⚠ WARNING

Before operation and maintenance, the drivers and maintenance personnel shall always read and get understanding of the manual. Otherwise, fatal accident may occur. This manual shall be kept properly for future reference by the personnel concerned.

Operation and Maintenance Manual of ER618H Hydraulic Excavator

First edition, February 2026 1st print

SHANDONG LINGONG CONSTRUCTION MACHINERY CO., LTD.

Foreword

Thanks for choosing a hydraulic excavator produced by Shandong Lingong Construction Machinery Co., Ltd.

This manual provides a guidance for the correct operation and maintenance of the machine, and thus please keep it in the cab for reference by the personnel concerned when necessary. If this manual gets lost or becomes illegible due to damage, please contact SDLG or our dealers immediately to get a new one.

Any optional working devices should be removed/refitted, replaced and operated as per their respective operation manual.

All the parameters, pictures and descriptions covered in this manual apply only to the basic version, and for any variants, please contact SDLG or refer to related materials. (Note: The outline drawing in this manual is for illustration only.)

Please also read carefully the accompanying technical documents on operation and maintenance of the functional components such as the diesel engine.

We have always been committed to improve our products for their further advancement and higher reliability. We reserve the right to make changes, but disclaim introducing such changes to the delivered products. We also reserve the right to modify the data, machine and maintenance instructions. The related design as well as operation and maintenance instructions are subject to change without prior notice. For the latest information of the machine or in case of any question about this manual, please consult us.

If any imperfection is found in the process of use, please do not hesitate to give us the feedback so that we can make continual quality improvement to better satisfy your demands.

This manual is the property of Shandong Lingong Construction Machinery Co., Ltd., and shall not be reproduced or reprinted without our written permission.

⚠ WARNING

Only the personnel who have professionally trained and qualified are allowed to operate and maintain the machine.

Before operation or maintenance, please carefully read this manual. Otherwise, do not operate, maintain and repair this machine.

The operating procedures and precautions in this manual apply only to the intended use of the machine. If the machine is used for an operation that is out of the specification but not clearly prohibited, always make sure that this operation will not hurt yourself or others.

Under no circumstances shall those operations and behaviors expressly prohibited herein be performed.

Safety precautions

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

Most accidents are caused by failure to obey operation and maintenance specifications of the machine. To avoid the occurrence of any accident, please read, understand and follow all warnings and precautions in this manual and on the machine before the operation or maintenance.

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

The operation and maintenance precautions referred to herein apply only to the intended use of this machine. If the machine is used for any purpose other than those listed herein, it is the user or operator instead of SDLG that shall take the safety liabilities therefrom.

In no case shall any operations expressively prohibited herein be performed.

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

DANGER - Indicating any existing dangers, that if not avoided, will cause serious injury or even death, 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.

Table of Contents

FOREWORD ..... **I**

SAFETY PRECAUTIONS ..... **III**

CHAPTER 1 PRODUCT INTRODUCTION **1**

1. OUTLINE DRAWING AND COMPONENTS 1

2. OVERALL DIMENSION DIAGRAM AND OPERATION DIMENSION DIAGRAM 2

2.1 Overall dimension diagram 2

2.2 Operation dimension diagram 4

3 NAMEPLATE 6

3.1 PRODUCT NAMEPLATE 6

3.2 CANOPY NAMEPLATE 6

4 APPLICABLE WORKING CONDITIONS 7

5 FEATURES 8

6 TECHNICAL PERFORMANCE AND PARAMETERS 9

6.1 Performance parameters 9

6.2 Reference standard 9

7 LOCATION AND DESCRIPTION OF SAFETY SIGNS 10

7.1 Positions of safety signs ..... 错误!未定义书签。

CHAPTER 2 MONITOR AND CONTROLS **18**

1 MONITOR 18

2 SWITCH 22

3 OTHER CONTROL 24

3.1 Working device control lever 24

3.2 Travel control lever 27

3.3. Bulldozer/track extension/retraction switch 27

3.4 Bulldozer/track extension/retraction control lever 28

3.5 Engine throttle control lever 28

3.6 Safety lock control lever 29

3.7 Seat adjustment 30

3.8 Seat belt 30

3.9 Fire extinguisher 31

3.10 Emergency exit 31

3.11 Lid/cover with lock 32

3.12 Storage of the Operation and Maintenance Manual 32

CHAPTER 3 OPERATION INSTRUCTIONS 33

1 INTRODUCTION 33

2 RUNNING-IN 33

3 SAFETY RULES DURING OPERATION 34

3.1 Operator's obligations 34

3.2 Safety regulations 35

4 WORKING IN DANGEROUS AREAS 37

4.1 Operations near overhead HV lines 37

4.2 Working in an area with overhead cables for electric trains 38

4.3 Working in an area where cables and pipes are laid under the ground 38

4.4 Working in an area with a limited space 38

4.5 Working under poor lighting conditions 38

4.6 Working in other hazardous areas 39

4.7 Prevention of environmental pollution 39

5 MACHINE STARTUP 41

5.1 Inspections before engine startup 41

5.2 Operations before engine startup 42

5.3. Engine startup 42

5.4 Operation and inspection after engine startup 43

6. OPERATION OF MACHINE 46

6.1 Operation of working device 46

6.2 Travel direction control 48

7 AFTER OPERATION 50

7.1 Steps for parking the machine 50

7.2 Operation and inspection after engine shutdown 51

8 PARKING THE MACHINE 52

9 TRANSPORTATION OF MACHINE 54
9.1 Loading 54
9.2 Securing of machine 55
9.3 Unloading 56
9.4 Lifting the machine 58
10 TOWING OF MACHINE 60
10.1 Precautions 60
10.2 Heavy-load towing 60
10.3 Light-load towing 61
CHAPTER 4 OPERATION TECHNIQUES 62
1 EXCAVATION RULES 62
1.1 Precautions 62
1.2 Precautions for loading materials 65
1.3 Precautions during slewing or reversing 66
1.4 Prohibited operations 66
2 MACHINE VIBRATION 69
2.1 Guiding principles for reducing machine vibration levels 69
2.2 Guiding principles for effectively minimizing back pain 70
3 OPERATION UNDER SPECIAL WORKING CONDITIONS 71
3.1 Travel 71
3.2 Travel on slopes 71
3.3 Moving out of muddy ground 74
3.4 Travel in water 75
3.5 Operation in cold weather 75
3.6 Working on sites with debris 76
3.7 Operation under poor visibility condition 76
4 RECOMMENDED OPERATIONS 78
5. TRACK 80
6 OPTIONAL MULTI-FUNCTIONAL WORKING DEVICES 82
6.1 Precautions for selecting working devices 82

6.2 Hydraulic hammer 82
7 REPLACEMENT OF BUCKET 86
8 GESTURE SIGNALS 88

CHAPTER 5 SAFETY DURING MAINTENANCE 93

1 MAINTENANCE LOCATION 93
2 ACCESS OR CLIMBING OF MACHINE 95
3 SAFETY REGULATIONS 96
3.1 Prevention of personnel injury 96
3.2 Prevention of machine damage 99
3.3 Preventing environmental pollution 100
4 FIRE PREVENTION 102
4.1 Fire prevention measures 102
4.2 Measures in the event of a fire 105
4.3 Measures after fire is extinguished 105
5 DISPOSAL OF HAZARDOUS MATERIALS 106
5.1 Heated paint 106
5.2 Heated rubber and plastic 106
5.3 Heated fluorocarbon rubber 108
5.4 A/C refrigerant 109
5.5 Battery 110

CHAPTER 6 MAINTENANCE 112

1 CLEANING OF MACHINE 112
2 MAINTENANCE OF PAINTWORK 112
3 CLEANING OF CAB 112
4 ENGINE 114
4.1 Checking the engine oil level 115
4.2 Replacing engine oil and oil filter element 115
4.3 Adjusting intake/exhaust valve clearance 118
5 FUEL SYSTEM 119
5.1 Refueling and checking fuel level 120

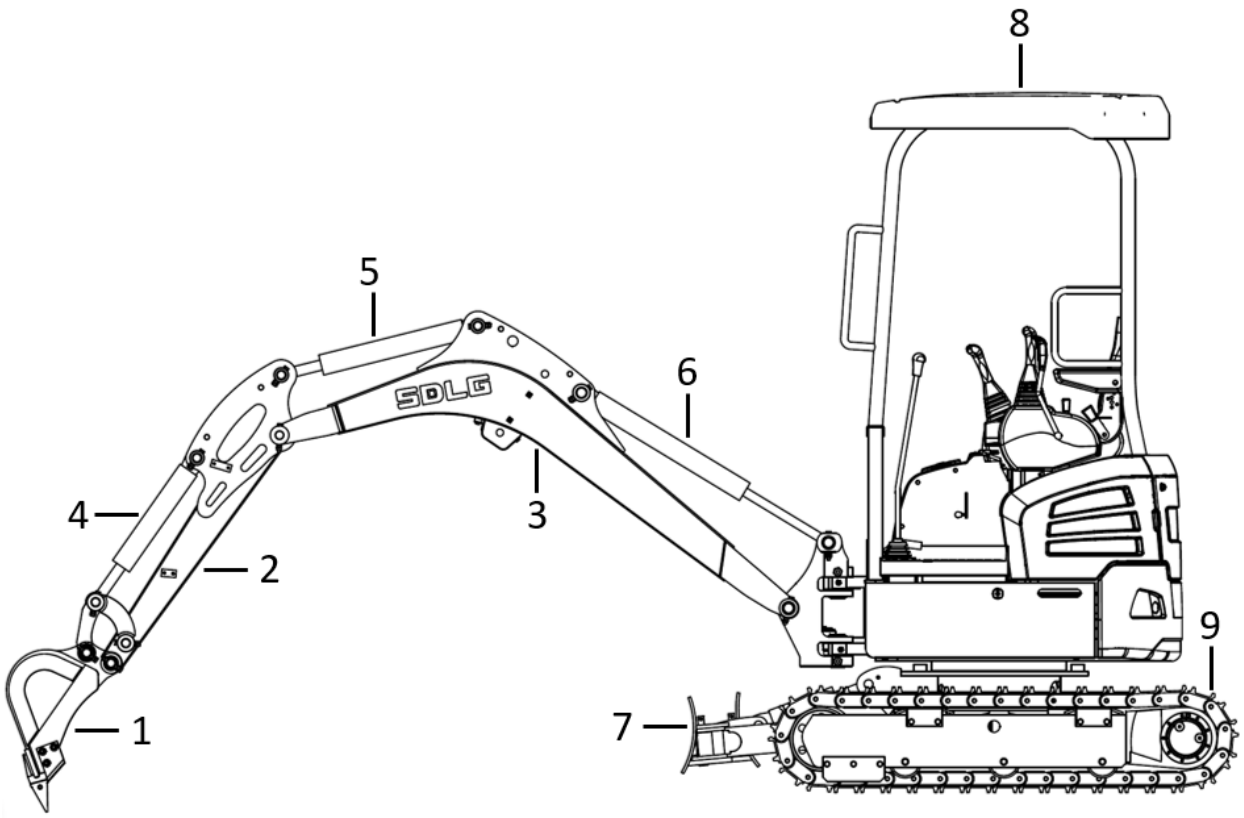
5.2 Sediment discharge 120
5.3. Replacing the secondary fuel filter 120
5.4 Draining water from water separator 121
5.5 Bleeding the fuel system 122
6 AIR FILTER 123
6.1 Cleaning air filter ash valve 123
6.2 Cleaning and replacing filter element 123
7 COOLING SYSTEM 127
7.1 Checking the coolant level 127
7.2 Changing the coolant 129
7.3 Cleaning radiator, oil cooler, and condenser fins 131
8 HYDRAULIC SYSTEM 133
8.1 Checking the hydraulic oil level 133
8.2 Changing hydraulic oil 133
8.3 Replacing return oil filter element of the hydraulic oil tank 136
8.4 Replacing the hydraulic oil suction filter element 136
8.5 Replacing the hydraulic pilot filter element 136
8.6 Replacing the ventilation filter element. 137
8.7 Releasing the pressure in the hydraulic oil tank and hydraulic circuit 137
9 SLEWING DRIVE MECHANISM 137
10 TRAVEL DRIVE MECHANISM 138
10.1 Check the gear oil level of the travel drive mechanism 138
10.2 Changing the gear oil 139
11 ELECTRICAL SYSTEM 140
11.1. Charging the battery. 140
11.2 Precautions for welding 142
11.3 Replacing fuse 144
12 LUBRICATION SYSTEM 145
12.1 Greasing the working device 145
12.2 Applying grease to the slewing bearings 147

13 REPLACING THE BUCKET TEETH 148
14 TRACK TENSION 150
14.1 Checking the track tension 150
14.2 Adjusting the track tension 150
15 LUBRICATION 152
16 REGULAR MAINTENANCE 153
16.1 Maintenance every 10 h 153
16.2 Maintenance every 50 h 153
16.3 Maintenance every 250 h 154
16.4 Maintenance every 500 h 154
16.5 Maintenance every 1000 h 155
16.6 Maintenance every 2000 h 155
16.7 Maintenance every 3000 h 155
17 REGULAR REPLACEMENT OF MAIN COMPONENTS 156
18 SELECTION OF OIL PRODUCTS 158

Chapter 1 Product introduction

1. Outline drawing and components

This diagram shows the appearance of the machine and the names of its main components. In this manual, front, rear, left and right refer to the directions of traveling as viewed from the cab when the cab is facing forward and the traveling motor is located at the rear of the machine.

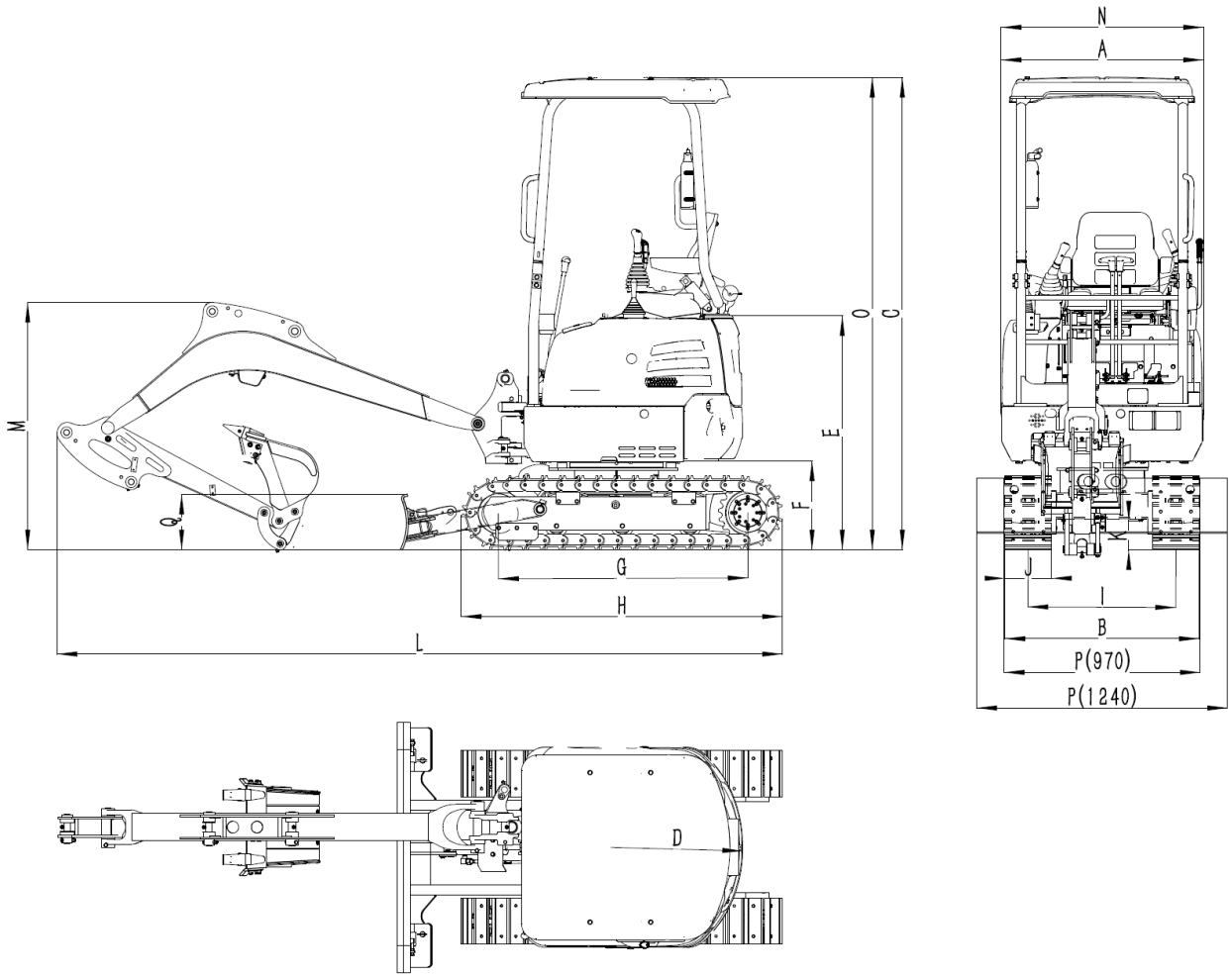


1 Bucket 2 Stick 3 Boom 4 Bucket cylinder 5 Stick cylinder

6 Boom cylinder 7 Bulldozer blade 8 Ceiling 9 Track

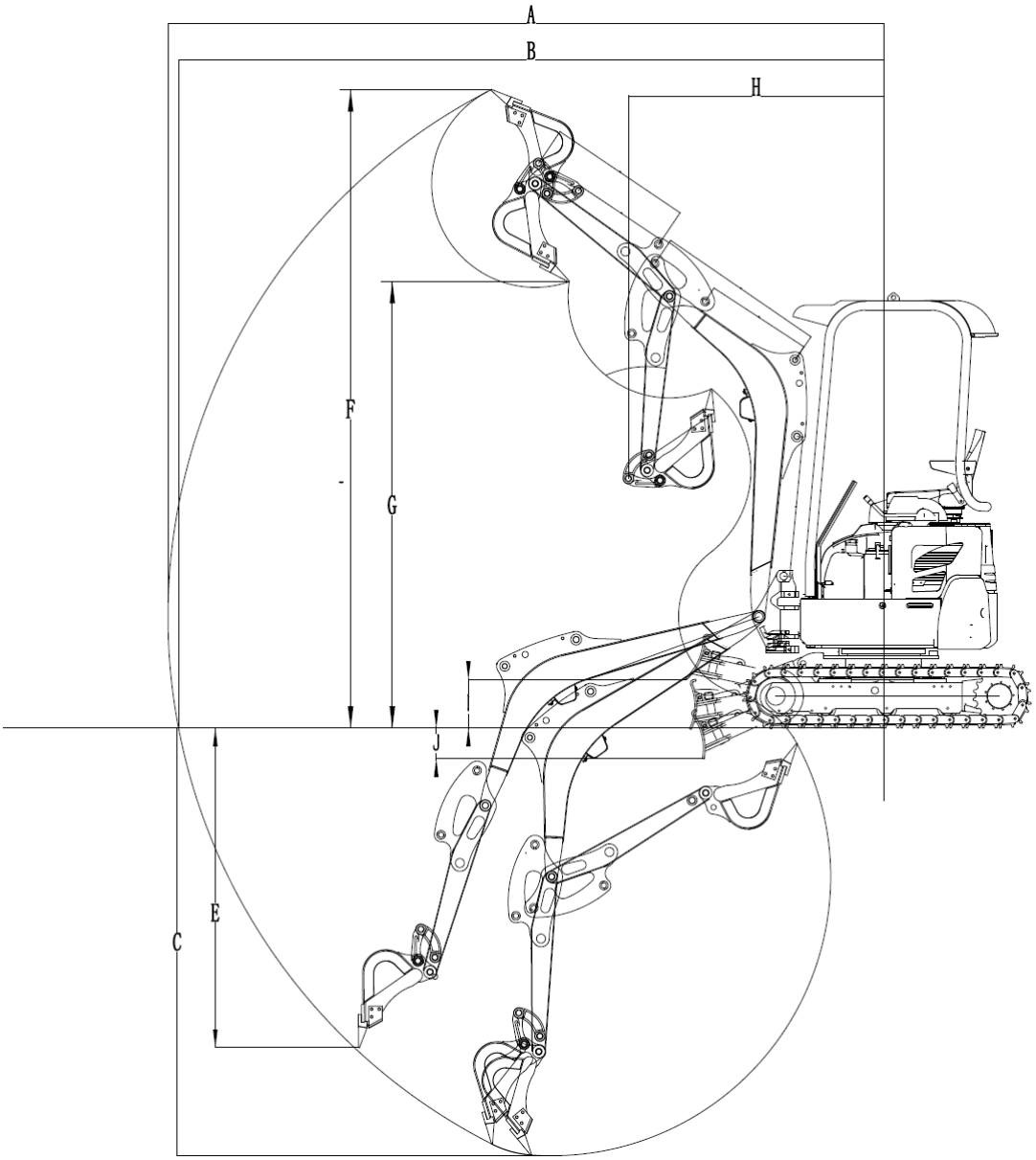
2. Overall dimension diagram and operation dimension diagram

2.1 Overall dimension diagram



Item		Unit	Value
L	Overall length	mm	3610
N	Overall width		990
O	Overall height		2365
A	Width of upper structure assembly		990
B	Overall chassis width (outer edge of track shoe)		970（1240）
C	Overall height to cab roof		-
J	Track shoe width		230
I	Track width		730/1010
K	Min. ground clearance		145
D	Tail turning radius		640
G	Track wheelbase		1230
H	Track length		1585
F	Ground clearance of upper structure assembly		430
E	Overall height to hood top		-
M	Total height of boom		
P	Blade width		
Q	Blade height		

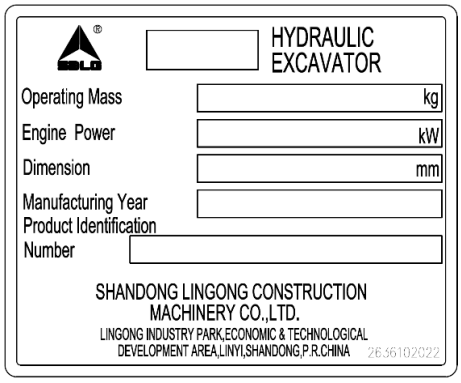
2.2 Operation dimension diagram



Item		Unit	Value
A	Max. digging radius	mm	3910
B	Max. digging range		3850
C	Max digging depth		2330
E	Max. vertical digging depth		1745
F	Max. digging height		3470
G	Max. dumping height		2425
H	Min. front slewing radius		1590
I	Max. bulldozer lifting height		
J	Max. bulldozer cutting depth		

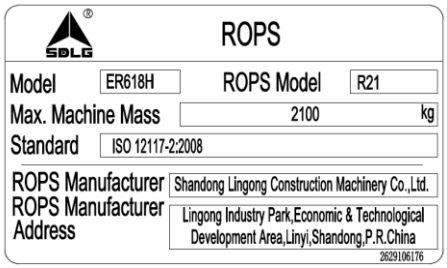
3 Nameplate

3.1 Product nameplate



The nameplate of this machine is fixed on the front end of the upper structure, indicating the model, manufacture date, PIN, manufacturer and other information of the machine. (The PIN is also printed below the product nameplate).

3.2 Canopy nameplate



This machine is equipped with an tip-over protective structure sign, as shown in the left figure.

4 Applicable working conditions

This machine is a professional crawler hydraulic excavator. widely applicable for small building construction, highway maintenance, farmland reconstruction, subway tunnel construction, cable/water pipe trench foundation pit excavation, municipal works, environmental sanitation, landscaping, and oil pipeline works and others. Quick change mechanism is optional for quick replacement of various working devices under various working conditions. The optional working devices include various digging buckets, breaking hammer, ground auger and extension rod, hydraulic scissor, hydraulic grab, etc., improving the adaptability of the machine. In an environment prone to falling objects, a protection net can be installed at the cab to protect the driver's safety. For specific information, please consult SDLG or designated dealers.

The suitable working environment temperature for the machine is -20 ℃ to 45 ℃, and the altitude is below 1400 meters. If any operation in an environment out of the specification given here, please contact us in advance to obtain relevant technical guidance and permission. Otherwise, we will refuse to take any responsibility for any consequences caused therefrom.

5 Features

- A powerful and highly reliable engine is installed, ensuring the excellent working performance of the machine. The machine has such advantages as low emission and low noise, especially suitable for working in noise sensitive areas and at night.
- A hydraulic load-sensing system and pilot control are applied, making the operation simple and convenient. The high-pressure travel motor provides the machine with a high traction force and a high travel speed.
- The superstrong structure design through computer optimization and three-dimensional finite element analysis is applied, and high-strength steel sheets are applied at key locations, improving the adaptability of the machine to harsh operating conditions.
- Luxurious seats are installed to provide a comfortable driving and riding environment.
- The streamline modeling is applied, providing simple, smooth and beautiful lines. Open-type engine hood is adopted for easy maintenance.
- A bulldozer is equipped. The boom swing function is designed.

6 Technical performance and parameters

6.1 Performance parameters

Item	Unit	Value
Total weight	kg	1840
Standard bucket capacity	m^3	0.04（0.03～0.06）
Travel speed (low/high)	km/h	2.1/3.3
Max. slewing speed	r/min	9.2
Engine model		D902-EF08-CN4
Rated engine power (kW)	kW	11.8
Rated engine speed	r/min	2300
Hydraulic system working pressure	kgf/cm^2	206
Boom length	mm	1830
Stick length	mm	965

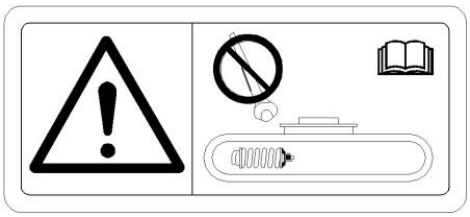
6.2 Reference standard

Q/371300 003 *Hydraulic Excavator*.

7 Location and description of safety signs

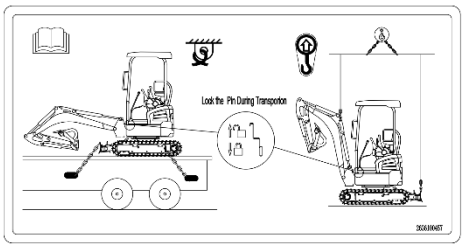
Positions of safety signs for this machine are given in the table below. Please carefully read and follow the instructions given by all the safety signs on the machine. Keep the safety signs properly, and if a safety sign becomes lost, damaged or illegible, install a new one or replace it immediately. To replace a part with safety signs, make sure that the newly placed part has the same safety sign as before.

Wipe the safety sign using a piece of cloth soaked with soapy water instead of detergent, gasoline or the similar.



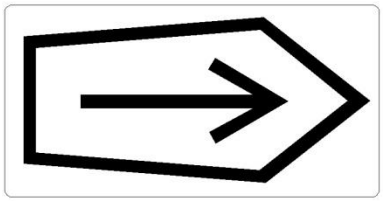
1. No spring counter-screwing or recoiling sign

On the outer covers of the left and right track tension adjustment springs



2. Hoisting sign

On the right side of the upper structure



3. Driving direction sign

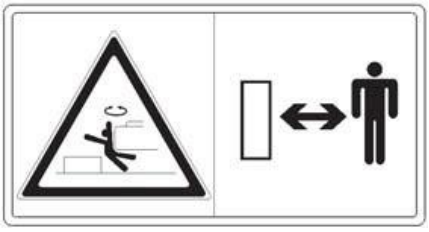
Inside the guide wheel guards on both sides

4. Articulated steering sign

On both sides of the boom

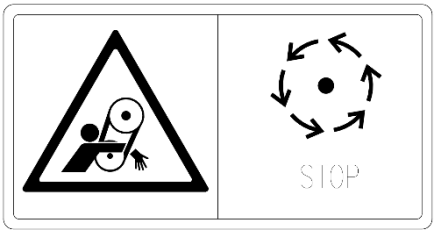
5. Working device caution sign

On both sides of the stick



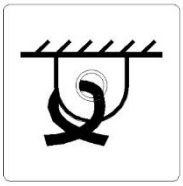
6. “No Entry into Slewing Radius” sign

On both sides of the rear of the hood



7. Machine access warning sign

At the rear of the hood

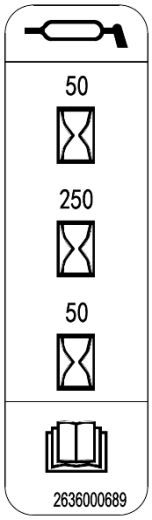


8. Lug sign

At the lifting points, for fixing the machine during transport, and towing is prohibited.

9. Battery disconnection sign

Near the main power switch on the left side of the upper structure

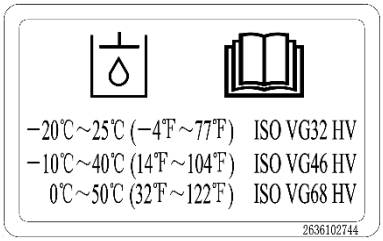


10. Grease filling sign

Near the grease filler of upper structure slewing ring gear

11. Fire extinguisher location sign

On the pillar at the right rear of the cab

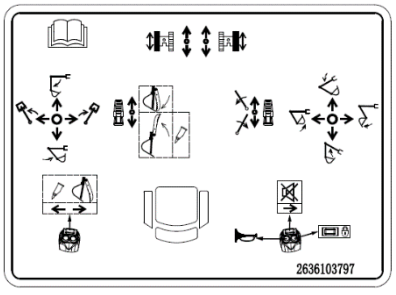


12. Hydraulic oil grade sign

On the hydraulic tank which can be seen with the right side hood opened

13. Hydraulic oil level sign

Near the oil marker in the hydraulic tank which can be seen with the right side hood opened

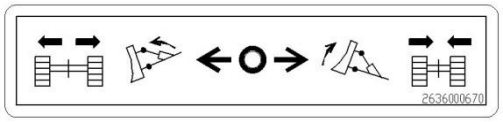


14. Operation mode caution sign

On the inner side of the right control box

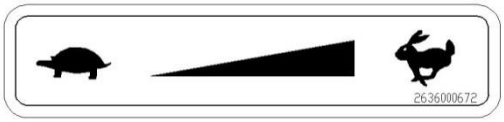
15. “Fuel Tank - No Open Fire” sign

Near the fuel tank filler on the right side of the machine



16. Bulldozer/track extension/retraction sign

Near the bulldozer/track extension/retraction control lever on the right side in the cab

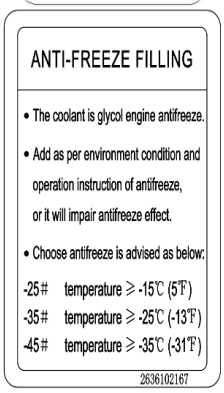


17. Throttle operation sign

Near the right throttle control lever in the cab

18. High-temperature Fluid warning sign

Near the antifreeze filler

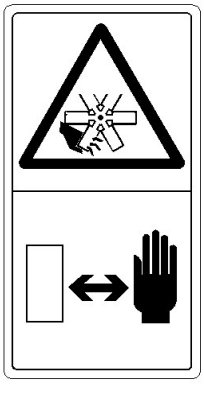


19. Antifreeze Filling sign

Near the antifreeze filler

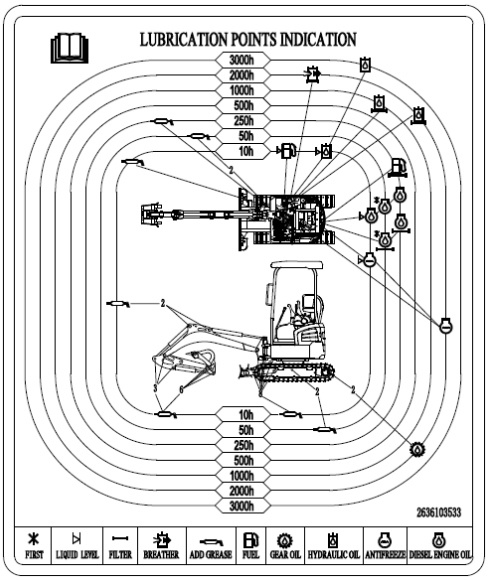
20. High-temperature Scald warning sign

Near high-temperature parts



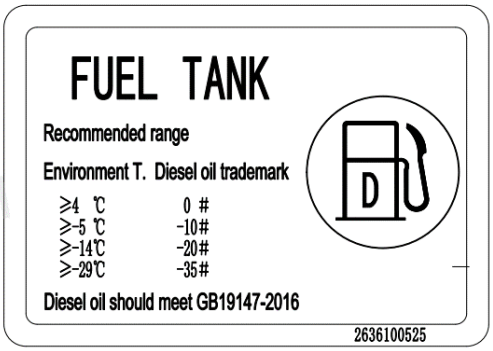
21. Fan Injury warning sign

Near the fan



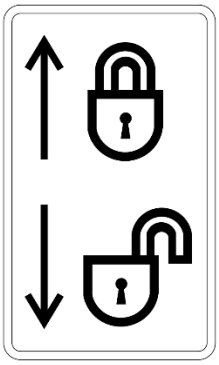
22. Lubrication sign

On the left front hood



23. Fuel tank sign

On the right front hood

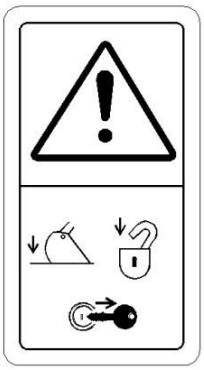


24. Safety lock warning sign

On the side of the left control box

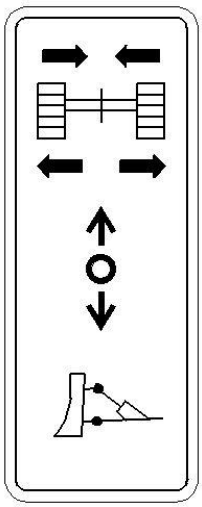
25. “No Unlocking by Safety Lock Control Lever Before Leaving” sign

On the side of the left control box



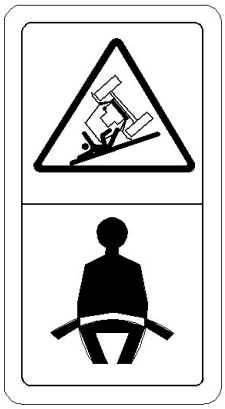
26. “Leave Machine” warning sign

On the inner side of the right control box



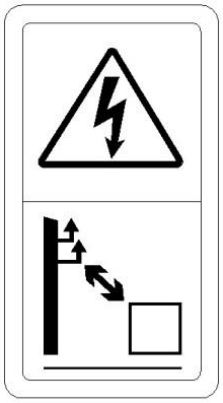
27. Bulldozer/track extension/retraction switching sign

On the inner side of the right control box



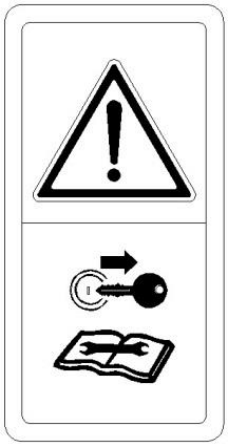
28. Seat belt warning sign

On the inner side of the right control box



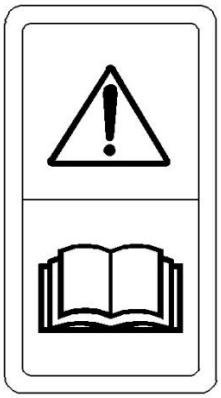
29. “Keep Distance from Power Line” sign

On the inner side of the right control box



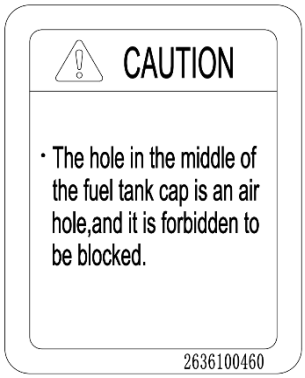
30. “Shut Down Engine Before Maintenance or Repair” sign

On the inner side of the right control box



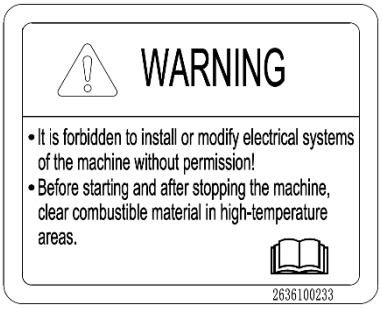
31. “READ THE MANUAL” warning sign

On the inner side of the right control box



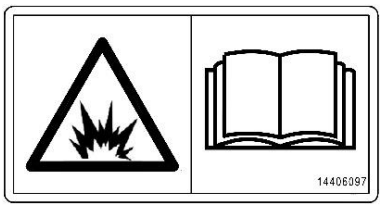
32. Fuel tank cover caution sign

Near the filler of the fuel tank on the right side of the machine



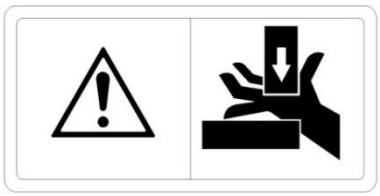
33. Fire prevention warning sign

In the hood



34. Explosion warning sign

On the accumulator

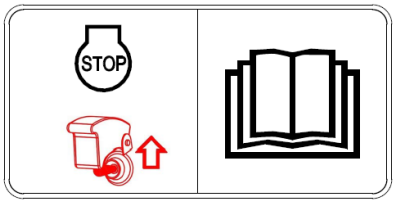


35. Hand pinch warning sign

Located below the left front of the seat

36. Lifting sign

Located at each lifting point



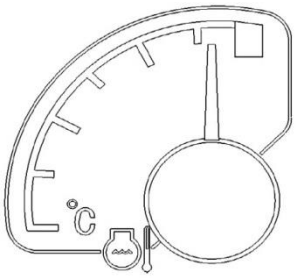
37. Engine emergency stop switch operation identification

On the inner side of the right control box

Chapter 2 Monitor and controls

⚠WARNING
Do not operate the machine until the location, function, and usage of the instruments and controls are clear. Always check the instruments and controls for abnormal readings, and take necessary measures to prevent serious damage to the machine.

1 Monitor



- Engine coolant temperature gauge

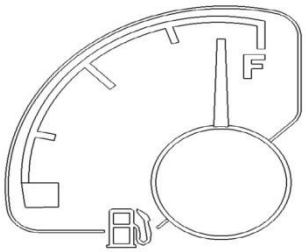
The pointer indicating range is 60 ℃ to 120 ℃.

When the pointer falls in the range of 60℃ ~ 110℃, the engine coolant temperature is normal.

When the pointer falls in the range of 110℃ ~ 120℃ (red area), the engine coolant temperature is too high. At this time, the warning lamp flashes in red and the buzzer sounds.

When the pointer falls in the red area, immediately stop the operation. Run the engine at a low idle speed until the

pointer falls to the range of 60℃~110℃.



- Fuel level gauge

This gauge shows the fuel level in the fuel tank. If the pointer falls into the red area, the machine should be refueled.

- Operation hour indicator

This indicator displays the total operation hours of the engine on the LCD, 6-digit type, 0.1h-99999.9h.

This indicator starts timing when any of the following conditions are met:

The oil pressure switch is disconnected; the vehicle speed is not lower than 700rpm.

- Tachometer

This indicator displays the current engine speed on the LCD, ranging 600rpm-3000rpm. If the engine speed exceeds this range, the count value will be inaccurate.

- Warning lamp

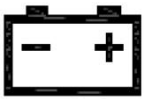
The warning lamp flashes in red for alarming.

The warning lamp flashes at a frequency of 0.5Hz when any of the following conditions are met:

- The engine speed is no less than 700rpm, and the engine oil pressure switch is grounded for 3s;
- The engine speed is no less than 700rpm, and the system voltage is no more than 11V for 3s;
- The engine speed is no less than 700rpm, and the system voltage is no less than 15V for 3 s.
- The engine coolant temperature is no less than 110℃
- Oil pressure warning indicator lamp

When the oil pressure switch is grounded, the oil pressure warning indicator lamp will be on in red.

- Charge indicator lamp



When the engine is running, this indicator lamp is off, indicating that the battery is being charged. If the indicator lamp comes on while the engine is running, it indicates that a malfunction occurs in the charging system.

If the ignition key is turned to the "I" position before the engine starts, this indicator lamp will be on. If any of the following conditions is meet, the alarm will be activated, and the indicator lamp will be on in red.

- The engine speed is less than 700rpm.
- The engine speed is no less than 700rpm, and the system voltage is no more than 11V for 3s;
- The engine speed is no less than 700rpm, and the system voltage is no less than 15V for 3 s.

- Air filter blockage warning lamp

If the air filter is blocked when the engine is running, this indicator lamp will be on in red, indicating that the air filter must be replaced or cleaned.

If the ignition key is turned to the "I" position before the engine starts, this indicator lamp will be on.

- Coolant temperature warning lamp

When the engine coolant temperature is no less than 110℃, the coolant temperature warning indicator lamp will be on in red, and the buzzer will sound at the same time; when the engine coolant temperature drops to 108℃ or below, the alarm will be deactivated.

- Hydraulic oil temperature warning lamp

When the hydraulic oil temperature T is 90°C or above, this indicator lamp will be on in red.

- Hydraulic oil filter blockage warning lamp

When the hydraulic oil filter is blocked, this indicator lamp will be on in red.

- High-speed travel indicator lamp

When the machine is traveling at high speed, this indicator lamp will be on in green.

- Preheating indicator lamp

When the ignition key is turned to the " " position for preheating in cold weather, this indicator lamp will be on in yellow until the preheating is completed.

- Buzzer

The buzzer in the instrument cluster panel will start beeping at a frequency of 0.5Hz when any of the following conditions are met:

- The engine speed is no less than 700rpm, and the engine oil pressure switch is grounded for 3s;
- The engine speed is no less than 700rpm, and the system voltage is no more than 11V for 3s;
- The engine speed is no less than 700rpm, and the system voltage is no less than 15V for 3 s.
- The engine coolant temperature is no less than 110℃

If all the above conditions are not met, the buzzer will not sound for alarm.

2 Switch

- Ignition switch

This switch is located at the rear of the right control box for turning on/off the electrical system and starting the engine.

Position O

The key can be inserted and pulled out in this position. If the key is turned to this position, the circuit will be off.

Position I

This position is for turning on the overall electrical system, and when the engine is running, please keep the key at this position.

Position

This position is for starting the engine, and during engine startup, please keep the key at this position. After the engine is started, release the key, and then the key will return to position I automatically.

- Horn button

The horn button is located at the top of the right working device control lever, and the horn will sound once the button is pressed.

- Monitor button

The monitor buttons from top to bottom and from left to right are exit button, OK/mute button, up button, right button, down button, high/ low speed button, boom working lamp button, and cab working lamp button.

- Main power switch

The main power switch is installed on the left side of the machine.

Position "I": The main power switch is turned on.

Position "O": The main power switch is turned off.

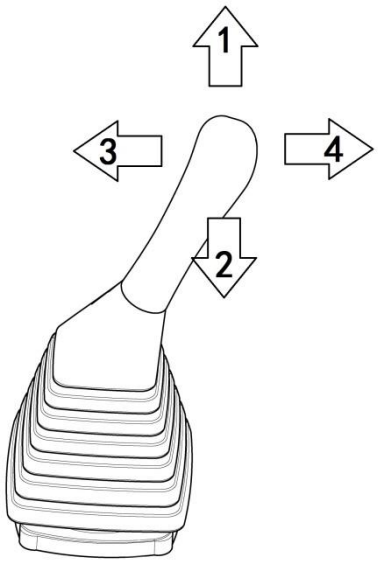
IMPORTANT! The engine can be started only when the main power switch is in position "I" (ON). Before checking the electrical system or parking, please confirm that the main power switch is in position "O" (OFF) to prevent the battery from being consumed. When the machine is running, do not place the main power switch in the position "O".

CAUTION! It is forbidden to turn off the main power switch within 2min after the engine is shut down. Otherwise, the engine might be damaged.

3 Other control

3.1 Working device control lever

- Working device control lever (left)



This lever is used for slewing and controlling the stick.

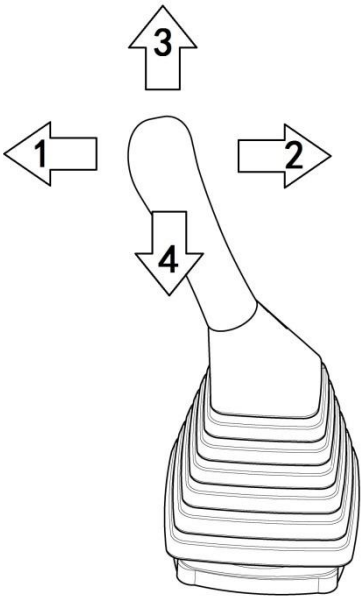
1 Stick extension (dumping)

2 Stick retraction (excavation)

3 Left slewing

4 Right slewing

- Working device control lever (right)



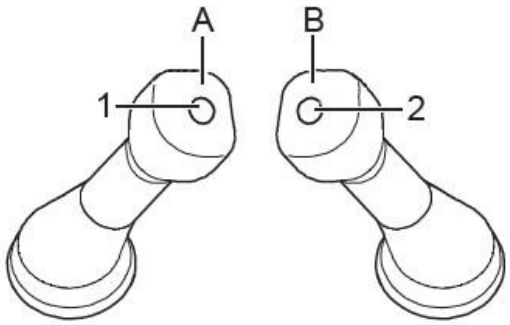
This control lever is used for controlling the boom and bucket.

1 Bucket retraction (excavation)

2 Bucket extension (dumping)

3 Boom lowering

4 Boom lifting

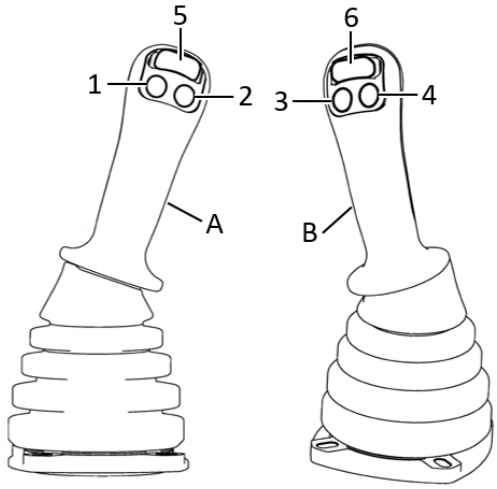


- Control lever with one button

  A Left control lever

  B Right control lever

  2 Horn button



- Control lever with three buttons

  A Left control lever

  B Right control lever

  1 The quick fit oil cylinder shrinks and the quick change device can be removed. (Reserved)

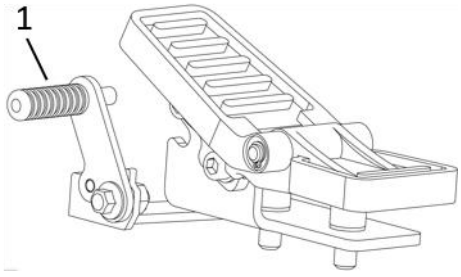
  2. The quick fit oil cylinder extends and can be equipped with a quick change device. (Reserved)

  3 Horn

  4 Reserved

  5 When the left end of the switch is pressed, select the breaking hammer function; When pressing the right end of the switch, select the thumb clip function

  6 When the left end of the switch is pressed, a walking buzzer will sound; When the right end of the switch is pressed, the walking buzzer is silenced



Optional pedal (left side)

Position 1 Operating breaking hammer or hydraulic cutter, or thumb clip.

During operation of the hydraulic breaker, depressing the front end of this pedal may cause the breaker to vibrate.

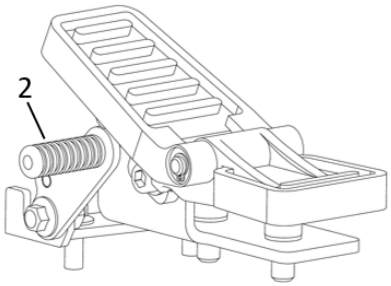
During operation of the hydraulic shear, depressing the front end of this pedal may close the hydraulic shear;

depressing the rear end of this pedal may open the hydraulic shear.

When operating the thumb clip, pressing the front end of the pedal can close the thumb clip; Pressing the back of the pedal can open the thumb clip.

Warning! If the whole machine is equipped with accessories other than the standard bucket, attention should be paid to the interference between the accessories and components such as the boom or boom cylinder when operating the whole machine.

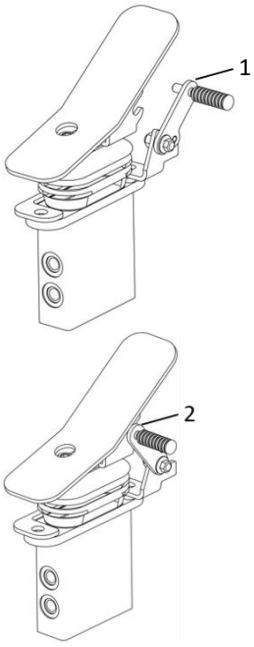
Warning! Do not use the thumb clip for round wood working conditions.



Position 2: Locking pedal

Attention! When the machine does not require optional pedal operation, ensure that the pedal is in the locked position to prevent accidental operation.

Selective Pedal (Right Side)



Position 1: Operating the working device swing cylinder

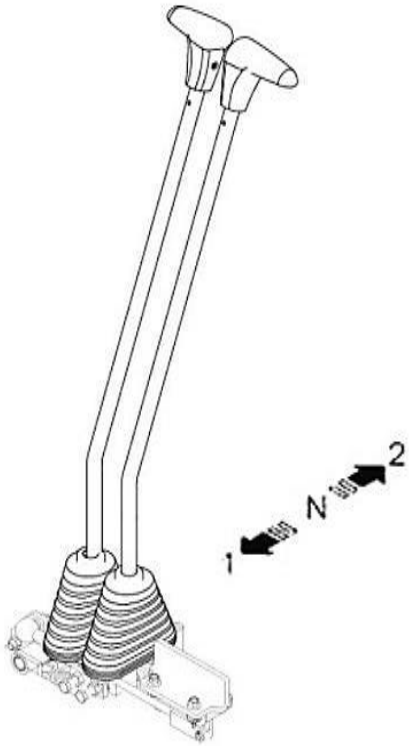
During operation of the swing cylinder of the working device, depressing the front end or the rear end of this pedal may make the swing cylinder can extended and retracted.

Position 2 Locking pedal

Attention! When the machine is not operated by the optional pedal, be sure to keep the pedal in the locking position, to avoid the unexpected operation.

3.2 Travel control lever

IMPORTANT! Before operating the travel control lever, check the direction of the track. When the travel motor is at the front, the sequence of the travel operation should be reversed.



This control lever is used to move and stop the machine.

Position N: neutral position (stop machine)

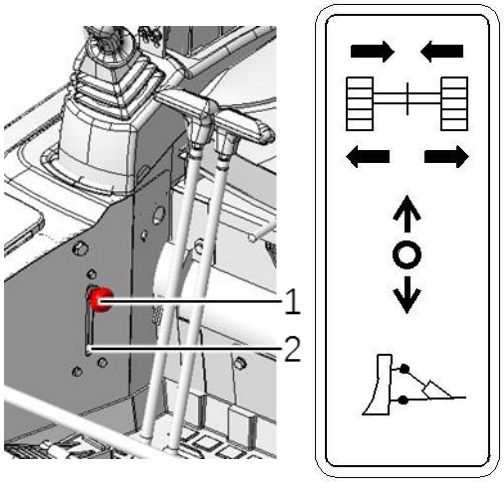
Position 1: forward

When the travel motor is at the rear, and the control lever is pushed forward (or the pedal is depressed forward), the machine travels forward.

Position 2: reverse

When the travel motor is at the rear, and the control lever is pulled backward (or the pedal is depressed backward), the machine reverses.

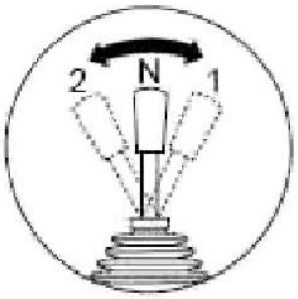
3.3. Bulldozer/track extension/retraction switch



This switch is located on the inner side of the right control box.

Position 1: track extension/retraction enabled

Position 2: bulldozer lifting/lowering enabled



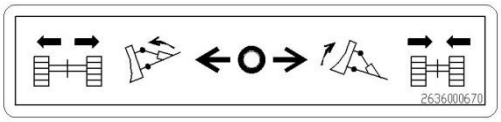
3.4 Bulldozer/track extension/retraction control lever

This control lever is located on the right control box.

Position 1: Rear - bulldozer lifting, or track retracted inward

Position 2: Front - bulldozer lowering, or track extended outward

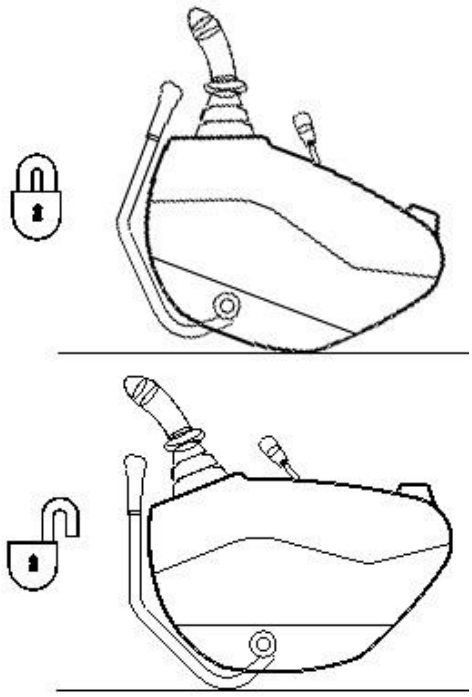
Position N: neutral position



3.5 Engine throttle control lever

This lever is located outside the right control box. The throttle will gradually increase when it is pulled from front to back.

3.6 Safety lock control lever



⚠WARNING
If the safety lock control lever is not secured in the locked position, the control levers may move, causing serious accidents or injuries.

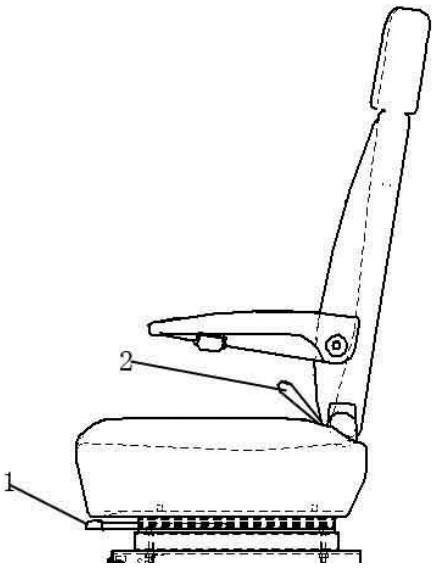
Only when the safety lock control lever is in the "locked" position can the engine be started. After starting, the control lever can be moved to “unlocked” position so that the working device can be operated to slew and travel.

IMPORTANT! Before leaving the cab, firmly pull the safety lock control lever to the “locked” position to lock the system. If the safety lock control lever is not in the “locked” position and the working device control lever is touched by accident, serious personal injury will be caused.

CAUTION! When pulling up or pushing down the safety lock control lever, do not touch the working device control lever.

3.7 Seat adjustment

⚠ WARNING
Before adjusting the seat, park the machine at a safe place and shut down the engine. Before changing the driver or operating the machine, always adjust the driver's seat to the most comfortable seating position. Do not adjust the seat while operating the machine.



- Horizontal adjustment

Adjust the handle 1 leftward and rightward to move the seat forward and backward, and release it after adjusting the seat to a position suitable for operation. For example, in case of deep excavation, move the seat forward to improve the sight in the front lower direction of the machine.

- Seat back reclining

The operator pulls the handle 2 backward while sitting on the driver's seat, and releases it after adjusting the backrest to a proper position.

- Armrest adjustment

The left and right armrests can be manually pulled to a vertical position, and can be moved up or down as needed for easy operation and accessing of the machine.

3.8 Seat belt

IMPORTANT! Replace the seat belt immediately if it is worn or damaged.

Never modify the seat belt or its fittings without permission.

Never share the seat belt with another person.

Always replace the seat belt every three years.

3.9 Fire extinguisher

The mounting holes for the fire extinguisher bracket have been reserved in the left rear of the cab of this machine. Please install a fire extinguisher that meets the national laws and local requirements.

Warning! Be sure to prepare a fire extinguisher and read the instructions on the fire extinguisher before operating the machine. Be sure to know how to use the fire extinguisher.

Check regularly to ensure that the fire extinguisher is within the warranty period.

If the fire extinguisher has expired, it must be replaced in time.

Install the fire extinguisher as follows:

Remove the two bolts installed at the right rear of the cab, and then install the fire extinguisher. For the use method and precautions of the fire extinguisher, please refer to the text instructions on the fire extinguisher.

The fire extinguisher shall be inspected and maintained frequently.

3.10 Emergency exit

This machine is equipped with a cab and is not equipped with an emergency hammer. In an emergency, please choose the escape direction according to the actual situation and escape from the cab.

3.11 Lid/cover with lock

The fuel filler cap, engine hood, tool box, main power switch cover and other parts are all equipped with locks. The opening and closing of these lockable parts require the use of the key of the machine.

CAUTION! Insert the key to the limit and then turn the key. If the key is not fully inserted, it may be broken when turned.

3.12 Storage of the Operation and Maintenance Manual

The Operation and Maintenance Manual should be placed in the storage bag at the back of driver's seat for use when needed.

Chapter 3 Operation instructions

1 Introduction

This chapter contains regulations on operation and safety, and in order to ensure the correct and safe running/operation of the machine, the operator shall follow the regulations in this chapter and the national, provincial and municipal laws of transport, traffic and industry safety, labor welfare, etc. and fulfill the responsibilities and obligations specified therein.

2 Running-in

IMPORTANT! Check the fluid level frequently.

The machine has been thoroughly adjusted and tested before delivery. However for a new machine, operating it under harsh conditions will have adverse effects on its performance and shorten its service life. Always subject the machine to running-in in the first 100h of operation (as indicated on the hour meter), so as to improve the hardness and smoothness of all bearing surfaces, thus greatly improving their service life. Follow the regulations on running-in below:

- Run the engine at idle speed for 5min after startup.
- Avoid operation under heavy load or high speed.
- Except for an emergency, avoid abrupt start, acceleration, turning and braking.

3 Safety rules during operation

3.1 Operator’s obligations

- The operator must abide by the rules and recommendations in the Operation and Maintenance Manual, and pay attention to laws, regulations, and special requirements and precautions for the workplace.
- The operator must have a good rest and maintain good mental and physical conditions, and shall not operate the machine after drinking or taking drugs and other narcotics.
- The operator must thoroughly know about the condition of the workplace of the machine and prevent any personnel from passing by or standing below the lifted excavating tool, which is essential to avoidance of serious personal injury or property loss and possible fatal accident.
- The operator shall prevent any personnel from entering or staying in the dangerous area within 7m away from the machine. If any person is present, the operator must be extremely careful and operate the machine only when seeing the person or knowing where he or she is.
- In case of any abnormality (noise, vibration, smell, incorrect instrument display, smoke, oil leakage, etc., or any abnormal display on the alarm device or monitor) during operation or maintenance, report it to the supervisor and take necessary

measures. Do not operate the machine until the fault is corrected.

3.2 Safety regulations

- Eliminate the fault or defect that affects the safety before startup.
- Wear clothes suitable for safe operation and a hard hat for head protection.
- Do not use communication equipment during driving, otherwise the signal may interfere with important electronic devices of the electrical system in the machine.
- Always sit on the seat when starting the engine.
- Keep your hands away from places where there is a risk of pinching (such as covers, doors and windows) to avoid pinching of hands or fingers.
- Sit in the seat and fasten the seat belt.
- When getting on or off the machine, face toward the machine, use steps and handrails rather than gripping any control levers, and contact with the machine on at least three points, i.e. use two hands and one foot or one hand and two feet. Do not jump.
- Close the door of the cab during operation.
- The vibration (shaking) that occurs during operation may cause injury to the operator.
- The methods to reduce vibration are as follows:
- Adjust the seat and fasten the seat belt.
- Select the smoothest operating surface (level it if

necessary).

- Adjust the machine speed.
- Prevent the machine from tilting to one side for more than 10° on the uneven ground.
- The cab has two emergency exits, namely the door and the rear window. In case of danger, break the window glass with an emergency hammer to escape. Refer to "3.10 Emergency exit" in Chapter 2.
- Only use the access passage with anti-skid pads to climb onto the top of the machine. Do not climb onto the engine hood or cover without anti-skid pads.
- Check the handrails and steps (including the track shoe) before getting on or off the machine. If there is oil, grease or mud on the handrails or steps (including the track shoe), remove it promptly. Keep the handrails and steps clean. In case of any damage, repair the handrails or steps and tighten the loose bolts.

4 Working in dangerous areas

CAUTION: The machine is not suitable for environments that are harmful to human health, such as environments with toxic gas, dust, etc.

4.1 Operations near overhead HV lines

- If the machine is close to the HV power line, personnel may get an electric shock because the current can be conducted from the power line in spite of no direct contact.
- All personnel shall be prevented from approaching the machine in case of working near the high-voltage power lines.
- Before starting operation near HV power lines, be sure to contact the relevant power company to determine the line voltage.
- Therefore, for the sake of safety, the minimum safe distance between the machine and the HV power line shall be observed,

  as listed below:

Voltage	Minimum safety distance from the power line
0~1kV	2m (7ft)
1~55kV	4m (13ft)
55~500kV	6m (20ft)

- If the working device comes into contact with the power line, the operator must stay in the cab, and if the machine is still serviceable, try moving the working device away from the HV power line to disconnect the circuit.

4.2 Working in an area with overhead cables for electric trains

- Contact the railway authority to obtain the operation approval before loading or unloading the machine.
- Contact the railway authority again if the operation is to be resumed after interruption.

4.3 Working in an area where cables and pipes are laid under the ground

- Contact the departments in charge of underground cables and pipes and follow their instructions before operating the machine.
- Appoint a signaler in case that it is difficult to take handling measures due to the complexity of the cable or pipe locations or the operator cannot see the actual working point in the workplace. For gesture signals, refer to “8 Gesture signals” in Chapter 4.

4.4 Working in an area with a limited space

- Check whether the space is enough before operation.
- Perform the operation slowly.

4.5 Working under poor lighting conditions

- When working in buildings and tunnels, turn on the frame work light and the boom work light.
- Do not operate the machine under the poor visibility conditions, e.g. on foggy, snowy or rainy days.

4.6 Working in other hazardous areas

- Turn on the warning lamp (optional, with reserved wires) on the top of the cab in case that the machine impedes or endangers the traffic or the width of the device connected to the machine is more than that of the machine.
- Pay special attention when moving the machine with a suspended load, and appoint a signaler if necessary. For gesture signals, refer to “8 Gesture signals” in Chapter 4.
- Use road markings when working on or near the road.
- Be extremely careful when operating the machine in areas marked to be dangerous.
- Do not work near the edges of facilities such as piers and skew bridges.

4.7 Prevention of environmental pollution

During maintenance, care should be taken to protect the environment. Draining oil/fluid that is harmful to the environment into the environment will pollute the environment. The degradation of oil in water and sediment is very slow. One liter of oil is enough to pollute millions of liters of drinking water.

⚠CAUTION

For the following points, all waste must be sent to an officially approved waste management company for processing.

- The oil must be collected in a suitable container and measures to prevent overflow must be taken during draining.
- Before disposing of the used filter, all the working fluid in it must be drained. If the machine is working in an environment that contains asbestos or other dust that is harmful to health, put the used filter of the machine in the sealed bag that comes with the new filter.
- The battery contains substances harmful to personal health and the environment. The used battery must be disposed of as environmentally hazardous waste.
- Consumables such as used rags, gloves, bottles and cans may also be contaminated by oil/fluid that is harmful to the environment. These consumables must also be treated as environmentally hazardous waste.
- When the product needs to be scrapped, please follow the local laws, regulations and environmental protection policies.

5 Machine startup

5.1 Inspections before engine startup

IMPORTANT! Before startup, always walk around the machine to check that there are no people closest to the machine.

- Place the machine in the maintenance position. Refer to "1 Maintenance position" in Chapter 5.
- Perform daily maintenance. Refer to "15 Regular maintenance" in Chapter 6.
- Adjust the seat for comfortable and safe operation of the controls and pedals. Refer to "3.7 Seat adjustment" in Chapter 2.
- Check the monitor, turn the ignition key to the "I" position, and check that all lights are immediately on. If any light is off, it indicates that there is a malfunction in the light or electrical system. When the engine is running, all lights go out.
- Check if the frame work light, boom work light, wipers, rearview mirrors, etc. are serviceable.
- Check that there are no leaks.
- Check that there are no defective or loose parts, which can cause damage.
- Check that there is fuel in the fuel tank. If the fuel tank is empty or if air enters the system for some reason, be sure to do bleeding before starting the engine. Refer to "5.4 Bleeding of fuel system" in Chapter 6.
- Check that the hood and guard are closed.

5.2 Operations before engine startup

- Clean or defrost the window.
- When starting the engine, always sit in the driver's seat. Refer to "5.3 Engine startup" in this chapter.
- Before performing all operations, fasten the seat belt.
- Check that the monitor, all controls, and switches are functioning properly.
- Before starting the machine, check that there is no one near the machine.
- Sound the horn.
- Lower the safety lock control lever (refer to "3.5 Safety lock control lever" in Chapter 2), and start the engine.

5.3. Engine startup

⚠WARNING
Start the engine after checking that there are no people and obstacles around the machine, and sound the horn at the same time. Do not operate any control levers, buttons and switches during startup.

IMPORTANT! Do not keep the key in the“Start” position for more than 20s, as this will cause serious damage to the starting system. When a start fails, try to start the engine again 2min later.

IMPORTANT! If unusual noise, excessive vibration, or abnormal operation is found, please immediately place the ignition key in the "O" position and shut down the engine.

CAUTION! Ensure that the safety lock control lever is in the “locked” position, otherwise the engine cannot be started. Please refer to "3.6 Safety lock control lever” in Chapter 2.

- Set the engine throttle control lever to the low speed position. Refer to “3.5 Engine throttle control lever” in Chapter 2.
- After the engine starts, immediately release the key.
- If the engine fails to start, wait until the engine stops completely, turn the key back to the "O" (Stop) position, and then try to start the engine again.

CAUTION: When it is very cold (below -15℃=+5℉), do not put the engine into high-load operation immediately after startup. Run the engine at idle speed for 10-15 min.

5.4 Operation and inspection after engine startup

IMPORTANT! If unusual sound, excessive vibration, or abnormality occurs, immediately turn the key to the "O" (Stop) position and shut down the engine.

- Do not operate the working device immediately after the engine is started, and instead, check that all systems have reached sufficient operating temperature.
- Set the engine throttle control lever to the middle position, and idle the engine for 5min.

IMPORTANT! Do not run the engine at high speed or low idle speed for more than 20 min.

IMPORTANT! If the idling time is long, please run the engine at medium speed.

- Pull the safety lock control lever to the "unlocked" position. Refer to "3.6 Safety lock control lever" in Chapter 2, and raise the bucket from the ground.
- Slowly operate the control lever, move the bucket cylinder and the stick cylinder to the end of their strokes in turn and keep them at the end of their strokes for 30s and 5min to increase the temperature of the hydraulic oil.

IMPORTANT! If the hydraulic oil temperature is low, do not perform any operation, and instead, run the engine at low speed and light load until the oil in the engine and hydraulic system becomes hot and easier to flow.

- After warming up, check if the monitor is in the following state.
- The reading of engine coolant temperature gauge is within 30℃ ~ 110℃
- The pointer of fuel level gauge is near H
- The central warning lamp (red) goes out
- The charging indicator lamp (red) goes out
- The air filter blockage warning indicator lamp (red) goes out
- The engine water temperature warning indicator lamp (red) goes out
- The hydraulic oil temperature warning indicator lamp (red) goes out
- The hydraulic oil filter blockage warning indicator

lamp (red) goes out

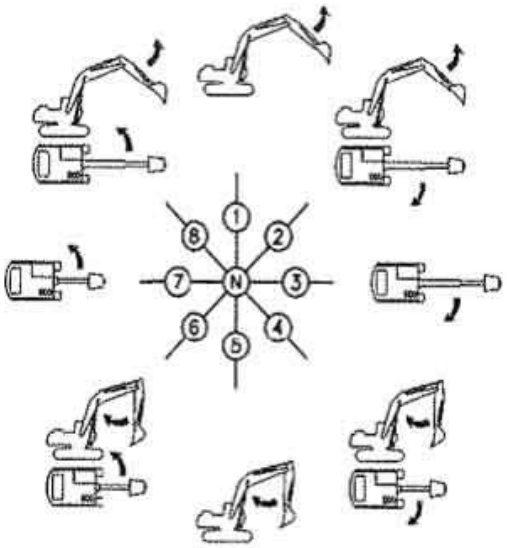
- The preheating indicator lamp (yellow) goes out
- Check for abnormal exhaust color, noise, or vibration. Do repair for any abnormalities found.
- Place the safety lock control lever in the “locked” position and confirm that the slewing and operation of working device cannot be controlled by the left and right work device control levers.

6. Operation of machine

6.1 Operation of working device

Left working device control lever

This control lever controls the slewing mechanism and stick.



N - neutral position (with upper structure and stick in stationary position)

1-Stick extension

2- Stick extension and right slewing

3- Right slewing

4- Stick retraction and right slewing

5- Stick retraction

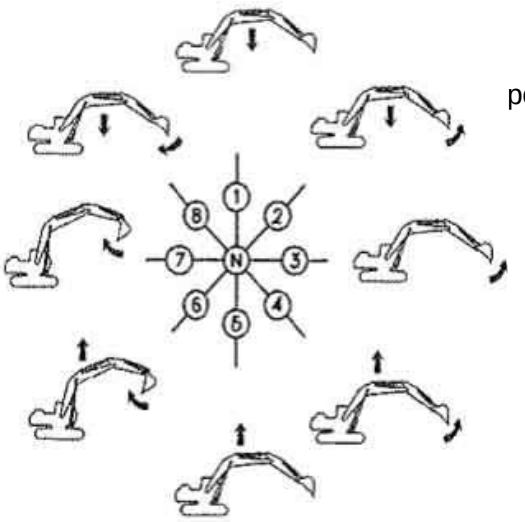
6- Stick retraction and left slewing

7- Left slewing

8- Stick extension and left slewing

Right working device control lever

This control lever controls the boom and bucket



N - neutral position (with boom and bucket in stationary position)

1- Boom down

2- Boom down and bucket out

3- Bucket out

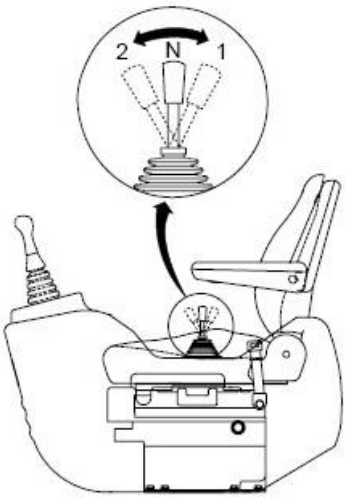
4- Boom up and bucket out

5- Boom up

6- Boom up and bucket in

7- Bucket in

8- Boom down and bucket in



Bulldozer control lever

This control lever controls the bulldozer

N - Neutral (with the bulldozer in stationary position)

1- Bulldozer lifting

2- Bulldozer lowering

6.2 Travel direction control

IMPORTANT! Before operating the travel control lever or the travel pedal, check the direction of the track. If the travel motor is at the front of the machine, the travel control lever or the travel pedal must be operated in the opposite direction.

IMPORTANT! Be sure to operate the travel control lever smoothly and avoid sudden starts and stops. Do not change the travel direction quickly.

If the machine is going to continue traveling, please follow the operating conditions below:

Ground conditions	Operation
Flat, normal or loose soil	Do not continue traveling for more than 2h. Be sure to stop the machine for at least 20min during travel at high speed for more than 2h, and drive the machine forward. Otherwise, the track rollers and idlers may be overheated, causing oil leakage.
Uneven or rough soil (mixed with gravel, rubble, boulders, or on a slope)	Drive the machine at low speed, and do not drive it for more than 1 hour. Be sure to stop the machine for at least 20min during travel at high speed for more than 1h, and drive the machine forward. Otherwise, the track rollers and idlers may be overheated, causing oil leakage.

- Travel forward
- Set the engine throttle control lever to the high speed position to increase the engine speed.

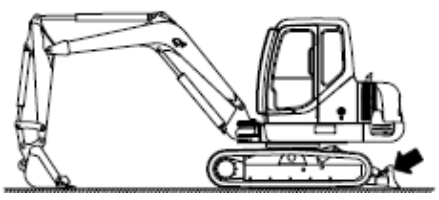
- When the travel motor is at the rear of the machine, slowly push the travel control lever forward, or slowly step on the front of the pedal;
- When the travel motor is at the front of the machine, slowly pull the travel control lever backward, or slowly step on the rear of the pedal;
- Travel backward
- Set the engine throttle control lever to the high speed position to increase the engine speed.
- When the travel motor is at the rear of the machine, slowly pull the travel control lever backward, or slowly step on the rear of the pedal;
- When the travel motor is at the front of the machine, slowly push the travel control lever forward, or slowly step on the front of the pedal.
- Turn left
- When the travel motor is at the rear of the machine, push the right travel control lever forward to realize forward left steering; pull the left travel control lever backward to realize backward left turning.
- When the travel motor is at the front of the machine, operate the travel control lever in the opposite direction to the above.
- Turn right
- When the travel motor is at the rear of the machine, push the left travel control lever forward to realize forward right steering; pull the right travel control lever backward to realize backward right turning.

- When the travel motor is at the front of the machine, operate the travel control lever in the opposite direction to the above.
- Direction switch, reverse rotation
- When the travel motor is at the rear of the machine, pull the left travel control lever backward, and push the right travel control lever forward to quickly switch direction to the left; pull the right travel control lever backward, and push the left travel control lever forward to quickly switch direction to the right;
- When the travel motor is at the front of the machine, operate the travel control lever in the opposite direction to the above.

7 After operation

⚠ WARNING
When getting on/off the cab, always face the machine and use the step or handrail to prevent slipping. Always apply three-point contact method (i.e. two hands and one foot or two feet and one hand) when getting on/off the vehicle. Do not jump off the machine.

7.1 Steps for parking the machine



IMPORTANT! Park the machine on a flat ground instead of dangerous places. If it is necessary to park the machine on a slope, place blocks under track shoes. As an added safety measure, insert the bucket into the ground.

- Place the left and right travel control levers in the “N” position.
- Set the engine throttle control lever to the low speed position.
- Lower the bucket and bulldozer to the ground until the bottom of the bucket is parallel to the ground.
- Place the safety lock control lever in the “locked” position. Refer to "3.6 Safety lock control lever” in Chapter 2.
- Run the engine at low speed for approximately 5 min to cool it down gradually.
- Turn the ignition key to the "O" position and shut down the engine.
- Remove the ignition key.

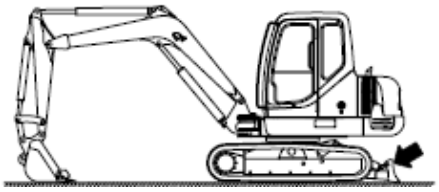
IMPORTANT! Avoid sudden stopping of the machine. If the machine is to be stopped for a period of time (regardless of the duration), place the main power switch in the "0” (off) position.

7.2 Operation and inspection after engine shutdown

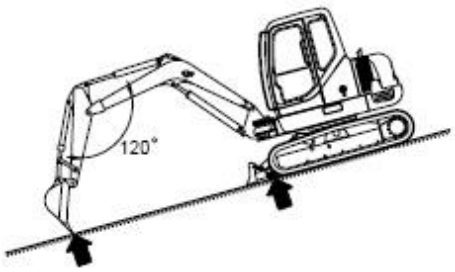
- Walk around the machine to check the working device, machine exterior and chassis for water or oil leaks. Do repair for any abnormalities found.
- Top up the fuel tank.
- Check the engine compartment for paper scraps and debris. Remove paper scraps and debris to avoid fire.
- Remove sludge, rock debris and rubble on the track shoes and attached to the chassis.

- In icy weather, park the machine on a wooden deck after cleaning the tracks.

8 Parking the machine



IMPORTANT! Park the machine on a flat ground. Place the bucket and bulldozer flatly on the ground. If it is necessary to park on a slope, place blocks under each track to prevent the machine from moving, adjust the bucket to the downhill side, and insert the bucket teeth into the ground.



- Park the machine in a place where there is no risk of rockfall, landslide or flooding.
- Pay attention to the weather conditions and take appropriate measures to prevent the machine from freezing on the ground, so as not to cause sinkage or any other undesirable consequences.
- When parking the machine in case of a fault, place fences, signals, flags or warning lamps and other necessary signals to ensure that the drivers of passing vehicles can see the machine clearly. Moreover, prevent the machine, fence and flag from hindering the traffic.
- After shutting down the engine and before leaving the machine, place the safety lock control lever in the “locked” position. Refer to "3.6 Safety lock control lever” in Chapter 2.
- Close the window, lock the cab and all covers, remove the key, take it with you, and put it in the designated place.

- Turn off the main power switch. Refer to the "2 Main power switch" in Chapter 2.

IMPORTANT! If the engine is stopped without cooling, it may shorten the service life. Do not shut down the engine immediately unless in an emergency. In the event of engine overheating, cool it down at low speed before shutting it down.

The following must also be observed for parking of the machine for a long time:

- Check the machine for oil or water leaks, and the work device and tracks for any malfunctions.
- Remove dirt and debris from tracks and rollers.
- Protect the exposed parts against rust, and lubricate the machine thoroughly.
- Fill the fuel and hydraulic tanks to the maximum capacity mark.

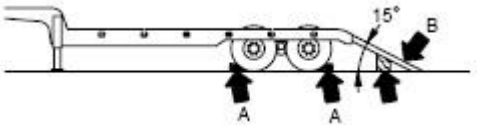
After long-term storage of excavator, perform as follows:

- Wipe off the grease on the piston rod of the hydraulic cylinder.
- Add grease to all parts that require lubrication.

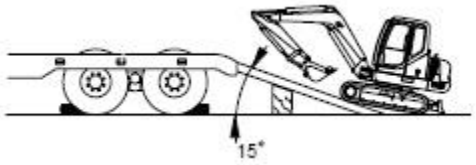
9 Transportation of machine

⚠WARNING
➢ When transporting the machine, follow the safety regulations regarding weight, height, length, and load. ➢ Pay special attention to the loading and unloading of the machine. ➢ Run the engine at low speed and set to a low travel speed. ➢ Choose a sturdy and flat ground and keep a sufficient distance from the road shoulder. ➢ Ensure that the firmness, width, length, and thickness of the wooden boards used for loading and unloading machine comply with safety standards. If the wooden board is excessively bent, support it with wooden mats. ➢ Remove grease, oil, mud, ice, etc. from wooden boards and truck bottom to prevent side-slip. ➢ Do not change the driving route on the wooden board. If this is necessary, unload the vehicle from the wooden board before changing the direction. ➢ As the base is unstable, perform slewing on the truck slowly. ➢ After loading, block tracks and secure them with a rope of sufficient strength to prevent the vehicle from moving. ➢ Lock the cab door.

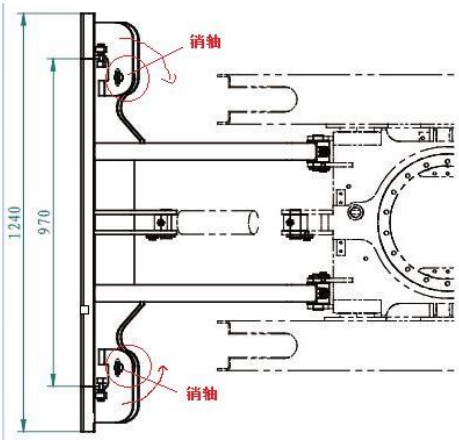
9.1 Loading



- Apply appropriate braking to the trailer and place a cushion block A under the tires to ensure that the trailer does not move.
- Install the loading platform B between the trailer and the machine and firmly secure it:



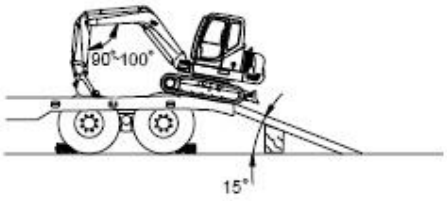
- Ensure that the strength, width, length, and thickness of the loading platform are safe for loading.
- Ensure that the angle of the loading platform is 15° or less.
- Ensure that the distance between the loading platform matches the center of the track.
- Check whether the height of the left and right loading platforms is the same.
- Set to a low travel speed.
- Operate the engine at low speed.
- Determine the direction and slowly drive onto the loading platform.
- When loading the machine, prevent the piston rod of the bucket from contacting the trailer.
- When the machine is on the loading platform, do not operate any control lever other than the levers (pedals) controlling the travel of machine.

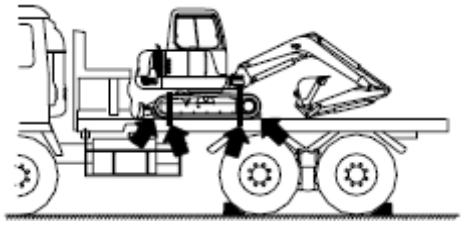


- Load the machine correctly onto the trailer and secure the machine firmly.

9.2 Securing of machine

- Lower the bucket.
- Fully extend the bucket cylinder and stick cylinder, then slowly lower the boom.
- Lower the safety lock control lever to firmly lock the system. Refer to "3.6 Safety lock control lever" in Chapter 2.
- Shut down the engine and remove the key from





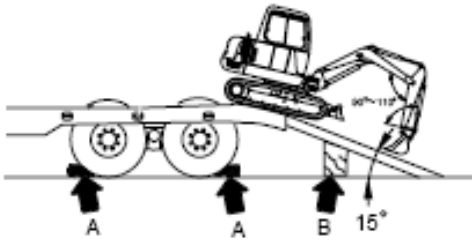
the ignition switch.

- Turn off the main power switch (set to the "0" position),. Refer to the "2 Main power switch" in Chapter 2.
- Lock the cab door, and all lids and covers with locks. Refer to "3.11 Lids/covers with lock" in Chapter 2.
- Cover the exhaust pipe to prevent damage to the turbocharger.

- Place blocks under two ends of each track and secure the machine with a cable of suitable load capacity to prevent it from moving.

CAUTION! When the machine is loaded with working devices not removed, even if the boom is stowed, the pressure on the hydraulic cylinder of the boom is still high due to the weight of the machine. Therefore, please insert a support between the stick and the boom during loading.

9.3 Unloading

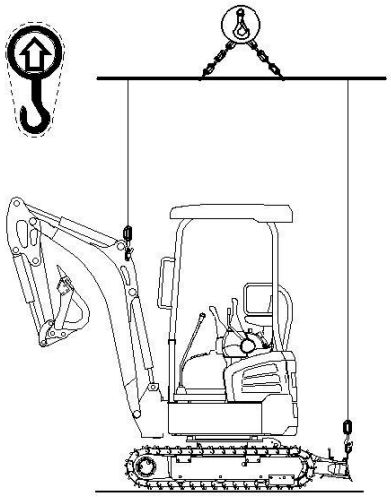


- Apply appropriate braking to the trailer and place a cushion block A under the tires to ensure that the trailer does not move.
- Install loading platform B between the trailer and the machine and firmly secure it.
- Ensure that the strength, width, length, and thickness of loading platform B are safe for loading.
- Ensure that the angle of loading platform B is 15° or less.

- Ensure that the distance between loading platform B matches the center of the track.
- Check whether the height of the left and right loading platforms is the same.
- Remove the iron chain or rope that secures the machine.
- Start the engine and warm it up.
- Place the safety lock control lever in the “locked” position. Refer to "3.6 Safety lock control lever” in Chapter 2.
- Place the engine throttle control lever in the low speed position.
- Lift the working device and slowly move the machine. When the machine is level with the upper edge of the trailer's rear wheel, stop moving.
- Adjust the angle between the stick and boom to 90°~110°, lower the bucket to the ground, and slowly move the machine from the rear of the trailer to the unloading platform.
- When the machine is moved down from the unloading platform, slowly operate the boom and stick, and carefully lower the machine until it is completely off the platform.

CAUTION! Keep the working device as low as possible without touching the ground or other objects. On a slope, do not operate any control lever other than the travel control lever.

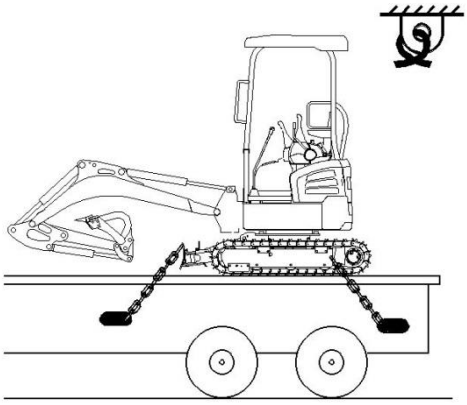
9.4 Lifting the machine



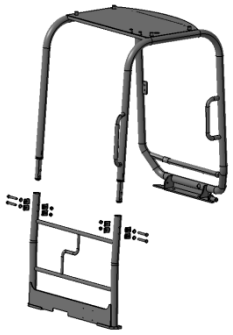
⚠WARNING!
If there are people in the cab or on the machine, do not lift the machine. Use qualified rope, chains, and hooks with sufficient load capacity. Always lift the machine as shown in the figure below. Improper lifting will deflect the load, resulting in personal injury or machine damage. During lifting, no pedestrians or vehicles are allowed to pass from the underside of the lifted machine.

Lift the machine on a flat, solid and level ground.

- Start the engine, and install the working device as shown in the figure.
- Move the safety lock control lever upward to lock this system. Refer to "3.5 Safety lock control lever" in Chapter 2.
- Shut off the engine, check the safety of the machine, and firmly close and lock the cab door, front window, and engine hood.



- Connect the lifting cables or chains that are strong enough for the weight of the machine correctly in the lifting positions (between the first and second track rollers at the front and rear, respectively) as shown in the figure.
- After installing all the lifting sling, adjust the lifting angle of the sling to 30°~40°, and lift the machine slightly to check its balance. If there is no problem,



lift the machine slowly and evenly.

CAUTION:

The lifting steps described herein are applicable to the machine with standard technical specifications.

The lifting method depends on the actual accessories and options installed on the machine. In this case, please contact our dealer for consultation.

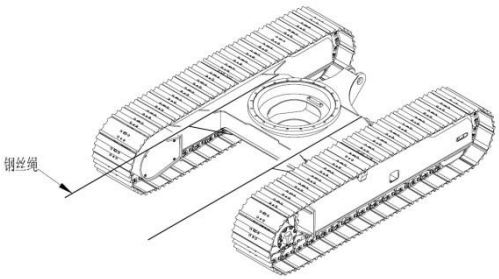
When the transportation height is limited, the original cab can be disassembled as shown in the figure to reduce the transportation height. The cab has a protective effect and cannot be removed during work. Our company is not responsible for the dangerous situation caused by removing the cab during work.

10 Towing of machine

10.1 Precautions

- Use cables with sufficient strength to tow the machine, and do not use broken, reduced or twisted ropes.
- Do not tow the machine on a slope.
- Prevent anyone from standing near the towing rope, or cross or approach the towing cable during towing.
- When the towed machine is being connected, do not allow anyone to enter between the tractor and the towed machine.
- Pull the cable slowly instead of suddenly, as this may break the slack rope.
- Keep the cable horizontal, straight, and parallel to the track.
- Select low-speed travel mode. It is allowed to drive the machine slowly during towing.

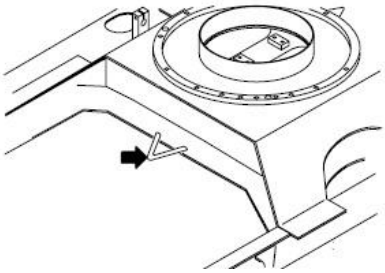
10.2 Heavy-load towing



- If the machine is stuck in mud and cannot be driven out , or when the machine is used to tow a heavy weight, use the rope as shown.
- Place wooden blocks between the towing cable and the machine to protect the machine and prevent cable damage.

10.3 Light-load towing

- When a light weight is to be towed, it is allowed to use the hook and loop on the undercarriage.



Chapter 4 Operation techniques

This chapter provides instructions and suggestions on the operation of machine, including the operation method of the most common working devices, so that operators can operate the machine safely and effectively.

1 Excavation rules

1.1 Precautions

⚠WARNING
During excavation, the operator must sit in the driver's seat. During the operation of the machine, no one is allowed to be on the outside of upper structure, on the tracks, or at the door of the machine.

First, read "**3 Safety rules during operation**" in Chapter 3.

- Before operation, carefully study the workplace drawings and local rules, know about the conditions of the ground and dangerous areas of the workplace, cut off the gas, power and water if necessary, and mark the locations of underground cables and pipes.
- Put fences and “No Entry” signs around the machine if there is a risk of unauthorized approach. Pay special attention to the rotating machine.
- Do not allow the bucket to pass over the heads of

other workers or over the driver's seat of dump trucks and other transportation equipment, as the loaded material may fall, and the bucket may hit the dump truck, causing serious injury or damage.

- Never use a bucket for cutting and chiseling.
- Never use bulldozer as a support.
- Never use this machine as a crane for lifting.
- Release the pedal and control lever and shut down the engine promptly in case of loss of control of the machine.
- Shut down the engine promptly and find out the cause if the red warning lamp goes on and the buzzer sounds.
- Do not equip the machine with a bucket larger than the specification or other working devices.
- In the event of a fire, turn off the main power switch (set it to position “0”) when possible.
- Do not excavate the working surface below the suspended part, as the machine is in the risk of damage by falling rocks or collapse of suspended part.
- Do not dig too deep under the front of the machine. Otherwise, the ground beneath the machine may collapse and cause the machine to fall.
- When performing excavation, adjust the tracks to be at right angle to the shoulder or cliff, and place the travel motor at the rear, so that the machine can be easily driven away in any situation.

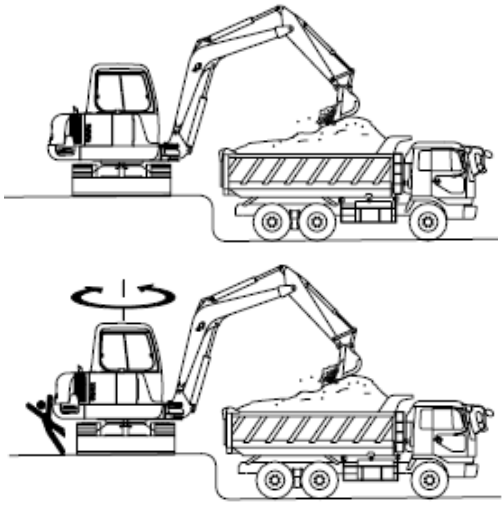
- Do not carry out removal under the machine, as this will make the machine unstable and roll over thereafter.
- When working on the top of building or other structure, check the strength of the structure at first, as such operation poses a risk of buildings collapse, causing serious injury or damage thereafter.
- Do not perform demolition to structures above the head, as this poses a risk of debris falling or building collapse, causing serious injury or damage thereafter.
- Do not use the impact force of the working device for breaking, as this poses a risk of personnel injury or damage to the working device caused by flying broken materials.
- Generally speaking, the risk of rollover with the working device on the side is higher that with the working device on the front or rear.
- When a breaking device or other heavy working device is used, there is a risk of balance loss and roll-over. When operating on a flat surface or slope, do not suddenly drop, rotate, or stop the working device, and do not suddenly extend or retract the boom cylinder, as these operations pose a risk of machine roll-over due to the impact force.
- For construction in places with height restrictions, such as tunnels, bridges, cables, or garages, take

special care not to damage the working device.

- When the working device is on the same side as the bulldozer, operate with prudent if the working device is close to the bulldozer to avoid contact between them; when the working device is used for digging, place the bulldozer on the ground and do not lift it, so as to avoid contact with the boom cylinder.
- Always ensure that the machine is stable enough for excavation. For operation on a level ground, always place the bulldozer flatly on the ground; for operation on a slope, always place the bulldozer on the ground at the lower side of the slope.

1.2 Precautions for loading materials

⚠WARNING
When loading materials, check that there are no other people standing near it, as stones may fall out during loading.



- If possible, locate the excavator at a position higher than the truck.
- Place the truck in an appropriate position to avoid unnecessary rotation or lifting of the excavator.
- Confirm that the driver of the truck is outside the working area of the machine, and never rotate the bucket above the cab of the truck.
- Load the materials to the truck stably and well control the loading height to avoid unnecessary

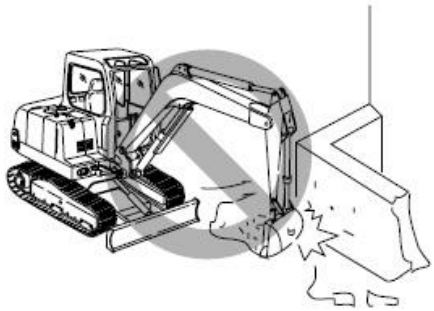
scattering.

1.3 Precautions during slewing or reversing

- Appoint a signaler for working in areas with dangers or low visibility. Refer to "8 Gesture signals" in this chapter.
- Confirm that no unrelated personnel enters the slewing radius or operating radius.
- Before starting the machine, activate the horn or signal to warn all personnel to leave the machine.
- Check that there is no one in the blind corner at the rear of the machine during reversing.

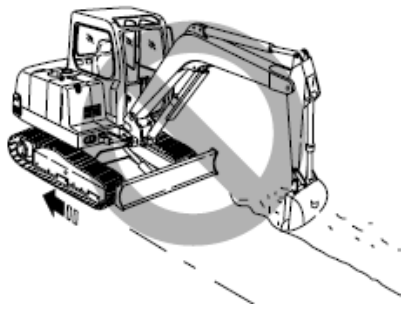
1.4 Prohibited operations

- Operation using swing force

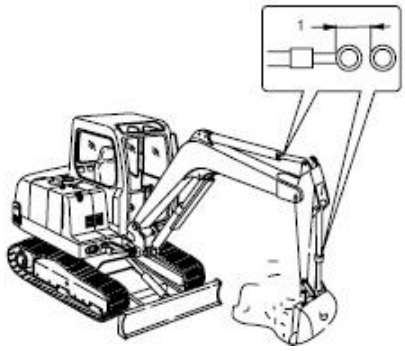


Do not use swing force to rake soil on the ground, demolish buildings, or push bucket teeth into the ground, as such operations may cause damage to the machine and working devices.

- Operation using travel force

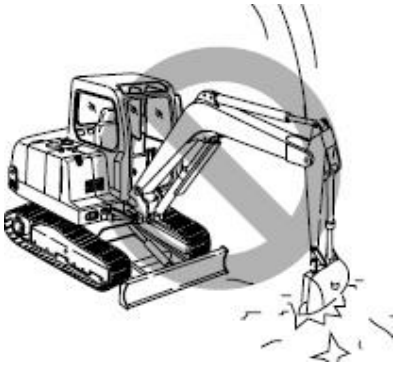


Do not use travel force to excavate and push the bucket teeth into the ground, as such operations will cause overload at the rear of the machine and damage the travel drive mechanism.



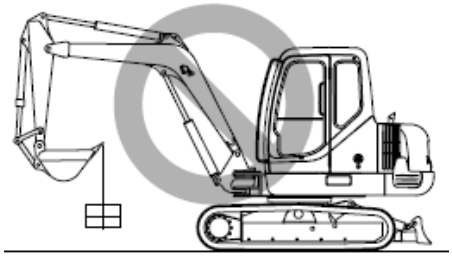
- Operation with hydraulic cylinder extended to the end of the stroke

Do not extend the cylinder to the end of its stroke, as this will overload the limiter inside the cylinder and shorten the service life of the machine. During operation, the interval 1 should be as large as possible as shown in the figure on the right.



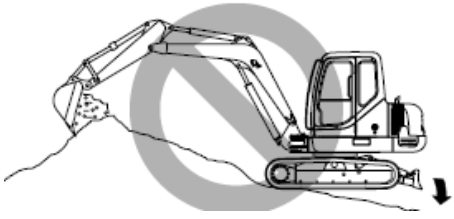
- Operation using bucket lowering force

Do not use the lowering force of the machine for digging or the lowering force of the bucket as a pick, breaking hammer or pile driver. Hammer digging or continuous hammering may overload the rear of the machine or damage the working device. This will significantly shorten the life of the machine.



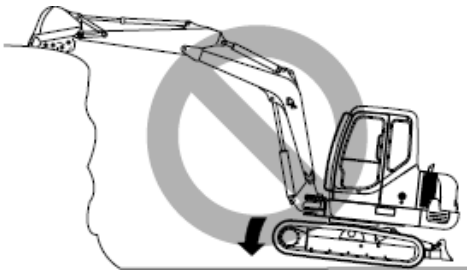
- Lifting operations

The machine shall never be used for lifting in principle. But if lifting is allowed, please use push type hooks of correct rating and certified lifting sling/shackle clips.



- Operation using machine lowering pressure

Do not operate by the lowering pressure of machine. For digging road surface with hard rocks, it is best to rocks them with other methods before digging, as this not only can reduce damage to the machine but also is more economical.



- Rock excavation operations

Use a break hammer to break rock and then perform excavation to prevent machine damage and improve work efficiency.

2 Machine vibration

Vibration on construction machinery is influenced by many factors, such as working mode, ground conditions, speed, etc., and the operator can also affect the actual vibration level to a large extent.

2.1 Guiding principles for reducing machine vibration levels

- Use the machine of the appropriate type and size according to the use, and equip it with appropriate options and working devices.
- Maintain the site and transportation roads in good condition.
- Remove all large stones or obstacles.
- Fill in all ditches and holes.
- Provide equipment and make a schedule to maintain site condition.
- Adjust the machine speed and travel path to minimize vibration levels.
- Avoid obstacles and uneven tablelands.
- Reduce speed when driving over uneven ground.
- Maintain the machine according to the manufacturer's recommendations.
- Check the braking system and steering system.
- Check the controllers, hydraulic system and their connections.
- Regularly maintain and adjust seats.
- Adjust the seat and suspension according to the weight and body size of the operator.

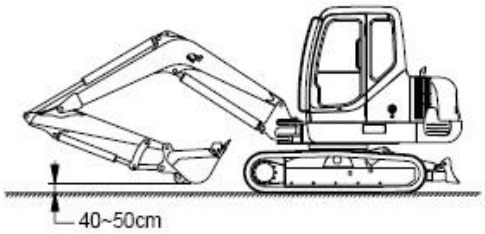
- Check and maintain the seat suspension and adjust the device of machine.
- Fasten the seat belt and adjust it correctly.
- Perform steering, braking, acceleration, gearshifting and movement of working device steadily.
- Minimize vibrations caused by long work cycle or long-distance travel.
- If possible, use the suspension system.
- If there is no suspension system available, reduce the speed to prevent vibration.
- When the construction sites are far apart, transport the machine.

2.2 Guiding principles for effectively minimizing back pain

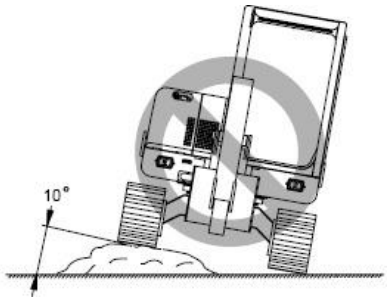
- Adjust the seat and controls to achieve the best operating posture.
- Take a break and reduce prolonged sitting posture.
- Avoid jumping off the cab or access system.
- Reduce repetitive handling and lifting of heavy weights.
- Maintain a suitable weight and good physical condition.

3 Operation under special working conditions

3.1 Travel



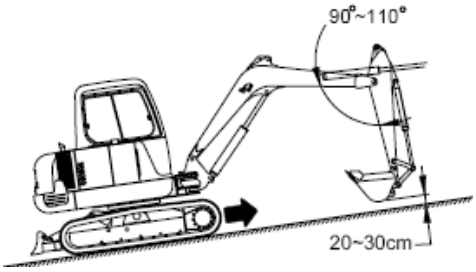
- The working device must be retracted and lifted so that it is 40cm to 50cm above the flat ground.



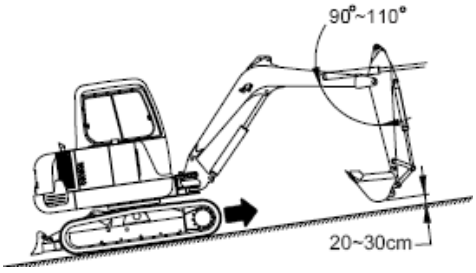
- Prevent the machine from tilting for more than 10° on the uneven ground.

- Drive thee machine at a low speed on uneven roadbeds, such as stone roadbeds or on uneven roads with large boulders. The drive wheels should be set forward for traveling at high speed.

3.2 Travel on slopes

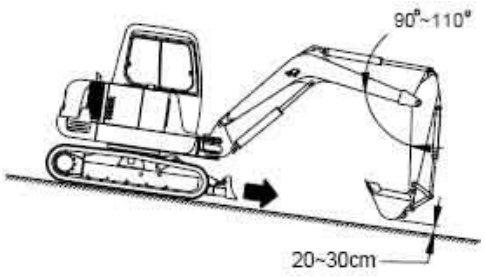


- For travel on a slope, keep the angle between the boom and the stick within 90° ~110°, and lift bucket 20cm ~ 30cm above the ground.
- Be careful when opening or closing the door on a slope. As the pushing/pulling force of the door may change rapidly, please keep the door closed and securely locked.
- Do not travel on slopes of 30° or above, as this poses a risk of roll-over.

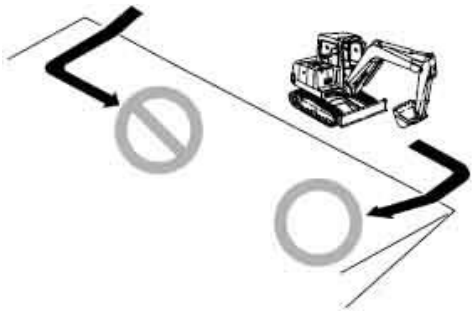


- For travel upwards a slope of 15° or above, keep the posture of the machine as shown in the figure. If the track shoes slip on slopes, insert the bucket

into the ground and pull the stick move the machine up with the power of the working device.



- For travel downwards a slope of 15° or above, keep the posture of the machine as shown in the figure and maintain a low speed.



- Neither reverse down a slope nor turn on the slope or drive across the slope, and instead, please turn on the flat ground, or drive downhill to the flat road and then bypass the slope.

- If the machine slips, immediately lower the bucket to the ground to stop the machine.
- Do not perform slewing action or operation of working device on the slope, otherwise the machine will lose its balance and tip over. Especially when the bucket is loaded with goods, no slewing action is allowed.

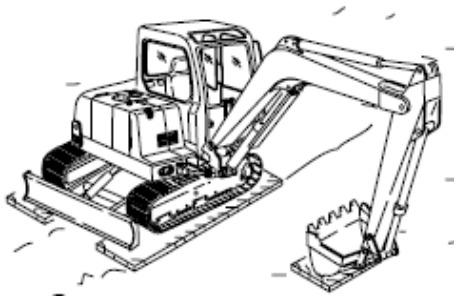
- When this is unavoidable, stack soil on the slope to level the ground, make the machine level and stable and operate with care.

- If the engine is suddenly shut down during travel on a slope, please place the travel control lever in "N" and lower the bucket to the ground, then restart the engine.
- If the engine is shut down on a slope, turn the ignition switch to the "I" position and operate the control lever to have the upper structure of the machine slew under its own weight. Therefore, do not operate the slewing function.

3.3 Moving out of muddy ground

Be very careful when working on muddy ground.

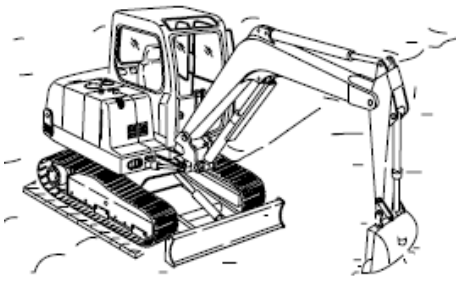
⚠ WARNING
When the boom or stick is used to support the machine, be sure to use the bottom of the bucket (instead of the bucket teeth). Keep the angle between the boom and the stick within 90°~110°. After working in water or moving out of muddy ground, apply grease to the pin shaft of the working device. Check the lubricating oil in the driving wheels, rollers and track drive box. If the lubricating oil is contaminated, replace it.



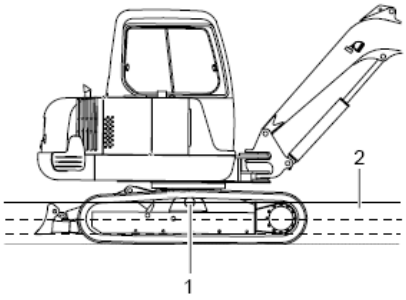
- When tracks on one side are entrapped in the mud

If tracks on one side are entrapped in the mud, support the entrapped track with the bucket, and place a wooden board under the track. If necessary, place a wooden board under the bucket.

- When tracks on both sides are entrapped in the mud



If tracks on both sides are entrapped in mud, place wooden boards under tracks on both sides. Push the bucket teeth into the ground, pull the stick in the same way as that for excavation, and push the travel control lever to the F position to drive the machine out of the swamp.



1. Upper track roller
2. Water surface

3.4 Travel in water

IMPORTANT! When the machine is driven out of the water, and the angle of the machine exceeds 15°, the rear of the upper structure body will enter the water, and the water will be kicked up by the radiator fan, which will cause damage to the radiator fan, so take special care in this case.

- The allowable water depth can reach the center of the upper track roller, and the upper track roller can not be completely submerged.
- After leaving the water area, ensure that all affected areas, such as pin shaft of bucket, are refilled with grease.
- Always clear the used grease, no matter whether the maintenance interval is reached or not.
- In addition, check if the oil in the travel drive mechanism is contaminated, and if necessary, replace the oil.

3.5 Operation in cold weather

⚠WARNING
Avoid direct contact of unprotected skin with very cold metal parts because the skin may be frozen on the metal parts. The hydraulic system of the machine will respond very slowly at an extremely low temperature, therefore, be very careful before the normal operating temperature of the system is reached, so as to avoid accidents.

Please refer to "5 Machine startup" in Chapter 3 for

suggestions on startup.

- Remove ice and snow on the window before operation.
- The snow-covered or frozen surface is very slippery. Therefore, when driving or operating the machine on such a surface, be extremely careful, and do not operate the control lever suddenly. Even a small slope can cause the machine to slip. Therefore, pay special attention when working on a slope.
- The frozen ground will become soft when the temperature rises, which will cause roll-over of the machine.
- If the machine is driven through deep snow, it may be turned upside down or covered by snow. Be careful not to drive the machine away from the road shoulder or get stuck in snow.

3.6 Working on sites with debris

For operation on sites that are polluted or harmful to health, always equip the machine with devices suitable for such sites, and shorten the maintenance interval of machine appropriately.

3.7 Operation under poor visibility condition

⚠WARNING
Check whether the machine can be operated safely when the visibility becomes poor. If the visibility is below the safety limit, stop the operation immediately and park the machine in a safe place after the visibility gets better.

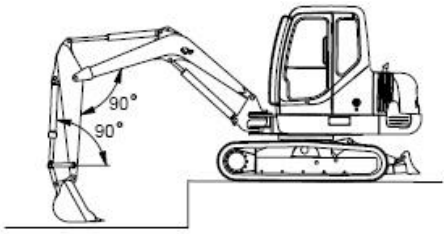
For working at night or during dark hours:

- Confirm that the excavator is equipped with sufficient work lights and reflectors.
- Be more careful during excavation at night, as it is more difficult to determine distance and height in the dark.
- Set up a road warning sign or turn on the top warning lamp (optional) in case of operation on roads.

4 Recommended operations

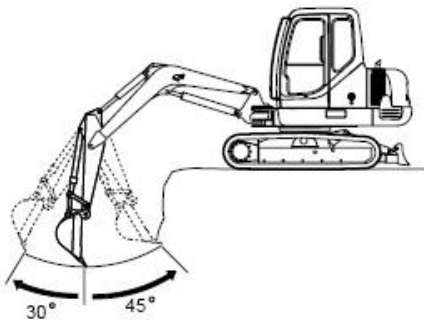
Excavator is a multi-functional machine that can be installed with various professional working devices to complete various types of operations. The following are some simple operations allowed by the excavator.

- Backhoe



Backhoe is suitable for excavation in a position lower than the machine.

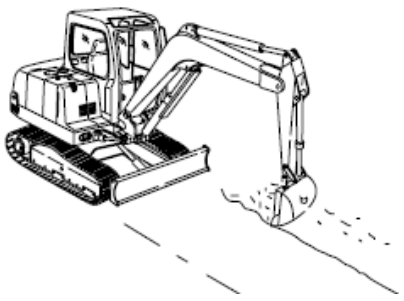
When the angle between the bucket cylinder and the connecting rod, as well as the angle between the stick cylinder and the stick are set at 90°, the work efficiency of the cylinders is the highest. Therefore, for the purpose of excavation, it is recommended to make use of such angles to improve work efficiency. The operating range of stick is 30° forward to 45° backward measured from the stick angle. From the perspective of digging depth, the difference may be small. When the cylinder is to be used, do not extend it to the end of its stroke.



- Face shovel

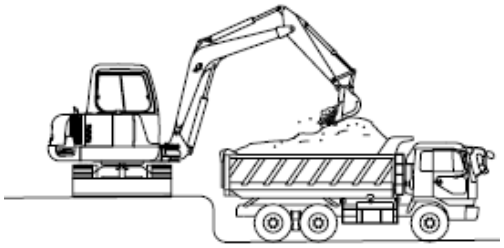
Face shovel is suitable for excavation at a position higher than the machine. Face shovel can be carried out by installing a bucket in the opposite direction.

- Trenching



Install a suitable bucket and adjust the track in the direction of trenching (track parallel to the ditch) so that the machine can work effectively.

To make a wide trench, first excavate the two sides of the trench, and then excavate the central area.



- Loading

When parking the dump truck, minimize the slewing radius and ensure a good visibility for the operator to improve the work efficiency.

In addition, perform loading at the rear of the dump truck instead of on the side, which makes the operator's work easier and improves work efficiency.

5. Track

Track shoe	Application	Safety precautions
A	Stony ground, general soil	Be sure to drive the machine slowly on the ground with pits or many obstructions.
B	Soft ground	High-speed traveling is only possible on flat ground. If it is inevitable to cross obstacles during traveling, reduce the travel speed to about half of the low speed. CAUTION! Do not drive the machine on uneven ground with large obstructions such as boulders and fallen tree trunks.
C	Extremely soft ground (muddy ground)	Only on grounds where category "A" and "B" track shoes are not possible to be used. High-speed traveling is only possible on flat ground. If it is inevitable to cross obstacles during traveling, reduce the travel speed to about half of the low speed. CAUTION! Do not drive the machine on uneven ground with large obstructions such as boulders and fallen tree trunks.
D	Pavement	Only on pavement CAUTION! They can not be used on uneven or extremely hard surfaces

Spec.	Category
350mm, 380mm steel track shoes	A
400mm steel tracks & rubber block track shoes	D

6 Optional multi-functional working devices

IMPORTANT! Select other working devices, if required, that are suitable for the machine.

6.1 Precautions for selecting working devices

When installing and using optional work devices, please read the operation manual for the relevant working devices and the relevant information in this manual.

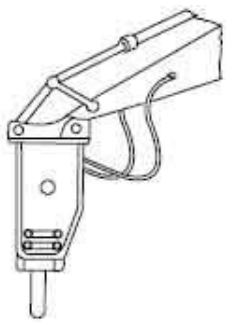
Do not use working devices not approved by Shandong Lingong Construction Machinery Co., Ltd. or its designated dealers, as this may cause safety problems, affect the normal operation of the machine, and shorten its service life.

Shandong Lingong Construction Machinery Co., Ltd. will not be responsible for any damage, accidents, or machine damage caused by the use of unauthorized working devices.

When optionally installing a breaker or hydraulic shear, please contact SDLG or dealers. For some models, it is necessary to install a specified number of solenoid valves in the pipeline and re-flash the program. To ensure the safety of your machine and personnel, and achieve higher work efficiency.

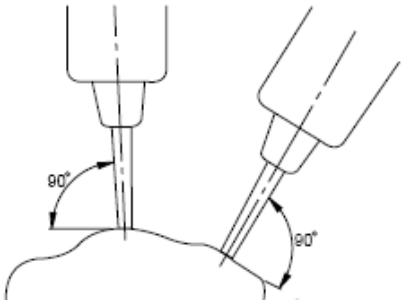
6.2 Hydraulic hammer

CAUTION: Do not install or use a hydraulic breaking hammer when the protective net is not installed



Main applications

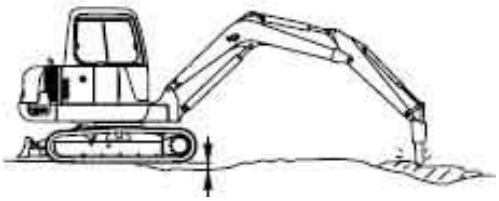
- Stone breaking
- Blasting
- Road repair



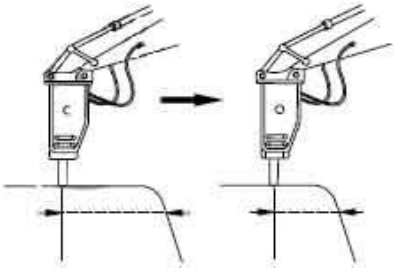
Hydraulic hammer is widely applicable for building demolition, road surface breaking, tunnel excavation, slag crushing, and stone breaking and cutting.

Install a protective equipment when a hydraulic hammer is installed for use.

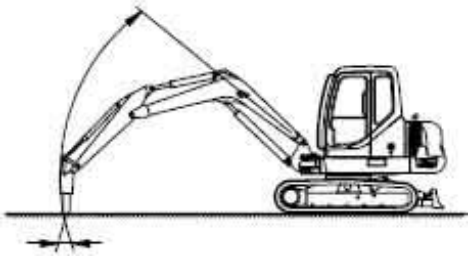
Press the hammer head at right angle on the working surface, as shown in the figure.



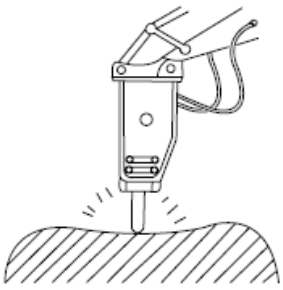
During striking, press the hammer against the working surface and lift the frame by approximately 5 cm. Do not lift the vehicle too high.



If the working surface is repeatedly struck several times but does not break within 1 min, move the hammer head to the nearby working surface and perform striking again.

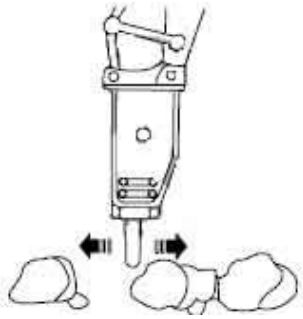


There is a slight deviation between the striking direction of the hammer head and the direction of the breaking hammer body. Therefore, it is necessary to adjust the direction of the bucket cylinder so that the direction of the hammer head and the breaking hammer body are always the same.

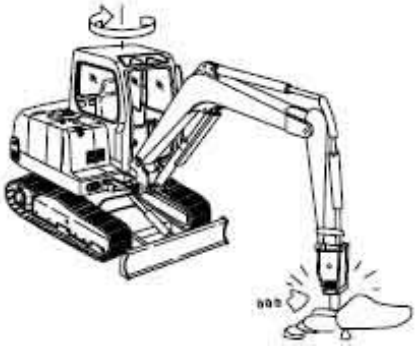


Press the hammer head against the working surface to avoid empty striking.

Precautions for operating hydraulic hammer

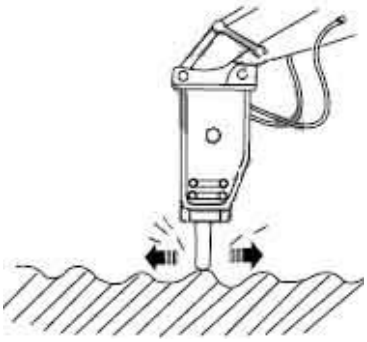


Do not extend the hydraulic cylinder to the end of its stroke, and instead, leave a clearance of approximately 5 cm.

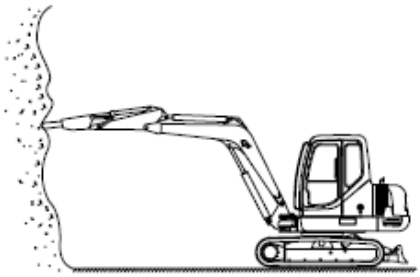


Do not throw the breaking hammer towards the rock or concrete.

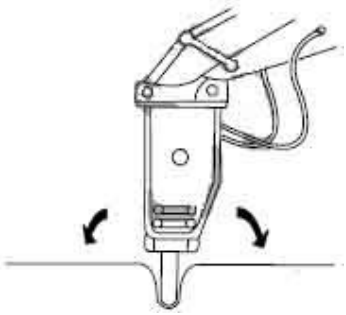
Do not move the hammer head during striking.



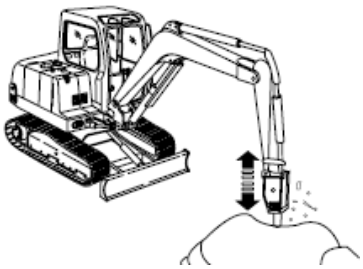
Do not strike horizontally or upwards.

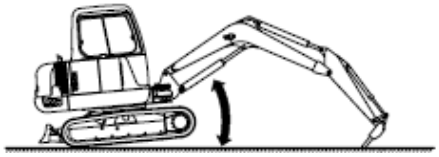


Do not twist the hammer head when drilling holes on the ground.



Do not use the hammer as a hoe.





When lifting the machine, do not extend the bucket cylinder to its maximum position.

7 Replacement of bucket

⚠WARNING

When knocking the pin shaft with a hammer, metal shavings may fly into the eyes and cause serious injury.

Therefore, always wear goggles, safety helmets, gloves, and other PPEs during this operation.

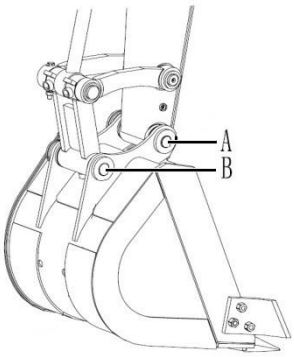
When removing the bucket, place the bucket securely.

If the pin shaft is knocked with force, it may fly out and harm personnel in the surrounding area. Therefore, check whether the surrounding area is safe.

When removing the pin shaft, do not stand under the bucket, and do not stretch feet or any part of your body under the bucket.

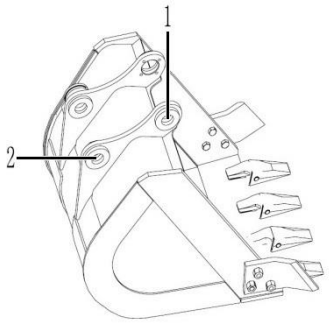
When removing or installing the pin shaft, be careful not to get your hands injured.

When aligning the holes, do not insert your fingers into the pin holes.



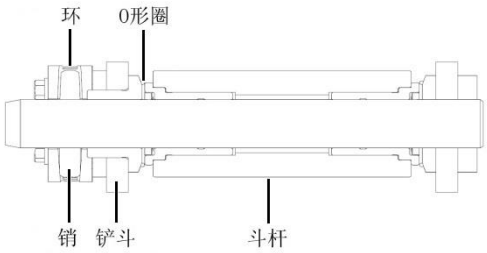
- Gently place the bucket on a flat surface.
- Remove the retainer ring and stop pin, pull out the pin shafts (A) and (B), and remove the bucket.

CAUTION! After removing the pin shaft, ensure that the pin shaft is not contaminated by soil. Be careful not to damage the dust seals installed at two ends of the shaft sleeve.

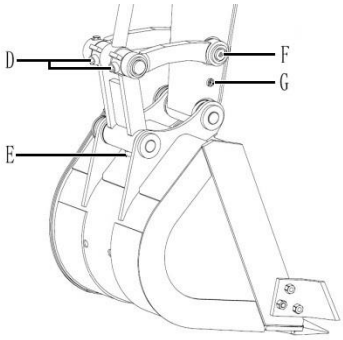


- Align the stick with the hole (1) and the connecting rod with the hole (2), and then install the lubricated pin shafts (A) and (B).

CAUTION! When installing the bucket, the O-ring is easily to be damaged, so the O-ring should be installed on the boss at the end of the stick. When knocking the pin shaft, move the O-ring down into the standard groove.



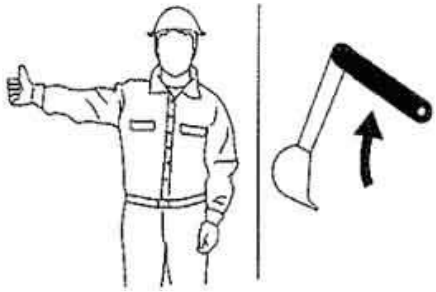
- Install the retainer ring and pin onto each pin shaft.



- Add grease through the grease nipples (D), (E), (F), and (G) (5 in total) on the bucket linkage.

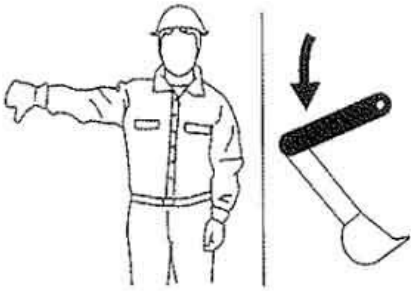
8 Gesture signals

Gesture signals are suitable for machine travel commanding during ground operations (including excavation and leveling) and when obstacles affect the operator's field of vision. If rapid lowering, lifting, or movement is required, the arm movements must be more vivid.



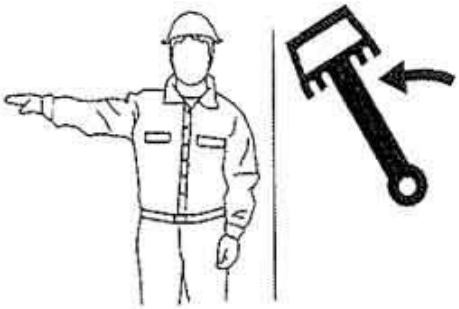
- Boom lifting

As shown in the figure, stretch one of the arms horizontally, clench the fist and extend the thumb, with the fingertip facing upwards.



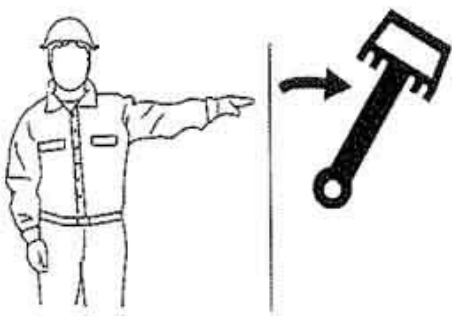
- Boom lowering

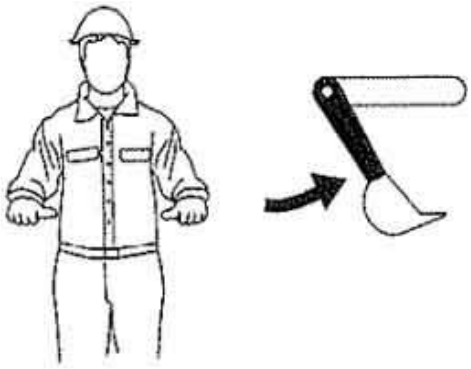
As shown in the figure, stretch one of the arms horizontally, clench the fist and extend the thumb, with the fingertip facing downwards.



- Slewing

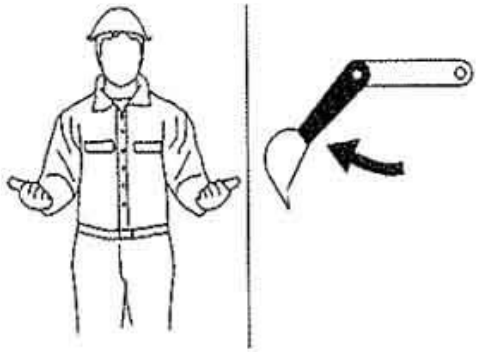
As shown in the figure, stretch one of the arms horizontally, clench the fist and extend the index finger to indicate the slewing direction.





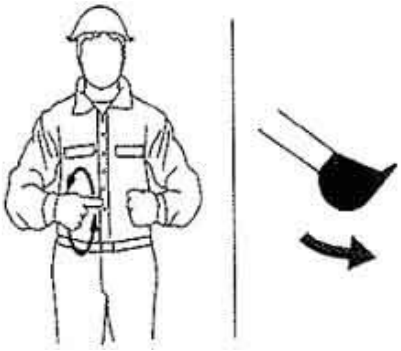
- Stick retraction

As shown in the figure, clench the fists of both hands, and extend the thumbs with fingertips inward.



- Stick extension

As shown in the figure, clench the fists of both hands, and extend the thumbs with fingertips outward.

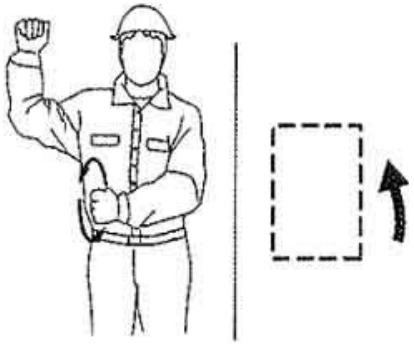


- Bucket retraction

As shown in the figure, clench the fist of one hand and keep stationary, clench the fist of the other hand and extend the index finger towards the clenched hand horizontally and draw a small circle on the vertical plane.

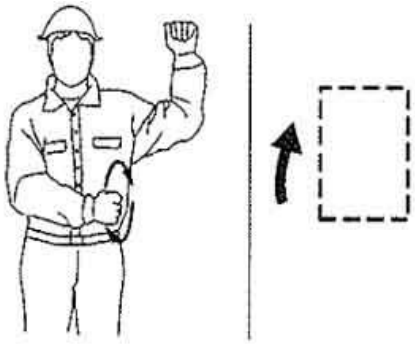
- Bucket extension

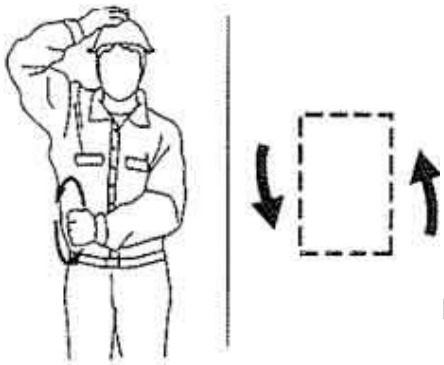
As shown in the figure, stretch one hand and keep stationary, clench the fist of the other hand and extend the index finger towards the stationary hand horizontally and draw a small circle on the vertical plane.



- Steering

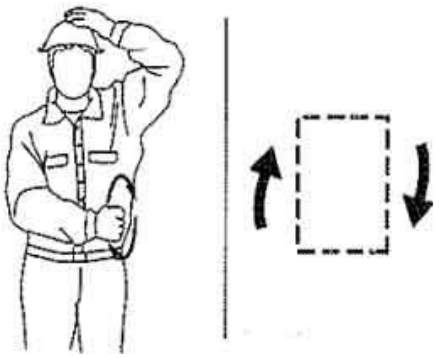
As shown in the figure, raise one arm and clench the fist to indicate the inner side of steering, and clench the fist of the other hand and draw a circle on the vertical plane to indicate the steering direction of track or wheel.

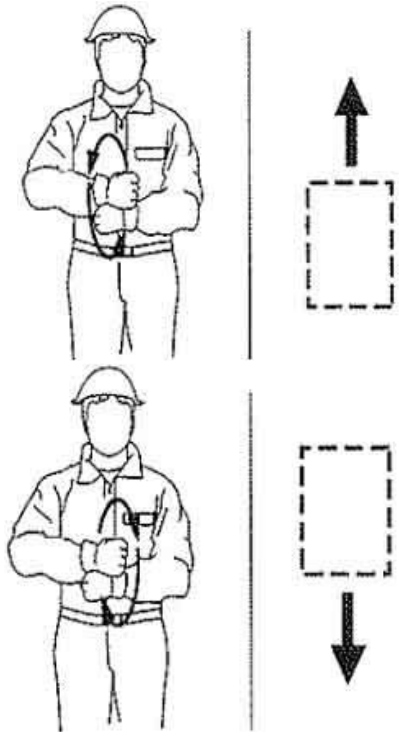




- In-situ steering

As shown in the figure, place your hand on top of the head to indicate the rotation of the track or wheel on the side or rear, while clench the fist of the other hand and draw a circle on the vertical plane to indicate forward rotation of the track or wheel on the other side.



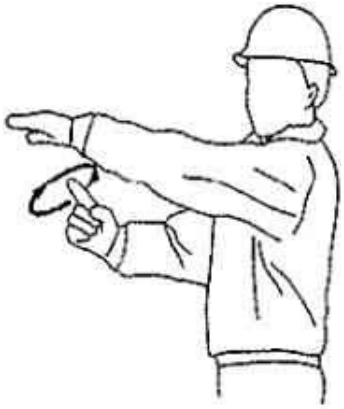


- Movement

As shown in the figure, clench the fists of both hands and raise them, and draw a circle on the vertical plane according to the rotation direction of the track or wheel.

- Moving distance

As shown in the figure, raise both hands and move them horizontally with the palms facing inward to indicate the moving distance.



- Slow movement

As shown in the figure, keep one hand stationary and place it in front of the hand that emits the movement signal to indicate slow performance of action.

- Stop

As shown in the figure, stretch one of the arms horizontally with the palm facing downwards, and then move the arm back and forth.

- Emergency stop

As shown in the figure, stretch both arms horizontally with the palms facing downwards, and then move the arm back and forth.

- Engine shutdown

As shown in the figure, move the thumb or index finger across the front of the throat.

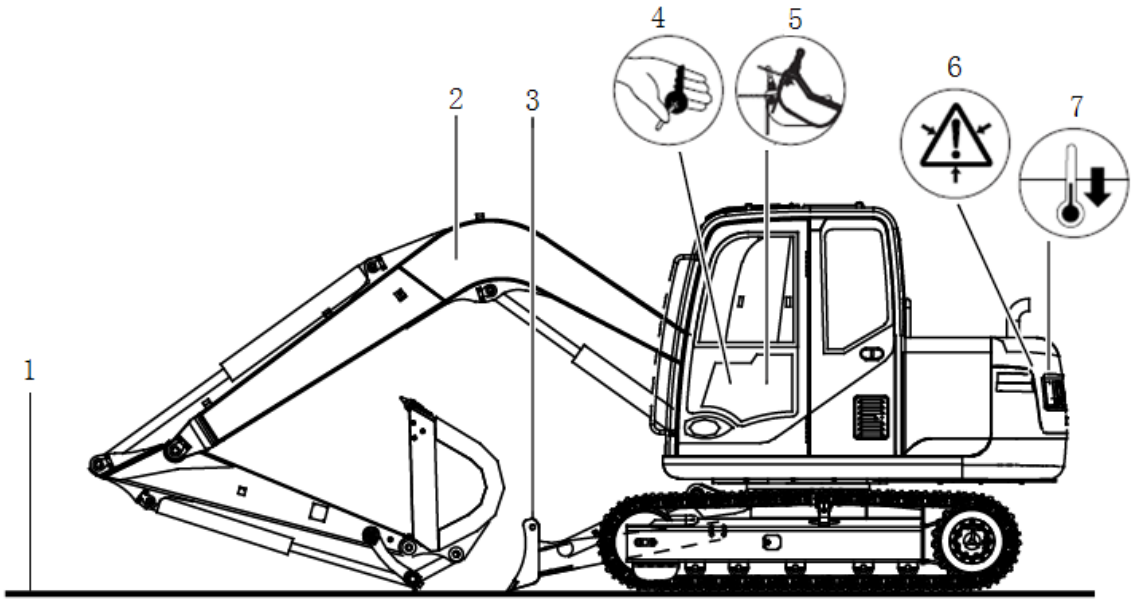
Chapter 5 Safety during maintenance

⚠WARNING
If maintenance is required before cooling of the machine, be extremely careful, so as not to get burned by hot liquids and parts.

The general safety provisions are covered in this chapter and shall be followed during inspection and maintenance of the machine. The safety provisions and warnings for operation of the machine are described in different chapters.

1 Maintenance location

Before maintenance, park the machine on a flat ground, and make preparations for maintenance as follows:

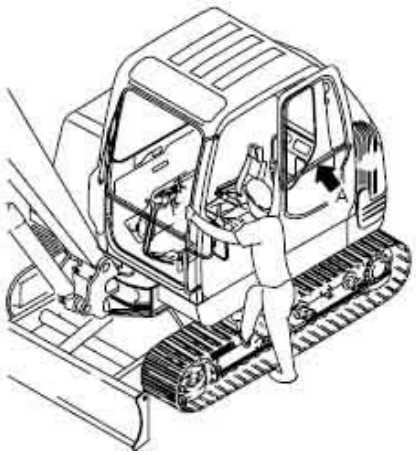


- Place the machine on a flat and solid ground.

- Lower the working device to the ground.
- Lower the bulldozer on the ground.
- Shut down the engine and remove the ignition key.
- Place the safety lock control lever in the “locked” position, refer to "3.5 Safety lock control lever” in Chapter 2.
- Release the pressure in the pipe and container gradually to avoid dangers.
- Wait for the machine to fully cool down.

2 Access or climbing of machine

⚠WARNING
Always take care.



- Check the handrails or steps before getting on or off the machine. If there is oil, lubricant or mud, remove it promptly to avoid slipping when you get on or off the machine.
- Do not grip any control levers when getting on or off the machine.
- Never jump on or off the machine. Do not get on/off the machine when it is moving.
- When getting on or off the machine, use the steps and handrails to support your body, and contact with the machine on at least three points (i.e. use two hands and one foot or one hand and two feet) to ensure that your body doesn't shake.
- Always face towards the machine.
- Do not use the outer handle A of the cab as a handrail for getting on or off the machine because it is intended for closing of the cab door.

3 Safety regulations

3.1 Prevention of personnel injury

- It is very dangerous to adopt incorrect maintenance methods. Make sure that you have sufficient knowledge, correct information and suitable tools and equipment for maintenance of the machine.
- Read all labels, signs and marks on the machine and the Operation and Maintenance Manual before maintenance of the machine. Important information about machine maintenance is contained in the instructions.
- Before maintenance, paste “No Operation” sign or other similar warning sign on ignition switch and instrument panel, Prevent others from starting the engine or operating the control lever. Otherwise, the operator may incur injury or even death.
- When working on the machine, do not wear loose clothes such as headscarf or jewelry which may be caught by moving parts, otherwise personal injury will be caused.
- Be sure to wear safety hat, goggles, gloves, protective shoes and other required PPE during repair.
- Ensure that enough ventilation equipment is provided when starting the engine indoors.
- Do not stay in front of or behind the machine when the engine is running.

- Shut down the engine and make sure that the tools or other articles which may cause damage are not left in the machine before opening the engine hood, radiator housing, etc.
- Open all pressure vessels carefully, and release any residual pressure. Residual pressure is still accumulated in the system after the engine is shut down. In case of opening before release of the pressure, the fluid will be ejected under a high pressure. Similarly, the tightness of leaky connections and joints can be checked only after the pressure is released from the system completely.
- Check for leakage with paper or wood chips rather than by hand directly.
- Make sure that the surfaces to be stepped on, handrails and non-slip surfaces are free of oil, diesel, dust, ice, etc. Do not step on the machine surfaces that are not allowed for this purpose.
- When maintaining the machine, be sure to shut down the engine, unless otherwise stated on the label or in this manual.
- Any unauthorized modification may lead to dangers. Before modification of the machine, be sure to consult us or our designated dealers. Otherwise, we will not bear responsibility for any damage caused therefrom.

If one of the following conditions was satisfied, the modification will be formally permitted:

1. Auxiliary devices, accessories, assemblies, accessories or software are produced, distributed or licensed by Shandong Lingong Construction Machinery Co., Ltd.
2. The modification shall be made with the written permission of SDLG's technique department.

Maintenance safety with engine running

To prevent personal injury, do not perform maintenance with engine running, and if such maintenance is necessary, follow precautions below:

- Assign an operator to sit in the driver' seat, and maintain a smooth communication with all maintenance personnel, and ask the operator to be ready to shut down the engine at any time.
- Do not touch the exhaust tailpipe, muffler or other hot parts, so as to avoid scalding.
- Be more careful if the operation point is near a rotating part, as there is risk of catching by such rotating part.
- Do not touch any control lever. If it is necessary to operate a control lever, send a signal to other personnel concerned and warn them to walk to a safe place.
- Prevent any tool or any body part from contacting fan blade or fan belt. Otherwise, serious injury may occur.
- Do not adjust an unfamiliar part without investigation.

3.2 Prevention of machine damage

- It is very dangerous to adopt incorrect maintenance methods. Make sure that you have sufficient knowledge, correct information and suitable tools and equipment for maintenance of the machine.
- Hoist or support the machine or its parts using the equipment with a sufficient lifting or supporting capacity.
- All lifting devices must comply with the corresponding national regulations. We will not bear responsibility for any failure to use the lifting devices, tools or working methods specified in this manual.
- Release the pressure from the hydraulic system before working.
- If the machine is used in contaminated areas (in contaminated environments and/or unsanitary areas), maintain it as per special methods. Additionally, always observe special safety regulations when maintaining the machine.
- In case of repair or replacement, use the parts designated by us; in case of maintenance, use the oil and grease designated by us, and select the oil and grease with proper viscosity according to the ambient temperature.

- Never use oil of different brands together. If only one type of oil is provided and it is different from the oil being used, change the current oil completely.
- When pouring/draining oil or fuel, avoid spillover. In case that the fluid cannot be drained into the container directly, use a pump or connect a hose to drain fluid safely. Oil spilled onto the ground will pollute the environment and cause a fire. Any used oil and other fluids shall always be disposed of by an authorized waste disposal agency.
- Make sure that all covers on the machine are closed before starting the engine.
- For measures related to electric welding, refer to "11.2 Precautions during welding" in Chapter 6.

3.3 Preventing environmental pollution

- In case of maintenance of the machine, take into account the possibility of environmental pollution. Oil and other fluids harmful to the environment cannot be drained directly.

CAUTION: All waste shall be handed over to a qualified waste disposal agency.

- When draining oil and other fluids, collect them in a suitable container, take splash-proof measures, and hand them over to a waste disposal agency.
- Do not discard the used battery, because it contains substances harmful to the environment and health. Hand it over to a waste disposal

agency.

- Do not discard the rags, gloves and bottles stained with oil directly, otherwise the environment will be polluted. Hand them over to a waste disposal agency.
- When the product needs to be scrapped, please follow the local laws, regulations and environmental protection policies.

4 Fire prevention

4.1 Fire prevention measures

⚠WARNING
If the machine is used in an environment prone to fire, e.g. in an explosive environment, special equipment shall be provided. Be careful when cleaning the machine using a high-pressure nozzle, because electrical components and wires may be damaged even at very low water pressure and temperature. Protect the electrical components and wires properly. Meanwhile, shut down the engine and turn off the main power switch.

- Never place other unrelated matters around the electrical wires of the machine to avoid friction between them, which may cause short circuits in the wires, and even a fire.
- Be alert to fire hazards. Learn how to use the fire extinguisher and know where it is stored so that you can find it if required.
- When refilling or opening the fuel tank, never smoke near the machine and ensure that there are no open flames around the machine.
- Do not use diesel to clean the machine because it is flammable (except for some smaller components), and instead, use an approved solvent.

- Some solvents can cause skin rashes, so minimize inhaling these solvent vapors.
- Most solvents are flammable and should be stored properly to avoid a fire hazard.
- Keep the maintenance site clean. Cleanliness is essential to the normal operation of all systems in the machine. If oil or water is accumulated, the ground and steps will be slippery, and the relevant electrical systems and power tools will also be affected adversely. Clothes covered with oil or cloth dipped in grease will bring about serious potential fire hazards.
- Check the machine and equipment on a daily basis to make sure that there is no dirt and oil on the guard plates, which can reduce the risk of fire and help you find out the faulty or loose parts more easily.
- When working in sensitive environments (e.g. sawmill, garbage dump or similar places), keep the machine clean. When operating the machine in such environments, equip the machine with proper facilities (e.g. muffler cover, radiator partition, high-power fan or special filter) to reduce the possibility of accumulation of flammable materials.
- Ensure that any fire extinguishing equipment on the machine is in the working state. Some additional devices can also be used by the operator for fire fighting in the event of a fire, but

they cannot substitute the fire prevention work that shall be done by the operator.

- Check the wires especially when they are not connected with fuses, and confirm that they are not and will not be damaged due to friction.
- After disconnecting the wires that are not connected with fuses, check them, and confirm that they are connected and clamped in such a way that they aren't affected by friction. Meanwhile, ensure that these wires don't rest on oil and fuel pipes.
- Check the fuel hose, hydraulic system and brake hose, and confirm that they are not damaged due to friction.
- Only carry out welding and grinding in clean places. Do not weld or grind the parts filled with compressed air or flammable fluids (e.g. fuel tank and hydraulic pipe). Be careful to weld and grind the parts near flammable objects. Always have fire extinguishers available.
- Do not discard batteries, plastics and other materials that may endanger the environment. Ensure that they are disposed of in such a way that the environment will not be polluted.

4.2 Measures in the event of a fire

Take the following measures immediately after a sign of fire is found:

- Drive the machine to a safe place to prevent the fire from spreading.
- Lower the working device to the ground.
- Turn the ignition switch to “OFF”, and leave the cab.
- Turn off the main power switch.
- Try to extinguish the fire. If necessary, call the fire department for rescue.

4.3 Measures after fire is extinguished

Take the following protection measures when handling the machine which was damaged by fire or high temperature:

- Wear thick rubber protective gloves and goggles.
- Do not touch the parts by hand directly, so as not to get burned. Use lime water for thorough cleaning.
- Dispose of hot fluorocarbon rubber. Refer to “5.3 Heated fluorocarbon rubber”.

5 Disposal of hazardous materials

5.1 Heated paint

⚠WARNING
The paint will be decomposed and produce irritating compounds when heated. Working in this environment for a long time is very harmful to health.

Heated paint will emit toxic gas. Therefore, remove paint in areas 10cm (4in) away from the part subject to welding, grinding or gas cutting, otherwise your health and the welding quality will be affected adversely.

Methods and precautions for removal of paint

- Powerful blowing. In case that this method is adopted, wear respiratory protective equipment and goggles.
- Paint remover or other chemicals. In case that this method is adopted, use a portable air pump, and wear respiratory protective equipment and goggles.
- Grinding machine. In case that this method is adopted, use a portable air pump, and wear respiratory protective equipment, gloves and goggles. Do not discard these devices after use. Hand them over to a qualified department for disposal.

5.2 Heated rubber and plastic

CAUTION! When polymeric materials are heated, the compounds that have a bad effect on your health and the

environment may be formed.

- Do not weld or cut the parts near the polymer materials (plastic and rubber parts) that aren't subjected to thermal insulation in advance.
- Do not burn polymer materials when removing them.
- Be careful when handling the machine that has been burnt or exposed to high heat.
- Always use gloves, goggles and respiratory protective equipment.

5.3 Heated fluorocarbon rubber

⚠WARNING
When fluorocarbon rubber is heated to a high temperature, it will be decomposed into hydrogen fluoride and hydrofluoric acid which are very corrosive to the skin and respiratory tract.

Take a series of measures to handle the machine that has been burnt or exposed to high hear:

- Wear thick rubber gloves and goggles.
- After rubber gloves, rags, etc. get into contact with heated fluorocarbon rubber, wash them with lime water and discard them.
- Decontaminate the surrounding area thoroughly and adequately with hydrated lime after the parts that may be made of fluorocarbon rubber are subjected to high heat.
- Dispose of all seals (O-rings or oil seals) as fluorocarbon rubber products for the purpose of prevention.
- Note that hydrofluoric acid may remain on the machine for several years after the fire.
- Seek medical care immediately in case of swelling, redness or tingling after contact with heated fluorocarbon rubber.

CAUTION: It may take several hours for any symptom to appear.

- As hydrofluoric acid cannot be washed away from the skin, treat it with medicine, and seek medical

care.

5.4 A/C refrigerant

CAUTION! The workshop disposing of refrigerants must have been qualified r approved, and its responsible personnel must have corresponding qualifications.

⚠WARNING
If exposed skin comes into contact with refrigerant, frostbite is likely to be caused. Refrigerant may be heated into gas, which can harm the lungs and nervous system.

IMPORTANT! Do not use refrigerants of different types together.

If exposure to leaked refrigerant occurs, take the following measures:

- If there is suspicion of refrigerant leakage, leave the hazardous area and contact a qualified workshop for repair.
- The gas formed by heating of refrigerant can harm the lungs and nervous system. Even in cases where the gas has a too low concentration to be smelt, it is important to immediately leave this area; if the concentration is too high, the victim may be anesthetized and should be immediately moved from the hazardous area to a place with fresh air. If symptoms persist, please seek medical attention.
- Liquid refrigerant may cause frostbite. If this occurs, warm the affected area with warm water or warm clothing. If the symptom persists, please

seek medical treatment.

- If liquid refrigerant is splashed into eyes, rinse with flowing warm water and then seek medical attention.

5.5 Battery

- Do not smoke near the battery which will release explosive gas.
- Make sure that metal objects (such as tools, rings and watch bands) don't contact the battery poles, otherwise personal injury or fire may be caused.
- Make sure that protective components are always installed on the battery poles.
- Do not place the battery upside down or horizontally or subject it to any mechanical shock

⚠WARNING
The battery contains sulfuric acid which is very corrosive to the skin.

or heavy load.

- Do not connect a discharged battery with a fully charged battery in series, otherwise explosion may be caused.

- Disconnect the ground wire first when removing the battery and connect it last when installing the battery, so as to reduce the risk of sparks.
- The battery contains substances that are harmful to health and pollute the environment. Therefore, dispose of the waste battery in accordance with relevant local/national regulations.
- For battery charging, refer to "11.1 Charging the battery" in Chapter 6.

Chapter 6 Maintenance

1 Cleaning of machine

The machine shall be cleaned regularly.

IMPORTANT! Avoid cleaning the machine with corrosive cleaners or chemicals to prevent damage to the paintwork of the machine.

CAUTION! Clean the machine parts with flammable materials such as wood chips, leaves and paper on a daily basis, and remove fuel and lubricating oil from the machine to ensure that there are no oily cloth or other flammable articles.

Precautions for cleaning of the machine:

- Make sure that the water temperature isn't higher than 60°.
- Use a soft sponge.
- Lubricate the machine again after cleaning.
- Repair paint if necessary.

2 Maintenance of paintwork

The machine is more prone to rust in a humid and corrosive environment. It is recommended that the paintwork of the machine should be maintained every six months.

3 Cleaning of cab

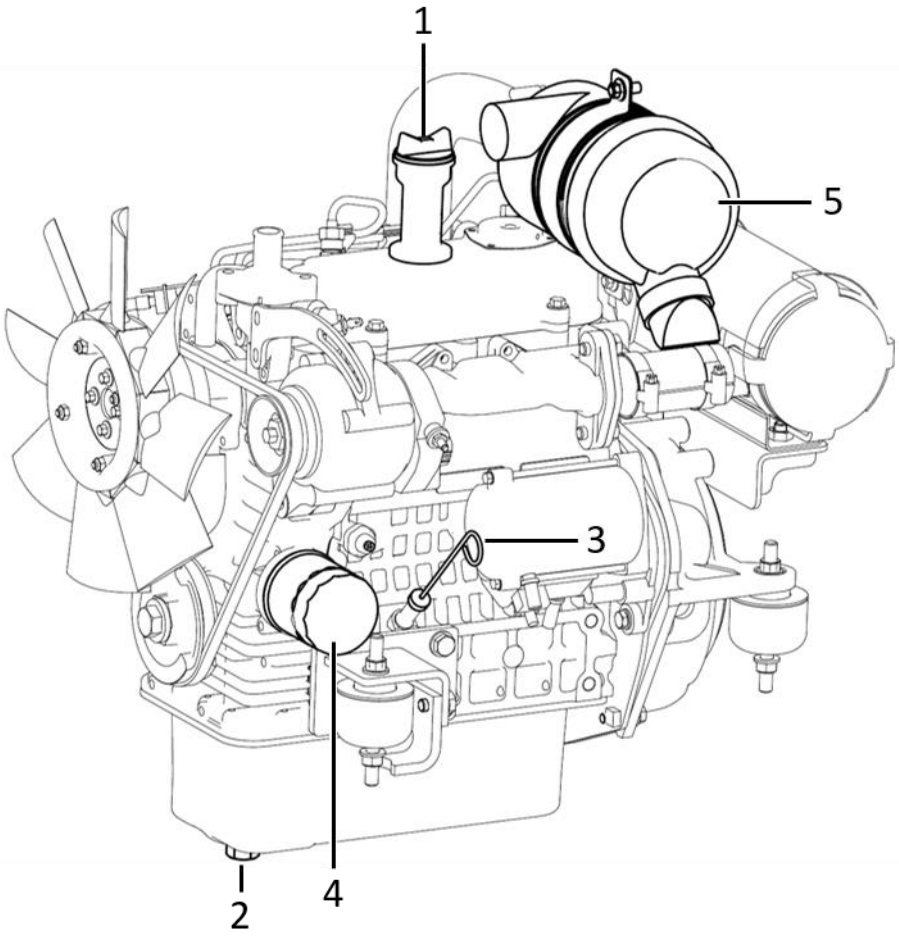
Clean the cab every day if the machine works in an environment with heavy dust or potential fire hazards.

Check and clean the machine at least once a week in case of operation in other environments.

⚠WARNING
When cleaning the cab, do not keep the engine running, because rotating parts will cause personal injury.

- It is recommended to clean the machine before parking after the work is completed.
- Wear personal protective equipment such as goggles, gloves and breathing mask.
- After cleaning, check for leakage, and repair the leaky parts if any.
- Close all covers.

4 Engine



1. Oil filler 2. Oil drain plug 3. Oil dipstick

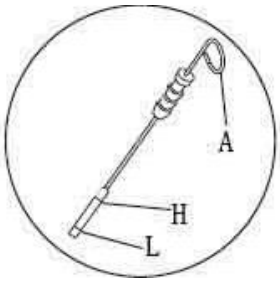
4. Oil filter element 5. Air filter

Kubota engine

4.1 Checking the engine oil level

Check the engine oil level every day.

- Place the machine in the maintenance position. Refer to "1 Maintenance position" in Chapter 5.
- Open the engine hood.
- Pull out the oil dipstick A, wipe it clean, insert it, and then pull it out (at least twice).
- If the oil level is above the H mark, find out the cause and do troubleshooting. If there are no abnormalities, drain excess oil from the drain plug at the bottom of the engine and then check the oil level.
- If the oil level is between "H" and "L", it indicates that the oil level is normal. If the oil level is below the "L" mark, add the specified oil through the oil filler. For the selection of oil, refer to "19 Selection of oil products" in this chapter.
- If the oil level is normal, refit the dipstick and close the engine hood.



H Max. oil level
L Min. oil level

IMPORTANT! If the oil level is to be checked after the engine is running, wait for 10min after shutting down the engine. If the machine is tilted, level it before inspection.

4.2 Replacing engine oil and oil filter element

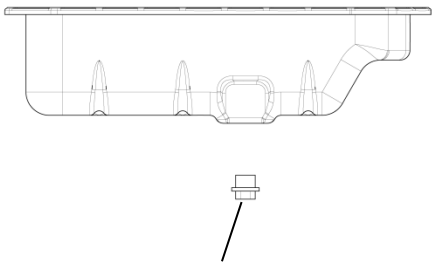
Replace the oil and oil filter every 250h (after first 50h of operation for Kubota engine).

If the machine is operating in an acidic or dusty environment, the replacement interval should be shortened. The oil filter is disposable, which cannot be cleaned and

must be replaced.

⚠WARNING
Be careful when replacing oil, as hot engine oil can cause skin scalding if no protective measures are taken.

- Start the engine, run it at idle speed, and when the oil temperature reaches 80℃, shut down the engine.
- Place the machine in the maintenance position. Refer to "1 Maintenance position" in Chapter 5.



Drain plug

- Unscrew the drain plug at the bottom of the engine and connect a connector and a matching drain hose. The connector and hose are provided as driver's tools, and the oil is drained into in a container.

CAUTION! When handling waste oil and fluids, pay attention to protecting the environment!

- Secure the seat to the flip up position, open the small cover, open oil filler cap to accelerate the draining speed.
- Drain the used oil completely, remove the joint and drain hose, and screw on the drain plug.
- Turn the oil filter counterclockwise with a wrench.
- Clean the mounting surface of the oil filter.
- Fill the filter element with oil, place a new gasket on the new filter, and at the same time, apply an appropriate amount of oil to the surface of the gasket. Rotate the filter to the right to install it onto the engine until the

surface of the filter comes into contact with the engine. Then tighten it with a wrench by 3/4 turns.

IMPORTANT! Mechanical overtightening may damage the thread or the seal of the oil filter element.

IMPORTANT! After replacing the filter element, run the engine at a low idle speed for at least 1min to ensure that it is lubricated before being put into operation.

- Fill the engine with oil of specified amount from the oil filler and tighten the filler cap.
- Run the engine at idle speed for about 5min, and then shut it down, and check the oil filter and the drain plug for leakage.
- About 10 min after engine shutdown, check the oil level again, and top up when necessary.

4.3 Adjusting intake/exhaust valve clearance

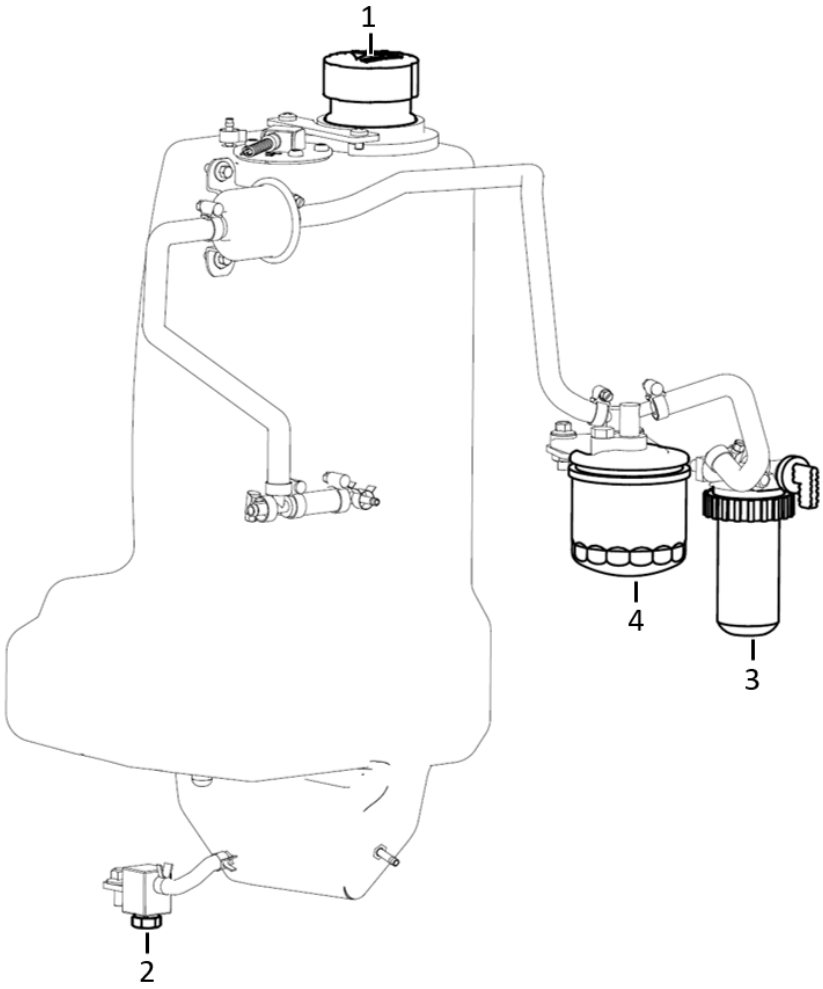
Check and adjust the valve clearance every 1000 h.

To ensure the accuracy of valve opening and closing time, it is necessary to adjust its clearance correctly. Otherwise, it will cause excessive noise during engine operation, affect engine performance, and cause machine damage. The valve clearance shall be adjusted by after-sales service personnel designated by Shandong Lingong Construction Machinery Co., Ltd.

5 Fuel system

IMPORTANT! Clean fuel is very important for guaranteeing the trouble-free operation of diesel engine.

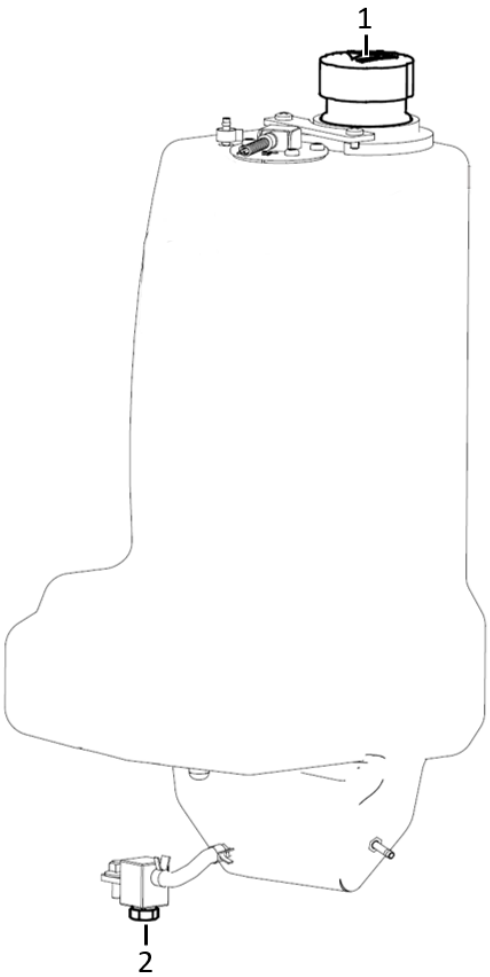
IMPORTANT! Before removing the fuel filler cap, be careful to clean the surrounding area and avoid fuel splashing during refueling. In cold season, keep the fuel tank full to prevent condensate water in it.



1 Fuel filler 2 Fuel drain port 3 Water separator

4 Fuel filter

Kubota engine



Yanmar engine
1 Fuel filler
2 Fuel drain port

5.1 Refueling and checking fuel level

The operator can check the fuel level at all times through the fuel level gauge on the monitor. If the pointer falls in the red area, add the specified fuel. Before refueling, it is recommended to rotate the upper structure for an appropriate angle relative to the undercarriage, so that operator can stand on the track for refueling after the machine is stopped. For the selection of fuel, please refer to "19 Selection of oil products" in this chapter.

5.2 Sediment discharge

Discharge sediment every 50 h.

- Place a container under the drain valve.
- Open the fuel filler cap.
- Connect the drain hose, open the drain valve at the bottom of the fuel tank, and drain all sediment into a container.

IMPORTANT! Dispose of waste oil and waste fluid in an environmentally-friendly manner!

- Remove the drain valve, and close the valve and filler cap.

5.3. Replacing the secondary fuel filter

⚠WARNING
The fuel is hot immediately after machine operation, and be sure to wait for the fuel to cool down. Avoid open flames.

Replace every 250 h, and if fuel of inferior quality is used, shorten the replacement interval. (Kubota engine)

Replace every 500 h, and if fuel of inferior quality is used, shorten the replacement interval. (Yanmar engine)

- Place a container to collect the fuel in the filter.
- Close the fuel cock of the water separator (set to "OFF" position).
- Remove the fuel filter with the filter wrench.

IMPORTANT! Dispose of filters and fuel in an environmentally-friendly manner!

- After thoroughly cleaning the filter cover, fill the new fuel filter with clean fuel.
- Apply engine oil to the new O-ring and attach it to the filter cover. When installing, rotate the filter 2/3 turns first, and then slowly rotate it by hand.

CAUTION! The filter shall be tightened appropriately: if the filter is overtightened, the O-ring may be damaged and fuel leakage may occur thereafter; if the filter is undertightened, the fuel will also leak out of the O-ring.

- After installation, open the fuel cock of the water separator (set to "ON" position).

5.4 Draining water from water separator

- Prepare a container and place it under the drain plug.
- Close the fuel cock of the water separator (set to "OFF" position).
- Release the drain plug and drain the accumulated water inside.
- Tighten the drain plug.
- Open the fuel cock (set to "ON" position).
- Bleed the fuel system

5.5 Bleeding the fuel system

Note! Air in the fuel system can cause difficulty starting or abnormal operation of the engine. After draining the water and sediment in the water separator and replacing the fuel filter, it is necessary to ensure that the air in the fuel system is discharged. The engine of this machine is equipped with automatic bleeding function, and thus no manual bleeding is required.

6 Air filter

The air cleaner can prevent ingress of dust and other impurities into the engine. The degree of engine wear largely depends on the cleanliness of the intake air. Therefore, the air cleaner shall be checked regularly and maintained properly.

IMPORTANT! Do not start the engine without an air cleaner or with a damaged air cleaner under any circumstances.

Regularly check the hose and pipe connections from the air cleaner to the engine suction pipe for leakage.

Prepare a spare air cleaner, and store it in a dust-proof place.

6.1 Cleaning air filter ash valve

Clean the ash valve every day.

Press the ash valve to discharge the dust or remove the ash valve from the air filter to discharge the dust and clean it.

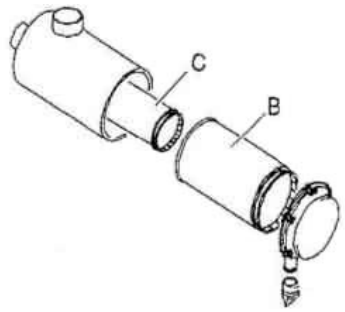
6.2 Cleaning and replacing filter element

When the air filter blockage warning indicator lamp on the monitor is on, it is required to clean or replace the filter. Even if the warning lamp is not on, the outer filter element should be replaced at least every 500 h. When the outer filter element is replaced for the third time, the inner filter element should also be replaced. If damaged, the filter element must be replaced regardless of whether the replacement interval is reached or not.

IMPORTANT! The replacement interval of the filter

depends on the working environment of the machine. If the working environment is harsh, the replacement interval should be shortened.

CAUTION! The inner filter element does not need to be cleaned, and only needs to be replaced.



Clean the outer filter element

- Release the snap ring.
- Remove the air filter cover and gently rotate the outer filter element B back and forth to slowly remove it.
- Clean the filter element mechanically:

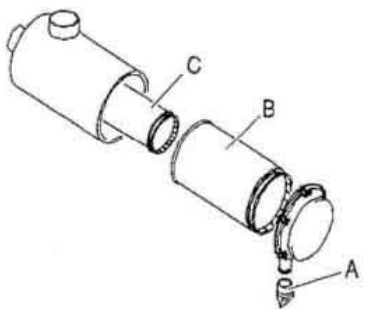
Put the filter element against a soft and clean surface and carefully tap the end of the outer element.

CAUTION! Do not put the filter element against a hard surface for tapping.

- Clean the filter element with compressed air:

Use clean and dry compressed air with a maximum pressure of 500 kPa (5 bar) (73 psi/in^2) for cleaning. Keep the distance between the nozzle and the filter not less than 3-5 cm (1-2 in). Blow the filter clean along the internal folding area.

CAUTION! After cleaning, check that the filter element is not damaged. For this purpose, it is recommended to check with a lamp in a darkroom, and even if there are holes, scratches, cracks, or other damages are very small, replace the filter element.



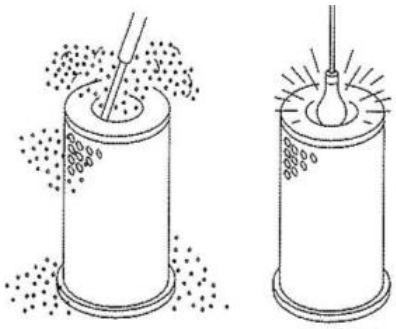
Replace the outer filter element

- Take out the outer filter element and follow the

steps in "Cleaning of outer filter element".

- Clean the inner surface of the housing with a damp cloth, and pay special attention to the sealing surface of the housing and the outlet pipe.

IMPORTANT! Do not use compressed air to clean the housing.



- Check that the rubber ring on the new filter element has good elasticity, and then install the new filter element into the housing.

Replace the inner filter element

The inner filter element will, when the outer filter element is damaged, serve as a protective filter. If the warning lamp is on with the outer filter element replaced or cleaned, it indicates that the inner filter element is blocked.

CAUTION! The inner filter element can only be replaced and cannot be cleaned.

- Follow the steps in "Cleaning of outer filter element" to remove the outer filter element.
- Clean the filter housing.
- Carefully remove the inner filter element C from the housing.
- Wipe the mounting surface of the inner filter element with a clean and damp cloth.
- Install a new filter element and then install the outer filter element.
- Install the end cover.

CAUTION! When removing the inner filter element, take great care and operate accurately in place to prevent foreign matters from entering the engine. Carefully check if the new inner filter element is installed correctly.

CAUTION! Do not remove the inner filter element unless it is to be replaced.

7 Cooling system

If the coolant level is normal but the engine temperature becomes high, the radiator must be cleaned.

IMPORTANT! Be careful not to damage the chip of the radiator.

7.1 Checking the coolant level

Check the coolant level every day.

⚠WARNING
The coolant is very hot immediately after the engine stops, and do not open the radiator cap until the coolant cools down. Open the radiator cap slowly to release the internal pressure.

Open the engine hood.

- Check the coolant level of the expansion tank. When the engine is in a cold state, the coolant level in the expansion tank should the aligned with "LOW" mark; when the engine is in a hot state, the coolant level in the expansion tank should be at or near the "FULL" mark.
- Add the coolant to the specified level from the filler of expansion tank if it is insufficient.

IMPORTANT! It is recommended to use the special coolant of SDLG, and it is strictly prohibited to use coolants of different brands to prevent radiator blockage.

IMPORTANT! Never use water as the coolant.

- Tighten the expansion tank filler cap.

IMPORTANT! Do not fill a hot engine with cold coolant,

otherwise the cylinder block and cylinder head may be cracked.

CAUTION! If the expansion tank is empty, check for leaks and check the coolant level of the radiator, and if the level is too low, add coolant to the specified level.

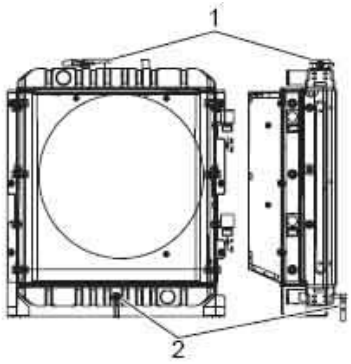
7.2 Changing the coolant

The coolant should be changed every 2000 h or every year, whichever comes first.

⚠WARNING
Keep the antifreeze away from open flames as it is flammable.

IMPORTANT! Do not use coolant of different types together, otherwise it will cause damage to the engine.

IMPORTANT! Since the antifreeze is toxic, be careful when removing the drain plug to prevent the coolant with antifreeze to splash onto the body. If the antifreeze is splashed into the eyes, rinse with plenty of clean water and seek medical attention immediately.



- Open the engine hood.
- Remove the bottom cover.
- Place a container under the drain valve 2 at the bottom of the radiator to collect coolant, slowly loosen the radiator filler cap 1, and open the drain valve 2 to drain the coolant.
- Open the drain plug on the engine block, and drain the coolant into a container.
- After draining the coolant, close the drain valve and drain plug, and refill the radiator with clean soft water.
- Start the engine and run it at a low idle speed for approximately 10 min.
- Shut down the engine, open drain valve 2 and drain plug, and drain the coolant.

- Clean the radiator with the descaling agent. For cleaning methods, follow the instructions for the descaling agent.
- After cleaning, close the drain valve 2 and drain plug, open the water pipe, and refill the radiator with coolant.
- Start the engine and run it at a low idle speed. Open the drain valve and drain plug, and rinse with a water pipe until the flowing water becomes clear.

IMPORTANT! During flushing, prevent the draining volume from exceeding the water supply volume, as the cylinder block must be kept fulfilled with water.

- Shut down the engine, close the water pipe, empty the cooling system, close the drain valve 2, wrap the drain plug with sealing tape and tighten it.
- Add coolant through the radiator filler to the lower edge of the filler.
- Run the engine at a low idle speed for approximately 5 min, then at a medium idle speed for 5 min to discharge any air in the coolant. (At this time, do not install the radiator filler cap.)
- Shut down the engine, wait for about 3 min, add coolant until the coolant is near the radiator filler, and the coolant level in the expansion tank is aligned with the "LOW" mark, and then tighten the radiator filler cap and expansion tank cap.
- Install the radiator bottom cover, and check whether the cooling system leaks.

IMPORTANT! When draining coolant, pay attention to protecting the environment.

7.3 Cleaning radiator, oil cooler, and condenser fins

Clean all fins every 500 h.

⚠WARNING
When the compressed air is used for cleaning, it is necessary to wear goggles and a mask

- Open the engine hood and battery cover on the rear side of the machine.

- Use compressed air to remove sludge, dust, and leaves attached to the radiator fins and oil cooler fins. At the same time, wash the protective net in front of the oil cooler and clean the A/C condenser fins.
- Check the rubber hose. If the hose is found cracked or hardened due to aging, replace it with a new one. Additionally, check if the hose clamp is loose.

IMPORTANT! When the compressed air is used for cleaning, maintain a certain distance from the fin to prevent damage. If the fin is damaged, leakage and overheating may be caused. For operation in a dusty environment, perform inspection every day regardless of the regular maintenance interval.

8 Hydraulic system

IMPORTANT! A high degree of cleanliness shall be maintained during operation of the hydraulic system. Even small particles can damage or block the system.

8.1 Checking the hydraulic oil level

Check the hydraulic oil level every day.

- Park the machine on a solid and flat ground.
- Operate the left/right working device control lever to the end in all directions to release the pressure in the hydraulic circuit.
- Place the safety lock control lever in the "locked" position. Refer to "3.6 Safety lock control system" in Chapter 2.
- Check the hydraulic oil level through the round oil level sight glass.

If the oil level can be seen through the round oil level sight glass, it indicates that the oil level is normal. If the oil level is below the lower limit, open the filler cap on the top of the oil tank and add the specified hydraulic oil. For the selection of hydraulic oil, refer to “19 Selection of oil products” in this chapter.

IMPORTANT! Do not add hydraulic oil to a level that is higher than the normal level, because excessive hydraulic oil may overflow or cause damage to the hydraulic circuit.

IMPORTANT! Do not use hydraulic oil of different grades together.

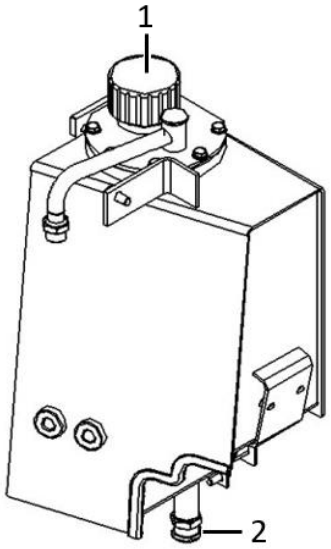
8.2 Changing hydraulic oil

Change hydraulic oil every 3000h when the machine is

used for excavation, and a shorter interval when the machine is used for breaking, which depends on the frequency of use of the hydraulic hammer.

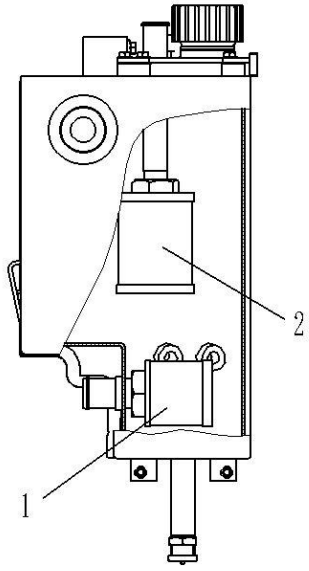
⚠WARNING
Be careful when changing oil, as hot oil can cause scalding to the skin if no protective measures are taken

- Park the machine on a solid and flat ground.
- Start the engine and rotate the upper structure so that the drain plug at the bottom of the hydraulic oil tank is located between the left and right tracks.
- Fully retract the bucket cylinder and stick cylinder, and then lower the boom.



1 Ventilation filter
2 Drain valve

- Shut down the engine, and place the safety lock control lever in the “locked” position, refer to "3.6 Safety lock control lever” in Chapter 2.
- Release the pressure inside the hydraulic oil tank through the ventilation filter.
- Remove the cover plate under the hydraulic oil tank.
- Place a container under the drain plug.



1 Oil suction filter element
2. Return oil filter element

- Remove the drain plug, install the drain valve, and drain the hydraulic oil into a container.
- Open the filler cap to speed up the oil draining. Remove the O-ring and oil suction filter.
- Drain hydraulic oil completely, remove the drain valve, and install the drain plug.
- Reinstall the suction filter after cleaning it thoroughly.
- Add hydraulic oil, and tighten the filler cap.
- Start the machine, check the oil level on the round oil level sight glass, and top up if necessary.

8.3 Replacing return oil filter element of the hydraulic oil tank

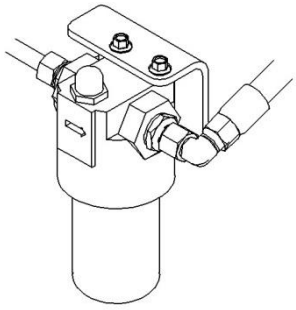
Change hydraulic oil every 1000h when the machine is used for excavation, and a shorter interval when the machine is used for breaking, which depends on the frequency of use of the hydraulic hammer.

- Release the pressure inside the hydraulic oil tank through the ventilation filter.
- Unscrew the fixed cover, remove the O-ring, spring, and washer, pull out the filter, and remove the filter element.
- Clean the removed parts.
- Install a new filter element and all parts. When installing the cover, press down the cover while tightening the bolts.
- Start the engine and run it at a low idle speed for 10 min for bleeding.
- Shut down the engine.

8.4 Replacing the hydraulic oil suction filter element

Replace every 2000h.

- Unscrew the screw plug, remove the cover, and pull out the filter element.
- Clean and replace if damaged.



8.5 Replacing the hydraulic pilot filter element

Replace every 1000h. (This model has no pilot filter element and no replacement is required)

- Place a container under the filter.
- Remove the filter body.

- Replace the filter element of the hydraulic pilot filter.

8.6 Replacing the ventilation filter element.

Replace the ventilation filter every 2000 h.

- The ventilation filter may become blocked after operation in dusty environment for a certain period of time.
- Loosen the bolts on the ventilation filter, and pull out the filter element.
- Replace the ventilation filter element.

8.7 Releasing the pressure in the hydraulic oil tank and hydraulic circuit

IMPORTANT! There is always pressure in the hydraulic circuit. Before releasing the pressure, do not add or drain oil or maintain or check the machine. Stand by the machine to loosen the hydraulic oil tank cover and hose joint slowly.

- Release the pressure in the hydraulic circuit.
- Turn the ignition key to ON position, operate the left/right working device control lever and pedals to the end in all directions to release the pressure in the hydraulic circuit.
- Release the pressure in the hydraulic oil tank.
- Press the ventilation filter for several times to release the pressure from the hydraulic oil tank.

9 Slewing drive mechanism

★ CAUTION

CAUTION! This machine is equipped with a

maintenance-free slewing drive mechanism, so no change of gear oil is required.

10 Travel drive mechanism

10.1 Check the gear oil level of the travel drive mechanism

Check the oil level at working temperature every 250h.

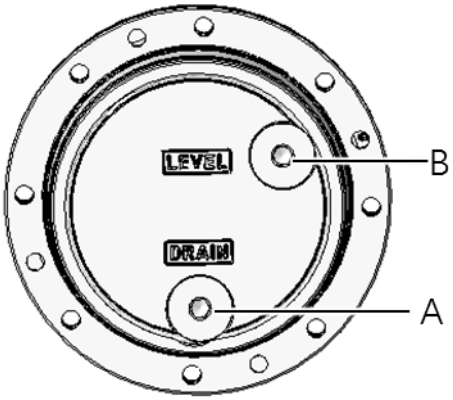
IMPORTANT! Before checking the oil level of the travel drive mechanism, clean up the surroundings of the oil port. If there are impurities in the oil, the travel drive mechanism will be damaged.

To check the oil level at operating temperature, maintain the normal gear oil level.

If the oil level is low, the travel drive mechanism will not drive correctly, resulting in damage.

If the oil level high, the oil will foam and cause the travel drive mechanism to overheat.

⚠WARNING
The oil is very hot after the machine has just stopped working. Do not operate until the oil cools down.



- Park the machine on a flat surface.
- Adjust the drain plug A to the bottom, facing the ground vertically, as shown in the figure.
- Place the safety lock control lever in the “locked” position. Refer to "3.6 Safety lock control lever” in Chapter 2.
- Remove the oil level inspection/filling plug B. If the

gear oil almost overflows from the hole, the oil level is normal.

- If the oil level is too low, add the specified gear oil through the inspection/filling plug B. For the selection of gear oil, refer to "18 Selection of oil products" in this chapter.

10.2 Changing the gear oil

Change the gear oil every 2,000h.

- Prepare a container to collect the drained gear oil.
- Place the oil level inspection/filling plug B in a horizontal position, so that the drain plug A is at its lowest point.
- Remove the oil drain plug A and the oil level inspection/filling plug B, and use a container to collect the gear oil.
- Check the O-ring on the plug, and replace it if damaged.
- After the oil is drained, install the drain plug A.
- Add the specified gear oil through the oil level inspection/filling plug B.
- Check the oil level again, and top up when necessary.
- Install the inspection/filling plug B.

11 Electrical system

11.1. Charging the battery.

⚠WARNING
When the battery is to be charged by fast charging, remove the battery cover first. During charging of the battery, explosive hydrogen-oxygen mixtures may be generated, which may lead to a powerful explosion in case of short circuit or use of open flames nearby.

- The battery cover is equipped with an indicator showing the state of charge of the battery. If the indicator turns green, the battery can be used normally. If the indicator turns black, the battery shall be charged in time, and if the indicator turns white, the battery shall be replaced promptly.
- Improper treatment of battery during charging may cause risk of explosion. Therefore, the battery handling procedures and the charging procedures in the manual shall be followed, and the following precautions shall be observed:
- Hydrogen and oxygen will be generated during battery charging, leading to an explosion in case of use of open flames or blockage of the air vent. Therefore, the battery shall be kept away from the open flames and prevented from short circuits.
- Remove all screw plugs to ensure proper ventilation during charging. Do not keep fire or

sparks close to the battery, so as to avoid an explosion.

- When charging the battery, connect the positive and negative terminals of the charger to the cathode and anode of the battery respectively. Avoid reverse charging.
- As gas will be generated during battery charging, regularly check the air vent on the battery to ensure that it is unblocked so as to avoid an explosion of the battery.
- If the temperature of the battery electrolyte is higher than 45°C during charging, reduce the charging voltage or charging current as appropriate to avoid splashing of the electrolyte due to overtemperature.
- Remove the cable from the anode of the battery before charging. Otherwise, a high voltage will be generated, leading to damage of the alternator.
- Connect the positive and negative terminals of the charger to the cathode and anode of the battery respectively. Do not charge the battery through connection in series (24V).
- It is recommended to charge the battery using a charger with a constant voltage of 16.0V (maximum limit: 16.2V. If the maximum limit is exceeded, a large amount of water will be electrolyzed. As a result, the electrolyte level will drop, and the indicator will turn white. In this case,

the battery shall be scrapped.) and a limited current of 25A until the charging current is lower than 2A and the indicator turns green.

- Stop charging immediately and find out the cause if a large amount of acid sprays from the air vent of the battery during charging.
- Check the indicator status on a hourly basis during battery charing. If the battery indicator turns green, the battery is fully charged and charging is stopped.
- The voltage of the battery that has just been charged may be above 13V, but this is a floating charge voltage which will disappear after the battery is kept still for a few days or discharged for several times.
- After the battery is charged and tested to be qualified, it is recommended to apply grease to the terminal to prevent electrical corrosion.
- Switch off the charger immediately after charging. Overcharging will cause the following problems: battery overheating; electrolyte decrease; electrode plate damage.

11.2 Precautions for welding

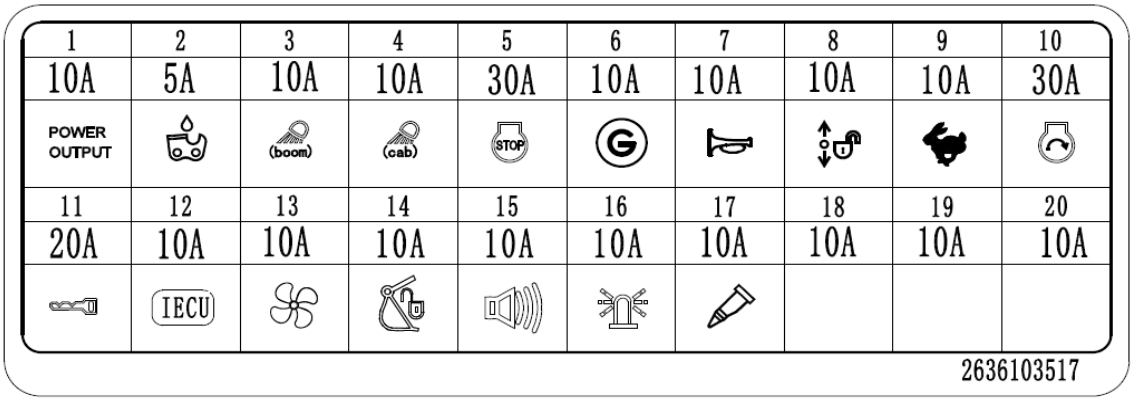
Electric welding shall be performed by welders with corresponding qualifications and sophisticated skills at a site provided with appropriate devices. The electric welding will produce gases, and any improper operation may cause fire or electric shock. Therefore, any unqualified personnel are strictly prohibited from performing welding. Always

follow precautions below for welding:

- Before welding, turn off the main power switch.
- Disconnect the terminals of the battery to avoid an explosion of the battery.
- Remove the paint from the part to be welded (in the surrounding area at least 10cm away from the welding spot) so as not to generate any harmful gas.
- If welding is performed on or near the hydraulic equipment or pipe, flammable steam and sparks will be generated, leading to a risk of fire or explosion. Therefore, avoid welding in such a place.
- Sparks splashed during welding will directly fall onto the rubber hoses, wires or pressurized pipes, which may cause pipe crack and wire insulation damage. Therefore, these parts shall be covered with fireproof baffles.
- Wear protective clothes for welding.
- Ensure that the welding site is ventilated.
- Remove all flammable materials, and provide fire extinguishers in the workplace.
- Do not may any modification that affects the performance, safety and strength of the machine and working device.

11.3 Replacing fuse

IMPORTANT! When replacing the fuse, turn the ignition key to “0” position and be sure to use the fuse of the same specification.



No.	Spec.	Applicable circuit
1	10A	Reserved power supply
2	5A	Feed pump
3	10A	Boom lamp
4	10A	Cab lamp
5	30A	Power supply for oil shut-off valve relay
6	10A	Alternator excitation circuit
7	10A	Horn circuit
8	10A	Safety lock control circuit
9	10A	High/low travel speed control circuit
10	30A	B+
11	20A	Start circuit
12	10A	IECU monitor
13	10A	Fan
14	10A	Quick fit function circuit
15	10A	Silent walking buzzing
16	10A	Warning light switch
17	10A	Hydraulic Breaker
18	10A	
19	10A	
20	10A	

12 Lubrication system

12.1 Greasing the working device

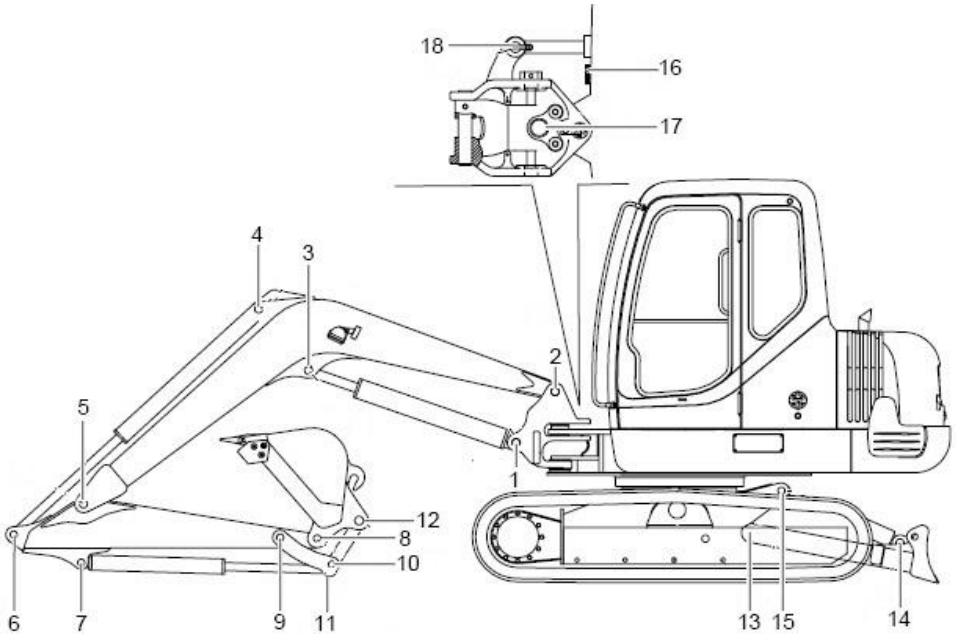
For the lubrication points 1-12 of the linkage system of the working device, lubrication and maintenance should be carried out every 10h or every day.

For lubrication points 13-15, lubrication and maintenance should be carried out every 50h. When mud, water, or grinding material may enter the gear bearing under harsh working conditions (or after the hydraulic hammer is used), or within the first 100h of operation of the machine, lubrication and maintenance should be carried out every 10h or every day.

Place the working device on the ground and shut down the engine, as shown in the figure.

- Use an manual or electric grease gun to apply grease through the grease nipple.
- Remove any spilled grease.

CAUTION: After working in water, immediately add new grease to the parts that are submerged in water, such as the pin shaft of the bucket, and remove the used grease, regardless of the grease filling interval.



1 Boom cylinder mounting pin 2 Boom mounting pin

3 Boom cylinder piston rod end pin 4 Stick cylinder mounting pin

5 Boom and stick connecting pin 6 Stick cylinder mounting pin

7 Bucket cylinder mounting pin 8 Stick and bucket connecting pin

9 Stick and connecting rod connecting pin 10 Piston rod and connecting rod connecting pin

11 Bucket cylinder piston rod end pin 12 Bucket and piston rod connecting pin

13 Bulldozer cylinder mounting pin 14 Bulldozer cylinder mounting pin

15 Bulldozer cylinder piston rod end pin 16 Boom slewing cylinder mounting pin, slewing gear and slewing bearing

12.2 Applying grease to the slewing bearings

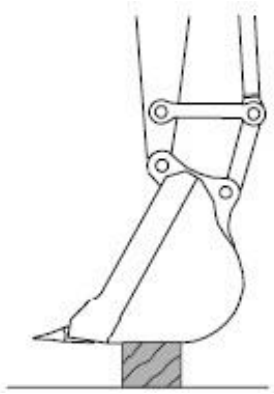
Check the lubrication points every day, and add grease if necessary.

- Park the machine on a level surface and lower the bucket to the ground.
- Turn the ignition key to the "0" position.
- Move the safety lock control lever upward to lock this system. Refer to "3.5 Safety lock control lever" in Chapter 2.
- Clean the grease nipple, and use an manual or electric grease gun to apply grease.
- Set the safety lock control lever to the "unlocked" position, start the engine, raise the bucket to about 1m above the ground and then rotate the upper structure 1/8 turn.
- Lower the bucket to the ground.
- From step 2, repeat the operation steps 4 times.
- Fill the slewing bearing with grease until the grease can be seen coming out of the slewing bearing.
- Do not apply too much grease, and after adding the grease, the spilled grease should be removed.

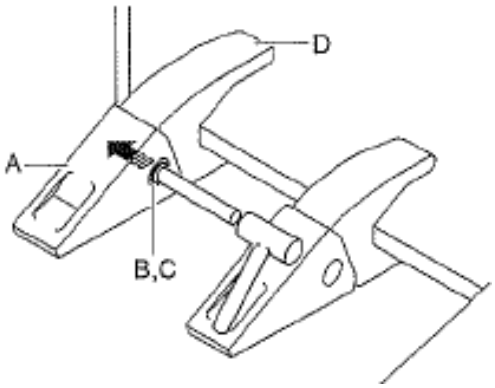
13 Replacing the bucket teeth

⚠WARNING
When replacing the bucket teeth, it is very dangerous if the working device moves due to misoperation. Therefore, secure the working device, then shut down the engine and securely lock all control levers. If an excessive force is used to knock out the fixing pin, the fixing pin may fly out. Ensure that there are no people in the surrounding area. There are often flying blocks during replacement, so it is necessary to wear goggles, gloves, and other PPEs.

Replace the bucket teeth before the bucket tooth mounting wears out.



- Place a cushion block under the bucket so that the pin assembly can be removed, then place the bucket horizontally on the cushion block, shut down the engine, and place the safety lock control lever in the “locked” position.



- Place a metal rod (with a diameter smaller than the diameter of the pin shaft) on the fixing pin head, and use a hammer to hit the metal rod to knock out the pin shaft B. Be careful not to damage the lock washer C and remove the bucket teeth.
- Clean the mounting surface. Install the new bucket

tooth A into the tooth mounting, push the pin assembly partially by hand, and then use a hammer to drive in the pin assembly to install the bucket tooth onto the bucket.

14 Track tension

14.1 Checking the track tension

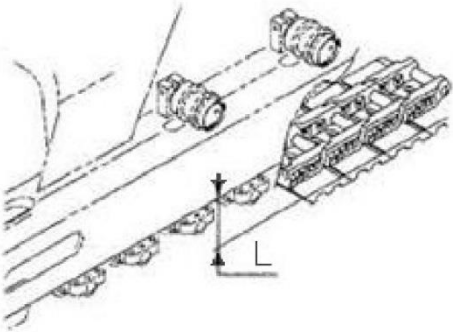
Check the track tension every 50h.

⚠WARNING
To check the track tension, lift the track off the ground. During measurement, great care should be taken so that the tracks do not fall or move.

The wear of the track usually changes with the working conditions or the characteristics of the soil.

Always check the track tension and keep it at the specified value.

Clean the lower chassis thoroughly, once or more a day according to the soil conditions of the job site.

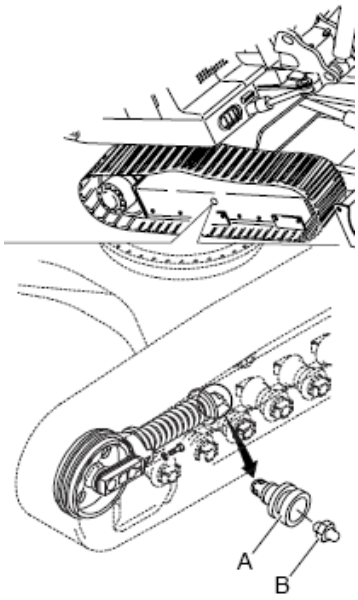


The track tension is measured by the clearance L between the bottom surface of the track frame and the upper surface of the lower track shoe. The measurement method is as follows:

- Slowly operate the lever and use the boom and stick to raise the track.
- Depending on the characteristics of the soil, check the track tension.

Working conditions	Clearance L (mm)
General soil	195~205
Stony ground	185~195
Moderate soil (sand, snow, etc.)	205~215
Rubber track	175~185

14.2 Adjusting the track tension



⚠WARNING
Valve A may be ejected due to the high-pressure compressed grease in the cylinder. Do not loosen the valve A for more than one turn. Do not loosen other parts than valve A. Keep away from this valve installation location. If the track tension cannot be adjusted by the method in this manual, please contact the service center of Shandong Lingong Construction Machinery Co., Ltd.

To increase track tension:

- Apply grease through the grease nipple with a high-pressure grease gun.
- Check the adjusted track tension by moving the machine forward and backward.
- If the tension is incorrect, it should be adjusted again.

To reduce track tension:

- Gradually loosen valve A to drain the grease.

NOTE: Do not loosen the valve A for more than one turn. If the grease can not be drained smoothly, move the machine forward and backward. Do not drain grease through the grease nipple.

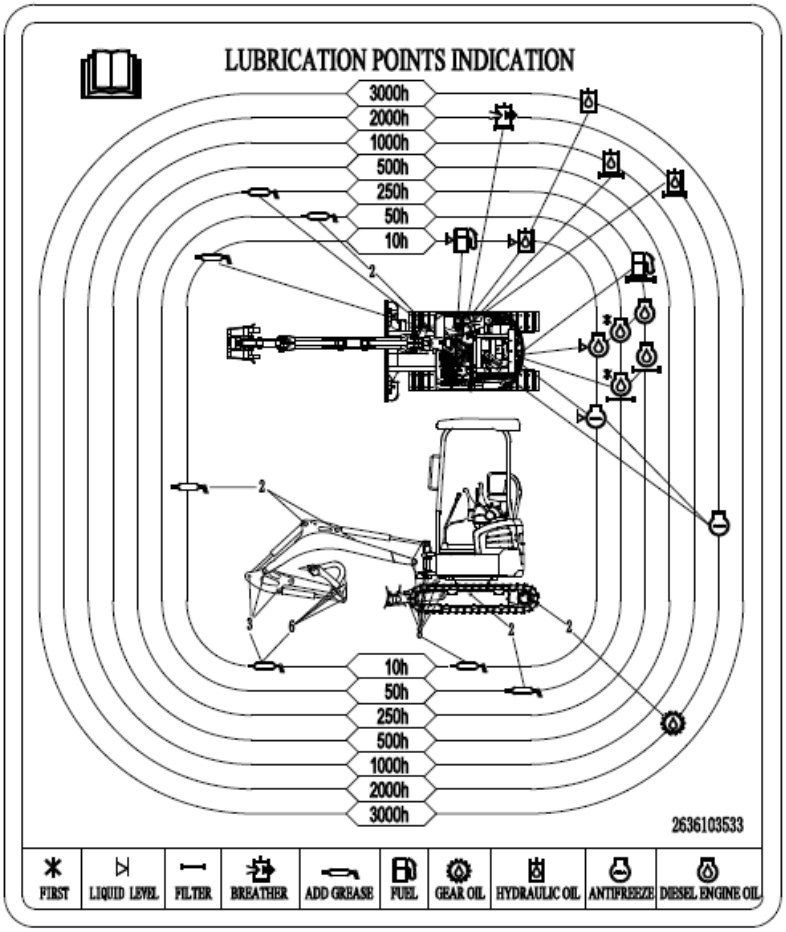
- Close the valve A, but do not overtighten, or the fitting will be damaged.
- Check the track tension again. If the tension is incorrect, it should be adjusted again.

15 Lubrication

Lubrication is an important part of maintenance. If the machine is lubricated in a correct way, the service life of washers, bearings and bearing pins can be greatly extended. The lubrication points indication can make the lubrication work easier and reduce the risk of forgetting to fill any lubrication point.

Through lubrication, grease can be supplied to bearings to reduce the wear between the bearing pin and the bearing bush; and any used and dirty grease can be changed.

IMPORTANT! Before adding grease, clean the grease nozzle and grease gun to avoid ingress of sand and dirt during filling.



16 Regular maintenance

Regular maintenance includes maintenances every 10 h, every 50 h, every 250 h, every 500 h, every 1000 h, and every 2000 h.

16.1 Maintenance every 10 h

- Check the engine oil level.
- Check the coolant.
- Check the fuel level.
- Check the oil level of the hydraulic oil tank.
- Check the window washer fluid level.
- Clean the air filter ash valve.
- Check all control levers and switches.
- Check the lights, horn, and monitor.
- Check the bucket teeth for wear.
- Check the seat belt for proper operation.
- Check the hydraulic system for leaks.
- Clean tracks and drive sprockets (after daily work).

16.2 Maintenance every 50 h

Perform this maintenance together with the maintenance every 10h.

- Remove sediment from the fuel tank.
- Inject grease into the lubrication point of the working device. (During the first 100 working hours of a new machine, grease the working device every day.)
- Check if there is water or sediment in the water separator and drain it.
- Check the track tension.

- Check the engine air filter and clean it, and replace it if necessary.
- Check and adjust the tension of the engine and A/C compressor belt.
- Check the working condition of the battery.
- Check the operation of the A/C, and start and run it for one minute.
- Check the lubrication of each articulation pin shaft and slewing bearing of the working device.
- Check the fixing bolts that fasten the counterweight, track shoe, travel motor, slewing motor, and slewing bearing.

Perform following maintenances additionally during the first 50 h of operation:

- Replace the engine oil and oil filter element.

16.3 Maintenance every 250 h

Perform this maintenance together with the maintenance every 10h and 50h.

- Replace the engine oil and oil filter element.
- Replace the secondary fuel filter element.
- Clean the air filter element.
- Apply grease to the bearings of the slewing gear bearing.

16.4 Maintenance every 500 h

Perform this maintenance together with the maintenance every 10h, 50h and 250h.

- Replace the air filter element.
- Apply grease to the bearings of the slewing motor.

- Clean the radiator, oil cooler, and condenser fins.
- Clean the sliding surface of the guide buffer.
- Clean the surface of the battery and terminals, and apply Vaseline to the surface of the terminals.
- Clean the A/C filter.

16.5 Maintenance every 1000 h

Perform this maintenance together with the maintenance every 10h, 50h, 250h and 500h.

- Replace the hydraulic oil return filter element (shorten the replacement interval when the hydraulic hammer is used).
- Replace the A/C filter.
- Adjust the engine valve clearance.
- Tighten the engine fixing bolts.

16.6 Maintenance every 2000 h

Perform this maintenance together with the maintenance every 10h, 50h, 250h, 500h, and 1,000h.

- Replace the hydraulic oil tank ventilation filter element (or if necessary).
- Change the coolant.
- Clean the hydraulic oil suction filter element.
- Replace the travel drive mechanism gear oil.

16.7 Maintenance every 3000 h

Perform this maintenance together with the maintenance every 10h, 50h, 250h, 500h, and 1,000h.

- Changing the hydraulic oil (shorten the change interval when the hydraulic hammer is used).

17 Regular replacement of main components

When operating or driving the machine, users must regularly inspect and maintain the machine for the sake of safety. In addition, to further improve safety, users should also regularly replace the parts in the list of parts subject to regular replacement. These parts are critical to safety and fire protection, so please contact your dealer for replacement.

These parts are become more prone to wear or deterioration as the material will change over time. However, it is difficult to fully determine the condition of the parts through regular maintenance, so when the specified replacement time is reached, replace the part to ensure the good performance of these parts regardless of the actual condition of the part.

But if any of these parts shows abnormalities before the replacement interval is reached, be sure to repair or replace it immediately. If the hose clamp deteriorates (for example, deformation or crack occurs), replace it at the same time when the hose is replaced.

In addition, hydraulic hoses that are not listed as regular replacement parts should also be inspected. If any abnormalities are found, they should be tightened or replaced. When replacing the rubber hose, replace the O-ring, gasket, and other similar parts at the same time.

S/N	Safety-critical parts	Quantity	Replacement
1	Fuel hose (fuel tank -	2	Every 2 years or 4000 h, whichever comes first
2	Fuel hose (fuel filter	1	
3	Return hose (nozzle -	1	
4	Rubber hose (main	1	
5	Rubber hose (pump oil	1	
6	Rubber hose (main	1	
7	Rubber hose (boom	4	
8	Rubber hose (stick	4	
9	Rubber hose (bucket	4	
10	Rubber hose (slewing	2	
11	Seat belt	1	Every 3 years

18 Selection of oil products

Oil type	Quality grade	Recommended viscosity for different ambient temperatures	Oil of Lingong and reference standards	Filling amount	Applied part
Engine oil	API CI-4	SAE 5W-30 -30℃～40℃ SAE 10W-30 -20℃～40℃ SAE 15W-40 -15℃～50℃ SAE 30 0℃～40℃ SAE 40 5℃～50℃	Mobil Super Black Overlord diesel engine oil CI-4 15W-40	3.8L	Kubota engine
Gear oil	API GL5	SAE 75W-90 -40℃～40℃ SAE 80W-90 -25℃～40℃ SAE 90 -20℃～30℃ SAE 85W-140 -10℃～50℃	Gear oil for heavy-duty vehicle SAE # 90 GL-5 GB 13895	2×0.35L	Travel reducer
Hydraulic oil	Anti-wear hydraulic oil with viscosity index above 160	ISO VG32 HV -20℃～15℃ ISO VG46 HV -10℃～30℃ ISO VG68 HV 0℃～40℃	L-HV46	Fuel tank, 8.5L System, 13L	Hydraulic oil tank and hydraulic system

Fuel		0 # ordinary diesel ambient temperature ≥ 4℃ -10 # ordinary diesel ambient temperature ≥ -5℃ -20 # ordinary diesel ambient temperature ≥ -14℃ -35 # ordinary diesel ambient temperature ≥ -29℃	GB 19147	11L	Fuel tank
Antifreeze			LCS antifreeze	3.8L	Radiator
Lubricating grease			2#/3# lithium based grease GB/T 7324		Articulation pins and slewing mechanism of the working device

Note: The filling amount in the table is for reference only, and the refilling shall be based on the oil level mark in actual use. Please use high-quality fuel, as impurities in the fuel may cause engine malfunction and affect its service life in a short period of time. The use of inferior fuel with sulfur content above 1000ppm is prohibited for Yanmar engines with external EGR.