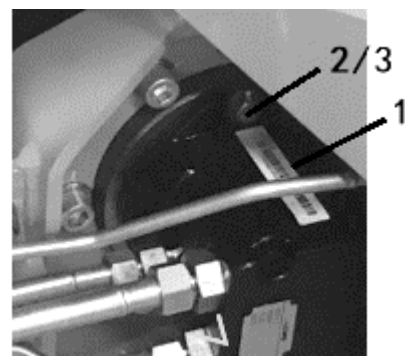
Reference tightening torque of part 2:



Note that the following requirements shall be met for the assembly of the reducer:

a. The reducer shall be installed to the right steering knuckle in such a way that the threaded hole of the driving motor shown in above figure A is vertical and the service brake fluid port shown in figure B is at the lower part;

b. The reducer shall be installed to the left steering knuckle in such a way that the threaded hole of the driving motor shown in above figure A is vertical and the service brake fluid port shown in figure B is at the lower part; finally, the driving motor pipe must be in front of the driving motor.



1. Driving motor 2. Bolt 3. Washer

4) Install the part 1 to the walking reducer with parts 2/3 after installing the O-ring to the mating surface and checking whether the O-ring of service brake fluid port falls off;

Reference tightening torque of part 2:

100±10N.m;

Tools: electric ratchet torque wrench; socket wrench 16

CAUTION:

1. Do not damage the O-ring;
2. Apply AT262 thread locker on the part 2 before installation;
3. Thread the bolt from inside out to prevent interference between the steel pipe and the bolt!

- 5) Remove the screw plug at port “T” of motor, and install the joint to port “T”;

Reference tightening torque of joint: 60±6N m;

Tools: Allen wrench 8; ratchet torque wrench/socket wrench 24.

- 6) Remove the screw plugs at ports “A” and “B” of motor, and install the joints to the ports;

Reference tightening torque of fitting: 140±14N.m;

Tools: ratchet torque wrench/ socket wrench 32.

- 7) Remove the screw plug at port “X” of motor, and install the joint and the right-angle joint to the port;

Reference tightening torque of joint: 32±3N.m

Reference tightening torque of right-angle joint: 22±2 N.m

Tools: ratchet torque wrench socket 19; torque wrench 17.

- 8) Remove the screw plug at service brake fluid port of motor, and install the joint and the right-angle joint to the port;

Reference tightening torque of fitting: 22±2N.m;

Reference tightening of right-angle joint: 23±2 N.m;

Tools: ratchet torque wrench socket 17;

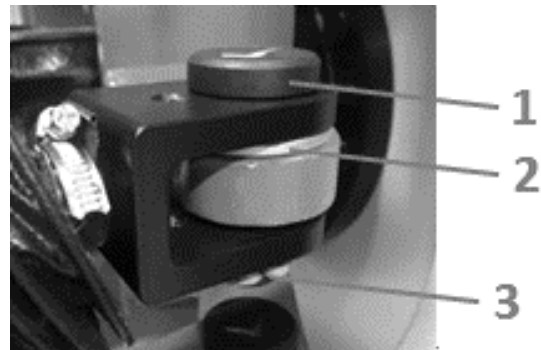
torque wrench 17;



1. Left pipe support 2. Bolt 3. Washer 4. Nut
- 9) Install the part 1 to the left steering knuckle (the inside of the knuckle) of front axle assembly with parts 2/3/4, and install the bolts from inside out;

Reference tightening torque of part 2: 78-104 N.m;

Tool: electric impact wrench 51070.



1. Pull rod pin 2. Washer 3. Pin
- 10) Install the steering linkage and the steering cylinder to the front axle assembly with parts 1/2/3 respectively. Then connect the cylinder piston rod to the steering knuckle and position the cylinder joint downward;

3.11.3 Removing the rear axle motor and reducer

 **CAUTION:** Risk of part damage

1. The procedure for servicing the motor is only performed by the dealer.
2. The working area and surface where this step is performed must be clean, and no

impurities will enter the hydraulic system, which may cause serious component damage. It is recommended that the dealer perform maintenance.

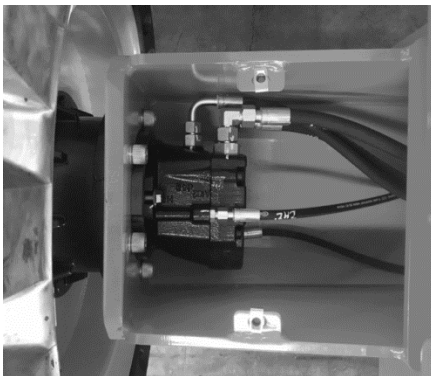
⚠ CAUTION:

Before refitting, the O-ring of the removed fitting and/or hose assembly must be replaced and then tightened to the specified torque. Please refer to hydraulic hose and joint torque specifications.

- 1) Lock the turning wheel.
- 2) (Mark, disconnect and plug the hydraulic hose of driving motor.

⚠ WARNING: Risk of personal injury.

Splashed hydraulic oil may penetrate and burn the skin. Therefore, please loosen hydraulic connectors very slowly to reduce the oil pressure gradually. Prevent the oil from spraying or splashing.



- 3) Remove the fasteners that fix the driving motor.
- 4) Pull out the driving motor shaft from the reducer, and remove the driving motor from the machine.

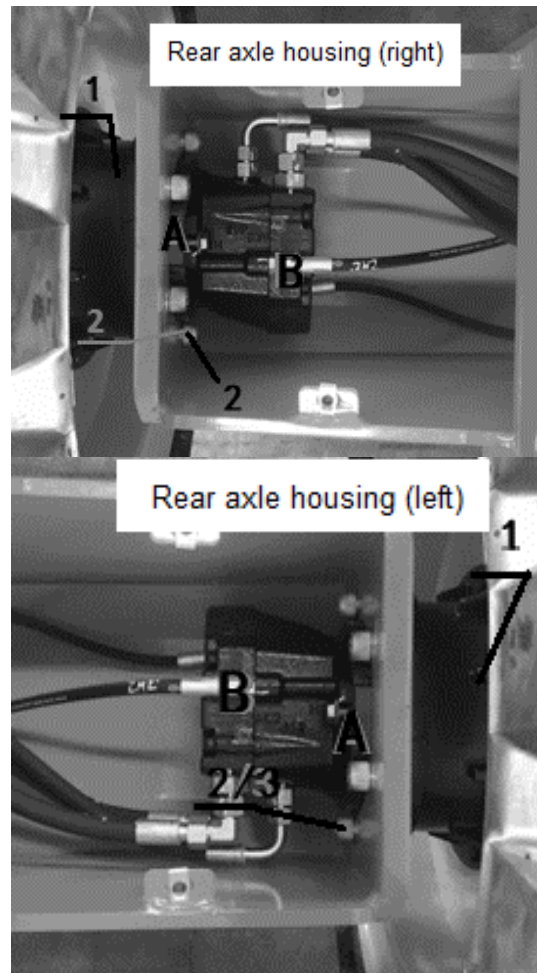
⚠ CAUTION:

An O-ring is installed between the driving motor and the reducer. When installing the driving motor to the machine, make sure that the O-ring is in the correct

position.

- 5) Lock the steering wheels and place the jack in the middle of the steering end of the chassis.
- 6) Unscrew the wheel nuts, and do not remove them.
- 7) Raise the machine by 5 cm. Place the bracket under the chassis for support.
- 8) Remove the wheel nuts to remove the tires.
- 9) Place another jack under the reducer to support and fix the reducer.
- 10) Remove the fasteners of the reducer and then remove the reducer.

3.11.4 Assembling the rear axle motor and reducer



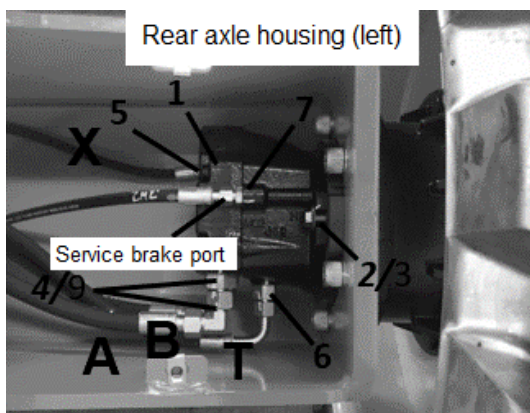
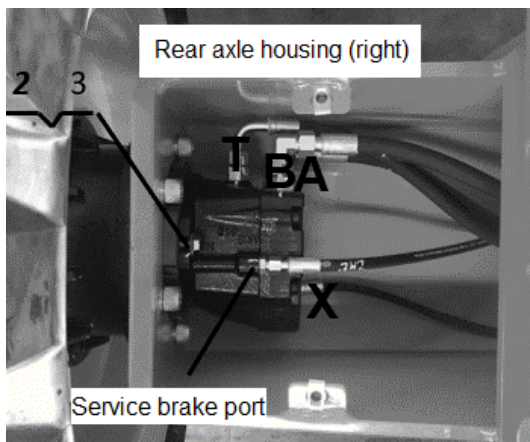
1. Reducer 2. Screw 3. Washer

- 1) Install the part 1 to the left and right rear axle housings with parts 2/3 respectively, and coat the screw with AT262 threadlocker before installing it:

Reference tightening torque of part 2:
280±28N.m.

Tools: Allen wrench, ratchet torque wrench 12

- 2) Note that the following requirements shall be met for the assembly of the reducer:
- The reducer shall be installed to the left rear axle housing in such a way that the threaded hole of the driving motor shown in above figure A is vertical and the service brake fluid port shown in figure B is at the upper part;
 - The reducer shall be installed to the right rear axle housing in such a way that the threaded hole of the driving motor shown in above figure A is vertical and the service brake fluid port shown in figure B is at the upper part;



1. Driving motor 2. Bolt 3. Washer 4. Joint
5. Joint 6. Joint 7. Joint 8. O-ring 9. Joint

- 3) Install the part 1 to the walking reducer with parts 2/3 after installing the part 8 to the

mating surface and checking whether the O-ring of service brake fluid port falls off;

CAUTION: 1. Do not damage the O-ring;
2. Before installing the part 2, Apply AT262 thread locker for 3-5 threads starting from the second thread at the threaded end;

- Remove the screw plug at port "T" of motor, and install the part 6 to port "T";
- Remove the screw plugs at ports "A" and "B" of motor, install the part 4 to the port, then install the part 9 to the joints.
- Remove the screw plug at port "X" of motor, and install the part 5 to the port;
- Remove the screw plug at service brake fluid port of motor, and install the part 7 to the port;

Tightening torque of part 2: 100±10N.m;

Tightening torque of part 4: 140±14N.m;

Tightening torque of part 5: 32±3N.m;

Tightening torque of part 6: 60±6N.m;

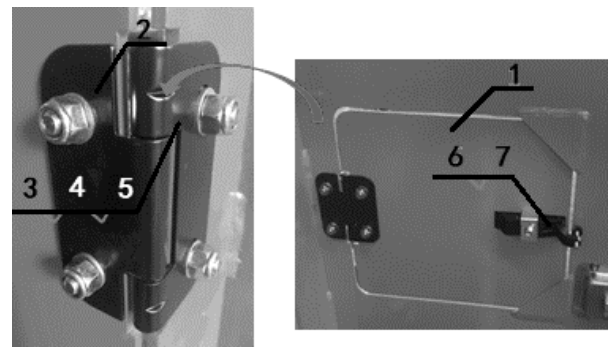
Tightening torque of part 7: 23±2N.m;

Tightening torque of part 9: 58±6N.m;

Tools: torque wrench SP67NX17; Allen wrench 8; Allen wrench 6; , Allen wrench 3/16; slotted screwdriver 6x150.

3.12 Adjusting structural parts

3.12.1 Assembling and adjusting the small door



1. Small door 2. Hinge 3. Nut 4. Washer 5.) Bolt
6. Lock 7. Nut

- 1) Connect the part 1 to the rear side of left rear door of left cabinet with the part 2, and

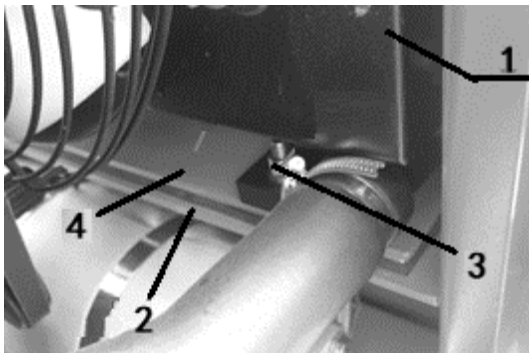
fasten it with the parts 3/4/5;

CAUTION: 1. The hinge is installed inside the cabinet.

2. The seam between the small door and the left rear door shall be even, the deviation of gap between upper and lower sides shall be ≤ 1 mm, the deviation of gap between left and right sides shall be ≤ 1.5 mm (theoretical reference value of seam on the side of hinge: 2.5 ± 0.5 mm; theoretical reference value of seam on other sides: 3 ± 0.5 mm)

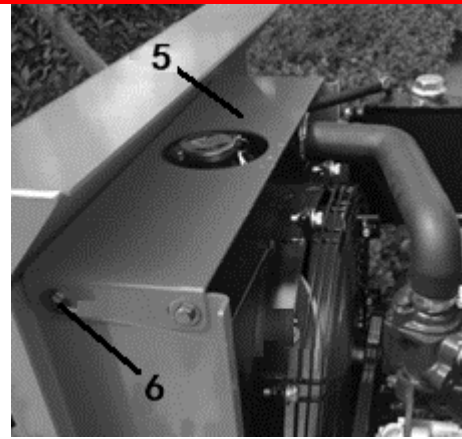
2) Install the part 6 to the small door with the part 7; the opening of U-type clamp plate shall be perpendicular to the horizontal plane; the distance between the lock stop bolt and the side door shall be 0-0.5 mm, the lock shall work flexibly and the side door shall not shake forwards and backwards.

3.12.2 Adjusting gap between fan and fan shroud



1.) Radiator assembly 2. Rubber plate 3. Fastener 4. Plate

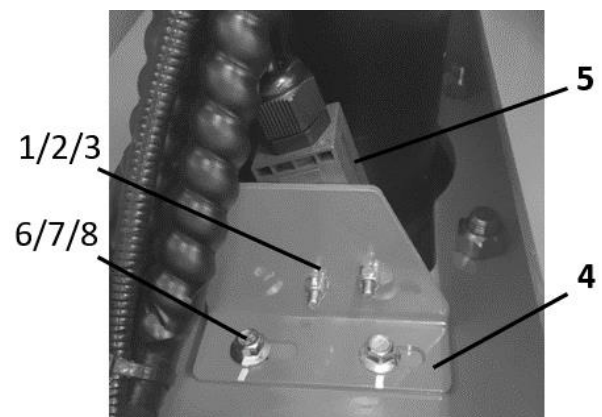
1) Install the part 4 on the part 2, flatten the part 2, and install the part 1 on the part 4 with the part 3;



5. Washer 6. Fastener

- 2) Install the part 5 to the engine platform;
- 3) Adjust the radiator assembly to ensure that the gap between the engine fan and the fan shroud is 15 ± 5 mm and the transverse gap between the outermost end of the fan and the outermost end of the guard net is 24 ± 6 mm;
- 4) The longitudinal distance between the round housing of the radiator and the fan may be adjusted by adding washers; after the adjustment, there shall be no interference between the radiator cap and the cover and the radiator cap can be opened smoothly.

3.12.3 Adjusting the outrigger travel switch

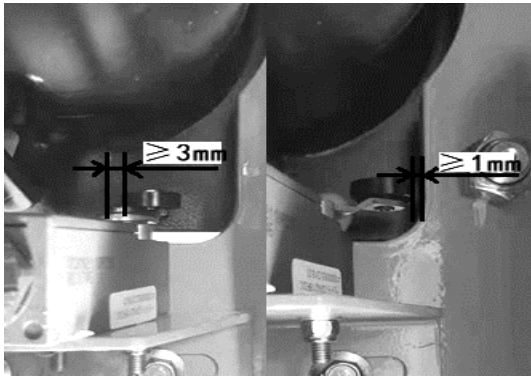


1. Screw 2. Washer 3. Nut 4. Plate

5. Travel switch 6. Screw 7. Nut 8. Washer

- 1) Install the part 5 to the part 4 with the fastener, and install washers on both sides;
- 2) Install the plate assembly to the support

beam with parts 6/7/8;



- 3) To adjust the position of the travel switch mounting plate, the following conditions must be met:
 - a) The distance between the edge of the travel switch contact roller and the groove of the outrigger cylinder is $\geq 3\text{mm}$;
 - b) Pull up the travel switch contact by hand to ensure the gap between the contact roller and the support beam is not less than 1 mm and ensure that there is no interference.

3.13 Machine Adjustment

3.13.1 Calibration of Platform Overload System

Under no-load state

- 1) Turn on the emergency stop switch of the platform and ground controllers, press the up and down buttons with both hands simultaneously, and turn the key to the ground control position.
- 2) Press the up button until the display shows Calibrate Mode, press the enable button to access the Set Height Limit screen.
- 3) Press the down button until the display shows Calibrate Empty Load.
- 4) After entering Calibrate Empty Load mode, press the start switch to start the engine.
- 5) Press the enable button to access the no-load calibration of the machine.

Rated load 680Kg

- 1) Turn on the emergency stop switch of the platform and ground controllers, press the up and down buttons with both hands simultaneously, and turn the key to the ground control position.
- 2) Press the up button until the display shows Calibrate Mode, press the enable button to access the Set Height Limit screen.
- 3) Press the down button until the display shows Calibrate Full Load.
- 4) After entering Calibrate Full Load mode, press the start switch to start the engine.
- 5) Press the enable button to access the load calibration of the machine.

Enabling of platform overload

- 1) After the full load calibration is completed, turn on the emergency stop switch of the ground and platform controllers, turn the key to the neutral position, press the up and down buttons on the ground control panel, and meanwhile turn the start switch to the ground control position to allow the system to enter the parameter setting mode.
- 2) Then press the up or down button until the LCD window displays Select Options.
- 3) Press the enable button to access the Select Options screen, and press the up and down buttons to adjust the options, and then press the enable button to enter the PLAT OVERLOAD ON mode.
- 4) Select ON mode by operating the enable button to enable the overload function.

Setting of platform overload parameter

- 1) Turn on the emergency stop switches of the ground and platform controllers, turn the key to the neutral position, press the up and down buttons on the ground control panel, and meanwhile turn the start switch to the ground control position to allow the system

to enter the parameter setting mode.

- 2) Then press the up or down button until the LCD window displays Select Options.
- 3) Press the enable button to access the Select Options screen, and press the up and down buttons to adjust the options, and then press the enable button to enter the OL Threshold mode.
- 4) Press the up and down buttons to adjust the parameter value so that it meets the requirements that no alarm is sounded during lifting when the load reaches to the rated value, and an alarm is sounded if the load reaches the 1.2 times rated value. If it does not meet the requirements, it is necessary to adjust it in time until it is requirements-compliant.

Resume of platform overload

- 1) Turn on the emergency stop switches of the ground and platform controllers, turn the key to the neutral position, press the up and down buttons on the ground control panel, and meanwhile turn the start switch to the ground control position to allow the system to enter the machine setting mode.
- 2) Select the setting function to access the setting screen, and operate the up and down buttons to find the overload function option;
- 3) After the overload function screen is displayed, press and hold the lift function button for 5S until the password screen appears;
- 4) Press the lift function button down and up to eliminate overload until the screen displays overload clear, and in this case, return to the main menu, and complete overload information clear.

3.13.2 Outrigger Leveling

Outrigger test: Turn the start switch to the platform control position, start the engine, press

and hold the outrigger selection button, and meanwhile, toggle the Hall switch (forward to retract the outrigger and backward to extend the outrigger). After the outrigger is firmly on the ground, the button indicator is on.

Auto leveling: Turn the start switch to the platform control position, start the engine, press and hold the AUTO LEVEL button, and meanwhile, move the platform control handle (forward to retract the outrigger and backward to extend the outrigger). After leveling, the 4 indicators on the outrigger buttons are on.

Criteria for control:The outriggers can extend and retract smoothly, the fork frame can be lifted and lowered smoothly, and the platform can extend and retract smoothly without abnormal noise.

3.13.3 Adjustment of No-load Lifting Time

Adjustment of lifting speed parameter

- 1) With the machine to be tested off, turn on the emergency stop switch of the ground and platform controllers, press the up and down buttons on the ground control panel, turn the key to the neutral position, and meanwhile turn the start switch to the ground control position to allow the system to enter the machine setting mode and the display to show: "Tune Speeds"
- 2) Press the enable button to enter the speed adjustment mode, and in this mode, the display shows MAX FWD HIGHT SPEED DRIVE; press the down button so that the display shows: "Max Lift Speed" Press the enable switch to enter;
- 3) Enter the maximum platform lifting speed adjustment mode, press the up button to increase the drive speed and the down button to decrease the drive speed;
- 4) Press the enable button to start to set the

speed value.

Adjustment of lifting speed parameter

- 1) With the machine to be tested off, turn on the emergency stop switch of the ground and platform controller, press the up and down buttons on the ground control, turn the key to the neutral position, and meanwhile turn the start switch to the ground control position to allow the system to enter the machine setting mode and the display to show: "Tune Speeds";
- 2) Press the enable button to enter the speed adjustment mode, and in this mode, the display shows MAX FWD HIGHT SPEED DRIVE; press the down button so that the display shows: "Max Descent Speed", Press the enable switch to enter;
- 3) Enter the maximum platform lowering speed adjustment mode, press the up button to increase the drive speed and the down button to decrease the drive speed;
- 4) Press the enable button to start to set the speed value.

3.13.4 Adjustment of No-load Speed

Adjustment of maximum forward speed (stowed)

- 1) With the machine to be tested off, turn on the emergency stop switch of the ground and platform controller, press the up and down buttons on the ground control, turn the key to the neutral position, and meanwhile turn the start switch to the ground control position to allow the system to enter the machine setting mode and the display to show: "Tune Speeds".
- 2) Press the enable button to enter the speed adjustment mode, and in this mode, the display shows: "Max Fwd High Speed Drive".
- 3) Enter the maximum current forward speed adjustment mode, press the up button to

increase the drive speed and the down button to decrease the drive speed;

- 4) Press the enable button to start to set the speed value.

Adjustment of maximum reverse speed (stowed)

- 1) With the machine to be tested off, turn on the emergency stop switch of the ground and platform controller, press the up and down buttons on the ground control, turn the key to the neutral position, and meanwhile turn the start switch to the ground control position to allow the system to enter the machine setting mode and the display to show: "Tune Speeds".
- 2) Press the enable button to enter the speed adjustment mode, and in this mode, the display shows: "Max Rev High Speed Drive".
- 3) Enter the maximum current reverse speed adjustment mode, press the up button to increase the drive speed and the down button to decrease the drive speed;
- 4) Press the enable button to start to set the speed value.

Adjustment of low forward speed (lifted)

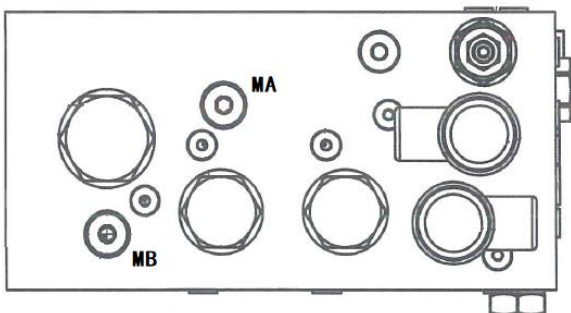
- 1) With the machine to be tested off, turn on the emergency stop switch of the ground and platform controller, press the up and down buttons on the ground control, turn the key to the neutral position, and meanwhile turn the start switch to the ground control position to allow the system to enter the machine setting mode and the display to show: "Tune Speeds".
- 2) Press the enable button to enter the speed adjustment mode, and in this mode, the display shows MAX FWD HIGHT SPEED DRIVE; press the down button so that the display shows: "Max Fwd Raised Drive Speed", Press the enable switch to enter;

- 3) Enter the maximum lifted forward speed adjustment mode, press the up button to increase the drive speed and the down button to decrease the drive speed;
- 4) Press the enable button to start to set the speed value.

Adjustment of minimum reverse speed (lifted)

- 1) With the machine to be tested off, turn on the emergency stop switch of the ground and platform controller, press the up and down buttons on the ground control, turn the key to the neutral position, and meanwhile turn the start switch to the ground control position to allow the system to enter the machine setting mode and the display to show: "Tune Speeds".
- 2) Press the enable button to enter the speed adjustment mode, and in this mode, the display shows MAX FWD HIGHT SPEED DRIVE; press the down button so that the display shows:"Max Fwd Raised Drive Speed", Press the enable switch to enter;
- 3) Enter the maximum lifted reverse speed adjustment mode, press the up button to increase the drive speed and the down button to decrease the drive speed;
- 4) Press the enable button to start to set the speed value.

3.13.5 Relief Pressure Test (Travel System)



- 1) Remove the walking control valves "MA" and "MB";

- 2) Connect the pressure gauge to the pressure tap;
- 3) Couple the machine to the ground hook, build up the pressure during forward or backward running until the pressure gauge indicates the maximum value and maintain the pressure for 5 s. At this time, the indication of the gauge is the walking pressure. Record the pressure;

Target walking relief pressure:28±1.5MPa;

Equipment and tools: pressure gauge, Allen wrench.

3.13.6 Relief Pressure Test (Lift System)

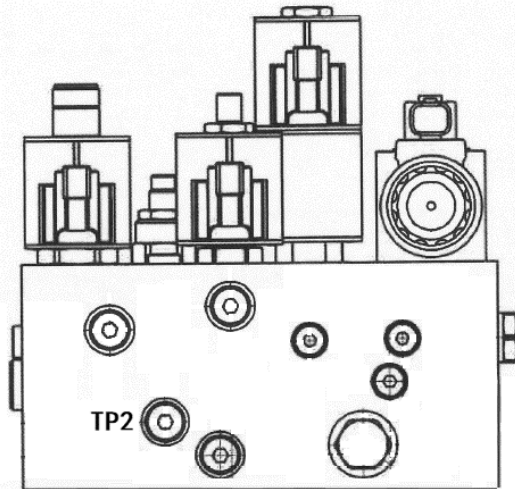
- 1) After measuring the system relief pressure, measure the lift relief pressure with the same pressure gauge;
- 2) Lift the machine to the limit height, observe the lift pressure until the pressure gauge indicates the maximum value, and maintain the pressure for 5 s. At this time, the indication of the gauge is the lift relief pressure. Record the pressure;

Target walking relief pressure:21±1.5(Mpa);

- 3) In case of inconsistency with the target value, do correction as follows:
 - a) Unscrew the fastening nut of the lift relief valve, and rotate the valve spool clockwise or counterclockwise with the Allen wrench to increase or decrease the pressure as appropriate until the pressure is consistent with the target value;
 - b) Keep the position of the Allen wrench unchanged, and tighten the fastening nut of the lift relief valve; restore the rocker arm to the normal position.
- 4) After the measurement, remove the tee and restore the pipe to its original state.

Equipment and tools: pressure gauge, Allen wrench

3.13.7 Relief Pressure Test (Steering)



- 1) Remove the plug at port TP2 of the lift control valve, install the pressure tap and connect it to the pressure gauge.
- 2) Turn the steered wheel to the left and right limit positions respectively, observe the steering pressure until the pressure gauge indicates the maximum value, and maintain the pressure for 5 s. At this time, the indication of the gauge is the steering relief pressure. Record the pressure;

Target steering relief pressure: 13.8±1.5 (Mpa);

- 3) In case of inconsistency with the target value, do correction as follows:
 - a) Unscrew the fastening nut of the system relief valve, and rotate the valve spool clockwise or counterclockwise with the Allen wrench to increase or decrease the pressure as appropriate until the pressure is consistent with the target value;
 - b) Keep the position of the Allen wrench unchanged, and tighten the fastening nut of the steering relief valve;
- 4) After the measurement, remove the pressure tap and install the plug.

Equipment and tools: pressure gauge, Allen

wrench

3.13.8 Calibration Test

Inclination calibration:

- 1) Run the machine to the absolute level platform;
- 2) Adjustment method:
 - a) Park the machine on the absolute level platform;
 - b) Press and hold the inclination switch reset button for about 7 s until the green indicator flashes. Then release the reset button and tap it three times continuously. At that time, the indicator will flash and then stay on, indicating that the calibration of inclination switch is finished;

Outrigger leveling

- 3) After the inclination calibration, place the machine on the absolute level platform again.
- 4) Adjusting method:
 - a) Press the emergency stop button of the platform control unit. Press and hold "AUTOLEVEL" and the outrigger extend button at the upper left corner at the same time.
 - b) Pull up the emergency stop button of the platform control unit until the buzzer sounds, indicating successful calibration.

Adjustment of level meter

- 1) After the outrigger leveling, place the machine on the absolute level platform again.
- 2) Adjustment method:
 - a) Adjust the three circled mounting points shown in the above figure with the Torx screwdriver and the open-end wrench to place the bubble of the level meter in the center, and then tighten

the fixing nut.

Note: The tighter the nut, the higher the spring compression, and the closer the bubble will be to the screw.

Equipment and tools: Torx screwdriver and open-end wrench 7

Inclination test (3° fore-and-aft)

- 1) Move the machine forwards and backwards to a 3° slope separately, ensuring the machine is completely on the slope;
- 2) Lift the fork, and test if the buzzer sounds. The inclination is conforming if the buzzer sounds; otherwise, the chassis inclination switch needs to be adjusted; refer to the calibration test (inclination calibration) for adjustment method.

Note: After the adjustment of the inclination switch, both the fore-and-aft inclination and the left-and-right inclination need to be tested again.

Inclination test (2° left-and-right)

- 1) Move the left and right wheels of the machine to the “single-sided axle” separately, ensuring one wheel is completely on the axle and the other on the level ground;

Target left-and-right inclination: 2°;

- 2) Lift the fork, and test if the buzzer sounds. The inclination is conforming if the buzzer sounds; otherwise, the chassis inclination switch needs to be adjusted; refer to the calibration test (inclination calibration) for adjustment method.

Note: After the adjustment of the inclination switch, both the fore-and-aft inclination and the left-and-right inclination need to be tested again;

3.13.9 Test of High-speed Traveling Time (No-load)

- 1) Turn the key switch to the PCU mode, start

the engine, and enable the high speed mode (the button indicator light is on).

- 2) Drive the machine to the test road at high speed;
 - a) Start timing when the center of front wheels of the machine crosses the first clearance line of the concrete ground, and stop timing when the center of front wheels of the machine crosses the finish line, i.e. record the time for the trolley to travel through the test road for a total of 50m.

Target value: 6.1±0.2km/h, i.e. 30±3(s);

CAUTION: Before walking, the machine shall be adjusted properly so that it can travel on a straight line; attention shall be paid to the driving safety;

- 3) After the forward walking test, the reverse walking speed test shall be carried out in the same way by adopting the same test method and criteria;

3.13.10 Test of Lifting and Traveling Speed (No-load)

- 1) Turn the key switch to the PCU mode, start the engine, and enable the low speed mode.
- 2) Drive the machine to the test road at low speed;
 - b) c. Start timing when the center of front wheels of the machine crosses the first clearance line of the concrete ground, and stop timing when the center of front wheels of the machine crosses the finish line, i.e. record the time for the trolley to travel through the test road for a total of 50m.

Target value: 1.1±0.1km/h, i.e. 165±15(s);

CAUTION: The machine under test shall be kept in the no-load state, with the fork retracted;

Before walking, the machine shall be adjusted properly so that it can travel on a straight line; attention shall be paid to the driving safety;

- 3) After the forward walking test, the reverse walking speed test shall be carried out in the same way by adopting the same test method and criteria;

3.13.11 Test of Lifting Time (No-load)

Lifting time

- 1) Move the machine under test to a flat ground, extend and level the platform outriggers, press the enable switch and UP switch in the GCU mode to lift the platform, and press the stopwatch switch to start timing. When the platform is lifted to the highest point, release the platform UP switch, and press the stopwatch switch again to stop timing. The value displayed on the timestopwatch is the lifting time; repeat the above steps twice;

SR3390D Target value: 45±5(s);

SR4390D/SR5390D Target value: 55±5(s);

CAUTION: If the time requirement isn't satisfied, the parameters shall be adjusted according to the parameter adjustment procedure until the requirement is satisfied.

3.14 Basic Function Test

3.14.1 Start/stop Test

GCU mode

- 1) Turn the key to the GCU mode, and pull up the emergency stop button. In this case, the GCU LCD screen will display System Ready;
- 2) Press and hold the ignition button on the GCU panel. When hearing the engine startup sound, release the ignition button after 3s, and the machine will be started;
- 3) Press the emergency stop button or turn

the key switch to the neutral position, and the engine will be shut down.

PCU mode

- 1) Turn the key to the PCU mode, and press the emergency stop buttons of PCU and GCU. In this case, the GCU LCD screen will display System Ready;
- 2) Press and hold the ignition button on the PCU panel. When hearing the engine startup sound, release the ignition button after 3s, and the machine will be started;
- 3) Press the emergency stop button, and the engine will be shut down.

3.14.2 Lifting/Lowering Function Test

- 1) Start the engine, and operate the control panel. Do not press the lift switch, instead, press and hold the platform UP switch;

Control criteria: The platform isn't lifted.

- 2) Press and hold the lift switch and the platform UP switch;

Control criteria: The platform is lifted.

- 3) Press and hold the lift switch and the platform DOWN switch;

Control criteria: The platform is lowered, and the lowering alarm sounds.

Use PCU.

- 1) Turn on the lifting joystick switch as indicated by the blue arrow;

Control criteria: The platform isn't lifted.

- 2) Press and hold the lift switch, and turn on the lifting joystick switch as indicated by the blue arrow;

Control criteria: The platform is lifted.

- 3) Press and hold the lift switch, and turn on the lowering joystick switch as indicated by the yellow arrow;

Control criteria: The platform is lowered, and the lowering alarm sounds.

3.14.3 Steering Test

- 1) Press and hold the joystick function enable

switch;

- 2) Operate the thumb joystick switch on the top of the joystick as indicated by the blue arrow on the control panel;

Control criteria: The steered wheel rotates as indicated by the blue arrow on the control panel.

- 3) Operate the thumb joystick switch on the top of the joystick as indicated by the yellow arrow on the control panel;

Control criteria: The steered wheel rotates as indicated by the yellow arrow on the control panel.

CAUTION: The tester shall stand in the middle of the platform and face toward the steering end of the machine under test.

3.14.4 Horn Test

- 1) Press the horn switch of PCU.

Control criteria: The horn sounds.

3.14.5 Test of Driving and Braking Function

- 1) Press and hold the joystick function enable switch;
- 2) As indicated by the blue arrow on the control panel, slowly move the joystick until the machine under test starts to travel, and return the joystick to the center;

Control criteria: The machine under test travels as indicated by the blue arrow and stops immediately.

- 3) As indicated by the yellow arrow on the control panel, slowly move the joystick until the machine under test starts to travel, and return the joystick to the center;

Control criteria: The machine under test travels as indicated by the yellow arrow and stops immediately.

CAUTION: The machine under test shall be able to stop steadily on any slope climbed by it.

3.14.6 Test of Driving and Braking on Slope

- 1) Carry out the gradeability test on the gradeability test platform with a gradient of 40% twice in the forward and reverse directions respectively;

Control criteria: Both front and rear wheels can climb the slope;

- 2) 2. Stop the machine on the gradeability test platform with a gradient of 40%

Control criteria: The machine doesn't slip.

CAUTION: Due to the limited space near the gradeability test platform, the speed shall be controlled when the machine travels; the trolley under test shall be kept in the no-load state, with the fork retracted;

Adjusting the maximum forward walking speed under the high torque condition

- 1) Shut down the machine, turn on the emergency stop buttons of PCU and GCU, press and hold the UP and DOWN switches of GCU, and turn the key switch to the GCU mode. In this case, the parameter configuration mode of the system is activated, and the following content is shown on the display screen: "Tune Speeds";
- 2) Press the enable switch to activate the speed adjustment mode. After MAX FWD HIGHT SPEED DRIVE is shown on the display screen, press the DOWN switch. In this case, the following content is shown on the display screen: "MAX FWD HIGHT SPEED DRIVE" Press the enable switch to activate the mode.
- 3) Activate the mode of adjustment of the maximum forward walking speed under the high torque condition, press the UP switch to increase the drive speed, and press the DOWN switch to reduce the drive speed;

- 4) Press the enable switch to set the speed.

Adjusting the maximum reverse walking speed under the high torque condition:

- 1) Shut down the machine, turn on the emergency stop buttons of PCU and GCU, press and hold the UP and DOWN switches of GCU, and turn the key switch to the GCU mode. In this case, the parameter configuration mode of the system is activated, and the following content is shown on the display screen: "Tune Speeds"
- 2) Press the enable switch to activate the speed adjustment mode. After MAX FWD HIGH SPEED DRIVE is shown on the display screen, press the DOWN switch. In this case, the following content is shown on the display screen: "Max Rev High Torque Drive", Press the enable switch to activate the mode;
- 3) Activate the mode of adjustment of the maximum reverse walking speed under the high torque condition, press the UP switch to increase the drive speed, and press the DOWN switch to reduce the drive speed;
- 4) Press the enable switch to set the speed.

3.14.7 Load Test (Turning, Traveling, and Pressure Build-up While Lifting)

- 1) Disable the overload alarm function (which shall be re-enabled after the test), apply a load equal to 1.25 times the rated load to the machine, and place the machine on a flat concrete ground
- 2) Build up the pressure when turning leftward and rightward to the limit position respectively, and maintain it for 2min
- 3) Extend the outriggers, perform automatic leveling, build up the pressure during lifting to the limit position, and maintain it for 2min

- 4) Build up the pressure during walking, and maintain it for 2min

Criteria: All oil circuit systems are sealed properly, without oil leakage;

3.14.8 Load Test (Lifting in the load state)

- 1) Disable the overload alarm function (which shall be re-enabled after the test), apply a load equal to 1.25 times the rated load to the machine, and place the machine on a flat concrete ground.
- 2) Extend the outriggers, perform automatic leveling, and carry out the test of lifting in the load state. A lifting and lowering cycle indicates the completion of one test, and 10 lifting and lowering cycles shall be performed.

Criteria: There is no abnormal noise, jitter, impact, deformed or cracked structure during lifting and lowering; the hydraulic system is free of oil leakage during lifting;

3.14.9 Post-lifting Height Test

- 1) Extend one side of the extended platform, and ensure that the platform limiter locks the extended platform;
- 2) Lift the platform to the highest point and measure the distance from the ground to the bottom of the extended platform with a laser range finder;

SR3390D Test target value: 10 ±0.05m;

SR4390D Test target value: 13 ±0.05m;

SR4390D Test target value: 16 ±0.05m;

- 3) Instructions for use of the laser range finder:
 - a) Press the upper middle red (MEAS) button of the laser range finder, align the laser dot with the bottom surface of the extended platform, press the upper left blue (Timer) button of the laser

range finder, and press the red (MEAS) button again for 5s (adjustable). In this case, the height data is shown on the display screen;

Caution: The laser range finder shall be placed on a flat ground;

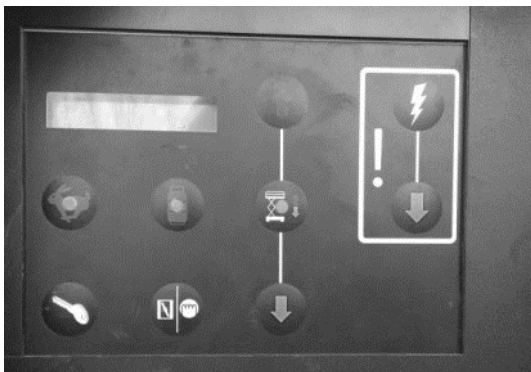
The platform test position shall be the steel plate on the bottom of the extended platform rather than the reinforcing rib;

4) The test height can be adjusted by adjusting the front and back positions of the upper limit travel switch until it meets the requirement

Equipment and tools: Laser range finder, Torx screwdriver

3.14.10 Emergency Lowering Test

1) After lifting the platform to the top position (16m), shut down the engine;



2) Turn on the emergency stop button, turn the key switch to the GCU mode (without starting the engine), and press the buttons in the white box simultaneously by hands as shown in the figure below:

Control criteria: The platform descends from a height of 16m to the lowest point under the dead load, and then the engine can be started normally.

3.14.11 Height Test While Traveling

1) Start the engine, lift the platform to a height of about (SR3390D : 10m , SR4390D/SR5390D: 8.5m) , and drive the

machine under test forward;

Control criteria: The machine cannot travel;

2) After lowering the outriggers and leveling the support, lift the platform;

Control criteria: SR3390D: 9.5-10m;

SR4390D/SR5390D: 8-8.5m;

3) otherwise it is necessary to add a gasket between the travel switch and the mounting plate until the standard height is reached; meanwhile, check the gap of the travel switch with a feeler gauge which shall be inserted;

Equipment and tools: Laser range finder.

3.14.12 Rated load test

- 1) Extend one side of the platform in place, place a counterweight (SR3390D: 870kg/SR4390D: 680kg/SR5390D: 450kg) on the main platform and a 230Kg counterweight on the extension platform;
- 2) b. Lift and lower the test machine fully for 3 times respectively, and conduct normal start and stop for 2-3 times in the process. And conduct platform extension operation.
- 3) Place the extension platform counterweight on the extension platform on the other side, and conduct the test specified in step 1; and record the data properly.

Control criteria: There is no abnormal noise, jitter, impact, deformed or cracked structure during lifting and lowering; the platform extends smoothly without abnormal noise.

3.14.13 Test with 1.25 times rated load

- 1) Extend one side of the platform in place, place a counterweight (SR3390D: 1044Kg/SR4390D: 816kg/SR5390D: 540kg) on the main platform and a 276Kg counterweight on the extension platform;
- 2) Lift and lower the test machine fully for 3 times respectively, and conduct normal

start and stop the platform extension/retraction for 2-3 times in the process.

- 3) Place the extension platform counterweight on the extension platform on the other side, and conduct the test specified in step 1; and record the data properly.

Control criteria: There is no abnormal noise, jitter, impact, deformed or cracked structure during lifting and lowering; the platform extends smoothly without abnormal noise, and the hydraulic system does not leak.

3.14.14 Test of Rated Load Settlement

- 1) After lifting the platform to any position, measure the settlement of the work platform within 20min after braking;
- 2) Measurement method: Measure the height of the platform before and after braking for 20min using a laser range finder, record the data properly, and calculate the difference;

Work platform settlement target value: $\leq 5\text{mm}$;

Equipment and tools: Laser range finder

3.14.15 Test of Outrigger Mechanism (No-load)

- 1) Drive the machine to a flat concrete ground, extend the outriggers, and perform automatic leveling;
- 2) Extend the two front or rear outriggers simultaneously until reaching the limit state, and maintain this state for half a minute;
- 3) After the two front or rear outriggers are extended until the limit state is reached, perform automatic leveling of the machine through PCU, and maintain this state for half a minute;
- 4) Inspection criteria:
 - a) The oil circuit system of the outrigger is sealed properly, without oil leakage;
 - b) The fastening bolts of the outrigger are

not loose, and the relevant parts of the outrigger such as the ball-head outrigger base are free of breakage, weld crack and other quality defects;

3.14.16 Floating Test

- 1) 1. Carry out the floating test, with the fork retracted and lifted respectively (lifted until the climbing indicator light is on):
- 2) 1. Make the four wheels cross the pit with a depth of 0.1m, during which one wheel falls into the pit while the others are placed on a flat ground.

Floating test criteria: The four wheels can touch the ground simultaneously after falling into the pit;

Chapter IV Maintenance

4.1 Compliance

- 1) The operator is only allowed to perform routine maintenance items as specified in this manual.
- 2) Regular maintenance inspections should be performed by qualified authorized service technicians as required by the manufacturer.

Maintenance Symbols

The following symbols are used in this manual to help convey relevant meanings in the instructions. When one or more symbols are shown at the first part of the maintenance program, the meanings expressed are as follows.



Indicates a tool required to carry out this procedure.



Indicates a new part required to carry out this procedure.



Indicates that the engine must be cooled down before carrying out this procedure.

4.2 Check for Operation and Safety Manual

It is required to keep the Operation and Safety Manual in good condition for safe operation. The manual and shall be stored in the manual storage box provided in the work platform. An illegible or missing manual is unable to provide necessary safety and operation information for safe operation.

- 1) Confirm that the storage container is present and in a good condition.

- 2) Confirm both the responsibility manual and safety manual are in the storage container within the work platform by the operator.
- 3) Check each page of the manual to be legible and in good condition.
- 4) Put the manual into the file storage box after use.



If the manual needs to be replaced,

please contact the service staff of LGMG North America.

4.3 Check for Decals and Warning Labels

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

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

Check for legibility and damage of all the decals and immediately replace any damaged or illegible decal.

If the decals need to be replaced, please contact the service staff of LGMG North America.

4.4 Check for Damaged, Loose, or Missing Parts

This step is performed every 8 hours or daily, 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, wiring and cables
 - Hydraulic hoses, connectors, valve blocks and hydraulic cylinders
 - Fuel and hydraulic tanks
 - Wear pads
 - Tires and wheels
 - Engine and related components
 - Limit switches and horn
 - Nuts, bolts, and other fasteners
 - Platform extension components
 - Platform entrance door
 - Indicators and alarms
 - Safety arm
 - Scissors arms pin and fastener
 - Platform control handle
 - Outrigger cover and foot pad
- 2) Check the entire machine for:
 - Cracks in welds or structural components
 - Whether the platform, scissors, and chassis are deformed or have cracked weld joints.
 - Damage to the machine
 - Ensure all structural components and other key components are complete and all relevant fasteners and pins are in the correct position and properly tightened.
 - Ensure the guardrail has been installed, and guardrail bolts have been properly installed and tightened.



Notice: If the platform must be raised to check the machine, ensure the safety arm is in the correct position. See the "Operation Instructions" section.

4.5 Checking Platform Control

Station and Ground Control Station

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

The functions of the test equipment and the red emergency shutdown switch are required for safe operation of the platform. If there is an unsafe working condition or any normal operation failure, the red emergency shutdown switch will disable all functions and shut down the engine. Each function shall be enabled for smooth operation without any pause, jitter or abnormal noise.

- 1) Pull out the red emergency shutdown switches on the Ground Control Station and Platform Control Station.
- 2) Turn the key switch to Ground Control Station. Start the engine.
- 3) Try to operate each function switch without using the enabling switch.

Result: No functions should operate.

- 4) Press and hold the enabling switch and activate each function switch.

Result: All functions should operate. The alarm shall sound when the platform lowers.

- 5) Push the red emergency shutdown switch button on the Ground Control Station to the "Off" position.

Result: The engine will be shut down and all functions will be disabled.

- 6) Turn the key switch to the platform control unit, and pull out the red emergency shutdown switch to the "On" position on the Ground Control Station.

- 7) Start the engine from the work platform.
- 8) Try to perform all platform functions without using the function enable switch.

Result: No functions should operate.

- 9) Press and hold the function enabling switch.

Try to perform all platform functions.

Result: All functions should operate.

- 10) Push the red emergency shutdown switch button at the Platform Control Station to the "Off" position.

Result: The engine will be shut down and all functions will be disabled.

4.6 Checking the Wiring

- 1) This check should be performed every 250 h or quarterly, whichever comes first..
- 2) Keeping the wiring in good condition is critical for safe operation and good performance of the platform. Failure to find and replace burned, scratched, corroded, or bent wires will result in unsafe operating conditions or even cause damage to platform parts.

Electric Shock/Explosion Hazards



Danger: Thermal contact or live conductors may lead to serious accidents. Do not wear rings, watches or other jewelry.

- 1) Check if the ground wires under the chassis are missing or damaged.
- 2) Check the following areas for wires burned, scratched, corroded, bent or loosened:
 - Interior of Ground Control Station box
 - Hydraulic valve group wiring
 - Battery Wirings
 - Interior of Platform Control Station box
- 3) Turn the key switch to the platform control station position and pull out the red emergency shutdown switches on the Ground Control Station and Platform Control Station.
- 4) Raise the platform to a height about 4

m/13.1ft off of the ground.

- 5) Lift the safety arm and move it to the middle of scissors axle sleeve, rotate it upward until it is vertical.
- 6) Lower the platform height until the safety arm contacts the axle sleeve completely.

Crushing Hazards



Warning: When the platform is lowered, make sure the operator's hand is not between the scissors.

- 1) Check the chassis and scissors area for burned, scratched, corroded, bent, or loosened wiring:
 - 2) Check the following areas for burned, scratched, corroded, bent, or loosened wiring:
 - Scissor arm wiring harness
 - ECU to platform harness
 - Harness connectors connected to the platform
 - 3) Check the free coating of insulating oil in the following locations:
 - Harness connectors connecting the ECU with PCU
 - Level sensors
 - All wire harness connectors
 - 4) Ascend the platform and restore the safety arm to the installation position.
 - 5) Shut down the machine after descending the platform to the folding position.

4.7 Checking the Batteries



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

Check the color of the battery hydrometer as shown in the figure:



Figure 1-1 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

- 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.

4.8 Checking Tires and Hubs

This check item is conducted every 200 hours or every two months, 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 sealing screws for tires are loose. If there is loosening of screws, and there is slight or no leakage of fillers, and no significant deformation is found for the tire body, screws which are slightly larger than the diameter (about 5mm) of the vent hole can be installed 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 immediately.

- 4) Check for nut torque of tires: $305 \pm 25 \text{N.m}$

4.9 Checking the Hydraulic Oil Tank Breather


- 1) This check item shall be conducted every 250 hours or quarterly, whichever comes first.
- 2) An unobstructed hydraulic oil tank breather is essential for good mechanical performance and long service life of the platform. A dirty or clogged breather may result in poor platform performance. More frequent checks are required for a harsh working environment.

① Remove the exhaust cover from the hydraulic oil tank cap.

② Check for ventilation.

Result: Air can pass through the breather.

Result: If air does not pass through the breather, clean or replace the exhaust cover. Continue with Step 3.

 **Notice: Air is supposed to pass freely while checking ventilation of the breather.**

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

④ Install the breather.

4.10 Checking for Hydraulic Oil Leakage

Check leakage every 8 hours or daily.

 **Danger of personal injury.**

Leaking hydraulic oil may penetrate and burn the skin.

Check for leakage of hydraulic oil, oil droplets or oil in the following areas:

All hydraulic cylinders.

Each valve element

Each oil pipe and connector

Driving motor

Drive hub

Filter

Hydraulic oil tank


Hydraulic pump

Under the chassis

Ground area under the platform.

4.11 Checking the Hydraulic Filter

Check or replace the hydraulic filter every 500 hours or six months, whichever comes first.

 **If the work environment is dusty, increase the maintenance interval.**

It is necessary to replace the hydraulic filter to maintain good machine performance and service life. Dirty or blocked filters may cause a decrease in machine performance and continuous use may result in damage to components.

 **Danger of personal injury.**

Be careful with hot oil. Contact could lead to severe burns.

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

Replacement of the Return Oil Filter Element of Hydraulic Oil Tank

- 1) This step shall be performed every 500 hours or half a year, whichever comes first.
- 2) It is crucial to replace the return oil filter

element for good performance and service life of the machine. Dirty or blocked filters may affect machine performance and continuous use will result in damage to components. The filter elements should be replaced more frequently under extremely dirty working condition.

Be careful: danger of scalding.

Watch out for hot oil. Contact with hot oil may cause severe burn.

- ① Remove the oil tank cover.
- ② Remove the filter element flange.
- ③ Pull the filter element out and install a new filter element.
- ④ Install flange and cover plate.
- ⑤ Make note of the replacement time and date on the filter element replacement table using a marker.
- ⑥ Turn the key switch to the Ground Control Station, and pull out the red emergency shutdown button on the Ground Control Station and Platform Control Station.
- ⑦ Press the lift function button.
- ⑧ Check the filter components for oil leakage.

Replacing the High-Pressure Filter Element

- 1) Place an appropriate container under the filter.
- 2) Remove the nuts at the bottom of the filter cover with a wrench and remove the filter cover.
- 3) Remove the filter element from the filter cover.
- 4) Check the seal of filter cover and replace if necessary.
- 5) Install the new high-pressure filter element and tighten.
- 6) Clean any oil spilled during installation.
- 7) Check the filter cover and the associated elements to ensure there is no leakage.

4.12 Replacing the Hydraulic Oil Tank Air Filter

Replace it every 500 hours or six months. If the work environment is extremely dirty, increase the service interval.



Perform this step when the engine is shut down.

- 1) Remove the filter element.
- 2) Scrub out the inside and tail cover of the tank with a piece of damp cloth.
- 3) Install a new air filter element.

4.13 Checking Hydraulic Oil Level

Check hydraulic oil level every 8 hours or daily.

It is crucial to keep the hydraulic oil at the proper oil level. If the oil is not at a proper level, damage to the hydraulic components will occur. Through routine inspection, the inspector can determine changes in the hydraulic oil level, which can indicate the problems in the hydraulic system.



Notice: Perform this procedure when the platform is in the stowed position and the engine is shut down.

- 1) Park the vehicle on flat ground and the platform is in the stowed position.
- 2) Check the oil level on the hydraulic oil tank gauge. With the machine in the stowed condition, the hydraulic oil level should be locked in the 1/2 - 2/3 of the liquid level meter (Short oil level gauge) or "LH" position of the liquid level meter (long oil level gauge), and fill the hydraulic oil if necessary.

Condition	Oil viscosity brand	Remark
-25℃ < The lowest temperature	L-HV 32 low temperature hydraulic oil	Chevron
-40℃ < The lowest temperature ≤ -25℃	L-HS 32 Ultralow temperature hydraulic oil	

The lowest
temperature $\leq -40^{\circ}\text{C}$

10# Aviation
hydraulic oil

4.14 Replacing the Hydraulic Oil

Replace the hydraulic oil every 2000 hours or two years, whichever comes first.



If the hydraulic oil is not replaced during the two-year inspection, send an oil sample to a qualified test lab quarterly. Replace it when the test is not satisfactory.



Perform this step when the machine is in the stowed position.



When removing the hose assembly or couplers, the O-rings or hose ends on the coupler must be replaced and tightened to the specified torque during installation.

Close the two ball valves located on the hydraulic oil tank (if equipped).



Hazard of damage to components.

Do not start the engine when the ball valve on the hydraulic oil tank is closed, otherwise components will be damaged. If the ball valve is closed, remove the key from the key switch and hang a warning sign on the equipment.

- 1) Remove the oil drain plug, ring magnet, and oil drain flange from the hydraulic oil tank.
- 2) Drain the hydraulic oil from the hydraulic oil tank into a suitable container.
- 3) Disconnect the hose connected to the oil tank. Cap or cover the hose coupler to prevent foreign matter from entering.
- 4) Remove the fasteners securing the hydraulic oil tank.
- 5) Remove the hydraulic oil tank from the machine.
- 6) Remove the suction filter from the hydraulic oil tank.

- 7) Flush the inside of hydraulic oil tank with mild solvent.
- 8) Clean the foreign material from the ring magnets.
- 9) Install a new filter screen.
- 10) Install the oil drain plug, ring magnet, and oil drain flange.
- 11) Install the hydraulic oil tank on the machine.
- 12) Install hose.
- 13) Fill the hydraulic oil to the hydraulic oil tank until the liquid level is locked in the 1/2 - 2/3 of the liquid level meter (Short oil level gauge) or "LH" position of the liquid level meter (long oil level gauge), and it is forbidden to overflow.
- 14) Clean any spilled hydraulic oil.
- 15) Open the ball valve on the hydraulic oil tank.



Danger of damage to components.

After installing the hydraulic oil tank, make sure to open the two ball valves and fill the hydraulic pump with oil.

- 16) Operate all machine functions through an entire cycle and check for oil leakage.
- 17) Recheck the liquid level of oil tank and refill it after a complete operating cycle.

4.15 Checking Oil Level in the Drive Hub

Perform this check every 250 hours or quarterly.

Incorrect oil level in the drive hub will lead to reduced equipment performance. Continuous use in this condition will result in damage to components.

- 1) Drive the machine until one drain plug is at the highest point.
- 2) Remove the other plug and check the oil level.

Result: The oil level shall be the same as the

bottom of the drain plug hole.

- 3) When required, remove the upper plug and add oil until the oil level is the same as the bottom of the lower plug hole.
- 4) Apply pipe thread sealant to the plug and install the plug in the reducer.
- 5) Repeat this step for each reducer.

Condition	Oil viscosity brand 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

4.16 Replacing Drive Hub Gear

Oil

Replace the oil after the first 50 hours of use, then every 1,000 hours or yearly.

It is necessary to replace the drive hub gear oil to maintain good equipment performance and service life. Failure to replace the oil every year may result in reduced equipment performance, and continuous use will result in damage to components.

- 1) Select the drive hub to be maintained, and drive the equipment until one plug is at the lowest point.
- 2) Remove the two plugs and drain the oil into the proper container.
- 3) Drive the machine until a plug is at the highest point.
- 4) Add oil from the hole at the high point until the oil level is the same as the hole at the bottom. Install the plugs.
- 5) Repeat this procedure for each reducer.

Condition	Oil viscosity brand 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
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4.17 Engine Maintenance –Deutz

4.17.1 Checking engine oil level



Do not perform maintenance on running engines!

No smoking and open flames!

Be careful when coming in contact with high temperature engine oil. There is a danger of scalding!



When maintaining the engine 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 drain 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.

- 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.


4.17.2 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 drain into the ground.**


 **Test run the engine after each procedure. Pay attention to engine oil pressure. Check for leaks and engine oil level after shutting down the engine. Check the engine oil level every 8 hours or daily.**


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), or the Sulphur content in the diesel fuel is 0.5 - 1%, 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**

Contact with high-temperature engine parts

and oil will cause severe burns.

 **Perform the following procedure after the engine is warmed up to normal operating temperature.**

 **After the filter element is replaced, be sure to keep the engine idling at a low speed for at least 3-5 minutes, so that the engine has been lubricated before being put into operation.**
Changing the Engine Oil

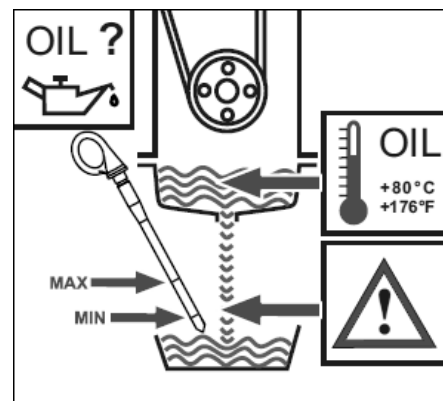


Figure 1-2

- 1) Place the machine on a level surface.
- 2) Warm up and run the engine (engine oil temperature $> 80^{\circ}\text{C}$).
- 3) Shut down the engine.
- 4) Place the container under the engine oil drain plug.
- 5) Remove the drain plug and drain the engine oil.
- 6) Install a new seal ring on the drain plug. Install the plug and tighten it.
- 7) Replace the engine oil filter. Refer to Replacing the Engine Oil Filter below.
- 8) Add new engine oil at the engine oil filler.
- 9) Warm up and run the engine (engine oil temperature $> 80^{\circ}\text{C}$).
- 10) Ensure the machine is on a level surface.
- 11) Check the engine oil level and add more if necessary.

Condition	Oil viscosity brand API CH-4
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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

Replacement of the engine oil filter

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

 **Never fill the filter in advance.**

There is risk of contamination.

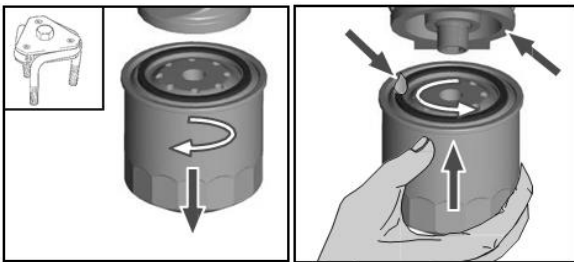


Figure 1-3

- 1) Place a proper container under the filter to catch draining oil.
- 2) If a torsion stopper is installed, remove the clamping clamp (optional).
- 3) Loosen and unscrew the filter element with a filter wrench.
- 4) Clean the sealing surface of the filter holder with a clean lint-free cloth.
- 5) Apply a thin layer of engine oil to the seal ring of the new filter.
- 6) Screw in a new filter hand tight and then tighten it to 10-12 Nm.
- 7) Install the clamping clamp of a torsion stopper (optional).

4.17.3 Checking for Fuel Leakage

 **The engine must be shut down!**


No smoking and open flames!


Be careful when contacting high temperature fuel!

Observe relevant local and safety

regulations for handling and disposing of fuel. Dispose of spilled fuel and filter elements in accordance with applicable regulations. The fuel must not penetrate into the ground.

Visually check for fuel leakage every 8 hours or daily.

 **There is danger of explosion and fire. Engine fuel is combustible. Check the location of the machine. When this step is performed, the machine shall be away from any heaters, sparks, open flames, and be in an open and well-ventilated area. A fire extinguisher certified for use on diesel fuel fires shall be placed in an easily accessible place.**

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

4.17.4 Draining the Fuel Pre-Filter

 **Risk of explosion and fire.**

Engine fuel is combustible. The location where the equipment is must be inspected. When this procedure is performed, equipment shall be located in an open and well-ventilated area, away from the heaters, sparks, and open flames. A qualified fire extinguisher shall be placed at the location that is easily accessible.

 **Perform this step when the engine is shut down.**

Check and drain the fuel filter every 8 hours or every day.

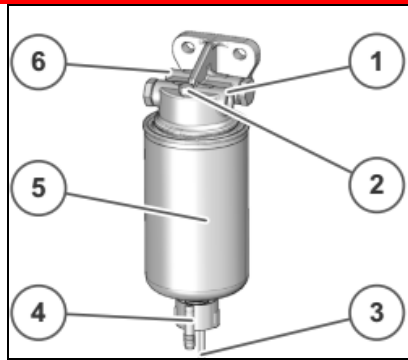


Figure 1-4

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 the wiring.
 - 3) Loosen the drain plug located at the bottom of the filter cartridge, draining any water into an appropriate container. Once fuel starts to flow out, tighten the drain plug immediately.
 - 4) Wipe up any fuel that may have spilled or splashed.
 - 5) Start the engine from the ground control and inspect for any leakage from the fuel filter.

Change the fuel pre-filter insert

- 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

- 1) The fuel system is vented via the electric fuel supply pump.
- 2) In order to ensure that no error messages are generated, no attempt should be made to start the system up whilst venting.
- 3) 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"
- 4) Repeat the process at least 2 times until the fuel system is vented



Risk of explosion and fire.

In the event of fuel leakage, prevent any unauthorized personnel from entering the area and prohibit any operation of the equipment. Repair the leak immediately.

4.17.5 Replacing the Fuel Filter



The engine must be shut down!

No smoking and open flames!

Be careful around high temperature fuel!



Do not loosen the fuel injection lines or high-pressure oil lines while the engine is running.



Carefully clean all areas around the fuel filter.



Observe relevant local and safety regulations for handling and disposing of fuel. Dispose of spilled fuel and filter elements in accordance with applicable

regulations. The fuel must not seep into the ground.

⚠ After completing any procedure on the fuel system, check for proper operation and any leakage. Replace the filter every 500 hours, or half a year. Replace the filter more frequently in the presence of an extremely dirty work environment.

⚠ There is danger of explosion and fire.

The engine fuel is combustible. Check the location of the machine.

When this step is performed, the machine shall be away from any heaters, sparks, open flames, and be in an open and well-ventilated area.

A certified fire extinguisher for extinguishing fuel fires must be easily accessible place.

⚠ Never fill the fuel filter in advance.

There is risk of contamination.

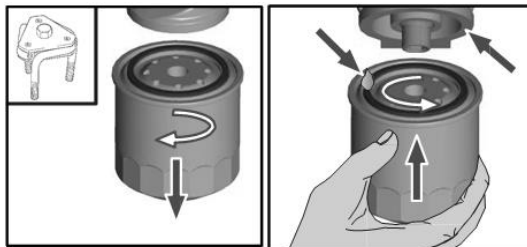


Figure 1-5

- 1) If a torsion stopper is installed, remove the clamping clamp (optional).
- 2) Unscrew the filter element with a filter wrench.
- 3) Use a proper container to catch any draining fuel.
- 4) Clean the sealing surface of the filter with a clean lint-free cloth.
- 5) Apply a thin layer of fuel to the seal ring of the new filter.
- 6) Screw in the new filter by hand until snug and then tighten to 10-12 Nm.
- 7) Fix the clamping clamp of a torsion stopper

(optional).

- 8) Bleed the fuel system.

4.17.6 Checking the Engine Air Filter

Check the maintenance indicator on the air filter every 8 hours or daily.

⚠ Perform this step when the engine is shut down.

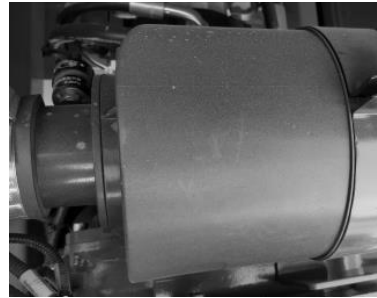


Figure 1-6

Check the maintenance indicator on the air filter. When the indicator is red, the filter element needs to be maintained and cleaned or replaced.

4.17.7 Cleaning or Replacing the Air Filter

Clean it every 250 hours or quarterly and replaced it for every 1000 hours.

⚠ 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.

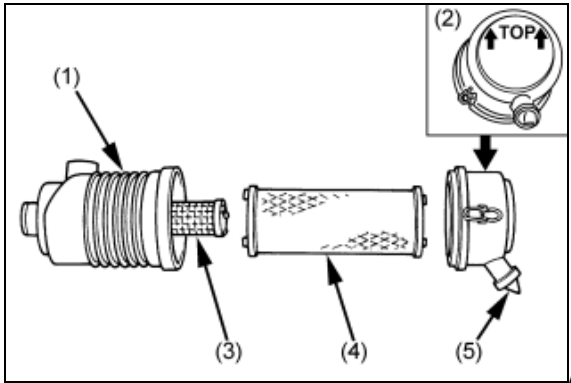


Figure 1-7

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);

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.

4.17.8 Checking Engine Coolant Level

Check the coolant liquid level every 8 hours or daily.

 **Engine coolant at high temperature**

can cause scalding.

The cooling system is under pressure! The cap can only be opened when cool.

Coolant must have the specified concentration of cooling system protectant! Observe all safety and local regulations for coolant.


Dispose of spilled coolant as specified. It must not penetrate into the ground.

Never run the engine without coolant, even for a very short time.

- 1) Carefully open the cap for the cooling system.
- 2) The coolant liquid level shall always be between min and max marks on the coolant reservoir. If necessary, fill to the maximum level.

4.17.9 Filling or Replacing Engine Coolant

Replace engine coolant every 2,000 hours or two years.

 **Engine Coolant at high temperature can cause scalding.**

The cooling system is under pressure! The cap can only be opened when cool.

The coolant must have a specified concentration of cooling system protectant!

Please observe all safety and local regulations for coolant disposal.

Dispose of the spilled coolant as specified. It must not penetrate the ground.

Never run the engine without coolant, even for a very short time..

Draining of the Cooling System

- 1) Carefully open the cap.
- 2) Place the drain container under the coolant drain.
- 3) Open the drain and drain the coolant from the radiator.
- 4) Close the radiator drain.
- 5) Install the coolant cap.

Filling of the Cooling System

- 1) Carefully open the cooling system cap.
- 2) Loosen the cooler exhaust bolts that may be present.
- 3) Fill the coolant to max level.
- 4) Close the cooler cap.
- 5) Run the engine to operating temperature.
- 6) Shut down the engine.
- 7) Check the coolant level when the engine is cooled, and fill it to max if necessary.

4.17.10 Checking the Engine Drive Belt

Check it every 8 hours or every day.



Only check the belt when the engine

is shut down.



There is danger of burns.

High-temperature engine components can cause serious burns.

Checking the Belt

- 1) Visually inspect all belt drives for damage.
- 2) Replace damaged belts.

- 3) Reinstall the protector if applicable.
- 4) With a new belt, ensure the position is correct. After 15 minutes of run time, check belt tension.

Replacing the Belt

Replace the belt every 2,000 hours or two years, whichever comes first.

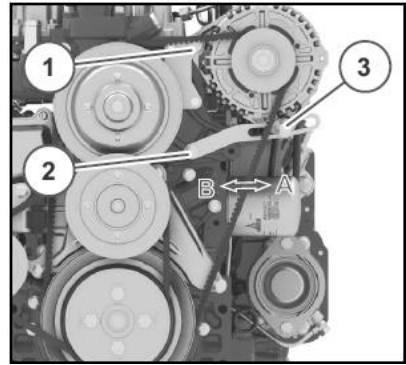


Figure 1-8

- 1) Loosen bolts (1,2,3).
- 2) Move the bolt (3) in direction B, until it is loose.
- 3) Remove the old belt, and install a new one.
- 4) Move the bolt (3) in direction A until the correct belt tension is reached.
- 5) Check the belt tension.
- 6) Tighten the bolts and nuts.

Tightening torque

Screw 1 42 Nm

Screw 2 30 Nm

Screw 3 M8 30 Nm

Screw 3 M10 42 Nm


4.18 Engine Maintenance -Kubota D1105/V2403


4.18.1 Checking Engine Oil Level




Do not perform maintenance on a running engine! No smoking or open fires are permitted! If the engine has been operated, the engine oil will be very hot and

there is a danger of scalding!

 When checking or changing engine oil, make sure all surrounding surfaces are clean.

 Observe safety regulations and relevant local regulations for engine oil. Dispose of spilled engine oil and filter elements as required. Waste oil must not drain into the ground.

 Test run the engine after each procedure. Pay attention to engine oil pressure. Check for leaks and engine oil level after shutting down the engine.

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 shut down. If the engine is hot, shut down the engine and check the engine oil level 5 minutes later. The oil can be checked immediately if the engine is cool.

Kubota-D1105:

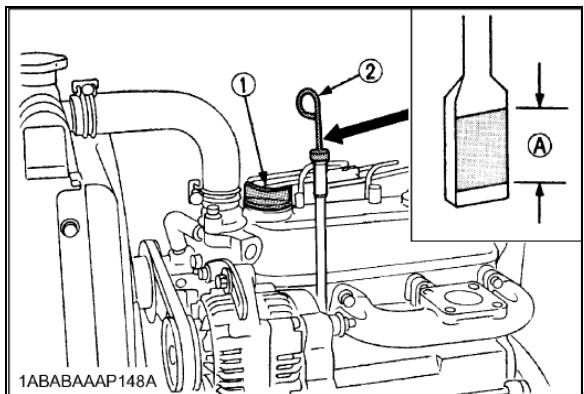


Figure 1-9

1. Oil fill plug
2. Oil measuring rod

Kubota-V2403:

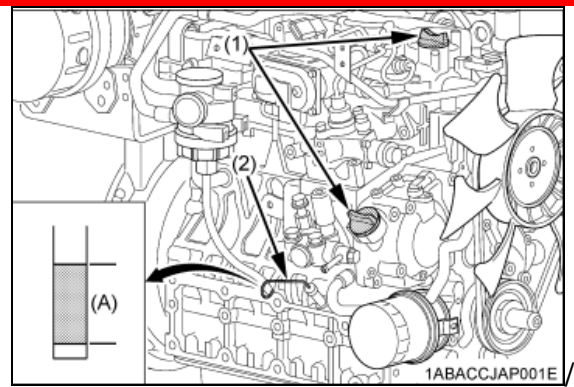





Figure 1-10

1. Oil measuring rod
 2. Oil filler plug
- 1) Pull out the engine dipstick and clean it with a clean, lint-free cloth.
 - 2) Fully insert the dipstick into the dipstick tube.
 - 3) Pull out the dipstick and read the engine oil level.
 - 4) The engine oil level shall always be between the MIN and MAX marks!
 - 5) If necessary, add oil up to the maximum level.

4.18.2 Changing the Engine Oil and Filter

 Do not perform maintenance on running engines! No smoking or open fires are permitted! If the engine has been operated, the engine oil will be very hot and there is a danger of scalding!

 When checking or changing engine oil, make sure all surrounding surfaces are clean.

 Observe safety regulations and relevant local regulations for engine oil. Dispose of spilled engine oil and filter elements as required. Waste oil must not drain into the ground.


 Test run the engine after each

procedure. Pay attention to engine oil pressure. Check for leaks and engine oil level after shutting down the engine.

It is available in the first 50 hours, and the engine oil and filter shall be replaced every 500 hours (Kubota-V2403-CR-E5) or half a year / every 200 hours (Kubota-D1105) or quarterly/. (If the ambient temperature continues to be below -10°C . (14°F) or the temperature of engine oil is below 60°C (84°F), or the Sulphur content in the diesel fuel is 0.5 - 1%, 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 Burns**

Contact with high-temperature engine parts and oil will cause severe burns.

 **Perform the following procedure after the engine is warmed up to normal operating temperature.**
Changing the Engine Oil

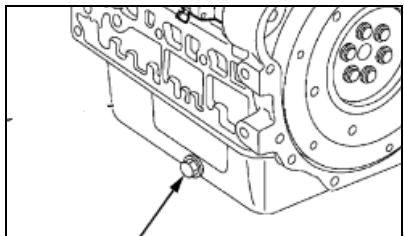


Figure 1-11

1. Oil drain plug

- 1) Place the machine on a level surface.
- 2) Warm the engine up to operating temperature.
- 3) Shut down the engine.
- 4) Place a proper container under the engine oil drain plug.
- 5) Remove the drain plug and drain the engine oil.
- 6) Install a new seal ring on the drain plug. Install the plug and tighten it.

- 7) Replace the engine oil filter. Refer to Replacing the Engine Oil Filter below.
- 8) Add new engine oil at the engine oil filler.
- 9) Warm up and run the engine.
- 10) Ensure the machine is on a level surface.
- 11) Wait for more than five minutes after filling the oil. Check the engine oil level and fill it if necessary.

Condition	Oil viscosity brand (D1105:API CH-4; V2403-CR-E5:API CJ-4)
Working temperature: $-20^{\circ}\text{C} \sim 40^{\circ}\text{C}$	15W-40
Working temperature: $-25^{\circ}\text{C} \sim 30^{\circ}\text{C}$	10W-30
Working temperature: $-30^{\circ}\text{C} \sim 30^{\circ}\text{C}$	5W-30
Working temperature: $-35^{\circ}\text{C} \sim 20^{\circ}\text{C}$	0W-20

Replacing the Engine Oil Filter

Kubota-D1105:

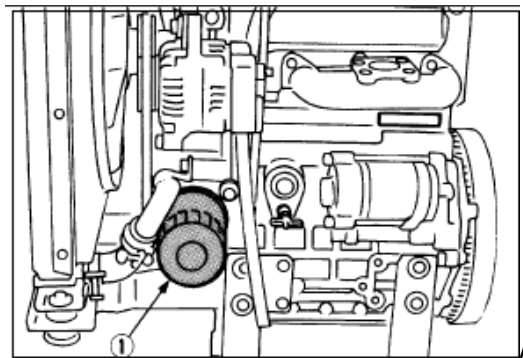


Figure 1-12

1. Oil filter

Kubota-V2403

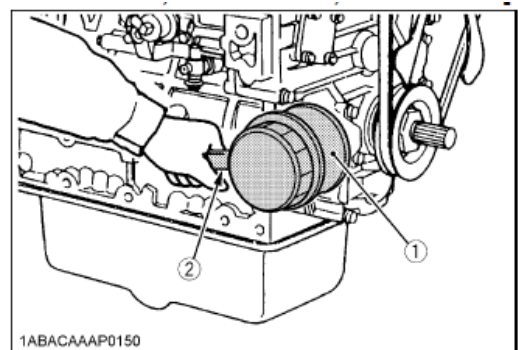


Figure 1-13

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


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

 **Never fill the filter in advance.**

There is risk of contamination.

- 1) Place a proper container under the filter to catch draining oil.
- 2) If a torsion stopper is installed, remove the clamping clamp (optional).
- 3) Loosen and unscrew the filter element with a filter wrench.
- 4) Clean the sealing surface of the filter holder with a clean lint-free cloth.
- 5) Apply a thin layer of engine oil to the seal ring of the new filter.
- 6) Screw in a new filter by hand until sealed.
- 7) Fix the clamping clamp of a torsion stopper (optional).

4.18.3 Checking for Fuel Leakage

 **The engine must be shut down!**

No smoking and open flames!

Be careful when around high temperature fuel!


Observe relevant local and safety regulations for handling and disposing of fuel. Dispose of spilled fuel and filter elements in accordance with applicable regulations. The fuel must not penetrate into the ground.

Visually check for fuel leakage every 8 hours or daily.

 **There is danger of explosion and fire.**

Engine fuel is combustible. Check the location of the machine. When this step is performed, the machine shall be away from any heaters, sparks, open flames, and be in an open and well-ventilated area. A fire extinguisher certified for use on diesel fuel fires shall be placed in an easily accessible

place.


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

4.18.4 Cleaning or Replacing the Fuel Filter


 **The engine must be shut down!**


No smoking and open flames!


Be careful when around high temperature fuel!

 **Do not loosen the injection lines or the high-pressure oil lines when the engine is running.**

 **Carefully clean all areas around the fuel filter.**

 **Observe relevant local and safety regulations for handling and disposing of fuel. Dispose of spilled fuel and filter elements in accordance with applicable regulations. The fuel must not seep into the ground.**

 **After completing any procedure on the fuel system, check for proper operation and any leakage.**

 **There is danger of explosion and fire.**
The engine fuel is combustible. Check the location of the machine. When this step is performed, the machine shall be away from any heaters, sparks, open flames, and be in an open and well-ventilated area.

A certified fire extinguisher for extinguishing fuel fires must be easily accessible place.

Kubota D1105

Clean the Fuel Pre-filter

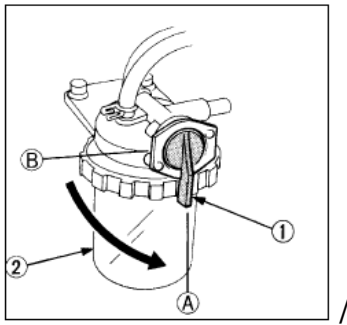


Figure 1-14

1. Fuel filter handle

2. Fuel filter pot

A: Open state

B: Close state

- 1) Clean the fuel filter after every 100 hours operation to prevent dust from entering.
- 2) Close the fuel filter handle.
- 3) Remove the top cover and clean the interior with clean diesel fuel.
- 4) Remove the filter and clean it with clean diesel fuel or replace it with a new one.
- 5) Apply a thin layer of diesel fuel to the seal ring of the new filter.
- 6) Reinstall the fuel filter.
- 7) Bleed the fuel system.

Replacement of fuel filter

- 1) It will be replaced every 400 hours, but an increase in the number of replacement filters is required for the extremely dirty work environment.
- 2) Apply a thin layer of diesel to the seal ring of the new filter and tight the filter manually.
- 3) Exhaust the fuel system.

Kubota V2403-CR (E5)

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.

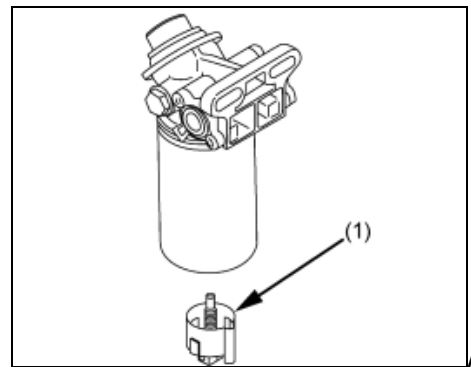


Figure 1-15

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.

Replacement of water separator filter

Replace the water separator filter with a new one every 500 hours.

- 7) Remove the old water separator filter with a

filter wrench.

- 8) Apply a film of oil to the gasket for the new water separator filter.
- 9) 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.


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.

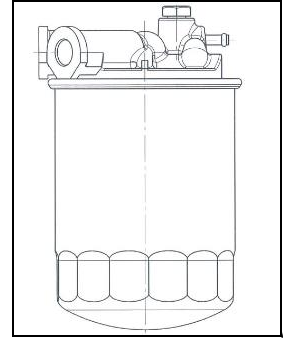


Figure 1-16

- 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.

4.18.5 Checking the Engine Air Filter

Check the maintenance indicator for the air filter every 8 hours or daily.

 **Perform this step when the engine is shut down.**

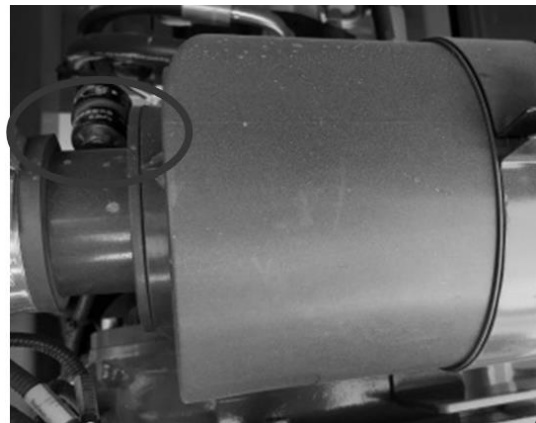


Figure 1-17

Check the maintenance indicator on the air filter. When the indicator is red, the filter element needs to be maintained and cleaned or replaced.

4.18.6 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.

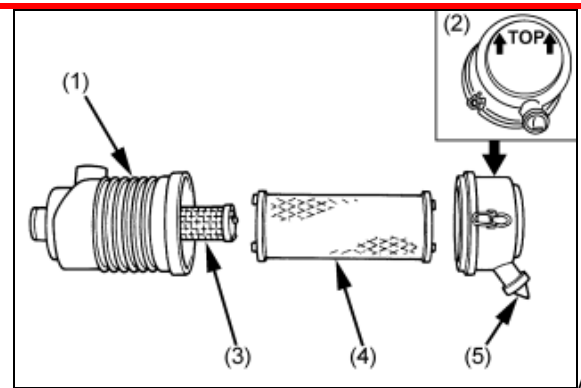


Figure 1-18

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);

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.

4.18.7 Checking Engine Coolant Level

Check the coolant liquid level every 8 hours or daily.

⚠ Engine coolant at high temperature can cause scalding.

The cooling system is under pressure! The cap can only be opened when cool.

Coolant must have the specified concentration of cooling system protectant! Observe all safety and local regulations for coolant.

Dispose of spilled coolant as specified. It must not penetrate into the ground.

Never run the engine without coolant, even for a very short time.

- 1) Carefully open the cap for the cooling system.
- 2) The coolant liquid level shall always be between min and max marks on the coolant reservoir. If necessary, fill to the maximum level.

4.18.8 Filling or Replacing Engine Coolant

Replace engine coolant every 2,000 hours or two years.

⚠ Engine Coolant at high temperature can cause scalding.

The cooling system is under pressure! The cap can only be opened when cool.

The coolant must have a specified concentration of cooling system protectant!

Observe all safety and local regulations for coolant disposal.

Dispose of the drained coolant as specified.

It must not seep into the ground.

Never run the engine without coolant, even for a very short time.

Draining of the Cooling System

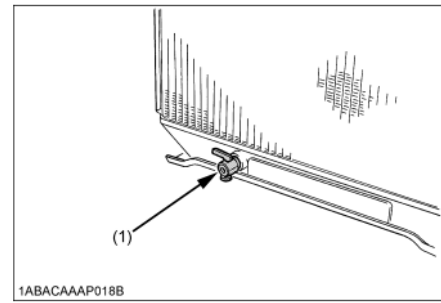


Figure 1-19

- 1) Carefully open the cap.
- 2) Place the drain container under the coolant drain.
- 3) Open the drain and drain the coolant from the radiator.
- 4) Close the radiator drain.
- 5) Install the coolant cap.

Filling the Cooling System

- 1) Carefully open the cooling system cap.
- 2) Loosen the cooler exhaust bolts that may be present.
- 3) Fill the coolant to max level.
- 4) Close the cooler cap.
- 5) Run the engine to operating temperature.
- 6) Shut down the engine.
- 7) Check the coolant level when the engine is cooled, and fill it to max if necessary.

4.18.9 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.

Adjustment of belt tension

D1105

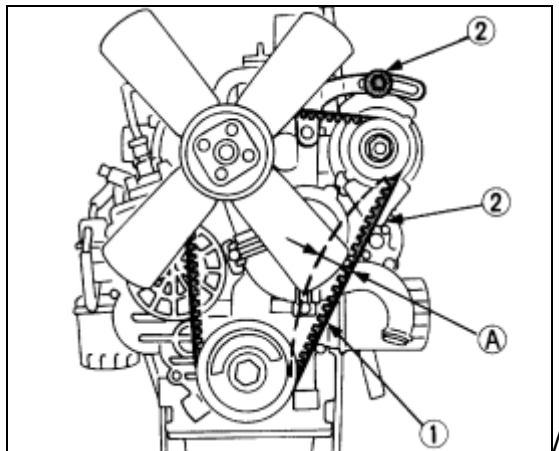


Figure 1-20

1. Fan belt
2. Bolt and nut

V2403-CR-E5

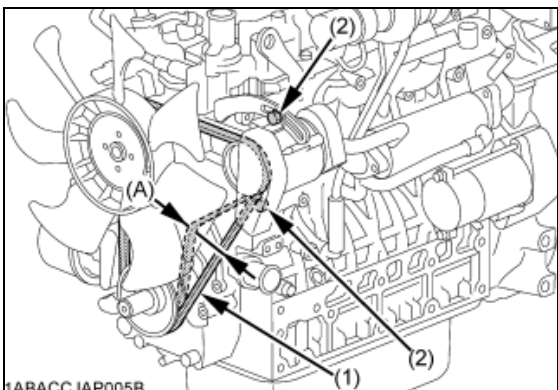


Figure 1-21

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.
7 to 9 mm	under load of 10 kg

4.18.10 Replacement of oil separator element

Replace it every 1500 hours.

V2403-CR-E5

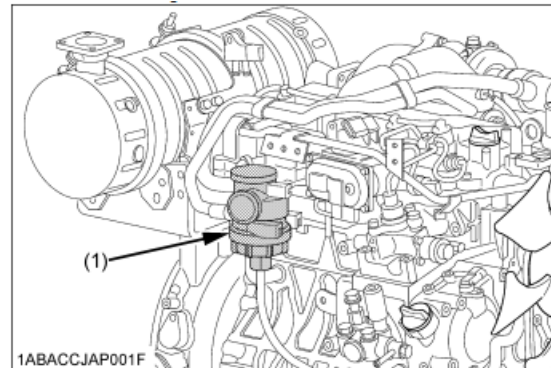


Figure 1-22

1. Oil separator



Warning

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.

4.19 Checking or Replacing Scissor Arm Wear Pads

This step shall be performed every 1,000 hours or yearly, whichever comes first.

The quality of the scissor arm wear pads block is crucial to the machine's safe operation. Worn wear pads may cause damage to the components and unsafe working hazards.

Check the wear pads in the stowed position of the platform.

- ① Measure the height of the wear pads on the chassis slide rail and platform slide rail.

Result: The measurement result is less than 8 mm. Replace the wear pad.

- ② Apply lubricant between the chassis slide rail and wear pad, and the platform slide rail and the wear pad.

4.20 Engine Maintenance-Kubota

WG972-GL-E4

4.20.1 Checking Engine Oil Level



⚠ Do not perform maintenance on a running engine! No smoking or open fires are permitted! If the engine has been operated, the engine oil will be very hot and there is a danger of scalding!

⚠ When checking or changing engine oil, make sure all surrounding surfaces are clean.

⚠ Observe safety regulations and relevant local regulations for engine oil. Dispose of spilled engine oil and filter elements as required. Waste oil must not drain into the ground.

⚠ Test run the engine after each procedure. Pay attention to engine oil pressure. Check for leaks and engine oil level after shutting down the engine.

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 shut down. If the engine is hot, shut down the engine and check the engine oil level 5 minutes later. The oil can be checked immediately if the engine is cool.

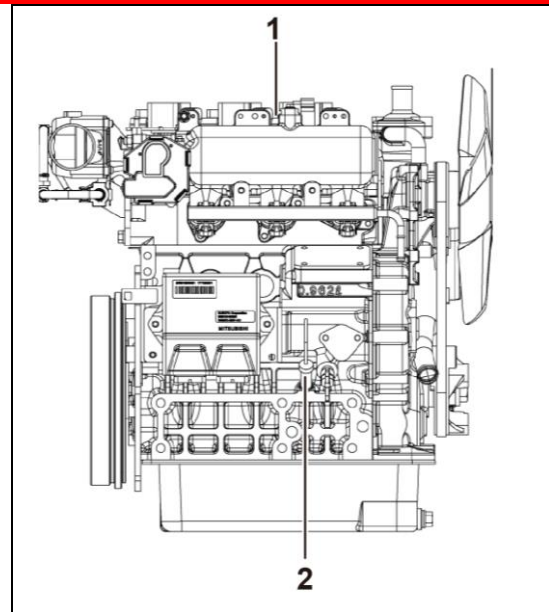


Figure 1-23

1. Oil fill plug

2. Oil measuring rod

- 1) Pull out the engine dipstick and clean it with a clean, lint-free cloth.
- 2) Fully insert the dipstick into the dipstick tube.
- 3) Pull out the dipstick and read the engine oil level.
- 4) The engine oil level shall always be between the MIN and MAX marks!
- 6) If necessary, add oil up to the maximum level.


4.20.2 Changing the Engine Oil and Filter

⚠ Do not perform maintenance on running engines! No smoking or open fires are permitted! If the engine has been operated, the engine oil will be very hot and there is a danger of scalding!

⚠ When checking or changing engine oil, make sure all surrounding surfaces are clean.

⚠ Observe safety regulations and relevant local regulations for engine oil. Dispose of spilled engine oil and filter elements as required. Waste oil must not


drain into the ground.

 **Test run the engine after each procedure. Pay attention to engine oil pressure. Check for leaks and engine oil level after shutting down the engine.**

Change the engine oil and filter the first 50 hours of use and then every 200 hours. 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 Burns**

Contact with high-temperature engine parts and oil will cause severe burns.

 **Perform the following procedure after the engine is warmed up to normal operating temperature.**

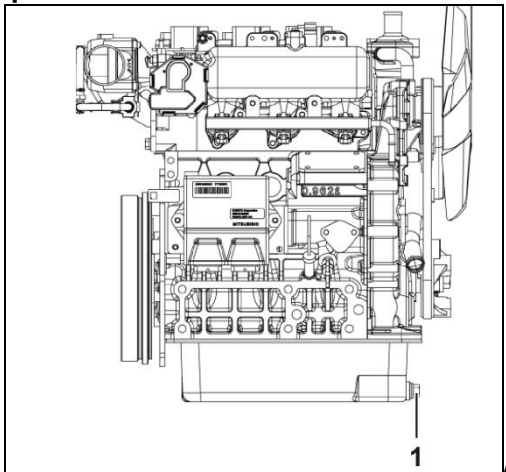


Figure 1-24

1. Oil drain plug

- 1) Place the machine on a level surface.
- 2) Start and warm up the engine for approx. 5 minutes.
- 3) Shut down the engine.
- 4) Place a proper container under the engine oil drain plug.
- 5) Remove the drain plug and drain the engine oil.
- 6) Install a new seal ring on the drain plug. Install the plug and tighten it.
- 7) Replace the engine oil filter. Refer to

Replacing the Engine Oil Filter below.

- 9) Add new engine oil at the engine oil filler.
- 10) Warm up and run the engine.
- 11) Ensure the machine is on a level surface.
- 12) Wait for more than five minutes after filling the oil. Check the engine oil level and fill it if necessary.

Condition	Oil viscosity brand	Remarks
Working temperature: -20°C ~ 40°C	SAE 15W-40	Better than SL class
Working temperature: -25°C ~ 30°C	SAE 10W-30	
Working temperature: -30°C ~ 30°C	SAE 5W-30	
Working temperature: -35°C ~ 20°C	SAE 0W-20	

Replacing the Engine Oil Filter

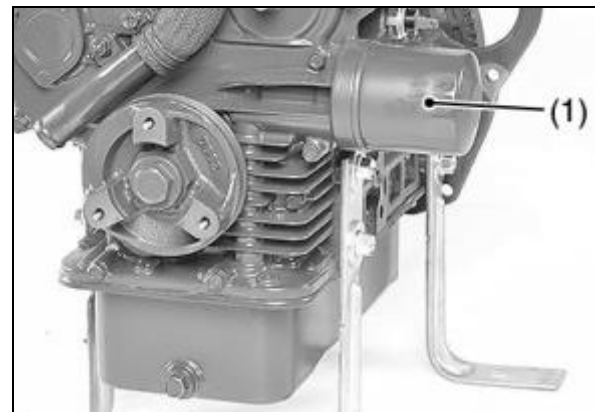



Figure 1-25

1. Oil filter

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

- 1) Place a proper container under the filter to catch draining oil.
- 2) Loosen and unscrew the filter element with a filter wrench.
- 3) Clean the sealing surface of the filter holder with a clean lint-free cloth.
- 4) Apply a thin layer of engine oil to the seal ring of the new filter.
- 5) Screw in a new filter by hand until sealed.

4.20.3 Checking for Fuel Leakage

 **The engine must be shut down!**
No smoking and open flames!

Be careful when around high temperature fuel!

Observe relevant local and safety regulations for handling and disposing of fuel. Dispose of spilled fuel and filter elements in accordance with applicable regulations. The fuel must not penetrate into the ground.

Visually check for fuel leakage every 8 hours or daily.


 **There is danger of explosion and fire.**

Engine fuel is combustible. Check the location of the machine. When this step is performed, the machine shall be away from any heaters, sparks, open flames, and be in an open and well-ventilated area. A fire extinguisher certified for use on diesel fuel fires shall be placed in an easily accessible place.

 **There is danger of explosion and fire.**

If any fuel leaks, prevent any additional personnel from entering the area or operating the equipment. Repair the leak immediately.

4.20.4 Checking Fuel Pipes and Clamps and Fuel Filter

 **The engine must be shut down!**

No smoking and open flames!


Be careful when around high temperature fuel!

 **Make sure to check the fuel line**

periodically. The fuel line is subject to wear and aging, fuel may leak out onto the operating engine, causing a fire.

 **When the fuel pipes are not installed,**

plug them at both ends with clean cloth or paper to prevent dirt from entering. Dirt in the pipes can cause fuel injector malfunction

 **Replace the fuel hose together with the clamp every year. However, since fuel**

pipes are made of rubber, if the fuel hose and clamp are found to be damaged or deteriorate before one year passes, replace or repair them at once

 **There is danger of explosion and fire.**

The engine fuel is combustible. Check the location of the machine.

Check fuel pipes and clamps every 50 hours.

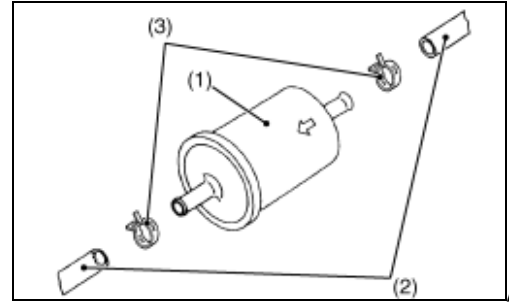


Figure 1-26

1. Gasoline Fuel Filter
2. Fuel Hose
3. Clamp

1. Check whether the clamps are loose. If the clamps are loose, apply oil to the screw of the clamp, and tighten the clamp securely.
2. Check whether the fuel pipes are worn out or damaged. If any worn or damaged are found, replace them and clamps at once.

Check Fuel Filter every 100 hours.

1. Check the fuel filter with visual check.
2. If the fuel filter is dirty, replace it.

4.20.5 Checking the Engine Air Filter

Check the maintenance indicator for the air filter every 8 hours or daily.

 **Perform this step when the engine is shut down.**

Check the maintenance indicator (If equipped) on the air filter. When the indicator is red, the 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.

4.20.6 Cleaning or Replacement of Air Filter

Clean it every 250 hours or quarterly and replaced it for every 1000 hours.



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.

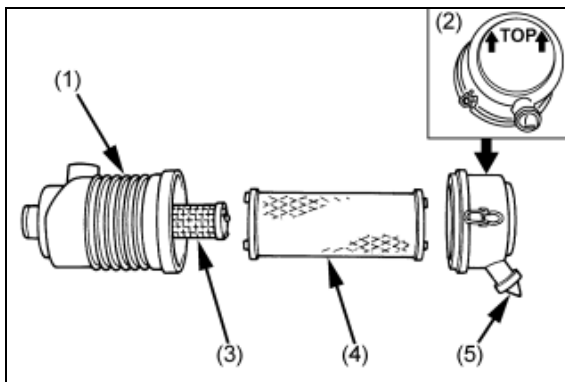


Figure 1-27

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);

Replace it in case of serious contamination.

Replacement of the Safety Filter Tube of the Air Filter



Never clean the safety filter tube (3).

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

4.20.7 Checking Engine Coolant Level

Check the coolant liquid level every 8 hours or daily.



Engine coolant at high temperature can cause scalding. The cooling system is under pressure! The cap can only be opened when cool.

Coolant must have the specified concentration of cooling system protectant!

Observe all safety and local regulations for coolant.

Dispose of spilled coolant as specified. It must not penetrate into the ground.

Never run the engine without coolant, even for a very short time.

- 1) Carefully open the cap for the cooling system.
- 2) The coolant liquid level shall always be between min and max marks on the coolant reservoir. If necessary, fill to the maximum level.

4.20.8 Filling or Replacing Engine Coolant

Replace engine coolant every 1000 hours or yearly.

⚠ Engine Coolant at high temperature can cause scalding.

The cooling system is under pressure! The cap can only be opened when cool.

The coolant must have a specified concentration of cooling system protectant!

Observe all safety and local regulations for coolant disposal.

Dispose of the drained coolant as specified. It must not seep into the ground.

Never run the engine without coolant, even for a very short time.

Draining of the Cooling System

- 1) Carefully open the cap.
- 2) Place the drain container under the coolant drain.
- 3) Open the drain and drain the coolant from the radiator.
- 4) Close the radiator drain.
- 5) Install the coolant cap.

Filling the Cooling System

- 1) Carefully open the cooling system cap.
- 2) Loosen the cooler exhaust bolts that may be present.
- 3) Fill the coolant to max level.
- 4) Close the cooler cap.
- 5) Run the engine to operating temperature.
- 6) Shut down the engine.
- 7) Check the coolant level when the engine is cooled, and fill it to max if necessary.

4.20.9 Checking the Engine Drive Belt

Check it every 100 hours.

⚠ Only check the belt when the engine is shut down.

⚠ There is danger of burns.

High-temperature engine components can cause serious burns.

Checking Fan Belt Tension

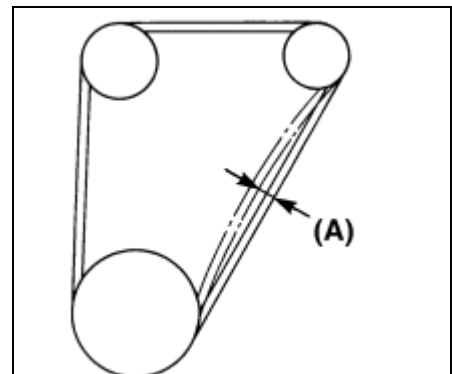


Figure 1-28

1. Measure the deflection (A), depressing the belt halfway between the fan drive pulley and alternator pulley at specified force 98 N (10 kgf, 22 lbf).
2. If the measurement is not within the factory specifications, adjust the fan belt tension.

Factory specification	7.0 to 9.0 mm 0.28 to 0.35 in.
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Adjusting Fan Belt Tension

1. Loosen the alternator mounting screws.
2. Relocate the alternator to adjust fan belt tension with the specified deflection.

4.21 Regular Maintenance

Maintenance intervals of quarterly, yearly, and two years must be completed by qualified personnel 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, a quarterly check must be performed before they can be put into service.

4.22 Engine Fault Table

DEUTZ Diesel Engines

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	Vent line blocked	Clean
	Lube oil cooler defective	Check/replace

system activates	Lube oil filter contaminated on the air or lube oil side	Change
	Lube oil level too high	Check lube oil level, drain off if necessary.
	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 defective	Check/replace	
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 Distributor
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 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
	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

Kubota Diesel Engines

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	Charge the battery

	not crank	
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 dust	Clean net or fin carefully
	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	

Gasoline/LPG Engines

Symptom	Probable Cause and Checking Procedure	Solution
Engine Does Not Turn Over	1. Seizure of crankshaft, piston, etc.	Check if crankshaft rotates Repair or replace
	2. Battery discharged	Charge
	3. Wire disconnection or damaged	Check the wire harness Reconnect or replace
	4. Starter malfunctioning	Repair or replace
Engine Turns Over Slowly But Does Not Start	1. Increased resistance of moving parts	Repair or replace
	2. Excessively high viscosity engine oil at low temperature	Use specified engine oil
Engine Turns Over At Normal Speed But Does Not Start	1. Fuel does not flow	Check the fuel tank, fuel filter, fuel hoses and fuel pump Repair or replace
	2. Fuel filter clogged	Check and replace
	3. Damaged spark plug	Check and adjust or replace
	4. Damaged ignition coil	Check and replace

	5. Wires disconnection or damaged	Check the wire harness Reconnect or replace
	6. Bad connection of ignition coil and spark plug	Reconnect
	7. Clogged air cleaner	Clean or replace
	8. Improper valve clearance	Check the compression pressure Adjust
	9. Improper intake and exhaust valve sealing	Check the compression pressure Check and replace
	10. Excessive wear of rings and liners	Check the compression pressure Check and replace

Deficient Output	1. Fuel is insufficient	Check the fuel system
	2. Damaged spark plug	Check and adjust or replace
	3. Damaged ignition coil	Check and replace
	4. Wires disconnection or damaged	Check the wire harness Reconnect or replace
	5. Bad connection of ignition coil and spark plug	Reconnect
	6. Clogged air cleaner	Clean or replace
	7. Insufficient oil in lubricating system	Check oil pressure and lubricating Repair
	8. Oil filter clogged	Check and replace
	9. Improper valve clearance	Check the compression pressure Adjust
	10. Improper intake and exhaust valve sealing	Check the compression pressure Check and replace
	11. Excessive wear of rings and liners	Check the compression pressure Check and replace
	12. Excessive carbon in engine	Remove carbon
	13. Improper clearance of bearing	Check and adjust
Rough Operating And Idling Low-speed	1. Damaged spark plug	Check and adjust or replace
	2. Damaged ignition coil	Check and replace
	3. Wires disconnection or damaged	Check the wire harness Reconnect or replace
	4. Bad connection of ignition coil and spark plug	Reconnect
	5. Improper valve clearance	Check the compression pressure Adjust
	6. Improper intake and exhaust valve sealing	Check the compression pressure Check and replace
	7. Excessive wear of rings and liners	Check the compression pressure Check and replace
Rough Operating High-speed	1. Damaged spark plug	Check and adjust or replace
	2. Damaged ignition coil	Check and replace
	3. Wires disconnection or damaged	Check the wire harness Reconnect or replace
	4. Bad connection of ignition coil and spark plug	Reconnect
	5. Improper valve clearance	Check the compression pressure Adjust
	6. Improper intake and exhaust valve sealing	Check the compression pressure Check and replace
	7. Excessive wear of rings and liners	Check the compression pressure Check and replace
Engine Speed Does Not Increase	1. Damaged spark plug	Check and adjust or replace
	2. Damaged ignition coil	Check and replace
	3. Wires disconnection or damaged	Check the wire harness Reconnect or replace
	4. Bad connection of ignition coil and spark plug	Reconnect
	5. Improper input signal to ECU	Check the wire harness
	6. Clogged air cleaner	Clean or replace
	7. Breather tube has separated	Attach correctly
	8. Damaged throttle body	Replace

Engine Suddenly Stop	1. Insufficient fuel	Check the fuel tank and refill the fuel Check the fuel system for air or leaks
	2. Wire disconnection or damaged	Check the wire harness Reconnect or replace
	3. Clogged air cleaner	Clean or replace
	4. Overheating of moving parts	Check amount of engine oil Check lubricating system Replace oil filter cartridge
	5. Improper valve clearance	Adjust
Excessive Black Exhaust Gas Is Observed	1. Fuel system is bad	Check the fuel system
	2. Fuel is extremely poor quality	Replace fuel
Excessive White Exhaust Gas Is Observed	1. Excessive engine oil	Reduce oil to specified level
	2. Damaged valve stem seal	Replace
	3. Piston ring and liner worn or stuck	Check and replace
Lubricant Oil Consumption Is Excessive	1. Oil leakage from oil seal, gasket, etc.	Replace
	2. Damaged valve stem seal	Replace
	3. Piston ring and liner worn or stuck	Replace
Engine Overheats	1. Insufficient engine oil	Check engine oil level Refill oil as required
	2. Fan belt broken or elongated	Check and adjust fan belt or replace
	3. Coolant insufficient	Refill coolant
	4. Excessive concentration of antifreeze	Add water only or change to coolant with the specified mixing ratio
	5. Radiator net or radiator fin clogged with dust	Clean net or fin carefully
	6. Inside of radiator or coolant flows route corroded	Clean or replace radiator and parts
	7. Damaged fan or radiator or radiator cap	Replace damaged parts
	8. Damaged thermostat	Check thermostat and replace
	9. Damaged temperature sensor	Check temperature with thermometer and replace
	10. Overload running	Reduce load
	11. Head gasket damaged or water leakage	Replace
Engine Noise	1. Improper valve clearance	Adjust
	2. Spark knock due to low octane fuel or carbon	Use higher-octane fuel and remove carbon
	3. Rattles from loosely mounted external components	Retighten
Exhaust Flames	1. Damaged spark plug	Check and adjust or replace
	2. Damaged ignition coil	Check and replace
	3. Wires disconnection or damaged	Check the wire harness Reconnect or replace
	4. Bad connection of ignition coil and spark plug	Reconnect

4.23 Engine Fault Codes

Engine Fault Codes-DEUTZ

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 its 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.

KWP-Code	SPN	FMI	Error Identification
			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.

KWP-Code	SPN	FMI	Error Identification
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

KWP-Code	SPN	FMI	Error Identification
			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 curent 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)

Engine Fault Codes –Kubota D1105

DTC	SPN	FMI	Detection item	DTC set parameter
Oil Pressure Error	100	1	Oil pressure switch	Despite rpm, oil pressure switch is on
Engine overheat	110	0	Overheat of engine water temperature	Engine water temperature ≥110 °C
Water temperature sensor: High	110	3	Open circuit of sensor / harness, + B short circuit	Voltage of coolant temperature sensor is 4.9 V or above

Water temperature sensor: Low	110	4	Ground short circuit of sensor / harness	Voltage of coolant temperature sensor is 0.1 V or less
Battery voltage: High	158	3	Open circuit, short circuit, or damage of harness. Failure of battery	ECU recognition of battery voltage is above 18 V.
Engine overrun	190	0	Engine speed exceeds threshold speed	Engine speed >(1.15*speed)min-1 (rpm)
Sensor supply voltage 1: Low	3509	4	Sensor supply voltage 1	Voltage to sensor is below 4.00 V
Actuator Abnormal	523771	2	Open circuit, short circuit, or damage of harness.	Actuator current >3.0A or < 80mA
Engine Speed Sensor Abnormal	523772	2	Open circuit, short circuit, or damage of harness.	Engine speed = 0 min-1 (rpm) and alternator L terminal has voltage, after engine start.
Starter error	523736	2	Starter running time exceed threshold time	Starter running time is above 12 sec
Alternator L, terminal Abnormal	523737	2	Open circuit, short circuit, or damage of harness	Alternator L terminal has voltage while engine 0 rpm (after key on)
Charging failure	523738	2	Open circuit, short circuit, or damage of harness	Alternator L terminal is 0V while engine is running
Speed sensor pulse abnormal	523740	2	Engine speed sensor pulse abnormal	Less than correct gear tooth number
CAN Communication Abnormal	523774	2	CAN bus	CAN bus off
Emergency stop	-	-	Emergency stop switch	Emergency stop CAN signal into ECU
+B disconnection	523749	2	+B disconnection	+B disconnection before key off

Engine Fault Codes –Kubota WG972-E4

DTC	SPN	FMI	Description
Tmap Sensor	102	3	Engine Intake Manifold 1 Pressure Abnormality
	102	4	Engine Intake Manifold 1 Pressure Abnormality
	105	3	Engine Intake Manifold 1 Temperature Abnormality
	105	4	Engine Intake Manifold 1 Temperature Abnormality
Engine Coolant Sensor	110	3	Engine Coolant Temperature Abnormality
	110	4	Engine Coolant Temperature Abnormality
TPS (Throttle Position Sensor)	51	3	Engine Throttle Position
	51	4	Engine Throttle Position
	3673	3	Engine Throttle 2 Position
	3673	4	Engine Throttle 2 Position
	51	2	Engine Throttle Position
	523717	2	TPS Main Interface Circuit Error
APS (Accelerator Position Sensor)	523718	1	TPS Power Supply Error
	91	2	Accelerator Pedal Position 1 Abnormality
	91	3	Accelerator Pedal Position 1 Abnormality
	91	4	Accelerator Pedal Position 1 Abnormality
	29	3	Accelerator Pedal Position 2 Abnormality
Heated O2 Sensor	29	4	Accelerator Pedal Position 2 Abnormality
	3217	2	Aftertreatment 1 Intake O2
	3217	5	Aftertreatment 1 Intake O2
Crank Sensor	3227	5	Aftertreatment 1 Outlet O2
	636	2	Engine Position Sensor Abnormality
Cam Sensor	723	2	Engine Speed 2 Abnormality
Oil Switch	523714	2	Oil Switch Error
IG Coil (Ignition Coil)	1268	2	Engine Ignition Coil #1
	1269	2	Engine Ignition Coil #2
	1270	2	Engine Ignition Coil #3
Injectors	651	2	Engine Injector Cylinder #01
	652	2	Engine Injector Cylinder #02
	653	2	Engine Injector Cylinder #03
Heated O2 Sensor	523719	2	"Pre O2 Heater Error (Manufacturer Assignable SPN)
	523726	2	"Post O2 Heater Error (Manufacturer Assignable SPN)
ETV (Electric Throttle Valve unit)	523710	2	F/B Error 1
	523710	0	F/B Error 2 (Valve Open)

	523710	1	F/B Error 2 (ISC Close)
	523711	2	Motor Error
	523712	2	F/B Error 3
	523712	1	Motor Current Open Error
	523712	7	Return Spring Breakage
	523713	0	DBW Open Stuck
Gasoline Fuel System	523716	2	Gasoline Fuel System Error
LPG Fuel System	523729	2	LPG Fuel System Error
Processor Diagnostics	523715	2	A/D Converter Error
	628	13	Program Memory
	523720	12	RAM Error
	629	12	Controller #1
	523722	12	Mutual surveillance Error (System LSI)
Lock Off Valve	523724	31	Lock Off Valve Error
Trim Valve	523728	2	Trim Valve Error
Fuel Pump	1347	2	Engine Fuel Pump Pressurizing Assembly #1
Power Relay	1485	3	ECM Main Relay
Sensor Power Source	3509	4	Sensor supply voltage 1
CAN Frame	695	9	Engine Override Control Mode
EEPROM	523721	2	EEPROM Error
Engine Overheat	110	0	Engine Coolant Temperature Abnormality
	110	15	Engine Coolant Temperature Abnormality
Intake Manifold Temp	105	0	Engine Intake Manifold 1 Temperature Abnormality
	105	15	Engine Intake Manifold 1 Temperature Abnormality
Oil Pressure	100	1	Engine Oil Pressure Abnormality
Battery	168	15	Battery Potential / Power Input 1
	168	17	Battery Potential / Power Input 1
Engine Over Run	190	0	Engine Speed Abnormality

Engine Fault Codes –Kubota V2403-CR

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 0: High	4765	3	Sensor/harness open or shorted to +B	DOC inlet temperature 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:	91	3	Short circuit to ground outside	Accelerator position sensor

High			sensor/harness	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 unburned fuel	T1 - T0 ≥ 250°C (482°F)
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 issued
CAN EBC1 Frame Error	523598	2	CAN_EBC1 communication interruption	CAN EBC1 frame timeout

4.24 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 maintenance	100h	Level 2 maintenance	Level 3 maintenance	Level 4 maintenance	Level 5 maintenance
Maintenance period	Daily	50h	100h	300h	500h	800h	1000h

Table of Maintenance Inspection Items

Diesel Engines:

System	Operation, inspection and replacement items	Routine inspection	Level 1 maintenance	100h maintenance	Level 2 maintenance	Level 3 maintenance	Level 4 maintenance	Level 5 maintenance	Remarks
Power train	Check the engine oil level	•							
	Check the fuel level in the fuel tank	•							
	Check if the fuel system pipeline leaks	•							
	Check the radiator coolant level	•							
	Check if the cooling system pipeline leaks	•							
	Check the connection between the engine and the tray				•	•	•	•	
	Replace the engine oil	First 50h, thereafter every 200h (Kubota-D1105)/ 500h (DeutzD2.9L4/Kubota-V2403-E5) or every six months, whichever comes first.							At least once a year
	Replace the engine oil filter element	First 50h, thereafter every 200h (Kubota-D1105)/ 500h (DeutzD2.9L4/ Kubota-V2403-E5) or every six months, whichever comes first.							At least once a year
	Check and adjust the tightness of the fan belt		•	•	•	•	•	•	
	Clean the radiator with compressed air				•	•	•	•	
	Clean the fuel tank filler filter			•	•	•	•	•	
	Drain deposits from the fuel tank			•			•	•	
	Replace the fine fuel filter element	Every 400h (Kubota-D1105)/ 500h (DeutzD2.9L4/Kubota-V2403 -E5) or every six months, whichever comes first.							
	Replace the primary fuel filter element	Every 500h (Kubota-V2403-E5)/1000h (DeutzD2.9L4) or every six months, whichever comes first. If necessary (Kubota-D1105).							
	Check the water level in the water separator, and drain the water regularly for cleaning	•							
Clean or replace the air cleaner outer element and inner element	Clean the air cleaner outer element every 250h or when the indicator alarms, and it is forbidden to clean the air cleaner inner element							It can be cleaned for at most 5 times generally.	
Change coolant	Every 2000h or every two years, whichever comes first.								
Electrical system	Check the battery for undervoltage	•							
	Check if the battery terminals are loose or	•							

	rusted								
	Check the color of the battery sight hole			•	•	•	•		
	Check if buttons on the PCU panel operate normally	•							
	Check if the PCU harness connector is connected firmly	•							
	Check if the PCU harness connector is stained	•							
	Check if the PCU harness is extruded or broken	•							
	Check if the angle sensor and inclinometer are wired firmly	•							
	Check if limit switch rocker arms are wired loosely	•							
	Check the limit switches on the fork pulling plate guard plate and the stoppers for misalignment, deformation, excessive wear, etc.	•							
	Check if the forward and reverse solenoid valve connector of the walking pump is loose	•							
	Check if buttons on the ground control panel operate normally	•							
	Check if the warning lamp and horn function normally	•							
	Check if the solenoid valve coils of main valve block are wired normally or loose	•							
	Check the starter motor terminals for looseness, breakage, etc.	•							
	Check if the battery terminals are loose or rusted	•							
Hydraulic system	Check if the system pressure is normal			•	•	•	•	•	
	Check if the lifting pressure system is normal			•	•	•	•	•	
	Check if the steering system pressure is normal			•	•	•	•	•	
	Check if the traveling system pressure is normal			•	•	•	•	•	
	Check the permeability of the hydraulic oil tank exhaust cap			•	•	•	•	•	
	Check if the oil pipes and joints are loose			Daily					
	Check if the oil cylinder leaks oil			Daily					
	Check if the valve spools leak oil			Daily					

	Check if the fork oil pipe is fixed firmly					Daily			
	Check if the walking oil pipe fixing clip is loose					Daily			
	Check the oil level in the hydraulic tank					Daily			
	Replace hydraulic oil and suction filter					Every 2,000h or every two years, whichever comes first			
	Replacement of the high pressure filter element					Every 500h or every six months, whichever comes first.			
	Replace the air cleaner					Every 1,000 hours or every year, whichever comes first			
	Check the reducer for oil leakage					Daily			
	Check the driving motor for oil leakage					Daily			
	Change the reducer gear oil					First 50h, thereafter every 1,000h or every year, whichever comes first.			
	Replace the return oil filter element					Every 500h or every six months, whichever comes first.			
Machi ne	Check the machine slider for abnormal noise					•	•	•	•
	Check the slider (replace it if necessary)		•	•	•	•	•	•	•
	Check the machine bolts for looseness or abnormal noise	•							
	Check the snap springs and washers of scissor arm for failure	•							
	Check if the emergency lowering device is normal	•							
	Check the platform, fork and chassis for deformation or open weld	•							
	Check if the vehicle paint falls off	•							
	Check if the safety identification is true or stained	•							
Lubric ation	Lubricate the steering knuckle			•	•	•	•	•	
	Lubricate the fork slider			•	•	•	•	•	

Chapter V Appendix

5.1 System fault codes

Display	Error code	Description	Solution
0x01 Internal ECU Fault	0x01	Main control system Ground Control Station Error	Replace the Ground Control Station
0x02 Platform ECU Fault	0x02	Communication error	Check the wiring, and replace the upper and lower control units separately to determine the fault if the wiring is in a good condition
0x07 lockout_two	0x07	lockout_two	Unlock by the server
0x09 Search statues	0x09	Search statues	Just remind the search statues, not fault
0x0C Tilt alarm LL	0x0C	Tilt alarm LL	Move the machine to the level ground
0x0E Angle sensor fault	0x0E	Angle sensor fault	Check the wiring and Angle sensor
0x0F Pressure sensor fault	0x0F	Pressure sensor fault	Check the wiring and Pressure sensor
0x10 Pressure Compens Fault	0x10	Vehicle with dual pressure compensation, single channel voltage type pressure compensation sensor failure	Check the wiring and Pressure sensor
0x14 Chassis Start Sw Fault	0x14	Chassis start switch error while starting	Check the switch and the wiring
0x15 Chassis Choke Sw Fault	0x15	Chassis Choke opening error while starting	Check the switch and the wiring
0x16 Chassis Up Sw Fault	0x16	Rising switch opening error while starting	Check the switch and the wiring
0x17 Chassis Lift Sw Fault	0x17	Hoisting switch opening error while starting	Check the switch and the wiring
0x18 Chassis Down Sw Fault	0x18	Descending switch opening error while starting	Check the switch and the wiring
0x19 Left Turn Sw Fault	0x19	Platform left turn switch opening error while starting	Check the switch and replace the upper control unit
0x1A Right Turn Sw Fault	0x1A	Platform right turn switch opening error while starting	Check the switch and replace the upper control unit
0x1B Drive Enable Sw Flt	0x1B	Platform enabling switch opening error while starting	Check the switch and replace the upper control unit
0x1C Off Neutral Drive Joystick	0x1C	No platform handle in the middle position while starting	Check the handle and replace the upper control unit
0x1D Platform lift Sw Fault	0x1D	Lifting function key opening error	Check the handle and replace the upper control unit
0x1E Off Neutral lift Joystick	0x1E	Center lifting operating handle closing	Check the handle and replace the upper control unit
0x1F Platform Choke Sw Fault	0x1F	Shutdown switch opening error while starting	Check the switch and replace the upper control unit
0x20 Platform Start Sw Fault	0x20	Platform ignition switch opening error while starting	Check the switch and replace the upper control unit
0x21 Left Front Outrig Sw Flt	0x21	Outrigger left front switch opening error while starting	Check the switch and replace the upper control unit
0x22 Right Front Outrig Sw Flt	0x22	Outrigger right front switch opening error while starting	Check the switch and replace the upper control unit
0x23 Left Rear Outrig Sw Flt	0x23	Outrigger left rear switch opening error while starting	Check the switch and replace the upper control unit
0x24 Right Rear Outrig Sw Flt	0x24	Outrigger right rear switch opening error while starting	Check the switch and replace the upper control unit
0x25 Auto Level Switch Fault	0x25	Automatic level switch opening error while starting	Check the switch and replace the upper control unit
0x26 Platform Walk Sw Fault	0x26	The button of walking on the PCU activated while the machine power on.	Check the button if necessary replace the PCU
0x28 LOST_COMM_GPS	0x28	Disconnect the communication between GCU and GPS	Check the wire between GCU and GPS
0x29 LOCKOUT_ONE	0x29	Lockout- primary level	Unlock the machine by the server
0x2A DOWNLIMIT DOWNLIMIT Fault	0x2A	Lower limit switch failure, lower limit switch trigger position and angle sensor detection height Inconsistent	Check the lower limit switch, check the angle sensor, or recalibrate the height
0x2B 9m limit fault	0x2B	9m limit switch failure, 9m limit switch trigger position and angle	Check 9m limit switch, check angle sensor, or recalibrate altitude

		sensor detect high Degree of inconsistency	
0x2C Down limit SW Open Fault	0x2C	Down limit SW Open Fault	Check the down limit SW open connection
0x2D Down limit SW Close Fault	0x2D	Down limit SW Close Fault	Check the down limit SW close connection
0x2E 9M Limit SW Open Fault	0x2E	9M Limit SW Open Fault	Check the 9m limit SW open connection
0x2F 9m limit SW close fault	0x2F	9m limit sw close fault	Check the 9m limit SW close connection
0x34 Func Prop Coil Fault	0x34	Parallel valve coil fault	Check the circuit and replace the solenoid valve
0x36 Up Coil Fault	0x36	Rising valve coil fault	Check the circuit and replace the solenoid valve
0x37 Down Coil Fault	0x37	Falling valve coil fault	Check the circuit and replace the solenoid valve
0x38 Right Turn Coil Fault	0x38	Right-turn coil fault	Check the circuit and replace the solenoid valve
0x39 Left Turn Coil Fault	0x39	Left-turn coil fault	Check the circuit and replace the solenoid valve
0x3A Brake Coil Fault	0x3A	Brake coil fault	Check the circuit and replace the solenoid valve
0x42 Low Oil Pressure	0x42	Low oil pressure fault	Check the circuit and replace the pressure sensor
0x43 High Coolant Temperature	0x43	High oil temperature fault	Check the circuit and replace the temperature sensor
0x44 Low ECU Voltage	0x44	Low voltage fault	Check the circuit and battery, and replace the battery
0x45 Low Engine Rpm	0x45	Engine underspeed fault	Check the circuit and engine
0x46 High Engine RPM	0x46	Engine overspeed fault	Check the circuit and engine
0x47 RF Limit SW Close Fault	0x47	RF Limit SW Close Fault	Check the harness and travel switch
0x48 RF Limit SW Open Fault	0x48	RF Limit SW Open Fault	Check the harness and travel switch
0x49 RR Limit SW Close Fault	0x49	RR Limit SW Close Fault	Check the harness and travel switch
0x4A RR Limit SW Open Fault	0x4A	RR Limit SW Open Fault	Check the harness and travel switch
0x4B LF Limit SW Close Fault	0x4B	LF Limit SW Close Fault	Check the harness and travel switch
0x4C LF Limit SW Open Fault	0x4C	LF Limit SW Open Fault	Check the harness and travel switch
0x4D LR Limit SW Close Fault	0x4D	LR Limit SW Close Fault	Check the harness and travel switch
0x4E LR Limit SW Open Fault	0x4E	LR Limit SW Open Fault	Check the harness and travel switch
0x50 Left Front Otrg Coil Flt	0x50	Left front outrigger solenoid valve coil fault	Check the circuit and replace the solenoid valve
0x51 Left Rear Otrg Coil Flt	0x51	Left rear outrigger solenoid valve coil fault	Check the circuit and replace the solenoid valve
0x52 Right Front Otrg Coil Flt	0x52	Right front outrigger solenoid valve fault	Check the circuit and replace the solenoid valve
0x53 Right Rear Otrg Coil Flt	0x53	Right rear outrigger solenoid valve fault	Check the circuit and replace the solenoid valve
0x54 Outrigger Ext Coil Flt	0x54	Outrigger extension solenoid valve fault	Check the circuit and replace the solenoid valve
0x55 Outrigger Ret Coil Flt	0x55	Outrigger retraction solenoid valve fault	Check the circuit and replace the solenoid valve
0x57 DPF Fault Lv3 Regeneration Needed	0x57	Alarming--DPF3 level	Operate DPF of the engine
0x58 DPF Fault Lv4 Regeneration Needed	0x58	Alarming--DPF4 level	Operate DPF of the engine
0x59 DPF Fault Lv5 Regeneration Needed	0x59	Alarming--DPF5 level	Operate DPF of the engine
0x5A 2 Speed Coil Fault	0x5A	2 Speed coil error	Check the circuit and replace the solenoid valve
0x5B Bypass Coil Fault	0x5B	Shunt coil fault	Check the circuit and replace the solenoid valve

0x5C Drive Fwd Prop Coil Fault	0x5C	Drive forward proportional coil error	Check the circuit and replace the solenoid valve
0x5D Drive Rev Prop Coil Fault	0x5D	Drive backward proportional coil error	Check the circuit and replace the solenoid valve
0x5E Machine Type Fault	0x5E	Model error	Reselect the correct model
0x5F Low Fuel	0x5F	Low Fuel	Check the fuel level and add the fuel
0x60 FreeWheel Coil Fault	0x60	Coil fault	Check the wire, replace the solenoid valve
0x61 ACCUM Coil Fault	0x61	Coil fault	Check the wire, replace the solenoid valve
0x62 HBY Coil Fault	0x62	Coil fault	Check the wire, replace the solenoid valve
0x63 Platform Overload Fault	0x63	Platform Overload Fault	Check the circuit and overload the platform
0X64 DPF Fault Lv6 Regeneration Needed	0X64	Alarming--DPF6 level	Operate DPF of the engine
0x65 Engine Fault	0x65	Engine Fault	Check engine maintenance manual,Conduct fault troubleshooting according to SPN
0x66 BPSCDNP	0x66	Fault of engine air inlet pressure sensor	Check the connector, sensor and the engine maintenance manual.
0x67 APP2SRC	0x67	Engine throttle pedal fault	Check the engine connector or sensor
0x68 OPSCD	0x68	Fault of the engine oil pressure	Check the connector, sensor and the engine maintenance manual.
0x69 BPSCD	0x69	Engine air intake pressure sensor fault	Check the engine connector or sensor
0x6A IATSCD SRC	0x6A	Engine air intake temperature sensor fault	Check the engine connector or sensor
0x6B CTSCD	0x6B	water temperature sensor fault	Check the engine connector or sensor
0x6C RAILCDOFSTST	0x6C	Rail pressure sensor failure	Check the engine connector or sensor
0x6D BATTCD SRC	0x6D	Battery voltage fault	Check the engine connector or sensor
0x6E OTSCD	0x6E	Oil temperature sensor fault	Check the engine connector or sensor
0x6F INJINI	0x6F	INJdriverIC initialization version number error	Check the engine connector or sensor
0x70 MSSCD	0x70	Multi-state switch signal failure	Check the engine connector or sensor
0x71 TECUSRC	0x71	ECU temperature sensor failure	Check the engine connector or sensor
0x72 INVLCYL1	0x72	Injector 1 malfunction	Check the engine connector or sensor
0x73 NVLCYL2	0x73	Injector 2 failure	Check the engine connector or sensor
0x74 INJLVCYL3	0x74	Injector 3 failure	Check the engine connector or sensor
0x75 INVLCYL4	0x75	Injector 4 malfunction	Check the engine connector or sensor
0x76 MEUNCD	0x76	Fuel gauge failure	Check the engine connector or sensor
0x77 ENGSPD	0x77	Engine speed signal failure	Check the engine connector or sensor
0x78 FANCDSP	0x78	Cooling fan speed failure	Check the engine connector or sensor
0x79 STRTCDLSSC	0x79	Starter motor relay failure	Check the engine connector or sensor
0x7A ENGPRTOVRSPD	0x7A	Engine speed overspeed	Check the engine connector or sensor
0x7B HWEMONEEPROM	0x7B	eeprom read error	Check the engine connector or sensor
0x7C AIRHT	0x7C	Intake heating normally open failure	Check the engine connector or sensor
0x7D ENGMCAS	0x7D	Missing camshaft signal	Check the engine connector or sensor
0x7E ENGMCRS	0x7E	Missing crankshaft signal	Check the engine connector or sensor
0x7F COMT5OST	0x7F	dec1 message t50 signal Receive error	Check the engine connector or sensor
0x80 GEARDETERR	0x80	The idle sleep switch does not work properly when the ecu powered on	Check the engine connector or sensor
0x81 ECBTCDPLAUS	0x81	Start / stop button stuck under car	Check the engine connector or sensor
0x82 FRMMNGTRF1	0x82	can receive trf1 data amount error	Check the engine connector or sensor
0x83 COMGPSDRV	0x83	t15 The time when the engine speed is 0 without powering off exceeds a certain value	Check the engine connector or sensor
0x84 RAILME	0x84	The amount of fuel in the fuel gauge exceeds the threshold	Check the engine connector or sensor
0x85 NETMNGCANA	0x85	Can communication error	Check the engine connector or sensor
0x86 FRMMNGEBC1	0x86	can receive frame ebc1 data length error	Check the engine connector or sensor

0x87 FRMMNGEBC2	0x87	Data length error	Check the engine connector or sensor
0x88 MNGENGTEMP2	0x88	CAN receive EngTemp2 data volume error	Check the engine connector or sensor
0x89 FRMMNGERC1DR	0x89	can receive frame erc1dr data volume error	Check the engine connector or sensor
0x8A FRMMNGETC1	0x8A	etc1 message data length error	Check the engine connector or sensor
0x8B FRMMNGETC2	0x8B	Can receive frame etc2 data amount error	Check the engine connector or sensor
0x8C FRMMNGRXCCVS	0x8C	RxCCVS message data length error	Check the engine connector or sensor
0x8D FRMMNGTCO1	0x8D	can receive frame tco1 message length error	Check the engine connector or sensor
0x8E FRMMNGTSC1AE	0x8E	can receive frame tsc1ae Data volume error	Check the engine connector or sensor
0x8F FRMMNGTSC1AR	0x8F	can receive frame tsc1ar Data volume error	Check the engine connector or sensor
0x90 FRMMNGTSC1DE	0x90	can receive frame tsc1de data volume error	Check the engine connector or sensor
0x91 FRMMNGTSC1DR	0x91	can receive frame tsc1dr Data volume error	Check the engine connector or sensor
0x92 FRMMNGTSC1PE	0x92	cantotsc1pe data Volume error	Check the engine connector or sensor
0x93 FRMMNGTSC1TE	0x93	cantotsc1te data Volume error	Check the engine connector or sensor
0x94 FRMMNGTSC1TR	0x94	cantotsc1tr data Volume error	Check the engine connector or sensor
0x95 FRMMNGTSC1VE	0x95	cantotsc1ve data Volume error	Check the engine connector or sensor
0x96 FRMMNGTSC1VR	0x96	Cantotsc1vr data Wrong quantity	Check the engine connector or sensor
0x97 FRMMNGHRVD	0x97	Can receives frame HRVD Wrong data volume	Check the engine connector or sensor
0x98 FRMMNGDASHDSP	0x98	CAN receives frame DashDspl data error	Check the engine connector or sensor
0x99 FRMMNGEGF1	0x99	Can receives frame EGF1 data error.	Check the engine connector or sensor
0x9A FRMMNGCMIDLC	0x9A	Can receives frame CM1 data error	Check the engine connector or sensor
0x9B FRMMNGDEC1	0x9B	Can receives frame DEC1 data error	Check the engine connector or sensor
0x9C FRMMNGETC7	0x9C	Can receives frame etc7 data error	Check the engine connector or sensor
0x9D FRMMNGAPP	0x9D	Bus to receive throttle signal overrun	Check the engine connector or sensor
0x9E FRMMNGREMAPP	0x9E	Bus to receive remote throttle signal overrun	Check the engine connector or sensor
0x9F COMGPS	0x9F	DEC1 message T50 signal Receiving error	Check the engine connector or sensor
0xA0 Gener Fault	0xA0	Generator Malfunction	Check the generator or generator connectors
0xA1 BATTVLTGERR	0xA1	High battery voltage	Check the engine connector or sensor
0xA2 ENGOVERHEAT	0xA2	Overheat of the engine	Check the engine connector or sensor
0xA3 WATERTEMPHIGH	0xA3	Coolant temp too high	Check the connector, sensor and the engine maintenance manual.
0xA4 WATERTEMPLOW	0xA4	Coolant temp too low	Check the connector, sensor and the engine maintenance manual.
0xA5 BATVOL_HIGH	0xA5	High voltage of the battery	Check the connector, sensor and the engine maintenance manual.
0xA6 ENGOVERRUN	0xA6	Engine over the running speed	Check the connector, sensor and the engine maintenance manual.
0xA7 SENVOLT_LOW	0xA7	Low voltage of the sensor	Check the connector, sensor and the engine maintenance manual.
0xA8 ACTUATORFAULT	0xA8	Fault of the actuator	Check the connector, sensor and the engine maintenance manual.
0xA9 SPEEDSENFALT	0xA9	RPM sensor fault	Check the connector, sensor and the engine maintenance manual.
0xAA ACCELERATOR_HIGH	AA	Pressure of throttle sensor too high	Check the connector, sensor and the engine maintenance manual.
0xAB ACCELERATOR_LOW	AB	Pressure of throttle sensor too low	Check the connector, sensor and the engine maintenance manual.
0xAC STARTERROR	AC	Boot fault	Check the connector, sensor and the

0xAD ALTEMATO_TERMINAL	AD	Engine fault	engine maintenance manual. Check the connector, sensor and the engine maintenance manual.
0xAE CHARGING_FAILURE	AE	Instruction fault	Check the connector, sensor and the engine maintenance manual.
0xAF CANCOMFAILURE	AF	CAN Communication fault	Check the connector, sensor and the engine maintenance manual.

5.2 Deutz Engine D2.9

DTC	FTB	SPN	FMI	Description
1021	0	100	3	Oil pressure sensor error; high SRC.
1022	0	100	4	Oil pressure sensor error; low SRC.
1025	0	100	1	Low oil pressure; above alarm threshold.
1026	0	100	1	Low oil pressure; above shutdown threshold.
1043	0	107	0	Air cleaner pressure difference; air cleaner clogging.
1071	0	411	2	PEGRdiff_p value stuck check failure. Unchanged pressure between engine operating points.
1077	0	411	3	Signal value above the maximum limit.
1078	0	411	4	Signal value below the minimum limit.
1079	0	108	0	Maximum ambient air pressure sensor range check error.
1080	0	108	1	Minimum ambient air pressure sensor range check error.
1081	0	108	15	Maximum ambient air pressure sensor SRC failure.
1082	0	108	17	Minimum ambient air pressure sensor SRC failure
1083	0	108	2	Ambient air pressure sensor error is found through self-diagnosis
1084	0	3720	0	DPF ash above shutdown level.
1086	0	3734	0	DPF soot above removal level.
1087	0	4781	14	DPF soot above shutdown level.
1088	0	4781	0	DPF soot above alarm level.
1089	0	4781	16	Too long shutdown time with a short time interval.
1090	0	10156	0	Shutdown-regeneration mode time above lower limit.
1091	0	3735	16	Stop required, but stop failure and above upgrade threshold 2.
1092	0	3735	0	Stop required, but stop failure and above upgrade threshold 2.
1093	0	4766	1	Failure to reach static main phase regeneration temperature.
1102	0	171	2	EnvT_t static plausibility check failure. Temperature deviates from the expected value in the case of cold start.
1113	0	102	0	High SRC in manifold pressure sensor Bank1.
1114	0	102	1	Low SRC in manifold pressure sensor Bank1.
1115	0	102	3	Intake manifold pressure sensor Bank 1 maximum threshold plausibility check failure.
1116	0	102	4	Intake manifold pressure sensor Bank 2 minimum threshold plausibility check failure.
1118	0	102	1	Intake manifold pressure sensor Bank 2 minimum threshold physical range check failure.
1121	0	102	2	Intake manifold pressure sensor Bank 2 signal change check failure.
1122	0	102	0	Intake pressure valve sensor above alarm level.
1123	0	102	1	Intake pressure valve sensor above shutdown level.
1124	0	1209	2	Turbocharger upstream pressure not equal to ambient pressure when engine is not running.
1125	0	1209	15	Turbocharger upstream pressure above upper limit.
1126	0	1176	1	Turbocharger upstream pressure below lower limit.
1127	0	1209	2	Turbocharger upstream pressure blockage check failure. Unchanged pressure between engine operating points.
1130	0	1209	3	Outlet valve downstream pressure high SRC.
1131	0	1209	4	Outlet valve downstream pressure low SRC.
1134	0	3251	3	DFC error when signal line is short-circuited to battery.
1135	0	3251	4	DFC error when signal line is short-circuited to ground.
1136	0	3251	14	Communication error.
1137	0	3251	14	Data error.
1138	0	3251	14	Fast channel 1 error.
1139	0	3251	14	Fast channel 2 signal range error.
1149	0	3251	2	Implausible DPF differential pressure.
1150	0	3251	0	DPF differential pressure above shutdown threshold.
1151	0	3251	16	DPF differential pressure above alarm threshold.
1152	0	3251	1	DPF differential pressure below shutdown threshold.
1153	0	3251	18	DPF differential pressure below alarm threshold.
1161	0	5571	16	PRV has reached the allowable number of activations.
1162	0	5571	2	PRV opened forcibly by pressurization.
1163	0	5571	2	PRV opened forcibly. By pressurization.
1164	0	5571	16	PRV opened forcibly. Shutdown level.
1165	0	5571	15	PRV opened forcibly. Alarm level.

1166	0	5571	0	Open PRV detected.
1167	0	5571	2	Unexpected opening of PRV.
1168	0	5571	2	Uncertain PRV opening success.
1169	0	5571	13	Average rail pressure after opening of PRV above the expected tolerance range.
1170	0	5571	16	Exceeding PRV opening time for wear detection.
1171	0	94	1	Fuel pressure rise during unsuccessful engine start.
1172	0	1347	5	Electric fuel pre-supply pump; open circuit.
1174	0	1347	3	Electric fuel pre-supply pump; short circuit to battery.
1175	0	1347	4	Electric fuel pre-supply pump; short circuit to ground.
119	0	1231	14	Error generated by DemEvent ComCILBusOffNode_APPL_CAN: application CAN bus off error.
1190	0	7103	13	Rail pressure below the set value and above the speed-related threshold.
1191	0	7103	13	Rail pressure gauge: fuel unbalance.
1194	0	7103	13	Negative deviation of rail pressure regulator in the case of zero pressure gauge.
1195	0	7103	1	Rail pressure below the minimum threshold.
1197	0	7103	0	Above the maximum rail pressure.
1198	0	7103	2	Implausible set value of pressure gauge in overspeed mode.
120	0	639	14	Error generated by DemEvent ComCILBusOffNode_PT_CAN: powertrain CAN bus off error.
1200	0	5357	14	Shutdown due to rail pressure below the minimum threshold.
1202	0	157	0	Above the maximum rail pressure in limp home mode.
1208	0	157	3	Rail pressure sensor error.
				Sensor voltage above upper limit.
1209	0	157	4	Rail pressure sensor error. Sensor voltage below lower limit.
121	0	520252	2	Checksum error in CAN message EAT control.
1212	0	629	12	Error generated by DemEvent RBA_IOEXTLIB_KEEPALIVE_DRV: KeepAlive error when external equipment is running.
1213	0	629	12	Error generated by DemEvent RBA_IOEXTLIB_KEEPALIVE_INI: KeepAlive error during initialization of external equipment.
1215	0	629	12	DTC generated by DemEvent rba_MemDiag_MemReadErr: non-volatile memory read error.
1216	0	629	12	DTC generated by DemEvent rba_MemDiag_MemWrErr: non-volatile memory write error.
1218	0	629	12	DTC generated by DemEvent rba_MultiStackTrace_Threshold: stack memory threshold above the limit.
1219	0	629	12	DTC generated by DemEvent rba_SyC_IrrSwOffTrigEngRun_Event: counter off due to irregularity triggered by running engine.
122	0	4207	2	Checksum error.
123	0	4207	2	Checksum error.
1233	0	5826	15	EU NCD level 1 induction
1235	0	5826	0	EU NCD level 2 induction
1236	0	5826	14	NCD level 2 induction pre-triggered
124	0	4207	2	Checksum error.
125	0	4207	2	Checksum error.
1274	0	91	3	Accelerator pedal sensor error (channel 1), short circuit to battery.
1275	0	2623	3	Accelerator pedal sensor error (channel 2), short circuit to battery.
1276	0	29	3	Remote accelerator pedal position signal 1 high SRC.
1277	0	2625	3	Remote accelerator pedal signal 2 short-circuited to battery.
1280	0	91	4	Accelerator pedal sensor error (channel 1), short circuit to ground.
1281	0	2623	4	Accelerator pedal sensor error (channel 2), short circuit to ground.
1282	0	29	4	Remote accelerator pedal position signal 1 low SRC.
1283	0	2625	4	Remote accelerator pedal signal 2 short-circuited to ground.
1289	0	3509	14	Sensor power supply voltage 1 fault.
1290	0	3509	0	DTC generated by DemEvent SSpMon1OV: sensor power supply 1 overvoltage.
1291	0	3509	6	DTC generated by DemEvent SSpMon1SCG: sensor power supply 1 short-circuited to ground.
1292	0	3509	1	DTC generated by DemEvent SSpMon1UV: sensor power supply 1 undervoltage.
1293	0	3510	14	Sensor power supply voltage 2 fault.
1294	0	3510	0	DTC generated by DemEvent SSpMon2OV: sensor power supply 2 overvoltage.
1295	0	3510	6	DTC generated by DemEvent SSpMon2SCG: sensor power supply 2 short-circuited to ground.
1296	0	3510	1	DTC generated by DemEvent SSpMon2UV: sensor power supply 2 undervoltage.
1306	0	677	3	Starter relay high side. Short circuit to battery.
1307	0	677	4	Starter relay high side. short circuit to ground.
1308	0	677	5	Starter relay low side no load.
1310	0	677	3	Starter relay low side short-circuited to battery.
1311	0	677	4	Starter relay low side short-circuited to ground.
1323	0	91	11	Plausibility error between APP1 and APP2 or between APP1 and idle switch.
1326	0	29	11	For dual analog accelerator pedal, plausibility check between RmtAPP1 and RmtAPP2. For potentiometer switch accelerator pedal, plausibility check between APP1 and idle switch.

1346	0	1041	14	Too long running time of terminal 50.
1354	0	105	0	High turbocharger air cooler temperature. Above alarm threshold.
1355	0	105	0	High turbocharger air cooler temperature. Above shutdown threshold.
1357	0	1136	0	High ECU temperature physical range check.
1358	0	1136	1	Low ECU temperature physical range check.
1359	0	1136	15	Maximum ECU temperature sensor SRC.
1360	0	1136	17	Minimum ECU temperature sensor SRC.
1361	0	1136	2	TECU sensor plausibility check.
1362	0	412	15	High EGR cooler downstream temperature physical range check.
1363	0	412	17	Low EGR cooler downstream temperature physical range check.
1364	0	412	3	EGR cooler downstream temperature electrical error. High SRC
1365	0	412	4	EGR cooler downstream temperature electrical error. Low SRC
1372	0	51	5	Throttle valve open circuit.
1375	0	51	3	Throttle valve short-circuited to battery 1.
1376	0	51	3	Throttle valve short-circuited to battery 2.
1377	0	51	4	Throttle valve short-circuited to ground 1.
1378	0	51	4	Throttle valve short-circuited to ground 2.
1379	0	51	6	Throttle valve overload.
1382	0	51	7	Check valve blocked and closed in fault diagnosis state.
1383	0	51	7	Check valve blocked and open in fault diagnosis state.
1391	0	51	3	Throttle valve short-circuited to battery.
1392	0	51	4	Throttle valve short-circuited to ground.
1397	0	105	0	TIntkVUs_t above upper limit.
1398	0	105	1	TIntkVUs_t below lower limit.
1399	0	4766	2	TOxiCatDs_t dynamic plausibility test failed. Excessive temperature difference between ToxiCatUs_t and ToxiCatDs_t.
1400	0	4766	2	TOxiCatDs_t plausibility test failed. Too low temperature.
1401	0	4766	15	DOC downstream temperature above upper alarm threshold.
1402	0	4766	3	Downstream (DOC) exhaust temperature sensor error; high SRC.
1403	0	4766	4	Downstream (DOC) exhaust temperature sensor error; low SRC.
1404	0	4765	2	DOC upstream temperature plausibility error.
1405	0	4765	15	DOC upstream temperature above upper alarm threshold.
1406	0	4765	3	Upstream (DOC) exhaust temperature sensor error; high SRC.
1407	0	4765	4	Upstream (DOC) exhaust temperature sensor error; low SRC.
1408	0	4765	2	TOxiCatUs_t value stuck check failure. No temperature change.
142	0	520256	9	EAT control message timeout. No message received.
144	0	523211	9	CAN-Receive-Frame EBC1 timeout.
154	0	523212	9	CAN-Receive-Frame ComEngPrt timeout. Engine protection.
1540	0	520254	8	Shutdown-regeneration mode time above upper threshold.
1541	0	520255	2	Inverted hose connected to dp DPF SENT sensor. Exchange the hose.
155	0	523741	14	Engine shutdown requested via CAN.
1587	0	97	0	Water in fuel prefilter; exceeding maximum value.
188	0	523240	9	CAN-message FunModCtl timeout. Function mode control.
219	0	520253	2	CAN message EAT control rolling counter fault.
220	0	4206	2	TSC1AE rolling counter fault check
221	0	4206	2	TSC1AR rolling counter fault check
222	0	4206	2	TSC1TE rolling counter fault check
223	0	4206	2	TSC1TR rolling counter fault check
349	0	3349	0	CAN-Receive-Frame active TSC1AE timeout.
350	0	3349	0	CAN-Receive-Frame passive TSC1AE timeout.
351	0	3349	0	CAN-Receive-Frame active TSC1AR timeout.
352	0	3349	0	CAN-Receive-Frame passive TSC1AR timeout.
353	0	3349	0	CAN-Receive-Frame TSC1TE - active timeout.
354	0	3349	0	Short circuit to ground.
355	0	3349	0	CAN-Receive-Frame TSC1TR timeout.
356	0	3349	0	CAN-Receive-Frame TSC1TR passive timeout.
361	0	3349	0	CAN-Receive-Frame TSC1AE timeout. Traction control.
363	0	3349	0	CAN-Receive-Frame TSC1AR timeout. Retarder.
365	0	3349	0	CAN-Receive-Frame TSC1TE timeout. Set value.
367	0	3349	0	CAN-Receive-Frame TSC1TR timeout; control signal.
38	0	1485	3	Short circuit to battery.
39	0	1485	3	Actuator relay 2 short-circuited to battery.
40	0	1485	3	Actuator relay 3 short-circuited to battery.
41	0	1485	4	Short circuit to ground.
42	0	1485	4	Actuator relay 2 short-circuited to ground.
43	0	1485	4	Actuator relay 3 short-circuited to ground.

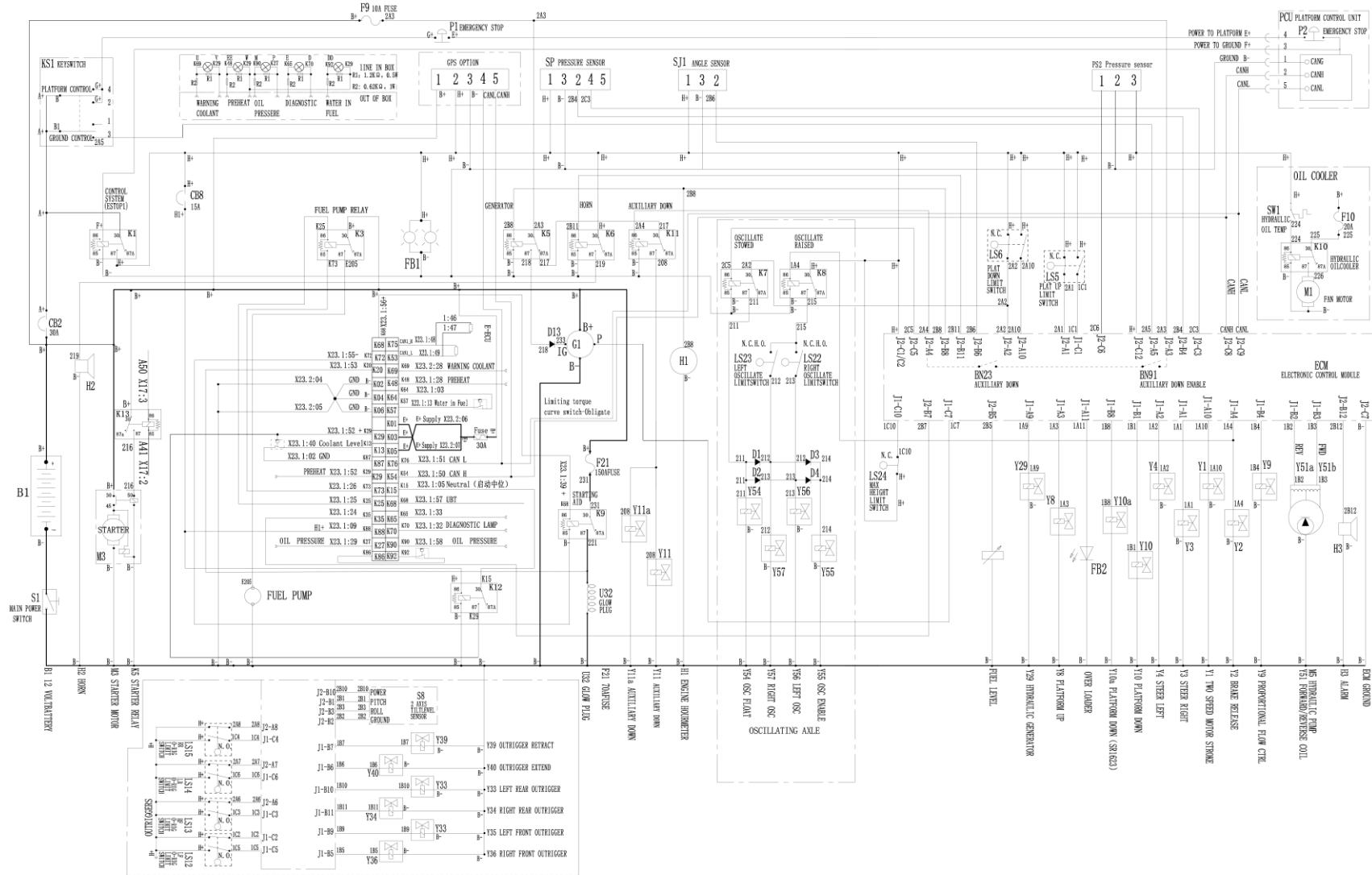
48	0	168	0	High battery voltage physical range check.
49	0	168	1	Low battery voltage physical range check.
50	0	168	3	Sensor battery voltage error; high SRC.
51	0	168	4	Sensor battery voltage error; low SRC.
516	0	523982	0	Power-stage diagnosis disabled. High battery voltage.
517	0	523982	1	Power-stage diagnosis disabled. Low battery voltage.
52	0	168	0	High battery voltage; above alarm threshold.
567	0	27	5	EGR valve open circuit.
570	0	27	3	EGR valve short-circuited to battery 1.
571	0	27	3	EGR valve short-circuited to battery 2.
572	0	27	4	EGR valve short-circuited to ground 1.
573	0	27	4	EGR valve short-circuited to ground 2.
574	0	27	6	EGR valve overload.
577	0	27	7	Check valve blocked and closed in fault diagnosis state.
578	0	27	7	Check valve blocked and open in fault diagnosis state.
582	0	5763	3	EGR valve short-circuited to battery.
583	0	5763	4	EGR valve short-circuited to ground.
586	0	3055	14	ECU internal software error. Injection cut off.
587	0	190	0	Engine speed above alarm threshold. Overspeed detection in engine assembly protection.
588	0	190	0	Engine speed above alarm threshold (FOC-Level 1).
589	0	190	0	Engine speed above alarm threshold (FOC-Level 2).
590	0	190	0	Engine speed above alarm threshold (overrun mode).
610	0	171	15	Ambient temperature sensor temperature above physical upper threshold.
613	0	171	3	SCR system ambient temperature sensor error. DPF system intake temperature high SRC.
614	0	171	4	SCR system ambient temperature sensor error. DPF system intake temperature low SRC.
615	0	723	8	Camshaft speed sensor signal interference.
616	0	723	14	Camshaft sensor detection. Out of range, signal interference, no signal.
617	0	723	13	Excessive offset angle between crankshaft and camshaft sensor.
618	0	4201	8	Crankshaft sensor detection. Out of range, signal interference or no signal
619	0	4201	14	Speed detection, out of range, signal interference or no signal.
68	0	1669	14	Error generated by DemEvent CAN_E_TIMEOUT: CAN hardware register not updated within expected time.
70	0	110	2	Fault check for dynamic plausibility test.
709	0	97	3	DFC SAE J1939 error.
710	0	97	4	Water-in-fuel sensor error; low SRC.
721	0	94	15	Low fuel system pressure out of maximum physical range.
723	0	94	3	Sensor error due to low fuel pressure; high SRC.
724	0	94	4	Sensor error due to low fuel pressure; low SRC.
725	0	94	1	Low fuel system pressure; above alarm threshold.
726	0	94	1	Low fuel pressure; above shutdown threshold.
75	0	110	3	Coolant temperature sensor error; high SRC.
76	0	110	4	Coolant temperature sensor error; low SRC.
77	0	110	0	High coolant temperature; above alarm threshold.
78	0	110	0	Coolant temperature; system response start.
797	0	676	12	Cold start auxiliary relay error.
798	0	676	5	Cold start auxiliary relay: open circuit.
799	0	676	5	Cold start auxiliary relay: open circuit.
80	0	411	2	Intake flow rate out of expected range.
803	0	676	3	Air intake heater: short-circuited to battery.
805	0	676	4	Power-stage element on CJ945 short-circuited to ground.
807	0	2797	14	Possible number of injection times limited by injection valve.
815	0	2797	4	Low boosting voltage.
816	0	5358	5	Open circuit on power-stage element of injection valve 0.
817	0	5359	5	Open circuit on power-stage element of injection valve 1.
818	0	5360	5	Open circuit on power-stage element of injection valve 2.
819	0	5361	5	Open circuit on power-stage element of injection valve 3.
820	0	5362	5	Open circuit on power-stage element of injection valve 4.
821	0	5363	5	Open circuit on power-stage element of injection valve 5.
822	0	2797	6	Short circuit on high side of HDEV power-stage (bank0 error).
823	0	2798	6	Short circuit on high side of HDEV power-stage (bank1 error).
824	0	5358	6	Short circuit on low side of power-stage (cylinder error 0).

825	0	5359	6	Short circuit on low side of power-stage (cylinder error 1).
826	0	5360	6	Short circuit on low side of power-stage (cylinder error 2).
827	0	5361	6	Short circuit on low side of power-stage (cylinder error 3).
828	0	5362	6	Short circuit on low side of power-stage (cylinder error 4).
829	0	5363	6	Short circuit on low side of power-stage (cylinder error 5).
83	0	111	1	Low coolant level.
830	0	5358	6	Short circuit between high side and low side of power-stage (high side implausible)
831	0	5359	6	Short circuit between high side and low side of power-stage (high side implausible)
832	0	5360	6	Short circuit between high side and low side of power-stage (high side implausible)
833	0	5361	6	Short circuit between high side and low side of power-stage (high side implausible)
834	0	5362	6	Short circuit between high side and low side of power-stage (high side implausible)
835	0	5363	6	Short circuit between high side and low side of power-stage (high side implausible)
836	0	105	3	Intake valve upstream temperature high SRC.
837	0	105	4	Intake valve upstream temperature low SRC.
838	0	2797	14	Injector 1 check of missing injector adjustment value programming (IMA).
839	0	2798	14	Injector 2 check of missing injector adjustment value programming (IMA).
840	0	4257	14	Injector 3 check of missing injector adjustment value programming (IMA).
841	0	4258	14	Injector 4 check of missing injector adjustment value programming (IMA).
853	0	0	0	
854	0	7103	5	MeUn power-stage open-circuit diagnosis.
855	0	7103	3	MeUn power-stage high side short-circuited to battery.
856	0	7103	3	MeUn power-stage low side short-circuited to battery.
857	0	7103	4	MeUn power-stage high side short-circuited to ground.
858	0	7103	4	MeUn power-stage low side short-circuited to ground.
859	0	7103	6	Short circuit between high side and low side of MeUn power-stage.
868	0	629	12	Function monitoring: ECU ADC fault - Zero load test pulse.
869	0	629	12	Function monitoring: ECU ADC fault - test voltage.
870	0	629	12	DTC indicating ICO request from MoCSOP module.
871	0	91	14	Function monitoring: accelerator pedal position monitoring:
875	0	190	2	Function monitoring: engine speed check failure.
876	0	5357	2	Plausibility error between level 1 power-on time and level 2 information in diagnosis fault inspection report.
877	0	5441	2	Error caused by plausibility between injection start and injection type in diagnosis fault inspection report.
878	0	5357	2	Error caused by implausibility of ZFC in diagnosis fault inspection report.
879	0	523612	12	Diagnosis fault inspection report error, ICO required due to Pol2 shutdown error.
88	0	598	10	No clutch edge within calibration time.
880	0	523612	12	Diagnosis fault inspection report error, ICO required due to Pol3 efficiency factor error.
881	0	523612	12	Diagnosis fault inspection report error, ICO required due to EOM change error.
882	0	5357	2	Diagnosis fault inspection report error, ICO required due to total torque correlative error.
883	0	5357	2	Error caused by injection volume correction in diagnosis fault inspection report.
884	0	5442	2	Rail pressure monitoring plausibility error in diagnosis fault inspection report.
885	0	29	2	Remote accelerator pedal position plausibility test fault in diagnosis fault inspection report.
886	0	677	2	Function monitoring: ECU powertrain activation failure.
887	0	513	2	Fault in power-on time comparison in diagnosis fault inspection report.
888	0	513	2	Torque comparison error in diagnosis fault inspection report.
889	0	520250	2	Function monitoring: optional monitoring error after establishment.
890	0	629	12	EMM alarm FCCU0 status read from FCCU hardware module.
891	0	629	12	Internal ECU error.
893	0	629	12	Internal ECU error.
894	0	629	12	Internal ECU error.
895	0	629	12	Internal ECU error.
896	0	629	12	Internal ECU error.
897	0	629	12	Internal ECU error.
898	0	629	12	Internal ECU error.
899	0	629	12	Internal ECU error.
900	0	629	12	Internal ECU error.
901	0	629	12	Internal ECU error.
902	0	629	12	Internal ECU error.
903	0	629	12	Internal ECU error.
904	0	629	12	Internal ECU error.
905	0	629	12	Internal ECU error.
906	0	629	12	Internal ECU error.
907	0	629	12	Internal ECU error.
908	0	629	12	Internal ECU error.
909	0	629	12	Internal ECU error.
91	0	1109	2	Engine shutdown request ignored.

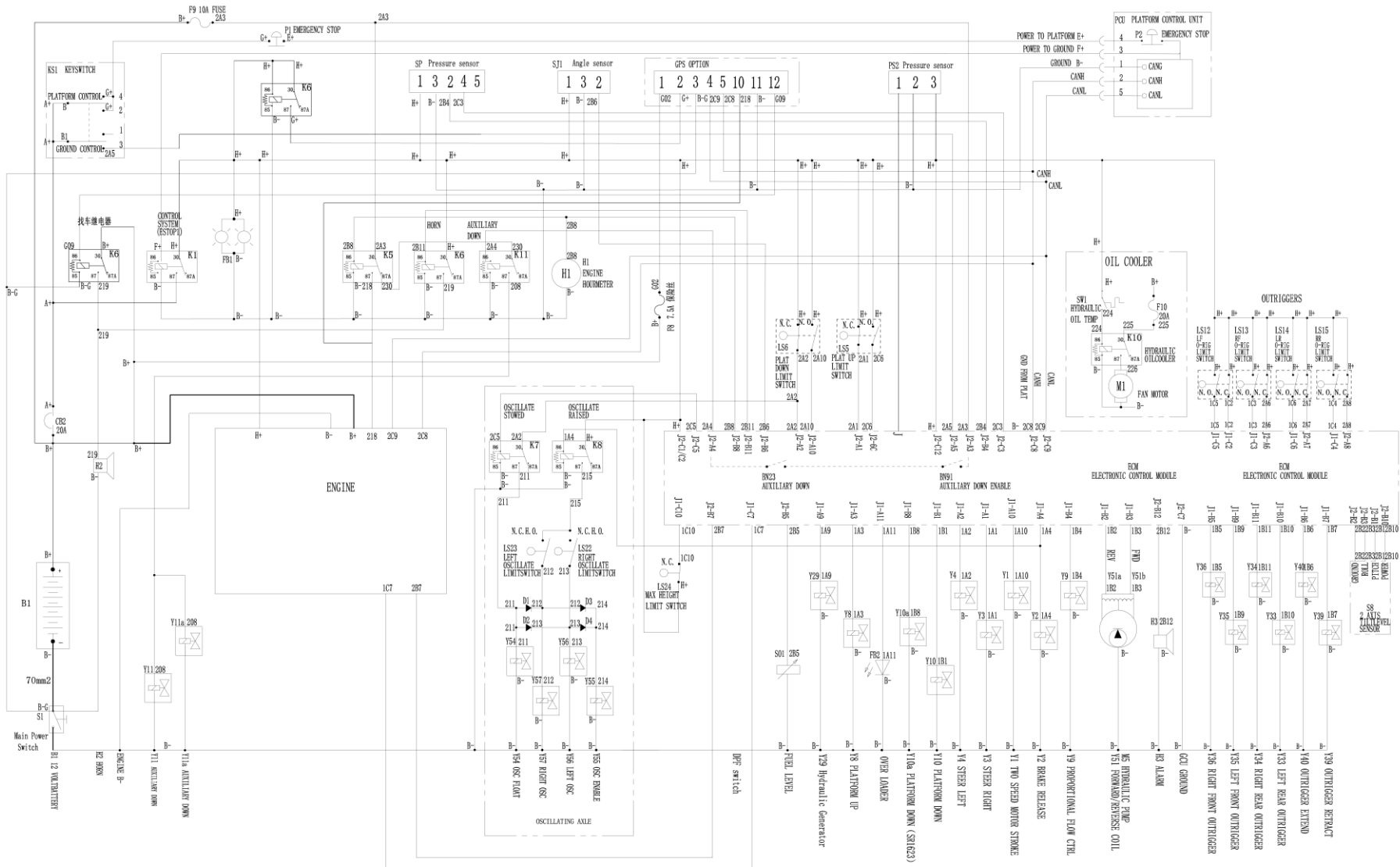
910	0	629	12	Internal ECU error.
911	0	629	12	Internal ECU error.
912	0	629	12	Internal ECU error.
913	0	629	12	Internal ECU error.
914	0	629	12	Internal ECU error.
915	0	629	12	Internal ECU error.
916	0	629	12	Internal ECU error.
917	0	629	12	Internal ECU error.
918	0	629	12	Internal ECU error.
919	0	629	12	Internal ECU error.
92	0	1109	14	Monitoring function deactivation request.
920	0	629	12	Internal ECU error.
921	0	629	12	Internal ECU error.
922	0	629	12	Internal ECU error.
923	0	629	12	Internal ECU error.
924	0	629	12	Internal ECU error.
925	0	629	12	Internal ECU error.
926	0	629	12	Internal ECU error.
927	0	629	12	Internal ECU error.
928	0	629	12	Internal ECU error.
929	0	629	12	Internal ECU error.
930	0	629	12	Internal ECU error.
931	0	629	12	Internal ECU error.
932	0	629	12	Internal ECU error.
933	0	629	12	Internal ECU error.
935	0	629	12	Internal ECU error.
936	0	629	12	Internal ECU error.
937	0	629	12	Internal ECU error.
938	0	629	12	Internal ECU error.
939	0	629	12	Internal ECU error.
940	0	629	12	Internal ECU error.
941	0	629	12	Internal ECU error.
942	0	629	12	Internal ECU error.
943	0	629	12	Internal ECU error.
944	0	629	12	Internal ECU error.
945	0	629	12	Internal ECU error.
996	0	629	12	ABE activation status in diagnosis fault inspection report.
997	0	629	12	Function monitoring: ECU fault, WDA activation via request/response communication.
998	0	629	12	Function monitoring: ECU fault, suspected hardware fault pin activation error.
999	0	629	12	Function monitoring: ECU fault, WDA activation due to overvoltage detection.

5.2 Schematic

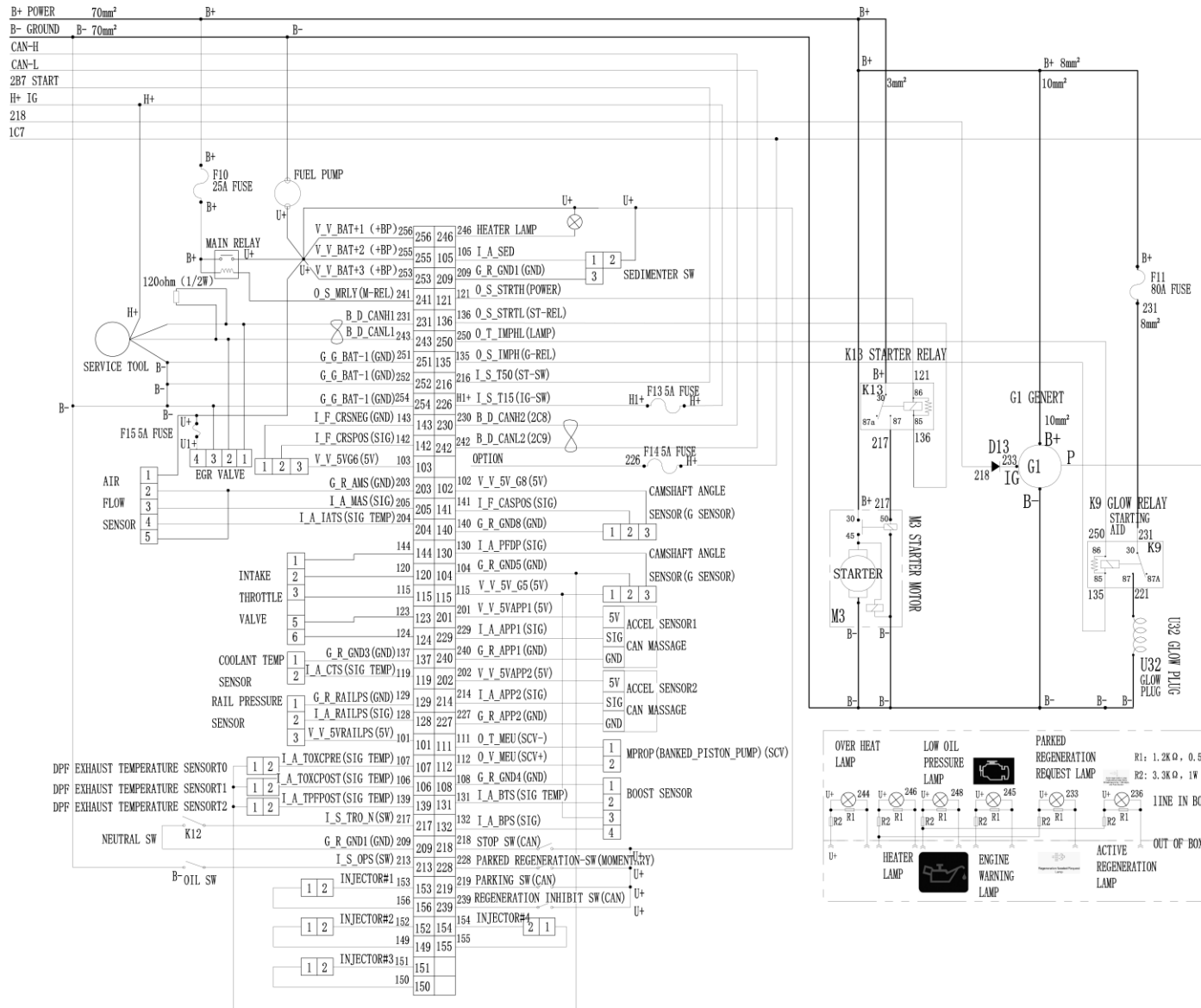
SR3390D(S33900NDAH20)/SR4390D(S43900NDAH20)/SR5390D(S53900NDAH20) Electric schematic

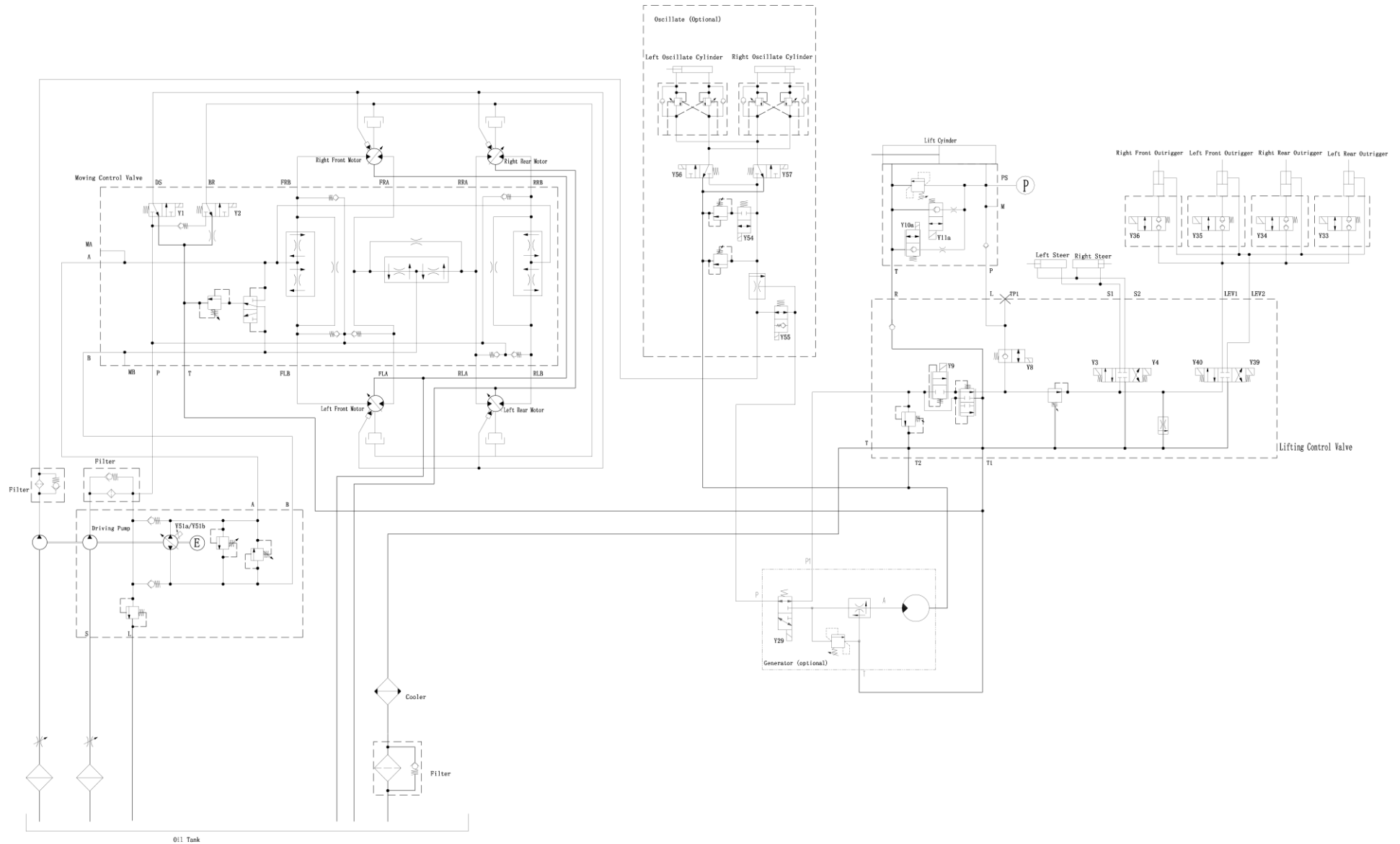


SR3390D(S339000WNK4AH2000)/SR4390D(S439000WNK4AH2000)/SR5390D(S539000WNK4AH2000) Electric schematic-1

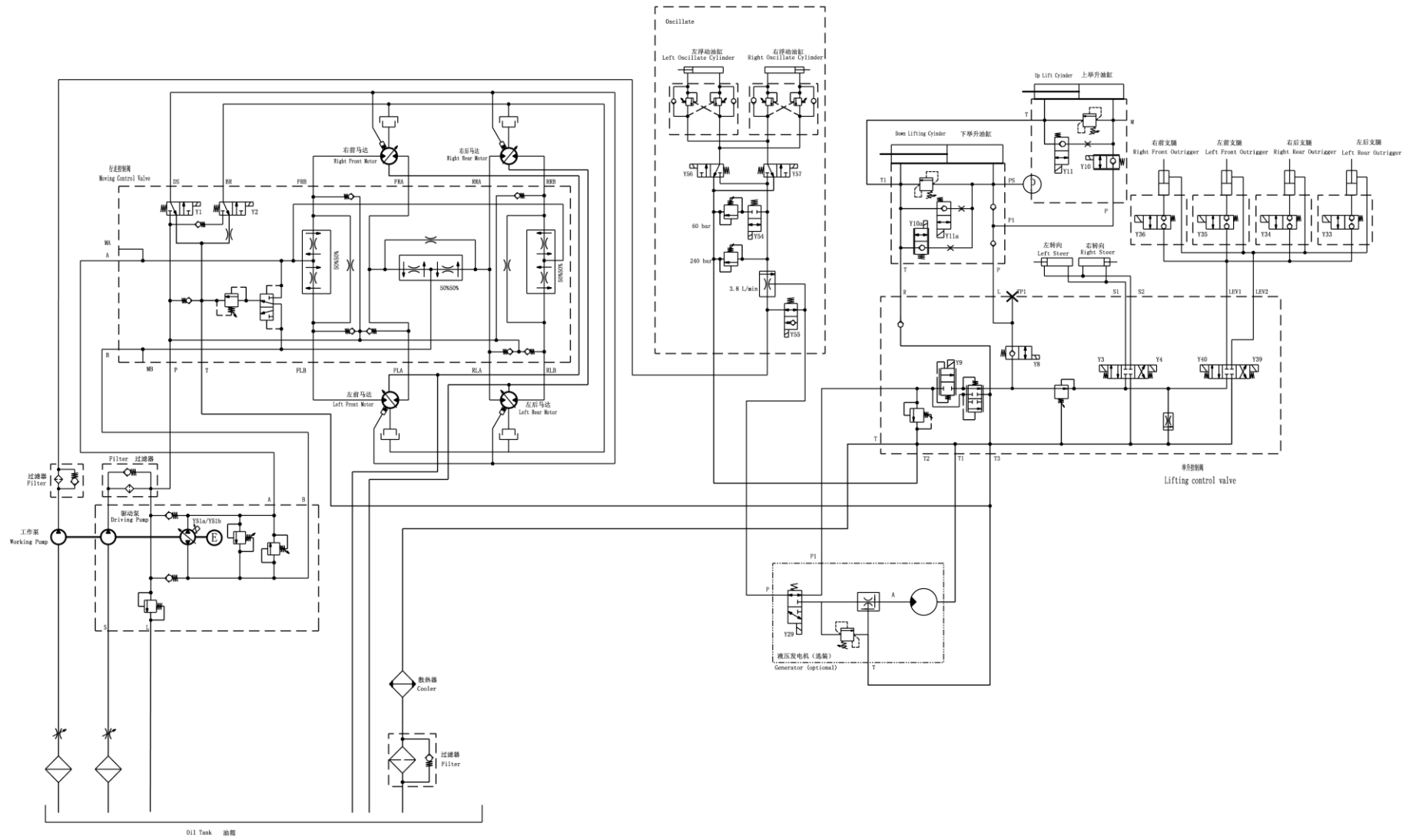


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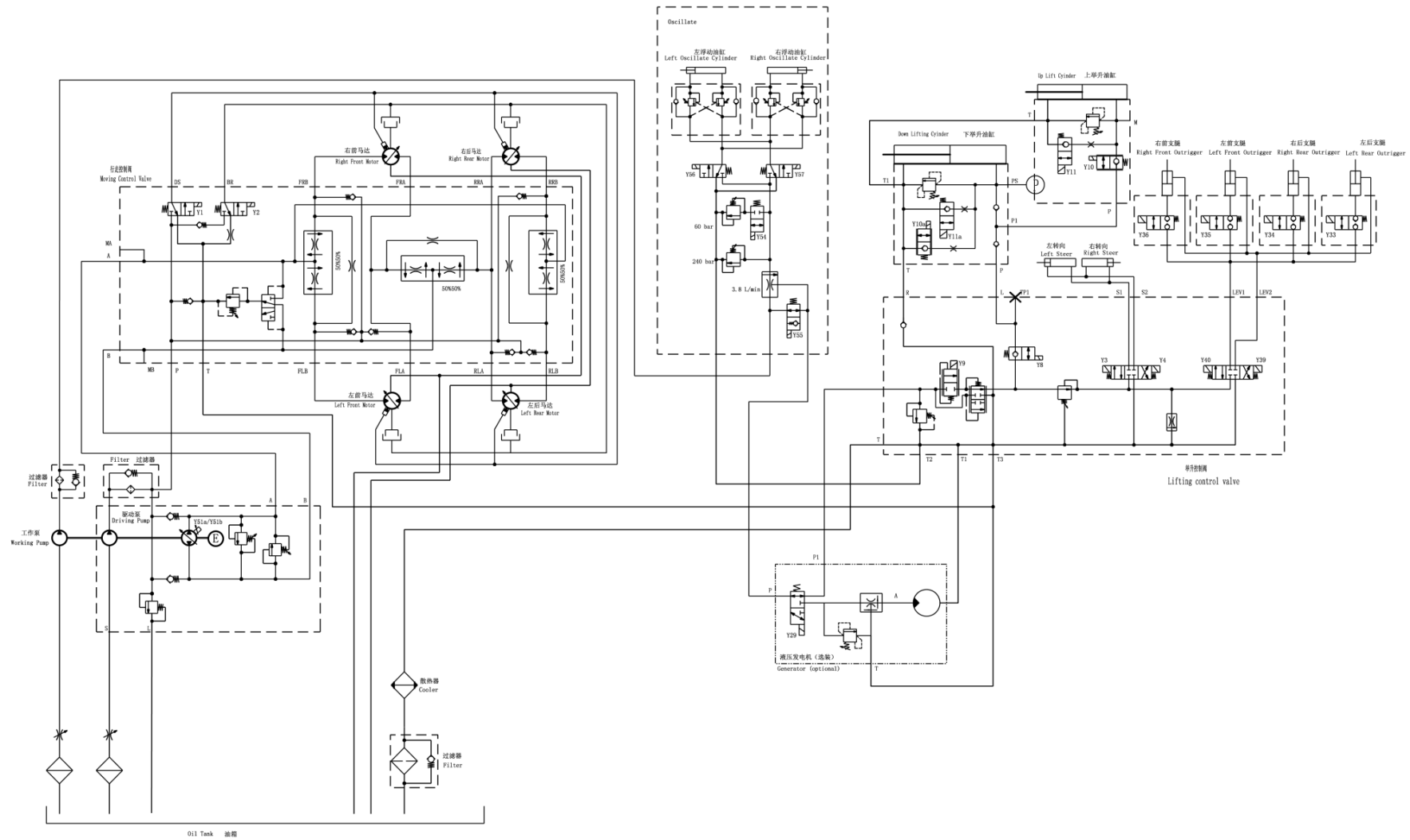




SR5390D(S5390NDAH20) Hydraulic schematic


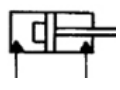
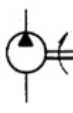
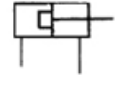



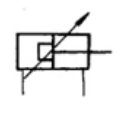


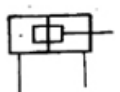

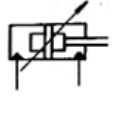

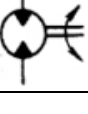



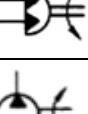

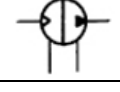
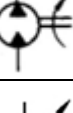

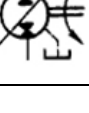



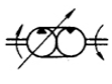

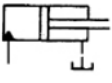

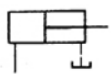

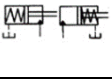

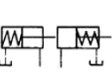

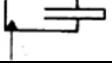




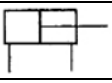

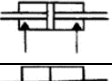

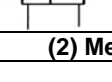



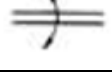



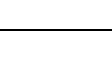



SR5390D(S539000WNK4AH2000) Hydraulic schematic


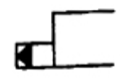

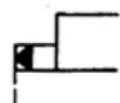




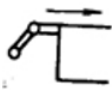
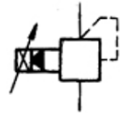

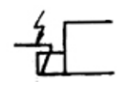
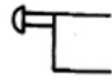
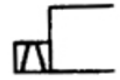


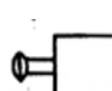

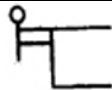
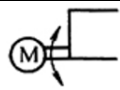
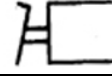
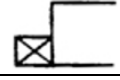
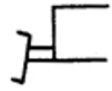



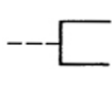
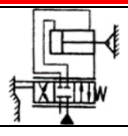
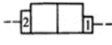
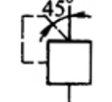
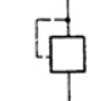


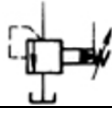
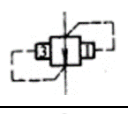
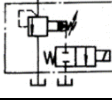
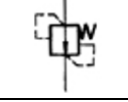
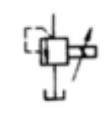
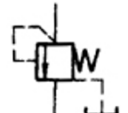
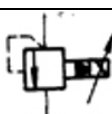
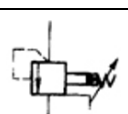
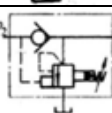
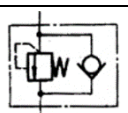
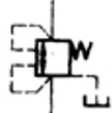
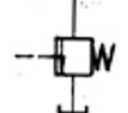
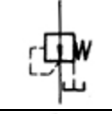
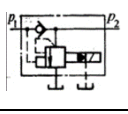
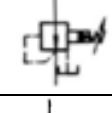
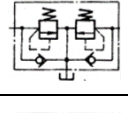
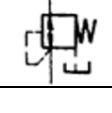
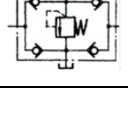
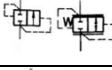

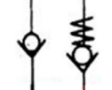

5.3 Schematic diagram of common symbols

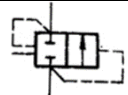




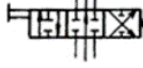


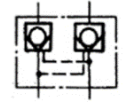
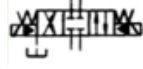
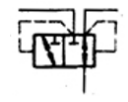

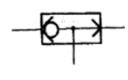

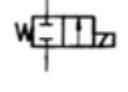

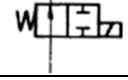

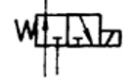
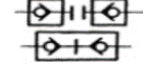



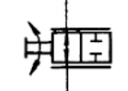
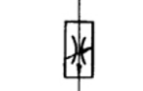
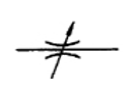
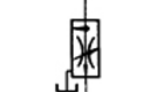
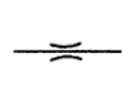
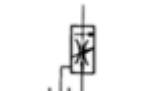
Common symbols of hydraulic components:

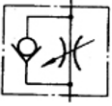
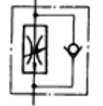
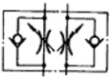


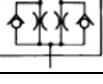
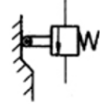
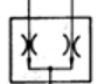
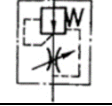
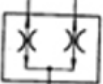
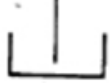

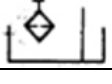
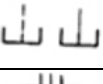





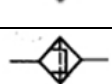

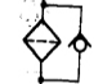

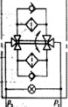







(1) Hydraulic pump, hydraulic motor and hydraulic cylinder							
Name		Symbols	Description	Name		Symbols	Description
Hydraulic pump	Hydraulic pump		General symbols	Double-acting cylinder	Non-adjustable one-way bounce cylinder		Detailed symbols
	Single-direction fixed displacement hydraulic pump		Single-direction rotation, one-way flow, fixed displacement				Simplified symbol
	Two-way fixed displacement hydraulic pump		Two-direction rotation, two-way flow, fixed displacement		Adjustable one-way cushion cylinder		Detailed symbols
	Single-direction variable displacement hydraulic pump		Single-direction rotation, two-way flow, variable displacement				Simplified symbol
	Two-way variable displacement hydraulic pump		Two-direction rotation, two-way flow, variable displacement		Non-adjustable two-way bounce cylinder		Detailed symbols
						Simplified symbol	
Hydraulic motor	Hydraulic motor		General symbols		Adjustable two-way bounce cylinder		Detailed symbols
	Single-direction fixed displacement hydraulic motor		One-way flow, single-direction rotation				
	Two-way fixed displacement hydraulic motor		Two-way flow, two-direction rotation, fixed displacement			Telescopic bar	
	One-way variable displacement hydraulic motor		One-way flow, single-direction rotation, variable displacement				
	One-way variable displacement hydraulic motor		Two-way flow, two-direction rotation, variable displacement				
	Swing motor		Two-way swing, fixed angle	Pressure transducer	Pneumatic-hydraulic converter		One-way action
						Continuous action	
Pump - motor	Fixed displacement hydraulic pump - motor		One-way flow, single-direction rotation, fixed displacement		Turbocharger		One-way action
	Variable displacement hydraulic pump - motor		Two-way flow, two-direction rotation, variable displacement, external draining			Continuous action	

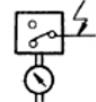








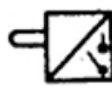

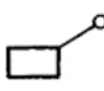



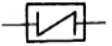


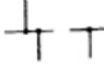



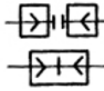

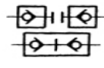

	Hydraulic integral transmission		Single-direction rotation, variable displacement, fixed displacement motor		Accumulator		General symbols
Single-action cylinder	Single piston rod cylinder		Detailed symbols	Accumulator or	Gas isolation type		
			Simplified symbol		Heavy hammer type		
	Single piston rod cylinder (with return spring)		Detailed symbols		Spring type		
			Simplified symbol	Auxiliary gas reservoir			
	Plunger rod r			Gas reservoir			
	Telescopic cylinder						
Double-acting cylinder	Single piston rod cylinder		Detailed symbols	Energy source	Hydraulic pressure source		General symbols
			Simplified symbol		Air pressure source		General symbols
	Double piston rod cylinder		Detailed symbols		Motor		
			Simplified symbol	Prime motor		Except motor	
(2) Mechanical control device and control methods							
Mechanical control device	Straight moving rod		Arrows can be omitted	Pilot pressure control method	Hydraulic pilot pressurized control		Internal pressure control
	Rotation movement axis		Arrows can be omitted		Hydraulic pilot pressurized control		External pressure control
	Locating device				Hydraulic secondary pilot pressurized control		Internal pressure control, internal draining
	Locking device		* Control method for unlocking		Pneumatic-hydraulic pilot pressurization control		Air pressure external control, hydraulic pressure internal control, external draining
	Jumper mechanism				Electro-hydraulic pilot pressure control		Hydraulic external control, internal draining

	Ejector rod type				Hydraulic pilot pressure relief control		Internal pressure control, internal draining
	Variable travel control type						External pressure control (with remote relief outlet)
	Spring controlled type						Electromagnetic control, external pressure control, external draining
	Roller type		Operation at two directions				With pressure adjusting spring, external draining, with remote relief outlet
	Single-direction roller type		Operate in a direction, with the arrow allowed to be omitted.				Pilot stage controlled by the proportional solenoid valve, and internal draining
Human control methods	Human control		General symbols	Electrical control method	Single-acting electromagnet		The electrical lead can be omitted, and the slash can also be directed to the lower right.
	Button type				Double-acting electromagnet		
	Button type				Single-acting adjustable electromagnetic operation (proportional solenoid valve,		
	Press-pull type				Double-acting adjustable electromagnetic operation (torque motor, etc.)		
	Handle type				Rotation electronic control unit		
	One-way pedal type				Feedback control method	Feedback control	
	Two-way pedal type			Electrical feedback			The position is detected by potentiometer, differential transformer, etc.

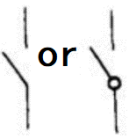

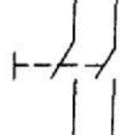
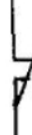
	Pressurizing or pressure relief control				Internal mechanical feedback		Such as follower valve profiling control circuit
	Differentiating control						
	Internal pressure control		Control path inside the original				
	External pressure control		Control path outside the original				
(3) Pressure controller							
Relief valve	Relief valve		General symbol or direct-acting relief valve	Pressure reducing valve	Pilot proportional solenoid pressure reducing valve		
	Pilot relief valve				Proportional pressure reducing valve		Pressure reducing ratio 1/3
	Pilot electromagnetic relief valve		(Normally closed)		Fixed differential reducing valve		
	Direct-acting proportional relief valve			Priority valve	Priority valve		General symbol or harmonious-acting sequence valve
	Pilot proportional relief valve				Pilot sequence valve		
	Load-relief overflow valve		Unloading at $p_2 > p_1$		One-way sequence valve (balance valve)		
	Two-way relief valve		Direct-acting, external draining	Unloading valve	Unloading valve		General symbol or direct-acting unloading valve
Pressure reducing valve		General symbol or direct-acting pressure reducing valve	Pilot electromagnetic unloading valve			$p_1 > p_2$	
Pressure reducing valve	Pilot pressure reducing valve			Brake valve	Double overflow brake valve		
	Overflow pressure relief valve				Overflow oil axle brake valve		
(4) Direction control valve							
Check valve	Check valve		Detailed symbols	Reversing valve	Two-position five-way hydraulic valve		
			Simplified symbol (spring can be omitted)		Two-position four-way motorized valve		

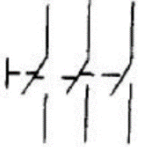

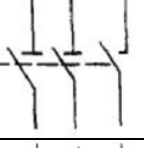
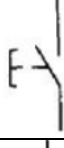
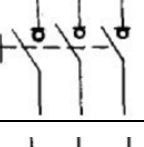

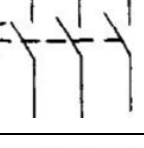
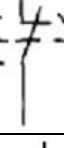
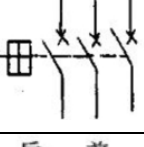

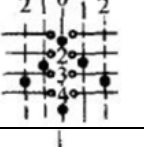

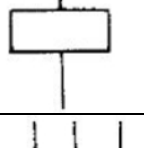

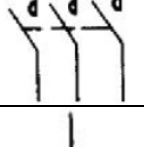

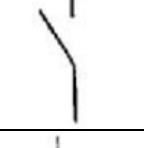
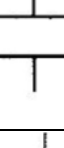
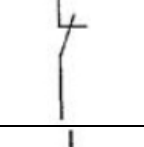

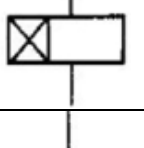

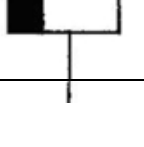
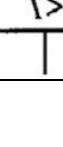
Hydraulic check valve	Hydraulically controlled check valve		Detailed symbol (control pressure shutoff valve)		Three-position four-way solenoid valve		
			Simplified symbol		Three-position four-way electro-hydraulic valve		Simplified symbol (internal leakage and external control)
			Detailed symbol (valve opening by pressure control)		Three-position six-way hand valve		
			Simplified symbol (spring can be omitted)		Three-position five-way solenoid valve		
	Double hydraulically controlled check valve				Three-position four-way electro-hydraulic valve		External control and internal leakage (with manual emergency control device)
Shuttle valve	Or gate valve		Detailed symbols		Three-position four-way proportional valve		Throttling type, overlapped center
			Simplified symbol		Three-position four-way proportional valve		Underlapped center
Reversing valve	Two-position two-way solenoid valve		Normally opened		Two-position four-way proportional valve		
			Normally open		Four-way servo valve		
	Two-position three-way solenoid valve			Four-way electro-hydraulic servo valve		Level 2	
	Two-position three-way solenoid ball valve					Live feedback level 3	
	Two-position four-way solenoid valve						
(5) Flow control valve							
Throttle valve	Adjustable throttle valve		Detailed symbols	Speed regulation valve	Speed regulation valve		Simplified symbol
			Simplified symbol		Bypass-type speed regulation valve		Simplified symbol
	Non-adjustable throttle valve		General symbols		Temperature compensated flow regulating valve		Simplified symbol

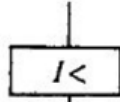


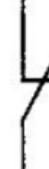

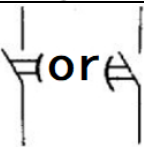
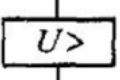
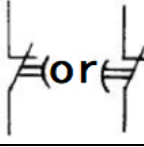
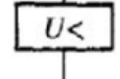
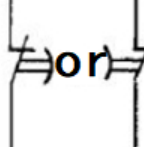

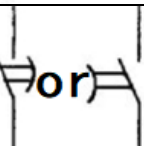

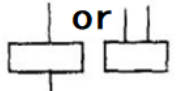
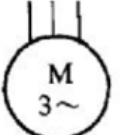
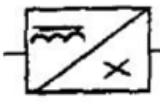
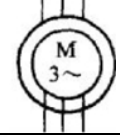
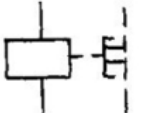
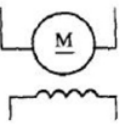
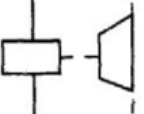
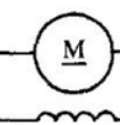
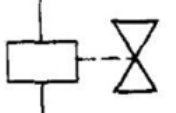
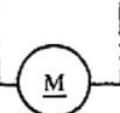
	One-way throttle valve			Synchronous valve	One-way speed regulation valve		Simplified symbol
	Double single-way throttle valve				Flow divider valve		
	Stop valve				Single flow divider valve		
	Roller control throttle valve (pressure reducing valve)				Flow combiner valve		
Speed regulation valve	Speed regulation valve		Detailed symbols		Flow diverter/combiner valve		
(6) Tank							
Ventilated type	Pipe end above the liquid level			Tank	Pipe end is at the bottom of the tank		
	Pipe end above the liquid level		With air filter		Local oil leakage or return		
				Pressurized tank or closed tank		Three oil lines	
(7) Flow regulator							
Filter	Filter		General symbols	Air filter			
	Filter with contamination indicator			Temperature regulator			
	Magnetic filter			Cooler	Cooler		General symbols
	Filter with bypass valve				Cooler to coolant pipeline		
	Duplex filter		p1: inlet p2: return	Heater		General symbols	
Pressure detector	Pressure indicator			Flow detector	Flow detector (flow indicator)		
	Pressure gauge				Flowmeter		
	Electric contact pressure gauge (pressure display controller)				Cumulative flow meter		



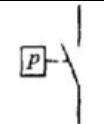

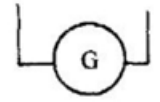
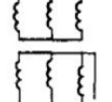
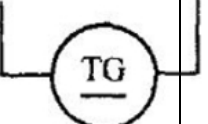


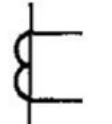

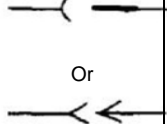

	Differential pressure control gauge				Temperature meter		
	Level gauge				Tachometer		
					Torque meter		
(8) Other auxiliary components							
Pressure relay (pressure switch)			Detailed symbols		Differential pressure switch		
			General symbols		Sensor		General symbols
Travel switch			Detailed symbols	Sensor	Pressure sensor		
			General symbols		Temperature sensor		
Coupling	Coupling		General symbols	Amplifier			
	Flexible coupling						
(9) pipeline, pipe joint and joint							
Pipeline	Pipeline		Pressure pipeline return pipeline	Pipeline	Cross pipeline		Two pipelines which are crossed but not connected
	Control pipeline		Two pipelines intersect		Flexible pipeline		
	Control pipeline		Representing drain pipeline		Single-way vent		
Quick-change joint	Quick connector without check valve			Rotary joint	Single-way rotation joint		
	Quick connector with check valve				Three-way rotary connector		

Common electrical component symbols:

Socket	Name	Graphic symbol	Text symbol	Category	Name	Graphic symbol	Text symbol
Switch	Single-pole control switch		SA	Position switch	Normally open contact		SQ
	General symbol of manual switch		SA		Normally closed contact		SQ

	Three-level control switch		QS		Composite contact		SQ
	Three-level isolating switch		QS	Button	Normally opened button		SB
	Three-level load switch		QS		Normally closed button		SB
	Combined rotary switch		QS		Combined button		SB
	Low-voltage circuit breaker		QF		Emergency stop button		SB
	Control unit or control switch		SA		Key-operated button		SB
Contactor	Coil operating device		KM		Heater relay	Heat element	
	Normally open main contact		KM	Normally closed contact			FR
	Normally open auxiliary contact		KM	Intermediate relay	Coil		KA
	Normally closed auxiliary contact		KM		Normally open contact		KA
Time relay	Power-up delay (slow closing) coil		KT	Current relay	Normally closed contact		KA
	Power-off delay (slow opening) coil		KT		Overcurrent coil		KA

					Undercurrent coil		KA	
	Instantaneously closed NO contact		KT		Normally open contact		KA	
	Instantaneously opened NC contact		KT		Normally closed contact		KA	
	Delay closed NO contact		KT		Overvoltage coil		KV	
	Delay opened normally closed contact		KT		Undervoltage coil		KV	
	Delay closed normally closed contact		KT	Voltage relay	Normally open contact		KV	
	Delay opened normally open contact		KT		Normally closed contact		KV	
Electromagnetic operator	General symbol for electromagnetic		YA		Motor	Three-phase cage asynchronous motor		M
	Electromagnetic chuck		YH			Three-phase wound rotor asynchronous motor		M
	Electromagnetic clutch		YC	Separately excited DC motor			M	
	Electromagnetic brake		YB	Shunt-excited DC motor			M	
	Solenoid valve		YV	Series DC motor			M	

Relay of non-electricity control	Speed relay normally open contact		KS	Fuse	Fuse		FU
	Pressure relay normally open contact		KP	Transformer	Single-phase transformer		TC
Alternator	Alternator		G		Three-phase transformer		TM
	DC tachogenerator		TG	Transducer	Voltage transducer		TV
Lamp	Signal lamp (indicator light)		HL		Current transformer		TA
	Light		EL	Connector	Plug and socket	 Or 	X Plug XP Socket XS