



Service manual

AR45J、AR52J Articulated Boom Mobile Elevating Work Platform

 WARNING
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Before operation and maintenance, the drivers and maintenance personnel are required to read this manual thoroughly. Otherwise, fatal accident may occur. This manual shall be kept properly for future reference by the personnel concerned.

LINGONG HEAVY MACHINERY CO., LTD.

Articulated Boom Mobile Elevating Work Platform Service Manual

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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 the Articulated Boom 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 Group Jinan 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 specially trained and qualified personnel can operate, repair 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 this 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 operating procedures and precautions provided in this manual are only applicable to the specified purposes of this machine. If it is used for operations other than those specified but not prohibited, make sure that this operation does not cause harm to you or others.

Safety Notices

The operator should understand and follow the current national and local safety regulations. If there are no national or local regulations, the safety instructions in this manual shall be applicable.


Most 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 will result in death or serious injury.


Since it is impossible to foresee all possible dangers, the safety instructions in this manual and on the machine cannot include all safety precautions. If steps and operations not recommended in this manual are used, you must ensure that you and other people are safe and the machine will not be damaged. If you are not sure about the safety of some operations, please contact our company or dealer.


Some operations to the machine require not only basic mechanical, hydraulic and electrical skills, but also professional skills, tools, lifting equipment and suitable workshop. In these cases, we strongly recommend that the maintenance and repair should be carried out at a service center authorized by Lingong Heavy Machinery Co., Ltd.

The maintenance precautions given in this manual are only applicable when the machine is used for the specified purpose. If the machine is used in the scope out of this manual, our company will not assume any safety responsibility, and the safety responsibility in such operations shall be borne by the user and the operator. Under no circumstances shall the operations prohibited in this manual be performed.

Most of the maintenance process can only be performed by trained professional service personnel in properly equipped workshops.

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

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

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

1. Safety and Environment

1.1 Terms and Definitions

Administrator: the entity or individual that directly controls the use and application of the lifting platform, which usually refers to the owner, the renter or the authorized personnel of owner who obtains the control right of the lifting platform;

Operator: personnel who has been professionally trained and mastered qualified knowledge and practical experience to operate the lifting platform.

Qualified personnel: those with recognized academic qualifications, certificates, professional status, or relevant professional knowledge, trained and experienced, who can effectively prove their ability to solve the difficulties encountered in related matters, work or projects.

Safety notice: relevant safety information issued by Lingong Heavy Machinery Co., Ltd.

1.2 Compliance

1. The maintenance is required to be carried out by personnel who have received and qualified in the maintenance training of this machine.
2. Immediately mark the machine if it is damaged or faulty, and withdraw it out of service.
3. Repair any damage or fault before operating the machine.

1.3 Before maintenance

1. Read and follow the safety rules and maintenance instructions in the corresponding operation manuals on the machine.
2. Ensure that all necessary tools and parts are in place.
3. Do not use parts not sold by Lingong Heavy Machinery Co., Ltd.
4. Please read each step thoroughly and follow the instructions, and do not try to perform repair by shortcut, as this is dangerous.

1.4 Workplace requirements

Unless specially specified, the machine shall be able to operate safely under the following conditions:

1. Altitude $\leq 1000\text{m}/3281\text{ft}$;
2. Ambient humidity $\leq 90\%$ (at $+25^{\circ}\text{C}$).
3. The machine shall be able to operate normally under the following safe conditions:
 - Ambient temperature of $-20^{\circ}\text{C} \sim +40^{\circ}\text{C}$;
 - Wind speed: $\leq 12.5\text{m/s}/28\text{mph}$.
4. The ground should be firm and smooth, and should not sag during operation;
5. The allowable fluctuation of the supply voltage should be 10%.

1.5 Safety precautions for maintenance and repair

1. Before adjusting and repairing the machine, the following preventive measures shall be taken
 - Park the machine on a solid and level ground
 - Block the wheels
 - Cut off the power supply to disable the machine;
 - Set all controls in "OFF" position to prevent the operating system from being started by accident;

- If possible, lower the platform to the lowest position, otherwise, ensure that it will not fall;
 - Before loosening or removing hydraulic components, release the hydraulic oil pressure in the hydraulic pipeline;
 - Place safety supports 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. Parts replacement
The replacement components and parts must be the original parts of our company, otherwise the product will not be maintained or repaired.
 4. Service announcement
Users shall maintain and repair the machine in strict accordance with the service announcement issued by Lingong Heavy Machinery Co., Ltd.

1.6 Intended use

This machine is only intended for lifting people and their tools and materials to a high-altitude workplace.

1.7 Description

Most maintenance processes can only be performed by professionally trained maintenance personnel in a properly equipped workshop. After troubleshooting, select the appropriate maintenance steps.

Perform the disassembly steps until the repair can be completed. Then perform the disassembly steps in the reverse order.

It is strongly recommended to carry out maintenance and repair at the service center authorized by Lingong Group Jinan Heavy Machinery Co., Ltd.

Symbol representation

Symbols, color codes and symbolic words used by LGMG products have the following meanings:

Safety warning sign - used for warning of potential personal injury. Observe all safety tips after this sign to avoid possible personal injury or death.



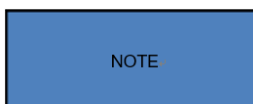
Red - Indicating a hazardous situation. If it is not avoided, it will lead to death or serious injury of personnel.



Orange - Indicating a hazardous situation. If it is not avoided, it may cause death or serious injury.



Yellow - Indicating a dangerous situation. If not avoided, it may cause minor or moderate personal injury.



Blue - Indicating a dangerous situation. If not avoided, it may result in property damage.

2. Product Introduction

2.1 Machine parameters

2.1.1 Parameters of AR45J (A0014JNKAH21) articulated lifting platform

1. Parameters of machine

Item	Parameter	Item	Parameter
Rated load (kg/lbs)	230/510	Rotary table rotation time per circle (stowed) (s)	82-92
		Rotary table rotation time per circle (extended) (s)	82-92
Total weight (kg/lbs)	7160/15785	Boom lifting time (s)	35-45
Max. allowed workers	2	Boom lowering time (s)	30-40
Max. working height (m/ft)	16.09/52.8	Articulating boom lifting time (s)	25-35
Max. platform height (m/ft)	14.09/46.2	Articulating boom lowering time (s)	26-40
Max. horizontal reach (m/ft)	7.67/25.2	Boom extension time (s)	20-30
Max. span height (m/ft)	7.56/24.8	Boom retraction time (s)	20-30
Min. turning radius (inner wheel) (m/ft)	1.94/6.36	Jib lifting time (s)	30-50
Min. turning radius (outer wheel) (m/ft)	4.41/14.47	Jib lowering time (s)	20-35
Max. braking distance (no-load, stowed) (m/ft)	$1 \leq S \leq 1.5$ / $3.3 \leq S \leq 4.9$	Platform rotation time (s)	13-26
Max. travel speed (stowed) (km/h/mph)	6.1 ± 0.5 / 3.8 ± 0.3	Theoretical maximum gradeability (no-load, stowed)	45%
Max. travel speed (extended) (km/h/mph)	0.8 ± 0.05 / 0.5 ± 0.03	Max. operation effort (N)	400
Climbing speed (stowed) (km/h/mph)	>1.5/>0.9	Max. allowed wind speed (m/s/mph)	12.5/28
Climbing speed (extended) (km/h/mph)	$\leq 0.8/\leq 0.5$	Drive mode	Four-wheel drive Front wheel steering
Max. allowed inclination of chassis	Along the boom 4.5° Orthogonal to boom 4.5°		

2. Main dimensions

Item	Parameter	Item	Parameter
Overall length (mm/in)	6766/267	Track width (mm/in)	2059/81
Overall width (mm/in)	2310/91	Wheelbase (front/rear) (mm/in)	1981.5/78
Overall height (mm/in)	2170/86	Min. ground clearance (mm/in)	360/14
Dimension of working platform (length × width) (mm/in)	1830 × 760/72 × 30	Tire specification	315/55D20

3. Engine system

Item	Parameter	Item	Parameter
Model	V2403-CR-E5B-LGL-1	Rated speed (r/min)	2600
Displacement (ml)	2434	Maximum torque (Nm)	159.8/1600rpm
Rated power (KW)	36	Emission standard	EPA Tier 4f

4. Transmission system

Item	Parameter
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Walking reducer	Rated output torque (Nm)	3500
	Speed ratio	57.49: 1
Slewing reducer	Rated output torque (Nm)	8729
	Speed ratio	86: 1

5. Hydraulic system

Item		Parameter	
Walking system	Type	Closed	
	Pump displacement (ml/r)	46	
	Max. working pressure (MPa/psi)	28/4061	
	Motor displacement (ml/r)	38	
Functional system	Type	Open	
	Pump displacement (ml/r)	11	
	Lifting system Max. working pressure (MPa/psi)	23.5/3408	
	Slewing system	Max. working pressure (MPa/psi)	23.5/3408
		Motor displacement (ml/r)	160
Steering system Max. working pressure (MPa/psi)	23.5/3408		

6. Electronic control system

Item		Parameter
Battery	Output voltage (V)	12
	Capacity (Ah)	120 (20HR discharge rate)
Control system	Voltage (V)	12

7. Refilling capacity

Item	Parameter	Item	Parameter
Hydraulic oil (L/gal_US)	130/34.3	Engine oil (L/gal_US)	8/2.1
Gearbox oil (L/gal_US)	0.68×4/0.18×4	Engine antifreeze (L/gal_US)	7.5/2
Diesel (L/gal_US)	65/17.2		

2.1.2 Parameters of AR45J (A0014JNDAH21) articulated lifting platform

1. Parameters of machine

Item	Parameter	Item	Parameter
Rated load (kg/lbs)	230/510	Rotary table rotation time per circle (stowed) (s)	82-92
		Rotary table rotation time per circle (extended) (s)	82-92
Total weight (kg/lbs)	7160/15785	Boom lifting time (s)	35-45
Max. allowed workers	2	Boom lowering time (s)	30-40
Max. working height (m/ft)	16.09/52.8	Articulating boom lifting time (s)	25-35
Max. platform height (m/ft)	14.09/46.2	Articulating boom lowering time (s)	26-40
Max. horizontal reach (m/ft)	7.67/25.2	Boom extension time (s)	20-30

Max. span height (m/ft)	7.56/24.8	Boom retraction time (s)	20-30
Min. turning radius (inner wheel) (m/ft)	1.94/6.36	Jib lifting time (s)	30-50
Min. turning radius (outer wheel) (m/ft)	4.41/14.47	Jib lowering time (s)	20-35
Max. braking distance (no-load, stowed) (m/ft)	$1 \leq S \leq 1.5$ / $3.3 \leq S \leq 4.9$	Platform rotation time (s)	13-26
Max. travel speed (stowed) (km/h/mpH)	6.1 ± 0.5 / 3.8 ± 0.3	Theoretical maximum gradeability (no-load, stowed)	45%
Max. travel speed (extended) (km/h/mpH)	0.8 ± 0.05 / 0.5 ± 0.03	Max. operation effort (N)	400
Climbing speed (stowed) (km/h/mpH)	>1.5 / >0.9	Max. allowed wind speed (m/s/mpH)	12.5/28
Climbing speed (extended) (km/h/mpH)	≤ 0.8 / ≤ 0.5	Drive mode	Four-wheel drive Front wheel steering
Max. allowed inclination of chassis	Along the boom		
	Orthogonal to boom	4.5°	

2. Main dimensions

Item	Parameter	Item	Parameter
Overall length (mm/in)	6766/267	Track width (mm/in)	2059/81
Overall width (mm/in)	2310/91	Wheelbase (front/rear) (mm/in)	1981.5/78
Overall height (mm/in)	2170/86	Min. ground clearance (mm/in)	360/14
Dimension of working platform (length × width) (mm/in)	1830×760/72×30	Tire specification	315/55D20

3. Engine system

Item	Parameter	Item	Parameter
Model	D2.9L4	Rated speed (r/min)	2600
Displacement (ml)	2900	Maximum torque (Nm)	150/1600rpm
Rated power (KW)	36.4	Emission standard	EPA Tier 4f

4. Transmission system

Item		Parameter
Walking reducer	Rated output torque (Nm)	3500
	Speed ratio	57.49: 1
Slewing reducer	Rated output torque (Nm)	8729
	Speed ratio	86: 1

5. Hydraulic system

Item		Parameter
Walking system	Type	Closed
	Pump displacement (ml/r)	46
	Max. working pressure (MPa/psi)	28/4061
	Motor displacement (ml/r)	38
Functional	Type	Open

system	Pump displacement (ml/r)		11
	Lifting system Max. working pressure (MPa/psi)		23.5/3408
	Slewing system	Max. working pressure (MPa/psi)	23.5/3408
		Motor displacement (ml/r)	160
	Steering system Max. working pressure (MPa/psi)		23.5/3408

6. Electronic control system

Item		Parameter
Battery	Output voltage (V)	12
	Capacity (Ah)	120 (20HR discharge rate)
Control system	Voltage (V)	12

7. Refilling capacity

Item	Parameter	Item	Parameter
Hydraulic oil (L/gal_US)	130/34.3	Engine oil (L/gal_US)	8.5/2.2
Gearbox oil (L/gal_US)	0.68×4/0.18×4	Engine antifreeze (L/gal_US)	8.5/2.2
Diesel (L/gal_US)	65/17.2		

2.1.3 Parameters of AR52J (A0016JNKAH21) articulated lifting platform

1. Parameters of machine

Item	Parameter	Item	Parameter
Rated load (kg/lbs)	230/510	Rotary table rotation time per circle (stowed) (s)	82-92
		Rotary table rotation time per circle (extended) (s)	82-92
Total weight (kg/lbs)	8180/18034	Boom lifting time (s)	35-45
Max. allowed workers	2	Boom lowering time (s)	30-40
Max. working height (m/ft)	17.7/58	Articulating boom lifting time (s)	25-35
Max. platform height (m/ft)	15.7/52	Articulating boom lowering time (s)	26-40
Max. horizontal reach (m/ft)	9.39/30.8	Boom extension time (s)	20-30
Max. span height (m/ft)	7.56/24.8	Boom retraction time (s)	20-30
Min. turning radius (inner wheel) (m/ft)	1.94/6.36	Jib lifting time (s)	30-50
Min. turning radius (outer wheel) (m/ft)	4.41/14.47	Jib lowering time (s)	20-35
Max. braking distance (no-load, stowed) (m/ft)	1≤S≤1.5/ 3.3≤S≤4.9	Platform rotation time (s)	13-26
Max. travel speed (stowed) (km/h/mpH)	6.1±0.5/ 3.8±0.3	Theoretical maximum gradeability (no-load, stowed)	45%
Max. travel speed (extended) (km/h/mpH)	0.8±0.05/ 0.5±0.03	Max. operation effort (N)	400
Climbing speed (stowed) (km/h/mpH)	>1.5/>0.9	Max. allowed wind speed (m/s/mpH)	12.5/28
Climbing speed (extended) (km/h/mpH)	≤0.8/≤0.5	Drive mode	Four-wheel drive Front wheel steering
Max. allowed inclination of boom	4.5°		

chassis	Orthogonal to boom	4.5°		
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2. Main dimensions

Item	Parameter	Item	Parameter
Overall length (mm/in)	7560/298	Track width (mm/in)	2059/81
Overall width (mm/in)	2310/91	Wheelbase (front/rear) (mm/in)	1981.5/78
Overall height (mm/in)	2170/86	Min. ground clearance (mm/in)	360/14
Dimension of working platform (length x width) (mm/in)	1830×760/72×30	Tire specification	315/55D20

3. Engine system

Item	Parameter	Item	Parameter
Model	V2403-CR-E5B-LGL-1	Rated speed (r/min)	2600
Displacement (ml)	2434	Maximum torque (Nm)	159.8/1600rpm
Rated power (KW)	36	Emission standard	EPA Tier 4f

4. Transmission system

Item		Parameter
Walking reducer	Rated output torque (Nm)	3500
	Speed ratio	57.49: 1
Slewing reducer	Rated output torque (Nm)	8729
	Speed ratio	86: 1

5. Hydraulic system

Item		Parameter	
Walking system	Type	Closed	
	Pump displacement (ml/r)	46	
	Max. working pressure (MPa/psi)	28/4061	
	Motor displacement (ml/r)	38	
Functional system	Type	Open	
	Pump displacement (ml/r)	11	
	Lifting system Max. working pressure (MPa/psi)	23.5/3408	
	Slewing system	Max. working pressure (MPa/psi)	23.5/3408
		Motor displacement (ml/r)	160
Steering system Max. working pressure (MPa/psi)	23.5/3408		

6. Electronic control system

Item		Parameter
Battery	Output voltage (V)	12
	Capacity (Ah)	120(20HR discharge rate)
Control system	Voltage (V)	12

7. Refilling capacity

Item	Parameter	Item	Parameter
Hydraulic oil (L/gal_US)	130/34.3	Engine oil (L/gal_US)	8/2.1
Gearbox oil (L/gal_US)	0.68×4/0.18×4	Engine antifreeze (L/gal_US)	7.5/2
Diesel (L/gal_US)	65/17.2		

2.1.4 Parameters of AR52J (A0016JNDAH21) articulated lifting platform

1. Parameters of machine

Item	Parameter	Item	Parameter
Rated load (kg/lbs)	230/510	Rotary table rotation time per circle (stowed) (s)	82-92
		Rotary table rotation time per circle (extended) (s)	82-92
Total weight (kg/lbs)	8180/18034	Boom lifting time (s)	35-45
Max. allowed workers	2	Boom lowering time (s)	30-40
Max. working height (m/ft)	17.7/58	Articulating boom lifting time (s)	25-35
Max. platform height (m/ft)	15.7/52	Articulating boom lowering time (s)	26-40
Max. horizontal reach (m/ft)	9.39/30.8	Boom extension time (s)	20-30
Max. span height (m/ft)	7.56/24.8	Boom retraction time (s)	20-30
Min. turning radius (inner wheel) (m/ft)	1.94/6.36	Jib lifting time (s)	30-50
Min. turning radius (outer wheel) (m/ft)	4.41/14.47	Jib lowering time (s)	20-35
Max. braking distance (no-load, stowed) (m/ft)	$1 \leq S \leq 1.5$ / $3.3 \leq S \leq 4.9$	Platform rotation time (s)	13-26
Max. travel speed (stowed) (km/h/mph)	6.1 ± 0.5 / 3.8 ± 0.3	Theoretical maximum gradeability (no-load, stowed)	45%
Max. travel speed (extended) (km/h/mph)	0.8 ± 0.05 / 0.5 ± 0.03	Max. operation effort (N)	400
Climbing speed (stowed) (km/h/mph)	>1.5/>0.9	Max. allowed wind speed (m/s/mph)	12.5/28
Climbing speed (extended) (km/h/mph)	≤ 0.8 / ≤ 0.5	Drive mode	Four-wheel drive Front wheel steering
Max. allowed inclination of chassis	Along the boom		
	Orthogonal to boom	4.5°	

2. Main dimensions

Item	Parameter	Item	Parameter
Overall length (mm/in)	7560/298	Track width (mm/in)	2059/81
Overall width (mm/in)	2310/91	Wheelbase (front/rear) (mm/in)	1981.5/78
Overall height (mm/in)	2170/86	Min. ground clearance (mm/in)	360/14
Dimension of working platform (length × width) (mm/in)	1830×760/72×30	Tire specification	315/55D20

3. Engine system

Item	Parameter	Item	Parameter
Model	D2.9L4	Rated speed (r/min)	2600
Displacement (ml)	2900	Maximum torque	150/1600rpm

		(Nm)	
Rated power (KW)	36.4	Emission standard	EPA Tier 4f

4. Transmission system

Item		Parameter
Walking reducer	Rated output torque (Nm)	3500
	Speed ratio	57.49: 1
Slewing reducer	Rated output torque (Nm)	8729
	Speed ratio	86: 1

5. Hydraulic system

Item		Parameter	
Walking system	Type	Closed	
	Pump displacement (ml/r)	46	
	Max. working pressure (MPa/psi)	28/4061	
	Motor displacement (ml/r)	38	
Functional system	Type	Open	
	Pump displacement (ml/r)	11	
	Lifting system Max. working pressure (MPa/psi)	23.5/3408	
	Slewing system	Max. working pressure (MPa/psi)	23.5/3408
		Motor displacement (ml/r)	160
	Steering system Max. working pressure (MPa/psi)	23.5/3408	

6. Electronic control system

Item		Parameter
Battery	Output voltage (V)	12
	Capacity (Ah)	120(20HR discharge rate)
Control system	Voltage (V)	12

7. Refilling capacity

Item	Parameter	Item	Parameter
Hydraulic oil (L/gal_US)	130/34.3	Engine oil (L/gal_US)	8.5/2.2
Gearbox oil (L/gal_US)	0.68×4/0.18×4	Engine antifreeze (L/gal_US)	8.5/2.2
Diesel (L/gal_US)	65/17.2		

2.2 Specification for selection of tightening torque of the lifting platform

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 torque of metric/imperial-threaded fittings and plugs (unit: N.m)

Tightening torque of metric-threaded oil ports					Tightening torque of imperial-threaded oil ports				
Pipe diameter	Thread specification (mm)	Fitting type		Plug VSTI-E	Pipe diameter	Thread specification (Inch)	Fitting type		Plug VSTI-ED
		Type E	Type F				Type E	Type F	
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 UN-threaded fittings and plugs (unit: N.m)

Product Series	Thread UN/UNF	Non-directional assembly torque N.m	Non-directional 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
1-5/8-12 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.

For example:

- 1) GE 28 L M ED OMD A3C: 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; then 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; then according to O 22L R3/4, the torque selected from Table 2 is 160N.m;
- 3) GE O 20S R OMDCF: S for heavy pressure; then according to O 20S R, the torque selected is 160N.m;

Table 3: Tightening Torque of Metric-Threaded Swivel Nuts (unit: N.m)

Pipe diameter	Thread specifications	Tightening torque	Pipe diameter	Thread specifications	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 2, an error of +10% is allowed;
- 2) The torque values given in Table 3 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 1 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.

For example:

- 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) F412 SN CACF 1210 06: SN represents heavy pressure hose, the torque at end 12 is 63 N.m, and the torque at end 10 is 53 N.m;
- EW15LOMDA3C: EW represents a right-angle combination fitting. The torque value selected from

Table 1 according to 15L is 32 N.m.

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

Strength grade of bolt	Yield strength N/MM ²	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
Strength grade of bolt	Yield strength N/MM ²	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
Strength grade of bolt	Yield strength N/MM ²	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

3. Service

3.1 Platform assembly

3.1.1 Assembling the file box

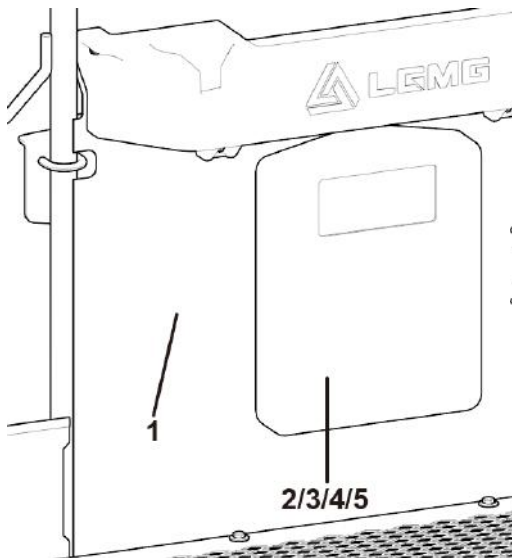


Fig. 3.1 Assembling the file box

1. Platform frame 2. File box 3. Bolt 4. Washer 5. Nut

1. Assemble part 2 with part 3/4 (nut end)/5 to the mounting position in the middle of part 1, and tighten the bolts.

Reference tightening torque of part 3: 12±1N.m

Tools: open-end wrench 8-10

Note: Pay attention that the simple removal process will not be described. Please refer to the assembling process.

3.1.2 Assembling the foot switch

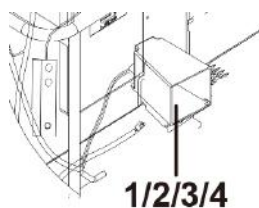


Fig. 3.2 Assembling the foot switch

1. Foot switch 2. Screw 3. Screw 4. Washer

1. Assemble part 1 with parts 2/3/4 to the assembling position at the bottom of the platform frame, and tighten the screws.

Reference tightening torque of parts 2/3: 6N.m

Tools: Allen wrench M4

3.1.3 Assembling the lifting cross bar

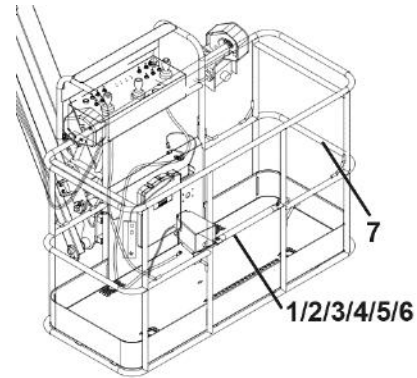


Fig. 3.3 Assembling the lifting cross bar

1. Lifting cross bar 2. U-bolt 3. Rubber hose 4. Nut 5. Washer 6. Nut 7. Lifting side bar

1. Pre-install part 3 on part 2, screw on part 4, then attach part 1 to the front door railing of the platform with U-bolts, fix it with parts 5/6, and install part 7 to the side door railing of the platform in the same way as part 1.

Reference tightening torque of part 6: 12±1N.m

Tools: open-end wrench 13-16

3.1.4 Assembling the load cell

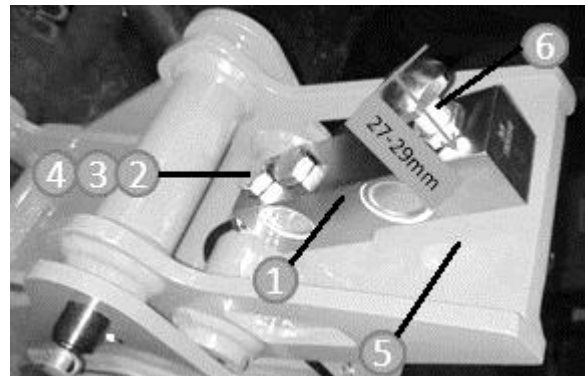


Fig. 3.4 Assembling the load cell

1. Load cell 2. Bolt 3. Washer 4. Nut 5. Triangular bracket assembly 6. the tumbler adjusted his feet

1. Install part 1 with part 2/3(nut end)/4 on part 5, and then part 6 on part 1, with the farthest end of part 6 27-29mm/1.6-1.14in away from the surface of the load cell, and back part 6 to the load cell using the nut on part 6.

Reference tightening torque of part 2: 90±9N•m; Reference tightening torque of part 6: 52±

5N•m;

Tools: Open spanner16–18; Open spanner 13–16; Socket1/2-18mm; QSP100N4; S6 internal hexagonal wrench.

3.1.5 Assembling the stop block

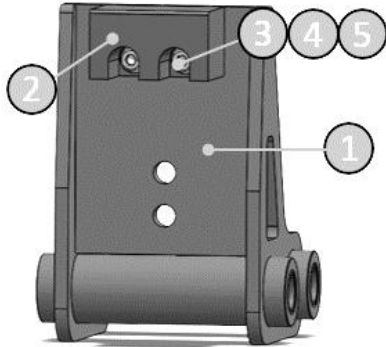


Fig. 3.5 stop block

1. Triangular bracket assembly 2. Stop block 3. Screw 4. Washer 5. Nut

1. Assemble part 2 to part 1 with part 3/4/5.

Reference tightening torque of part 3: $12 \pm 1N \cdot m$

Tools: Allen wrench M4; Open ratchet wrench 13.

3.1.6 Assembling the swing motor mounting bracket

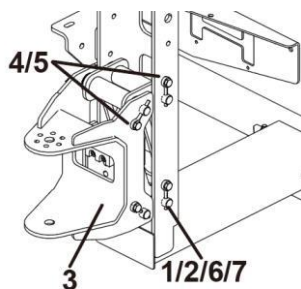


Fig. 3.6 Assembling the swing motor mounting bracket

1. Transition support pin 2. Adjusting washer 3. Swing motor mounting bracket 4. Bolt 5. Bolt 6. Bolt 7. Bolt

1. Connect the triangular bracket assembly to part 3 and platform support with parts 1. When knocking the part 1 for assembling, adjust the

gap of triangular bracket assembly with platform support and swing motor mounting bracket using part 2 until the part 2 cannot be inserted any more. Pay attention that the knocking direction of parts 1 shall be consistent (that is, the grease nipples are on the same side after installation).

2. Insert part 4, fix it with part 5 (to be pre-coated with adhesive), install part 6 on part 1, then add lithium grease 2# until the grease overflows from both sides of triangular bracket assembly, and then assemble part 7 to part 6.

Tightening torque of part 5: $52 \pm 5N \cdot m$

Tools: QSP100N4/socket wrench 1/2-16mm/open-end wrench 13-16

3.1.7 Assembling the platform control unit (PCU)



Fig. 3.7 Platform controller box

1. PCU assembly 2. Bolt 3. Washer 4.nut

1. Assemble part 1 to the mounting position in the middle of platform frame with parts 2 (to be pre-coated with adhesive)/3/4.

Reference tightening torque of part 2: $52 \pm 5N \cdot m$

3.1.8 Assembling the platform

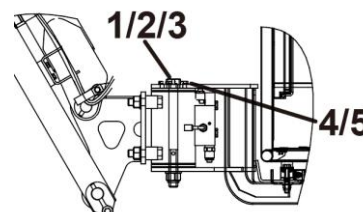


Fig. 3.8 Assembling the platform

1. Screw 2. Washer 3. Nut 4. Screw 5. Washer
1. Lift the platform to the assembling position of

the swing cylinder, insert the part 1 through the platform support and the swing cylinder, manually screw on the parts 2/3 (note that do not tighten the part 1 at this time), adjust the perpendicularity between the platform and the fly jib, and after the adjustment, apply adhesive to parts 4 and pre-tighten them symmetrically (do not torque tighten them for the time being), then apply adhesive to parts 1 and torque tighten them, and finally torque tighten parts 4;

2. Connect the platform harness to PCU and connectors of load cell and platform valve block, and connect the corresponding oil pipes to the platform.

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

Tightening torque of part 4: 71±7N.m

Tools: open-end wrench 30-32/QLE-750N/QSP100N4

3.2 Jib assembly

3.2.1 Disassembling the swing cylinder, the fly jib cylinder and the jib



CAUTION:

This procedure should be implemented when the boom is retracted.



CAUTION:

The O-ring (if any) of the removed fitting and/or 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. Remove the platform.
2. Disconnect the electrical connection from the

jib/platform changeover valve installed on the platform bracket.

3. Mark, disconnect and plug all hydraulic hoses on the jib/platform changeover valve. Plug the hose fittings, as shown below:



WARNING: Risk of personal injury

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

4. Remove the platform mounting weldment.
5. Attach the sling from the overhead crane to the swing cylinder for the purpose of supporting.
6. Remove the fastener of dowel pin from the cylinder mounting shaft at the fly jib cylinder barrel end. But do not remove the cylinder mounting shaft.
7. Remove the fasteners of dowel pins at two ends of the jib link. But do not remove the pin.
8. Use the copper hammer to knock out the cylinder mounting shaft connected to the upper link, to make the upper link sink.
9. Disconnect and plug the hoses and fittings on the swing cylinder, remove the securing fasteners on the swing cylinder, and remove the swing cylinder from the machine.
10. Slide the two jib leveling arms away from the pivot pin at the boom cylinder rod end.
11. Remove the hose/ cable cover from the jib (upper link) side, and then take off the hose/ cable cover.
12. Attach the sling from the overhead crane to the fly jib.
13. Use a suitable lifting device to support the fly jib cylinder barrel end.
14. Mark, disconnect and plug the hydraulic

hoses of the fly jib cylinder. And plug the fittings on the cylinder.

! WARNING: Risk of personal injury

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

15. Remove the fastener of dowel pin from the pivot at the fly jib cylinder block end.
16. Use a copper hammer to remove the pin and make the cylinder sink.

! WARNING: Risk of crushing

If not properly supported by the crane, the jib may fall during removal of the pivot pin at the barrel end.

17. Remove the fastener of dowel pin from the jib mounting shaft. Remove the pin with the copper hammer, and then remove the jib from the boom head connecting plate.

! WARNING: Risk of crushing

If not properly supported by the crane, the jib may fall due to loss of balance during removal from the machine.

18. Attach the sling from the overhead crane to the lifting lug at the fly jib cylinder rod end.
19. Knock out the mounting shaft at the fly jib cylinder barrel end with the copper hammer, and then remove the fly jib cylinder from the boom head connecting plate.

! WARNING: Risk of crushing

If not properly supported by the crane, the jib may fall due to loss of

balance during removal from the machine.

3.2.2 Assembling the swing cylinder, the fly jib cylinder and the jib

1. Place part 1/2/3/4 onto the jib subassembly tooling as shown below.

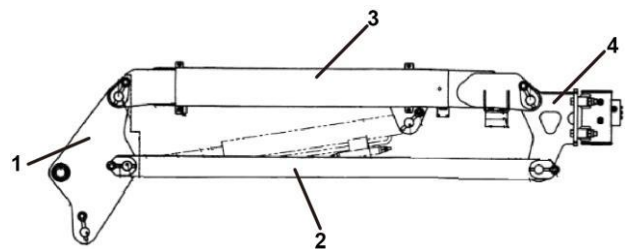


Fig. 3.9 jib assembly

1. Lower connecting bracket assembly 2. Lower link 3. Upper link 4. Upper connector assembly
2. Connect the upper/lower connector assembly to the upper link with part 5, and then fix them with part 6/7/8/9, as shown below:

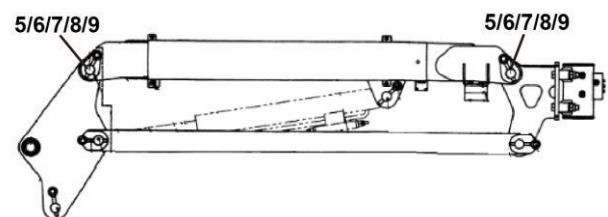


Fig. 3.10 jib assembly

5. Shaft 6. Latch 7. Bolt 8. Washer 9. Nut

Tool: Open-end ratchet wrench 16

3. Install the cushion block, use part 10/11 to install part 12 to the assembly position at front end of upper link, and tighten the bolt, as shown below:

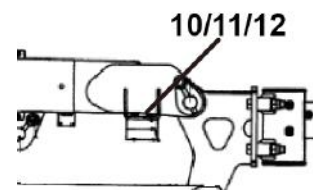


Fig. 3.11 Jib Cushion block assembly

10. Cushion block 11. Bolt 12. Washer

Reference tightening torque of part 3: 12±1N.m

Tool: Open-end ratchet wrench 13

4. Install the balance valve (part 14) onto the fly jib cylinder (part 13), and fasten it with the bolt (part 16). Then remove the attached plugs at ports V1 and V2 of the balance valve, install the straight fitting (part 15) to the two ports and tighten them to specified torque. See the Fig. below:

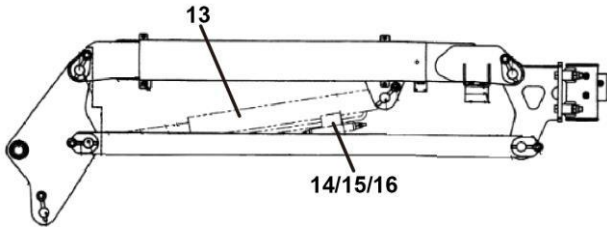


Fig. 3.12 Jib luffing balance valve assembly

13. Fly jib cylinder 14. Jib luffing balance valve
15. Straight fitting 16. Bolt

Tightening torque of part 3: 32±3N.m

Tightening torque of part 4: 19±2N.m

Tools: electric impact wrench (SATA 51082), socket wrench 1/2-10mm

5. 使Connect the cylinder piston rod to the jib lower connecting bracket assembly and the lower link with the shaft (part 1), and fix them with part 2/3/4/5. Similarly, connect the lower link to the upper connecting bracket assembly with part 1/2/3 (coated with sealant)/ 4/5, connect the cylinder base to the upper link with part 6, and fix them with part 2/4/5/7 (coated with sealant). See the Fig. below:

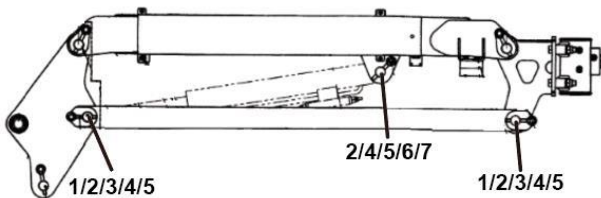


Fig. 3.13 Assembly of piston rod and lower arm connecting frame and lower connecting rod

1. Shaft 2. Latch 3. Bolt 4. Washer 5. Nut 6. Shaft
7. Bolt

Tightening torque of part 3/7: 52±5N.m

Tools: socket wrench 1/2-16mm, open-end

wrenches 16-18

6. Install part 1 onto the upper connector assembly with part 2 (coated with sealant)/ 3/4, as shown below:

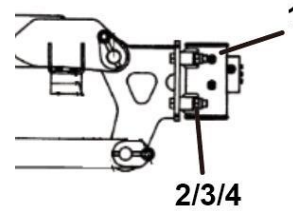


Fig. 3.14 The swinging cylinder is connected with the upper connecting piece

1. Swing cylinder 2. Bolt 3. Washer 4. Nut

Tightening torque of part 2: 305±25N.m

Tools: open-end wrenches 24-27, socket wrench 3/4-24

7. Lift the subassembled jib to the mounting position of telescopic boom, and connect the telescopic boom to the lower connector assembly with part 1, as shown below:

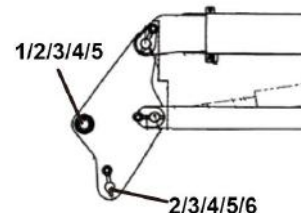


Fig. 3.15 The telescopic boom is connected with the lower connecting piece

1. Shaft 2. Latch 3. Bolt 4. Washer 5. Nut 6. Shaft
8. Install part 2/3 (coated with sealant)/ 4/5 for fixing; connect the upper leveling cylinder to the lower connector assembly with part 6.

Tightening torque of part 3: 52±5N.m

Tools: open-end wrench 16-1, open-end wrench 16-1

9. As shown above, fix the pipe and harness at the fly jib onto part 6 with part 2/3/4/5, and tighten the bolt.

The pipe harness should be arranged as shown below:

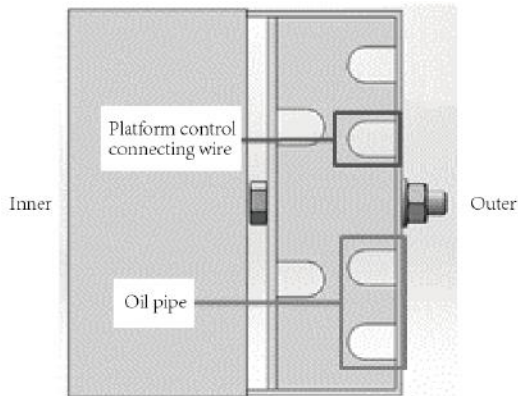


Fig. 3.16 Alignment of tubing harness

Reference tightening torque of part 3: 12±1N.m

Tools: Open-end wrench 13, ratchet wrench 13

10. Bundle up the platform control connecting wire and the fly jib valve block pipe at the illustrated position with the strap, and fix the pipe at the fly jib with part 1/2/3, as shown below:



Fig. 3.17 The upper control connecting line is fixed with the flyarm valve block tubing

1. Pipe clamp 2. Cushion collar 3. Spacer ring

11. Install the guard plate onto the fly jib upper link with part 1/2/3. Then thread the pipe and harness through the pipe clamp, wind 600PVC around them at the point 100 mm from the pipe clamp, and fix them with black insulating tape. Afterwards, fix the pipe at the fly jib with part 4/5/6. See the Fig. below:

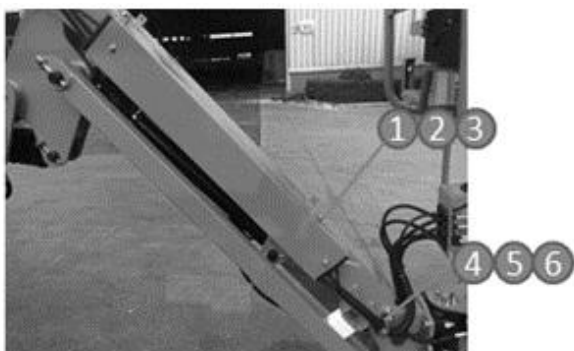


Fig. 3.18 Arm wiring board assembly

1. Bolt 2. Washer 3. Nut 4. Pipe clamp 5. Cushion collar 6. Spacer ring

Tightening torque of part 1: 12±1N.m

Tools: socket wrench 1/2-10mm, socket wrench 1/2-16mm, QSP100N4, QSP25N4


3.3 Cable carrier assembly

3.3.1 Disassembling the cable carrier

 **CAUTION:**

The O-ring (if any) of the removed fitting and/or 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. Determine the position of cable from the cable carrier to the platform control unit. Number each cable and its entry to the platform control unit.
2. Disconnect the cable from the platform control unit.
3. Remove the hose and cable cover from the side of boom. Remove the hose and cable connector.
4. Remove the hose clamp on the boom head connecting plate.
5. Pull out all cable harnesses from the cable carrier. Do not pull out the hydraulic hose.
6. Mark, disconnect and plug the hydraulic hoses on ports V1 and V2 of the balance valve on the swing cylinder. And cover the hose fitting.

 **WARNING: Risk of personal injury**
Sprayed hydraulic oil can penetrate

and burn the skin. Therefore, please loosen the hydraulic fitting connection very slowly to reduce the oil pressure gradually. Do not spray or eject the oil.

7. Mark, disconnect and plug the hydraulic hoses on the fly jib/ swing cylinder. And cover the hose fitting.
8. Mark, disconnect and plug the hydraulic hoses on the leveling cylinder. And cover the fittings on the cylinder.

 **WARNING: Risk of personal injury**

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

9. Lift the boom to a horizontal position.
10. Place the cushion block between the upper and lower cable carriers, and fix the moving parts of upper and lower rails.

 **WARNING: Risk of crushing**

If not properly fixed, the upper and lower cable carriers may become unbalanced and fall during removal from the machine.

11. Attach a sling from an overhead crane with the lifting capacity of 5 t/5,000 kg/11023lbs to the platform end of the boom for purpose of supporting. But do not lift it.
12. Remove all hoses and harness clamps from the underside of the boom.
13. Support the rod end of the boom luffing cylinder with a suitable lifting device.
14. Remove the latches and other securing fasteners from the cylinder mounting shaft at the rod end of the boom luffing cylinder. But

do not remove the cylinder mounting shaft.

15. Raise the boom slightly with the overhead crane to release the pressure on the pivot at the boom luffing cylinder rod end.
16. Remove the pivot at the boom luffing cylinder rod end with the copper hammer.

 **WARNING: Risk of crushing**

If not properly supported by the lifting device, the boom luffing cylinder may become unbalanced and fall.

17. Lower the rod end of the boom luffing cylinder by approximately 30 cm.
18. Pull all hoses and cables out of the mount at the rod end of the boom luffing cylinder.
19. Raise the rod end of the boom luffing cylinder in place, and then install the pivot at rod end and the dowel pin fasteners.
20. Attach the sling from the overhead crane to the cable carrier.
21. Remove the mounting fastener from the upper cable carrier at the platform end of the telescopic boom.
22. Remove the mounting fastener of the lower cable carrier at the platform end of the telescopic boom.
23. Remove the cable carrier from the machine and place it on a structure that will support it.

 **WARNING: Risk of crushing**

If not properly connected to the overhead crane, the cable carrier may become unbalanced and fall.

 **CAUTION: Risk of part damage**

If being kinked or squeezed, the cable harness and hose may be damaged. If being twisted, the boom

cable carrier may be damaged.

3.3.2 Assembling the cable carrier

- Place part 1 on the side mounting plate of the boom, then place parts 2/3 on the lower end of the mounting plate of the support plate near the counterweight, then pre-tighten them with parts 4/5/6 (do not tighten them at this time), arrange the boom oil pipe harness, and then tighten the pipe clamp bolt (part 4).

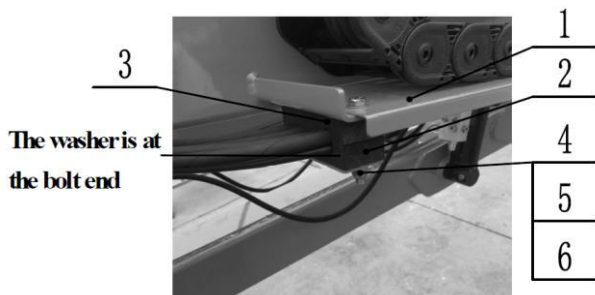


Fig. 3.19 Cable carrier support plate

- Cable carrier support plate
- Pipe clamp
- Pipe clamp pressure plate
- Bolt
- Washer
- Nut

Reference tightening torque of part 4:

15±2N.m

Tool: 13mm open-end ratchet wrench

- Arrange the oil pipes and harnesses under the support plate, then install clip rubber strips (with applied adhesive) at both ends of part 1, then fix part 1 with parts 2/3/4 (the insertion direction of the bolt is shown in the Fig.), and tighten the nut, as shown in the Fig. below:

The washer is at the nut end

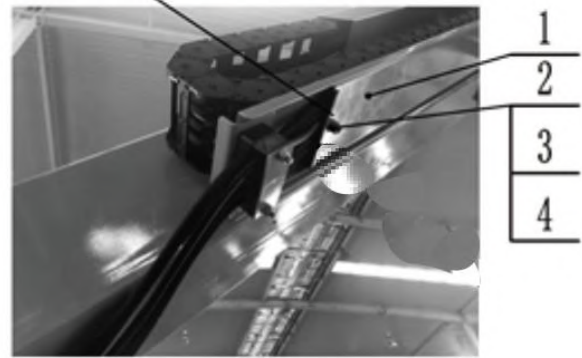


Fig. 3.20 Cover plate weldment

- Cover plate weldment
 - Bolt
 - Nut
 - Washer
- Install one end of the cable carrier on the support plate with parts 5/6/7 and the other end on the aluminum pipe with parts 5/6/7 (with the screw at the cable carrier end and the washer at the nut end, and tighten the screw), then insert the oil pipe and harness into the cable carrier when passing them upward from under the support plate, reserve the oil pipe and harness to be fixed at both ends of the cable carrier with straps according to the length as shown, and then wrap the reserved pipes and harnesses with 100mm long PVC (PVC ends are wrapped with black insulating tape) for protection, as shown in the Fig. below:

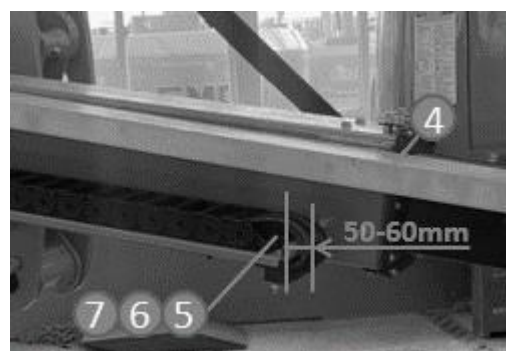


Fig. 3.21 Drag chain assembly

- Aluminum pipe
- Screw
- Washer
- Nut

Reference tightening torque of part 5: 12±1N.m;

Tools: open-end ratchet wrench 10

- Install the front end of the aluminum tube onto the telescopic boom mounting plate

with parts 1/2/3 (indicated by the yellow circle in the Fig.), and then fasten parts 4/5 with parts 6/7/8, as shown in the Fig. below:

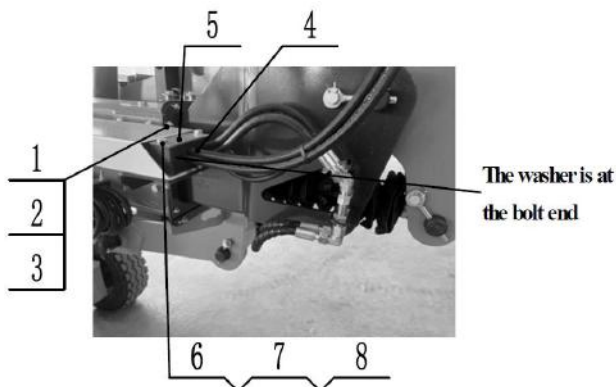


Fig. 3.22 Pipe clamp assembly

1. Screw
2. Washer
3. Nut
4. Pipe clamp
5. Pipe clamp pressure plate
6. Bolt
7. Washer
8. Nut

3.4 Boom/extension jib assembly

3.4.1 Disassembling the boom

 **WARNING: Risk of personal injury**

This procedure requires specific maintenance skills, lifting equipment and a suitable workshop. Carrying out this procedure 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:**

This procedure should be implemented when the boom is retracted.

 **CAUTION:**

The O-ring (if any) of the removed fitting and/or 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. Remove the platform.
2. Remove the fly jib. Refer to "Disassembling the fly jib".
3. Remove the cable carrier. Refer to "Disassembling the cable carrier".
4. Lift the boom to a horizontal position.
5. Remove the hose and cable cover from upper pivot.
6. Remove the fastener of dowel pin from the mounting shaft at the barrel end of the boom luffing cylinder. Remove the cylinder mounting shaft with a copper hammer. Then put down the cylinder and make it sink.

 **CAUTION: Risk of part damage**

When lowering the cylinder, make sure that the hose or fitting of the cylinder is not damaged.

7. Position the boom speed limit switch on the inner side of the upper pivot.
8. Remove the boom speed limit switch mounting fasteners. Do not disconnect the connecting wire.
9. Position the main telescopic boom drive speed limit switch inside the telescopic boom.
10. Remove the main telescopic boom drive speed limit switch mounting fasteners. Do not disconnect the connecting wire.
11. Pull the limit switch and wires out of the extension pipe and move it away.
12. Mark, disconnect and plug the hydraulic hose of the boom extension cylinder. And cover the fittings on the cylinder.

 **WARNING: Danger of injury**

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

13. Remove the hose clamp of the boom end spindle.
14. Connect a 5 ton/5000 kg/11023lbs overhead crane to the center point of the boom.
15. Connect similar lifting equipment to the boom luffing cylinder.
16. Place the support block under the boom luffing cylinder.
17. Remove the fastener of dowel pin from the boom luffing cylinder mounting shaft.
Remove the pin with a copper hammer.



WARNING: Risk of crushing

If the support is improper, the boom lift cylinder and the boom will descend.

18. Lower the link end of the boom luffing cylinder to the support block. Protect the cylinder rod from damage.
19. Remove the fastener of dowel pin from the boom spindle.
20. Remove the boom pivot with a copper hammer, then carefully remove the boom from the machine and place it on a structure capable of supporting the boom.



WARNING: Risk of crushing

If it is not properly connected to the overhead crane, the boom may become unbalanced and fall when removed from the machine.

3.4.2 Disassembling the extension jib assembly

Only when the outer jib or inner jib must be replaced, it is necessary to completely disassemble the boom. The telescopic cylinder can be removed with the boom not completely disassembled. Refer to "Disassembling the boom telescopic cylinder".

1. Remove the boom. Refer to "Disassembling the boom".
2. Place the cushion block under the barrel end of the boom telescopic cylinder for support.
3. Remove the fastener of dowel pin from the telescopic cylinder mounting shaft at the spindle end of the boom. Knock out the cylinder mounting shaft with a copper hammer.
4. Remove the wear-resistant cushion block from the platform end of the boom and mark its position.

Note: Pay attention to the position and quantity of washers used for each wear-resistant cushion block.

5. Make sure the support is secure and pull the telescopic boom and telescopic cylinder assembly out of the boom.



WARNING: Risk of crushing

If the support is improper, the boom may become unbalanced and fall off when the inner telescopic boom is removed from the boom.

Note: During disassembling, the overhead crane slings need to be carefully adjusted to achieve proper balance.

6. Remove the outer snap ring from the telescopic cylinder mounting shaft pin at the platform end of the telescopic boom. Knock out the cylinder mounting shaft with a copper

hammer.

- Support and slide the telescopic cylinder out of the bottom of the telescopic boom. Place the telescopic cylinder on the cushion block for support.



WARNING: Risk of crushing

If the support is improper, the telescopic cylinder may fall off due to imbalance when removed from the boom extension pipe.

Note: During disassembling, the overhead crane slings need to be carefully adjusted to achieve proper balance.

3.4.3 Assembling the extension jib assembly

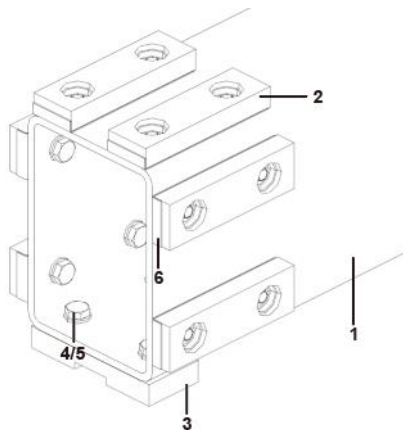


Fig. 3.23 Assembling the extension jib assembly

- Extension jib
- Slider
- Slider
- Bolt
- Washer
- Gasket

Tightening torque of part 4: 23±2N.m;

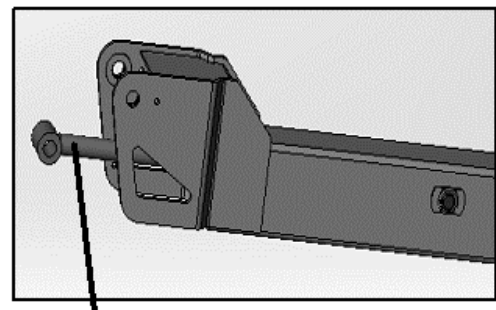
Tool: QSP50N3/socket wrench 16#

Note: Ensure the balance of the workpiece during lifting and placement. The operator shall not stand at either end of the workpiece.

- Lift the extension jib (part 1) onto the assembly tooling;
- Install the sliders (parts 2/3) at the rear end of the extension jib respectively, as shown in the Fig.;

Note:

- Install the slider (part 3) at the bottom of the extension jib;
- After the slider is installed, measure the outer dimensions of the upper, lower, left and right sliders, then measure the front end dimensions of the boom at the corresponding positions, and determine the number of washers (part 6) used according to the dimension difference;
- The gap between the sliders on both sides and the boom is required to be $\leq 1\text{mm}/0.04\text{in.}$
- Remove the slider bolt, then apply 242 threadlock, and fix the slider again;
- Install the upper leveling cylinder subassembly to the front end of the extension jib. As shown in the Fig. below, install the fixed end of the upper leveling cylinder from the front end of the extension jib:



The assembled oil pipe of the upper leveling cylinder faces down

Fig. 3.24 Assembly of up-leveling oil cylinder

- Adjust the shaft hole at the fixed end of the cylinder, make it coaxial with the first group of holes at the front end of the extension jib rectangular tube, and fix it with the shaft (part 1)

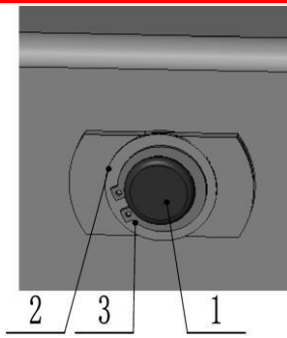


Fig. 3.25 Adjust and level the oil cylinder
1. Shaft 2. Washer 3. Snap ring

3.4.4 Assembling the boom assembly

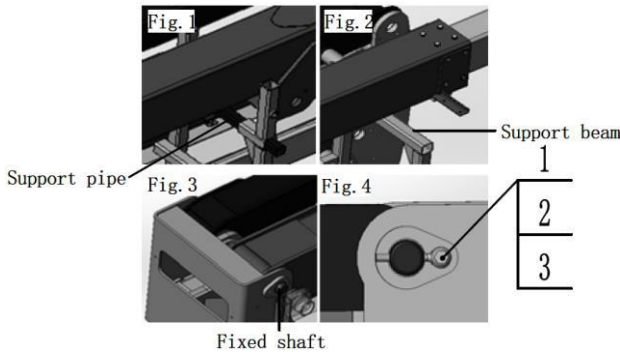


Fig. 3.26 Assembling the boom assembly
1. Latch 2. Bolt 3. Washer

Tightening torque of part 2: 90±9N.m;

Coat the latch fixing bolt (part 2) with AT262 threadlock.

Tool: QSP100N4/socket wrench 18#

1. Lift the telescopic boom assembly onto the right side of the boom subassembly tooling.

Note:

- ① Ensure the balance of the telescopic boom assembly during hoisting. The operator shall not stand at either end;
- ② Before lifting, place a support pipe in the middle of the tooling to prevent the telescopic boom from falling, as shown in Fig. 1;
- ③ Place the front end of the telescopic boom on the support beam at the front end of the tooling, as shown in Fig. 2;
- ④ Adjust the rear end hole of the telescopic boom to make it coaxial with the upper pivot hole, and hammer the pin that was not

completely installed previously, as shown in Fig. 3;

- ⑤ Fix the shaft with parts 1/2/3, as shown in Fig. 4. Note: After fixation, there shall be no gap between the inner surface of the latch and the plate surface.
2. Install the travel switch (part 4) (1 piece) at the rear end of the boom, and fix it with parts 5/6/7, as shown in the Fig.:

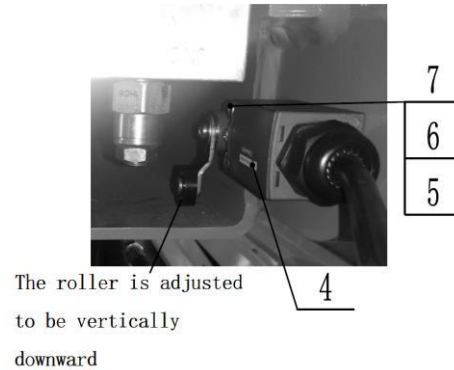


Fig. 3.27 Main arm back end travel switch assembly
4. Travel switch 5. Screw 6. Nut 7. Washer

Note:

- ① In this step, it is required to adjust the travel switch roller to be vertically downward;
 - ② The bolt passes outward from the travel switch side, with the washer at the bolt end and the nut on the outer side.
3. Install the travel switch (part 8) (1 piece) onto the right inner side of the upper pivot, and fix it with parts 9/10/11/12, as shown in the Fig.:

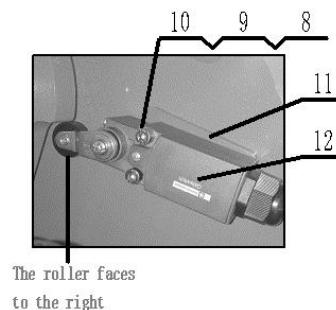


Fig. 3.28 Inner travel switch assembly on tight side of upper pivot

8. Travel switch 9. Screw 10. Nut 11. Washer 12. Boom luffing limit packing plate

Note:

- ① In this step, the travel switch roller faces the right side;
- ② The bolt passes outward from the travel switch side, with the washer at the bolt end and the nut on the outer side;
- ③ In this step, it is required to use the packing plate (part 8) on the right side of the travel switch.

Reference tightening torque of screw (part 5):

3±0.3 N.m;

Tools: open-end wrench 8-10

4. Connect the boom oil pipe.

3.5 Cylinder assembly

3.5.1 Disassembling the boom luffing cylinder



WARNING: Danger of 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/or 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. Lift the boom to a horizontal position.
2. Lift the folding jib until the cylinder mounting shaft pin at the barrel end of the boom luffing cylinder is higher than the cover.
3. Connect a 5 ton/5000 kg/11023lbs overhead crane to the boom for support.
4. Raise the boom slightly with the overhead crane to release the pressure of the mounting shaft pin of the boom luffing cylinder.
5. Support the rod end and barrel end of the boom luffing cylinder with a second overhead crane or similar lifting equipment.
6. Mark, disconnect and plug the hydraulic hose of the boom luffing cylinder. And cover the fittings on the cylinder.



WARNING: Risk of personal injury

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

7. Remove the fastener of dowel pin from the rod end cylinder mounting shaft of the boom luffing cylinder. Remove the cylinder mounting shaft with a copper hammer.



WARNING: Risk of crushing

During removal of the mounting shaft of the boom rod end cylinder, the boom will be lowered if it is not supported properly.

8. Place the support block under the luffing cylinder of the boom across the two covers for support.
9. Lower the rod end of the lift cylinder into the

cylinder block. Protect the cylinder rod from damage.

⚠ WARNING: Risk of crushing

If not properly supported by the lifting device, the boom luffing cylinder may become unbalanced and fall.

10. Remove the fastener of dowel pin of cylinder mounting shaft at the barrel end of the boom luffing cylinder. But do not remove the cylinder mounting shaft.
11. Remove the cylinder mounting shaft at the barrel end with a copper hammer. Carefully remove the boom luffing cylinder from the machine.

⚠ WARNING: Risk of crushing

If not properly supported and fixed on the lifting equipment, the lift cylinder may become unbalanced and fall.

3.5.2 Disassembling the boom telescopic cylinder

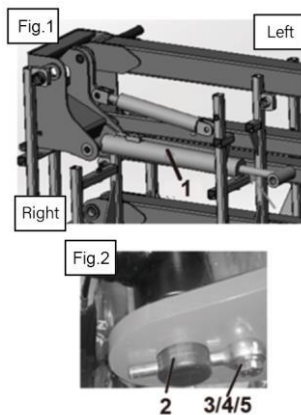


Fig. 3.29 Disassembling the boom telescopic cylinder

1. Boom luffing cylinder 2. Shaft 3. Latch 4. Bolt 5. Washer

1. Assemble the boom luffing cylinder onto the upper pivot:

Note:

- ① Hoist the middle position of the cylinder, and

pay attention to the balance of the cylinder. The operator shall not stand at either end.

- ② The telescopic end of the cylinder is placed on the tooling support beam (padded with a polyurethane plate).
 - ③ The hook can only be removed after the shaft at the rear end of the cylinder is knocked in.
2. Install the fixed end of the cylinder (part 1) onto the lower mounting hole of the upper pivot with the shaft (part 2);

Note: The end of the shaft with latch hole is on the left side.

3. Fix the shaft with parts 3/4/5, as shown in Fig. 2.

Note: After fixation, there shall be no gap between the inner surface of the latch and the plate surface:

Tightening torque of part 4: 90±9N.m;

Tool: QSP100N4/ socket wrench 18

3.5.3 Disassembling the boom telescopic cylinder

The boom telescopic cylinder is used to extend and retract the boom. The boom telescopic cylinder is provided with a balance valve to prevent movement in case of hydraulic pipeline failure.


⚠ 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.

NOTE:

The O-ring (if any) of the removed fitting and/or 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. Lift the boom to a horizontal position.
2. Extend the boom until the pivot at the link end of the boom telescopic cylinder can be reached in the boom telescopic pipe.
3. Remove the hose and cable guard from the upper pivot.
4. Mark, disconnect and plug the hydraulic hose of the boom telescopic cylinder. And cover the fittings on the cylinder.

 **WARNING: Risk of personal injury**
Sprayed hydraulic oil can 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.

5. At the platform end of the boom, remove the outer snap ring from the cylinder mounting shaft at the rod end of the telescopic cylinder. Remove the cylinder mounting shaft with a copper hammer.
6. Remove the fastener of dowel pin of the cylinder mounting shaft at the barrel end.
7. Pass a rod through the barrel end pivot, and remove the cylinder pin by turning it outward.
8. Support the telescopic cylinder and pull it out of the boom barrel.

 **WARNING: Risk of crushing**

If the support is improper, the telescopic cylinder may fall off when it is

removed from the telescopic boom.

 **CAUTION: Risk of part damage**

When removing the cylinder from the boom, be careful not to damage the balance valve on the boom extension cylinder.

 **CAUTION: Risk of part damage**

If the boom extension cylinder is dragged, the hose and harness may be damaged.

Note: Pay attention to the length of cylinder after disassembling. The mounting spacing of cylinders must be the same.

Note: For the assembling method of the boom telescopic cylinder, refer to Assembling the extension jib assembly.

3.5.4 Disassembling the lower leveling cylinder

The lower leveling cylinder are in the same hydraulic circuit as the upper leveling cylinder, and is intended for leveling the work gate. It is a part of the closed-loop hydraulic circuit, which keeps the platform level throughout the movement range of the boom. The lower leveling cylinder is located on the base of the boom.

 **WARNING: Danger of 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/or 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. Lift the folding jib until it can come into contact with the link end and barrel end pivots of the lower leveling cylinder.
2. Mark, disconnect and plug the hydraulic hose of the main pump. Plug the fittings on the cylinder.

WARNING: Risk of personal injury

Sprayed hydraulic oil can 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.

3. Connect the overhead crane or similar lifting equipment to the lower leveling cylinder.
4. Remove the fastener of dowel pin from the cylinder mounting shaft at the barrel end.
5. Pass a rod through the barrel end pivot, and remove the cylinder pin by turning it outward.
6. Remove the fastener of dowel pin from the rod end cylinder mounting shaft.
7. Pass a rod through the barrel end pivot, and remove the cylinder pin by turning it outward.
8. Remove the lower leveling cylinder from the machine.

WARNING: Risk of crushing

If not properly connected to the overhead crane, the lower leveling cylinder may become unbalanced and fall.

3.5.5 Assembling the lower leveling cylinder

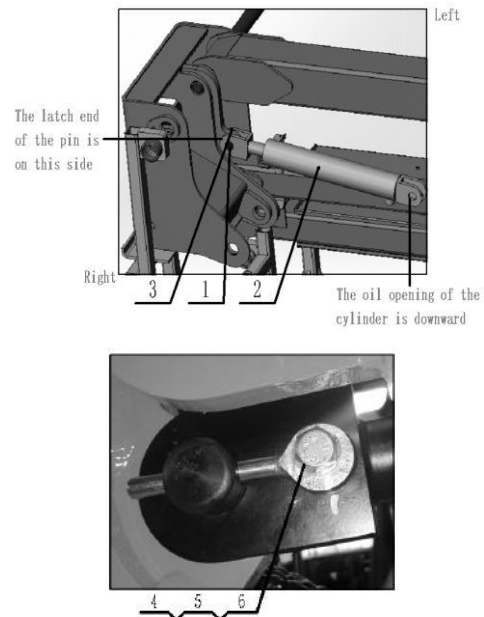


Fig. 3.30 Assembling the lower leveling cylinder

1. Shaft sleeve 2. Lower leveling cylinder 3.

Leveling cylinder shaft 4. Latch 5. Bolt 6. Washer

1. Install the lower leveling cylinder onto the upper pivot, as shown in the Fig.:
2. Install the shaft sleeve (part 1) in the mounting hole of the lower leveling cylinder on the middle plate of the upper pivot;
3. Install the lower leveling cylinder (part 2) onto the upper pivot, and fix it with part 3;

Note:

- ① Install the telescopic end of the lower leveling cylinder onto the upper pivot, with the oil port of the cylinder barrel facing down without reverse orientation;
- ② Knock in the shaft (part 3) leftward, the end with latch hole positioned on the right side.

4. Fix the shaft with parts 4/5/6, as shown in Fig.
 2. Note: After fixation, there shall be no gap between the inner surface of the latch and the plate surface.

Tightening torque of part 5: 52±5N.m;

Coat the latch fixing bolt (part 5) with AT262 threadlock.

Tool: QSP100N4/socket wrench 16#

3.5.6 Disassembling the upper leveling cylinder

Note:

1. **Make sure there is no air in the closed circuit before removing the cylinder.**
 2. **The O-ring (if any) of the removed fitting or 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. Extend the boom until it can come into contact with the cylinder mounting shaft at the barrel end of the upper leveling cylinder;
 2. Lift the boom slightly and place the cushion block under the platform for support;
 3. Lower the boom until the platform rests on the cushion block supporting the platform;
- Note: Do not concentrate all the weight of the boom on the cushion block.**
4. Mark, disconnect and plug the hydraulic hose of the swing cylinder at the fitting as shown below, and then connect them together with the fitting. Connect the hoses on the cylinder with the fitting;

 **WARNING: Risk of personal injury**

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

5. Remove the fastener of dowel pin from the cylinder mounting shaft at the rod end of the upper leveling cylinder. Do not remove the cylinder mounting shaft;
6. Remove the fastener of dowel pin on the cylinder mounting shaft at the barrel end of the swing cylinder. Do not remove the cylinder mounting shaft;
7. Place a cushion block under the upper leveling cylinder for support. Protect the cylinder rod from damage.
8. Support the rotating mechanism of the platform with suitable lifting equipment;
9. Knock out the cylinder mounting shaft at the rod end with a copper hammer;

 **WARNING: Risk of crushing**

If the support is improper, the platform may fall during removal of the cylinder mounting shaft at the link end of the slave cylinder.

 **CAUTION: Risk of part damage**

If the lifting equipment does not provide proper support and causes the slave leveling cylinder to fall, the cylinder may be damaged.

10. Knock out the pin at the barrel end with a copper hammer;
11. Carefully pull the cylinder out of the boom.

Note: For the assembling method of the upper leveling cylinder, refer to 3.6.4 Assembling the extension jib assembly.

3.6 Folding jib assembly

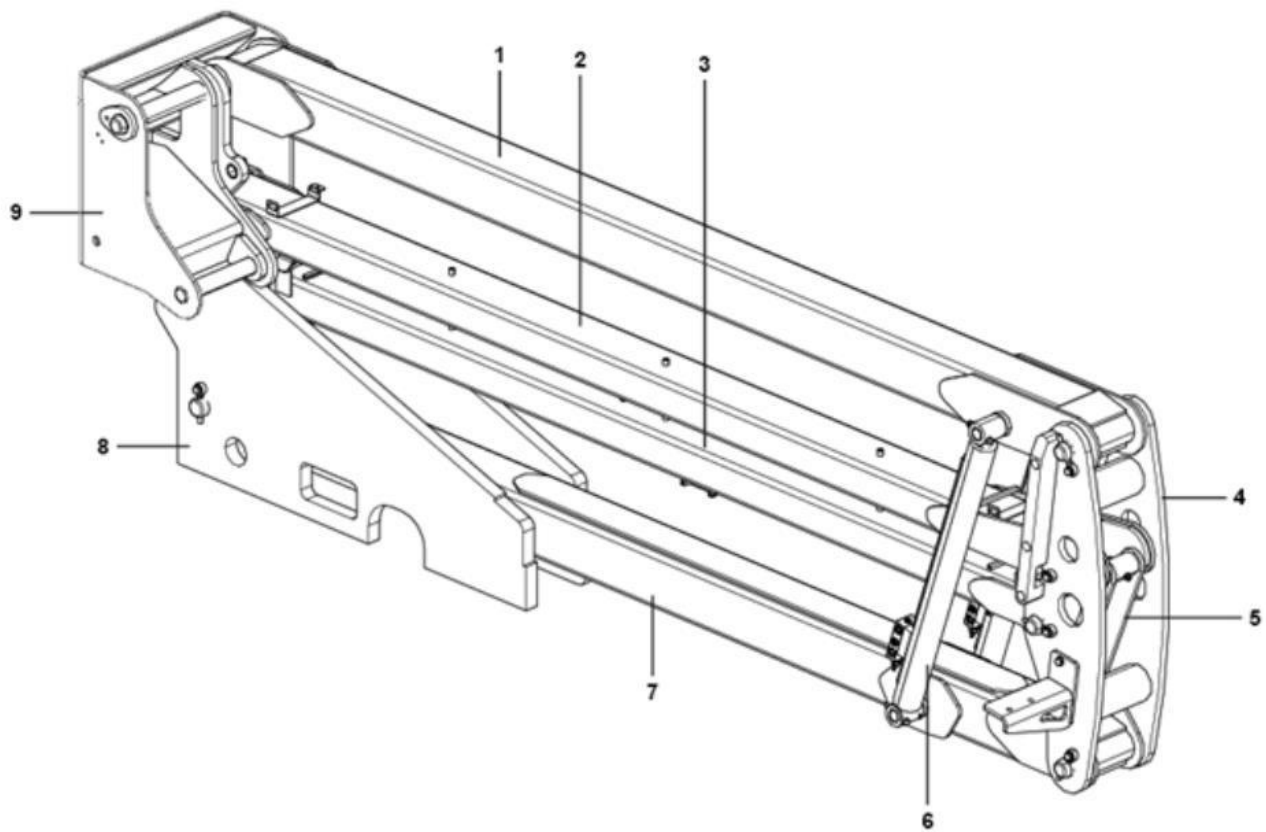


Fig. 3.31 Folding jib assembly

- | | |
|------------------------------------|------------------------------------|
| 1. Upper 2nd jib assembly (#1 jib) | 6. Folding jib cylinder |
| 2. Upper 1st jib assembly (#2 jib) | 7. Lower 2nd jib assembly (#4 jib) |
| 3. Lower 1st jib assembly (#3 jib) | 8. Rotary table assembly |
| 4. Middle pivot | 9. Upper pivot |
| 5. Link | |

3.6.1 Removing folding jib

 **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. Remove the jib.
3. Remove the main boom.
4. Remove the lower leveling cylinder.
5. Fix the crane sling to the main boom luffing cylinder end, and then lift the main boom luffing cylinder vertically with the crane.
6. Mark the main boom luffing cylinder, disconnect and plug the hydraulic hose. Cover the fittings on the cylinder.

 **WARNING: Risk of personal injury**

Spilled hydraulic oil can penetrate and burn skin. Release the hydraulic device slowly to reduce the oil pressure gradually. Avoid oil jet or splash.

7. Remove the fastener of the center pin from the main boom cylinder barrel end.
8. Remove the pin with a copper rod and

remove the main boom luffing cylinder from the machine.

 **WARNING: Risk of squeezing**

Without proper support from the lifting device, the main boom luffing cylinder may fall due to loss of balance.

9. Mark, disconnect and plug the hydraulic hoses on the two folding jib lift cylinders. And cover the fittings on the cylinder.

 **WARNING: Risk of personal injury**

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

10. Remove the pin securing fasteners at both sides of the pin at the connecting rod end and pivot at the barrel end of the folding jib lift cylinder. But do not remove the pin.
11. Tie the sling from the crane to the connecting rod end of the folding jib lift cylinder for support. Do not apply any lifting force.
12. Knock out half of the pivot pin at the cylinder barrel end with a copper hammer. Lower the barrel end of the folding jib lift cylinder so that it hangs down. Knock out half of the pivot pin at the rod end with a copper hammer.
13. Remove the folding jib lift cylinder from the machine.
14. Repeat steps 11 to 14 for the other folding jib lift cylinder.

 **WARNING: Risk of crushing**

Without proper connection to the crane, the folding jib lift cylinder may fall due to loss of balance during removal

from the machine.

 **CAUTION: Risk of part damage.**

When removing the folding jib lift cylinder from the machine, be careful not to damage the balance valve at the cylinder barrel end.

15. Connect the sling from the crane to the upper pivot for support. Do not lift it.
16. Connect the sling of another overhead crane to the #1 jib midway between the upper and middle pivots.
17. Remove the pin securing fasteners from the middle and upper pivots of the #1 jib. But do not remove the pin.
18. Knock out both pins with a copper hammer.
19. Remove the #1 jib from the machine.

 **WARNING: Risk of crushing**

Without proper connection to the overhead crane, the #1 jib may fall due to loss of balance during removal from the machine.

 **WARNING: Risk of crushing**

Without proper support from the overhead crane, the upper pivot may fall during removal of the #1 jib from the machine.

20. Connect an overhead crane to the upper pivot to raise the folding jib assembly by about 76cm/2.94ft.
21. Insert a 10×10×28cm//3.94×3.94×11 in block between the #2 jib and the boom. Then lower the folding jib assembly to the cushion block.

 **WARNING: Risk of crushing**

Without proper support from the 10×10×28cm/3.94×3.94×11 in cushion block, the folding jib may fall.

22. Pull out all cables and hoses through the upper pivot.

 **CAUTION: Risk of part damage**

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

23. Remove the hose and cable sheaths from the top of #2 jib.
24. Pull all hoses and cables out of the upper pivot through the middle pivot. Place the hoses and cables on the ground.

 **WARNING: Risk of part damage**

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

25. Remove the pin fastener securing the #2 jib on the upper pivot. Remove the pin with a copper hammer.
26. Remove the upper pivot.

 **WARNING: Risk of crushing**

Without proper connection to the overhead crane, the upper pivot may fall due to loss of balance during removal from the machine.

27. Connect the sling from the overhead crane to the #2 jib at the upper pivot end.
28. Lift the #2 jib slightly and remove the 10×10×28cm//3.94×3.94×11 in cushion block.
29. Lower the #2 jib to the boom support pad.
30. Insert a 10×10×22cm//3.94×3.94×8.66 in cushion block at the middle pivot end of #3 and #4 jibs.
31. Connect the sling from the overhead crane

to the middle pivot for support. Do not lift it.

32. Remove the pin securing fasteners from the pivots of #2, #3 and #4 jibs at the middle pivot. Do not remove the pin.
33. Knock out each pin with a copper hammer. Then remove the middle pivot from the folding jib assembly.

 **WARNING: Risk of crushing**

Without proper support from the overhead crane, the middle pivot may fall due to loss of balance during removal from the folding jib assembly.

34. Connect the sling from the overhead crane to the center point of the #2 jib for support. Do not lift it.
35. Connect the sling from another overhead crane to the center point of the #4 jib for support. Do not lift it.
36. Remove the pin securing fasteners from both links. Do not remove the pin.
37. Remove the lower link shaft from the #3 jib with a copper hammer.
38. Support the link with appropriate lifting equipment.
39. Remove the upper link shaft from the #2 jib with a copper hammer. Remove the link from the machine.

 **WARNING: Risk of crushing**

Without proper support from the overhead crane, the #2 jib may fall during removal of the link from the #2 jib.

 **WARNING: Risk of crushing**

Without proper support, the link may fall during removal from the boom assembly.

40. Remove the #2 jib from the machine.

 **WARNING: Risk of crushing**

Without proper support from the overhead crane, the #2 jib may fall due to loss of balance during removal from the folding jib assembly.

41. Remove upper and lower hose and cable connectors from the #3 jib.
42. Pull off all cables and hoses from #3 jib and place them on the rotary table counterweight.

 **CAUTION: Risk of part damage**

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

43. Open the hood on the ground control unit side.
44. Remove the fuel tank filler cap.
45. Use an approved manual pump to drain the fuel in the fuel tank into a container with appropriate capacity.

 **DANGER: Risk of explosion and fire**

Fuel is flammable. Operate in an open, well-ventilated area, and always keep away from heaters, sparks, flames and ignited smoke. Acceptable fire extinguishers should be provided in easily accessible places.

 **DANGER: Risk of explosion and fire**

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

Note: Ensure that only a manual pump suitable for diesel is used.

46. Mark, disconnect and plug the fuel hose of the fuel tank. Clean up any spilled fuel.
47. Remove the fuel tank mounting fasteners. Carefully remove the fuel tank from the machine.

⚠ CAUTION: Risk of part damage

CAUTION: Risk of part damage. The fuel tank may be damaged if it falls. Before installation on the machine, clean the fuel tank and check for cracks and other damage.

48. Remove the securing fasteners from the ground control unit and main boom function valve fixing plate.
49. Remove the ground control unit and main boom function valve fixing plate for easy access to the #3 jib pivot.
50. Connect the sling from the overhead crane to the center point of the #3 jib for support. Do not lift it.
51. Remove the mounting fasteners from the hood cover to get access to the pin fasteners for the pivots of #3 and #4 jibs at the rotary table riser.
52. Remove pin securing fasteners from the #3 jib of rotary table riser. Do not remove the pin.
53. Remove the #3 jib pivot from the rotary table with a copper rod through the access hole at the back of the ground control unit.
54. Remove the #3 jib from the machine.

⚠ WARNING: Risk of crushing

Without proper support from the crane, the #3 jib may fall due to loss of balance during removal from the machine.

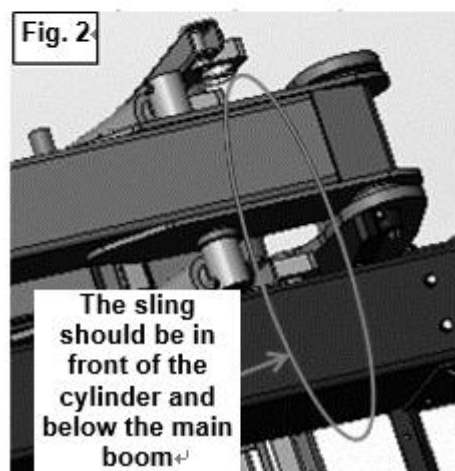
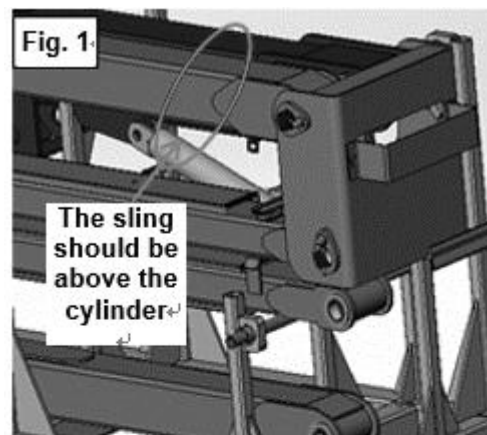
55. Remove upper and lower hose and cable covers from the #3 jib.

56. Remove the mounting fasteners of folding jib drive speed limit switch from the #4 jib at the middle shaft end. Do not disconnect the wire.
57. Remove the pin securing fasteners of rotary table connecting shaft from the #4 jib. Do not remove the pin.
58. Connect the sling from the overhead crane to the center point of the #4 jib. Do not lift it.
59. Remove the #4 jib from the rotary table riser with a copper rod through the ground control unit side partition.
60. Remove the #4 jib from the machine.

⚠ WARNING: Risk of crushing

Without proper support from the crane, the #4 jib may fall due to loss of balance during removal from the machine.

3.6.2 Assembling folding jib assembly



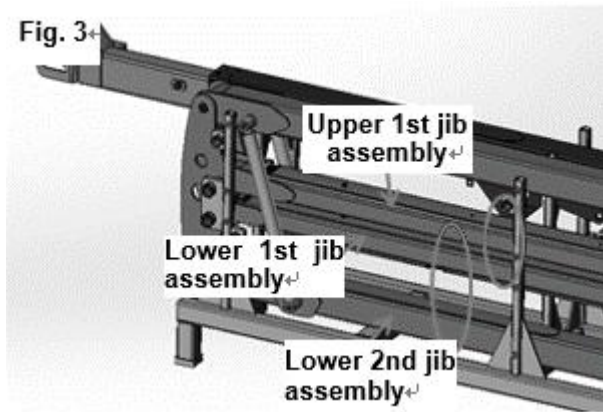


Fig. 3.32 Folding arm assembly

1. Lift the boom assembly on line using slings as shown in Fig. 1 and Fig. 2:
2. Use slings to tie the upper 1st jib assembly together with the lower 1st jib assembly, and tie the lower 1st jib assembly together with the lower 2nd jib assembly, as shown by the red circles in Fig. 3;
3. The rear lifting point of boom is the rear end of the leveling cylinder mounting plate. Pass the sling above the cylinder, as shown in Fig. 1;
4. The front lifting point of boom is in front of the articulating boom luffing cylinder, and it should be lifted together with the main boom, as shown in Fig. 2;

Note:

- ① After being lifted, the boom should be stable and basically vertical, with the front and rear ends basically horizontal;
- ② During lifting, no one shall stand in front of the boom, the boom shall not pass directly above any personnel, and the operator shall stand at the oblique rear;
5. Lift the boom assembly to the rotary table, so that the shaft holes at the rear ends of the lower 1st jib assembly and lower 2nd jib assembly are coaxial with the rotary table mounting holes, and fix them with the shafts (part 1); fix part 1 with parts 2/3 (glued)/4.

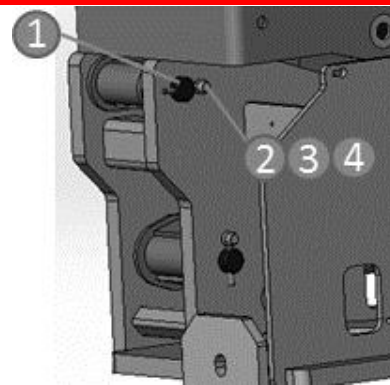


Fig. 3.33 Lower arm fittings and lower two arm fittings are installed

1. Shaft 2. Latch 3. Bolt 4. Washer

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

Tools: QSP100N4/open-end ratchet wrench 10 / socket wrench 1/2-18mm

Note:

- ① When adjusting the boom and rotary table mounting holes, make confirmation visually and not by hand; no one is allowed to stand in front of the boom in this process;
- ② Knock in the shaft leftward, the end with latch hole positioned on the right side.
- ③ Arrange the pipelines at the rear end of the boom in the rotary table in the order shown in the following table.
6. Wrap the oil pipe arranged above the lower 1st jib assembly with the canvas (part 1), and wrap the oil pipe and harness arranged below the lower 1st jib with PVC.

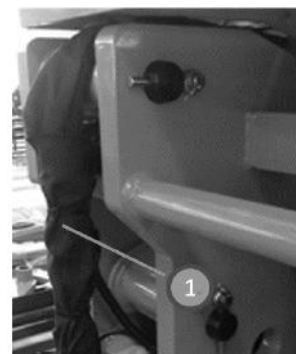


Fig. 3.34 The canvas is wound around the wire harness

1. Canvas

3.6.3 Removing folding jib lift cylinder

In the structure of folding jib assembly, there are two folding jib lift cylinders. The two cylinders work in parallel and extend and retract by hydraulic pressure. Each folding jib lift cylinder is equipped with a balance valve to prevent movement in the event of a hydraulic pipe failure.

! WARNING: Risk of personal injury
Removal requires specific maintenance skills, lifting equipment and a suitable workshop. Carrying out removal without these skills and tools may result in personal injury or death, as well as serious component damage. Be sure to contact the dealer service.

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

1. Lower the folding jib to the retracted position.
2. Lift the main boom so that it is higher than the shaft at the connecting rod end of the folding jib lift cylinder.
3. Mark, disconnect and plug the hydraulic hose of folding jib lift cylinder.

! WARNING: Risk of personal injury
Sprayed hydraulic oil can 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.

4. Remove the fasteners of the pins at the

- connecting rod end and barrel end of the folding jib cylinder. But do not remove the pin.
5. Connect the sling from the overhead crane to the connecting rod end of the folding jib lift cylinder for support. Do not apply any lifting force.
6. Knock out half of the pivot pin at the cylinder barrel end with a copper hammer. Lower the barrel end of the folding jib lift cylinder so that it hangs down.
7. Knock out half of the pivot pin at the rod end with a copper hammer.
8. Remove the folding jib lift cylinder from the machine.

! WARNING: Risk of crushing

Without proper connection to the overhead crane, the folding jib lift cylinder may fall due to loss of balance during removal from the machine.

! CAUTION: Risk of part damage

When removing the folding jib lift cylinder from the machine, be careful not to damage the balance valve at the cylinder barrel end.

3.6.4 Assembling folding jib lift cylinder

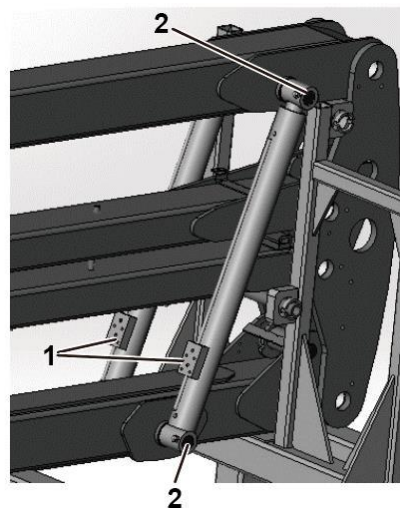




Fig. 3.35 Assembling folding jib lift cylinder

1. Folding jib lift cylinder 2. Shaft 3. Bolt 4. Nut

1. Assemble the folding jib lift cylinders to both sides of the front end of the boom, as shown:
2. Pass the shaft (part 2) through the lower mounting seat of left cylinder, and fix it with parts 3/4 (pass the bolt through it from back to front);
3. Pass the lower shaft of left cylinder into the front shaft hole of lower 2nd jib assembly, adjust the position of the upper hole of left cylinder, fix the upper 2nd jib assembly with the shaft (part 2), and make sure that the shaft does not protrude from the right side of upper 2nd jib assembly at this time;
4. Install the lower end of right cylinder to the right side of lower fixed shaft; be sure to block the left cylinder to prevent the shaft coming out.
5. Adjust the position of the upper mounting seat of right cylinder and knock the upper fixed shaft in;

Note: The shaft fixing bolts of both cylinders are at the outside, and should be passed from back to front.

6. Fix both ends of the upper and lower fixed shafts with parts 3/4:
7. Install the balance valves (part 5) to the lower part of both cylinders as shown below:

Note: Before installation, make sure that the supplied O-ring on the mounting surface of the balance valve does not fall off or be damaged.

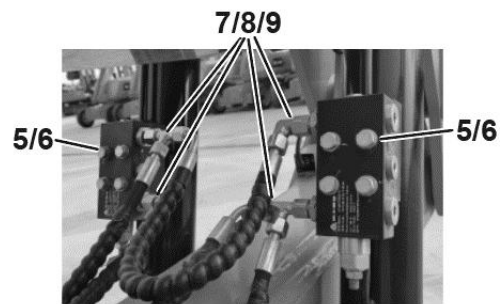


Fig. 3.36 Balance valve assembly

5. Folding jib luffing balance valve 6. Plug 7. Bolt
8. M8 hard gasket 9. Straight fitting 10. Right-angle fitting 11. Tee fitting

Note: The upper end of the folding jib luffing balance valve is V2 and the lower end is V1;

- ① The straight fitting (part 9) is installed at different positions on the left and right balance valves, and should be tightened using torque wrench and marked by a marker pen.
- ② The right-angle fitting (part 10) is installed at different positions on the left and right balance valves, and should not be tightened at this time (should be tightened after the oil pipes are connected).
- ③ The tee fitting (part 11) is installed at different positions on the left and right balance valves, and should not be tightened at this time (should be tightened after the oil pipes are connected).

Tightening torque of part 6: 32±3N.m;
tightening torque of parts 7, 8 and 9: 75±8N.m;
Tools: QSP50N3 / socket wrench 13/ socket wrench 22QSP100N4/SP120N*22

3.7 Kubota Engine Assembly

3.7.1 Engine drivetrain

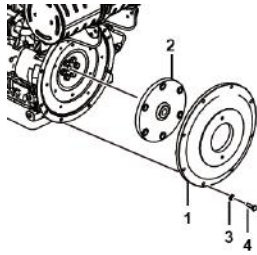


Fig. 3.37 Engine drivetrain

1. Pump cover 2. Flange coupling 3. Washer 4. Bolt

1. Removal of engine drivetrain

- ① Release the latch on the engine pallet, slide the engine pallet completely out, and fix the engine pallet after sliding to prevent it from moving.
- ② Connect the sling of the crane to the variable displacement walk pump for support without lifting.
- ③ Remove the fasteners for connecting the variable displacement walk pump and the engine assembly.
- ④ Carefully pull the pump assembly away from the engine and make sure it will not move.



Notice: Risk of component damage

The hose may be damaged if squeezed or kinked.

- ⑤ Remove the fixing fasteners of the pump cover to remove it from the engine.
- ⑥ Remove the fixing fasteners of the flywheel coupling to remove it from the flywheel.

2. Assembly of engine drivetrain

- ① Install the coupling and its fasteners to the engine and tighten them to specified torque.

Note:

- 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) **Apply AT277 high-temperature thread sealant to bolts before screwing.**

- ② Install the pump cover and its fasteners to the engine and tighten them to specified torque.

Note:

- 1) **Before installing the pump cover, apply 596 plane sealant to the connection between the pump cover and the engine flywheel housing, with the sealant covering the whole perimeter of the pump cover;**
- 2) **Apply AT262 thread locking adhesive to screws before assembling.**
- ③ Install the pump assembly and its fasteners to the engine and tighten them to specified torque.
- ④ Push the engine pallet to return the engine to its original position.

3.7.2 Assembly of engine intake system

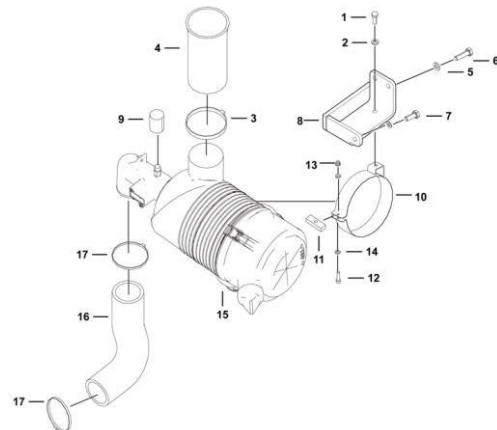


Fig. 3.38 Engine intake system

1. Bolt 2. Washer 3. Hose clamp 4. Air inlet hose
5. Washer 6. Bolt 7. Bolt 8. Air cleaner bracket 9. Mechanical differential pressure alarm 10. 7-inch air cleaner iron hoop 11. Air cleaner hoop cushion block 12. Screw 13. Nut 14. Washer 15. Air cleaner 16. Engine intake hose 17. Hose clamp

1. Assemble Part 4 on the air cleaner and fasten it with Part 3;

2. Assemble one end of Part 16 on Part 15, connect the other end to the engine intake port, and fasten both ends with Part 17 respectively;
3. Fasten Part 10 to Part 15 with Part 11/12/13/14;
4. Fix the air cleaner on the engine cooling system with Part 1/2/5/6/7/8;
5. Assemble Part 9 on the air cleaner as shown.

3.7.3 Assembly of engine exhaust system

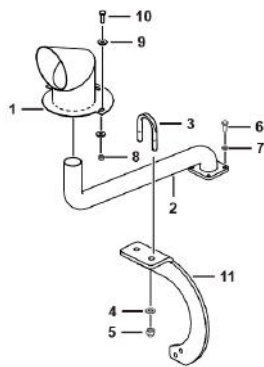


Fig. 3.39 Engine exhaust system

1. Upper exhaust tailpipe 2. Exhaust tailpipe weldment 3. U-bolt 4. Washer 5. Nut 6. Bolt 7. Washer 8. Nut 9. Washer 10. Bolt 11. Exhaust pipe bracket
1. Assemble Part 1 on Part 2 and fix it with Part 8/9/10;
 2. Assemble Part 2 at the tail of muffler with Part 6/7;
 3. Assemble Part 2 on Part 11 with Part 3/4/5.

3.7.4 Assembly of engine cooling system

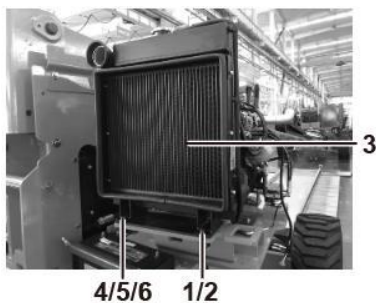


Fig. 3.40 Engine cooling system

1. Fixing plate 2. Rubber plate 3. Radiator assembly 4. Bolt 5. Washer 6. Nut
1. First place one fixing plate (Part 1) on the radiator bracket, place the rubber plate (Part 2) on the fixing plate, then place one fixing plate (Part 1) on the rubber plate, and after this, place the radiator assembly (Part 3) on the fixing plate, and connect the radiator assembly to the radiator bracket with bolt (Part 4, coated with adhesive), washer (Part 5) and nut (Part 6).
 2. Adjust the clearance between the engine fan and the radiator to ensure that the clearance between the engine fan and the cowl is within $15\pm 5\text{mm}$, and the clearance from the left/right end of the fan to the outermost end of the shroud is within $20\pm 6\text{mm}$, and then tighten the bolts of the radiator shroud.

Reference torque of Part 4: $30\pm 3\text{N.m}$

Tools: ratchet torque wrench QSP100N4, 16# open-end wrench, socket 16.

3.7.5 Hoisting and assembly of engine

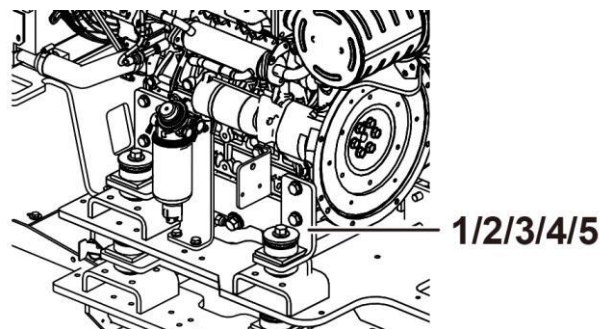


Fig. 3.41 Hoisting and assembly of engine

1. Vibration damper 2. Bolt 3. Washer 4. Nut 5. Bolt
1. Assemble Part 1 to the engine pallet with Part 2, and fix it with Part 2 (coated with adhesive)/3/4. Lower the subassembled engine to the vibration damping pad of the engine pallet, and fix the engine with Part 5.

3.8 Deutz Engine Assembly

3.8.1 Assembly of engine drivetrain

1. Assemble Part 1 to the engine with Part 2 (coated with adhesive)/3, apply adhesive, and tighten it to the specified torque.
Note: Apply AT272 thread locking adhesive before connecting the coupling for the purpose of locking.
2. After fastening Part 1, apply 596 plane sealant on the edge of the engine, and then assemble the pump cover (Part 4) to the engine with Part 5.

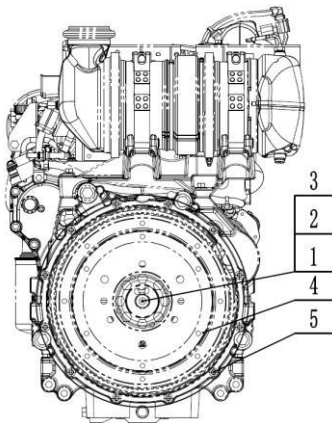


Fig. 3.42 Engine drivetrain

1. Flywheel coupling 2. Bolt 3. Washer 4. Pump cover 5. Screw

Tightening torque of Part 2/5: 52±5N m

Tool: QSP100N4, socket 16

3.8.2 Assembly of engine intake system

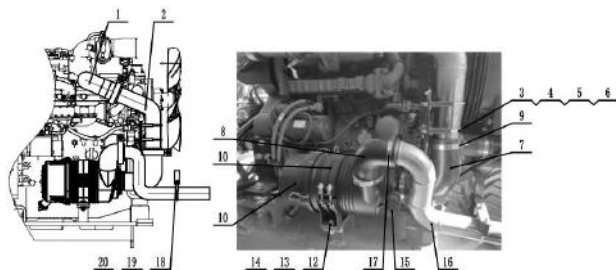


Fig. 3.43 Engine intake system

1. Engine intake hose 2. Engine intake steel tube
3. Stainless steel fixing seat 4. U-bolt 5. Washer
6. Nut 7. Engine intake hose I 8. Engine air

inlet connecting pipe 9. Hose clamp 10. Air cleaner 11. Hoop 12. Bolt 13. Washer 14. Nut 15. Mechanical differential pressure alarm 16. Engine air inlet steel tube 17. Hose clamp 18. Stainless steel fixing seat 19. U-bolt 20. Nut

1. Assemble the engine intake system as shown: Fix both ends of Part 1/2/7 with Part 9, fix the end of Part 8 to be connected to air cleaner with Part 9, fix Part 10 (with the tail port downward) with Part 11, fasten Part 12/13/14 with Part 11, and then assemble Part 15 to Part 10. Assemble the remaining parts as shown in the Fig..

Reference torque of Part 11: 10-1N.m;

Reference torque of Part 9/17: 5-5.5N.m;

3.8.3 Assembly of engine exhaust system

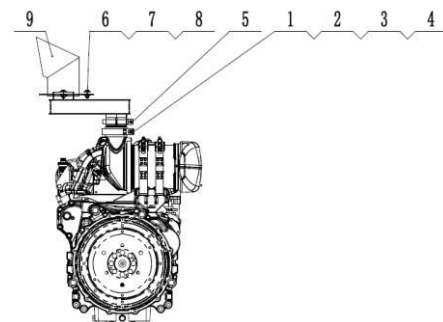


Fig. 3.44 Engine exhaust system

11. U-bolt 2. U-bolt mounting base 3. Washer 4. Nut 5. Exhaust connecting pipe weldment 6. Nut 7. Bolt 8. Washer 9. Upper exhaust tailpipe

1. Assemble the exhaust tailpipe in parallel to the axis of the engine's muffler, and fasten it with its own fasteners, as shown in the Fig..

Tools: electric wrench, 13 socket.

3.8.4 Assembly of engine cooling system

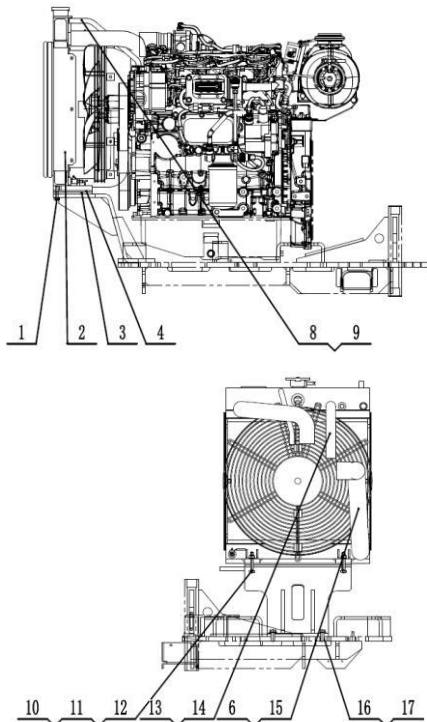


Fig. 3.45 Engine cooling system

1. Bolt 2. Radiator assembly 3. Fixing plate 4. Rubber plate 5. Radiator bracket weldment 6. Hose clamp 7. Engine water outlet pipe 8. Hose clamp 9. Engine breather pipe 10. Washer 11. Nut 12. Bolt 13. Engine water filler pipe 14. Hose clamp 15. Engine water inlet pipe 16. Bolt 17.

Washer

1. Fix Part 5 on the engine pallet with Part 16/17;
2. Place Part 4/3 on the radiator bracket in turn, and place Part 2 on Part 3, and then, fix one end of it with Part 1/10, and the other end with Part 10/11/12;
3. Connect one end of Part 7 with the radiator water inlet and the other end with the engine water outlet, and fasten both ends with Part 6; connect one end of Part 9 with the radiator vent and the other end with the engine vent, and fasten both ends with Part 8; connect one end of Part 13 with the water outlet on the top of the radiator and the other end with the water filler of the engine, and fasten both ends with

Part 14; connect one end of Part 15 with the water outlet at the bottom of the radiator and the other end with the water inlet of the engine, and fasten both ends with Part 6;

Note: Ensure that Part 1 does not interfere with the engine fan after assembling.

3.8.5 Hoisting and assembly of engine

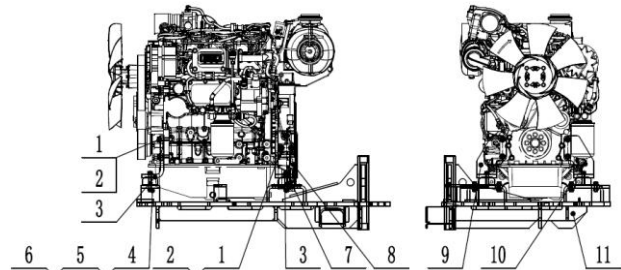



Fig. 3.46 Hoisting and assembly of engine

1. Bolt 2. Washer 3. Bolt 4. Bolt 5. Nut 6. Washer 7. Vibration damper 8. Rear outrigger 9. Right front outrigger 10. Left front outrigger 11. Engine pallet assembly

1. Install Part 7 on Part 8/9/10 respectively, assemble it on the engine pallet with Part 3, and fix it with Part 4/5/6;
2. Lower the subassembled engine to the vibration damping pad of the engine pallet, and fix the engine with Part 1/2.

3.9 Tank side assembly

3.9.1 Disassembling the fuel tank

 **WARNING: Risk of explosion and fire Fuel is combustible.**

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

 **WARNING: Risk of explosion and**

fire.

Do not drain or store fuel in open containers for fear of possible fire.

1. Mark, disconnect and plug the fuel supply and return hoses.
2. Remove the fuel filler cap from the fuel tank.
3. 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.

4. Remove the securing fasteners of the fuel tank.
5. Support the fuel tank and fix it to appropriate lifting equipment.
6. Remove the fuel tank from the machine.

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

3.9.2 Assembling the fuel tank

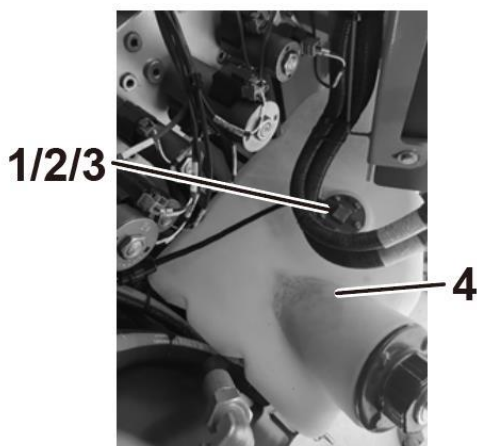


Fig. 3.47 Assembling the fuel tank

1. Oil level sensor 2. Screw 3. Washer 4. Fuel tank delivery assembly
1. Install the oil level sensor (part 1) on the top of

part 4 with parts 2 and 3, and tighten part 2:

Reference tightening torque of part 2: 6N.m

Tool: S4 Allen wrench

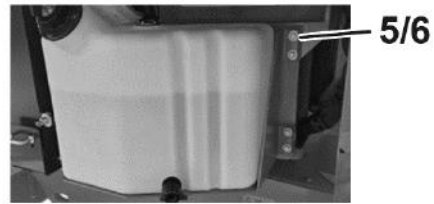


Fig. 3.48 Assembling the fuel tank

5. Bolt 6. Washer

2. Install the subassembled fuel tank at the assembling location on the right end of the rotary table near the counterweight with parts 5/6.

Tightening torque of part 1: 52±5N.m

Tools: QSP100N4/ socket wrench 16, open-end wrench 21

3. Assemble the two fuel pipes of the engine to the oil inlet and return ports at the rear end of the fuel tank, and tighten the bolts.

3.9.3 Disassembling the hydraulic tank



Risk of part 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 that this service is performed by dealers.

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. Close the two hydraulic ball valves 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 key switch and put a label on the machine to inform related personnel.

2. Remove the drain plug from the hydraulic tank, and completely drain hydraulic oil 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.

3. Mark, disconnect and plug the suction pipes connected to the ball valves of hydraulic tank.
4. Mark, disconnect and plug the fuel return pipe at the fuel tank.
5. Support the hydraulic tank and fix it to appropriate lifting equipment.
6. Remove the securing fasteners of the hydraulic tank.
7. 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 tank may become unbalanced and fall.

3.9.4 Assembling the hydraulic tank

1. Install the air cleaner (part 1) onto the hydraulic tank weldment (part 2).

2. Install the oil return filter element (part 3), the O-ring (part 4) and the oil return flange assembly (part 5) onto the top of the hydraulic tank weldment with the bolts (part 6), and install the oil level meter (part 7) onto the hydraulic tank weldment with its accompanying bolt; then install part 8 at the position shown in the Fig.:

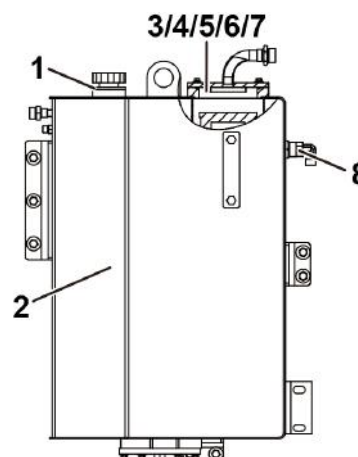


Fig. 3.49 Assembling the hydraulic tank

1. Air cleaner
2. Hydraulic tank weldment
3. Oil return filter element assembly
4. O-ring
5. Oil return flange assembly
6. Bolt
7. Oil level meter
8. Fitting

Tightening torque of part 6: $28 \pm 3 \text{N.m}$

Tightening torque of part 8: $135 \pm 14 \text{N.m}$

Tools: QSP50N3/socket wrench 10#, and SP220N*36

3. Install the oil suction filter together with the O-ring and the oil suction flange assembly (part 11) at the bottom of the hydraulic tank with the bolts (part 12), connect the straight fitting (part 13) onto the oil suction flange externally, connect the ball valve externally onto the straight fitting, and connect the straight fitting (part 7) externally onto the ball valve, tighten the parts to the specified torque and make marks.

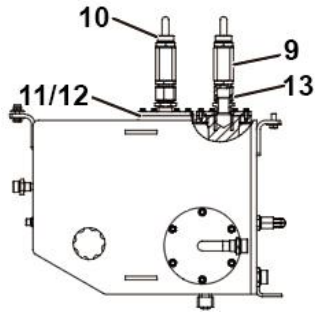


Fig. 3.50 Assembling the hydraulic tank

9. Ball valve 10. Straight fitting 11. Oil suction flange assembly 12. Bolt 13. Straight fitting

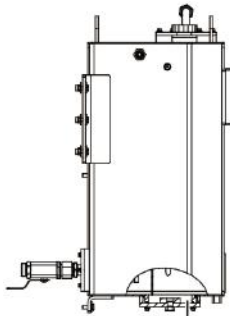
Tightening torque of part 12: $12 \pm 1 \text{N.m}$;

Tightening torque of part 13: $135 \pm 14 \text{N.m}$;

Tightening torque of part 10: $220 \pm 22 \text{N.m}$

Tools: QSP25N4/socket wrench 8#, and SP160N*41

4. Install the ring magnet, the O-ring and the screw plug onto the oil drain flange cover. Install the subassembled oil drain flange cover together with the O-ring at the bottom of the hydraulic tank with the bolt, tighten the parts to the specified torque and make marks.



14/15/16/17/18/19

Fig. 3.51 Oil discharging flange assembly

14. Ring magnet 15. O-ring 16. Screw plug

17. Oil drain flange cover 18. O-ring 19. Bolt

Tightening torque of part 6: $28 \pm 3 \text{N.m}$

Tool: QSP25N4/ socket wrench 10

5. Install the subassembled hydraulic tank at the assembling location at the right end of the rotary table near the platform with parts 20/21/22 (indicated by the blue box in the Fig.) and parts 21/23 (indicated by the red box in the Fig.).

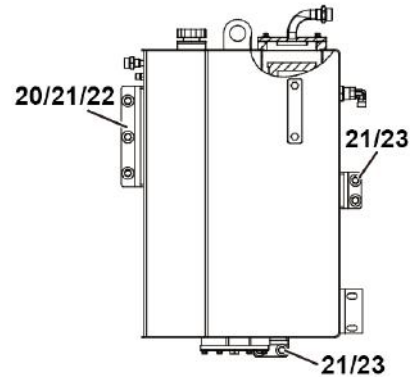


Fig. 3.52 Assembling the hydraulic tank

20. Bolt 21. Washer 22. Nut 23. Bolt

Tightening torque of part 21/23: $52 \pm 5 \text{N.m}$

Tools: QSP100N4/ socket wrench 16, open-end wrench 16

3.9.5 Assembling ground control system

1. Assemble the electric control box bracket weldment 1 (part 1) to the upper right part of the rotary table weldment with the bolt (part 2) and washer (part 3), assemble the electric control box bracket weldment 2 (part 4) to the electric control box bracket weldment 1 with the bolt (part 2) and washer (part 3), and tighten them to the specified torque:
2. Assemble part 1 to the ground control unit bracket weldment on the right side of the rotary table, and fix it with parts 2/3:

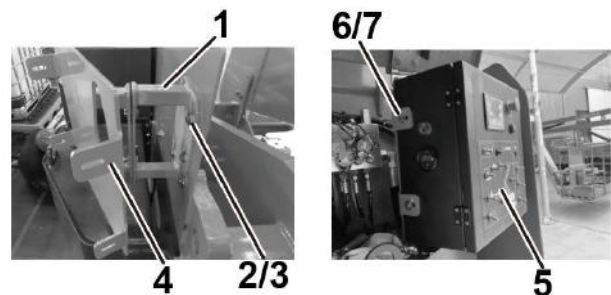


Fig. 3.53 Assembling ground control system

1. Electric control box bracket weldment 2. Bolt 3. Washer 4. Electric control box bracket weldment

Tightening torque of part 2: $28 \pm 3 \text{N.m}$

Tool: QSP50N3/ socket wrench 13

3.9.6 Assembling slewing ring grease filler hose

1. Remove the grease filler from the slewing ring and screw-on part 1 (just tighten it), connect part 2 to part 1 and then wind it around to the right side of the rotary table, install parts 3/4/5/6/7 to the mounting position on the hydraulic tank (upper installation hole), and then connect the hose to the bulkhead fitting.
2. Fill the grease into the grease filler hose with the grease filling machine until the grease overflows from the oil bowl slightly.

Note: The removal is carried out in reverse order of assembly, and just corresponding fasteners need to be removed, which is not described in detail here.



Fig. 3.54 Grease fitting

1. Straight fitting
2. Hose
3. Bulkhead fitting
4. Nut
5. Washer
6. Oil bowl
7. Oil bowl dust cap

Tightening torque of part 2: 22±2N.m

Tool: SP67N*19

3.9.7 Emergency power unit assembly

1. Using part 2/3 to assemble the power unit in the position shown on the right riser of the turntable.

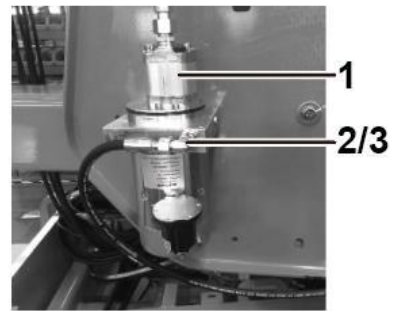


Fig. 3.55 Emergency power unit

1. Emergency power unit
2. Bolt
3. Washer

Tightening torque of part 2: 32±3N.m;

Tools: Torque wrench QSP50N3, Sleeve socket 16

3.9.8 Assembling horn

1. Assemble the horn (part 1) to the part 2 with the parts 3/4/5, and assemble the subassembled horn to the assembly position on the right hood mounting plate with the parts 3/4/5.

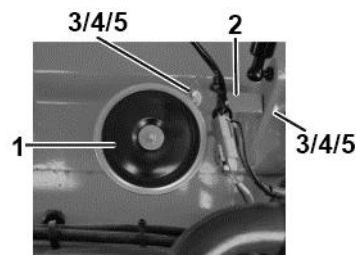


Fig. 3.56 horn

1. Horn
2. Horn fixing plate
3. Bolt
4. Washer
5. Nut

Tightening torque of part 3: 28±3N.m

Tools: QSP50N3/ socket wrench 13, open-end wrench 13

Note: The removal is carried out in reverse order of assembly, and just corresponding fasteners need to be removed, which is not described in detail here.

3.10 Rotary table swing assembly

3.10.1 Removing slewing drive assembly

! CAUTION:

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

! WARNING: Risk of personal injury

This procedure requires specific maintenance skills, lifting equipment and a suitable workshop. Carrying out this procedure 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. Remove the rotary table.
2. Mark, disconnect and plug the hydraulic hose of the rotary table slewing drive assembly. Plug the fitting.

! WARNING: Risk of personal injury

Sprayed hydraulic oil can 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.

3. Connect the sling and overhead crane or other suitable lifting device to the slewing drive assembly.
4. Remove the slewing drive assembly

mounting fasteners.

5. Carefully remove the slewing drive assembly from the machine.

! WARNING: Risk of crushing

Without proper connection to the overhead crane, the rotary table rotation assembly may fall due to loss of balance during removal from the machine.

3.10.2 Assembling slewing drive assembly

1. Install the hose fittings to the two ports in part 1, as shown.
2. Lift the slewing drive assembly to the slewing assembly tooling, and assemble the slewing drive assembly to the rotary table with parts 2 (glued) and 3.

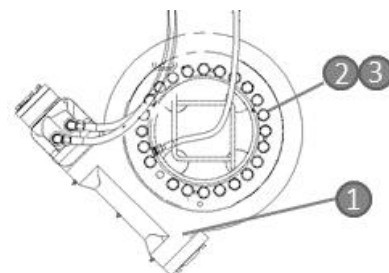


Fig. 3.57 Rotary support

1. Slewing drive assembly 2. Bolt 3. Washer

Tightening torque of part 2: 305±25N.m

Tools: QSP420N, QSP100N4, socket wrench 24, socket wrench 18

3.10.3 Lifting rotary table

1. Lift the rotary table assembly to the chassis.
2. Adjust the mounting position of the slewing ring and fix it with parts 1 (glued)/2.

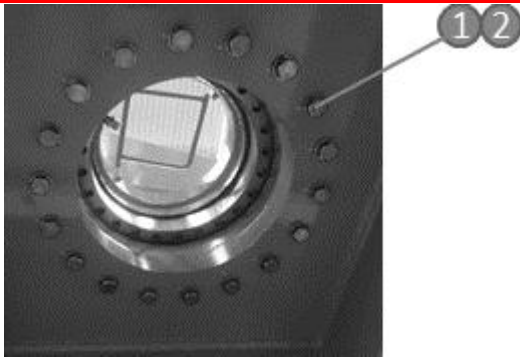


Fig. 3.58 Turntable fall outfit

1. Bolt 2. Washer

Tightening torque of part 1: 305±25N.m

Tool: QSP420N/ socket wrench 24

3.11 Axle assembly

3.11.1 Disassembling the front 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 fitting torque specifications.

1. Fix the 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/19.7in. Place the bracket under the chassis for the purpose of supporting.
4. Fix the sling connected to the crane to the front axle securely.

Caution: Risk of crushing.

If not supported, the chassis may fall.

5. Unscrew the wheel nuts and remove the tires.

6. Remove the pipe clamp.
7. Mark, disconnect and plug the hoses and fittings connected to the floating cylinder.

WARNING: Risk of personal injury

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

8. Remove the pins and securing fasteners at two ends of the floating.
9. Remove the floating cylinder carefully.
10. Mark, disconnect and plug the hoses and fittings connected to the walking motor.

WARNING: Risk of personal injury

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

11. Remove the securing fastener of center shaft for connecting the front axle to the chassis, and knock the pin out with the copper bar.
12. Move away the front axle slowly with the crane.

Caution: Risk of crushing.

If not supported correctly by the sling, the front axle may fall.

3.11.2 Assembling the front axle assembly

1. Lift part 1 to the subassembly tooling, and lift part 2 onto part 1. Then rotate part 2 to adjust the assembly position so that the illustrated motor mounting bolt hole is parallel with the pin mounting hole. Next, remove the plug in

the illustrated yellow circle, which is located at right-hand end of the operator. After the adjustment, use part 3 (coated with sealant)/ 4 to put fastener 5 for the connecting plate and the walking reducer at the plug hole, and press-fit part 6 into the pin hole of steering connecting plate steering cylinder and steering rod.

Note: The right steering connecting plate should be connected to the reducer in the same way.

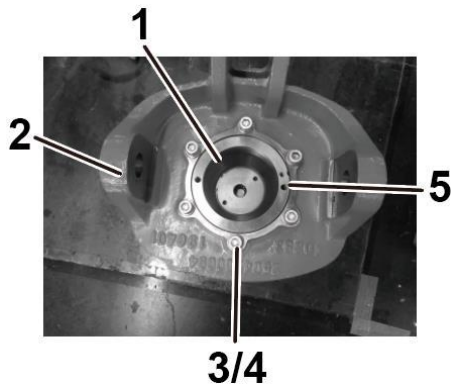


Fig. 3.59 Gear assembly

1. Walking reducer
2. Left steering connecting plate
3. Screw
4. Washer
5. O-ring
6. Shaft sleeve

Tightening torque of part 3: 260±26N.m

Tool: QSP420N4/ hexagon head socket wrench S14

2. Install the subassembled walking motor onto the walking reducer, making the brake oil ports coincident. Then install part 6, and fasten it with part 7 (coated with sealant) / 8. See the Fig. below:

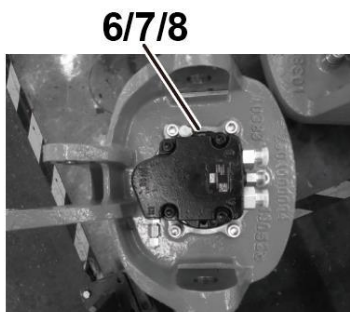


Fig. 3.60 Walking motor assembly

1. O-ring
2. Bolt
3. Washer

Tightening torque of part 2: 110±11N.m

Tool: QSP200N4/ hexagon head socket wrench

S14

3. Lift the subassembled connecting plate to the assembly position of the front axle, and install part 1 to the upper and lower contact surfaces between the connecting plate and the front axle weldment. Install the pin (part 2) from top to bottom (from bottom to top for the lower part), adjust its position and fix it with parts 3, 4 and 5. See the Fig. below:

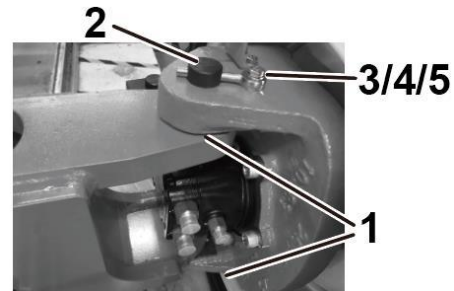


Fig. 3.61 Connecting plate assembly

1. Wear washer
2. Front hub connecting pin
3. Latch
4. Bolt
5. Washer

Note: Wear washers should be installed on both upper and lower surfaces of the steering connecting plate.

Tightening torque of part 4: 52±5N.m

Tool: QSP100N4/ socket wrench 16

4. Remove the plug of the steering cylinder (part 1). Note that residual oil in the cylinder will flow out during removal, and should be collected with an oil collector. Install the steering cylinder rod with the non-rod piston chamber pulled out in the middle of front axle weldment. Then install washers (2504000277:4) on both upper and lower surfaces of the cylinder pin mounting hole, and install part 2 from top to bottom. Next, fix the pin with part 3/4/5 at the upper part, and install the rod end of steering cylinder to the steering connecting plate. Afterwards, install part 6 from top to bottom, install the washer, fixation.

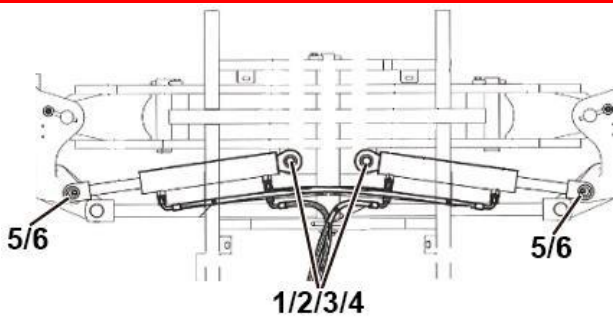


Fig. 3.62 Steering cylinder assembly

1. Steering cylinder
2. Steering cylinder pin
3. Latch
4. Bolt
5. Washer
6. Rod pin

Tightening torque of part 4: 52±5N.m

Tool: QSP100N4/ socket wrench 16

5. Connect and install the hoses and fittings of two steering cylinders.
6. Install part 1 to the front axle, and connect the two ends to the left and right steering connecting plates. Then install part 2 from top to bottom, install part 3, and fix with part 4.

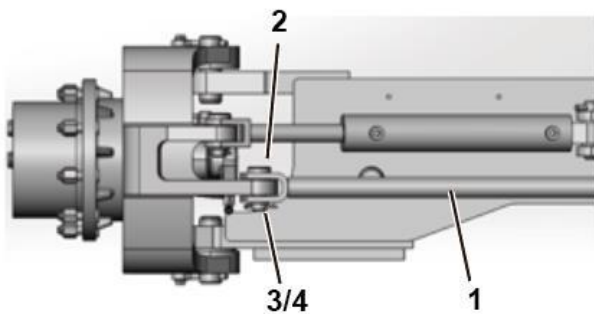


Fig. 3.63 Pull rod assembly

1. Steering rod
2. Rod pin
3. Washer
4. Cotter pin
7. Lift the subassembled front axle assembly with the lifting rope. Note: The lifting rope should be laid such that the front axle is horizontal during lifting. Adjust the position and height of front axle to make the axes of two connecting holes between the chassis and the front axle coincident.
8. Thread the front axle connecting pin (part 1) through the lower connecting hole of the floating cylinder from outside to inside, and add the adjusting washer (part 2) at the inside welded plate of front axle until it can be no longer added.

9. Adjust the position of pin, and fasten part 1 to the outside weld surface of front axle with parts 3, 4 and 5 tightened to specified torque. See the Fig. below:

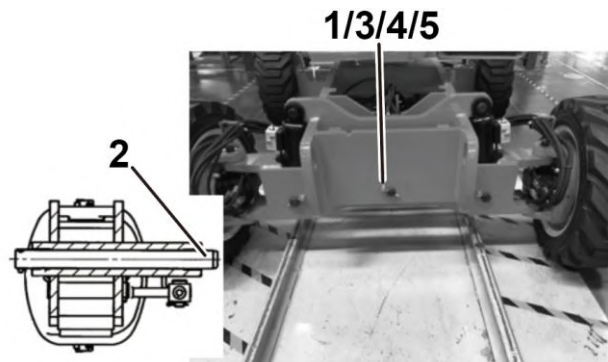


Fig. 3.64 Camb

1. Axle connecting pin
2. Adjusting washer
3. Bolt
4. Washer
5. Latch

Tightening torque of part 3: 52±5N.m

Tool: QSP100N4/ socket wrench 16

10. Pull out the floating cylinder, and make the upper opening of the cylinder parallel with the front axle.
11. As shown (at the part of front axle indicated in the yellow circle), thread the lower pin (part 1) of floating cylinder through the lower connecting hole of floating cylinder from outside to inside, and bring it out of the inside welded plate of front axle; adjust the position of pin, and fasten the floating cylinder to the outside weld surface of front axle with parts 2, 3 and 4 tightened to the specified torque.

See the Fig. below:



Fig. 3.65 Floating cylinder assembly

1. Lower pin of floating cylinder
2. Latch
3. Bolt
4. Washer

Tightening torque of part 3: 52±5N.m

Tool: QSP100N3/ socket wrench 16

3.11.3 Disassembling the rear 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 fitting torque specifications.

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/1.97in. Place the bracket under the chassis for the purpose of supporting.
4. Fix the sling connected to the crane to the rear axle securely.
5. Mark, disconnect and plug the hoses and fittings connected to the rear axle walking motor, as shown below:

 **WARNING: Risk of personal injury**

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

1. Removing fasteners from the walking motor.
2. Pull the walking motor shaft out of the reducer and remove the walking motor from the machine.

 **Caution:**

A type o ring is installed between the

traveling motor and the reducer when the traveling motor is installed on the machine, Making sure the o-ring are in the correct position.

3. Another jack is placed under the reducer to support and hold the reducer.
4. Removing fasteners from reducer, removing reducer.

 **Caution: Danger of personal injury.**

The hydraulic fluid sprayed can penetrate and burn skin, Replacing the hydraulic joint very slowly so that the oil pressure gradually decreases, Do not allow oil to squirt or spray.

5. Remove the securing fastener of connecting shaft for connecting the rear axle to the chassis, and knock the pin out with the copper bar.
6. Move away the front axle slowly with the crane.

 **Caution: Risk of crushing.**

If not supported correctly by the sling, the front axle may fall.

3.11.4 Assembling the rear axle assembly

1. Lift the rear axle weldment onto the subassembly tooling, and lift the walking reducer to the mounting positions at two ends. Then rotate the walking reducer to adjust its mounting angle, ensuring that the motor mounting hole is at the horizontal mounting position and the reducer plug is on the right of the operator. Next, fasten the walking reducer with part 3 (coated with sealant)/ 4. Afterwards, remove the protection of parking brake oil port on the

reducer, and install the O-ring. After that, press-fit the shaft sleeves at two ends of the pin mounting hole in the middle of rear axle.

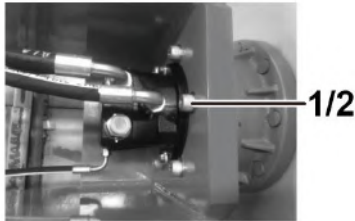


Fig. 3.66 Rear axle reducer assembly
1. Screw 2. Washer

Tightening torque of part 1: 260±26N.m
Tool: QSP400N4/ hexagon head socket wrench S14

- Remove the plug (indicated by the illustrated yellow circle) of the subassembled rear axle motor, and lift the motor to the assembly position of the rear axle reducer. Remember to add part 1 before installing the motor, and ensure that the motor parking brake oil port is coincident with the reducer parking brake oil port during the installation. Then fix the motor with part 2 (coated with sealant)/ 3.

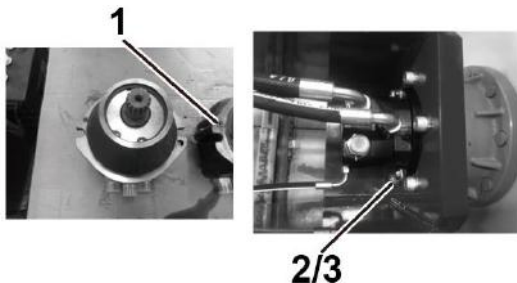


Fig. 3.67 Rear axle motor assembly
1. O-ring 2. Bolt 3. Washer

Tightening torque of part 2: 110±11N.m
Tool: QSP200N4/ socket wrench 19

- Lift the grooved parts of reducers on two sides of rear axle to the chassis, and install the shaft (part 1), making the side with gap toward the rear side of machine. During installation of the shaft, adjust the gap between the rear axle and the chassis with part 2 until the part can no longer be added. Install the part from outside to inside, connect

the inside and install it as a whole.

Afterwards, fasten the part with parts 3, 4 and 5 tightened to specified torque. See the Fig. below:

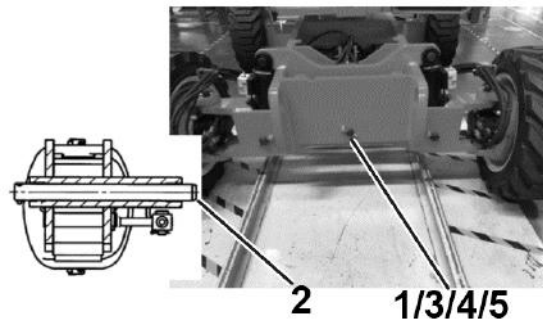


Fig. 3.68 Rear axle assembly

- Rear axle connecting pin 2. Adjusting washer 3. Bolt 4. Washer 5. Latch

Tightening torque of part 3: 52±5N.m

Tool: QSP100N4/ socket wrench 16

- Place the gap adjusting block between the chassis and the rear axle, and install part 1 to the rear axle with parts 4 and 5. Then adjust the gap of rear axle with parts 2 and 3. Gap control criterion: 4-5 mm.

Note: The number of part 2/3 may be determined according to the actual gap.

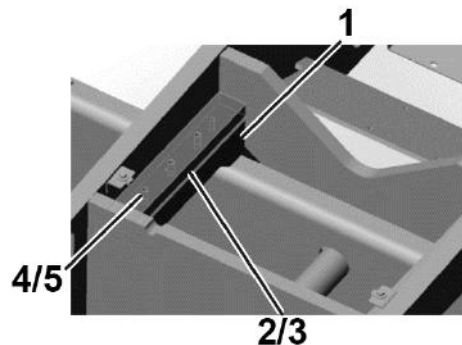


Fig. 3.69 Limit block assembly

- Stop block 2. Adjusting washer 3. Adjusting washer 4. Bolt 5. Washer

Tightening torque of part 4: 52±5N.m

Tool: QSP100N4/ socket wrench 16

3.11.5 Disassembling the wheel

- Unscrew the wheel nuts, but do not remove them .
- Block the non-steered wheel, and place a jack

with sufficient bearing capacity under the steering axle.

3. Raise the machine by 15 cm/0.49ft, and place a cushion block under the chassis for the purpose of supporting.

⚠ CAUTION: Risk of crushing.

If improperly supported, the machine may fall.

4. Unscrew the wheel nuts and remove the wheel.
5. Unscrew the hub fixing nuts.
6. Remove the hub.

3.11.6 Assembling the wheel

1. Lift the tire with the crane, and adjust the angle of tire to make the tire bolt holes coincident with the motor bolts.
2. Push in the tire horizontally and make it fit closely. Then pretighten the tire with part 2 (coated with threadlock before pretightening).
3. Tighten all nuts to specified torque diagonally.

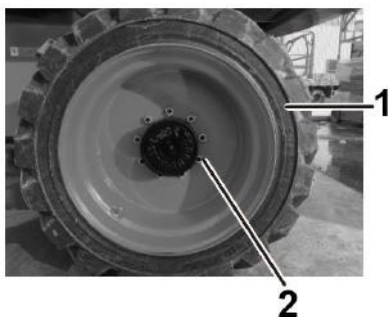


Fig. 3.70 Assembling the wheel

1. Tire 315/55D20
2. Hexagon cone nut

Note: The left and right tires may not be mistaken during installation;

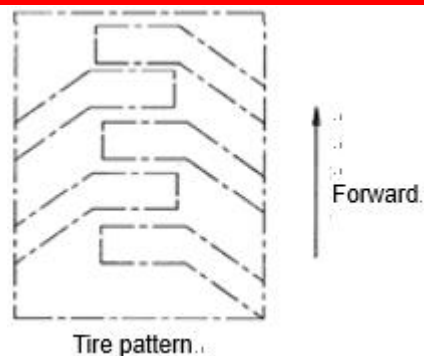


Fig. 3.71 Type assembly direction

Tightening torque of part 2: 305±25N.m

Tool: QSP400N4/ socket wrench 24

3.12 Bleeding cylinder

3.12.1 Bleeding function pump

1. After each cylinder is replaced, it is necessary to carry out bleeding. After checking the "key switch", activate the ground control mode;
2. Activate the "Turtle" position to keep the machine at a low speed;
3. Activate the platform swing button to keep the function pump running at a low speed for 1-2min;

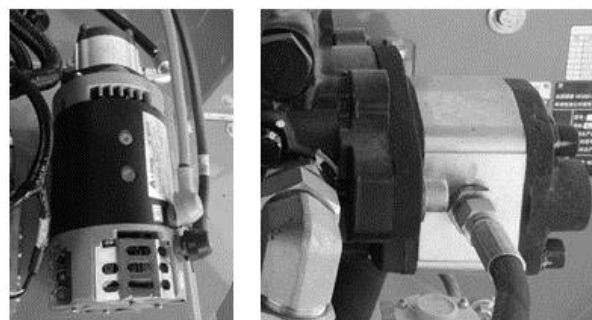


Fig. 3.72 Bleeding function pump

3.12.2 Bleeding slewing motor

1. Keep the "Turtle" position, and activate the rotary table slewing button to carry out left and right slewing for 1~2min. The machine should not swing greatly to ensure safety;

3.12.3 Bleeding walking motor

1. Use the platform control mode and activate the "Turtle" position;
2. Operate the machine to walk back and forth

for 1-2min under no load.

3.12.4 Bleeding steering cylinder

1. Use the platform control mode and activate the "Turtle" position;
2. Activate the steering button, and operate the machine to turn left and right. The steering cylinder can be divided into three parts, as shown. The extension and retraction of piston rod should count as one cycle. The operation steps are as follows:

Step 1: Operate the machine so that the piston rod of the steering cylinder moves slowly 5 times in area A;

Step 2: Operate the machine so that the piston rod of the steering cylinder moves slowly twice in the minimum (C) and maximum (B) stroke areas;

Precautions:

Take care when bleeding the machine, and operate the machine gently;

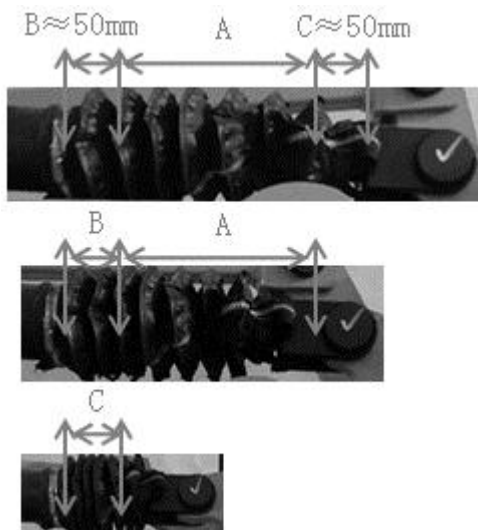


Fig. 3.73 Bleeding steering cylinder

3.12.5 Bleeding folding jib luffing cylinder

1. Activate the "Rabbit" position to keep the machine at a high speed;
2. Activate the folding jib lifting button, and operate the machine to retract and extend

the folding jib luffing cylinder. The folding jib luffing cylinder can be divided into three parts, as shown. The extension and retraction of piston rod should count as one cycle. The operation steps are as follows:

Step 1: Operate the machine so that the piston rod of the folding jib luffing cylinder moves slowly 5 times in area A;

Step 2: Operate the machine so that the piston rod of the folding jib luffing cylinder moves slowly twice in the minimum (C) and maximum (B) stroke areas;

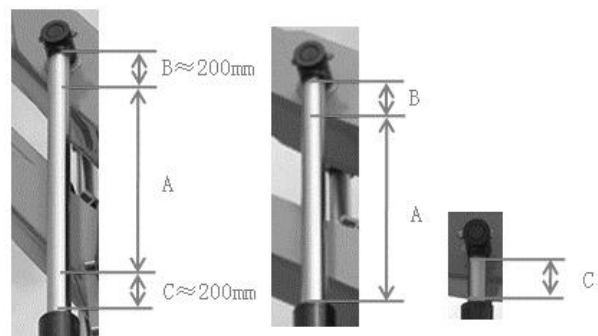


Fig. 3.74 Bleeding folding jib luffing cylinder

3.12.6 Bleeding main boom luffing cylinder and lower leveling cylinder

1. Activate the main boom luffing lifting button to bleed the main boom luffing cylinder and lower leveling cylinder;
2. Taking the main boom luffing cylinder as the reference, it can be divided into three parts, as shown. Refer to "Bleeding folding jib luffing cylinder" for the bleeding steps and requirements.

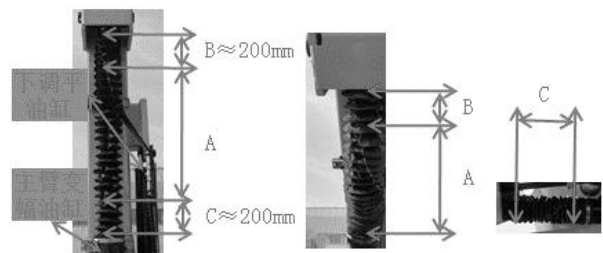


Fig. 3.75 Bleeding main boom luffing cylinder and lower leveling cylinder

3.12.7 Bleeding main boom telescopic cylinder

1. Activate the main boom telescoping button to bleed the main boom telescopic cylinder;
2. The main boom luffing cylinder can be divided into three parts by taking the extension jib as the reference, as shown. Refer to "Bleeding folding jib luffing cylinder" for the bleeding steps and requirements.

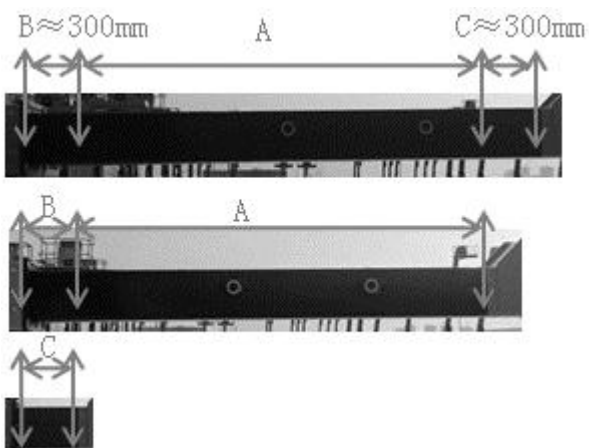


Fig. 3.76 Bleeding main boom telescopic cylinder

3.12.8 Bleeding fly jib luffing cylinder and upper leveling cylinder

1. Activate the fly jib luffing lifting button to bleed the fly jib luffing cylinder and upper leveling cylinder;
2. Taking the fly jib luffing cylinder as the reference, it can be divided into three parts, as shown. Refer to "Bleeding folding jib luffing cylinder" for the bleeding steps and requirements.

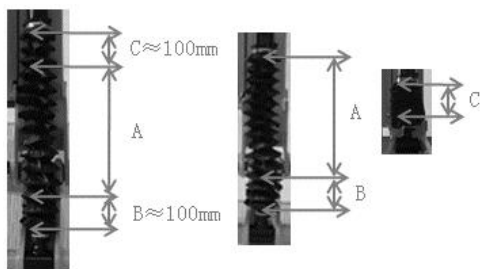


Fig. 3.77 Bleeding fly jib luffing cylinder

3.12.9 Bleeding platform swing cylinder

1. Activate the platform rotation button, and carry out left and right slewing for 1~2 min. The machine should not swing greatly to ensure safety.

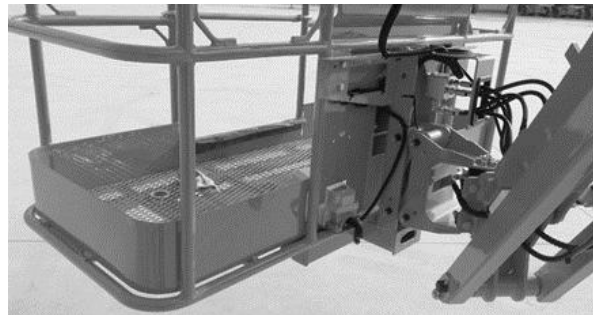


Fig. 3.78 Bleeding platform swing cylinder

3.13 Other components

3.13.1 Assembling tilt sensor

1. Install the tilt switch (part 1) to the mounting position on the engine tray with the screw (part 2) and washer (part 3), and tighten the screw;



Fig. 3.79 Assembling tilt sensor

1. Tilt switch 2. Screw 3. Washer

Note: When installing the tilt switch, ensure the correct installation direction, where X is in the direction of the boom, and adjust the bubble to the center by tightening the screw on the tilt switch. The tilt switch X is in the direction of the boom.

Note: The removal is carried out in reverse order of assembly, and just corresponding fasteners need to be removed, which is not described in detail here.

3.13.2 Assembling hydraulic oil radiator

1. Assemble part 1 to the radiator mounting plate

weldment with parts 2/3/4.

2. Install the parts 5/7 at the upper port and do not tighten the part 7.
3. Install the parts 5/6/8 (4120002548 fitting 2C-22-30 1) at the lower port and do not tighten the parts 6/8.

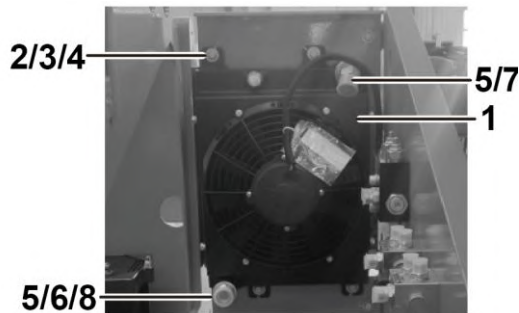


Fig. 3.80 Assembling hydraulic oil radiator

1. Hydraulic oil radiator
2. Bolt
3. Washer
4. Nut
5. Straight fitting
6. Tee fitting
7. Combination fitting
8. fitting

Tightening torque of part 2: $28 \pm 3 \text{N.m}$

Tightening torque of part 5: $160 \pm 16 \text{N.m}$

Tools: Electric impact wrench 51082, socket wrench 13

3.13.3 Assembling battery

1. Place the battery (part 1) on the battery tray, fix it with the locking angle steel (part 2), threaded rod (part 3), washer (part 4) and nut (part 5), and then tighten the nut.

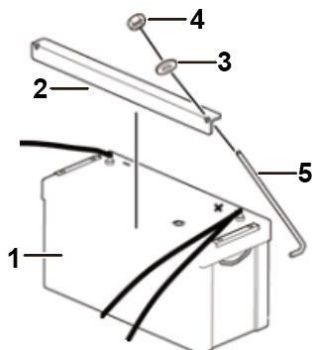


Fig. 3.811 battery

1. Battery
2. Locking angle steel
3. Washer
4. Nut

Reference tightening torque of part 5: $12 \pm 1 \text{N.m}$

Tools: Ratchet wrench 13

Note: The removal is carried out in reverse order of assembly, and just corresponding fasteners need to be removed, which is not described in detail here.

3.14 Valve group

3.14.1 Installing the spool

1. Immerse the spool in clean oil to lubricate the O-ring.
2. Manually screw in the spool until it reaches the top of the O-ring, and then adjust the torque to meet specification requirements.
3. If necessary, install the solenoid coil on the valve stem. Fix the coil to the valve stem with nuts and adjust the torque to meet the specification requirements.

3.14.2 Walk control valve block

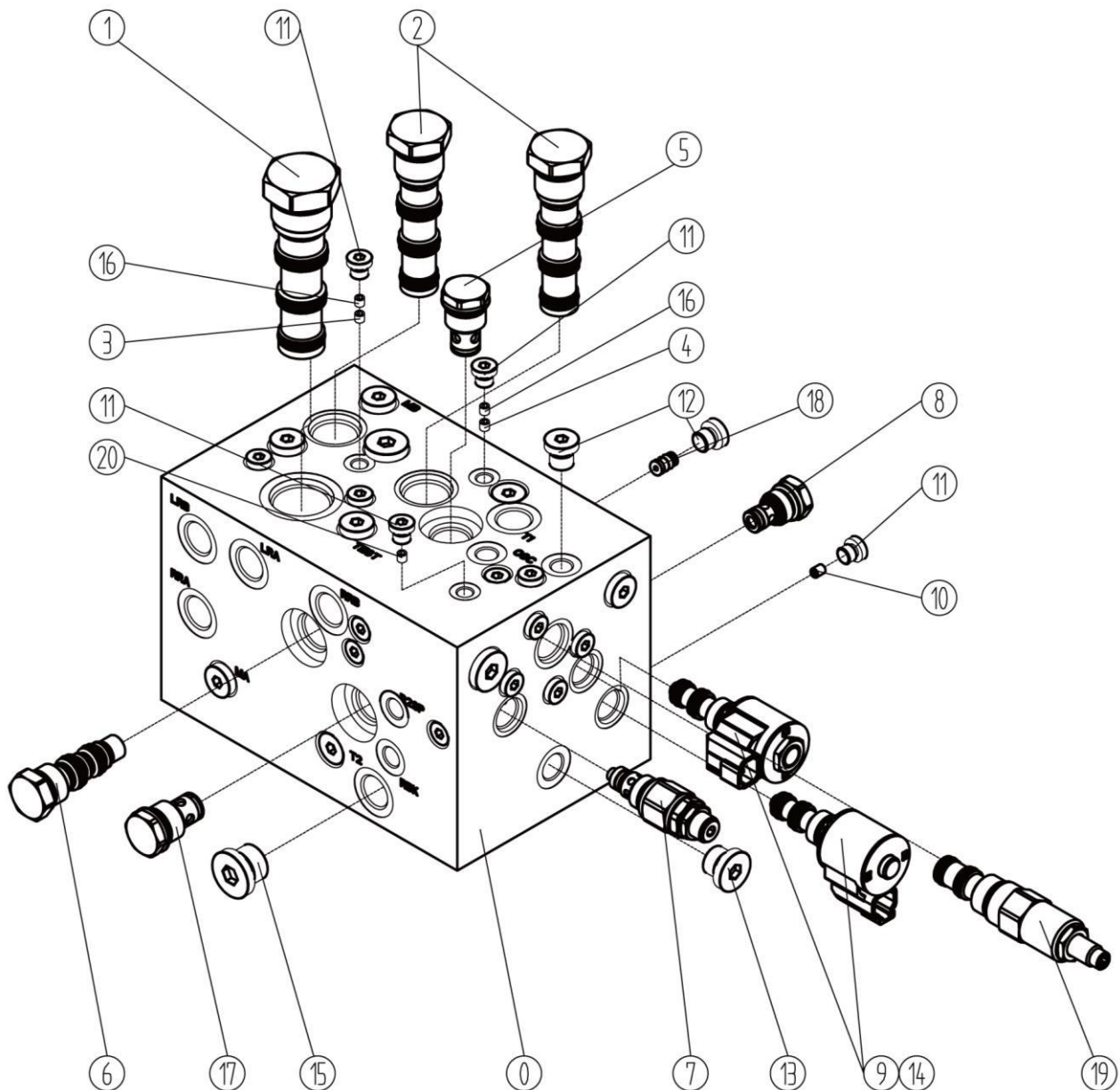


Fig. 3.82 Walk control valve block

No.	Description	Function of valve spool	Pressure (bar/psi)	Torque (Nm)
0	Valve block	Valve spool, oil passage carrier	-	-
1	Flow divider/combiner valve	Dividing/combining the fluid flow to increase or	-	133-138

No.	Description	Function	Pressure (bar/psi)
2	Flow divider/combiner valve	decrease fluid flow Dividing/combining the fluid flow to increase or decrease fluid flow	99-104
3	Damper	Limiting and stabilizing the flow	5
4	Damper	Limiting and stabilizing the flow	5
5	Check valve	Enabling one-way oil supply	55-65
6	Purge valve	Closed system purge valve	33-35
7	Relief valve	Limiting purge pressure	40-45
8	Check valve	Enabling one-way oil supply	40-45
9	Solenoid valve	Braking with two speeds	43-47
10	Damper	Limiting flow	5
11	Plug	Plug	11-12
12	Plug	Plug	25-28
13	Plug	Plug	41-48
14	Coil	Coil	4
15	Plug	Plug	72-82
16	Damper	Limiting flow	5
17	Plug	Plug	55-65
18	Shuttle valve	Shuttle valve	12-15
19	Pressure relief valve	Limiting float pressure	33.9
20	Damper	Limiting flow	5

3.14.3 Luffing balance valve

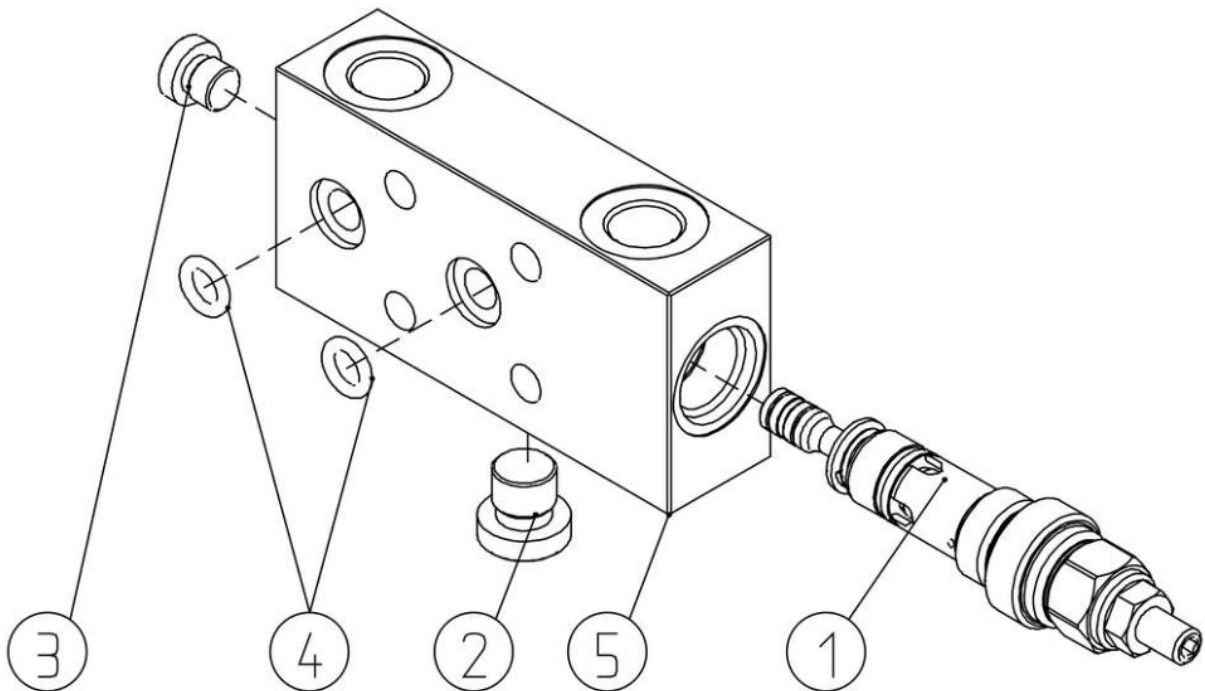


Fig. 3.83 Luffing balance valve

No.	Description	Function of valve spool	Pressure (bar/psi)
1	Balance valve	Balancing pressure	-
2	Plug	Plug	-
3	Plug	Plug	-
4	O-ring	O-ring	-
5	Valve block	-	-

3.14.4 Balance valve

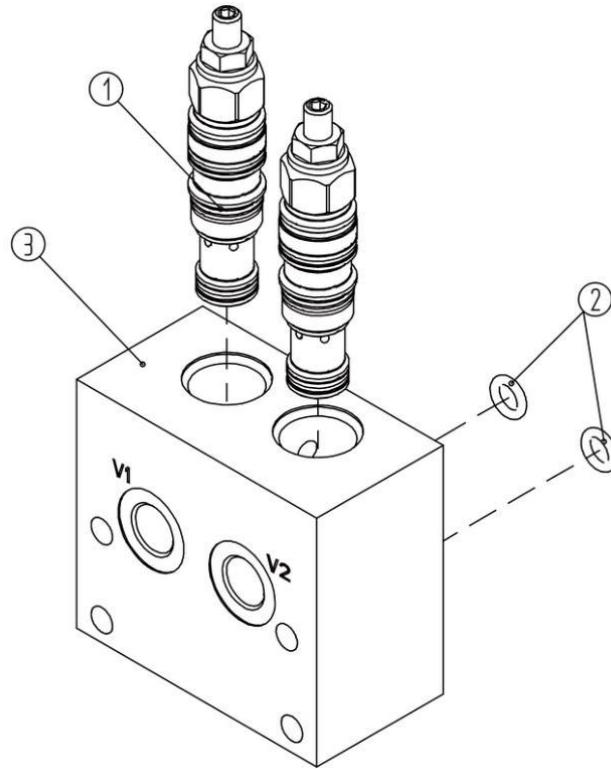


Fig. 3.84 Balance valve

No.	Description	Function of valve spool	Pressure (bar/psi)	Torque (Nm)
1	Balance valve	Pressure balance	-	40-50
2	O-ring	-	-	-
3	Valve block	-	-	-

3.14.5 Boom function valve block

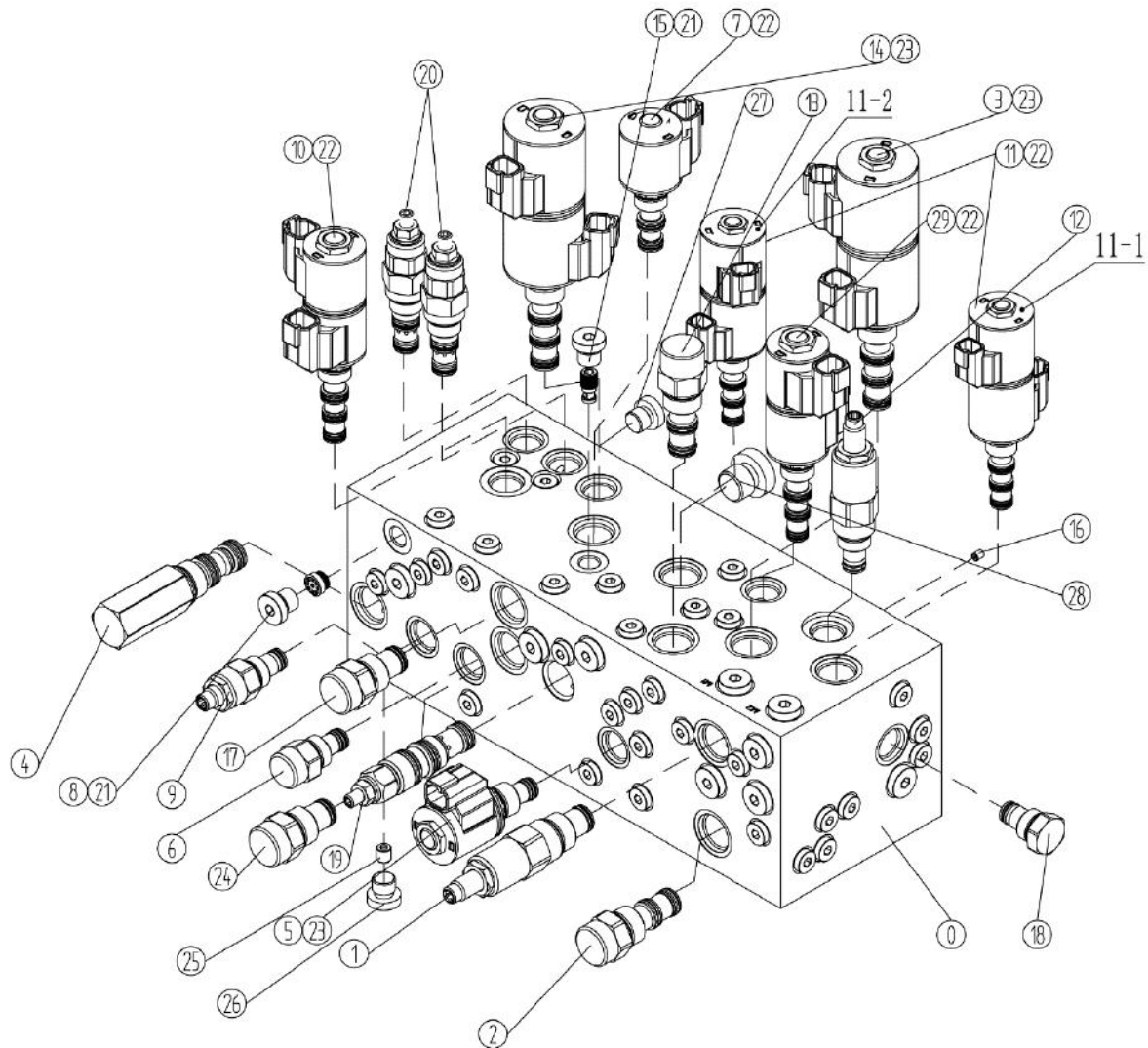


Fig. 3.85 Boom function valve block

No.	Description	Function of valve spool	Pressure (bar/psi)	Torque (Nm)
1	Relief valve	Limiting the maximum pressure of the lifting system	-	33.9
2	Flow valve	Adjusting the hydraulic oil flow	-	33.9
3	Solenoid valve	Switching between left turn and right turn	-	33.9
4	Compensation valve	Compensating hydraulic oil	-	34-36
5	Flow valve	Adjusting the hydraulic oil flow	-	32-35
6	Flow valve	Adjusting the hydraulic oil flow	-	27.1
7	Solenoid valve	Switching between boom luffing and platform swing	-	32
8	Check valve	Enabling one-way flow of hydraulic oil	-	15
9	Flow valve	Adjusting the hydraulic oil flow	-	27.1
10	Solenoid valve	Leveling upper/lower cylinder	-	27.1
11-1	Proportional solenoid valve	Folding jib luffing	-	25-27
11-2	Proportional solenoid valve	Boom luffing	-	25-27
12	Relief valve	Limiting the maximum pressure of the folding jib	-	27.1

		luffing system		
13	Compensation valve	Compensating hydraulic oil	-	33.9
14	Proportional solenoid valve	Extending/retracting boom	-	32.5-35.3
15	Shuttle valve	Switching hydraulic oil circuit	-	12-15
16	Damper	Stabilizing hydraulic oil flow	-	-
17	Flow valve	Adjusting the hydraulic oil flow	-	33.9
18	Check valve	Enabling one-way flow of hydraulic oil	-	40-45
19	Balance valve	Balancing pressure	-	40-45
20	Balance valve	Balancing pressure	-	34-41
21	Plug	-	-	11-12
22	Coil	-	-	25-28
23	Coil	-	-	4
24	Flow valve	Adjusting the hydraulic oil flow	-	4
25	Anti-block damper	Preventing blocking	-	33.9
26	Plug	-	-	41-48
27	Plug	-	-	5
28	Plug	-	-	25-27
29	Proportional solenoid valve	Swing control	-	41-48
30	Valve block	-	-	-

3.14.6 Floating valve

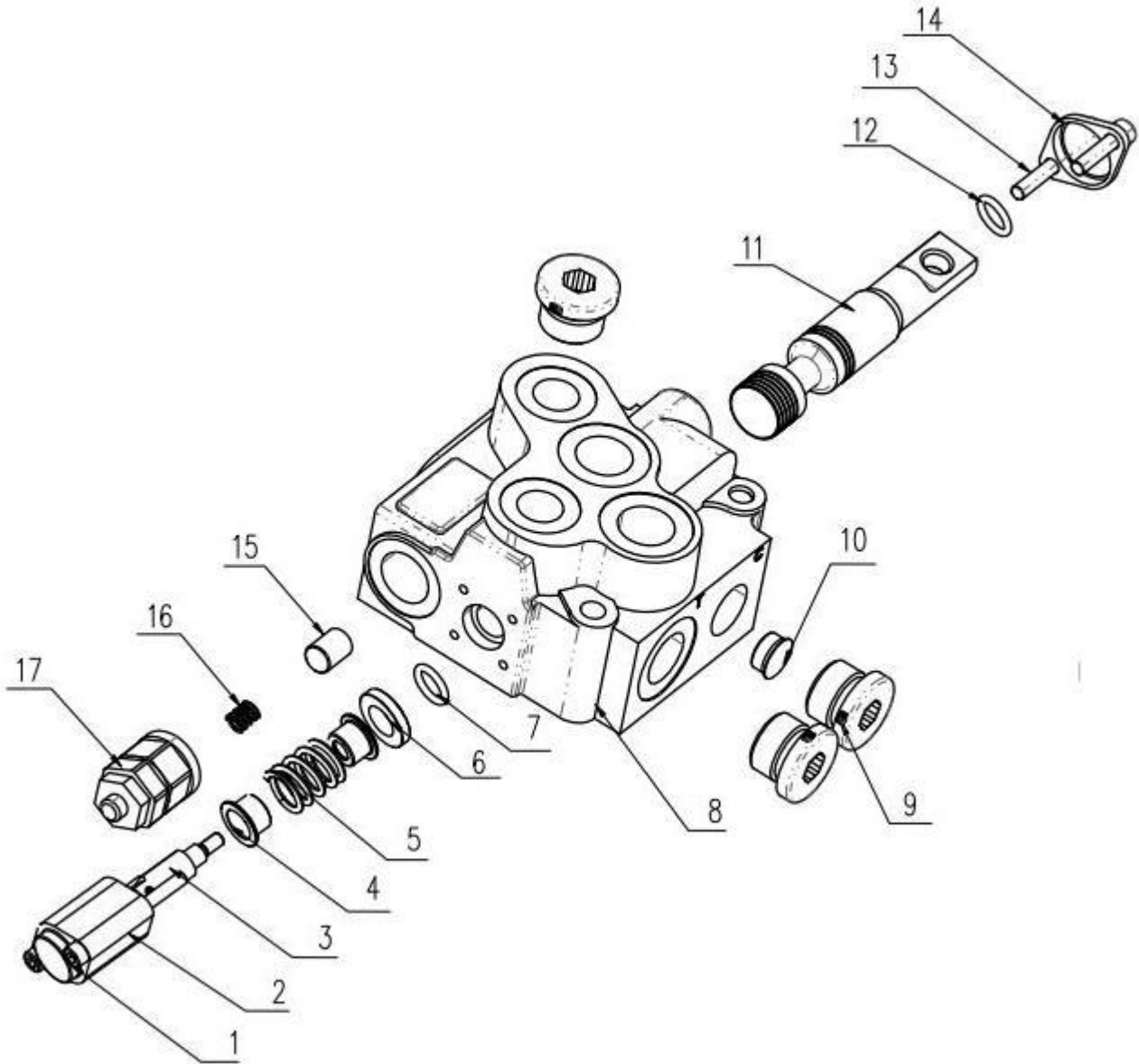


Fig. 3.86 浮动阀

No.	Description	Function of valve spool	Pressure (bar/psi)
1	Screw	-	-
2	Back cover	-	-
3	Set screw	-	-
4	Spring seat	-	-
5	Return spring	-	-
6	Dust ring	-	-
7	Seal ring	-	-
8	Valve body	-	-
9	Plug	-	-
10	U2 plug	-	-
11	Valve spool	-	-
12	Seal ring	-	-
13	Screw	-	-
14	Pressure plate	-	-
15	Check valve	-	-
16	Spring	-	-
17	Relief valve	Limiting the maximum floating pressure	-

3.14.7 Floating cylinder balance valve

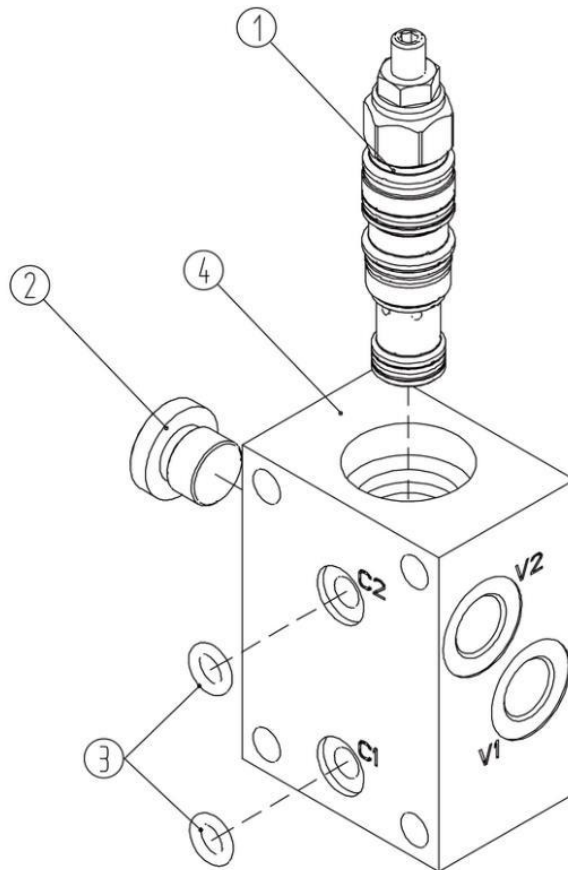


Fig. 3.87 Floating cylinder balance valve

No.	Description	Function of valve spool	Pressure (bar/psi)	Torque (Nm)
1	Balance valve	Pressure balance	-	45-50
2	Plug	-	-	41-48
3	O-ring	-	-	-
4	Valve block	-	-	-

3.14.8 Platform valve

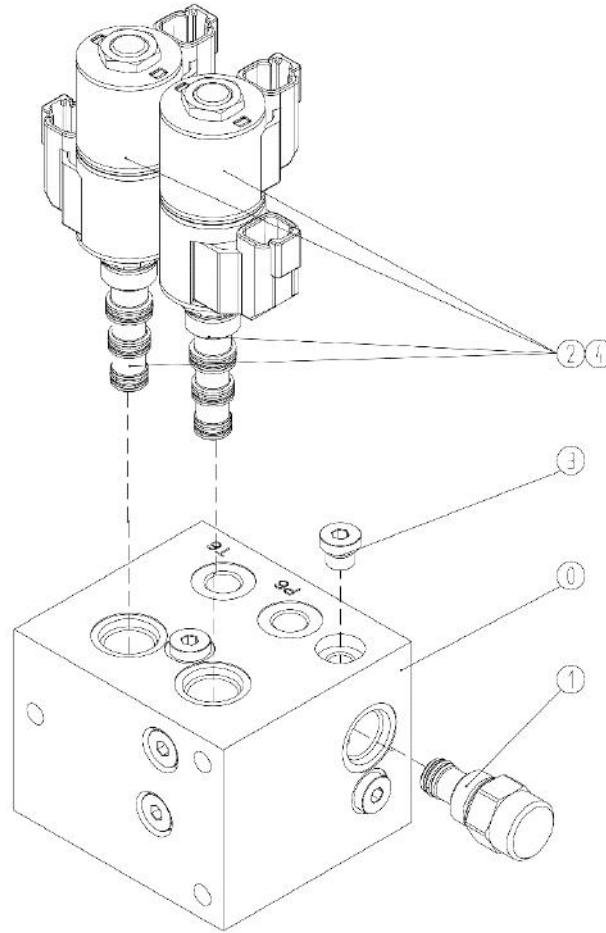


Fig. 3.88 Platform valve

No.	Description	Function of valve spool	Pressure (bar/psi)	Torque (Nm)
1	Flow valve	Adjusting the hydraulic oil flow	-	27.1
2-1	Solenoid valve	Control the flyarm amplitude	-	43-47
2-2	Solenoid valve	Control platform swing	-	43-47
3	Plug	-	-	11-12
4	Coil	-	-	4
5	Valve block	-	-	-

3.14.9 Counterbalance valve

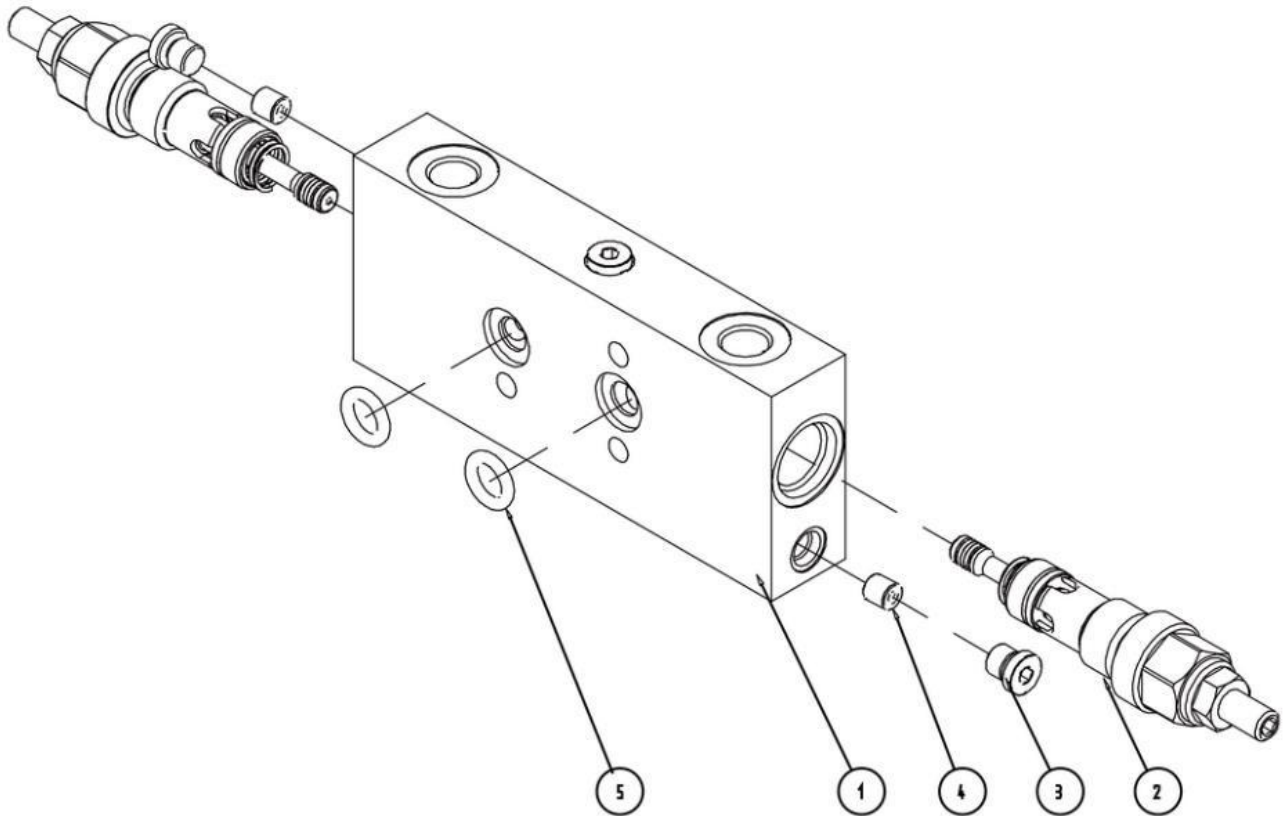


Fig. 3.89 Counterbalance valve

No.	Description	Function of valve spool	Pressure (bar/psi)	Torque (Nm)
1	Valve block	-	-	-
2	Balance valve	Pressure balance	-	70-75
3	Plug	-	-	15
4	Damper	-	-	5
5	O-ring	-	-	-

4. Maintenance

4.1 Compliance

- 1) The operator can only 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 appear in this manual to indicate the relevant meaning in the maintenance instructions. When one or more symbols appear in front of the maintenance procedure, the meanings expressed are as follows.



Indicates a tool required to perform this procedure.



Indicates a new part required to perform this procedure.



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

4.2 Check for labels and signs

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

Refer to the label section in this operation

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

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



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

4.3 Check for damaged, loose or missing parts

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

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

- 1) Check for damaged parts for the whole platform, and check for incorrect installation or missing parts and components, including:
 - Electrical components, wirings and cables
 - Hydraulic hoses, connectors, valve blocks and hydraulic cylinders
 - Fuel and hydraulic tanks
 - Wear-resistant pads
 - Tires and wheels
 - Engine and related components
 - Limit switch and horn
 - Nuts, bolts and other fasteners
 - Platform entrance door
 - Indicators and alarms
 - Platform controller
- 2) Check the entire machine for:
 - Cracks in welds or structural components
 - Whether the platform, boom and chassis

are deformed or have cracked weld joints.

- Indentation or damage to the machine
- Ensure that all structural components and other key components are complete and all relevant fasteners and pins are in the correct position and tightened.

4.4 Check Hydraulic Oil Level

Check it every 8 hours or every day.

Maintaining the hydraulic fluid at the proper oil level is essential for the vehicle operation. If the hydraulic oil is at an appropriate oil level, the hydraulic components may be damaged.

Through daily inspections, the inspector can determine changes in the hydraulic oil level which can indicate problems with the hydraulic system.

- 1) Make sure the boom is in the telescoped position and then visually check the hydraulic tank.

Result: The hydraulic oil is above the middle scale of the level gauge and below the maximum scale of the level gauge.

- 2) The hydraulic oil should be filled as needed. No over-filling will be allowed. Hydraulic oil

Specification

Use temperature	Oil type	Remark
The lowest temperature > -25°C	L-HV32 Low temperature hydraulic oil	Chevron
-40°C < The lowest temperature ≤ -25°C	L-HS32 Ultra low temperature hydraulic oil	
The lowest temperature ≤ -40°C	10# Aviation hydraulic oil	

4.5 Check for hydraulic oil leakage

Check hydraulic oil leakage once every 8 h or every day.



Caution: Risk of personal injury!

Splashed hydraulic oil will penetrate

and burn the skin. Therefore, be sure

to wear goggles and protective gloves.

- Leakage of high pressure oil may not be visible to the eye. Cardboard or wood chips should be used as a tool for checking hydraulic oil leakage, and verification by hands is prohibited. Check the oil residue on the following components:

- Hydraulic tank, filter, pump, hydraulic cylinder, motor, reducer, valve block, hydraulic pipe.

Check the oil residue in the following areas:

- Back of arm rod, fly jib, top of rotary table, top and bottom of drive chassis, ground area under equipment.

4.6 Check for Batteries



A sound battery condition is critical to good engine performance and safe operation. Improper electrolyte levels or damaged cables or wires may cause damage to engine components and bring hazardous conditions.

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 Fig.:



Fig. 4.1 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.

4.7 Checking the Wires

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

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

Risk of electric shock/explosion

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

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

- Engine wiring harness
- All wire harness connectors to ground control box
- All wire harness connectors to platform control box
- Hydraulic manifold wiring

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

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

4.8 Check for tires and hubs

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

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

- 1) Check treads and sides of tires for scratches, cracks, punctures, and other abnormal wear.
- 2) Check if the hubs are damaged, bent or cracked.
- 3) Check whether or not the technological screws for tires are detached. Upon the detaching of screws, if there is slight or no leakage of fillers, and no significant deformation is found for the tire body, and users can knock in screws which are slightly larger than the diameter (about 5mm) of the vent hole with a hammer. If leakage of a large quantity of fillers is found, and the tire body deforms significantly, it is necessary to reduce the height of the working platform and replace the tires timely.

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

4.9 Checking Oil Level in the Drive Hub

Check oil level in the drive hubs every 250 hours or quarterly, whichever comes first.

Incorrect oil level in the drive hub will lead to reduced machine performance. Continuous use with low oil level will result in damage to components.

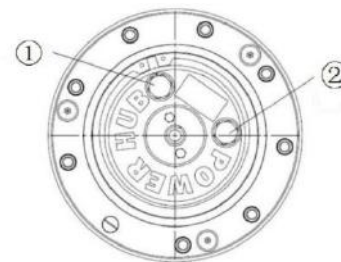


Fig. 4.2 Hub

1. Oil filler 2. Viewing port

1. There are two fill plugs on the drive hub. Drive the machine until one fill plug is at its' highest point.
2. Remove the other fill plug and check the oil level.

Result: The oil level shall be the same as the bottom of the fill plug hole.

- 1) When necessary, remove the upper plug and add oil until the oil level is the same as the bottom of the lower fill plug hole.
- 2) Apply pipe thread sealant to the fill plug and install the plug in the drive hub.
- 3) Repeat this step for each drive hub.

4.10 Check for exhaust cover of hydraulic oil tank

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

An unobstructed hydraulic oil tank cap is essential for good mechanical performance and long service life of the platform. A dirty or clogged exhaust cover may result in poor

platform performance. Given harsh working environment, more frequent check is required.

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

② Check for ventilation.

Result: Air can pass through the exhaust cover.

Result: If air does not pass through the exhaust cover, clean or replace the exhaust cover.

Continue with Step 3.

 **Notice:**

Air is supposed to pass freely while checking ventilation of the oil tank cap.

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

Install the exhaust cover of the hydraulic oil tank.

4.11 Visual Inspection of the Hydraulic Oil

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

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

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

inspections, continue the scheduled maintenance intervals. If the hydraulic oil fails any of the above inspections, the hydraulic oil must be tested by an oil distributor or replaced.

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

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

4.12 Platform weighing structure lubrication

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

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

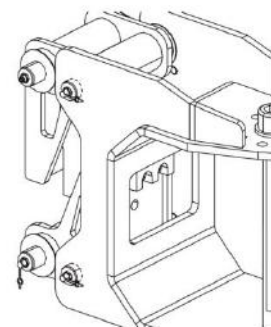



Fig. 4.3 Mild steel shelf bracket


- Locate the pin grease nipple at the triangle bracket assembly.
- Fill grease until grease spills on both sides


of the triangle bracket assembly. (Lithium base grease)

- Wipe off spilled grease.

4.13 Replacing the return filter of hydraulic tank

 Risk of personal injury. Be careful of hot oil. The contact with hot oil will cause severe burns.

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

 In a dusty working environment, this step should be performed more frequently. Perform this step once every 500 h or every six months, whichever comes first. Replacing the return filter is crucial for superior performance and service life of the machine. Dirty or clogged filter may affect the performance of the machine, and if not replaced, may cause damage to the parts. The filter shall be replaced frequently in a harsh working environment. Park the machine on a solid and level ground. Lower the arm rod and make the machine retracted.

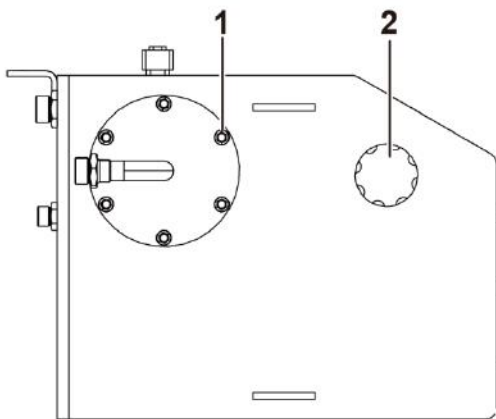



Fig. 4.4 Hydraulic oil tank


No.	Description	Tightening torque
1	Oil return flange bolt	28±3 N.m
2	Air cleaner	-


- ① Remove the upper filter flange of the hydraulic tank.
- ② Remove the old filter and install a new one.
- ③ Refit the filter flange.
- ④ Use a marker to write down the replacement date on the filter replacement record.
- ⑤ Implement any arm rod function with the GCU.

Check the filter components for oil leakage.

4.14 Replacing the high-pressure filter element

 Risk of personal injury. Be careful of hot oil. The contact with hot oil will cause severe burns.

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

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

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

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

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

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

4.15 Replacing Drive Hub Gear

Oil

Replace the oil after the first 50 hours of operation, and then every 1,000 hours or yearly afterward.

It is necessary to replace the gear oil to maintain good equipment performance and service life. Failure to replace the oil every year may result in reduced equipment performance. Continuous use may result in damage to components.

1. Select the drive hub to be maintained, and drive the machine until one plug is at the lowest point.
2. Remove the two plugs and drain the oil into a proper container.
3. Drive the machine until a fill plug is at the highest point.
4. Add oil from the fill plug hole at the high point until the oil level is the same as the bottom of the lower fill plug hole. Install the

plug.

5. Repeat this procedure for the remaining drive hubs.

Use temperature	Oil type 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 the air cleaner

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

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



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

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

4.17 Maintenance of worm-Type

Slewing Drive

There are three positions to be lubricated on the worm-type slewing drive assembly, i.e., lubrication of the roller path (Position I), lubrication of the engaging position (Position II) between the worm and the slewing bearing, and lubrication of the tapered roller bearing (Position III). The specific lubrication positions are shown as below:

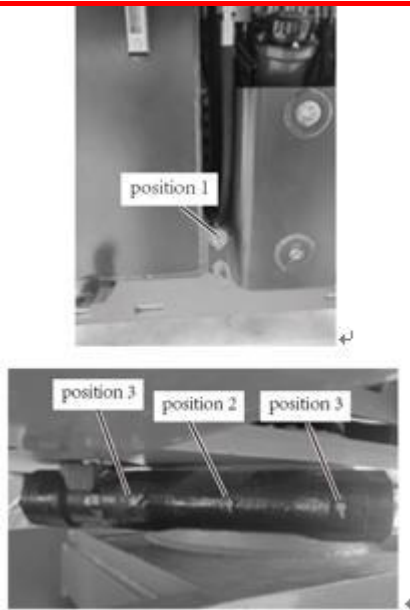


Fig. 4.5 Lubrication position

4.17.1 Maintenance before Delivery



Notice: It refers to the lubrication


of the LGMG platform for working at heights before delivery.


- 1) Position 1: Lubrication of the roller path:
The roller path is full and does not need to be lubricated again.
- 2) Position 2: Lubrication of the engaging position between the worm and the slewing bearing
- 3) Quantity: It is required to inject 650g of lubricating grease.
- 4) Lubrication method: Continuously inject lubricating grease into the injection port of lubricating grease while rotating the slewing reducer
- 5) Model of the lubricating grease: 3# lubricating grease
- 6) Position 3: Lubrication of the tapered roller bearing: the tapered roller bearing is full and does not need to be lubricated again.

4.17.2 Market Maintenance

1. Position I: Lubrication of the roller path:
 2. Quantity: Proper amount (18g is recommended)
 3. Lubricating frequency: Lubricate every year or every 1,000 h, whichever occurs first.
 4. Lubrication method: Continuously inject lubricating grease into the injection port of lubricating grease while rotating the slewing reducer
 5. Model of the lubricating grease: 3# lubricating grease
- 1) Position II: Lubrication of the engaging position between the worm and the slewing bearing
 - 2) Quantity: Proper amount (It is suggested to inject a total of 400g of lubricating grease)
 - 3) Lubricating frequency: Lubricate every three months or every 150 h, whichever occurs first.
 - 4) Lubricating method: Continuously inject lubricating grease into the injection port of lubricating grease while rotating the slewing reducer
 - 5) Model of the lubricating grease: 3# lubricating grease
- 1) Position III: Lubrication of the tapered roller bearing:
 - 2) Quantity: Proper amount (5g is recommended at each position, and a total of 10g for the two positions)
 - 3) Lubricating frequency: Lubricate every year or every 1,000 h, whichever occurs first.
 - 4) Lubricating method: Direct lubrication
 - 5) Model of the lubricating grease: 3# lubricating grease

4.18 Changing hydraulic oil and replacing the suction filter

 Risk of personal injury. Be careful of hot oil. The contact with hot oil will cause severe burns.

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


 In a dusty working environment, this

step should be performed more frequently.

Perform this step once every 2000 h or every two years, whichever comes first.

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

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

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

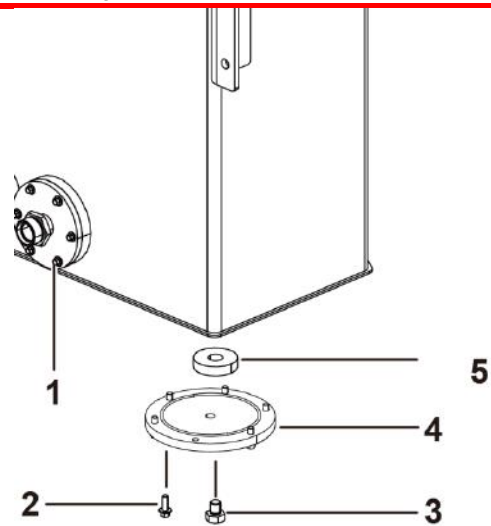



Fig. 4.6 Oil suction filter

No.	Description	Tightening torque
1	Oil suction flange bolt	12±1N.m
2	Oil drain flange bolt	28±3N.m
3	Screw plug	-
4	Oil drain flange	-
5	Ring magnet	-


Park the machine on a solid and level ground.

Lower the arm rod and make the machine retracted.

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

 **Risk of part damage. Do not start the engine when the ball valves of the hydraulic tank are closed; otherwise the parts will be damaged.**

If the ball valves are closed, it is required to remove the key from the key switch and hang a warning sign on the equipment.

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

- 2) Place a proper container under the hydraulic tank.

- 3) Remove the oil drain plug from the hydraulic tank.
- 4) Drain the hydraulic oil from the hydraulic tank completely into a suitable container.
- 5) Remove the oil drain flange and the ring magnet.
- 6) Remove the suction filter from the hydraulic tank.



Note: If necessary, when you

need to remove hydraulic oil tank, please refer to “Disassembly & Assembly of Hydraulic Oil Tank”.

- 7) Flush the inside of the hydraulic tank with a mild solvent. (Clean it with chemical cleaning agent at first. After drying, flush with clean hydraulic oil and drain the oil.)
- 8) Remove the foreign objects adsorbed by the ring magnet.
- 9) Install a new suction filter.
- 10) Refit the ring magnet, oil drain flange and oil drain plug.
- 11) Add the hydraulic oil to the hydraulic tank until the oil level is at specified position of the level gauge (refer to the section about inspection of hydraulic oil level). Ensure that the hydraulic oil doesn't overflow.
- 12) Remove the possibly splashed hydraulic oil.
- 13) Open the ball valves on the hydraulic tank.



Risk of part damage. After installing

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



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

- 14) Check all functions of the machine in a full cycle, and check for oil leakage.

- 15) After a working cycle is finished, recheck the oil level of the hydraulic tank, and add oil until specified oil level is reached. Ensure that the hydraulic oil doesn't overflow.

Disassembly of Hydraulic Oil Tank:

1. Mark, cut off and plug into the rubber hose on hydraulic oil tank (hydraulic oil return pipe and oil suction pipe).
2. Remove other parts which is able to obstruct removal of hydraulic oil tank.
3. Support oil tank with lifting equipment.
4. Remove the fasteners from hydraulic oil tank, and remove oil tank from the machine.



Body Hazards. When removing

the hydraulic oil tank with improper support, there would be fall hazards of hydraulic oil tank.

Assembly of Hydraulic Oil Tank:

1. Lift oil tank with proper lifting equipment and mount the oil tank to machine.
2. Mount the oil suction pipe and oil return pipe.
3. Mount other parts which is probably disassembled.

4.19 Engine maintenance – Deutz

4.19.1 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 daily. 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.

- 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.

If necessary, add oil up to the maximum level.

4.19.2 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 penetrate into the ground.

 Test run shall be carried out after

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

It is available in the first 50 hours, and the engine oil and filter shall be replaced every 500 hours. (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, be careful of

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

 Perform the function after engine

warm up to normal operation temperature.

Replacement of engine oil

! 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.

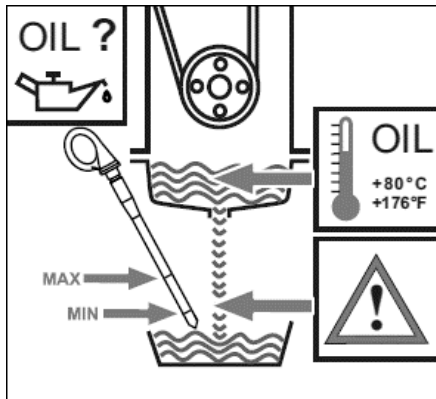


Fig. 4.7 The oil level

- 1) Warm up and run the engine (engine oil temperature > 80°C).
- 2) Place the engine horizontally.
- 3) Shut down the engine.
- 4) Place the container under the engine oil drain plug.
- 5) Screw off the engine oil drain plug to drain the old engine oil.
- 6) Install the new seal ring for the engine oil drain plug and screw in and tighten it.
- 7) Add engine oil at the engine oil filler.
- 8) Warm up and run the engine (engine oil temperature > 80°C).
- 9) Place the engine horizontally.
- 10) Check the engine oil level and fill it if necessary.

Use temperature	Oil type API CH-4
Working temperature:- 20°C ~ 40°C	15W-40
Working temperature:- 25°C ~ 30°C	10W-30

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

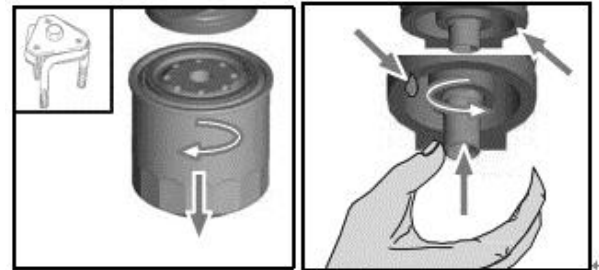


Fig. 4.8 Fuel strainer

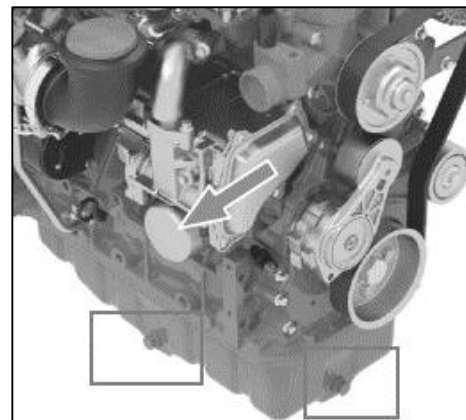


Fig. 4.9 Oil filter and oil drain plug

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.

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

and tighten it with 10-12 Nm.

4.19.3 Check for Fuel Leakage

 **The engine must be shut down!**

No smoking and open fires!

Be careful when contacting high temperature fuel!

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

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

 **There is danger of explosion and**

fire. The fuel of the engine is combustible. Check the position of the machine. When this step is performed, the machine should be in a well-ventilated area away from the heater, spark, flame, and burning tobacco. A qualified fire extinguisher shall be placed in an easily accessible place.

 **There is danger of explosion and**


fire. If fuel leaks, prevent any additional person from entering the area or operating the equipment. Repair the leakage immediately.

4.19.4 Vent Fuel Pre-Filter

 **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.

 **Perform the step when the engine flames out.**

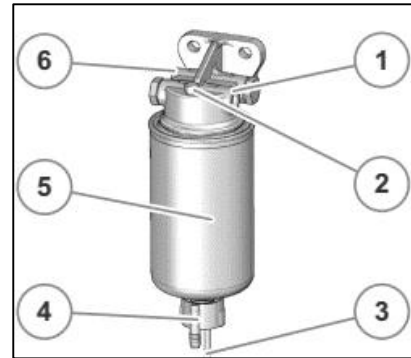


Fig. 4.10 Fuel preliminary filter

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

Check and drain the fuel filter every 8 hours or every day.

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

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

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

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

This process is carried out as follows:

- Ignition "ON"

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

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

- Ignition "OFF"

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



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

4.19.5 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.

The fuel filter should be replaced every 500 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 this step is performed, the

machine should be in a well-ventilated area away from the heater, spark, flame, and burning tobacco.

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

 **Never fill the filter in advance.**

There is risk of contamination.

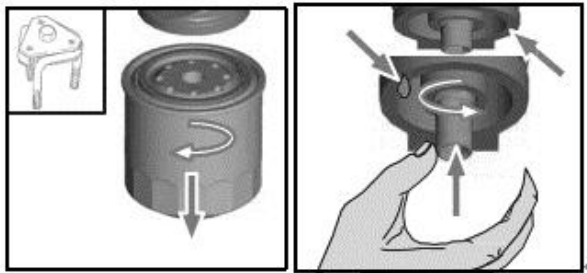



Fig. 4.11 Fuel strainer

- 1) If a torsion stopper is installed, remove the clamping clamp (optional).
- 2) Release and unscrew the filter element with a wrench.
- 3) Contain the diesel fuel drained.
- 4) Clean the sealing surface of the filter holder with a clean fiber-free wiper.
- 5) Apply a thin layer of diesel to the seal ring of the new filter.
- 6) Screw in a new filter manually until seal fit and tighten it with 10-12 Nm.
- 7) Fix the clamping clamp of a torsion stopper (optional).
- 8) Exhaust the fuel system.

4.19.6 Check for Engine Air Filter

Check the maintenance indicator for the air filter every 8 hours or every day.

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

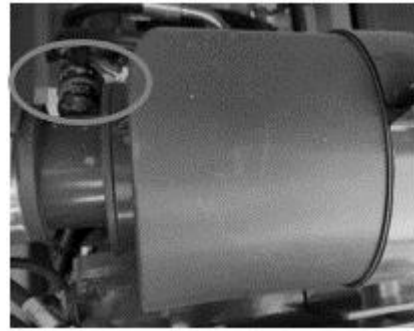


Fig. 4.12 Air filter

Check the maintenance indicator of the air filter (If equipped). When the transparency of the indicator turns red, filter element needs to be maintained and cleaned or 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.

4.19.7 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.

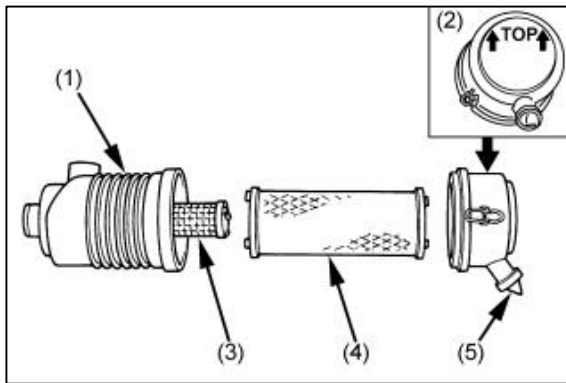


Fig. 4.13 Air Filter

1. Air cleaner body
2. Dust cup
3. Secondary element
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.

4.19.8 Check for Coolant Liquid Level

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

 **The coolant at high temperature**

has the risk of scald.

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

Coolant must have a specified concentration of cooling system protectant!

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

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

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

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

4.19.9 Filling or Replacement of Engine Coolant

Replace it every 2,000 hours or two years.

 **The coolant at high temperature has the**

risk of scald.

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

Coolant must have a specified concentration of cooling system protectant!

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

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


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

Draining of the Cooling System

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


Filling of the Coolant


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

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

4.19.10 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.

Replacement of belt

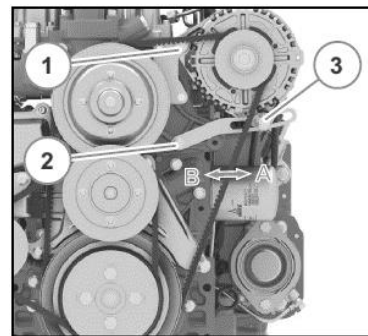


Fig. 4.14 belt

- 1) Loosen bolts (1,2,3) and nuts.
- 2) Move the engine in direction B, until the belt is loose.
- 3) Remove the old belt, and install a new one.
- 4) Move the engine 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

4.20 Engine maintenance –

Kubota

4.20.1 Check for Engine Oil Level



⚠ Do not operate on running engines!

No smoking and open fires!

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

⚠ When operating on the oil

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

⚠ Please observe the safety

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

⚠ Test run shall be carried out after

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

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

Insufficient or excessive engine oil may cause damage to the engine. The engine oil level can only be checked when the engine is placed horizontally and closed. If the engine is hot,

close the engine and check the engine oil level 5 minutes later. Check it immediately if the engine is cooled.

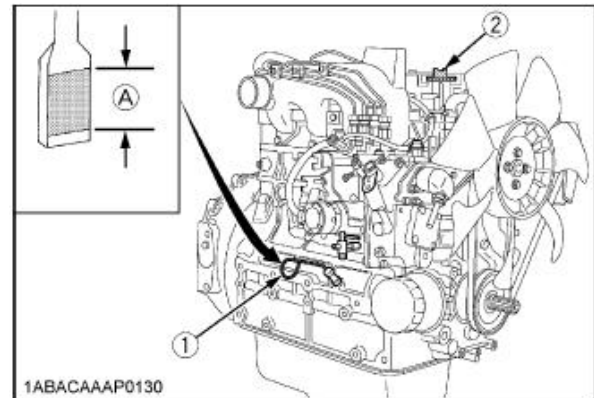


Fig. 4.15 Check the engine oil level

1. Oil measuring rod 2. Oil filler plug

- 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!

Fill up to the maximum liquid level if necessary.

4.20.2 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 penetrate into the ground.

⚠ Test run shall be carried out after each operation. At the same time, pay attention to the sealing and lubrication oil pressure, and then check the engine oil level.

It is available in the first 50 hours, and the engine oil and filter shall be replaced every 400 hours (V2403-E3)/500 hours (V2403-CR-E5B) 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, be careful of high-temperature engine parts and oil, contacting with high temperature engine oil and/or engine parts will cause severe burns.

⚠ Perform the function after engine warm up to normal operation temperature.

Replacement of engine oil

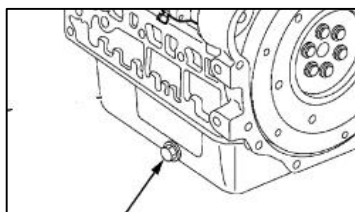


Fig. 4.16 Purge cock

1. Oil drain plug

- 1) Warm up and run the engine.
- 2) Place the engine horizontally.

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

Replacement of the Engine Oil Filter

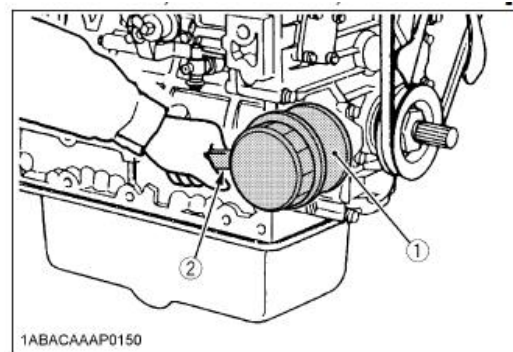


Fig. 4.17 Oil filter

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

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

- 1) If a torsion stopper is installed, remove the clamping clamp (optional).
- 2) Release and unscrew the filter element with a wrench.
- 3) Contain the oil that was drained.
- 4) Clean the sealing surface of the filter holder with a clean fiber-free wiper.
- 5) Apply a thin layer of engine oil to the seal ring of the new filter.
- 6) Screw in the cartridge by hand. When the seal ring contacts the seal surface, tighten the cartridge enough by hand. Because, if you tighten the cartridge with a wrench, it will be tightened too much.

- 7) Fix the clamping clamp of a torsion stopper (optional).

4.20.3 Check for Fuel Leakage


 **The engine must be shut down!**


No smoking and open fires!

Be careful when contacting high temperature fuel!

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

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

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

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

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

4.20.4 Clean or Replace the Fuel Filter

 **The engine must be shut down!**


No smoking and open fires!

Be careful when contacting high

temperature fuel!


 **Do not release the injection**


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

 **Carefully clean all areas involved in cleaning. Blow wet parts with compressed air.**

 **Please observe the safety**

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

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

 **There is danger of explosion and fire. The fuel of the engine is combustible. Check the position of the machine.**

When this step is performed, the machine should be in a well-ventilated area away from the heater, spark, flame, and burning tobacco.

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

Kubota V2403-E3

Clean the Fuel Pre-filter

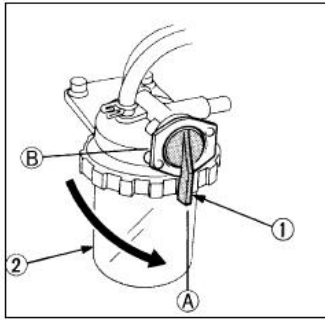


Fig. 4.18 Fuel strainer

- 1. Fuel filter handle
- 2. Fuel filter pot
- A: Open state
- B: Close state

- 1) Clean the fuel filter 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 diesel.
- 4) Take out the filter and clean it with diesel oil or replace a new one.
- 5) Apply a thin layer of diesel to the seal ring of the new filter.
- 6) Reinstall the fuel filter.
- 7) Exhaust 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.

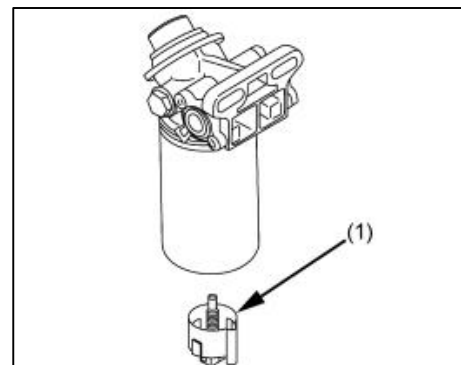


Fig. 4.19 Drain plug

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.

- 1) Remove the old water separator filter with a filter wrench.
- 2) Apply a film of oil to the gasket for the new water separator filter.
- 3) Screw in the water separator filter by hand. Because, if you tighten the water separator filter with a wrench, it will be tightened too much.

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.

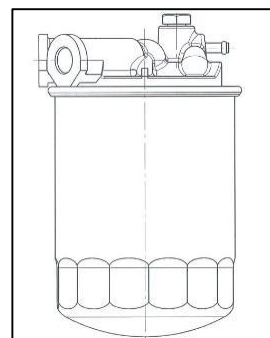


Fig. 4.20 Refined filtration

- 9) Release and unscrew the filter element with a wrench.
- 10) Contain the diesel fuel drained.
- 11) Clean the sealing surface of the filter holder with a clean fiber-free wiper.
- 12) Apply a thin layer of diesel to the seal ring of the new filter.
- 13) Screw in a new filter manually until seal fit and tighten it.

Exhaust the fuel system.

4.20.5 Check for Engine Air Filter

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



Fig. 4.21 Air filter

! Perform this step when the engine is turned off.

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

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

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

4.20.6 Cleaning or replacement of air filter

Clean it every 250 hours or quarterly and replaced it for every 1000 hours or every year, which come 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.

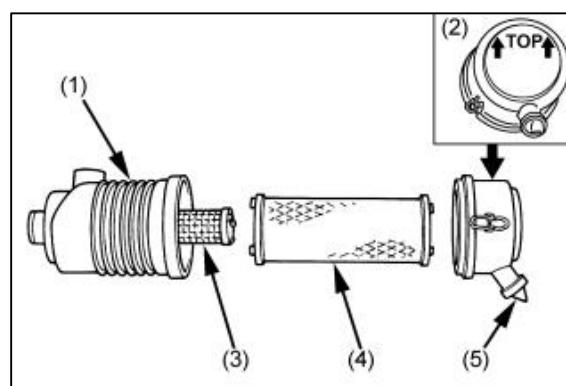


Fig. 4.22 Air filter

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.

4.20.7 Check for coolant liquid level

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

 **The coolant at high temperature**

has the risk of scald.

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

Coolant must have a specified concentration of cooling system protectant!

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


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

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

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

4.20.8 Filling or Replacement of Engine Coolant

Replace it every 2,000 hours or two years.

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

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

Coolant must have a specified concentration of cooling system protectant!

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

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


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

Draining of the Cooling System

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

Filling of the Coolant

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

 **Note: The coolant with different freezing point should be selected**

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

4.20.9 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

V2403-E3

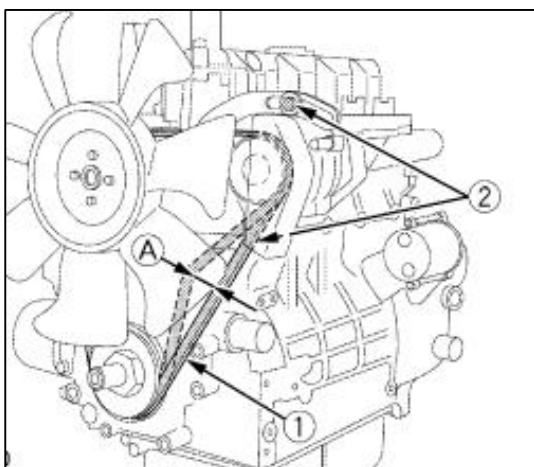


Fig. 4.23 belt

1. Fan belt

2. Bolt and nut

Adjustment of belt tension

V2403-CR-E5B

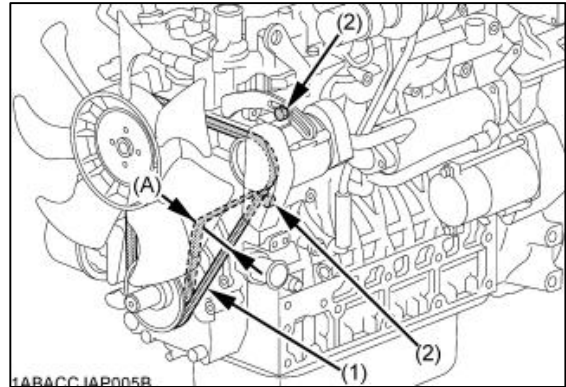


Fig. 4.24 Belt

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

4.21 Regular Maintenance

Items with 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

Kubota

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

	Excessive concentration of antifreeze	Add water only or change to coolant with the specified mixing ratio
	Radiator net or radiator fin clogged with 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

Deutz

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

	Injector defective	Change
	Injection line leaks	Check injection line
	Engine cable harness defective	Check/replace
Speed changes are possible and diagnostic lamp lights up	Engine electronics has detected a system error and activates an equivalent speed	Check error according to error code and eliminate error if necessary
Engine becomes excessively hot. Temperature warning system activates	Vent line blocked	Clean
	Lube oil cooler defective	Check/replace
	Lube oil filter contaminated on the air or lube oil side	Change
	Lube oil level too high	Check lube oil level, if necessary drain off.
	Lubricating oil level too low	Fill up lube oil
	Injector defective	Change
	Coolant heat exchanger soiled	Clean
	Defective cooling water pump (torn or loose V-belt)	Check whether torn or loose
	Low coolant	Fill up
	Resistance in cooling system is too high / flow volume too low	Check the cooling system
	Fan / viscous coupling defective, V-belt torn or loose	Check/replace/tension
	Charge air line leaking	Check charge air line
	Charge air cooler soiled	Check/clean
	Air filter clogged / turbocharger defective	Check/replace
	Air filter maintenance switch / maintenance indicator defective	Check/replace
	Fan defective/V-rib belt torn or loose	Check fan/V-belt, change if necessary
	Exhaust gas backpressure too high	Check
	Throttle valve defective	Check/replace
	Coolant temperature transmitter	Check/replace
	Coolant thermostat defective	Check/replace
Coolant cover defective	Check/replace	
Engine output is deficient	Lube oil level too high	Check lube oil level, if necessary drain off.
	Fuel suction temperature too high	Check the system
	Fuel quality does not comply with operating manual	Change the fuel
	Air filter clogged / turbocharger defective	Check/replace
	Air filter maintenance switch / maintenance indicator defective	Check/replace
	Fan defective/V-rib belt torn or loose	Check fan/V-belt, change if necessary
	Charge air line leaking	Check charge air line
	Charge air cooler soiled	Clean
	Injection line leaks	Check injection line
	Injector defective	Change
	Throttle valve defective	Check/replace
	Exhaust gas recirculation, actuator 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 partner
Engine does not run on all cylinders	Injection line leaks	Check injection line
	Injector defective	Change
	Compression pressure too low	Check compression pressure
	Engine cable harness defective	Check/replace
Engine lubricating oil pressure is nonexistent or excessively low	Lubricating oil level too low	Fill up lube oil
	Excessive inclination of engine	Check engine mounting / reduce inclination
	Wrong SAE viscosity class of the engine lubricating oil	Change the lubricating oil
	Lubricating oil pressure sensor defective	Check/replace
	Lubricating oil control valve jammed	Check/clean
	Lubricating oil suction pipe blocked	Check/clean
Engine lubricating oil consumption excessive	Lube oil level too high	Check lube oil level, if necessary drain off
	Excessive inclination of engine	Check engine mounting / reduce inclination
	Crankcase breather	Check/replace
Lubricating oil in the exhaust system	Engine operated continuously with too low a load (< 20-30%)	Check load factor
	Valve shaft seals defective	Check/replace
	Exhaust gas turbocharger defective	Check/replace
Engine producing blue smoke	Lube oil level too high	Check lube oil level, if necessary drain off
	Excessive inclination of engine	Check engine mounting / reduce inclination
Engine producing white smoke	Fuel quality does not comply with operating manual	Change the fuel
	Injector defective	Change
	Condensation	Warm up engine so that water residues evaporate
Engine producing black smoke	Air filter clogged / turbocharger defective	Check/replace
	Air filter maintenance switch / maintenance indicator defective	Check/replace
	Charge air line leaking	Check charge air line
	Injector defective	Change
Engine shutdown frequently	Air filter clogged / turbocharger defective	Check/replace
	Charge air line leaking	Check charge air line
	Injector defective	Change
	Differential pressure of flow meter defective	Change
	Nox sensor defective	Change
	Differential pressure sensor of diesel particulate filter is issuing an implausible signal	Change
Differential pressure line added	Clean	

4.23 Engine fault Codes

4.23.1 Engine fault Codes (Kubota)

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	652	3	Harness or injector coil open	Harness or injector coil

Harness/Coil Open Circuit			circuit	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)
DTC Description	SPN	FMI	Inspection Item	DTC Set Parameter
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	● Checksum error

				<ul style="list-style-type: none"> ● Delete error ● Write error ● Read error
ECU CPU (Master IC) Error	1077	2	CPF and/or IC failure	Critical CPU and/or IC errors
DTC Description	SPN	FMI	Inspection Item	DTC Set Parameter
ECU CPU (Monitoring IC) Error	523527	2	CPU Monitor IC Failure	CPU monitor IC failure
Injector Charge Voltage: Low	523525	1	Injector charge voltage: low ECU charge circuit failure	Injector charge voltage: low ECU charge circuit failure
SCV (MPROP) Open Circuit	1347	5	SCV open circuit	SCV open circuit
SCV (MPROP) Drive System Failure	1347	4	SCV open or shorted to ground	SCV open or shorted to ground
SCV (MPROP) Shorted to +B	1347	3	SCV shorted to +B	SCV shorted to +B
Injector Driver IC Error or Open Circuit	1077	12	Injector driver IC error, or No. 1 & No. 4 cylinder injector open circuit, or No. 2 & No.3 cylinder injector open circuit	Injector driver IC error, or No. 1 & No. 4 cylinder injector open circuit, or No. 2 & No.3 cylinder injector open circuit
Injector Driver IC Short Circuit	523605	6	Intake air glow plug relay open circuit	Injector IC error reported
Sensor Supply Voltage 1: Low	3509	4	Sensor supply voltage 1 error or recognition error	Sensor supply voltage below 4.75 V
Sensor Supply Voltage 1: High	3509	3	Sensor supply voltage 1 error or recognition error	Sensor supply voltage above 5.25 V
Sensor Supply Voltage 2: Low	3510	4	Sensor supply voltage 2 error or recognition error	Sensor supply voltage below 4.75 V
Sensor Supply Voltage 2: High	3510	3	Sensor supply voltage 2 error or recognition error	Sensor supply voltage above 5.25 V
Sensor Supply Voltage 3: Low	3511	4	Sensor supply voltage 3 error or recognition error	Sensor supply voltage below 4.75 V
Sensor Supply Voltage 3: High	3511	3	Sensor supply voltage 3 error or recognition error	Sensor supply voltage above 5.25 V
Main Relay Locked in Closed Position	1485	2	Main relay failure	The main relay stays on for more than 1 s with no command given
Starter Motor Relay Drive Circuit Shorted to Ground	677	4	Starter motor relay drive circuit shorted to ground	Harness shorted to ground
EEPROM Checksum Error	523700	13	KBT-EEPROM checksum error	EEPROM checksum error
Intake Throttle Feedback Error	523580	2	Intake throttle feedback error	Throttle position deviation is not corrected after 20 load error recovery operations
Accelerator Position Sensor 1: Low	91	4	Sensor/harness shorted to ground or open	Accelerator position sensor 1 voltage below 0.3 V
Accelerator Position Sensor 1: High	91	3	Short circuit to ground outside sensor/harness	Accelerator position sensor 1 voltage below 4.8 V
Accelerator Position Sensor 2: Low	29	4	Sensor/harness shorted to ground or open	Accelerator position sensor 2 voltage below 0.3V
Accelerator Position Sensor 2: High	29	3	Short circuit to ground outside sensor/harness	Accelerator position sensor 2 voltage below 4.8V
Accelerator Position Sensor Error (CAN)	523543	2	Accelerator position sensor error signal (sensor/harness open or shorted to ground, etc.)	Accelerator position sensor error signal received via CAN
Accelerator Position Sensor Association Error	91	2	Deviation with two designed sensor associations	Deviation with two designed sensor associations
No.1 & No.4 Cylinder Injector Shorted to Ground, or All Cylinder Injectors Shorted to Ground	523523	3	Harness shorted to ground	Harness shorted to ground
No.1 & No.4 Cylinder Injector Shorted to +B, or All Cylinder Injectors Shorted to +B	523523	3	Harness shorted to +B	Harness shorted to +B
No.2 & No.3 Cylinder Injector Shorted to Ground, or All Cylinder Injectors Shorted to Ground	523524	3	Harness shorted to ground	Harness shorted to ground
No.2 & No.3 Cylinder Injector Shorted to +B, or All Cylinder Injectors Shorted to +B	108	4	Harness shorted to +B	Harness shorted to +B

Barometric Pressure Sensor Failure (Low Side)	108	3	Sensor/ECU internal circuit shorted to ground	Barometric pressure sensor voltage: below 0.2 V
Barometric Pressure Sensor Failure (High Side)	679	7	Sensor/ECU internal circuit shorted to +B	Barometric pressure sensor voltage: above 4.850 V
DTC Description	SPN	FMI	Inspection Item	DTC Set Parameter
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:	523601	0	Outputs of exhaust temperature	All exhaust gas

DTC Downstream Exhaust Gas Temperature High			sensors 0, 1, 2	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 $\geq 110^{\circ}\text{C}$ (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

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

565	523350	4	Injector cylinder bank 1: The current drop measured by ECU is above the target range
566	523352	4	Injector cylinder bank 2: The current drop measured by ECU is above the target range.
567	523354	12	Internal hardware monitoring: The ECU detects an error of its injector high current output
568	651	5	Injector cylinder 1: Interruption of electrical connection
569	652	5	Injector cylinder 2: Interruption of electrical connection
570	653	5	Injector cylinder 3: interruption of electrical connection
571	654	5	Injector cylinder 4: Interruption of electrical connection
572	655	5	Injector cylinder 5: interruption of electrical connection
573	656	5	Injector cylinder 6: Interruption of electrical connection.
580	651	3	Injector cylinder 1: The current drop measured by ECU is above the target range
581	652	3	Injector cylinder 2: The current drop measured by ECU is above the target range
582	653	3	Injector cylinder 3: The current drop measured by ECU is above the target range
583	654	3	Injector cylinder 4: The current drop measured by ECU is above the target range
584	655	3	Injector cylinder 5: The current drop measured by ECU is above the target range
585	656	6	Injector cylinder 6: The current drop measured by ECU is above the target range.
592	523615	5	Detecting an open load fault in the metering unit of the fuel system
594	523615	3	Fuel metering unit: The current drain measured by ECU is above the target range
595	523615	4	Fuel metering unit: The current drain measured by ECU is above the target range
596	523615	3	Fuel metering unit: The current drain measured by ECU is above the target range
597	523615	4	Fuel metering unit: The current drain measured by ECU is above the target range
612	523612	12	Internal hardware monitoring: the CPU of the ECU is reset and the cause is logged internally; no item will be created in error memory
613	523612	12	ECU reported internal software error Internal ECU monitoring detection reported error
614	523612	12	Internal hardware monitoring: the CPU of the ECU is reset and the cause is logged internally; no item will be created in error memory
619	523612	12	Internal hardware monitoring: the CPU of the ECU is reset and the cause is logged internally; no item will be created in error memory
625	523612	12	Internal hardware monitoring: the CPU of the ECU is reset and the cause is logged internally; no item will be created in error memory
637	523612	12	Engine speed: the engine speed calculated by ECU is above the target range; the ECU activates a system reaction
732	100	3	Oil pressure sensor: the voltage of sensor measured by ECU is out of the target range
733	100	4	Oil pressure sensor: the voltage of sensor measured by ECU is out of the target range
734	100	0	High oil pressure; warning threshold exceeded
735	100	0	High oil pressure; shut off threshold exceeded
736	100	1	Oil pressure is below the target range (warning threshold)
737	100	1	Oil pressure is below the target range (shut off threshold)
746	175	0	High oil temperature; shut off threshold exceeded
747	1237	2	Override switch: the ECU receives a permanent signal.
752	107	0	Air filter differential pressure: the pressure difference of the intake air between

			the filter inlet and outlet calculated by ECU is above the target range and the ECU activates a system reaction
776	102	3	Charge air pressure sensor: the measured voltage of sensor by ECU is out of the target range
777	102	4	Charge air pressure sensor: the measured voltage of sensor by ECU is out of the target range
825	523009	9	The pressure relief valve (PRV) has reached the number of allowed activations.
826	523470	2	Pressure relief valve is forced to open, perform pressure increase
827	523470	2	Pressure Relief Valve (PRV) forced to open. Performed by pressure increase.
828	523470	12	Pressure Relief Valve (PRV) forced to open. Shutoff conditions.
829	523470	12	Pressure Relief Valve (PRV) forced to open. Warning conditions.
830	523470	14	Open Pressure Relief Valve (PRV)
831	523470	11	Rail pressure relief valve can not be opened due to the railpressure.
832	523470	11	Rail pressure out of tolerance range. The PRV can not be opened at this operating point with a pressure shock.
833	523009	10	The pressure relief valve (PRV) has reached the allowed opening time
834	523906	5	ECU detects open load on the electric fuel feed pump output
835	523906	12	ECU detects too high temperature in powerstage of fuel pump circuit.
836	523906	3	ECU detects shortcut to battery in fuel feed pump circuit.
837	523906	4	Electrical fuel pre - supply pump. Short circuit to ground.
856	523613	0	Rail pressure below setpoint, speed-dependent threshold exceeded. The rail pressure is below the target range, which is determined as a function of the engine speed.
857	523613	0	Rail pressure below setpoint, threshold exceeded
858	523613	0	Rail pressure: the fuel pressure in rail calculated by ECU is above the target range which is dependant on the engine speed
859	523613	0	Rail pressure: the fuel pressure in rail calculated by ECU is below the target range which is dependant on the engine speed.
861	523613	1	Rail pressure: the fuel pressure in rail calculated by ECU is below the target range which is dependant on the engine speed
862	523613	0	Rail pressure: the fuel pressure in rail calculated by ECU is above the target range.
864	523613	2	Rail pressure metering unit, Setpoint of metering unit in overrun mode not plausible.
876	523470	7	Rail pressure is out of the expected average range.
877	157	3	Rail pressure sensor: the voltage of sensor measured by ECU is out of the target range
878	157	4	Rail pressure sensor: the voltage of sensor measured by ECU is out of the target range
932	29	3	Analog accelerator pedal 2 (hand pedal): the voltage measured by ECU is out of the target range.
935	91	3	Analog accelerator pedal sensor 1 or double accelerator pedal sensor: the voltage measured by ECU is out of the target range or the calculated pedal position is implausible compared with the position of the second pedal
937	29	4	Handthrottle; short circuit to ground
940	91	4	Sensor error accelerator pedal. Signal is below the range
946	1079	13	Internal hardware monitoring: the ECU detects a deviation of the target range of the power supply voltage of sensor output 1
947	1080	13	Internal hardware monitoring: the ECU detects a deviation of the target range of the power supply voltage of sensor output 2
948	523601	13	Internal hardware monitoring: the ECU detects a deviation of the target range of the power supply voltage of sensor output 3

956	677	3	Start relay (high side power stage): the current drop measured by ECU is above the target range.
957	677	4	Start relay (high side power stage): the current drain measured by ECU is above the target range
958	677	5	Start relay (low side power stage): the current drop measured by ECU is above the target range
959	677	12	Start relay (low side power stage): the current drop measured by ECU is above the target range
960	677	3	Start relay (low side power stage): the current drain measured by ECU is above the target range
961	677	4	Starter relay low side short circuit to ground
973	523612	14	Internal hardware monitoring: the CPU of the ECU is reset and the cause is logged internally; no item will be created in error memory
974	523612	14	Internal hardware monitoring: the CPU of the ECU is reset and the cause is logged internally; no item will be created in error memory.
975	523612	14	Internal hardware monitoring: the CPU of the ECU is reset and the cause is logged internally; no item will be created in error memory
976	91	11	Diagnostic fault check of synchronism of single potentiometer and Low idle switch(LIS).
978	29	2	Plausibility error between sensor and idle switch, Acceleration Pedal Detection. In case of Hand Throttle with Low Idle Switch, it is the plausibility check between hand throttle and idle switch
980	523550	12	Terminal 50 was operated for more than 2 minutes. This may happen due to short to battery or wrong usage of Terminal 50. Starter control is disabled until this error is healed.
994	105	3	Electrical error charged air temperature. Signal range check high.(SRC)
995	105	4	Electrical error charged air temperature. Signal range check low
996	105	0	Charged air cooler temperature. System reaction initiated. High charged air cooler temperature. Warning threshold exceeded.
997	105	0	Charge air temperature downstream calculated by ECU is over the shut off threshold. The ECU activates a system reaction.
1016	51	7	Actuator position for EGR valve is not plausible, internal error, angular misalignment of the flap
1024	51	3	Actuator of the external EGR valve: the ECU detects a short circuit to battery or open load
1025	51	4	Actuator of the external EGR valve: the ECU detects a short circuit to ground
1157	97	12	Water in fuel level prefilter; maximum value exceeded
1170	523612	12	Internal hardware monitoring: the CPU of the ECU is reset and the cause is logged internally; no item will be created in error memory
1180	168	0	Physical range check high for battery voltage
1181	168	1	Physical range check low for battery voltage
1223	51	5	Actuator EGR-Valve: Open load on ECU output is detected
1224	51	6	Actuator EGR-valve: too high current is going into the actuator. Output is switched off
1226	51	3	Actuator EGR-valve: short cut to battery is detected
1227	51	3	Actuator EGR-valve: short cut to battery on ECU pin is detected
1228	51	4	Actuator EGR-valve: short cut to ground on ECU pin is detected
1229	51	4	EGR-Valve (2.9;3.6) or Throttle-Valve (4.1;6.1;7.8); short circuit to ground
1230	51	6	Actuator error EGR-Valve (2.9;3.6) or Throttle-Valve (4.1;6.1;7.8); Overload by short-circuit

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

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

List of maintenance items

System	Operation	Maintenance level							Remarks
		Routine inspection	Level 1 maintenance	100h maintenance	Level 2 maintenance	Level 3 maintenance	Level 4 maintenance	Level 5 maintenance	
Powertrain	Check the 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								
	Change the engine oil	First 50h, thereafter every 400h (Kubota-V2403-E3)/500h (DeutzD2.9L4/Kubota-V2403-CR-E5) or every six months, whichever comes first.							At least once a year
	Replace the engine oil filter element	First 50h, thereafter every 400h (Kubota-V2403-E3)/500h (DeutzD2.9L4/Kubota-V2403-CR-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 filter of fuel tank			•	•	•	•	•	
	Drain deposits from the fuel tank			•		•		•	
	Replace the fine diesel filter	Every 400h (Kubota-V2403-E3)/500h (DeutzD2.9L4/Kubota-V2403-CR-E5) or every six months, whichever comes first.							
	Replace the primary fuel filter element	Every 500h (Kubota-V2403-CR-E5)/1000h (DeutzD2.9L4) or every six months, whichever comes first. If necessary (Kubota-V2403-E3).							
	Check the water level in the water separator, and drain the water regularly	•							
	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 inclinometer is wired firmly	•							
	Check the position of the rotary table swing limit switch rocker arm and if it is wired loosely	•							
	Check if the solenoid valve connector of the walking pump is loose	•							

	and is wired normally									
	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 the color of the battery sight hole				•	•	•	•		
	Load cell zero calibration				•	•	•	•		
Hydraulic system	Check if the system pressure is normal			•	•	•	•	•		
	Check if the steering system pressure is normal			•	•	•	•	•		
	Check if the traveling system pressure is normal			•	•	•	•	•		
	Check if the oil pipes and joints are loose	•								
	Check if the oil cylinder leaks oil	•								
	Check if the valve spools leak oil	•								
	Check if the two ball valves at the suction port at the bottom of the hydraulic tank are open	•								
	Check if the walking oil pipe fixing clip is loose	•								
	Check the oil level in the hydraulic tank	•							Add hydraulic oil L-HV32 when the oil level is lower	
	Check the permeability of the hydraulic oil tank exhaust cap				•	•	•	•	•	
	Replace hydraulic oil and suction filter		Every 2,000h or every two years, whichever comes first							Hydraulic oil L-HV32
	Replacement of the high pressure filter element		Every 500h or every six months, whichever comes first.							
	Check the hydraulic tank vent cap for leakage		Daily							

	Replace the air cleaner	Every 1,000 hours or every year, whichever comes first							
	Check the reducer for oil leakage	Daily							
	Check the walking 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.							
Machine	Check if the attached documents are complete, easy to read, and if they are in the file box	Daily							
	Check if the safety identification is correct or stained	Daily							
	Check the machine bolts, nuts and other fasteners for looseness or abnormal noise	Daily							
	Check the structural parts of the machine for cracks and if there is any open weld	Daily							
	Check if the machine paint for falling off, serious rust, corrosion or oxidation	Daily							
	Check if the slider is loose and if there is zero clearance between the slider and the boom						•	•	
	Check the bolt of slew support					•		•	Torque: 305±25N.m
Lubrication	Lubricate the slewing bearing			•	•	•	•	•	Lithium-based grease 3#
	Grease the slewing bearing and the gears of the slewing reducer			•	•	•	•	•	Lithium-based grease 3#
	Grease the platform load cell mechanism					•		•	Lithium-based grease

5. Commissioning

5.1 Safety instructions

Before commissioning, please make sure to refer to the *Operation and Maintenance Manual*, familiarize yourself with the relevant safety precautions and basic operating requirements, and be particularly familiar with the following safety matters:

1. It is strictly forbidden for alcoholics, drug users, and those taking inhibition reaction drugs to approach and operate the machine;
2. Before operating the machine, please ensure that you have equipped with protection equipment, such as helmet, safety belts (five-point), safety shoes, and your body is in good condition;
3. The machine cannot be operated with the hood open. Before starting the engine, confirm the surrounding environment of the machine to ensure that the engine is unmanned to avoid the danger of starting the engine. and these instructions will not be repeated below;
4. Before operating the machine, sound the horn to ensure that there are no people or obstacles around, so as to avoid safety damage to others, yourself, the machine or obstacles, and other people are not allowed to operate the machine during commissioning;
5. This machine is not insulated, and does not provide protection against electric shock when it is in contact with or near wires, power supplies or electrical equipment.



Please follow the applicable laws and regulations and the instructions in the table

below to maintain a sufficient safety distance from wires, power supplies, and electrical equipment.

Voltage	Required safety distance
0V~50KV	3.05m/10ft
50V~200KV	4.60m/15ft
200V~350KV	6.10m/20ft
350V~500KV	7.62m/25ft
500V~750KV	10.67m/35ft
750V~1000KV	13.72m/43.3ft

If the machine comes into contact with a live wire, stay away from the machine immediately. Before the power of the wire is cut off, personnel are forbidden to touch or operate the machine. Do not operate or use the machine during lightning or storms.

6. Do not raise the arm rod when the wind speed may exceed 12.5m/s/28mph. If the wind speed exceeds 12.5m/s/28mph after the arm rod is raised, lower the arm rod and do not continue to operate the machine;
7. Do not operate the machine in strong winds or gusts. Do not increase the surface area of the platform or load. Enlarging the area exposed to the wind will reduce the stability of the machine;
8. Do not operate the machine via the PCU box when the platform is tripped, stuck, or other objects nearby hinder its normal movement. If it is expected to operate the machine via the ground control unit, this operation can be done only after all personnel have left the platform;
9. In the retracted state, be very careful and reduce the speed when the machine is driven on gravel, unstable or smooth surfaces, near openings or steep slopes, etc.;
10. Do not sit, stand or climb on the protective guard of the platform. Stand steadily on the platform base plate at all times.

5.2 Basic test

5.2.1 Start test

1. After the key is inserted into the key switch socket and turned to "Platform Control" mode, then the beacon will flash, the screen will light up, and the platform control unit will run; after the key switch is turned to the neutral position, the machine will be turned off, and the beacon will be turned off, the screen will be off; after the key switch is turned to "Ground Control" mode, the beacon will flash, the screen will light up, and the ground control unit will run;

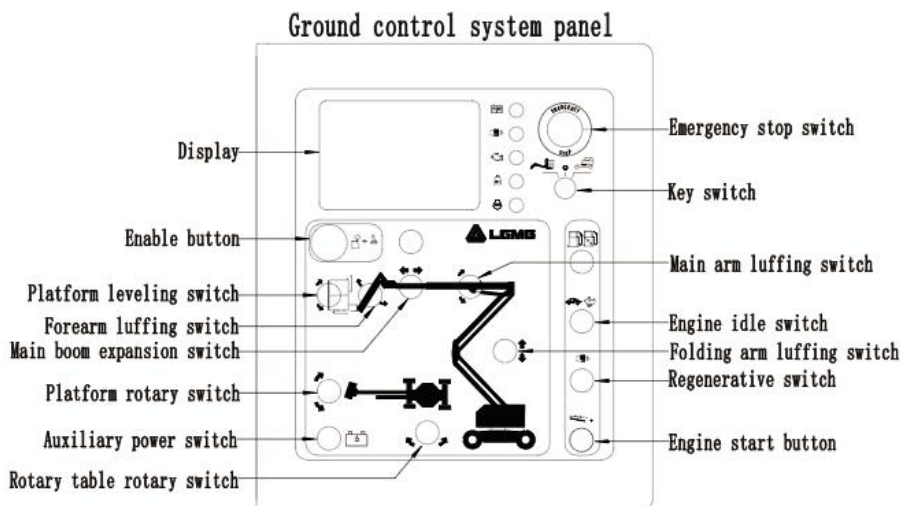


Fig. 5.1 Ground control system panel

Control criteria: effective in use

2. Engine start switch

The engine can be started smoothly without abnormal noise if the engine start switch is turned;

Control criteria: effective in use, conforming to requirements

3. Engine high/low speed test:

Low speed : 1,500r/min, engine running smoothly without abnormal noise (idling)

High speed: 2,500r/min, engine running smoothly without abnormal noise (high idle speed)

Control criteria: conforming to requirements

4. Emergency stop switch

The engine cannot be started smoothly without abnormal noise after the emergency stop switch of the ground control system is pressed and the engine start switch is turned;

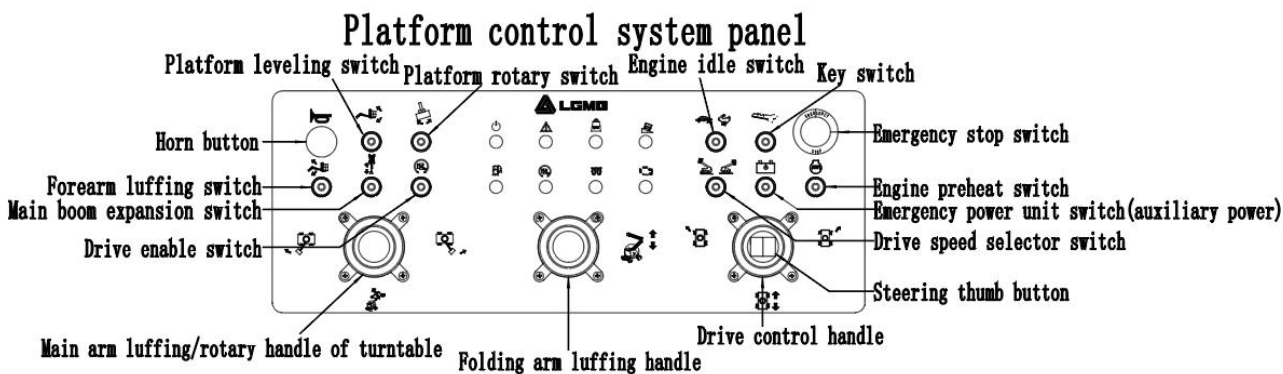


Fig. 5.2 Platform control system panel

The engine can be started smoothly after the emergency stop switches of the platform control switch

and the ground control switch are pulled outward and the engine start switch is turned;

The engine can be started smoothly after the emergency stop switch of the platform control system is pressed, the emergency stop switch of the ground control system is pulled outward, and the engine start switch (ground control) is turned;

The working engine stops working if the emergency stop switch is pressed;

5. Horn switch

The horn will sound if the horn switch is pressed;

6. Enable button

With the enable button not held, all arm rods and platform functions should not operate after each boom and platform function toggle switch is turned on.

With the enable button held, all arm rods and platform functions should operate for a complete cycle after each boom and platform function toggle switch is turned on.

Control criteria: effective in use

5.2.2 Basic operation test of ground control unit

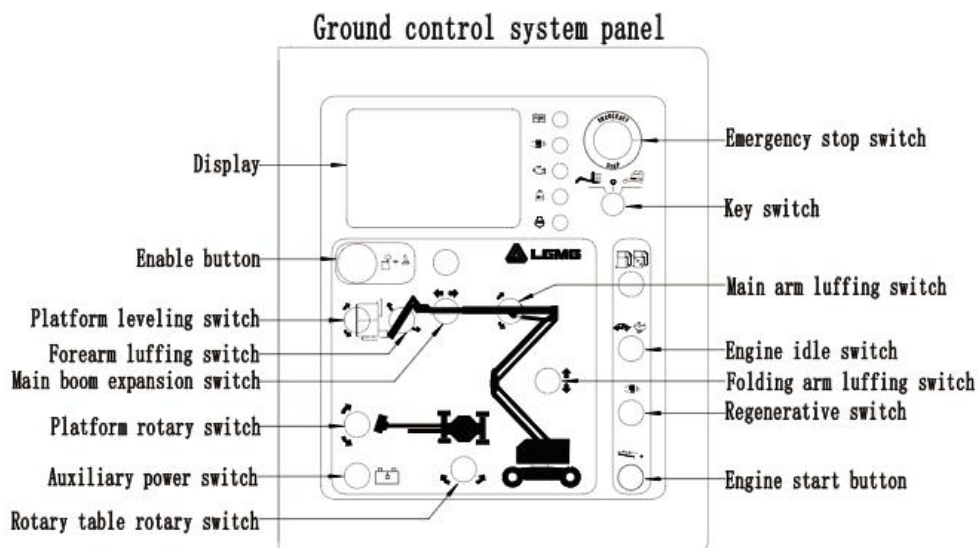


Fig. 5.3 Ground control system panel

1. The machine can be started when the key is turned to the GCU mode, and the emergency stop switch is turned on.

2. Press and hold the enable button (this operation is required for the following basic operation test)

3. Platform leveling switch

The platform level will rise if the platform leveling switch is moved upwards; the platform level will drop if the platform leveling switch is moved downwards.

4. Platform rotary switch

The platform will rotate to the left if the platform rotary switch is moved upwards; the platform will rotate to the right if the platform rotary switch is moved downwards.

5. Short arm lift switch

The short arm will rise if the short arm lift switch is moved upwards; the short arm will drop if the short arm lift switch is moved downwards.

6. First arm rod extension and retraction switch

The arm rod will extend if the first arm rod extension and retraction switch is moved leftward; the arm rod will retract if the first arm rod extension and retraction switch is moved rightward.

7. First arm rod lift switch

The first arm rod will rise if the first arm rod lift switch is moved upwards; the first arm rod will drop if the first arm rod lift switch is moved downwards.

8. Second arm rod lift switch

The second arm rod will rise if the second arm rod lift switch is moved upwards; the second arm rod will drop if the second arm rod lift switch is moved downwards.

9. Rotary table rotary switch

The rotary table will rotate to the right if the rotary table rotary switch is moved rightward; the rotary table will rotate to the left if the rotary table rotary switch is moved leftward.

10. Auxiliary power switch

Turn the key switch to the GCU; pull the red "emergency stop switch" button outward to the ON position; move the auxiliary power switch to either side, repeat all the above operations until all operations can be achieved.

Note:

- (1) When testing the auxiliary power switch, in order to save battery power, please test each function in a part of the cycle.
- (2) The drive function shall not work with the auxiliary power supply.

5.2.3 Basic operation test of platform control system

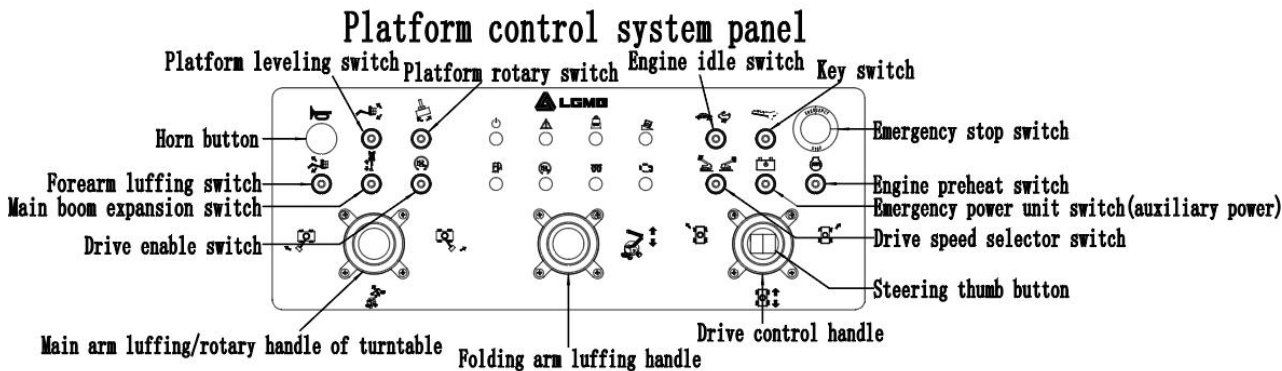


Fig. 5.4 Platform control system panel

1. Start the machine and turn the key to the platform control mode
2. Push the red emergency stop button inward to the "OFF" position. Control criteria: all functions cannot be operated after each function control lever or button of the machine is turned on.
3. Push the red emergency stop button outward to the "ON" position. Control criteria: the function control lever or button can be operated normally to operate the machine.
4. Do not press down the foot switch, and test the control lever or button of each function of the machine.

Control criteria: the machine functions shall not run;



Fig. 5.5 Foot switch

5. Press down the foot switch, and test the control lever or button of each function of the machine.
Control criteria: all arm rods and platform functions should operate for a complete cycle.
6. When the emergency stop switch is in the "ON" position, press the horn button. **Control criteria:** The horn sounds.
7. Release the horn button.
Control criteria: The horn stops sounding.

 **CAUTION:**

① **Commissioning shall be done by a dedicated person, and during the commissioning period, no one else is allowed to operate the machine;**

② **Each commissioning should be done separately, two or more operations cannot be carried out at the same time;**

③ **The commissioning time of each operation should be 3-5S, the commissioning is visible to the naked eye, and it should be stopped when it is effective;**

④ **After the all commissioning operations are completed, the buttons and switches shall be returned to their positions.**

8. Turn the key switch to the platform control mode, turn on the emergency stop switch, start the engine, and step on the foot switch.
9. Platform leveling switch
Control criteria: The platform level will rise if the platform leveling switch is moved upwards; the platform level will drop if move the platform leveling switch if the platform leveling switch is moved downwards.
10. Platform rotary button
Control criteria: The rotary table will rotate to the right if the rotary table rotary switch is moved rightward; the rotary table will rotate to the left if the rotary table rotary switch is moved leftward.
11. Short arm lift switch
Control criteria: The short arm will rise if the short arm lift switch is moved upwards; the short arm will drop if the short arm lift switch is moved downwards.
12. Control the lifting/lowering of the second arm rod via the middle lever.
Control criteria: The folding jib will rise if the lever is moved upwards, the folding jib will drop and the alarm will sound if the lever is moved downwards.

13. Control the rotation of the rotary table via the left control lever.
Control criteria: The rotary table will rotate to the right if the left control lever is moved rightward. The rotary table will rotate to the left if the left control lever is moved leftward.
14. Control the lifting/lowering of the first arm rod via the left control lever.
Control criteria: The boom will rise if the lever is moved upwards, the boom will drop and the alarm will sound if the lever is moved downwards.
15. First arm rod extension and retraction switch
Control criteria: The first arm rod will extend if the first arm rod extension and retraction switch is moved downwards; the first arm rod will retract if the first arm rod extension and retraction switch is moved upwards.
16. Control the drive travel of the machine via the right control lever.
Control criteria: The machine will be driven forward if the right control lever is moved upwards. The machine will be driven backward if the right control lever is moved downwards.
17. Control the turning of the machine via the right control lever.
Control criteria: When the thumb presses the left button (red circle) of the right control lever, the machine will turn to the left. When the thumb presses the right button (blue circle) of the right control lever, the machine will turn to the right.
18. Move the speed adjustment switch to select different speed modes, and perform the function tests respectively.
Control criteria: The speed of the machine function increases or decreases with different modes, and the speed of the fly jib and platform does not change.
19. Drive speed selector switch
The machine is on a slope. Symbol: Climbing position, driving at low speed.
The machine is on a horizontal plane. Symbol: driving at high speed
20. Engine idle speed selection
If the foot switch is not depressed, the engine will idle at the lowest speed. Turtle symbol: foot switch activates low idle speed; rabbit symbol: foot switch activates high idle speed.

Note:

In the case of a large slope, engage climbing gear for operation, and for other road conditions, please select the horizontal gear.

5.2.4 Hydraulic oil level test

1. Retract the boom in place, lower the short arm to the lowest position, push the emergency stop switch to the "OFF" position, pull open the rubber hook under the right cover by hands, open the right cover, and snap the support rod into the rubber groove.

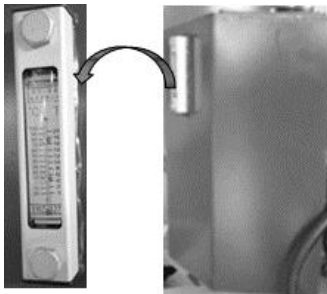


Fig. 5.6 Hydraulic oil level gauge

2. After parking for 5 min, observe the oil level of the hydraulic tank.

Control criteria: The amount of oil in the hydraulic tank is higher than 1/3 of the scale of the level gauge, but not higher than 1/2 of the level of the level gauge.

5.2.5 Load test (1.1 times rated load)

1. When the machine is stopped, suspend the counterweight trolley with a load 1.1 times rated load (253Kg/557.8lbs) on the working platform.

Control criteria: If the engine is overloaded during running, the overload indicator will be always on and the buzzer will sound; if the engine is overloaded in the non-running state, the engine cannot be started. After removing the heavy object to the standard weight, it will return to normal.

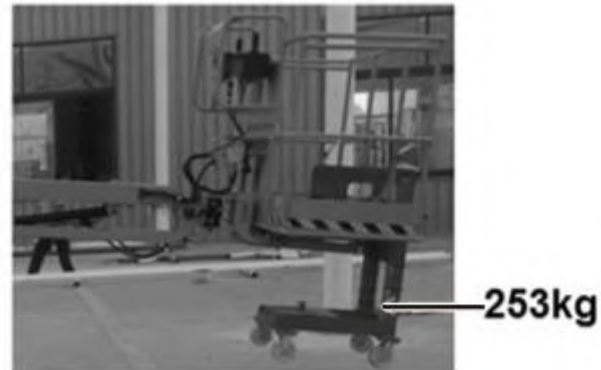


Fig. 5.7 Load test (1.1 times rated load)

5.2.6 Travel speed (high speed) test

1. Press down the foot switch in the platform control mode;
2. Drive the machine to the test road at a low speed, adjust the direction of the machine to ensure that the machine is straight and travels in a straight line;
3. Slowly move the drive control lever 5m in front of start line of test road to the high speed position; start timing when the center of front wheels of the machine crosses the test start line, 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 20m/65.6ft. Stop the machine safely and record the time.

Control criteria: $6.1 \pm 0.5 \text{ km/h} / 3.79 \pm 0.31 \text{ mph}$, i.e. $10.9 < t < 12.8 \text{ S}$

5.2.7 Braking distance test

1. Follow the travel speed test closely;
2. When the center of the front wheel of the machine passes the 20m/65.6ft test line, turn off the power switch and let the machine stop automatically.

Control criteria: 1.0m-1.5m/3.28-4.92 ft.

Note:

- ① The machine under test shall be kept in the no-load state, with the boom

retracted;

- ② Pay attention to driving safety.

5.2.8 Drive speed limit test

1. In the platform control mode, depress the foot switch, after which the boom is lifted by about 90cm/2.95ft (or the articulating boom is lifted by about 90cm/2.95ft, or the boom is extended by 30cm/0.98ft);
2. Adjust the traveling direction of the machine to ensure that the machine is straightened and driven on a straight line;
3. Slowly move the drive control lever about 5m/16.4ft in front of start line of test road to the full drive position; start timing when the center of front wheels of the machine crosses the test start line, 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 20m/65.6ft. Stop the machine safely and record the time.

Control criteria: $0.8 \pm 0.05 \text{ km/h} / 0.50 \pm 0.03 \text{ mph}$, i.e.
time: $85 < t < 96 \text{ s}$

Note:

- ① Conduct timing in one of the three states. For other two states, determine that the speed limit function can be achieved under specific conditions;
- ② Expect the test arm rod, the other arm rods are retracted;
- ③ Pay attention to driving safety.

5.2.9 Braking distance test (at slow speed)

1. Follow the travel speed (low speed) test

closely;

2. When the center of the front wheel of the machine passes the 20m/65.6ft test line, turn off the power switch and let the machine stop automatically. Use a tape measure to measure the distance from the 10m/32.8ft line to the center line of the front wheel (stopped), and the measured distance is the braking distance

Control criteria: $\leq 0.5 \text{ m} / 1.64 \text{ ft}$

Note:

- ① The machine under test shall be kept in the no-load state, with the boom retracted;
- ② Pay attention to driving safety.

5.2.10 Drive enable system test

1. Start the machine, and operate it using the platform control system;
2. Adjust the arm rod to the retraction position, keep the vehicle retracted, and depress the foot switch; rotate the rotary table until the arm rod moves over one non-steered wheel (in both directions);
3. Turn and hold the drive enable toggle switch to one side, and move the drive control lever away from the center slowly, after which the drive function can be achieved normally.

Control criteria: the drive indicator light is on at any position within the rotation range. Move the drive control lever away from the center, after which the drive function cannot be achieved.

Note:

- ① The machine travels in the opposite direction of the travel and direction control lever movement;
- ② Pay attention to safety during the

rotation test.

arm rods are retracted;

③ Pay attention to driving safety.

5.2.11 Tilt sensor test

1. In the platform control mode, depress the foot switch, after which the boom is lifted by about 90cm/2.95ft (or the articulating boom is lifted by about 90cm/2.95ft, or the boom is extended by 30cm/0.98ft);
2. Keep the arm rod in a direction consistent with the travel direction, and drive the machine up the slope (below the highest point) in the direction of the slope.

Control criteria: the tilt indicator light does not come on, the buzzer does not sound, and all functions are normal.

3. Continue driving to the upper plane of the slope, with an angle between the chassis and the ground of 4.5°.

Control criteria: the tilt indicator light stays on, the buzzer sounds, and the functions of lifting, arm rod extension, slewing, leveling and traveling are restricted.

4. Continue driving to the downhill plane of the slope. Control criteria: the tilt indicator light does not come on, the buzzer does not sound, and all functions are normal.
5. In the platform control mode, depress the foot switch, retract the boom, and repeat the above 4.5° test.
6. Similarly, use the same method to test the slope with a 4.5° angle between the chassis and the ground for both the front and rear axles.

Note:

- ① Conduct the test in one of the three states. For other two states, test the tilt indicator light and buzzer under specific conditions;
- ② Expect the test arm rod, the other

5.2.12 Gradeability test (45%)

1. Drive the machine to the front of a 45% slope, and adjust the machine state, with the platform at the upper part of slope and the counterweight at the lower part of slope;
2. Turn the drive speed selector switch on the platform control panel to the “Climbing” position;
3. Adjust the platform height, and drive the machine to the 45% slope.

Control criteria: the machine climbs to the top normally, the tires do not slip and the machine does not tip over.

4. During downhill driving, apply the brake to test the braking distance.

Control criteria: $\leq 0.8\text{m}/2.62\text{ft}$

5.2.13 Gradeability test (25%)

1. Drive the machine to the front of a 25% slope, and adjust the machine state, with the platform at the lower part of slope and the counterweight at the upper part of slope;
2. Turn the drive speed selector switch on the platform control panel to the “Climbing” position;
3. Adjust the platform height, and drive the machine to the 25% slope.

Control criteria: the machine climbs to the top normally, the tires do not slip and the machine does not tip over.

5.2.14 Floating test

1. Start the machine, drive it to the front of 10cm/3.94in test pit, and adjust the machine state;

2. Turn the speed selector switch on the platform control panel to the “Turtle” position, and retract the boom;
3. Adjust the travel direction of the machine, and drive it, so that the left front wheel and the left rear wheel cross the test pit in turn.
Control criteria: the machine tires are not off the ground.

5.2.15 Operation time test

1. Start the machine, keep it restarted in situ, and adopt the ground control mode for the test;
2. Press the enable button and rotary table rotary switch (to the left) at the same time, move the rotary table to the leftmost side; then start the rotary table rotary switch in the opposite direction, rotate the rotary table, start timing at the same time, rotate the rotary table to the rightmost side, stop the rotary table, and stop timing.
Control criteria: 82S–92S.

Note:

- ① **The control criterion of operation time test is based on an oil temperature of 40°C. The time will be affected when the oil temperature changes.**
- ② **Carry out the test for each operation separately. After the test, retract and return each part, and then perform the next test.**

3. Press the enable button and the first arm rod lift switch (up) at the same time to lift the boom and start timing simultaneously; when the boom is lifted to the highest position, stop lifting and timing.
Control criteria: 35S–45S.
4. Press the enable button and the first arm rod lift switch (down) at the same time to lower the

boom and start timing simultaneously; when the boom is retracted, stop lowering and timing.

Control criteria:30S–40S。

5. Press the enable button and the second arm rod lift switch (up) at the same time to lift the folding jib and start timing simultaneously; when the folding jib is lifted to the highest position, stop lifting and timing.

Control criteria:25S–35S。

6. Press the enable button and the second arm rod lift switch (down) at the same time to lower the folding jib and start timing simultaneously; when the folding jib is retracted, stop lowering and timing.

Control criteria:26S–40S。

7. Press the enable button and the first arm rod extension switch (leftward) at the same time to extend the boom and start timing simultaneously; when the boom is extended to the limit, stop extending and timing.

Control criteria:20S–30S。

8. Press the enable button and the first arm rod extension switch (rightward) at the same time to retract the boom and start timing simultaneously; when the boom is retracted, stop retracting and timing.

Control criteria:20S–30S。

9. Press the enable button and the short arm lift switch (up) at the same time to lift the short arm and start timing simultaneously; when the short arm is lifted to the highest position, stop lifting and timing.

Control criteria:30S–50S。

10. Press the enable button and the short arm lift switch (down) at the same time to lower the short arm and start timing simultaneously; when the short arm is retracted, stop lowering and timing.

Control criteria:20S-35S。

11. Press the enable button and the platform rotary switch (up) at the same time, and rotate the platform to the leftmost side; then start the platform rotary switch in the opposite direction, rotate the platform and start timing simultaneously; when the platform is rotated to the rightmost side, stop rotating and timing.

Control criteria:13S-26S。

Note:

- ① The control criterion of operation time test is based on an oil temperature of $40\pm 5^{\circ}\text{C}$. The time will be affected when the oil temperature changes;
- ② Carry out the test for each operation separately. After the test, retract and return each part, and then perform the next test;

5.2.16 Lifting height test

1. Move the machine under test at rated load to a level ground in the test area;
2. In the ground control mode, lift the platform to the highest point, make it horizontal, and measure the distance from the ground to the bottom of the platform with a laser range finder;

Test target value of AR52J: 15.70 \pm 0.16m/51.51 \pm 0.52ft;

Test target value of AR45J: 14.09 \pm 0.14m/46.22 \pm 0.46ft;

3. Instructions for use of the laser range finder:
 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;

5.2.17 Load test (1.25 times)

1. Place 1.25 times the rated load (287.5Kg/633.8lbs) on the lifting platform, and connect the seat belt to the platform guardrail. In this case, the overload alarm should be disabled;
2. Turn the emergency stop switch of the ground and platform controllers to “ON” position, turn the key switch to “Ground control” position, and operate the machine on the ground;
3. Lift the folding jib, telescopic boom, boom and short arm respectively to raise the platform to the highest position, and when each boom part reaches the highest position, stay for 5-10s, check whether the machine has oil leakage or structural interference and whether the oil pipe harness incurs squeezing, wear, etc.

Control criteria: the machine has no oil leakage or structural interference, and the oil pipe harness is free of squeezing, wear, etc.;

4. Lift the platform to the highest point, measure the platform height with a laser range finder, and wait for 60s to confirm whether there is any change in the platform height. Wait for 15min, and test the retraction of hydraulic cylinder piston rods and the sinkage of the platform.

Control criteria: the retraction of hydraulic cylinder piston rods is not more than 2mm, and the sinkage of the platform is not more than 1% of the height of the platform under the working condition.

5.2.18 Rated load calibration

1. After the tests are completed, park the machine on a solid ground;
2. Use the ground control mode, enter the system design interface, and calibrate the no load;
3. Hang the rated load of 230kg/507.1 lbs at the platform end, and calibrate the rated load.

5.3 Pressure test

5.3.1 System overflow pressure test

Pressure interface

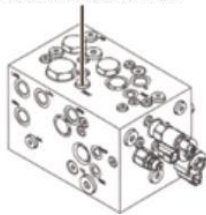


Fig. 5.8 Travel control valve set

1. Connect the pressure gauge with the pressure measuring interface of the walking control valve;
2. Lift platform to limit height and observe lifting pressure, hold for 5s until pressure gauge reaches maximum value, at this point, the value is the system overflow pressure value is recorded:
Control standards (Pressure target value): 280bar-320bar/4061psi-4641psi.
3. In case of inconsistency with the target value, do correction as follows:
Unscrew the fastening nut of the 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;
4. Keep the position of the Allen wrench unchanged, and tighten the fastening nut of the relief valve; restore the rocker arm to the normal position.

5.3.2 Functional overflow pressure test

Remove the plug of the pressure measuring connector of the control valve and install the pressure measuring connector;

Pressure interface



Fig. 5.9 Boom control valve set

1. Connect the pressure gauge to the pressure tap;
2. Lift the folding arm to the limit height, the rest is in the collection state; Lower the folding arm and observe the lifting pressure until the pressure gauge reaches the maximum value, which is the system overflow pressure value, and record the pressure value:
Control standards (Pressure target value): 235 bar \pm 10 bar/3408psi \pm 145psi.
3. In case of inconsistency with the target value, do correction as follows:
Unscrew the fastening nut of the 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;
4. Keep the position of the Allen wrench unchanged, and tighten the fastening nut of the relief valve; restore the rocker arm to the normal position.

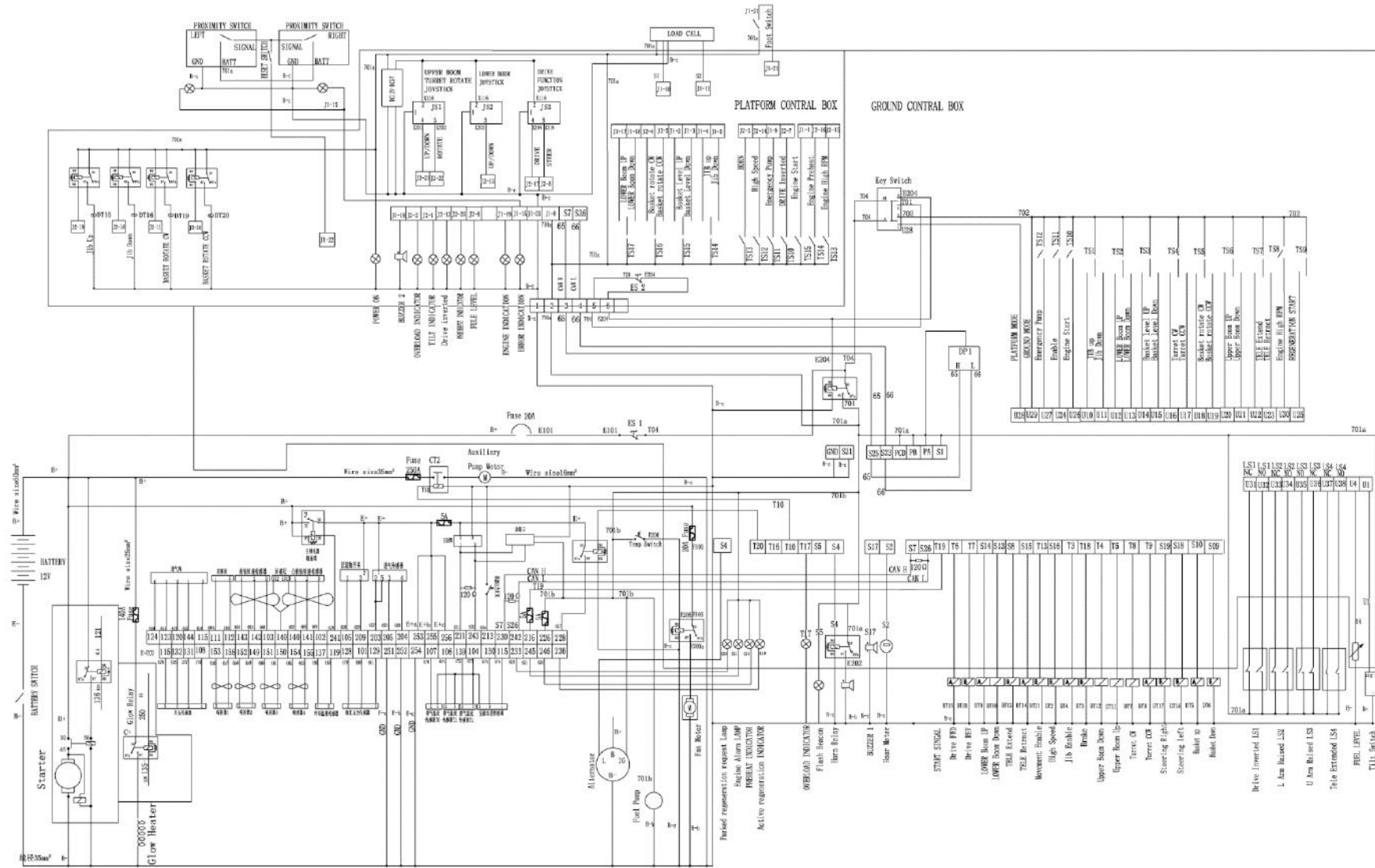
6. Appendix

Appendix I Machine fault code

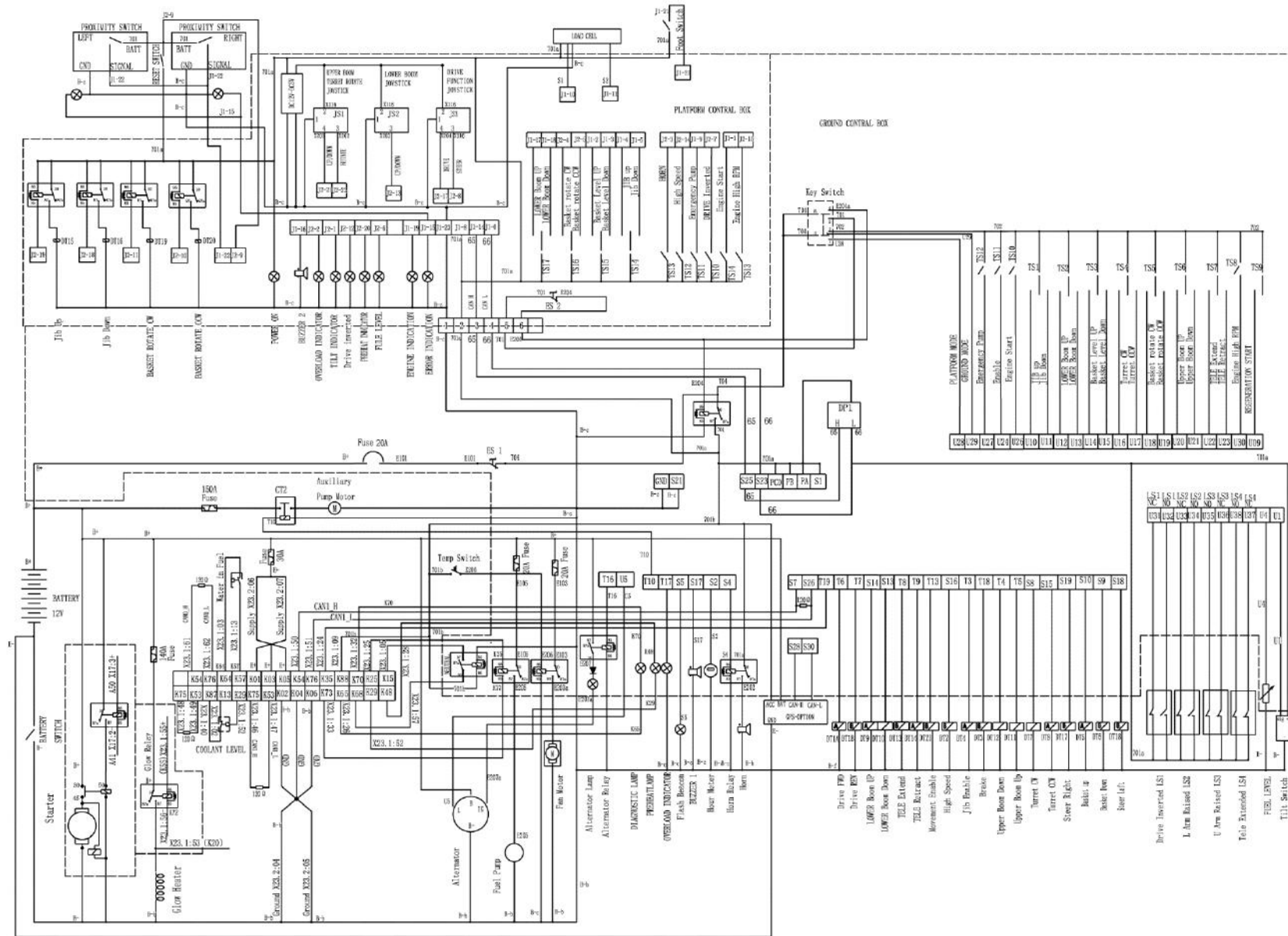
Fault Code	Fault Description	Limit Action	Fault Code	Fault Description	Limit Action
1	Cutoff of controller output power supply 1	Limit all actions	12	Fault of right handle	Amplitude of variation on principal arm
2	Cutoff of controller output power supply 2	Limit all actions	13	Fault of middle handle	Amplitude of variation on principal arm
3	Cutoff of controller output power supply 3 and 4	Limit all actions	14	Boom luffing limit switch fault	Limit all actions
4	Disconnection of CAN bus of extended module of electric box of platform	Limit all actions	15	Folding arm luffing limit switch fault	Limit all actions
5	Chassis electric box display Bus break circuit		16	Boom telescoping limit switch fault	Limit all actions
6	Weighing fault		17	Rear area detection limit switch fault	Limit all actions
7	Weighing sensor 1 fault		101	Chassis inclination	
8	Weighing sensor 2 fault		102	Walking motion is limited due to unactivated drive	
9	Weighing sensor checkout fault		103	Working bucket overweighted	
10	Weighing sensor 4 fault		104	Low oil level warning	
11	Fault of left handle	Amplitude of variation on principal arm	105	Oil pressure warning	
			106	Oil temperature warning	

Appendix II Electrical schematic diagram

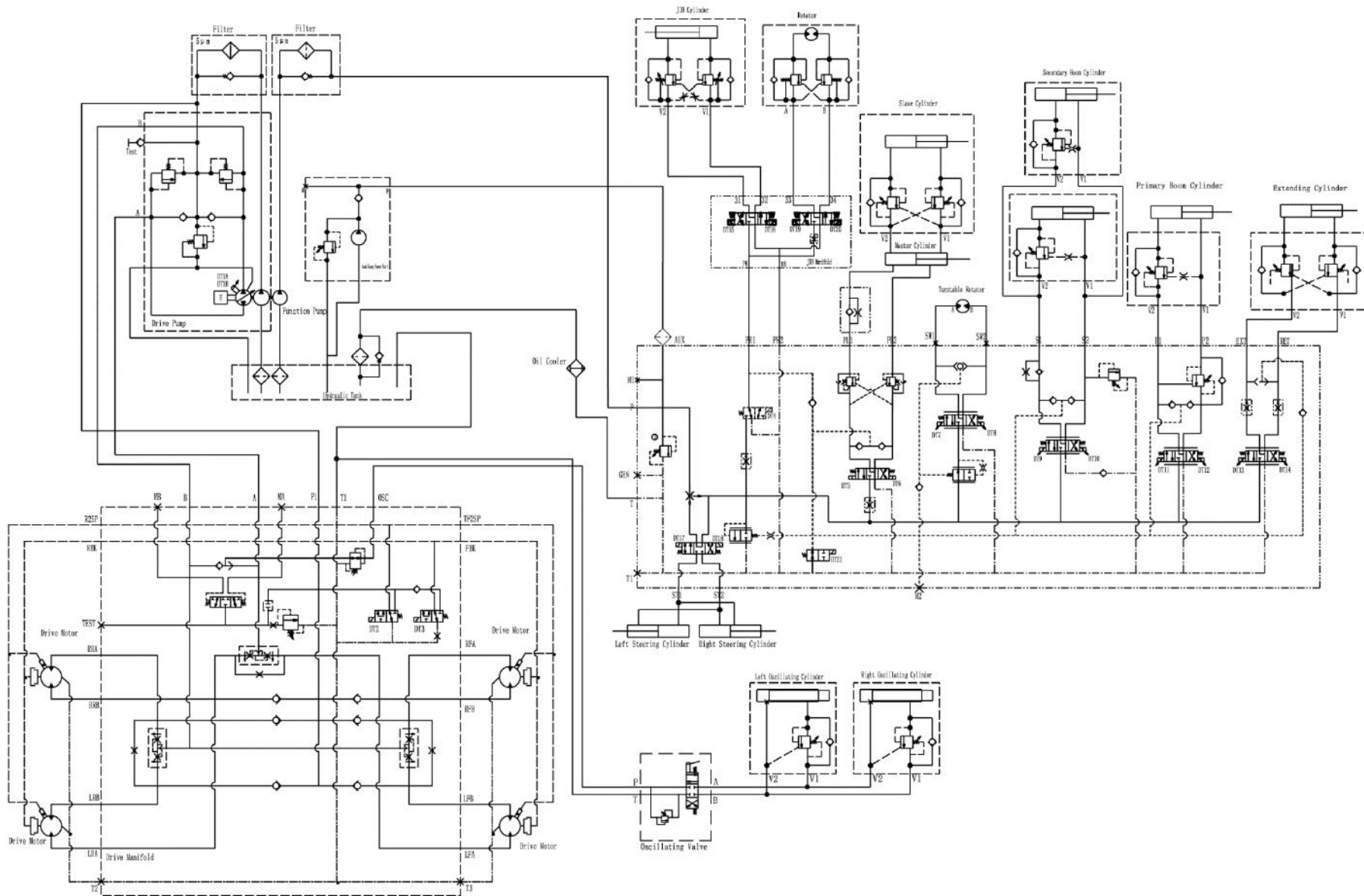
1. AR45J、AR52J Electrical schematic diagram (Kubota engine)






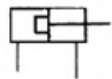

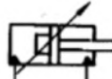

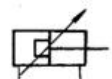



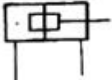

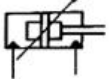

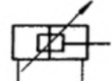






2. AR45J、AR52J Electrical schematic diagram (Deutz engine)







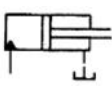

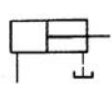

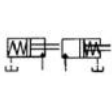

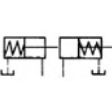

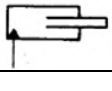
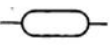


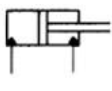

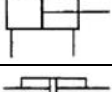

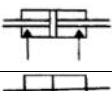

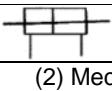

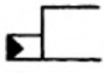

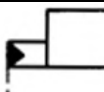

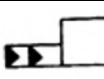



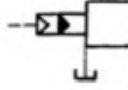



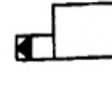

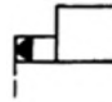

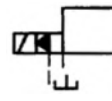

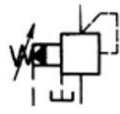

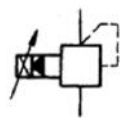

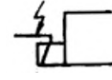

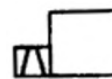

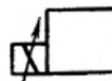
Appendix III Hydraulic schematic diagram

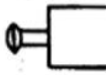

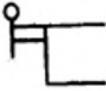
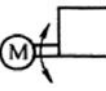
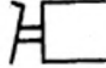



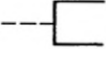

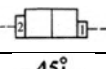
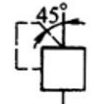
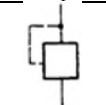
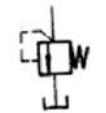

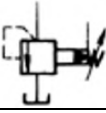
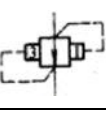
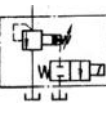

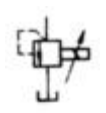

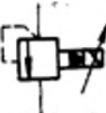
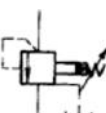
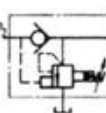
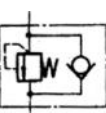


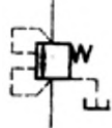
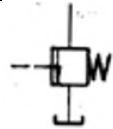

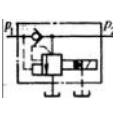
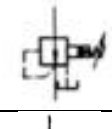
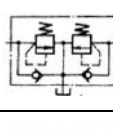
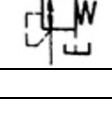
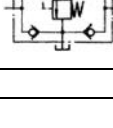


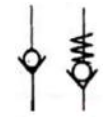

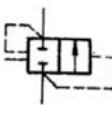







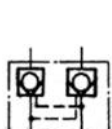

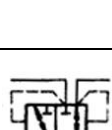
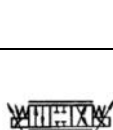
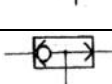

Appendix IV Diagram of common hydraulic part symbols



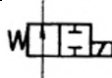


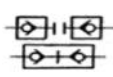














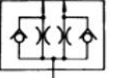
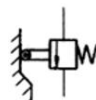
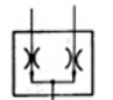

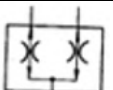


(1) Hydraulic pump, hydraulic motor and hydraulic cylinder							
Name		Symbol	Description	Name		Symbol	Description
Hydraulic pump	Hydraulic pump		General symbol	Double-acting cylinder	Non-adjustable one-way bounce cylinder		Detailed symbol
	One-way fixed displacement hydraulic pump		One-way rotation, one-way flow and fixed displacement		Non-adjustable one-way bounce cylinder		Simplified symbol
	Two-way fixed displacement hydraulic pump		Two-way rotation, two-way flow, fixed displacement		Adjustable one-way bounce cylinder		Detailed symbol
	One-way variable hydraulic pump		One-way rotation, two-way flow, variable displacement		Adjustable one-way bounce cylinder		Simplified symbol
	Two-way variable displacement hydraulic pump		Two-way rotation, two-way flow, variable displacement		Non-adjustable two-way bounce cylinder		Detailed symbol
Hydraulic motor	Hydraulic motor		General symbol		Non-adjustable two-way bounce cylinder		Simplified symbol
	One-way fixed displacement hydraulic motor		One-way flow, one-way rotation		Adjustable two-way bounce cylinder		Detailed symbol
	Two-way fixed displacement hydraulic motor		Two-way flow, two-way rotation, fixed displacement		Adjustable two-way bounce cylinder		Simplified symbol
	One-way variable displacement hydraulic motor		One-way flow, one-way rotation, variable displacement		Telescopic bar		
	One-way variable displacement hydraulic motor		Two-way flow, two-way rotation, variable displacement		Pressure converter	Gas-liquid converter	
	Swing motor		Two-way swing, fixed angle	Gas-liquid converter			Continuous action


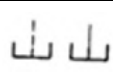

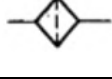
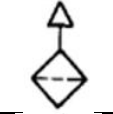


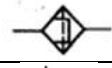

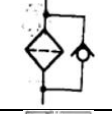
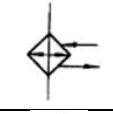
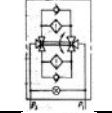
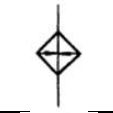



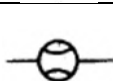
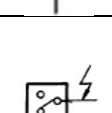

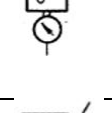
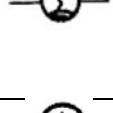
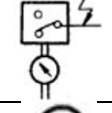
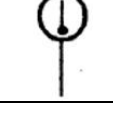
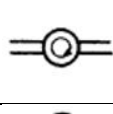

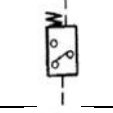
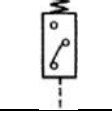
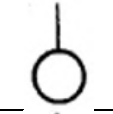
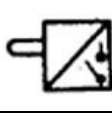

Pump-motor	Fixed displacement hydraulic pump-motor		One-way flow, one-way rotation, fixed displacement	Turbocharger		One-way action	
	Variable displacement hydraulic pump-motor		Two-way flow, two-way rotation, variable displacement, external oil drain				Continuous action
	Hydraulic integral transmission		Unidirectional rotation, variable displacement, fixed displacement motor	Accumulator		General symbol	
Single-acting cylinder	Single piston rod cylinder		Detailed symbol	Accumulator	Gas isolation type		
			Simplified symbol		Weight-loaded type		
	Single piston rod cylinder (with return spring)		Detailed symbol		Spring type		
			Simplified symbol	Auxiliary gas cylinder			
	Plunger rod			Gas tank			
	Telescopic cylinder			Energy source	Hydraulic pressure source		General symbol
Double-acting cylinder	Single piston rod cylinder		Detailed symbol		Air pressure source		General symbol
			Simplified symbol		Motor		
Double piston rod cylinder	Double piston rod cylinder		Detailed symbol	Prime motor		Except motor	
			Simplified symbol				
(2) Mechanical control device and control methods							
Mechanical control parts	Straight moving rod		Arrows can be omitted	Pilot pressure control method	Hydraulic pilot pressure control		Internal pressure control
	Axle of rotary motion		Arrows can be omitted		Hydraulic pilot pressure control		External pressure control
	Positioning device				Hydraulic secondary pilot		Internal pressure control,

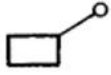

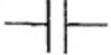




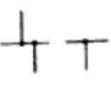
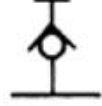
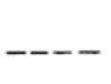

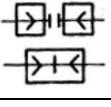
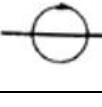
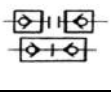
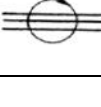
					pressure control		internal oil drain
	Locking device		* Control method for unlocking		Gas-liquid pilot pressure control		External control of air pressure, hydraulic internal control, external oil drain
	Bounce mechanism				Electro-hydraulic pilot pressure control		Hydraulic external control, internal oil drainage
	Ejector rod type				Hydraulic pilot pressure relief control		Internal pressure control, internal oil drain
	Variable travel control type						External pressure control (with remote relief outlet)
	Spring control type				Electro-hydraulic pilot control		Electromagnet control, external pressure control, external oil drain
	Roller type		Two-direction operation		Pilot pressure control valve		With pressure regulating spring, external oil drain and with remote relief outlet
	One-way roller type		It's only operated in one direction, so the arrow can be omitted.		Pilot proportional solenoid pressure control valve		Priority is controlled by proportional electromagnet with internal oil drainage
Manual control method	Manual control		General symbol	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 electromagnet)		

	Press-pull type				Double-acting adjustable electromagnetic operation (torque motor, etc.)		
	Handle type				Rotary motion electrical control device		
	One-way pedal type			Feedback control method	Feedback control		General symbol
	Two-way pedal type				Electrical feedback		The position is detected by potentiometer, differential transformer, etc.
	Pressurization or relief control				Internal mechanical feedback		Such as follower valve profiling control circuit
	Differential control						
	Internal pressure control		The control channel is inside the original				
	External pressure control		The control channel is outside the original				
(3) Pressure controller							
Relief valve	Relief valve		General symbols 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)		Constant difference pressure reducing valve		
	Direct-acting proportional relief valve			Sequence valve	Sequence valve		General symbols or harmonious-acting sequence valve
	Pilot proportional relief valve				Pilot sequence valve		
	Unloading relief valve		Unloading it when $p_2 > p_1$		One-way sequence valve (balance valve)		

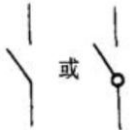

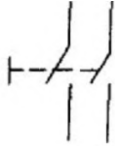
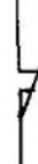
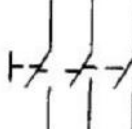
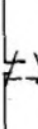
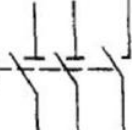
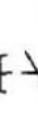
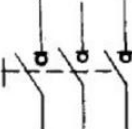
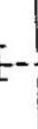
	Two-way relief valve		Direct-acting, external oil drain		Unloading valve		General symbols or direct-acting unloading valve
Pressure reducing valve	Pressure reducing valve		General symbols or direct-acting pressure reducing valve	Unloading valve	Pilot electromagnetic unloading valve		$p_1 > p_2$
	Pilot pressure reducing valve				Brake valve	Double overflow brake valve	
	Relief pressure reducing valve			Overflow oil bridge brake valve			
(4) Directional control valve							
Check valve	Check valve		Detailed symbol		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 (controlling pressure shutoff valve)	Reversing 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 (controlling pressure opening valve)		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 symbol		Three-position four-way proportional valve		Throttling type, overlapped center
			Simplified symbol		Three-position		Underlapped center

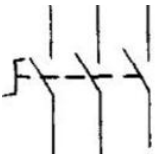
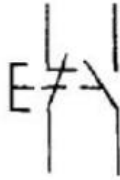
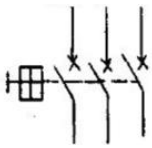

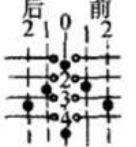

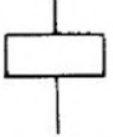
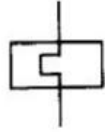
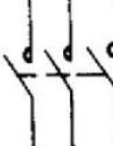


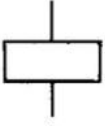


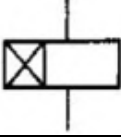

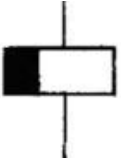
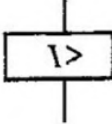

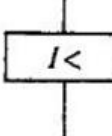

					four-way proportional valve			
Reversing valve	Two-position two-way solenoid valve		Normally closed		Two-position four-way proportional valve			
			Normally open		Four-way servo valve			
	Two-position three-way solenoid valve				Four-way electro-hydraulic servo valve		Level 2	
	Two-position three-way solenoid ball valve						Live feedback level 3	
	Two-position four-way solenoid valve							
(5) Flow control valve								
Throttle valve	Adjustable throttle valve		Detailed symbol	Flow regulating valve	Flow regulating valve		Simplified symbol	
			Simplified symbol		Bypass type flow regulating valve		Simplified symbol	
	Non-adjustable throttle valve		General symbol		Temperature compensated flow regulating valve		Simplified symbol	
	One-way throttle valve				One-way flow regulating valve		Simplified symbol	
	Double one-way throttle valve				Synchronous valve	Flow divider valve		
	Stop valve					One-way flow divider valve		
	Roller-controlled throttle valve (deceleration valve)					Flow combiner valve		
Flow regulating valve	Flow regulating valve		Detailed symbol		Diverter collector valve			
(6) Oil tank								
Atmospheric type	Pipe end above the liquid level			Oil tank	Pipe end at the bottom of the oil			

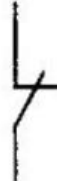


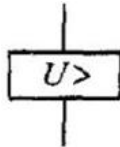
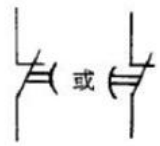





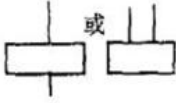
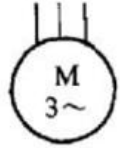
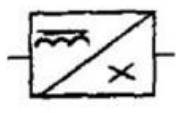

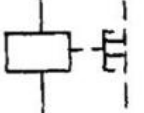
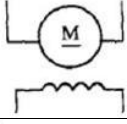
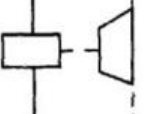
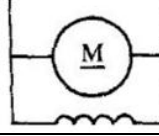
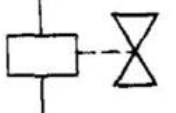
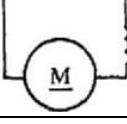
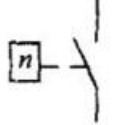

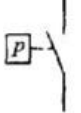

	Pipe end above the liquid level		With air cleaner		tank Local oil drain or return		
				Pressurized oil tank or closed oil tank			Three oil circuits
(7) Fluid regulator							
Filter	Filter		General symbol	Air cleaner			
	Filter with pollution indicator			Temperature regulator			
	Magnetic filter			Cooler	Cooler		General symbol
	Filter with bypass valve				Cooler to the coolant pipeline		
	Duplex filter		P1: oil inlet P2: oil return	Heater			General symbol
Pressure detector	Pressure indicator			Flow detector	Galvanometer (liquid flow indicator)		
	Pressure gauge				Flowmeter		
	Electric contact pressure gauge (pressure display controller)				Accumulated flowmeter		
	Differential pressure control gauge			Thermometer			
Level gauge			Tachometer				
				Torque meter			
(9) Other auxiliary components							
Pressure relay (pressure switch)		Detailed symbol	Differential pressure switch				
		General symbol	Sensor	Sensor		General symbol	
Travel switch		Detailed symbol		Pressure sensor			

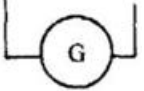
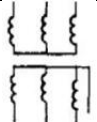
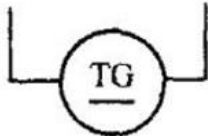
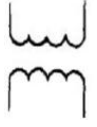




			General symbol		Temperature sensor		
Coupling	Coupling		General symbol	Amplifier			
	Flexible coupling						
(10) Pipeline, pipeline joints and connectors							
Pipeline	Pipeline		Pressure pipeline and return pipeline	Pipeline	Cross pipeline		The two pipelines are crossed and unconnected
	Control pipeline		Two pipelines intersected and connected		Flexible pipeline		
	Control pipeline		It can represent an oil draining pipeline		One-way air bleeder		
Quick-change connector	Quick connector without check valve			Rotary connector	Single-channel rotary connector		
	Quick connector with check valve				Three-way rotary connector		

Appendix V Diagram of common electrical part symbols

Socket	Name	Graphic symbol	Letter symbol	Category	Name	Graphic symbol	Letter symbol
Switch	Unipolar control switch		SA	Position switch	Normally open contact		SQ
	General symbols of manual switch		SA		Normally closed contact		SQ
	Three-level control switch		QS		Composite contact		SQ
	Three-level isolating switch		QS	Button	Normally open button		SB
	Three-level load switch		QS		Normally closed button		SB

	Combination knob switch		QS		Composite button		SB
	Low voltage circuit breaker		QF		Emergency stop button		SB
	Controller or operating switch		SA		Key-operated button		SB
Contactor	Coil operating device		KM	Thermal relay	Thermal element		FR
	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-on delay (slow pull-in) coil		KT		Normally closed contact		KA
	Power-off delay (slow release) coil		KT	Current relay	Overcurrent coil		KA
	Normally open contact which is Instantaneously closed		KT		Undercurrent coil		KA
					Normally open contact		KA

	Normally closed contact which is instantaneously disconnected		KT		Normally closed contact		KA
	Normally open contact which is closed with delay		KT	Voltage relay	Overtoltage coil		KV
	Normally closed contact which is disconnected with delay		KT		Undervoltage coil		KV
	Normally closed contact which is closed with delay		KT		Normally open contact		KV
	Normally open contact which is disconnected with delay		KT		Normally closed contact		KV
	General symbol of electromagnetic		YA		Motor	Three-phase cage asynchronous motor	
Electromagnetic operator	Electromagnetic chuck		YH	Three-phase wound rotor asynchronous motor			M
	Electromagnetic clutch		YC	Separately excited DC motor			M
	Electromagnetic brake		YB	Shunt DC motor			M
	Solenoid valve		YV	Series DC motor			M
	Non-electricity-controlled relay	Speed relay normally open contact		KS	Fuse	Fuse	
Pressure relay normally open contact			KP	Transformer	Single-phase transformer		TC

Generator	Generator		G		Three-phase transformer		TM
	DC tachometer generator		TG	Transformer	Voltage transformer		TV
Lamp	Signal lamp (indicator lamp)		HL			Current transformer	
	Lighting lamp		EL	Connector	Plug and socket	 X Plug XP Socket XS	