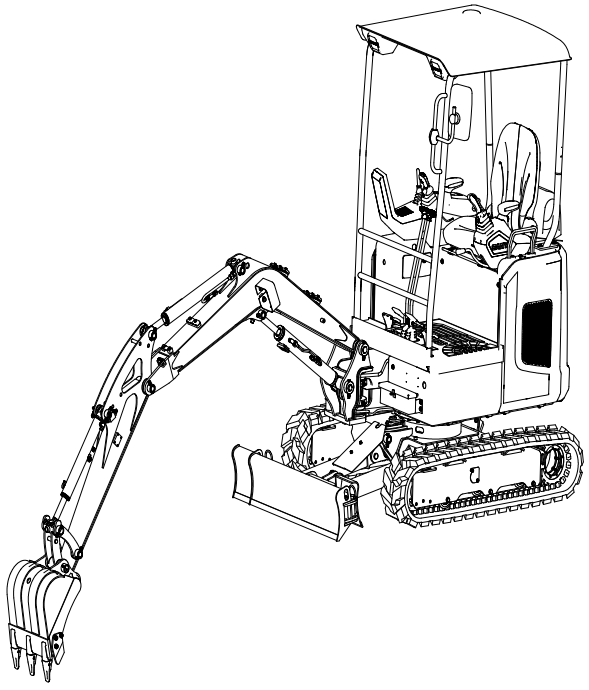
Quality Changes the World

SANY

Crawler Hydraulic Excavator

SY19E



Operation and Maintenance Manual

SANY

SY19E
Hydraulic Excavator

Operation and Maintenance Manual

⚠ WARNING

There is possibility of serious injury, death, or property loss!

Read and follow the safety precautions and instructions in this Manual and on the machine signs.

- Please keep this Manual with the machine for future reference.

SANY Group
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Post Code: 215300
Service Hotline: 4006 09 8318
http://www.sanygroup.com

Responsibility Division

Important statements

The crawler hydraulic excavator is a multipurpose machine for earthwork construction, intended for earth excavation and loading, land leveling, slope finishing, hoisting, crushing, demolition, ditching, and widely applied in highway and railway construction, bridge construction, urban construction, and construction of airports, ports and water conservancy. The machine has the features of bulldozers, loaders and cranes, and can replace them during operation. The machine is not intended for other purposes than those designated. We do not accept any responsibility for any consequence of use for purposes other than those designated.

We do not accept any responsibility for the following:

- Consequences of failure to correctly use the machine according to the instructions in the manual.
- Consequences of unauthorized retrofitting or modification of the machine.
- Equipment damage or accidents caused by failure to use genuine accessories or use of untested or unauthorized accessories or tools.
- Machine faults or damage because of nature disasters (earthquakes, typhoons, etc.), wars and other force majeure.

We cannot foresee all risks that may occur at the working site; therefore, the machine operators and customers shall pay high attention to safety issues.

The regions where the machine is used and their local governments may have more strict operating provisions which shall be observed if they conflict with these rules for safe operation.

Responsibilities of our manufacturer

- Ensure that the machine quality is acceptable and accompanying documents are accurate.
- Fulfill the after-sales service commitment, and document all the maintenance and repair work performed by after-sales service personnel.
- Provide trainings to the equipment operators and maintenance staff as required.

Responsibilities of customers or other authorized personnel concerned

- Personnel concerned shall be welled trained and fully acquainted with the Parts Catalogue and the Operation and Maintenance Manual before operating and maintaining the machine.
- Make sure that personnel operating and maintaining the machine are competent and aware of their respective responsibilities.
- Regularly inspect the safety awareness of personnel concerned in working.
- Immediately stop the machine in the event of any fault influencing safety.

- Our service personnel have the right to carry out the relevant safety check on the machine when necessary.
- Besides checks specified by Sany, carry out the relevant inspection according to the related regulations by the country or region where the machine is used.
- Make sure that the machine is timely maintained and repaired.
- Make a use plan carefully and consciously.

Responsibilities of all operation personnel

- In the event of any abnormalities that may cause abnormal operation of the machine or pose a potential risk, timely report them to the supervisor, and rectify them in time if possible.
- All staff working around the machine must obey all the warning signals and pay attention to the safety of themselves and others.
- All the operation personnel shall be acquainted with the content and procedures of work activities.
- Observe whether there are dangerous situations such as high voltage wires, irrelevant personnel, poor ground condition, and timely warn the operators and signalmen of them.

Responsibilities of management

Make sure that only operators that are well trained, fully understand the content of this manual, enjoy good health and possess the operation certificate can operate the machine.

- Make sure that only operators with good judgment, sense of cooperation and psychological state can operate or maintain the machine.
- Make sure that signalmen have good visual and audible judgment, know well standard commanding signals and send clear and accurate signals, and possess rich experience in hazard identification and instruct operators to avoid in time.
- Make sure that assistants can correctly determine the machine model and working condition, and choose an appropriate machine.
- Assign the corresponding safety responsibility to each operation personnel and ask them to timely report unsafe factors to the supervisor.

Table of Contents

Foreword

1.Foreword

1.1 General

This manual is a guide for correct use of the machine and mainly provides technical and safety information required in operation. Please be sure to read each part of it carefully.

This manual is conductive to the safe and efficient operation of the machine. During operation, be sure to observe the precautions stated in this manual. Understanding the basic safety rules related to operation of the machine can avoid accidents. You are responsible for correct operation and maintenance of the machine. Failure to do so may cause personal injury or damage to the machine.

Only qualified and experienced operators with an official license (according to local laws) can operate the machine.

Make sure that the relevant laws and regulations of the state, a province, an autonomous region or a municipality are always observed in operation of the machine, and the operation safety information and instructions contained herein are only provided as suggestions and cautions.

We cannot foresee all situations in operation and maintenance that may pose risks. Therefore, the safety information in this manual and on the machine do not contain all the possible safety measures. When methods or actions other than those specifically recommended or allowed in this manual are used or taken, you are obliged to take necessary measures to ensure safety.

All data, charts and specifications in this manual are the latest product information available at the time of publication. We reserve the right to alter the above information without notice. Please contact us or our authorized dealer for the latest product information or the problems related to the information covered in this manual.

Scope of application of machines of normal series: Altitude below 3000 m, atmospheric temperature: -10°C ~ +40°C.

⚠ WARNING

Equipment damage and casualties!
Before starting operation and maintenance, operators and maintenance personnel must do the following:

- Be sure to read through and understand this manual.
- Read and fully understand the safety notices in the manual and safety labels on the machine.
- In no circumstances use the machine for applications or operations forbidden in the manual.
- If the particulate size or latitude exceeds the upper limit specified for the model and application, it may result in injuries and is not covered by the warranty.
- Please note that the rated load of the machine is based on a flat and solid ground, and pay attention to the load deviation if the machine is used on a rough and soft ground or slope.
- Always keep the manual in the cab for reference at any time.
- Immediately contact our authorized dealer for reissue or replacement if this manual is lost or stained and thus unreadable.
- This manual shall be deemed as a permanent part of the machine, so please be sure to hand it over to a new user together with the machine if you resell it.
- Hydraulic excavators provided by Sany Heavy Machinery Co., Ltd. to the country of purchase meet all applicable regulations and standards. Purchasing from another country or a person of another country may deprive you of some safety devices and specifications necessary for use in your country. If you have any questions about the machine's compliance with national standards and regulations for use, contact our authorized dealer before using it.

1.2 Safety Information

To facilitate safe usage of the machine, this Manual explains the safety signs fixed on the machine, and describes potential dangers and methods to avoid such situations.

Before operating and maintaining the machine, users and the after-sales service personnel must get familiar with all the safety signs and symbols on the machine, strictly follow the safety guidelines and recommendations in this Manual, and take safety precautions and measures actively, so as to minimize the risk of personal injury and death, machine damage, and unsafe factors due to improper maintenance.

1. Safety warnings

A safety warning consists of a safety symbol and sign words used to indicate a potential dangerous situation that may lead to personal injury or damage. Safety warnings can be graded by using sign words according to the corresponding severity of the dangerous situation.

Three sign words are used in this Manual: DANGER, WARNING, and CAUTION. The dangerous situations they represent are as follows:

It indicates such situation might lead to death or serious injury if not avoided.

It indicates that such potentially dangerous situation may lead to death or serious injury if not avoided.

It indicates that such potentially dangerous situation may cause low or moderate injury. "Caution" can also be used to remind operators of unsafe operations that might cause personal injury and damage to the machine and environment.

Examples of safety warnings

⚠ WARNING
Risk of personal injury or death! If the joystick is not locked and touched accidentally, serious injury or death could occur. • When standing up from the seat, the operator must put the joystick in the locked position.

2. Safety signs

Safety signs are fixed on the machine to warn the operators or the maintenance workers on site that there will be potential dangers during operation or maintenance of the machine.

This machine adopts "text safety signs" and "graphic safety signs" to indicate safety measures.

1. Examples of text safety signs

Fig 1-1

2. Examples of graphic safety signs

The graphic safety graphs show the degree of danger equivalent to the signal terms by means of image. They help the operators or maintenance personnel know the type and degree of dangers at any time by means of graphs.

As shown in the right figure, the sign on the top shows the type of the danger and the sign at the bottom shows the method to avoid the danger.

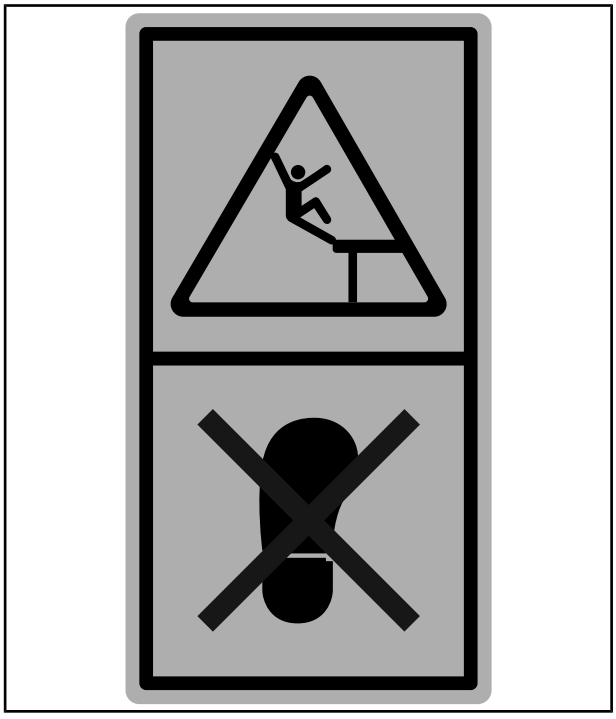
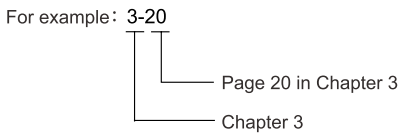


Fig 1-2

1.3 Page description

Description of Page Numbers

The page numbers of this Manual are relative page numbers.



Description of Numbers in Illustrations

The numbers in the illustrations correspond to the numbers in "[]" in the main text. For example, 1 corresponds to [1].

Unit Description

In this manual, measurement is expressed in international standard (SI) units.

1.4 Introduction

1.4.1 Overview

To maintain, order or replace components, please inform our authorized dealer of the following: Excavation

1.4.2 Direction of the Machine

In this Manual, front, rear, left and right refer to the travel direction as seen from the cab when the cab is facing forward and the drive wheels are at the rear of the machine.

[A] Front

[B] Rear

[C] Left

[D] Right

[E] Driver's seat

[F] Drive wheel

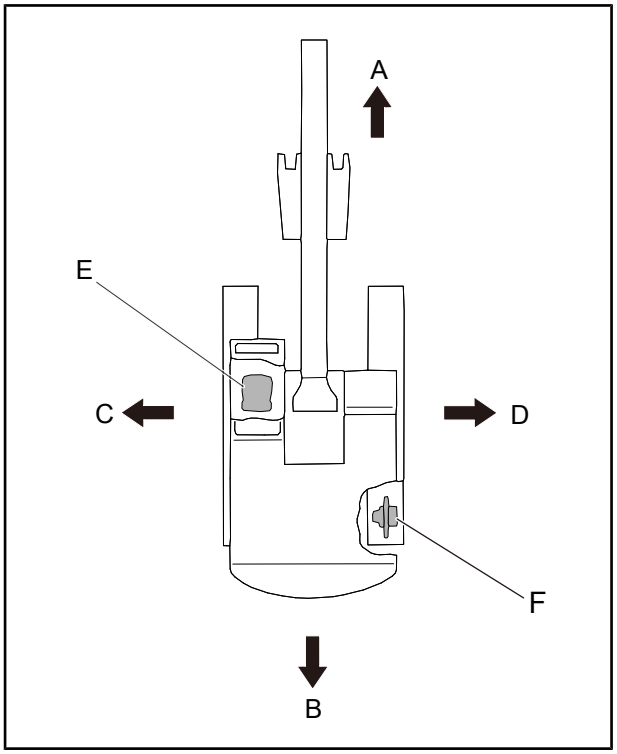


Fig 1-3

A. Front	D. Right
B. Rear	E. Driver's seat
C. Left	F. Drive wheel

1.5 Product Information

1.5.1 Overview

When you want to maintain or order replacement parts, inform the following information to authorized agents of SANY Heavy Industry.

1.5.2 Machine data plate

The machine data plate is at the lower front side of the cab (as shown below)

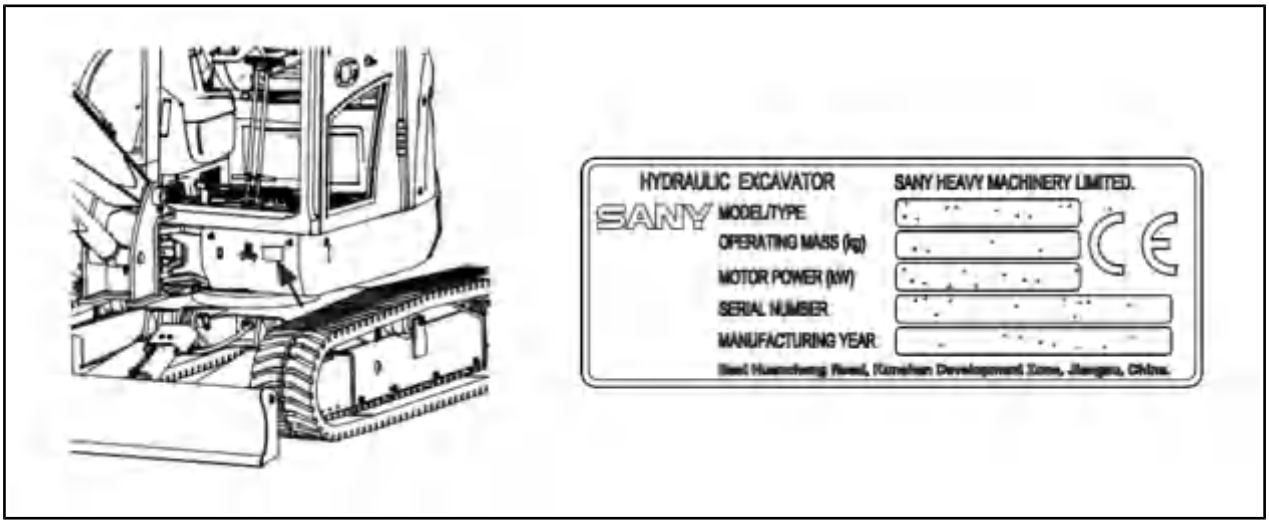


Fig 1-4

1.5.3 Motor data plate

The motor data plate is located as shown below. The location of the motor data plate may vary with the motor model.

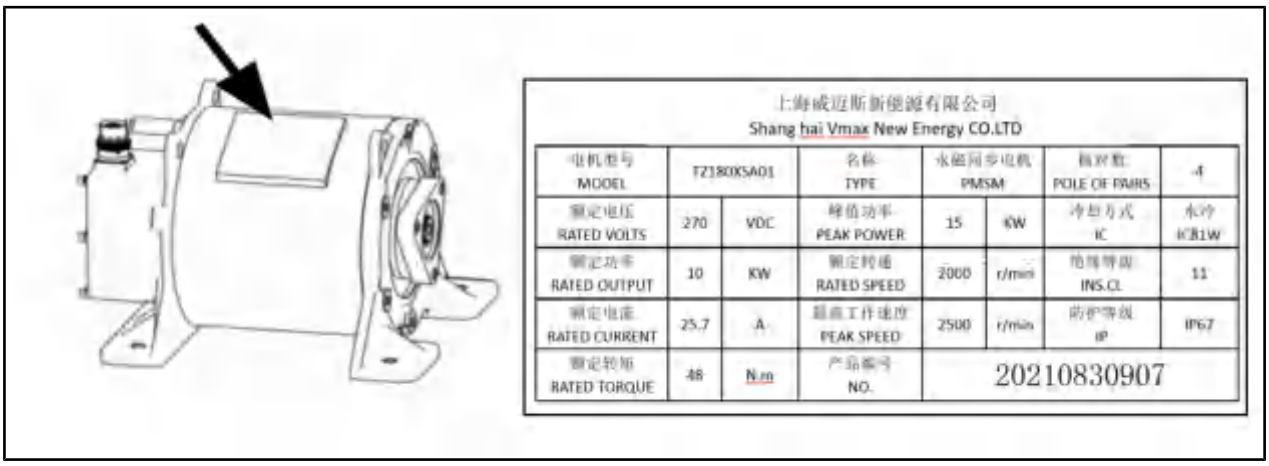


Fig 1-5

1.5.4 CE Certification and Statement

The machine meets the “basic health and safety requirements” according to 2006/42/EC Machinery Directive. Any safety impacts caused by any changes to the machine shall be at your own risk.

This declaration is an attachment provided alongside, please keep it properly. Failing to operate the machine in accordance with this manual, replacing or adding devices or accessories shall be at your own risk. The relevant personnel shall ensure and be responsible for the safety of the machine at all times and under all circumstances.

NOTE：

- The certification and statement are only applicable to relevant machines exported to Europe.

1.5.5 FOPS & TOPS certification and related declarations

The machine meets the “basic health and safety requirements” according to ISO 10262: 1998 / ISO 12117: 1997. Any safety impacts caused by any changes to the machine shall be at your own risk.

This declaration is an attachment provided alongside, please keep it properly. Failing to operate the machine in accordance with this manual, replacing or adding devices or accessories shall be at your own risk. The relevant personnel shall ensure the safety of the machine at all times and under all circumstances, and be responsible it.

Note: This certification and declaration are only used for relevant machines exported to Europe.

1.5.6 Regulatory Requirements

	Description	SY19E
Noise	Measured sound power of noise level A (unit: dB)	85dB(A)
	Assured sound power of noise level A (unit: dB)	/
Vibration	Effective acceleration value of handrails (unit: m/s)	< 2.5m/s²
	Effective acceleration value of body (unit: m/s)	< 0.5m/s²

NOTE：

Noise values are measured according to prEN 474-1 with reference to those basic standards ISO/DIS 6395, ISO/DIS 6396 and EN ISO 3744.

1.6 List of terms

Chinese term	English term	Description
附属装置	Attachment	A component assembly that is mounted on a main machine structure or working device for a specific purpose. The attachments of a hydraulic excavator are generally machine tools attached to the end of the bucket rod or telescopic arm, which provide the excavator's digging, cutting, leveling, and manipulation functions.

工作装置	Equipment	A group of components mounted on the main machine structure to perform the basic design functions of an excavator.
回转支承	Slewing Bearing	The swinging bearing is the force transfer element for the relative rotary motion between the upper carriage and the undercarriage, which supports the upper carriage mass and bears the working load.

1.7 Abbreviations

Abbreviations	Full name	Chinese
ANSI	American National Standards Institute	美国国家标准协会
GPS	Global Positioning System	全球定位系统
ISO	International Organization for Standardization	国际标准化组织
OEM	Original Equipment Manufacturer	原始设备制造商
OSHA	Occupational Safety and Health Administration	职业安全与健康管理局
PPE	Personal Protective Equipment	个人防护装备
PQR	Procedure Qualification Report	流程鉴定报告
ROPS	Rollover Protective Structure	侧防护结构
SAE	See SAE International (Formerly known as Society of Automotive Engineers)	汽车工程师学会
SCA	Supplemental Coolant Additive	补充冷却液添加剂
SDS	Safety Data Sheet	安全数据表
VDC	Volts Direct Current	伏直流电
WPS	Weld Procedure Specification	焊接程序规范

Safety

2.Safety

2.1 Safety Signs

2.1.1 Overview

This machine uses the following warning and safety decals.

- Make sure to know clearly the location and content of the decals.
- Please keep the decals in the right positions and clean to ensure their readability. Do not clean the decals with organic solvent or gasoline, which may peel off the decal paint.
- Treat other decals in the same way as warning and safety decals.
- When the decals are damaged, lost or unreadable, please replace them. As for detail of decal part number, please see this manual or the actual decals.

2.1.2 Location

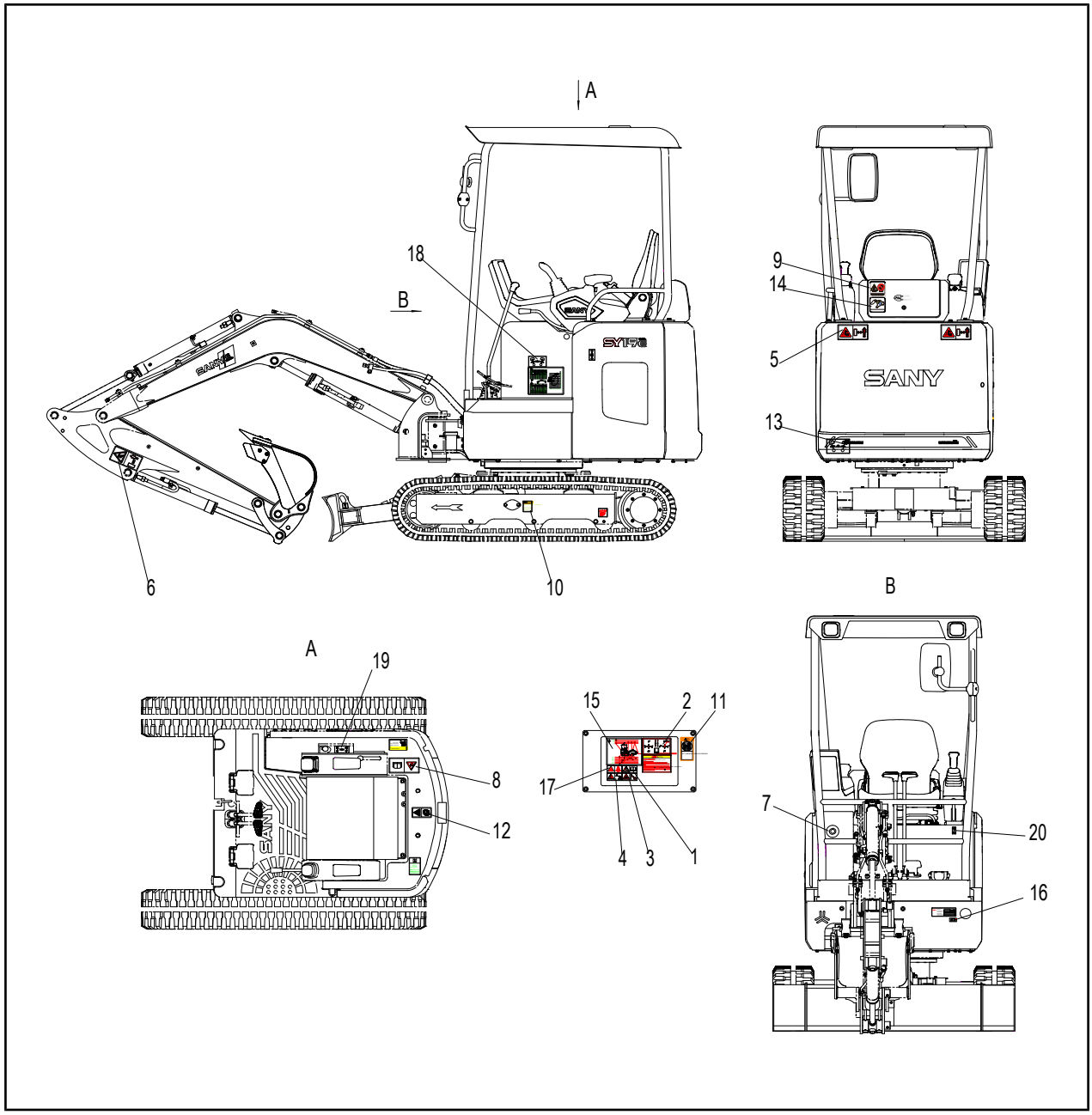


Fig 2-1

【1】 "Read manual" warning decal
【2】Operation instruction decal
【3】High voltage warning decal
【4】Power-off warning decal
【5】Counterweight warning decal
【6】Arm warning decal
【7】Hot surface warning decal
【11】"No climbing" warning decal
【12】"Stand clear of the area" warning decal
【13】Decal
【14】Glow plug warning decal
【15】Lubrication chart
【16】 Belt safety warning decal
【17】Seat safety warning decal

【8】Anti-splash warning decal

【9】"Injury by fan" warning decal

【10】Track tension adjustment warning decal

【18】Pedal decal

【19】 Dozer blade operation decal

2.1.3 Description

1. "Read manual" warning decal

- Warning!
- Please read this manual before operation, maintenance, disassembly, assembly and transportation of the machine.

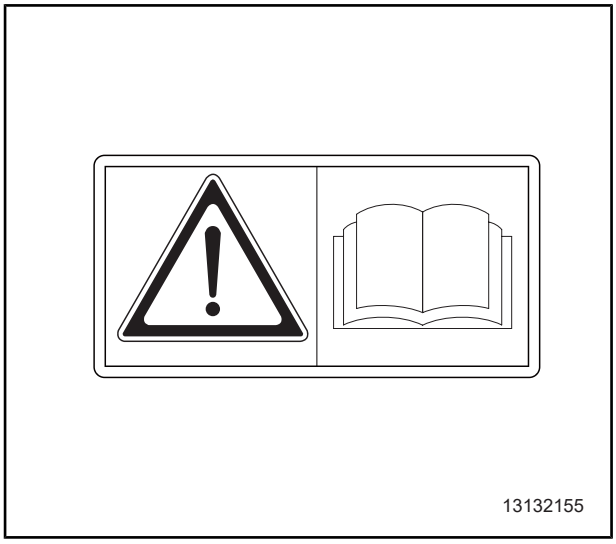


Fig 2-2

2. High voltage safety sign for power lithium battery

- Warning!
- Danger, high voltage, no stepping.。

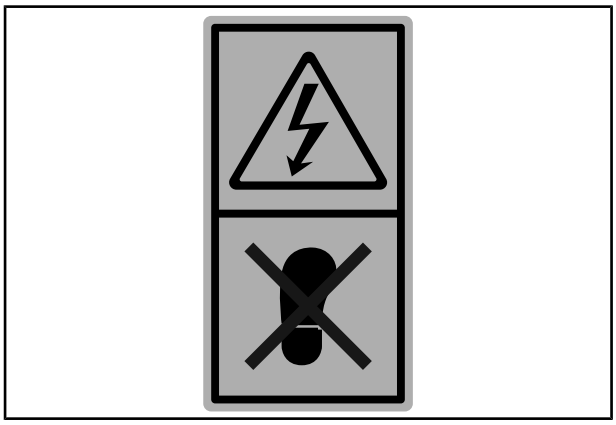


Fig 2-3

3. Operation instruction decal

- To avoid personal injury or death accidents during operation, please verify the running status of the machine and the displayed running mode, pay attention to the surroundings and operate the machine slowly.

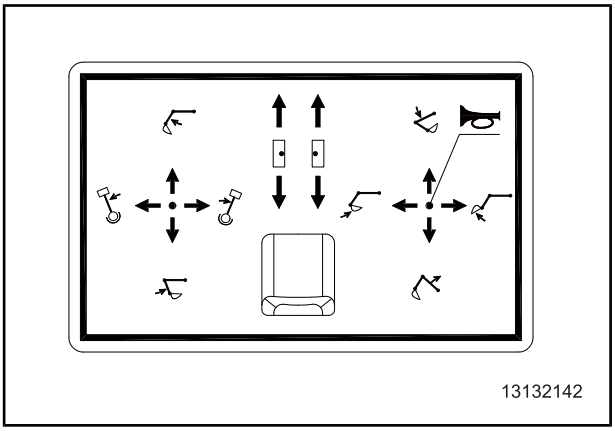


Fig 2-4

4. High voltage warning decal

- This decal indicates if the machine is too close to power transmission lines, there will be the danger of electric shock.
- Keep the safety distance from the power transmission line.

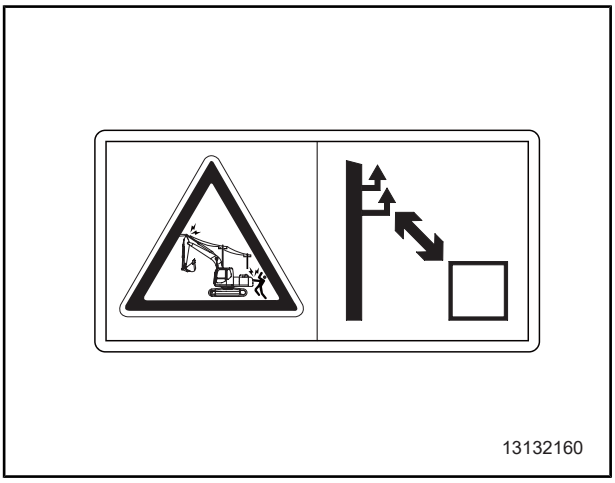


Fig 2-5

5. Power-off warning decal

- Before leaving the machine, please lower the work equipment down to the ground, pull the safety control lever to the Lock position and pull out the ignition key.

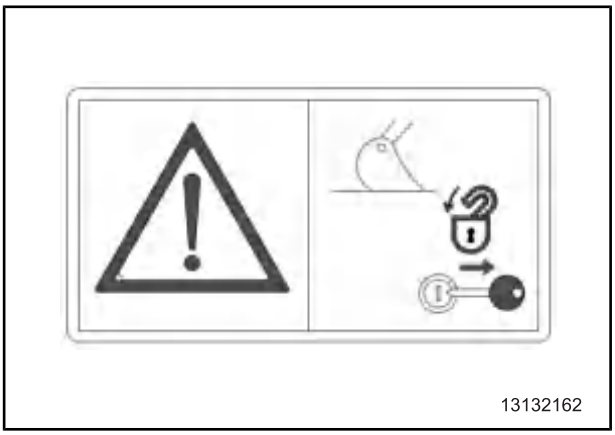


Fig 2-6

6. Counterweight warning decal

- The decal indicates there is the danger of being collided by the machine, please don't enter the turning circle of the machine.
- Keep away from the machine when it is operating.

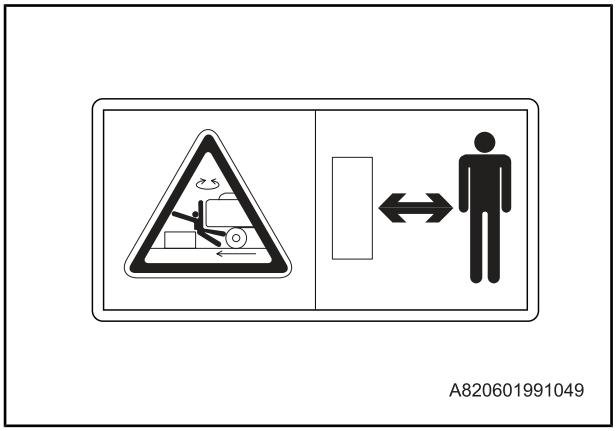


Fig 2-7

7. All-in-one controller warning sign

- Danger! High voltage! Please keep a safe distance between your hands and the power supply, and carry out maintenance only after power is disconnected for 3min.
- Danger! High voltage and high temperature. Please don't touch the hot surface to avoid scald.

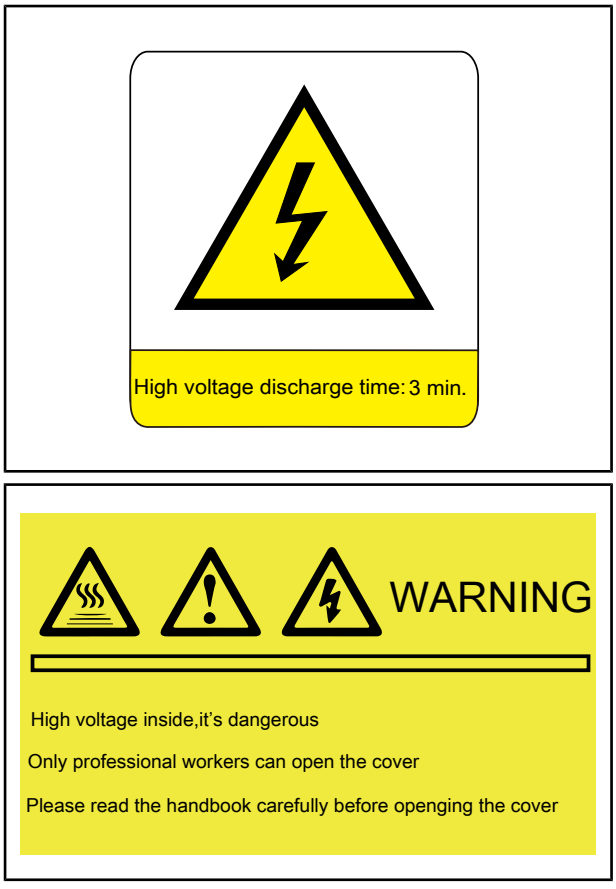


Fig 2-8

8. Arm warning decal

- The decal indicates there is the danger of being collided by the work equipment.
- Keep away from the machine when it is operating.

Fig 2-9

9. Hot surface warning decal

- Please don't touch the hot surface to avoid scald.

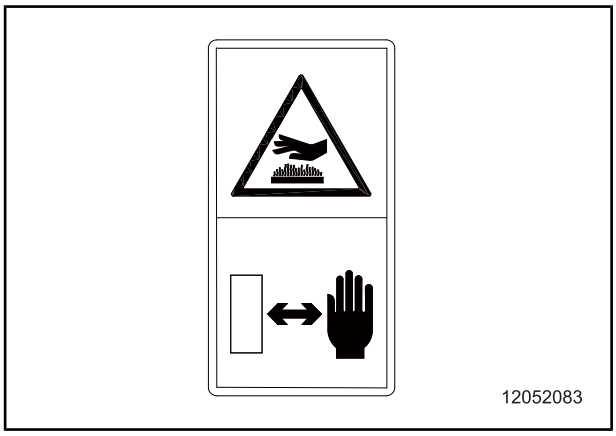


Fig 2-10

10. Anti-splash warning decal

- Please release the tank pressure in accordance with the operation instruction before opening the tank cover like fuel tank cover, and open the cover slowly to avoid splashing.

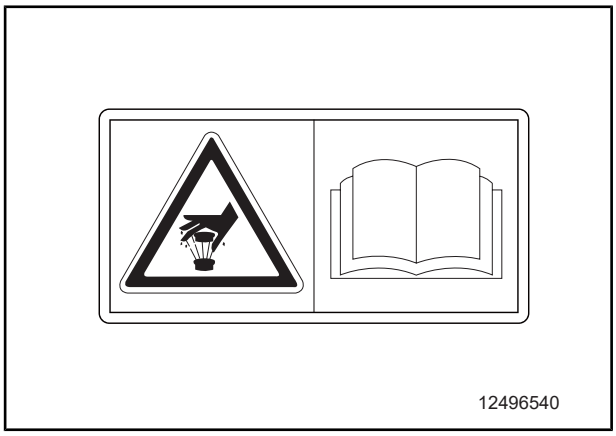


Fig 2-11

11. “Injury by fan” warning decal

- Please keep away from the rotary object to avoid injury.

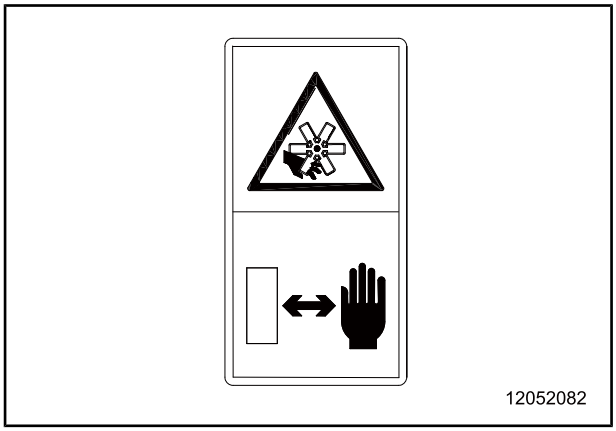


Fig 2-12

12. Track tension adjustment warning decal

- Don’t loosen the track more than 1 turn, or there will be a risk of injury caused by the flying regulating valve under high pressure.

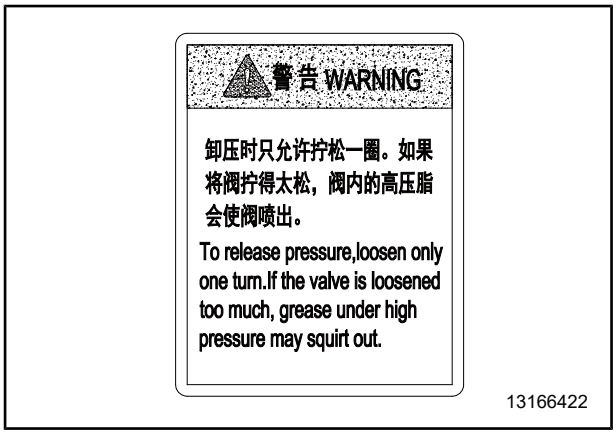


Fig 2-13

13. "No climbing" warning decal

Fig 2-14

14. "Stand clear of the area" warning decal

- There may be the danger of falling.
- Stand clear of the area!

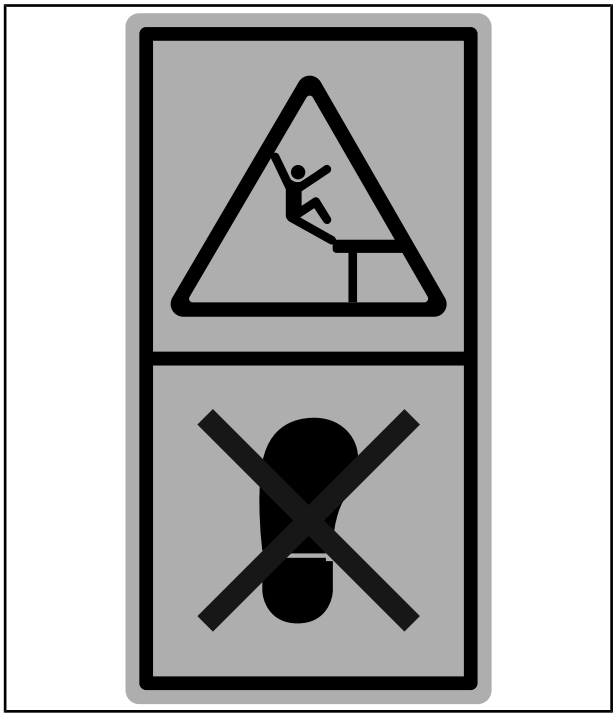


Fig 2-15

15. Lubrication chart

- See the Maintenance Section of Chapter 7 for details.

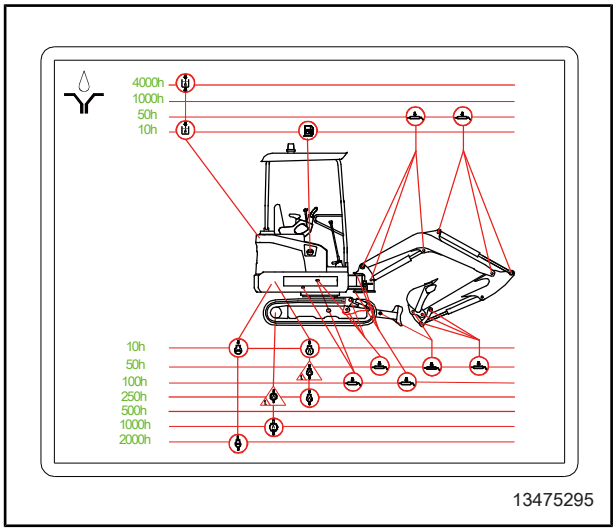


Fig 2-16

16. Seat safety warning decal

- The driver shall fasten the seat belt when operating the equipment.

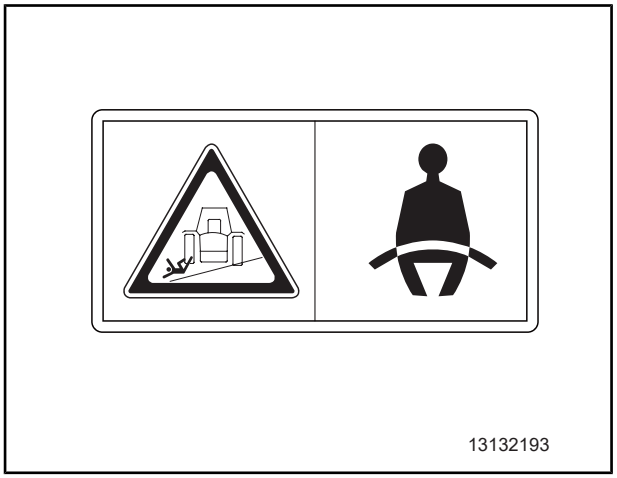


Fig 2-17

17. Pedal decal

- Boom swing operation instruction.

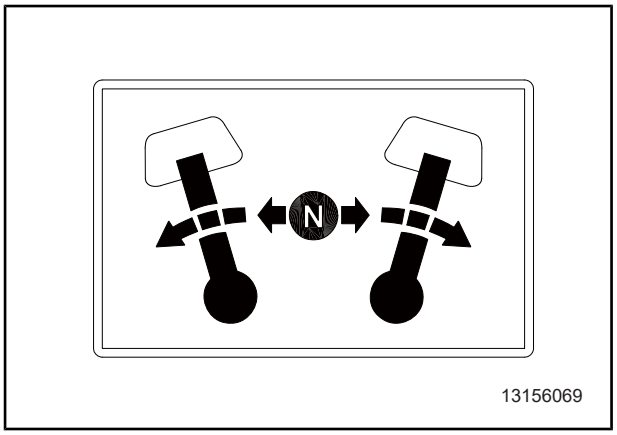


Fig 2-18

18. Dozer blade operation decal

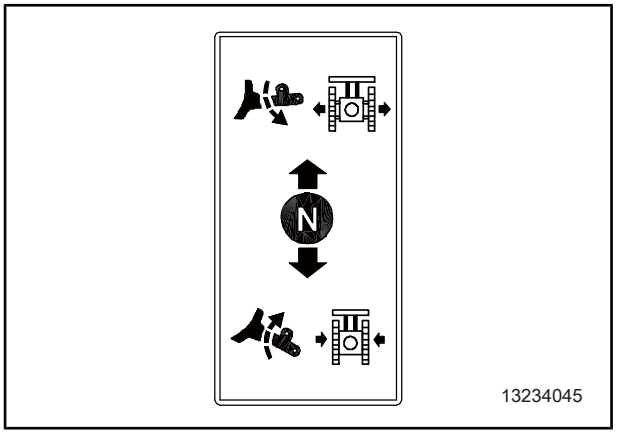


Fig 2-19

19. Charging indicator

- Do not remove the charging gun during charging.

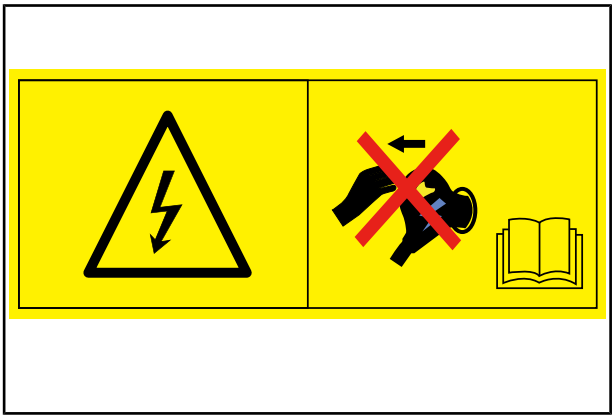


Fig 2-20

2.2 Safety Information

2.2.1 Safety Rules

⚠ WARNING

Damage to equipment and casualties!
Before starting operation and maintenance, operators and maintenance personnel must operate as required:

- Personnel who maintain and repair high-voltage equipment need to obtain a special operation certificate-low voltage electricity, at the same time, the high-voltage circuit of the equipment should be cut off before operation.
- Use insulating tools and protective equipment.
- Only trained personnel can operate and maintain the machine.
- When operating or maintaining the machine, the personnel must observe all safety rules, precautions and instructions.
- If you are affected by alcohol or drugs, your ability to operate or repair the machine safely can be severely reduced/impaired, putting yourself and others at risk.
- When working with another operator or supervisor, ensure that everyone is aware of all gesture signals used.
- Note: Insulating tools are selected from insulated hands with a voltage rating of 500V and aboveCover, insulated shoes, etc.

2.2.2 In Case of Anomaly

If any anomaly (noise, vibration, odor, incorrect meter display, smoke, oil leakage, or any abnormal display on the alarm device, instruments, or monitor) is detected during operation or maintenance, report it to your supervisor and take necessary measures. Do not operate the machine until the fault is removed.

2.2.3 Operator Protective Tools

⚠ WARNING

Risk of personal injury!
Injury could occur if work clothes and safety devices are not properly worn as required by work conditions.

- Do not wear loose clothing and ornaments.
- Ensure that long hair does not stick out of the safety helmet.
- Always wear the safety helmet and safety shoes. Wear safety glasses, face shield, gloves, earplugs, and seat belt as required by the work conditions when operating or maintaining the machine.
- Check whether the functions of all protection devices are normal before use.

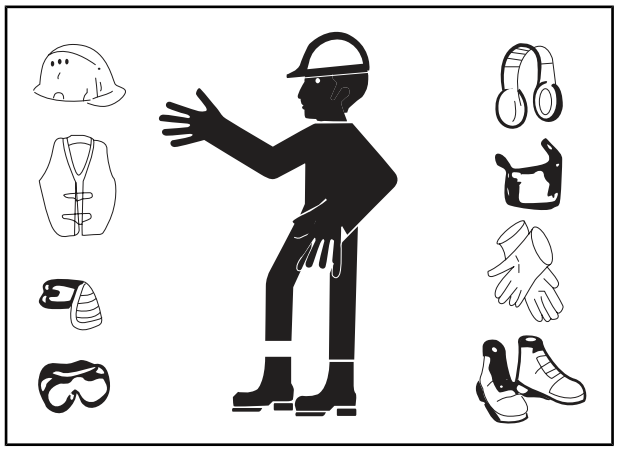


Fig 2-21

Wear tight-fitting clothes or work clothes and safety devices as required by work conditions. More specifically, you may need:

- Safety helmet
- Safety shoes
- Safety glasses, protective goggles, or protective mask
- Protective gloves
- Earplugs
- Reflective protective vest
- Dust mask

Wear necessary safety protective devices and other equipment as required by employers, utility authorities, governments, and laws and regulations. Do not take any chances when you can avoid unnecessary danger.

2.2.4 Fire Extinguisher and First-Aid Kit

A fire extinguisher is provided at the rear of the seat in the cab.

To prevent injury or fire, be sure to observe the following precautions:

- Prepare first-aid kits and fire extinguishers nearby.
- Read carefully and understand the instructions on the fire extinguisher, and use the fire extinguisher correctly.
- Perform regular inspection and maintenance to ensure that the fire extinguisher can be used at all times.
- If the fire extinguisher has expired, replace it in time.
- Regularly check the first aid kit and add supplies when necessary.
- Formulate emergency measures for fires and accidents.

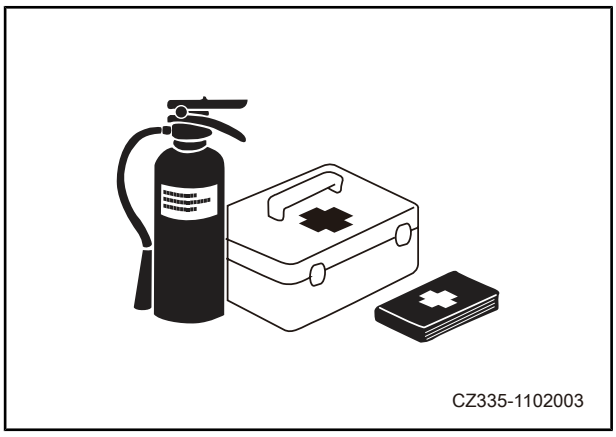


Fig 2-22

2.2.5 Safety Devices

⚠ WARNING

Risk of personal injury!
If operators do not ensure that all safety devices can be used properly, they or others could be injured.

- Ensure that all guard boards and covers are in appropriate positions. Repair the guard boards and covers immediately if damaged.
- Understand how to use safety devices and use them correctly.
- Do not remove the guardrail of the cab without authorization (except for maintenance).

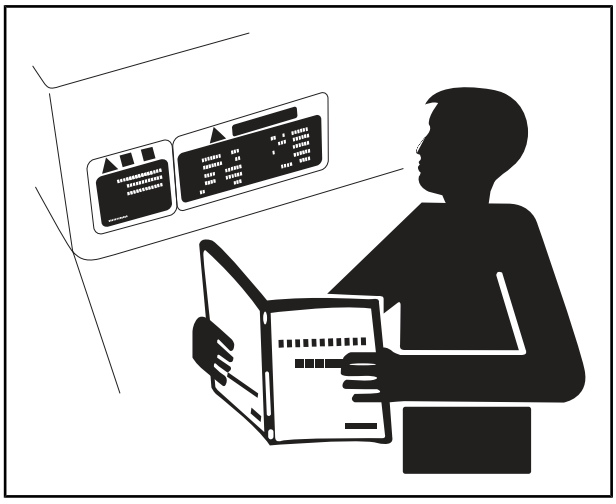


Fig 2-23

To protect you and the people around you, your machine can be equipped with the following safety devices. Ensure that each

device is fixed in place and in normal working condition:

- Falling object protection device
- Guardrail
- Protection plate
- Light
- Safety sign
- Horn
- Travel alarm (optional)
- Side mirrors
- Fire extinguisher (optional)
- First aid kit (prepare it by yourself)
- Wiper (for cab)

Ensure that all of the above devices are available, and do not remove or disconnect any safety devices.

2.2.6 Keep the Machine Clean

- Clean wipers, mirrors, and lamps. Clear grass, snow, ice, or mud from operating areas, steps, and handles in a timely manner to avoid slipping. Remove mud from your shoes before getting into the machine.
- If the machine is covered in mud or oil, there is a risk of slipping, falling, or getting dirt in your eyes while performing inspection or maintenance. So always keep the machine clean.
- If water enters the electrical system, do not turn on the power supply or start the motor immediately as this can cause machine failure, computer board damage, and other malfunctions. Do not wash electrical systems (such as sensors and connectors) with water or steam.

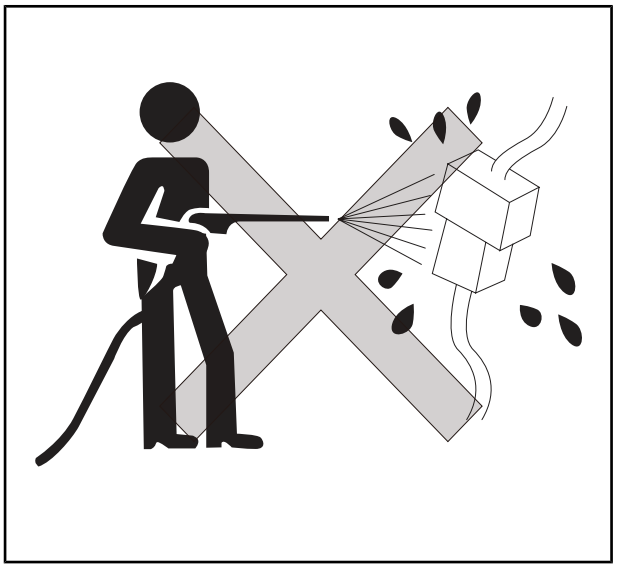


Fig 2-24

2.2.7 Keep the Cab Clean

- When entering the cab, clean the mud and oil from the soles of your shoes first; otherwise you may cause a serious accident due to slipping when operating the pedals.

- Store loose items in the toolbox, not in the cab.
- Do not use a mobile phone when operating or driving the machine.
- Do not bring hazardous materials such as flammable or explosive materials into the cab.

2.2.8 Locking the Safety Lock Lever

- Before standing up from the driver's seat (for example, adjusting the seat), lower the working device to the ground, place the safety lock lever to the locked position, and shut down the motor. If you accidentally touch a control lever or pedal that is not locked, the machine may move suddenly and cause serious injury to personnel or damage to the machine.

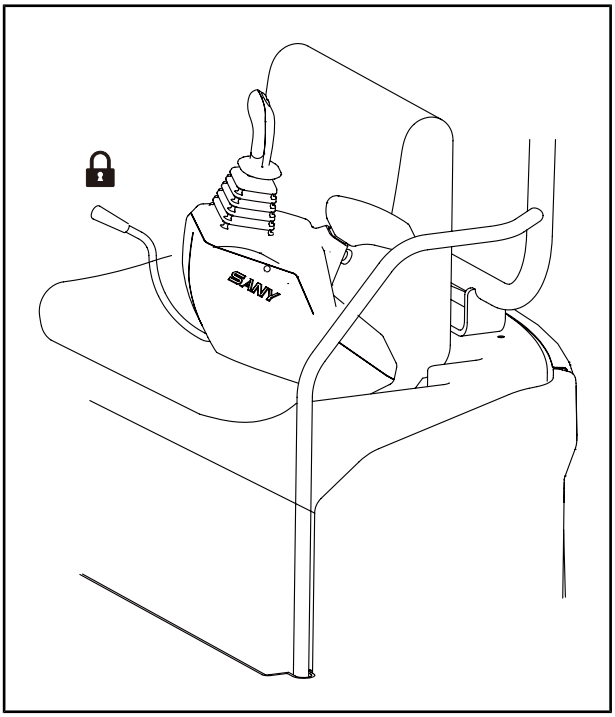


Fig 2-25

- When leaving the machine, be sure to lower the working device to the ground, wrench the safety lock lever firmly into the locked position, and then shut down the motor. Lock all devices with the key and remove the key and place it in the specified location.

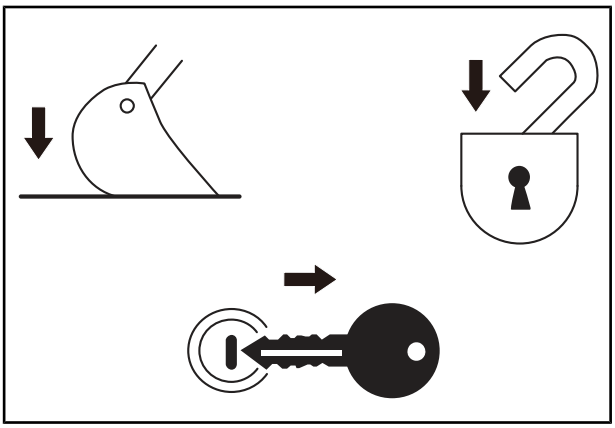


Fig 2-26

2.2.9 Precautions when Working at Heights

When working at heights, please use stepladder or other brackets to ensure safe operation.

2.2.10 No Standing on Accessories

Do not allow anyone to sit on working devices or other accessories because of the risk of falling and serious injury.

2.2.11 Do Not Get Stuck in the Hinge Area

The clearance surrounding the working device changes according to the movement of the link. If anything is stuck, severe personal injury may occur. Do not allow anyone to approach the rotating or telescoping parts.

2.2.12 Prevent Burns

2.2.12.1 Hot Coolant

- When checking or draining the coolant, wait the coolant to cool down completely before starting operation, so as to avoid scalding by hot coolant or steam jets.
- Do not open the radiator cover before the motor cools down. Even if the coolant has cooled down, open the radiator cover slowly to release internal pressure before removing it, so as to prevent serious scalding.

Fig 2-27

2.2.12.2 Hot Oil

- To avoid scalding by sprayed hot oil when checking or draining the oil, wait the oil to cool down completely before starting an operation. Loosen the cover or plug slowly to release internal pressure before removing the cover or plug, even if the oil has cooled down.

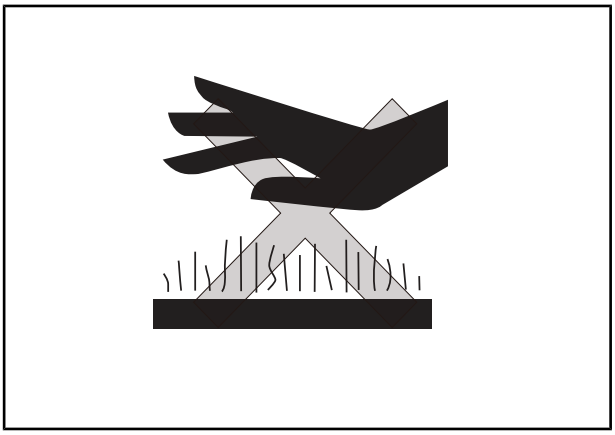


Fig 2-28

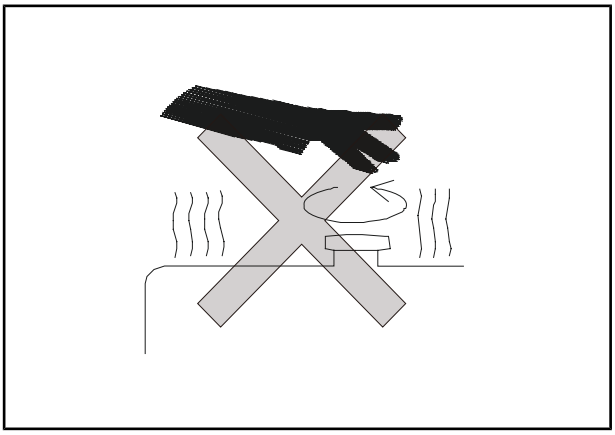


Fig 2-29

2.2.13 Fire and Explosion Prevention

2.2.13.1 Fire caused by the use of liquid lithium battery

- Regularly check the high-voltage harnesses and high-voltage connectors of the battery pack, and it is strictly prohibited to squeeze, pierce or burn the battery to damage the battery system.
- The working environment of the battery system shall be free from corrosive, explosive and insulation damaging gases or conductive dust, and shall be kept away from heat sources.
- If the harness catches fire, spray it with a carbon dioxide or dry powder fire extinguisher.
- If the battery catches fire, use a water torch to extinguish the fire at a safe distance (≥10m).
- If the fire continues, sand or cement needs to be used to cover it, or use a plenty of clean water to cool and extinguish it. However, it should be noted that the power battery is easy to be re-ignited after being flushed with water, so it is necessary to keep a sufficient distance from other items during storage.
- Personnel get out of the vehicle quickly and call the police in accordance with the site conditions.

2.2.13.2 Precautions during welding operation

- Only professionals with welding skills and welding certificates can carry out welding operations on excavators;
- Wear protective equipment (labor protection gloves and protective glasses, etc.) before work;
- Before operation, it is necessary to check whether there are flammable and explosive articles around, and if so, it must be removed to work;
- Before welding operation, cut off the high and low voltage power supply(the main power switch is switched to OFF gear, and the manual maintenance switch is unplugged);
- Use the flame retardant baffle to connect wiring harnesses and electronic components (including power batteries, integrated controllers, storage batteries, charging) near the welding siteBlock, motor, etc.) to avoid sparks, welding slag, high temperature damage parts, and then cause danger;
- After welding, the welding part should be cleaned after cooling to prevent welding slag from entering the electrical interface and causing failure.

2.2.13.3 Fire Caused by Stacked Flammable Materials

- Always remove any dry leaves, wood chips, paper, dust, and other flammable materials that have accumulated or stuck around the motor, exhaust manifold, silencer, and battery, or inside the hood to prevent fires.

2.2.13.4 Fire Caused by Electric Wires

A short circuit in the electrical system can cause a fire.

- Keep the wire connectors clean and tighten them securely.
- Check whether cables or wires are loose, twisted, stiff, or cracked after 8 to 10 hours of operation every day. Check whether the wiring end covers are lost or damaged.
- If a cable or wire is loose or twisted, tighten the loose connector or clamp, correct wiring, and repair or replace the damaged wire.

2.2.13.5 Fire Caused by Hydraulic Pipelines

- Check whether the clamps, guards, and pads of all hoses and pipes are fixed in position.
- If a part vibrates or rubs with other parts due to loose, it will cause hose damage or high-pressure oil spraying, resulting in fires or severe personal injury.

2.2.13.6 Fire Caused by Lighting Devices

- When checking fuel, battery electrolyte, window washing liquid, or coolant, you must use explosion-proof lighting devices. If no explosion-proof lighting device is used, an explosion may occur, causing severe injury.
- When using the power supply of the machine for lighting, follow the requirements in this Manual.

2.2.13.7 Fire Caused by Heat Shield

- Heat shield damage or loss can cause a fire.
- In case of any exception, be sure to repair the heat insulation hood or install a new head shield before operating the machine.

2.2.14 Actions to Take in Case of Fire

In case of fire, leave the machine quickly as required below.

- Turn the start switch to the OFF position, and shut down the motor.
- Use handrails and stairs to get off the machine.

2.2.15 Prevent Parts from Flying Out

The grease in the track tension adjustment device is under high pressure, and failure to comply with the following precautions may result in serious injury, blindness or death:

- Do not remove the grease nozzle or valve parts, as these parts may fly out. Therefore, the body and face must be kept away from or stay away from the valve body.
- The traveling reducer has internal pressure.
- The gear oil is a hot liquid, and the air discharge bolt must be loosened gradually to release the pressure after the gear oil is cooled down. As the parts may fly out, the body and the face must be kept away from or turned away from the air discharge bolt to prevent injury.

Fig 2-30

2.2.16 Avoid Falling Objects, Flying Objects, and Intruding Objects

In hazardous work area where there are falling objects, flying objects, and intruding objects hitting or entering the cab, install necessary shields according to the operating conditions to protect the operator.

- During removing or crushing operations, install the front shield and attach clear glass paper to the front glass.
- When working at a mine or quarry with a rock-falling risk, install the FPOS (Falling Object Protection System) and front shield, and attach clear glass paper to the front glass; operators should wear safety helmets and protective goggles.
- When performing the above operations, close the front window. In addition, keep others out of dangerous areas prone to falling objects and maintain a proper safe distance.
- The preceding cases are for typical working conditions. You may need to install other guards according to the site situation. If so, contact authorized agents of SANY Heavy Industry.

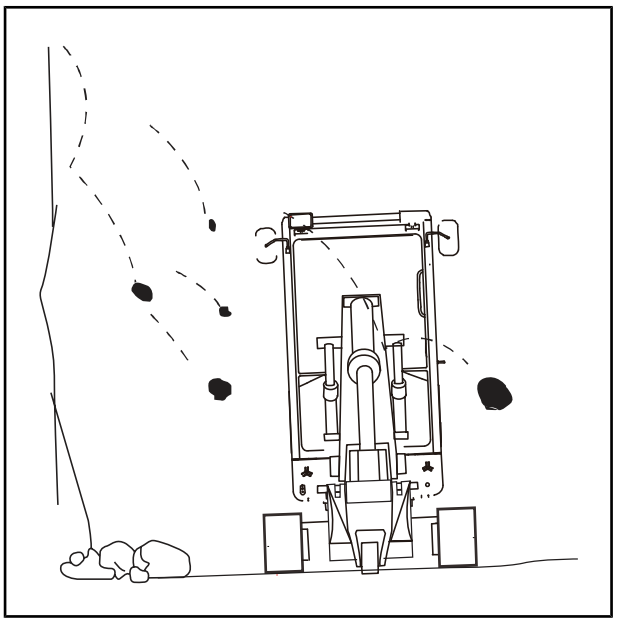


Fig 2-31

2.2.17 Installing the Accessories

- There are safety or legal constraints for installing the options or accessories. When required, contact authorized agents of SANY Heavy Industry in advance.
- SANY Heavy Industry is not liable for any injury, accident, or product fault due to using unapproved accessories or spare parts.
- When installing and using the purchased accessories, read the relevant accessory instruction manual and the general description of the accessories in this Manual.

2.2.18 Combinations of Accessories

Different types or combinations of working devices may present a risk of collision with the cab or other components of the machine. Before using unfamiliar working devices, check for the risk of collision and operate with care.

2.2.19 Unauthorized Modification

If the machine is modified without the approval of SANY Heavy Industry, it may lead to safety problems and cause injury or death. Modification will have major impacts on the strength and line of sight of the machine. Before making any modification, contact the authorized agents of SANY Heavy Industry. SANY Heavy Industry shall not be liable for any accident, fault, or damage due to unauthorized modification.

2.2.20 Survey the Job Site in Advance

- When operating the machine near inflammable materials such as lemongrass roof, dry leaves or dry grass, there is a risk of fire, so be careful.
- Check the terrain and ground conditions of the job site and determine the safest operation method. Do not operate in dangerous areas with a risk of landslides or rockfalls.
- When working at the trench edge, road shoulder or other dangerous areas, reinforce the ground as needed. Also, maintain a safe distance between the machine and the trench edge or road shoulder. When necessary, arrange a signalman to guide the work to avoid casualties.
- If there are water pipes, gas pipes, cables, high-voltage power cables and the like buried under the job site, contact relevant public utilities and mark their locations in advance, and take care not to cut or damage any pipe or line.
- Take necessary measures to prevent any unauthorized personnel from entering the work area. When working on a road, arrange a signalman and install a baffle to ensure traffic and pedestrian safety.
- When working on the frozen ground, be especially vigilant. The rise in ambient temperature will make the foundation soft and slippery.

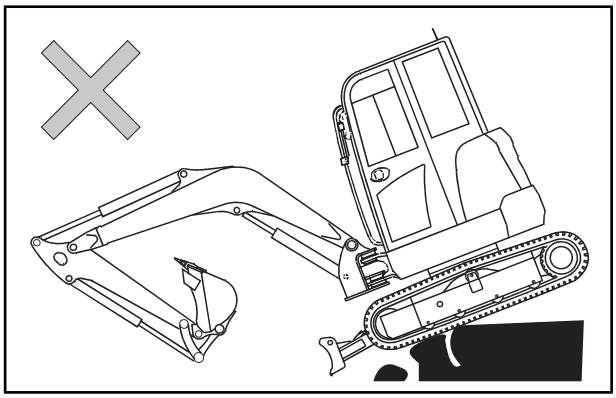


Fig 2-32

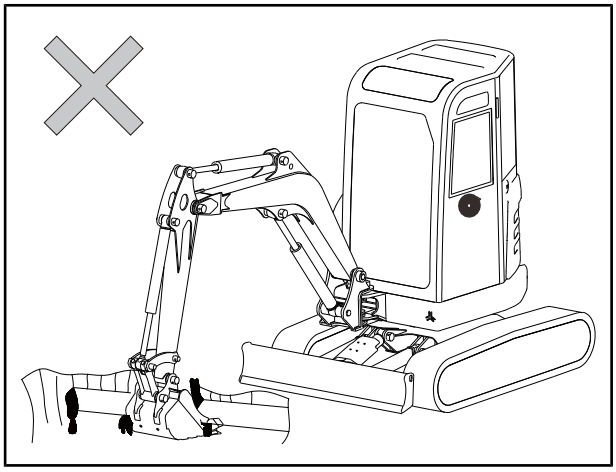


Fig 2-33

- Before traveling or operating in shallow water or on soft ground, check the type and condition of the rock bed, and the depth and flow rate of the water.

2.2.21 Operate on Loose Ground

- Do not travel or operate the machine near cliffs, shoulders, and deep canals. In these areas, the ground is very soft, and in addition to the machine weight and vibration, the machine has a risk of falling or tip-over. It is worth noting that the soil becomes softer after heavy rain, blasting or earthquake.
- When working on a dam or near a dug trench, there is a risk of soil collapse due to the weight and vibration of the machine. Before starting an operation, take measures to ensure the ground safety and prevent the machine from tipping over or falling.

2.2.22 Keep Away from High-voltage Cables

Do not walk or operate the machine near the cables; otherwise there will be a danger of electric shock, resulting in device damage or casualties. In the workplace near cables, follow the steps below:

- Notify the local power company of future operations near the job site with cables and ask it to take necessary measures.
- If the machine is too close to cables, it is very likely to receive an electric shock, causing severe burns or even death of the operator. A safe distance must be maintained between the machine and the cable (see the table on the right). Before starting operations, consult with the local power company on measures related to safe construction.
- If the machine is too close to cables, designate a signalman to command the work.
- When working near high-voltage cables, no one is allowed to get close to the machine.
- If the machine is too close to the cable or gets contact with the cable, to prevent electric shock, the operator should not leave the

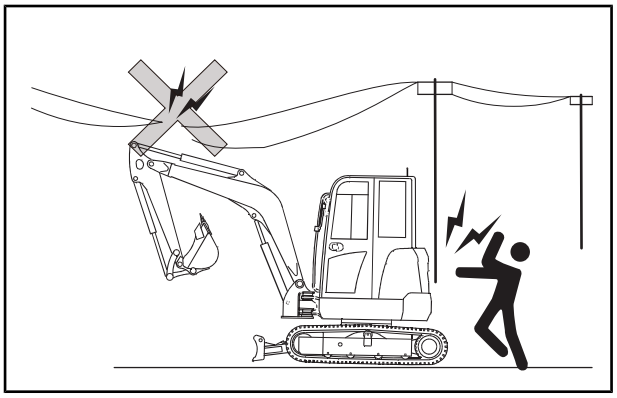


Fig 2-34

Cable voltage	Safe distance
100 V ~ 200 V	Over 2 m (7 ft)
6,600 V	Over 2 m (7 ft)
22,000 V	Over 3 m (10 ft)
66,000 V	Over 4 m (14 ft)
154,000 V	Over 5 m (17 ft)
187,000 V	Over 6 m (20 ft)
275,000 V	Over 7 m (23 ft)
500,000 V	Over 12 m (36 ft)

cab before ensuring that the cable has been cut off. Also, do not allow anyone to get close to the machine.

- To prevent accidents, operate with rubber shoes and rubber gloves. Put a rubber mat on the seat and take care not to allow the exposed part of the body to touch the undercarriage.

2.2.23 Ensure a Good View

The machine is equipped with rearview mirrors to improve the vision, but there are still places that cannot be seen on the seat. Therefore, be careful when operating the machine.

During operation in a place with poor vision, the machine may be damaged or personnel may be injured if the conditions of the job site or the obstacles in the area around the machine cannot be confirmed. When operating in places with poor vision, strictly observe the following items:

- Check the rearview mirrors before starting work every day. Clean the dirt and adjust the rearview mirrors to ensure good vision.
- When working in a dim place, turn on the working lights and headlights of the machine, and set auxiliary lighting in the working area if necessary.
- If the vision cannot be guaranteed, such as in foggy, snowy, rainy, or sandstorm days, the operation should be stopped.
- Set up signs on the road shoulder or soft ground. If the vision is poor, arrange a signalman if necessary. The operator should pay special attention to the signs and follow the instructions of the signalman.
- Ensure that all workers understand all signals and gestures before operation.

2.2.24 Ventilation in the Work Environment

- Do not operate the machine in the environment of toxic gas or underground; if necessary, please wear a gas mask and ensure ventilation.

Fig 2-35

2.2.25 Prevent Asbestos Dust Hazards

⚠ WARNING

Risk of serious injury!
If counterfeit parts containing asbestos are used, a large amount of inhalation could cause lung injury or death.

- Use the genuine components of SANY Heavy Industry.

If asbestos dust in the air is inhaled, it will cause lung cancer. There is a risk of inhaling asbestos during or disposing of industrial wastes at job sites. The following rules must be observed:

- During the cleaning work, spray water to reduce dust. Do not use compressed air for cleaning.
- When working in an environment with asbestos dust in the air, be sure to operate the machine at a windward location. All personnel must use a dust filter mask.
- No other personnel are allowed to get close to the machine during operation.
- Comply with laws, regulations, and environmental standards for the job site.

2.3 Operate the Machine Safely

2.3.1 Start the Machine Safely

2.3.1.1 Board the Machine Safely

When you get on and off the machine:

- Always face the machine and keep in three-point contact by hands and feet (one hand and two feet or two hands and one foot).
- Never jump on and off from the machine, and never climb the machine while it is running.
- Do not use any control lever as an armrest.
- Remove mud, oil, and water from all the pedals, armrests, and shoes at any time.
- Before entering or leaving the cab, ensure that the cab is in the right position.

Fig 2-36

2.3.1.2 Adjust the Seat

- An uncomfortable seat position can result in operator fatigue and cause improper operations.
- The seat position should be re-adjusted each time the machine operator is changed.
- When leaning on the seat back, the operator should be able to fully depress the pedal and operate the joystick correctly. Otherwise, move the seat back and forth to re-adjust it.

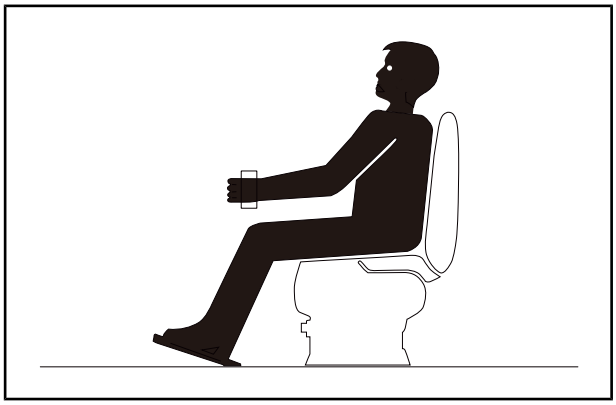


Fig 2-37

2.3.1.3 Buckle up the Seat Belt

- In case of an overturn, the operator may be injured or thrown out of the cab, or may be crushed by the overturned machine, resulting in serious injury or even death.
- Check the seat belt, buckle, and fasteners carefully and replace them immediately in case of any damage or wear before operating the machine.
- When the machine is running, be sure to sit on the operator's seat and buckle up the seat belt to avoid accidents.
- It is recommended that the seat belt be replaced every three years, regardless of its condition.

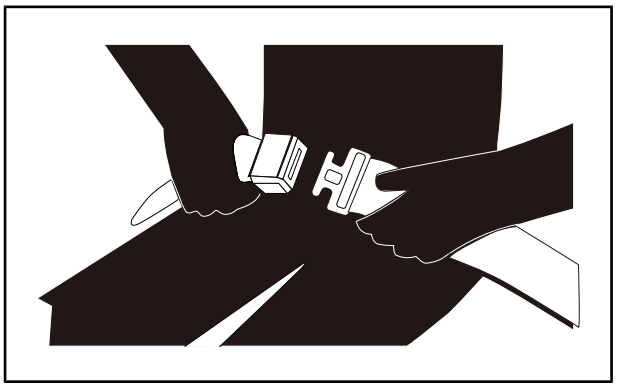


Fig 2-38

2.3.1.4 Inspection before starting the motor

When starting daily work, perform the following inspections before power on the machine:

- Wipe off dust on the lens surfaces of the front lamp and work light and check if the work light works well.
- Check the motor coolant level and the hydraulic oil level.
- Check if the electrical wire is damaged.
- Adjust the seat to the position which is easy for operation and check if the seat belt and fixture are damaged or worn.
- Check if the instruments work well, check the angle of the work light and check if all control levers are in the neutral position.

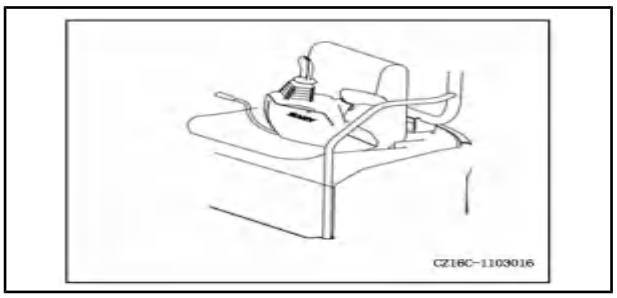


Fig 2-39

2.3.1.5 Start the Machine Safely

⚠ WARNING

There is a risk of serious injury or death!
Be familiar with the correct starting procedure of the machine. Otherwise, serious accidents may be caused, and inhaling a large amount of exhaust gas can be fatal.

- If it is necessary to start the motor or operate the machine in an enclosed environment, ensure adequate ventilation.
- Do not start the motor if you do not know how to shut it down.

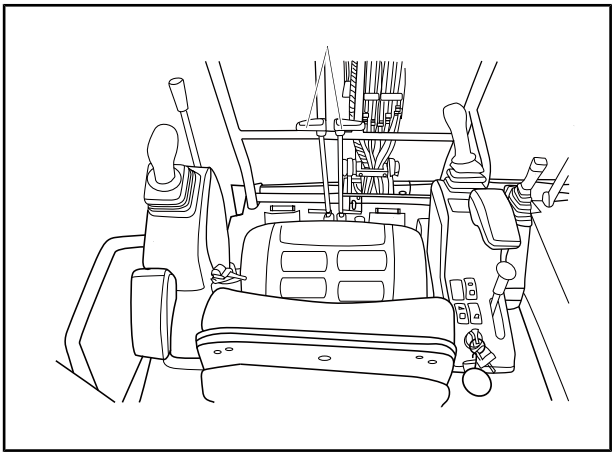


Fig 2-40

- Be familiar with the correct starting procedure of the machine. For details, see the machine start instructions.
- Before starting the machine, ensure that no one is above, below, or in the area around the machine, and sound the horn as a warning to start the machine.
- Sit in the driver's seat and adjust the seat so that you can comfortably operate all controllers.
- Get familiar with all warning devices, instruments, and controllers.
- Place all controllers in the neutral/stop position.
- No one is allowed to ride on the machine except for the operator.
- Follow the instructions in the operation section of this Manual exactly to start the motor. Do not start the motor in a way that will result in short-circuit of the start motor.
- Do not start the motor in a way that will result in short-circuit of the start motor.

2.3.1.6 Start the Engine in Cold Weather

- Check if the battery acid is frozen or leaks before starting. If the battery acid is frozen, don't charge the battery or start the motor by different electric power. In that case, please melt the battery acid firstly, otherwise the battery may be on fire.
- Engine start in cold weather (power on at low voltage, press the one-key startup button): If the lowest cell temperature Tmin<15℃ is detected, the battery will automatically close the heating relay and enter the driving heating mode. The operator can observe the battery temperature on the instrument. If Tmin≥0℃, it can work normally; if Tmin<0℃, it needs to wait until Tmin≥0℃ before it can work normally.

2.3.1.7 Auxiliary Devices Required for Startup

When starting the motor by connecting auxiliary cables, follow the instructions in the operation manual. Incorrect operation may cause the battery to explode or make the machine out of control, resulting in personal casualties. It is strictly forbidden to use auxiliary cable to start the machine without authorization. If necessary, contact authorized agents of SANY Heavy Industry.

- To use auxiliary cable to start the motor, arrange 2 persons to help each other (one person sitting on the driver's seat and the other person operating the battery).
- Always wear protective goggles and rubber gloves before using auxiliary cables to start the motor.
- When using the auxiliary cable to connect the normal machine to the faulty machine, the battery voltage of the normal machine should be the same as the battery voltage of the faulty machine. Also be careful not to let the two machines contact each other.
- When connecting the auxiliary cable, turn both the key switches of the normal machine and the faulty machine to the OFF position. Otherwise, when the power is turned on, the machine moves and can cause danger.
- When connecting the auxiliary cable, be sure to connect the positive terminal (+) first. When removing the auxiliary cable, disconnect the ground or negative (-) cable (ground side) first.
- When removing the auxiliary cable, be careful not to allow the auxiliary cable clamps to touch each other or allow the cable clamps to come into contact with the machine.
  Diethyl ether cold start fluid is highly flammable and explosive. Read the instructions on the ether container before use.
  Do not use ether if the motor is equipped with a pre-heater of the spark plug type or other forms of pre-heater.

2.3.1.8 After Starting the Motor

After the motor is started, observe the system parameters displayed in the instruments to ensure the instruments function well and each reading is in normal operational range

2.3.1.9 Failure condition, put down the working device

When the machine is working, it suddenly breaks down and needs to put down the working device.

Place pads under the tracks to prevent the machine from moving.

Low voltage on the machine, the motor does not need to start, put down the pilot lock, move the working device joystick and walking joystick in all directions with full stroke to release the innerPart pressure.

2.3.2 Operation

2.3.2.1 Inspection before Operation

⚠ WARNING

Risk of personal injury!
If the machine has abnormal noise, it is necessary to stop the machine immediately to avoid the failure of the machine, causing serious equipment damage and casualties.

- Observe and listen carefully to the machine for strange noises, and if there is a fault or abnormal condition, stop the machine immediately.
- Before proceeding further, resolve the problem immediately and report it to your supervisor.

- When performing an inspection, move the machine to a wide area free of obstructions and operate it slowly, without allowing anyone to approach the machine.
- Be sure to fasten your seat belt.
- Check that the instruments and devices are operating normally, and check that the bucket, bucket rod, boom, traveling system, slewing system, and steer system are operating normally.
- Check the machine for normal sound, vibration, heating, smell or instrumentation, and check for oil or fuel leakage.
- With the travel control lever in the neutral position, test the motor speed controllers; operate each device control lever to determine that all functions are normal and to learn about the control mode of the working device.
- If you find any abnormality, do not continue to use the machine, but repair it immediately.

2.3.2.2 Dangerous Area when the Machine is Working

To prevent severe personal injury or death, please pay attention to the followings before operation:

- The turning circle of a 4 m radius is the working area (hazard zone) of the machine. Please press the horn button to warn the workers in this area before operation.
- No one shall be on, near the machine or in the turning circle.
- To ensure the view in the travel direction, please turn the cab if necessary.
- Please assign a signalman in the place with bad view.

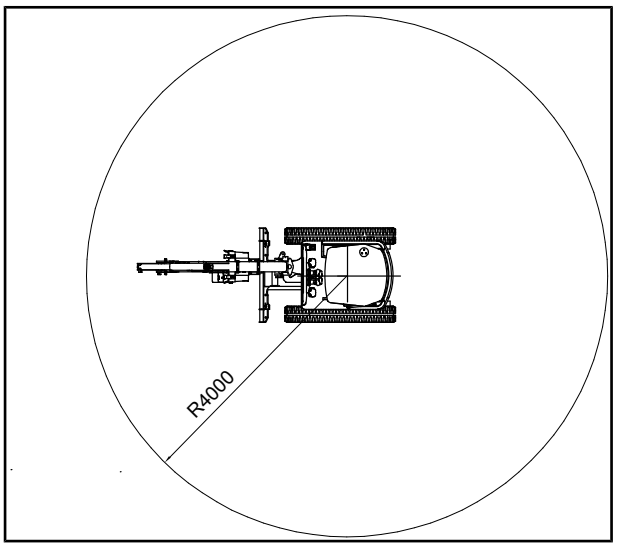


Fig 2-41

2.3.2.3 Confirm the Machine Traveling Direction

⚠ WARNING

Risk of serious injury or death!
Incorrect operation of travel joysticks and pedals could lead to serious injury and death accidents.

- Be familiar with and correctly operate the travel joysticks and pedals.

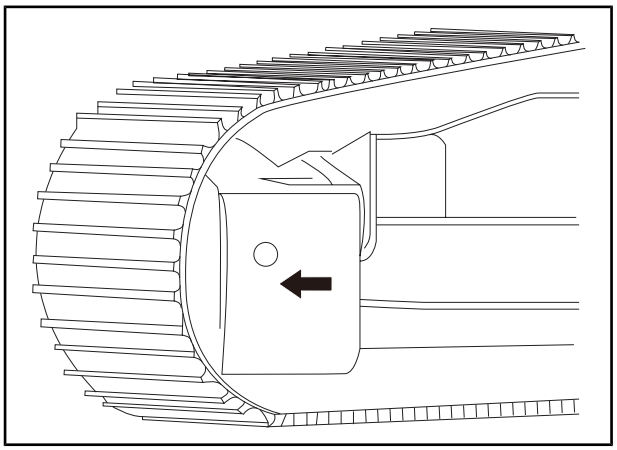


Fig 2-42

- Before driving the machine, confirm the location of the undercarriage and its relationship with the operator's location.
- If the guide wheel is located under the front of the cab, the machine moves forward when the joystick or pedal is pushed forward.
- If the travel motor is located under the front of the cab, the machine moves backward when the joystick or pedal is pushed forward.

- Inside the undercarriage of the machine, there is a driving direction sign. When the operator pushes the joystick or pedal forward, the arrow direction on the sign is the actual driving direction of the machine.

NOTE :

- In this Manual, front, rear, left and right refer to the direction as seen from the cab when the cab is facing forward and the drive wheels are at the rear of the machine.

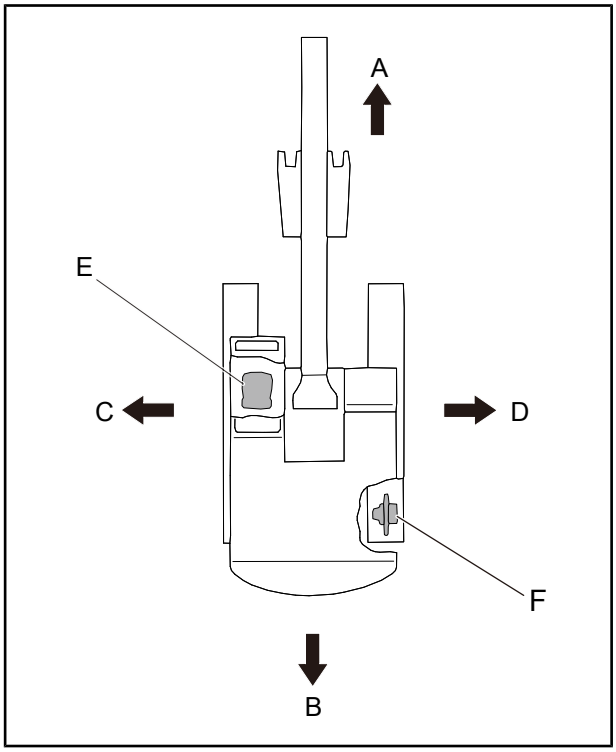


Fig 2-43

A. Front
B. Rear
C. Left
D. Right
E. Operator seat
F. Drive wheel

2.3.2.4 Safety Rules for Changing the Machine Direction

⚠ WARNING

Risk of serious injury or death!
People near the moving machine could be knocked down or crushed by the machine, causing serious injury or death.

- When reversing or slewing the upper carriage, pay attention to whether the surrounding environment is safe.

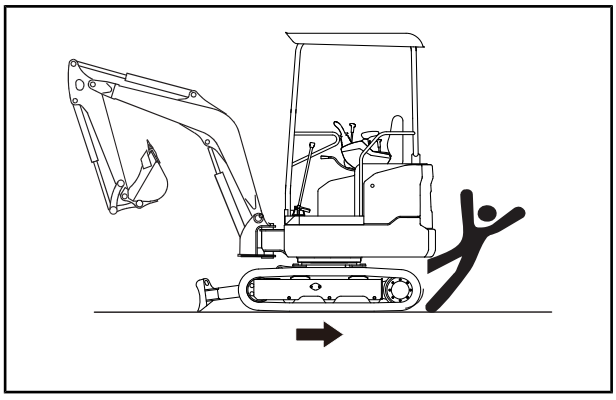


Fig 2-44

- Only sit on the seat to operate the machine.
- No one is allowed to ride on the machine except for the operator.
- Check that the travel alarm device is working normally.

- Lock the doors or windows of the cabs in the closed position. When there is a danger of flying falling objects entering the cab, check whether the doors and windows of the machine are closed tightly.

- Before reversing and slewing the machine, confirm that there are no persons or obstacles in the work area of the machine and honk the horn to give a warning.
- Always watch out for bystanders entering the machine work area.
  When the machine turns or slews, take special care not to touch other machines or people.

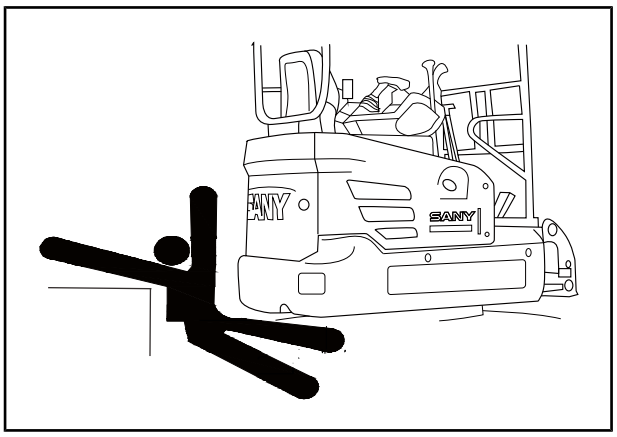


Fig 2-45

- Adjust the machine before traveling so that the drive wheels [1] are behind the driver seat.
- If the drive wheels are in front of the cab, the machine will move in the opposite direction to that of the joystick (when the joystick is moved forward, the machine will move backwards, which is also true when turning left or right). Special care must be taken when operating the machine under such circumstances.

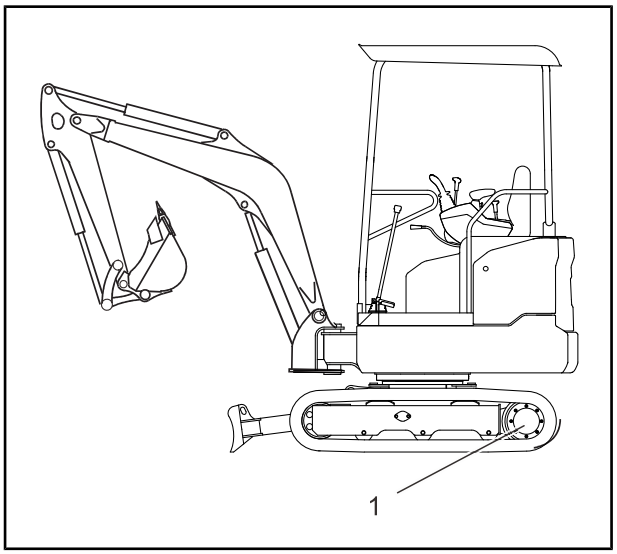


Fig 2-46

1. Drive wheel

⚠ WARNING

Risk of serious injury or death!

The machine has a certain blind area. If someone is near the machine when reversing or turning around, they may be knocked down or overwhelmed by the machine, causing serious casualties.

- When reversing or turning around, if your view is blocked, please arrangeThe signalman is in command, and always keep the signalman in viewInside.

- When reversing the machine, if the line of sight is blocked, arrange a signalman to provide instructions, and always keep the signalman in the field of view.
- When the working condition requires a signalman, use gesture signals that meet local regulations.
- The machine can only be moved when both the signalman and the operator clearly understand the signals.
- Understand the meanings of flags, signals and marks used in all work, and identify who is responsible for sending the signals.
- Keep the windows, rearview mirrors and working lights clean and intact.
- Dust, heavy rain, and fog can reduce visibility. When visibility is reduced, slow down and use appropriate lighting.

Fig 2-47

2.3.2.5 Safety Rules for Traveling

- When using the machine, do not exceed the maximum allowable load or other performance parameters of the machine, which can prevent the machine from stalling due to overload and avoid damage to the working device.
- When the machine travels or operates, be sure to maintain a safe distance from people, buildings or other machines to avoid collision.
- When walking on the road, you need to contact the relevant authorities and follow their instructions.
- When walking on a flat ground, retract the working device and keep it 20-30 cm (8-12 in) from the ground [1].
- When walking on rough ground, walk at a low speed and do not turn suddenly; otherwise the machine may tip over, and if the working device hits the ground, the machine will lose balance or be damaged

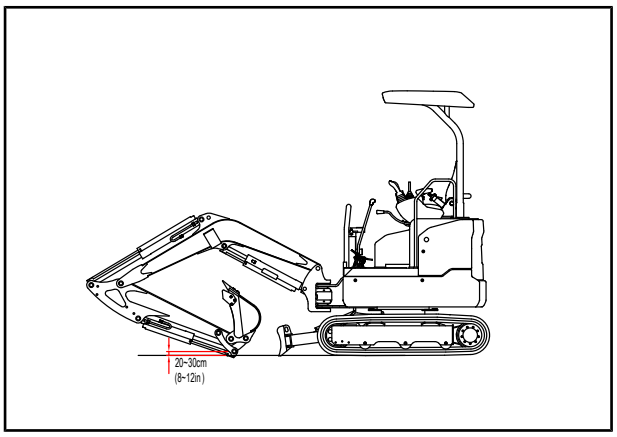


Fig 2-48

- When walking on rough ground or steep slope, if the machine has auto-idle function, disable the auto-idle function; if the auto-idle function is enabled, the motor speed will be reduced and the walking speed will suddenly become lower.
- Avoid walking on obstacles as much as possible, and if the machine has to walk on obstacles, keep the working device close to the ground and travel at a low speed.
- When passing over a bridge or building, first check whether the strength of the structure is sufficient to support the weight of the machine.
- When operating in tunnels, under bridges, under power cables or other places of limited height, operate slowly and take special

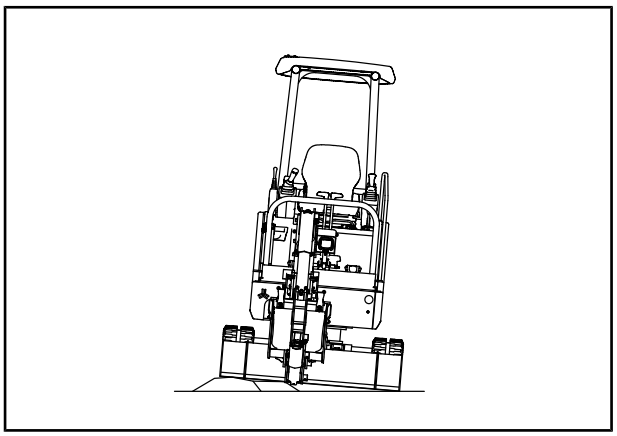


Fig 2-49

care not to let the working device touch anything.

2.3.2.6 Drive the Machine Safely

⚠ WARNING

Risk of serious injury or death!
Walking on the slope could cause the machine to slip or tip over, resulting in serious injury or death.

- When walking on the slope, keep the working device from the ground20~ 30Cm (8~ 12in). In case of emergency, you can quickly adjust the working device lowered to the ground to help stop the machine.

- Before moving the machine, ensure the guide wheel is under the front of the cab and you know how to move the joystick or pedals.
- Depress the front of the travel pedal or push the travel joystick forward to move the machine in the direction of the guide wheel.
- When walking on the slope uphill, keep the working device 20-30 cm (8-12 in) from the ground [A].
- When walking on the slope downhill, keep the working device 20-30 cm (8-12 in) from the ground [B].
- In an emergency, the working device can be quickly lowered to the ground to help stop the machine.

- Before the machine travels uphill, turn the cab to face the uphill direction, which is also true when downhill.
- Before moving the machine, check the hardness of the ground in front of the machine.

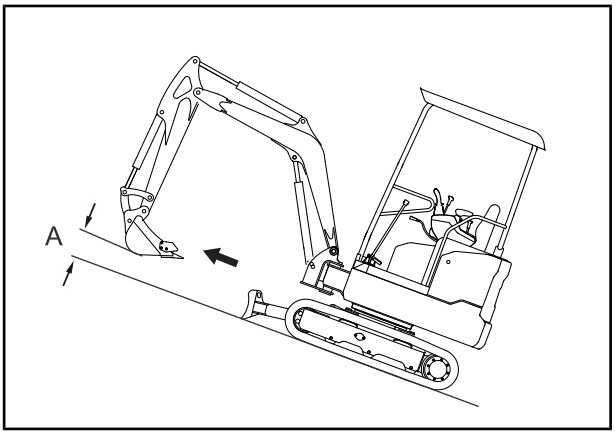


Fig 2-50

A. Ground clearance

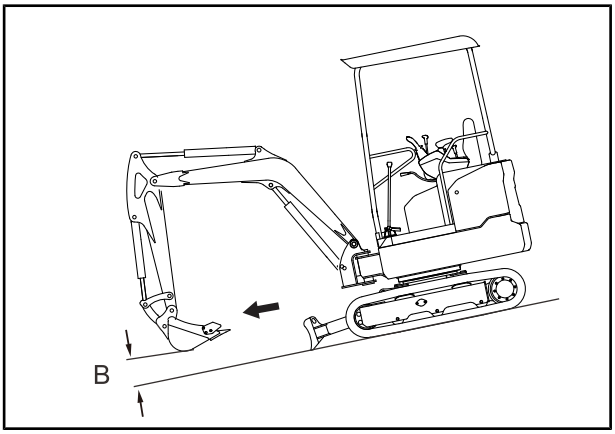


Fig 2-51

B. Ground clearance

- When the machine travels uphill, extend the working device to the front to increase the balance, while keeping the working device 20-30 cm (8-12 in) from the ground [C] and walking at a low speed.
- When going down a slope, reduce the motor speed, keep the travel joystick near the "neutral" position, and travel at a low speed.

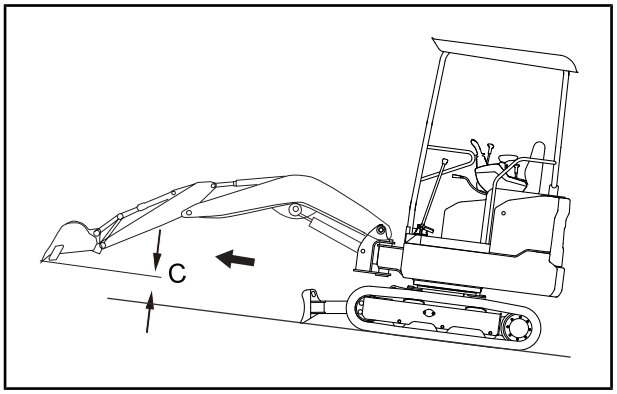


Fig 2-52

C. Ground clearance

- Straightly travel uphill and downhill, because it's extremely dangerous to make a turn on the slope or cross the slope.

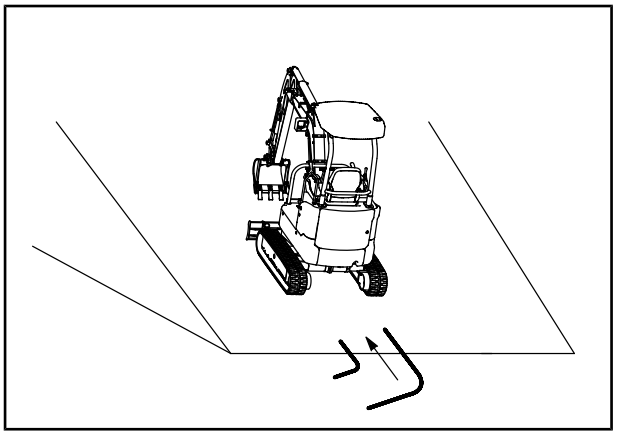


Fig 2-53

- Don't make a turn on the slope or cross the slope. Make sure to move the machine down to a flat ground, change the machine position, and then drive the machine uphill.
- Travel at a low speed on ground with grass, fallen leaves or wet steel plate. There may be the danger of slip even on a gentle slope.
- If the motor stops when the machine travels on a slope, please move the joystick to the neutral position immediately and restart the motor.

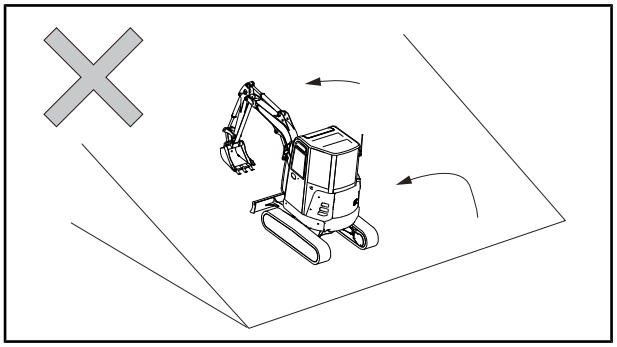


Fig 2-54

2.3.2.7 Operation on Slopes

When working on slopes, there is a risk that the machine loses balance and tips over when operating the swinging devices or working devices, which can cause serious injury or device damage. Therefore, when performing these operations, a flat work platform should be provided and handled with care.

- When the bucket is fully loaded, do not make the working device slew from the uphill side to the downhill side. This is dangerous and can tip the machine over.
- If the machine must be used on a slope, build up a working platform with soil to keep the machine as level as possible.

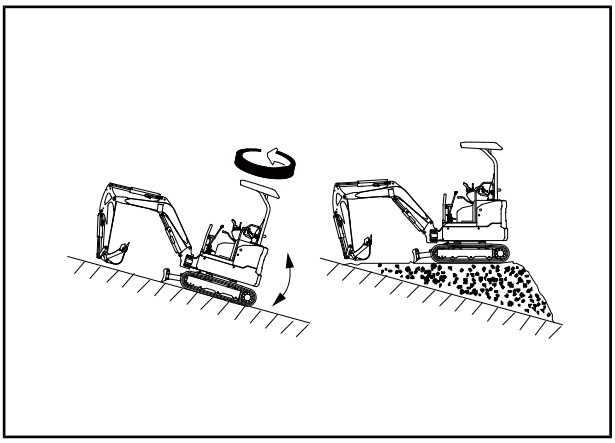


Fig 2-55

2.3.2.8 Operation in Snowy Weather

- Snow and frozen roads are very slippery, so do not operate the control lever abruptly when walking or operating the machine. Be especially careful when working on slopes, as even small slopes can cause the machine to slip.
- For frozen ground, the ground will become soft when the temperature rises, which will easily cause the machine to tip over.
- If the machine enters deep snow, there is a risk of tipping over and being buried in the snow. Be careful not to leave the shoulder of the road and get caught in the snow.
- When clearing snow, it is difficult to see objects near the shoulder and road that are buried in the snow, and there is a risk of the machine tipping over and hitting buried objects, so it must be operated carefully.

2.3.2.9 Prohibited Operations

- Do not excavate the working face under the overhanging part, as there will be a risk of falling rocks or even collapse of the overhanging part, resulting in a serious accident.

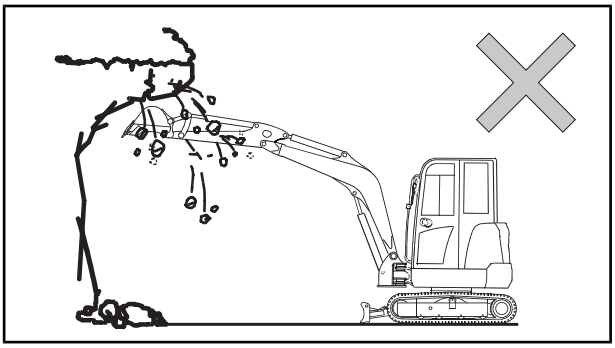


Fig 2-56

- Do not excavate too deep in front of the machine. Otherwise, the ground will collapse if hollowed out underneath, resulting in accidents.

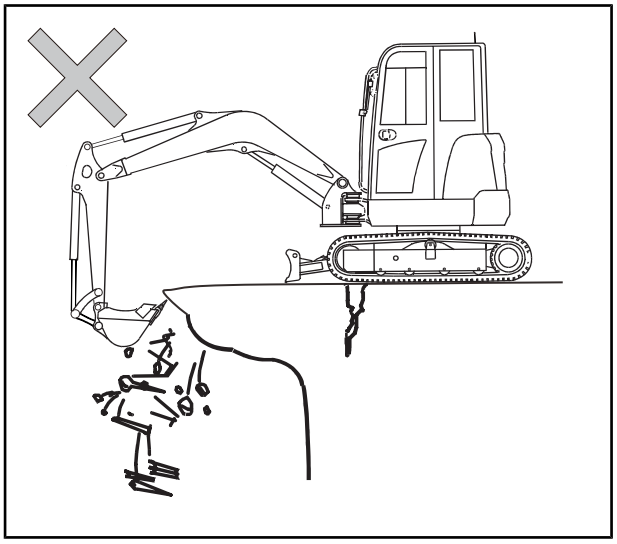


Fig 2-57

- During digging operation, adjust the track to be vertical to the shoulder or cliff and locate the sprocket at the back of the cab, so as to ensure that the machine can be easily evacuated when abnormality occurs.

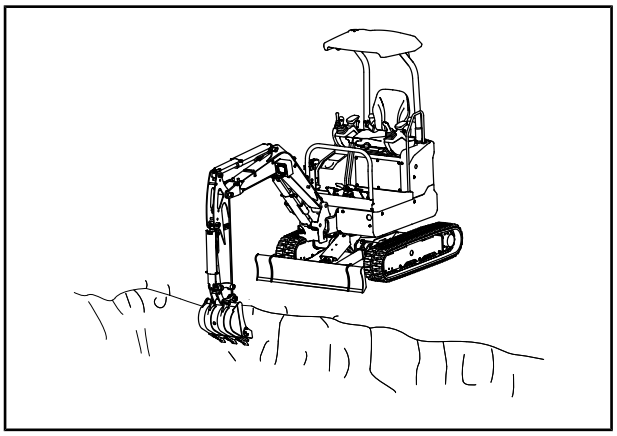


Fig 2-58

- Don’t conduct removal operation under the machine, which makes the machine unstable and face the danger of rollover.
- Before operation over the buildings or other structures, please check the structure strength to prevent casualty due to collapse of structure.

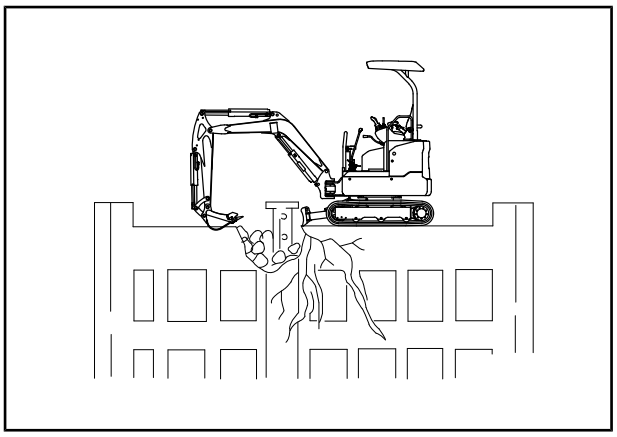


Fig 2-59

- When conducting removal operation, don't remove the part right above. Fragment falling down and structure collapse will lead to machine damage and casualties.

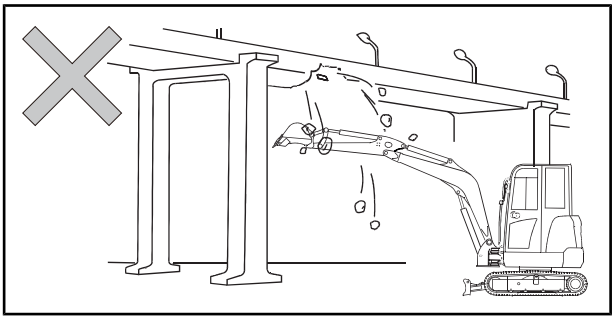


Fig 2-60

- Don't carry out breaking operations by the impact force of the work equipment; otherwise scattering fragment material may hurt people and damage the work equipment, and also the impact reaction may lead to machine rollover.
- Generally speaking, the work equipment on the side of the machine is easier to turn over than the one in the front or the back.

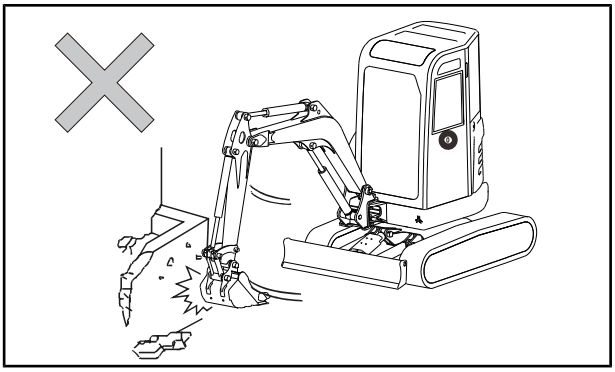


Fig 2-61

- Lifting, moving or swing of the bucket must not pass above anyone or the truck cab. If the materials in the bucket fall down or the bucket hits something, personal injury or machine damage may occur.
- Never lift or transport people with the machine, which may lead to casualty.
- The machine with breaker or other heavy work equipment has the danger of losing balance and rollover.
- Don't suddenly lower down, swing or stop the work equipment.
- Don't suddenly extend or retract the boom cylinder; otherwise, there will be the danger of rollover because of the impact force.

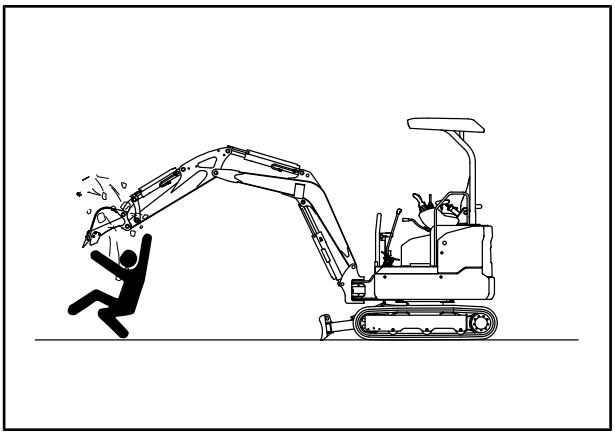


Fig 2-62

2.3.3 Park the Machine

2.3.3.1 Select a Parking Area

- Park the machine on a firm and level ground.
- Choose an area without danger of falling rocks, landslides, and other hazards to park the machine. If the machine is on low ground, park it in a place without danger of flooding.

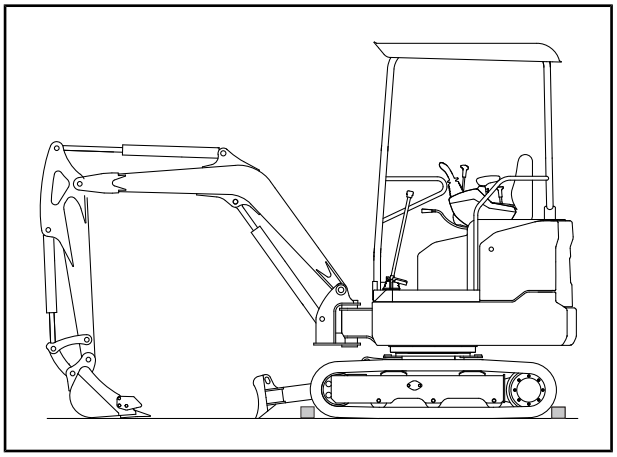


Fig 2-63

- Park the machine on a level ground as far as possible. If you do have to park the machine on a slope, be sure to observe the following rules:
  - Move the bucket to the downhill side and insert the bucket teeth into the ground with an angle [1] of 120°.
  - Place blocks underneath the belt tracks to prevent the machine from moving.

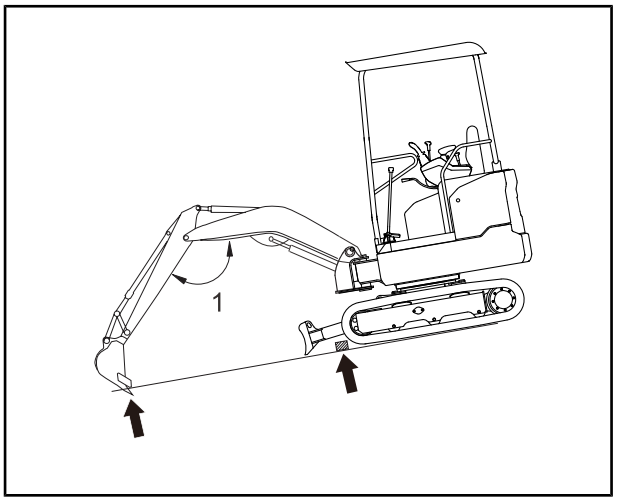


Fig 2-64

1. Angle range

- Do not park the machine on construction roads. If required, be sure to alert other people or vehicles with flags during the day and signal lights at night in accordance with local rules.

2.3.3.2 Shut Down the Machine

See the Section “Operation” of this Manual for detailed machine shutdown steps. General shutdown procedure is as follow:

- Stop the running machine.
- Adjust the body.
- Lower the work equipment to the ground or place it at fixed position.
- Short press the one-key startup switch to stop the motor.
- Pull the safety control lever [1] to the lock position.
- Lock all access doors and boxes.

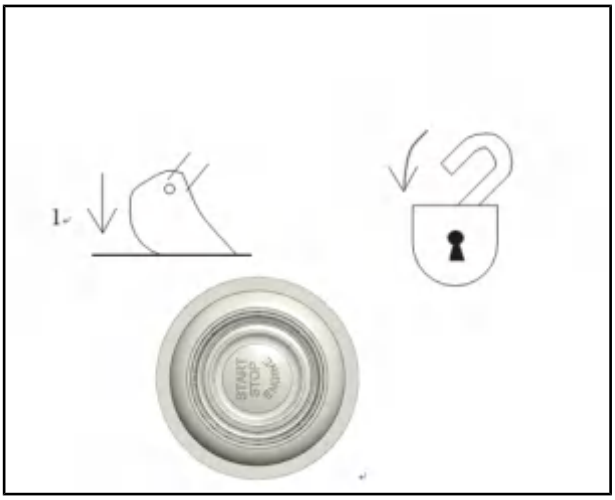


Fig 2-65

NOTE：

- When leaving the machine, please keep three-point contact and face the machine, and don’t jump down from the machine.
- When leaving the machine, be careful of the smooth track, steps and handles.

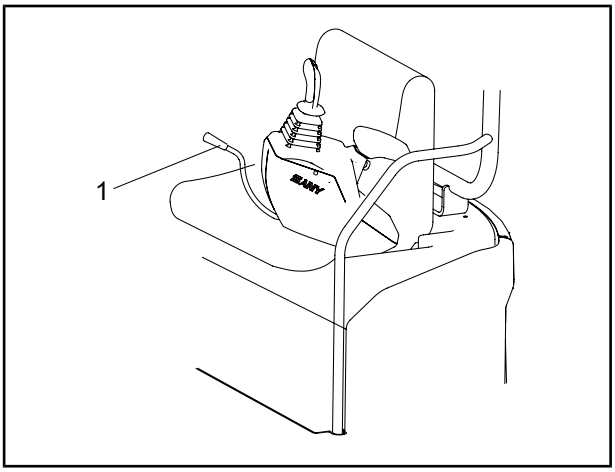


Fig 2-66

2.3.4 Transportation

2.3.4.1 Transport the Machine

When transporting the machine, pay attention to the following:

- Know the overall length, width and height of the transport vehicle and the machine and avoid contacting the obstacles at a high place and narrow channel.
- Before passing the bridge, please check if the bridge is able to support the weight in advance; when driving on road, please follow traffic laws and traffic police’s command.
- During transportation and storage of the battery, protect it from the sun, keep it away from heat sources, and prevent the battery pack from vibration, collision and falling;
- During transportation and storage of the battery, such fire-fighting facilities as carbon dioxide fire extinguishers, etc. shall be provided;
- The best storage capacity of the battery box is 50%~80%SOC;

- For battery storage, it is necessary to ensure effective packaging, keep dry, control the humidity at (65 ±20)% RH, avoid such chemicals as acids, alkalis and salts, avoid harmful gases, dust and smoke, and pay attention to ventilation.

2.3.4.2 Load and Unload

When loading and unloading the machine, incorrect operations can cause the machine to tip over or fall, so note the following matters:

- Load and unload the machine only on solid, level ground; keep a safe distance from the edge of the road or cliff.
- Always use a ramp with sufficient strength to ensure that the width, length, and thickness of the ramp are sufficient to provide a safe loading and unloading slope. The angle [1] should be ≤ 15°.
- Ensure that the surface of the ramp is clean and free of grease, oil, water and loose materials, and remove dirt from the machine belt track. Pay attention to the slippery surface of the ramp when loading and unloading the machine in rain or snow.
- Do not use working devices to load or unload the machine, as doing so may cause the machine to fall or tip over.
- Cancel the auto idle function, run the motor at low speed and walk slowly.
- While on the ramp, do not operate any joystick except the travel joystick.
- Do not correct the direction on the ramp. If needed, drive the machine off the ramp, correct the direction, and then drive it back into the ramp.
- The center of gravity of the machine will suddenly change at the connection between the ramp and the trailer, and the machine will easily lose its balance, so it is necessary to walk slowly over this part.

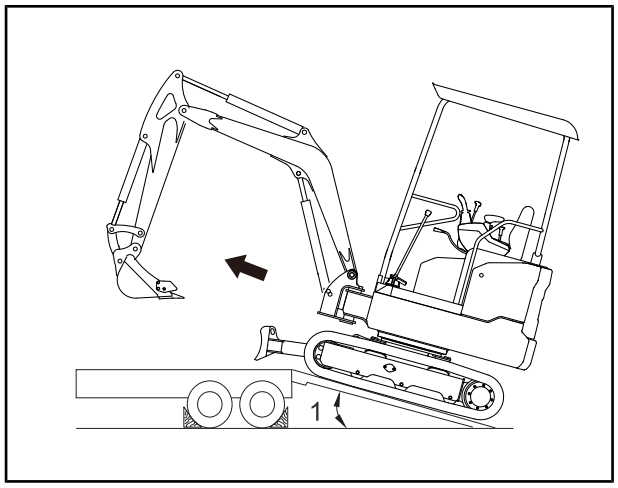


Fig 2-67

1. Angle range

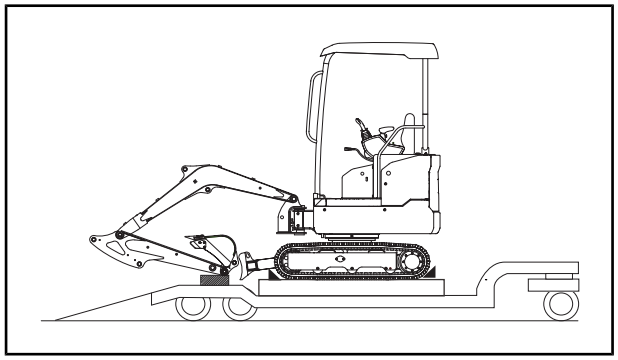


Fig 2-68

- When loading and unloading the machine on an embankment or platform, ensure it has sufficient width, strength and slope.
- When slewing the upper slewing body on the trailer, the trailer is unstable, so retract the working device and slowly slew.
- After loading the machine, lock the doors of the cab. Otherwise the doors may open suddenly in transit.
- Secure the machine with chains and chocks. Secure all working devices, lower the bucket, boom and arm, and place them in the transport position.

2.3.5 Battery

Preventing the danger caused by battery

Battery acid comprises sulfuric acid and is able to generate flammable and explosive hydrogen. Wrong operation will lead to injury or fire. Therefore, it is important to observe the following rules:

- No smoking or open flame near the battery.
- Turn the key switch to OFF position before checking or handling the battery.
- Please wear safety glasses and rubber gloves when handling the battery.
- Battery acid is highly corrosive. If battery acid splashes on clothes and skin, flush with plenty of water at once. If it enters your eyes, there will be a risk of blindness, therefore make sure to flush with plenty of water at once and seek for medical care.

Fig 2-69

To avoid battery explosion, please observe the following precautions during operation:

- Don't allow tool or other metal objects to contact battery terminal; don't allow tool or other metal objects to be placed near the battery.
- For disconnecting the battery, 1 min after the motor is shut down, disconnect the negative (-) terminal firstly, and then the positive (+) terminal; For connecting, connect the positive (+) terminal firstly, and then the negative (-) terminal. Ensure all terminals connect well.
- During charging process, when battery temperature exceeds 45℃, stop charging and lower the temperature to the room temperature; then half the charging current before continuing to charge the battery.
- When charging, the battery will generate inflammable hydrogen. Therefore, before charging, dismantle the battery from the superstructure, place it in a well-ventilated place and remove the battery cover.
- If acid sprays out of the battery exhaust hole during charging, please stop charging at once.
- Never smoke, or keep off any fire source during charging.
- When the battery electrical eye becomes green, it indicates completion of charging. In that case, stop charging.
- After charging, screw up the battery cover tightly.
- Install the battery to specified position tightly.

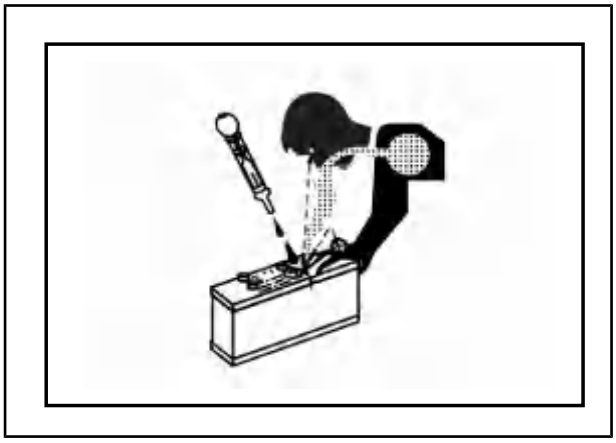


Fig 2-70

2.3.6 Towing

For towing of a damaged machine, incorrect operation method or choosing nonconforming wire rope will lead to severe accident:

- Don’t tow the machine on a slope.
- Wear protective gloves and helmet when using wire ropes.
- Check that the wire rope is of adequate strength that it can bear the weight of towed machine.
- Don’t use wire rope having such problems as broken strand [A], reduced diameter [B] and twisting [C]. These wire rope may break off during towing.
- Don’t stand between the towing machine and the towed machine during towing.
- Slowly operate the machine and pay attention not to loading the wire rope suddenly.

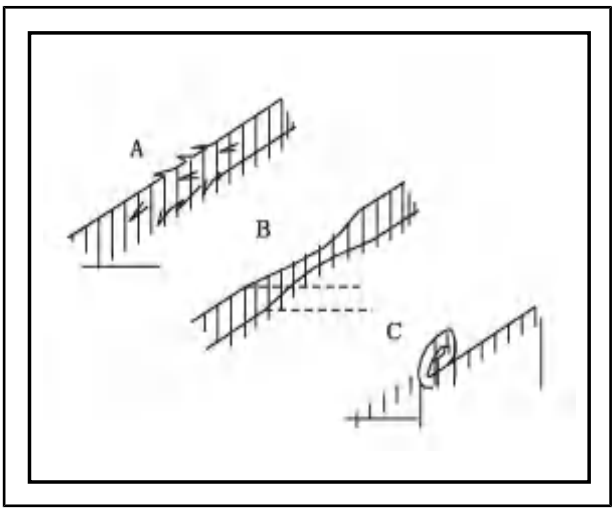


Fig 2-71

2.3.7 Lifting by excavator

- Allow no one to enter the working area.
- Before operation, determine all possible signals used in operation and assign a signalman.
- To prevent rollover or falling down, operate the machine on a flat ground.
- Before lifting, please know the lifting capacity of the machine, and don’t exceed the specified lifting load.
- Don’t use damaged chain, wire rope, lifting eye and brace.
- Hang the lifting sling on the lifting point specified by the manufacturer. Never hang lifting eye or rope on the bucket teeth. Otherwise, the bucket teeth may fall off, leading to falling down of lifted object.
- Don’t leave driver's seat during lifting.
- To prevent the lifted objects from contacting people or construction, check if the surrounding area is safe before swinging or operating the work equipment.
- Don’t suddenly swing or operate the work equipment. This will lead to the swing of the lifted objects, and even machine rollover. Use a tow rope to strengthen control if necessary.
- Don’t tow the load in any directions by the work equipment or by rotation. Once the lifting hook breaks and load separates from it, the work equipment will move suddenly and cause injury.

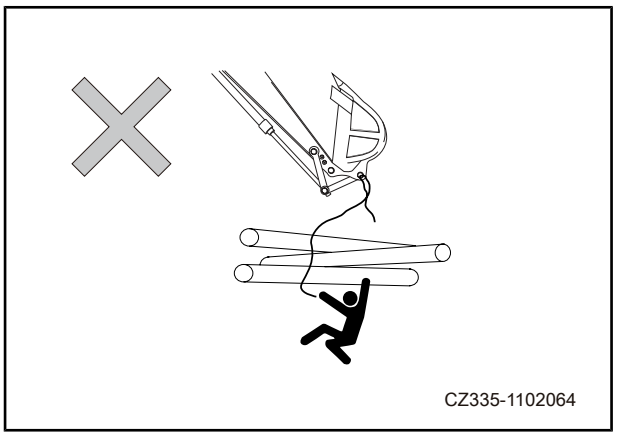


Fig 2-72

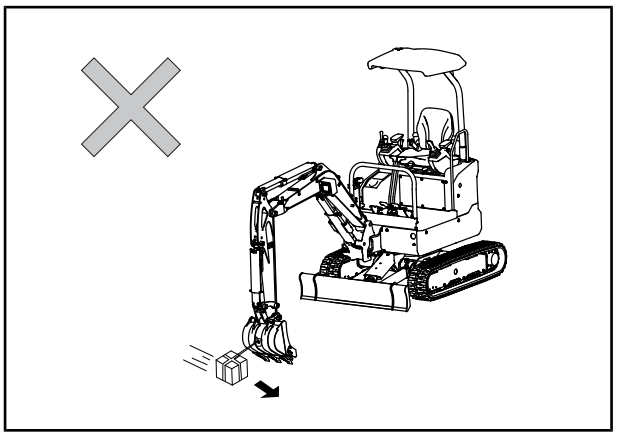


Fig 2-73

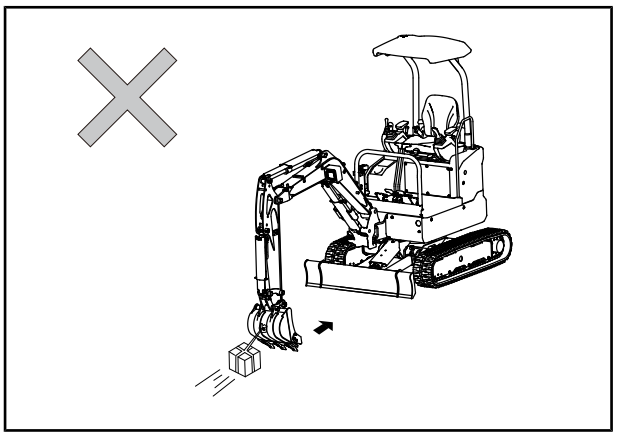


Fig 2-74

2.3.8 Lifting capacity

⚠ WARNING

Exceeding the rated lifting capacity will cause serious casualties.

- Before operating the machine, the operator shall fully understand the rated lifting capacity of the machine and always follow the safe operation rules for the equipment.
- The rated load of non-standard configuration shall be adjusted as necessary.

In accordance with the provisions of GB/T 13331, the lifting capacity can be considered as 75% of the tipping load, or 87% of the hydraulic lifting capacity of the boom or arm (whichever is less).

The lifting capacity is based on the following machine configurations:

- The machine is located on a level and solid ground.
- The lifting point is located on the center line of the pin where the bucket is installed on the arm.
- The lifting radius is the horizontal distance from the swing shaft of the machine to the vertical lifting cable or rigging.
- The working mass includes the machine and the work equipment.

Due to the existence of many ancillary device choices and changes in the available machine, the lifting capacity of the machine will vary in different configurations. When the change value exceeds 5% of the rated lifting capacity of the machine, please consult our authorized dealer for information on the lifting capacity of specific working tools and accessories.

Symbols in the lifting capacity table:

The following are common symbols in the lifting capacity table of crawler excavators.

The forward lifting capacity of the machine.

The lateral lifting capacity of the machine.

The lifting capacity is measured in kg。

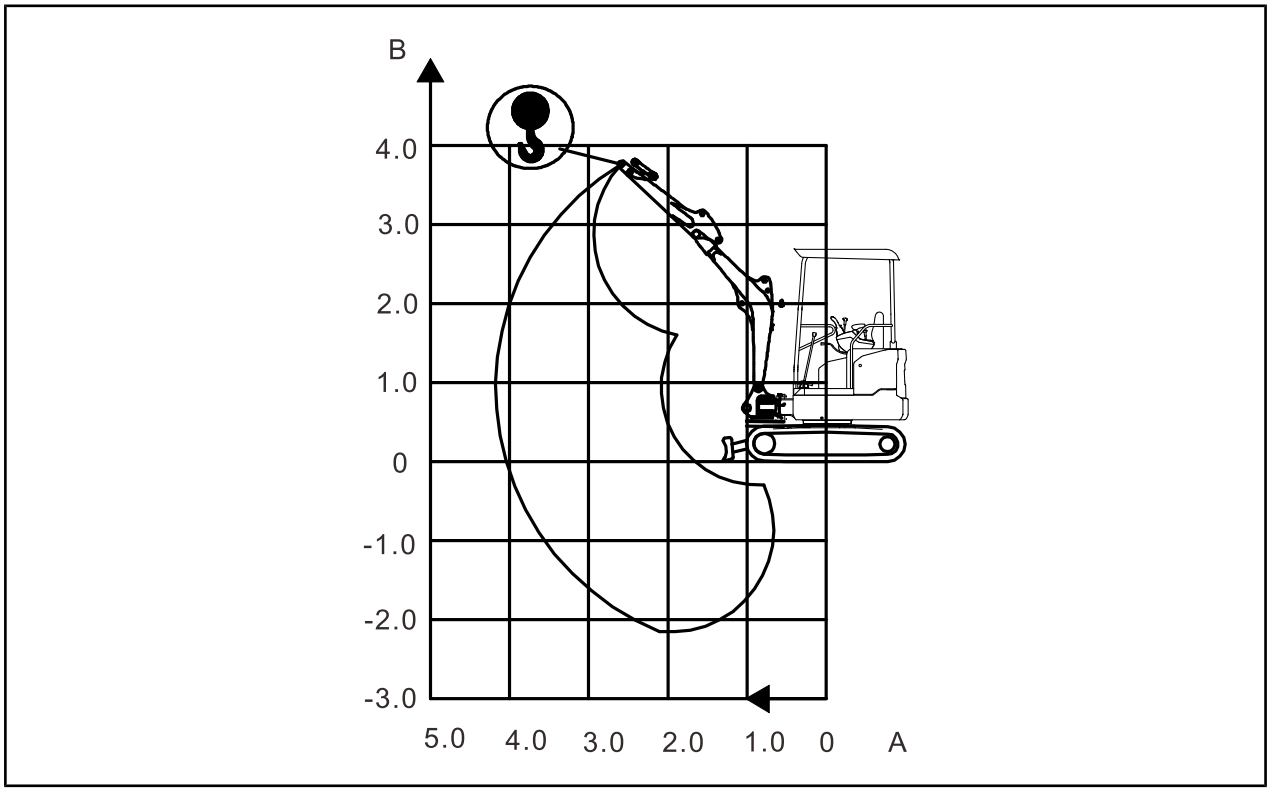


Fig 2-75

A. Loading point radius

B.Loading point height

Configuration: (Rubber tracks + driving shed)

Put down the dozer blade											
B	U-NI-T	A								MAX	
		1.5 m		2 m		2.5m		3.0 m			
											
3.0 m	kg									285	*285
2.0 m	kg					*267	*253	271	271	278	278
1.0 m	kg			483	483	371	370	316	306	288	244
0 m	kg	*826	*826	631	528	456	383	357	295	304	252
-1.0 m	kg	819	819	563	529	407	382			318	318

1. This lifting capacity is calculated in accordance with GB/T 13331, ISO 10567 and SAE J1097, in which the hydraulic system limit coefficient is 0.87, and the tipping limit coefficient is 0.75;

2. Those marked with * are limited by hydraulic pressure, and those not marked with * are limited by stability;

3. The lifting point is the front support hole of the arm (excluding the bucket weight). If there are additional attachments such as bucket, etc., it shall be deducted from the above lifting weight;

4. A-loading point radius (m); B-loading point height (m).

Configuration: (Rubber tracks + driving shed)

Lift up the dozer blade											
B	U-NI-T	A								MAX	
		1.5 m		2 m		2.5m		3.0 m			
											
3.0 m	kg									285	*285
2.0 m	kg					*253	*253	271	271	270	278
1.0 m	kg			483	483	370	370	296	306	235	244
0 m	kg	*811	*826	514	528	371	383	285	295	243	252
-1.0 m	kg	819	819	514	529	370	382			316	318

1. This lifting capacity is calculated in accordance with GB/T 13331, ISO 10567 and SAE J1097, in which the hydraulic system limit coefficient is 0.87, and the tipping limit coefficient is 0.75;

2. Those marked with * are limited by hydraulic pressure, and those not marked with * are limited by stability;

3. The lifting point is the front support hole of the arm (excluding the bucket weight). If there are additional attachments such as bucket, etc., it shall be deducted from the above lifting weight;

4. A-loading point radius (m); B-loading point height (m).

2.4 Safe maintenance instruction

2.4.1 Precautions before Maintenance

To prevent accidents:

- Understand the maintenance procedures before operation.
- Keep the work area clean and dry.
- Do not spray water or steam in the cab.
- Never do refueling, lubrication and other maintenance work while the machine moves.
- Keep your hands, feet and clothes off the rotary parts.

2.4.2 Self-preparation

The machine can be maintained or repaired by approved workers only. An observer could be assigned if necessary.

- Wear protective clothing and safety shoes required for work.
- When you remove spring, flexible components or add acid to the battery, please wear face shield. Wear helmets and eye protection when you weld or cut something.
- When cleaning with the compressed air, particles may fly off and result in personal injuries. Thus, it is important to wear the eye protection, dust masks, protective gloves and other PPE.
- When hitting hard metallic parts such as the pins, loading buckets teeth, cutting edges or bearings with a hammer, there might be parts and metallic fragments flying off and resulting in injuries. Thus, always wear eye protection and protective gloves and make sure that there are no people around.
- Grounding, flame cutting or welding is prohibited if there is no breather and ventilator. If it is necessary to perform welding on the hydraulic excavator, refer to relevant manuals for correct procedures.
- If the machine creates too much noise, it may lead to temporary or permanent hearing problem. When maintaining the motor, please wear ear muff or plug before working in the noise for a long time.
- Please wear rubber apron and rubber gloves when contacting corrosive materials. Please wear protective gloves when handling wooden materials, wire ropes or metal with sharp edge.

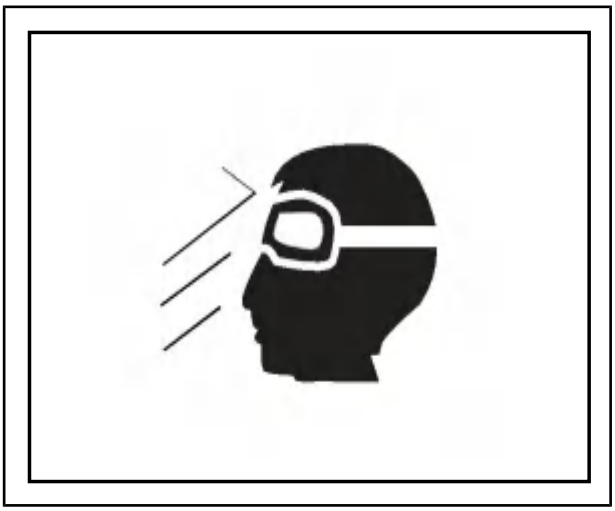


Fig 2-76

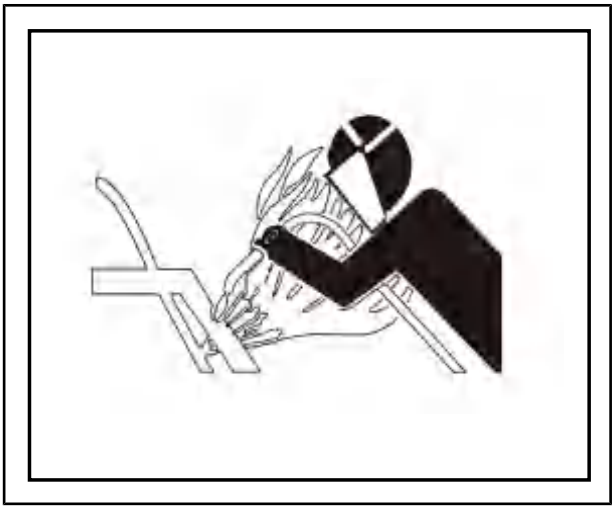


Fig 2-77

2.4.3 Preparation of working area

- Select a working area with enough space, sufficient light, good ventilation, clean and flat ground for maintenance.
- Clean the working ground, wipe off antifreeze, lubricant and water, and cover the slippery ground with sand or other adsorptive materials.
- Don’t leave the hammer or other tools in the working area.
- Fail to keep the working area clean and tidy will lead to risks of stumbling, slipping and falling, thus resulting in personal injury.

2.4.4 Steps of motor shutdown before maintenance

Before maintaining the machine:

- The maintenance personnel must hold the qualified electrician certificate issued by the Work Safety Supervision Bureau and have received specific training and passed tests with acceptable results before carrying out maintenance operations
- Park the machine on a solid and flat ground.
- Lower down the bucket to the ground.
- Place cushion blocks under the track to prevent the hydraulic excavator from moving.
- Rotate the gear control knob to Gear 1 and run the motor at low speed with no load for 5min.
- Power on the one-key startup switch on and operate the joystick to the front, rear, left and right for 2 to 3 times to relieve the pressure in the hydraulic system.
- Short press the one-key startup switch for powering off to stop the motor.
- After shutdown for about 5 seconds, unplug the MSD.
- Turn the safety lock control lever to “LOCK” position.
- Step 1, as shown in Fig. 1, lift the green locking piece with the right thumb to the state as shown in Fig. 2.

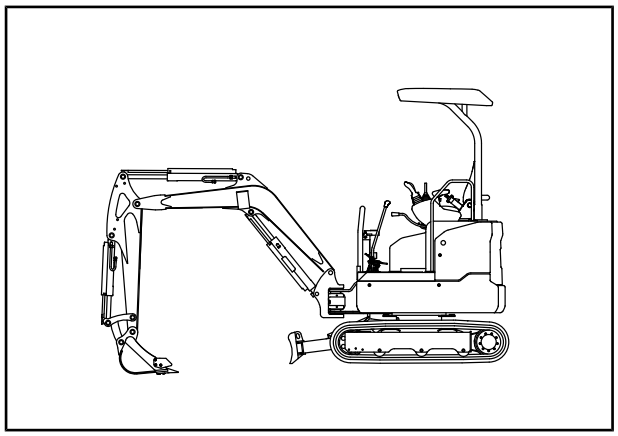


Fig 2-78

Step 2, as shown in Fig. 2, press and lift the black handle clip obliquely with the thumb, while turning the black handle to the vertical state as shown in Fig. 3.

Step 3, as shown in Fig. 4, pull the black handle by hand, pull it up, and unplug the maintenance switch plug from the socket to complete the disassembly operation.

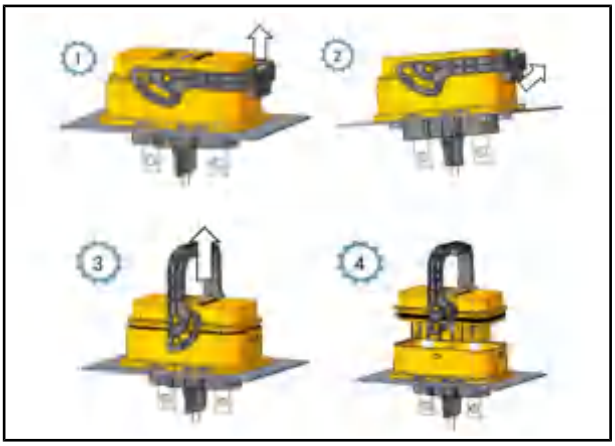


Fig 2-79

2.4.5 Safety precautions for battery maintenance

Safety instructions

- It is strictly prohibited to damage the battery system by squeezing, piercing or burning the battery artificially.
- The working environment of the battery system shall be free from corrosive, explosive and insulation damaging gases or conductive dust, and shall be kept away from heat sources.
- When cleaning the vehicle, avoid high-voltage components and avoid adverse consequences after contact with water.
- The maintenance personnel must hold the qualified electrician certificate and EVE maintenance authorization certificate issued by the State Administration of Work Safety before carrying out maintenance operations.
- It is strictly forbidden to touch anodes and cathodes of the battery pack with both hands at any time.
- You should wear insulating gloves when operating and maintaining the battery system. It is strictly prohibited to wear metal ornaments such as watches.

2.4.6 Warning decal

- Before performing maintenance on the machine, place a "Do Not Operate" sign or similar warning sign on the start switch or direction controls of the machine to warn others that the machine is under maintenance.
  If necessary, an additional warning sign can be attached around the hydraulic excavator.
  If someone starts the motor, touches or operates the control lever or pedal during maintenance, serious accidents may occur..

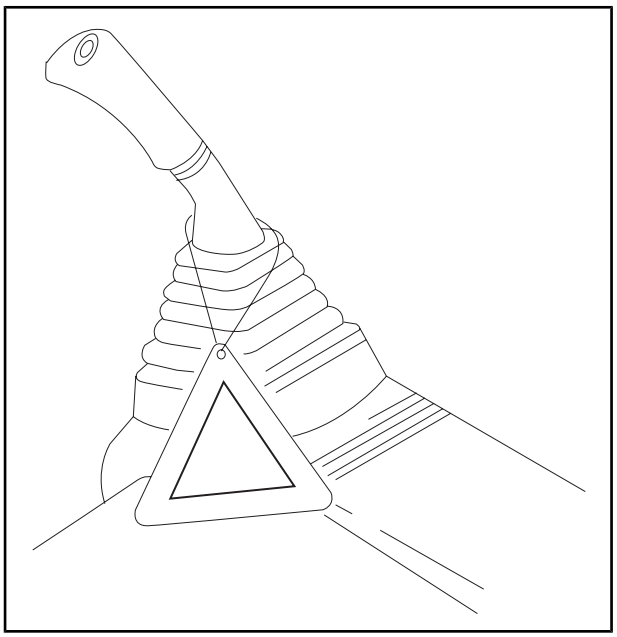


Fig 2-80

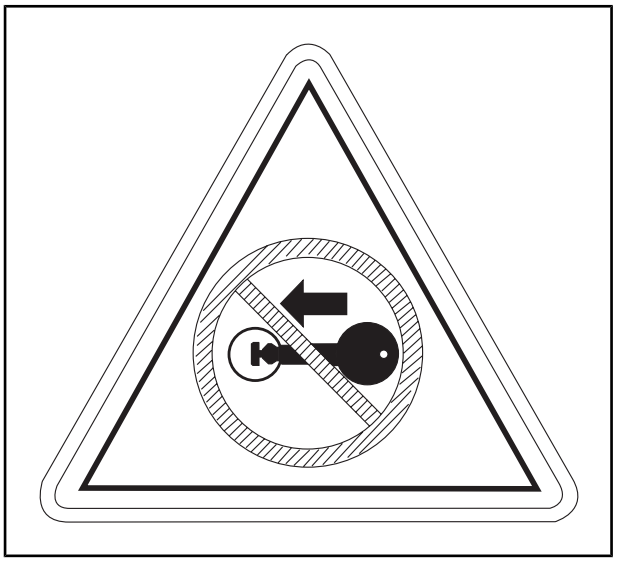


Fig 2-81

2.4.7 Proper Tools

- Only proper tools can be selected for maintenance and they shall be used correctly; using damaged, bad, defective and temporary tools or incorrectly using tools will lead to severe accident.

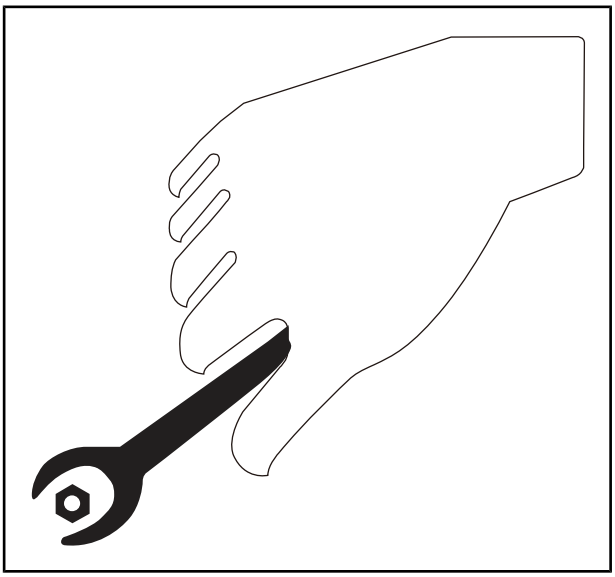


Fig 2-82

2.4.8 Operation under the machine

- Don’t maintain the machine before well supporting it.
- Lower down the work equipment to the ground before maintenance.
- If the machine or the work equipment must be lifted for maintenance, support it firmly with cushion blocks or brackets of sufficient strength, rather than slag bricks, cord tyres or racks; don’t support the machine by a single jack.
- Working under the hydraulic excavator can be very dangerous when the track shoe is away from the ground and the hydraulic excavator is only supported by the work equipment because once the hydraulics routing has been damaged or the control lever has been accidentally hit, the work equipment or hydraulic excavator will suddenly fall, resulting in casualty accidents. Therefore never work under the hydraulic

Fig 2-83

excavator if it is not firmly supported by the cushion blocks or brackets.

2.4.9 Rubber track maintenance

- Do not drive on the road covered with cornerstones, sharp stones, broken pieces of steel, etc., and do not force through the pits of a large span, otherwise it will lead to spline damage and iron tooth fracture.
- Wipe clean the track shoe immediately when it is stained with oil or paint. Clean the track shoe after working in saline-alkali soil, otherwise it will cause the iron teeth to rust or fall off.

2.4.10 Steel track maintenance

- Due to dry rubbing, the track pin and track bushing are very hot. To prevent scald, please wear safety protective gloves.
- Keep proper track tension. During operation on mud and snow ground, mud and snow will stick to the track parts, making the track too tight. In that case, please adjust track tension according to the operation manual of the product.
- Check if the track shoe is loose or broken, and if the track pin and the track bushing are worn or damaged, and check the track roller and the carrier roller.
- Don’t knock the track tension springs, as they may bear huge pressure and break suddenly, leading to injury. Don’t remove springs under compression condition. Tension spring should not be compressed.
- Follow the track maintenance guidance provided by the manufacturer.

2.4.11 Safety precautions for track tension adjustment

- Grease is pressed into the track tension adjustment system under high pressure.
- To loosen track tension, slowly loosen the grease drain plug and don’t unscrew it for more than one turn.
- • Failure to follow the specified maintenance process during adjustment will cause flying off of the grease drain plug, leading to severe injury or damage.
- • Keep your face, hands, feet or other parts of the body off the drain hole of the grease drain plug.

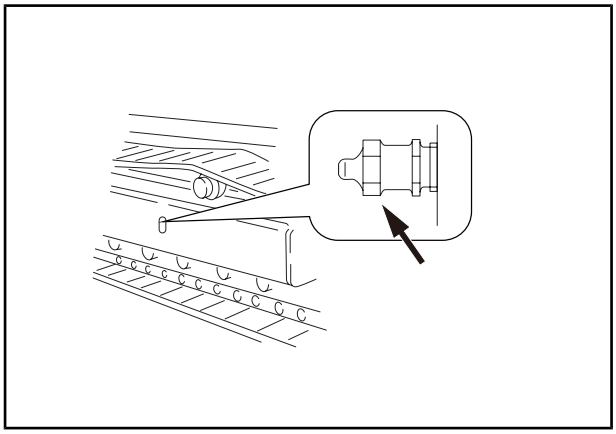


Fig 2-84

2.4.12 Don’t remove the buffer spring

Buffer spring assembly is used for reducing the impact force of the idler. It comprises a high-pressure spring, which, if incorrectly removed, will cause flying off of the spring, leading to severe casualty. If the buffer spring assembly must be removed, please contact our authorized dealer to conduct this operation.

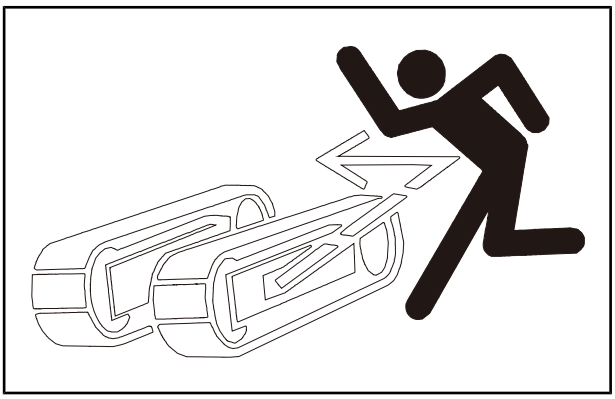


Fig 2-85

2.4.13 Be careful of hot cooling system

As temperature of the motor increases, pressure in cooling system builds up. Stop the motor to allow the system to cool down before removal of the radiator cap. Do not remove it until the coolant cools down.

• Contacting hot high-pressure coolant will cause severe injury.

Fig 2-86

2.4.14 Safe operation of high-pressure hoses

If leakage is found in the high-pressure hose, it may cause an operational failure and even lead to a fire. If bolts on the hose come loose, stop working and tighten the bolts to specified torque. If any damage is discovered in the hose, please stop operation at once and contact our authorized dealer.

Replace the hose at once when the following problems are discovered:

- Damage or leakage has been found on any hydraulic pipe fitting.
- The covering has been worn or broken, or the reinforcement layer of steel wire is exposed.
- Swelling has been partly found on the cover.
- Impurities have been found in the cover.
- Disorder or indentation has been found on any movable part.

2.4.15 Welding operation

There is a risk of fire or electric shock during welding, therefore, welding must be carried out by qualified welders with appropriate equipment. Unqualified personnel are not allowed for welding. Before welding, it is necessary to disconnect the low voltage circuit and the high voltage circuit.

2.4.16 Be careful of high-pressure liquids or HV/LV power

Pressure always exists in the hydraulic system. When checking or replacing the hose, always check if pressure in the hydraulic oil line has been relieved. If there is remaining pressure in the hydraulic oil line, serious accidents will occur. Therefore, it is important to observe following rules:

- Release system pressure before maintaining the hydraulic system;

  1. Screw off the butterfly nut of the breather valve, and press the exhaust button to release the internal pressure in the hydraulic tank.

  2. Release pressure in pilot lines group. In 15 seconds after shutdown, turn the key switch to ON position, set the safety lock control lever to Unlock position, and move the travel joystick and the left and right joysticks to all directions to release pressure in the accumulator.
- Open fire is forbidden around the hydraulic system. Spilled hydraulic oil, if any, should be removed immediately.
- Diesel or pressurized hydraulic oil can penetrate the skin or eyes, which may result in severe injuries, blindness or even death. It is difficult to check if the pressurized hydraulic oil leaks with naked eyes, a piece of cardboard or wood chip will be needed instead of touching leaked oil directly. Wear a face mask or protective goggles to protect eyes. If oil penetrates your skin, rinse it with water and seek medical attention as soon as possible.
- Before maintaining the EIC system, it is necessary to disconnect the low voltage circuit and the high voltage circuit.

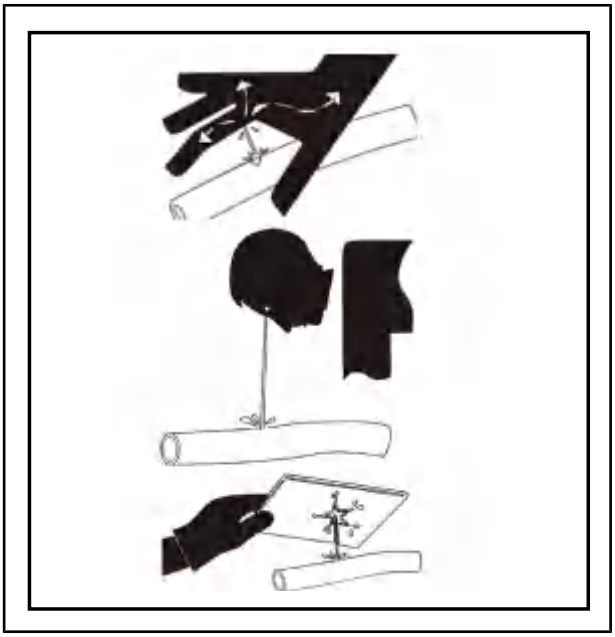


Fig 2-87

Fig 2-88

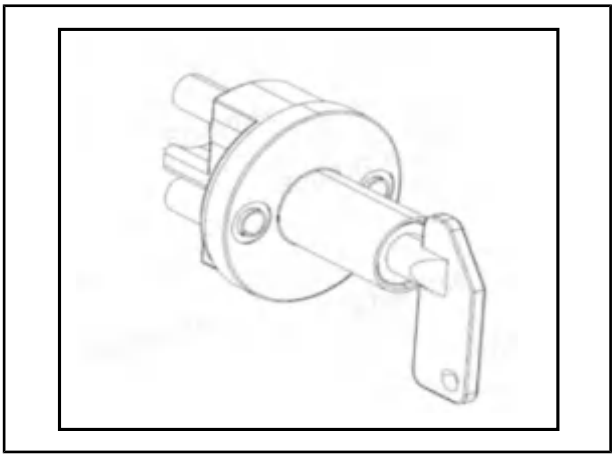


Fig 2-89

1. Short press the one-key startup switch to make the whole machine in a high-voltage power-off state.
2. Turn the low-voltage switch to the OFF position to cut off the low voltage of the whole vehicle.

2.4.17 Precautions related to high voltage power

- When the motor is running or was just shut down, high voltage will arise inside the motor controller, causing the danger of electric shock. Therefore, please don't contact the inside of the motor controller.
- If it’s necessary to contact the inside of the motor controller, please contact the dealer authorized by Sany Heavy Machinery Co., Ltd.

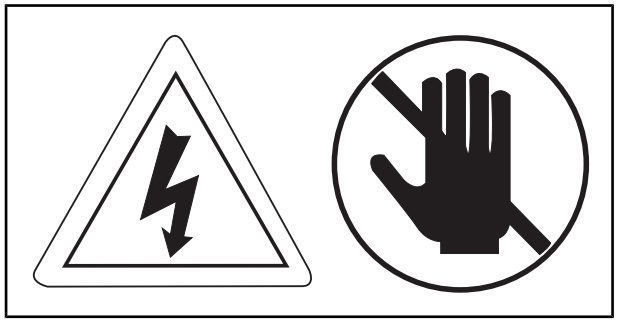


Fig 2-90

2.4.18 Accumulator

Fig 2-91

The accumulator is filled with high-pressure nitrogen, thus improper operation to the accumulator may cause an explosion, which may lead to serious accidents. Therefore, it is important to observe the following rules:

- • Do not disassemble the accumulator.
- • Do not place the accumulator close to a fire or expose it to a flame.
- • Do not punch, weld, or use gas cutting to the accumulator.
- • Don’t collide with or roll the accumulator, or make it suffer any impact.
- If the accumulator is to be disposed, it must be bled first. Please contact your Sany Heavy Machinery Co., Ltd. authorized distributor for this operation.

2.4.19 Preventing the danger of fire and explosion

- When refueling the hydraulic tank, stop the motor and turn off the electrical equipment to avoid any sparks.
- Dispose all solvents and dry chemicals at a well-ventilated area according to the steps indicated on the containers.
- Remove all the dust and residue from the hydraulic excavator where rags or any other flammable materials should not be placed on.
- When cleaning the parts, please use non-flammable solvents.
- Store the flammable fluids and materials in suitable containers according to safety regulations.
- Check if fire extinguisher, fire extinguishing system and fire detectors (if equipped) are ready for use.

2.4.20 Regular replacement of safety related parts

- To ensure long-term safe operation of the machine, parts related to safety such as hose, seat belt must be replaced regularly.
- Exceeding the specified replacement interval may cause aging problem of part materials. Overuse will lead to abrasion and damage, causing machine malfunction and personal injury. At the same time, it’s hard to identify how long these parts can work well only through visual inspection or touch. Therefore regular replacement is necessary.
- Safety related parts, if defective, shall be replaced or repaired even before the specified replacement interval.

2.4.21 Maintenance operation

- Check all components and parts and replace worn, broken and damaged ones during repair. Excessively worn and damaged components and parts will be inoperative during the operation of the machine, causing casualties. Replace damaged or illegible signal marks.
- Screw down all fasteners and connectors to specified torques.
- Install all guards, covers and shields after maintenance. Damaged guard boards shall be replaced or repaired. The system shall be refilled with the hydraulic fluid approved or suggested by Sany Heavy Machinery Co., Ltd only.
- Start the motor and check leakage condition (check the hydraulic system); then operate all control devices to confirm all functions of the machine are in well condition. Conduct road test if necessary. After test, shut down the motor and do self-check (check if there are lost cotter pins, washers and nuts etc.). Make sure to check all hydraulic fluid levels again before operating the machine.

2.4.22 Proper waste treatment

Improper disposal for waste may lead to environmental and ecological perils. Consult your local environmental collection center or our authorized dealer about collection or disposal methods.

- Potential harmful waste from the equipment of Sany Heavy Machinery Co., Ltd includes hydraulic oil, coolant, battery and etc.
- Please store the drained liquid with a leak-proof container instead of a food or drink container, as the latter may cause mistaken drinking.
- Don’t pour waste liquid onto the ground, into the sewer or any other water sources directly.

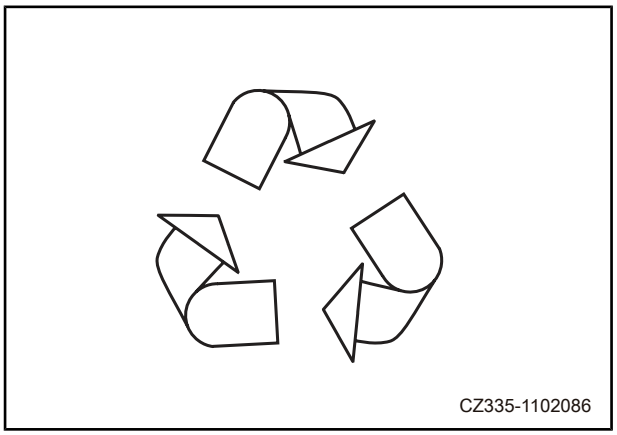


Fig 2-92

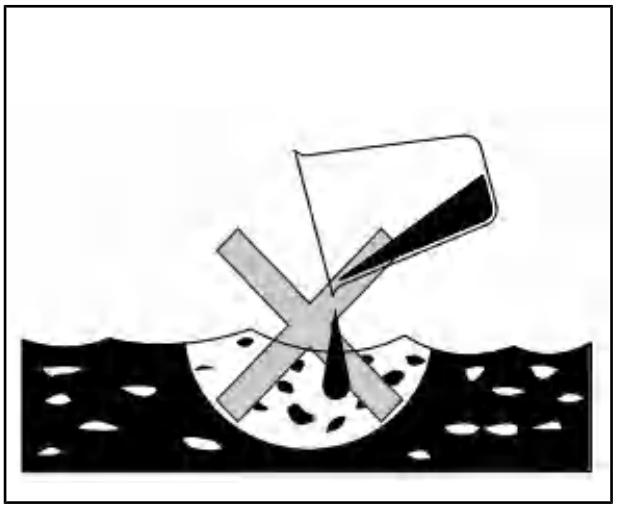
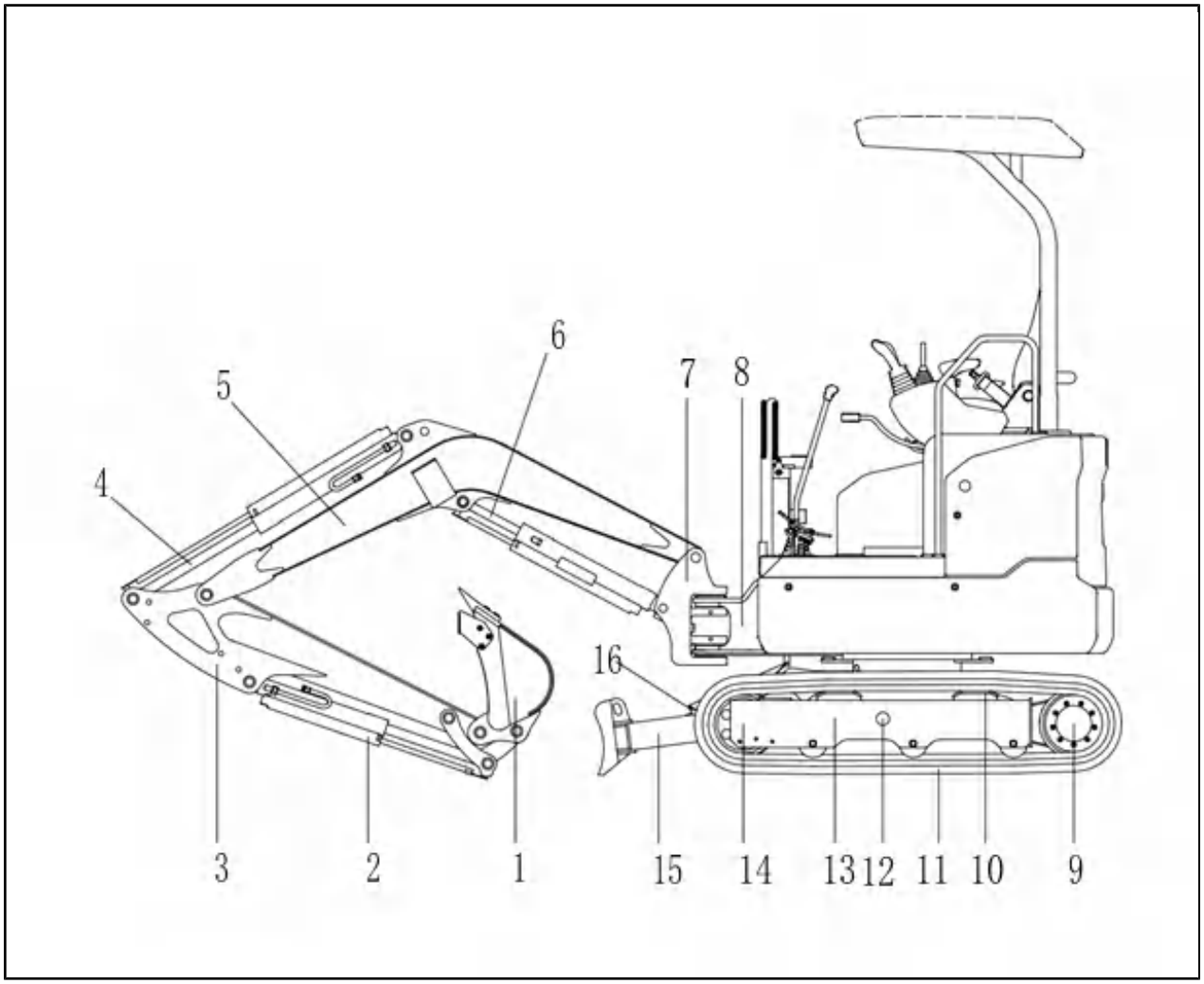


Fig 2-93

Technical Specifications

3.Technical Specifications

3.1 General drawing of machine



【1】 Bucket
【2】 Bucket cylinder
【3】 Arm
【4】 Arm cylinder
【5】 Boom
【6】 Boom cylinder
【7】 Swing joint
【8】 Swing cylinder
【9】 Sprocket
【10】 Carrier roller plate
【11】 Shoe
【12】 Telescopic cylinder
【13】 Track frame
【14】 Idler
【15】 Dozer blade
【16】 Dozer blade cylinder

The specific configuration function depends on the model.

3.2 Technical Specifications

3.2.1 Overall dimensions

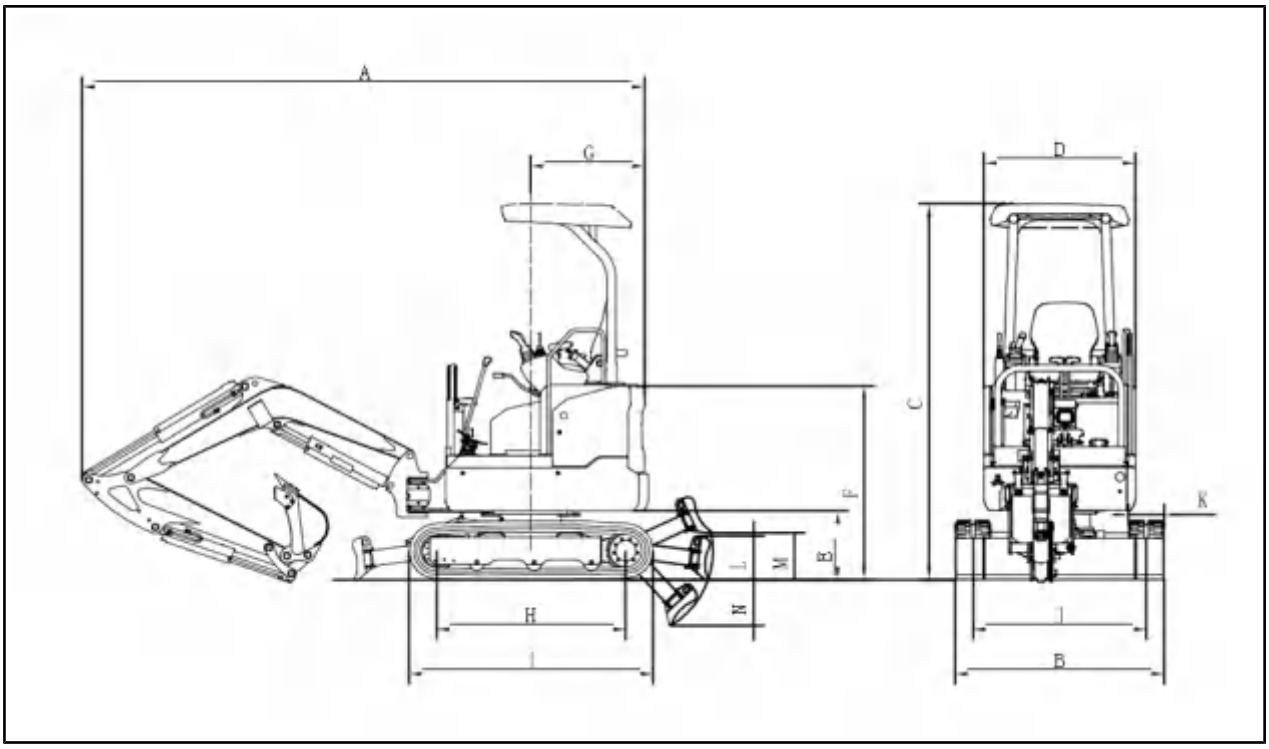


Fig 3-1

Unit：mm

Item		SY19E
A	Overall length (for transportation)	3722
B	Overall width	1065/1345
C	Overall height (for transportation)	2695
D	Cab ceiling width	1065
E	Platform ground clearance	500
F	Hood height	1574
G	Tail swing radius	980
H	Ground contact length of track	1250
I	Track length	1571
J	Track gauge	750/1120
K	Track shoe width	230

L	Height of dozer blade	270
M	Max. ground clear-ance of dozer blade after being lifted	310
N	Max. dozing depth	320

3.2.2 Working range

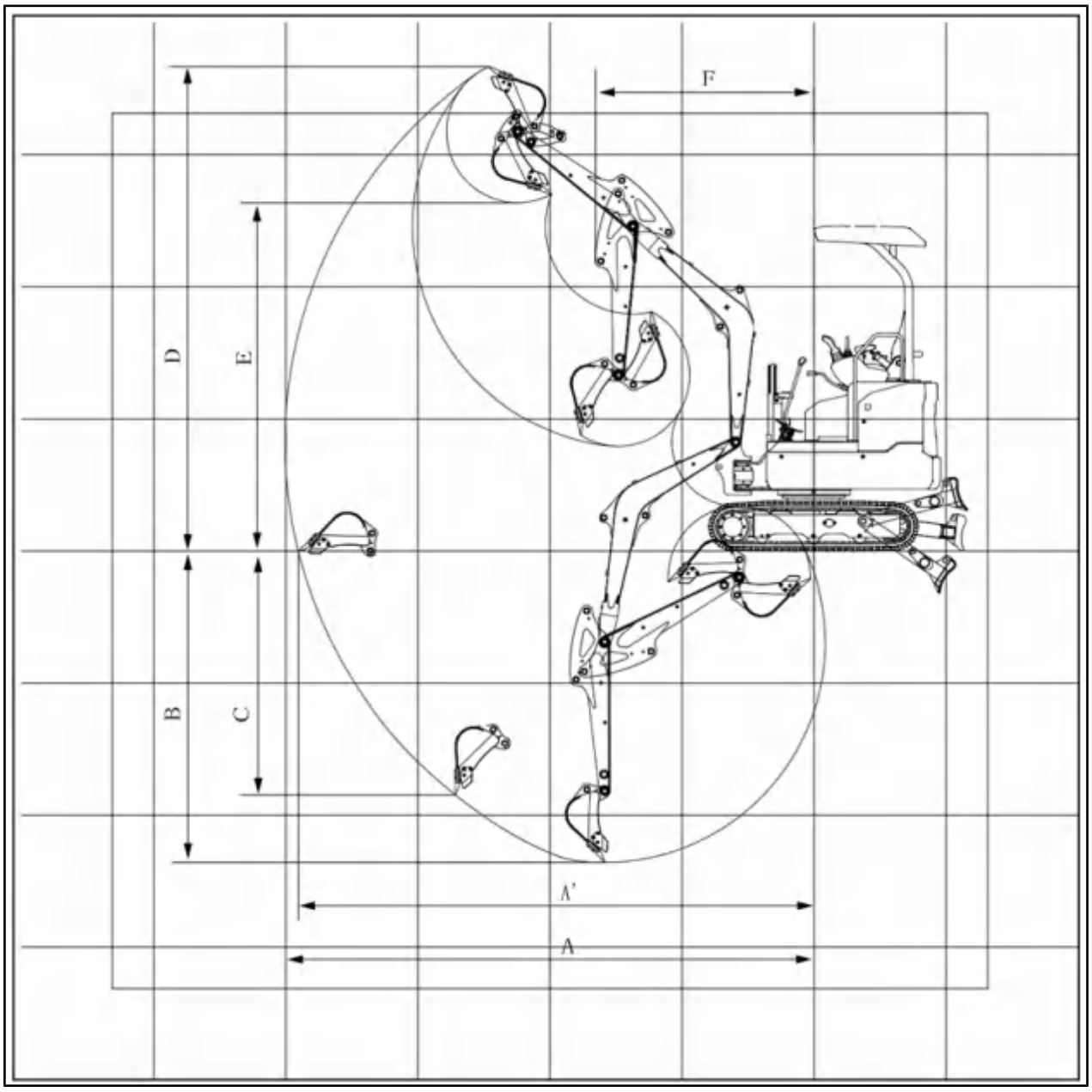


Fig 3-2

Unit：mm

Name	SY19E

A	Max. digging reach	3935
A’	Maximum ground ex-cavation distance	3835
B	Max. digging depth	2360
C	Max. vertical digging depth	2215
D	Max. digging height	3614
E	Max. dumping height	2637
F	Min. swing radius	1655

3.2.3 Technical parameters

Item	Unit	SY19E
Working weight	kg	1950
Bucket capacity	m^3	0.04
Motor type		VAIYS62317
Rated power of motor	kW/rpm	10/2400
Traveling speed (high/low)	km/h	3.6/2.6
Swing speed	rpm	10
Digging force of bucket	KN	12.5
Digging force of arm	KN	10

System functions

4.System functions

4.1 Display

Fig 4-1

【1】 Fault and maintenance interface

【2】 Total working hours

【15】 Automatic power-down

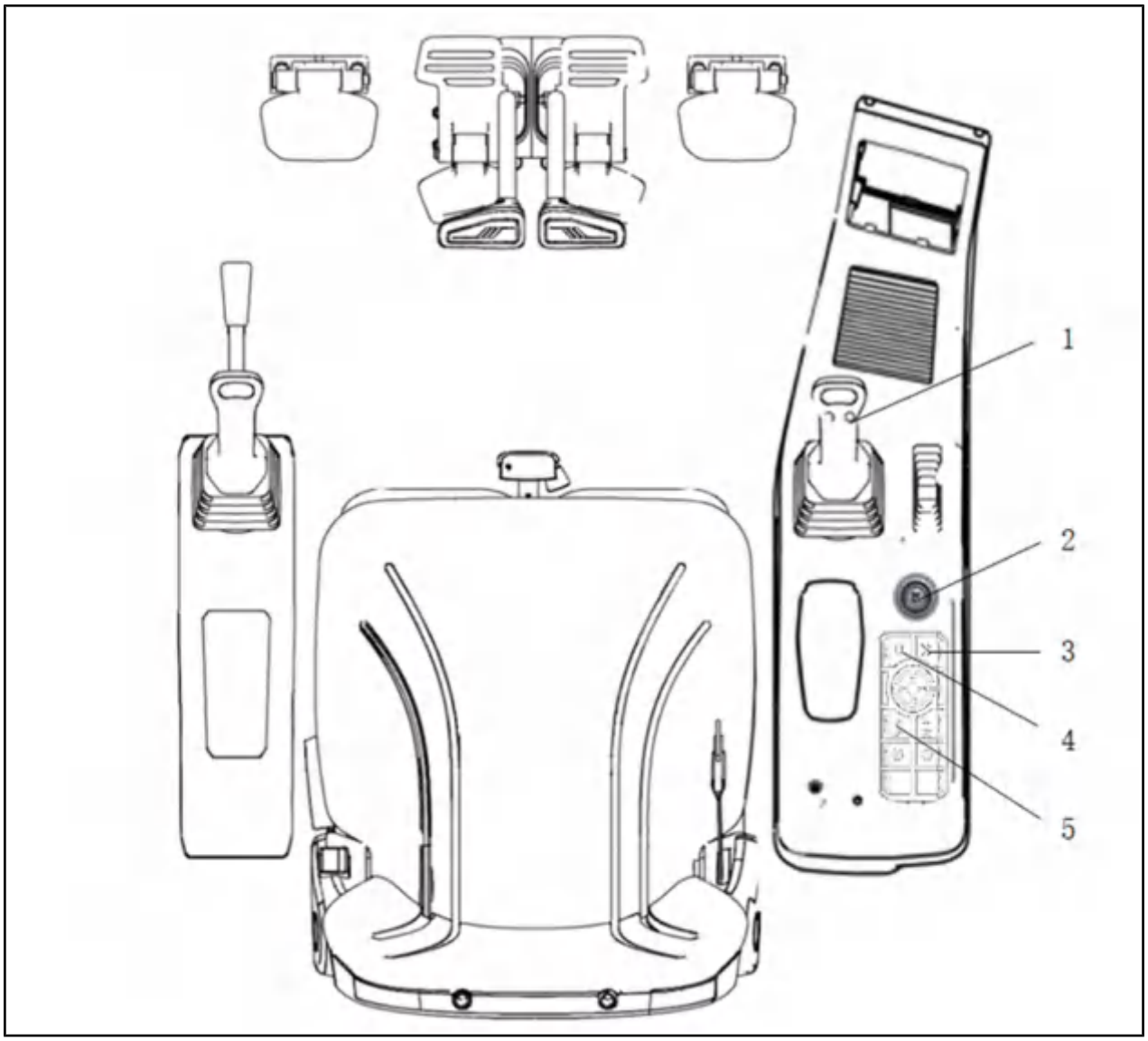
【16】 System state indicator light

【3】 Working mode
【4】 Power limit indicator light
【5】Insulation state indicator light
【6】DCDC State indicator light
【7】Power battery state indicator light
【8】 Charging state indication
【9】 Date and time
【10】GPS signal
【11】Locking indication
【12】 Fault alarm indicator lamp
【13】 Maintenance indicator
【14】Display update
【17】Motor state indicator light
【18】Cooling system state indicator light
【19】E-stop state indicator light
【20】 Limping state indicator light
【21】 Battery SOC
【22】 System ready state
【23】 Hydraulic oil temperature
【24】 Gear information
【25】 Current working hours
【26】 Charge and unlock
【27】 User function

4.2 Switch

4.2.1 Overview

Fig 4-2



【1】 Horn switch

【2】Startup switch

【3】 High/low speed switch

【4】 Working lamp switch

【5】 Dozer blade and chassis extension changeover switch

4.2.2 One-key startup switch

The one-key startup switch is used to start and stop the excavator. The one-key startup switch has three functions: power-on function, high-voltage function and shutdown function.

Fig 4-3

Power-on function

Short press to turn on the low-voltage power, and the current flows through the charging, display screen and working light circuits.

High-voltage function

Press and hold for 3-5s to turn on the high-voltage power of the excavator and start the motor.

Shutdown function

Short press to power off the motor and turn off the electrical system.

4.2.3 Working lamp switch

The working lamp switch is used to turn on and turn off the boom working lamp and the working lamp in the cab.

Fig 4-4

【1】Working lamp switch

Working lamp position

a. Boom working lamp—1 no

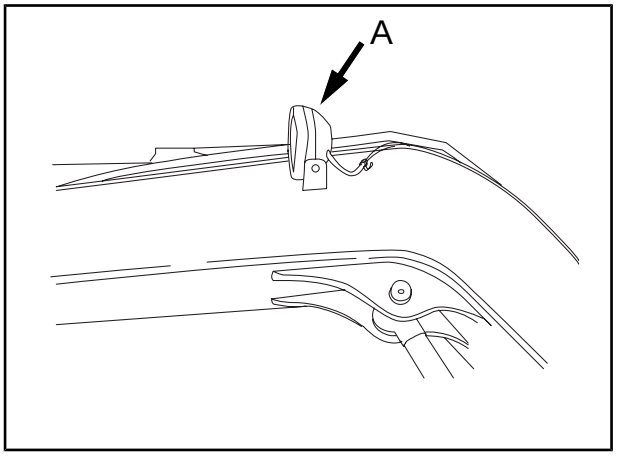


Fig 4-5

【A】Arm working lamp

4.2.4 Dozer blade and chassis extension changeover switch

The dozer blade and chassis extension change-over switch is used to control the working mode of the dozer blade handle. If it is currently in the dozer blade mode, press the “dozer blade and chassis extension change-over switch” button to change to the chassis extension mode.

Note: Some functions depend on the model.

Fig 4-6

【2】Dozer blade and chassis extension changeover switch

4.2.5 High/Low speed switch

The high/low speed switch is used to control the traveling speed of the machine. If it is currently in the low-speed traveling mode, press the “high/low speed switch” button to switch to the high-speed traveling mode of the excavator, and then press again to switch to the low-speed traveling mode of the excavator.

Fig 4-7

【3】High/Low speed switch

4.2.6 Horn switch

The horn switch button【2】is installed at the lower part of the right control handle, and this switch is used to honk the horn.

Press down and hold the switch, and the horn will sound continuously.

The button 【1】 is for standby and has no effect.

【1】 Standby button

【2】 Switch button

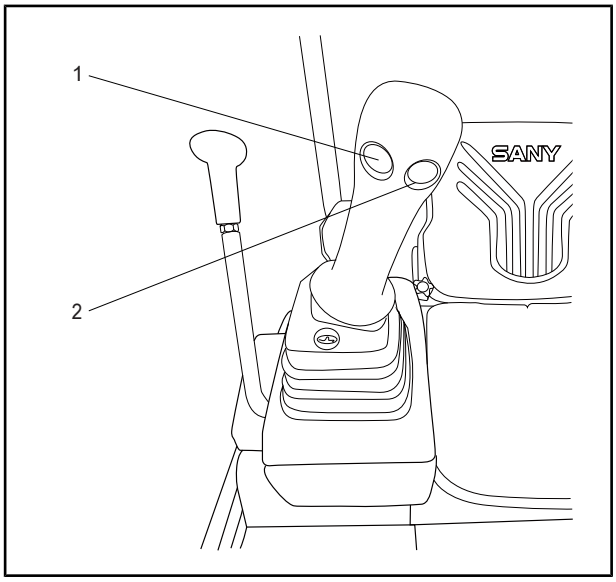


Fig 4-8

【1】 Standby button

【2】 Switch button

4.2.7 Main Switch

1. • When the motor is running, the master power switch shall not be placed in the OFF position, otherwise the electrical system will be damaged.

The power switch [a] is located on the front cover of the machine.

OFF position : Cut off the electrical circuit. In case of transportation, long-time parking of the machine or maintenance of the electrical system, be sure to place the master power switch in the OFF position .

ON position : Turn on the electrical circuit and place the master power switch in the ON position before starting the motor.

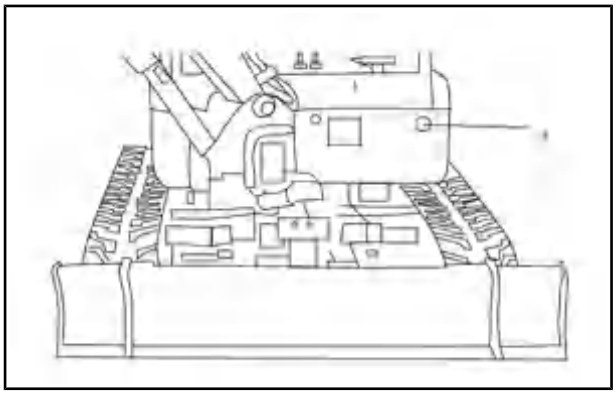


Fig 4-9

【a】12Vpower supply

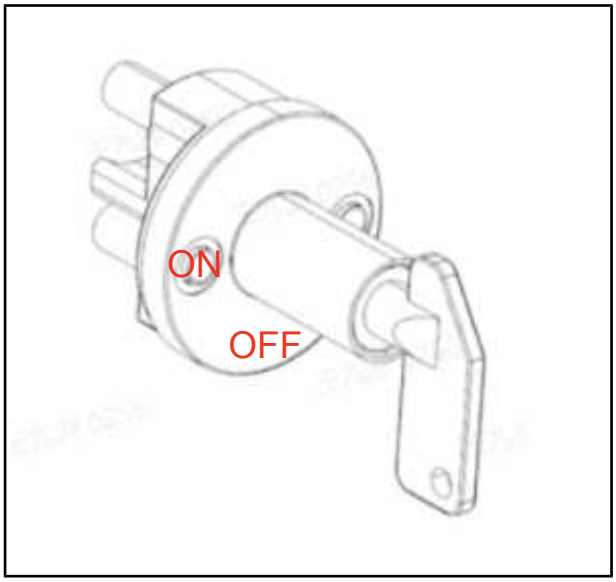


Fig 4-10

OFF：Power off mode ON：Power on mode

4.2.8 12V power supply

The socket can be used as a power supply not greater than 96W （12V×8A）.

Fig 4-11

12V power supply

4.3 Control Mechanism

4.3.1 Overview

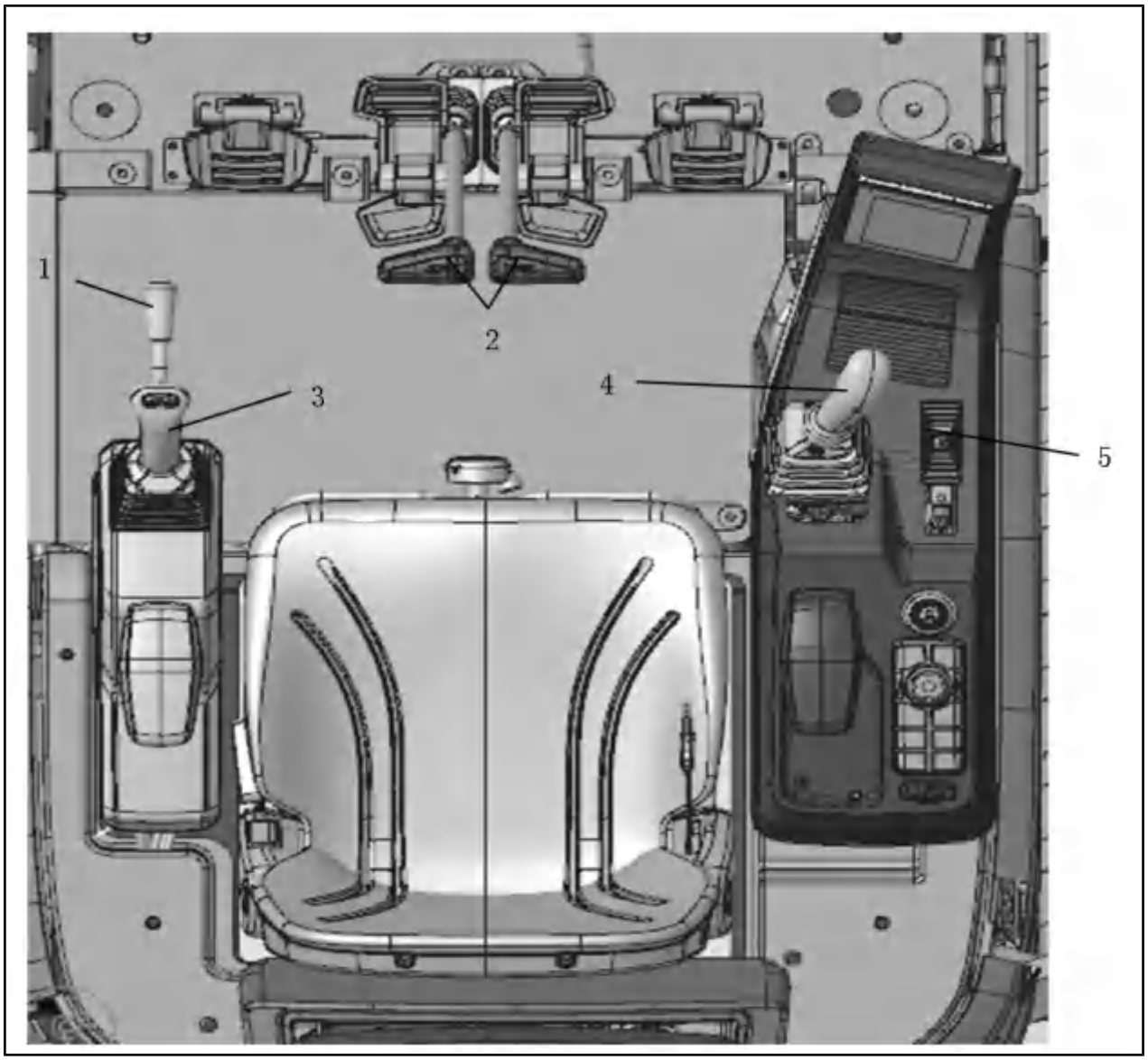


Fig 4-12

1. Safety lock control lever
2. Travel lever
3. Left joystick
4. Right joystick
5. Dozer blade joystick

4.3.2 Safety lock control lever

- When leaving the cab, the safety lock control lever shall be firmly located at the Lock position. If the safety lock control lever is not in the Lock position, accidental touching of the control lever can cause serious casualties.

- If the safety lock control lever is not firmly located at the Lock position, movement of the control lever can cause serious accidents. The inspection of the control lever is as shown in the Figure.
- When pulling or pushing the safety lock control lever, do not touch the left joystick.

A safety lock control lever [1] is a device that locks the work equipment, and swing, traveling and accessory (if equipped) control levers.

- LOCK position: Pull the control lever up, then even if you operate the joystick, the machine will not move.
- UNLOCK position: Push the control lever down to the free position to operate the machine.

NOTE :

Note: When the traveling joystick and the joystick are in a neutral position, when the safety lock control lever is pulled to the Unlock position, if any part of the machine moves, it means that the machine is faulty. In this case, immediately pull the safety lock control lever back to the LOCK position and stop the motor. And then contact SANY Heavy Machinery or its authorized dealer.

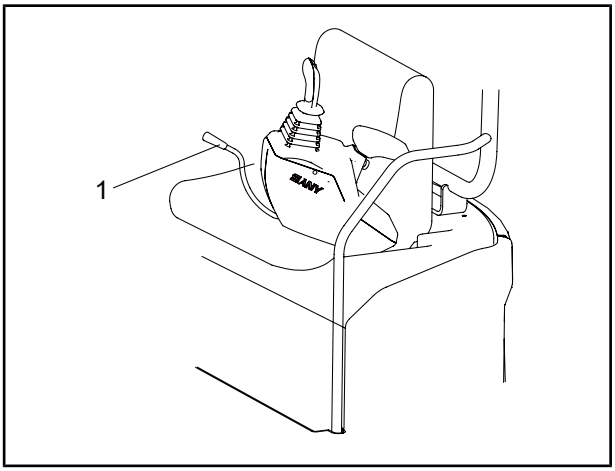


Fig 4-13

1. Locked state

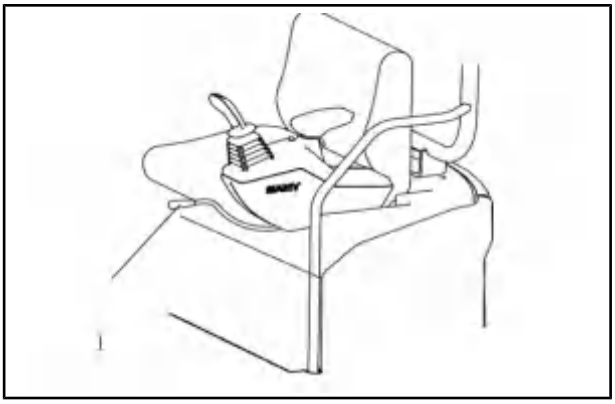


Fig 4-14

1. Unlocked state

4.3.3 Traveling joystick

The traveling joystick and traveling control pedal (as shown in the right Figure) are used to control machine traveling and change traveling direction of the machine.

[a] Forward:

Push the traveling joystick forwards (or step down front part of pedal)

[b] Reverse:

Pull the traveling joystick backwards (or step down rear part of pedal)

[N] Stop the machine (return the traveling joystick and pedal to the neutral position)

NOTE :

Note: Confirm the sprocket position before operating the traveling joystick or pedal. Ensure that the sprocket is at the back of the machine. If the sprocket is in the front of the machine and the traveling joystick is pushed forwards, the machine will move backwards.

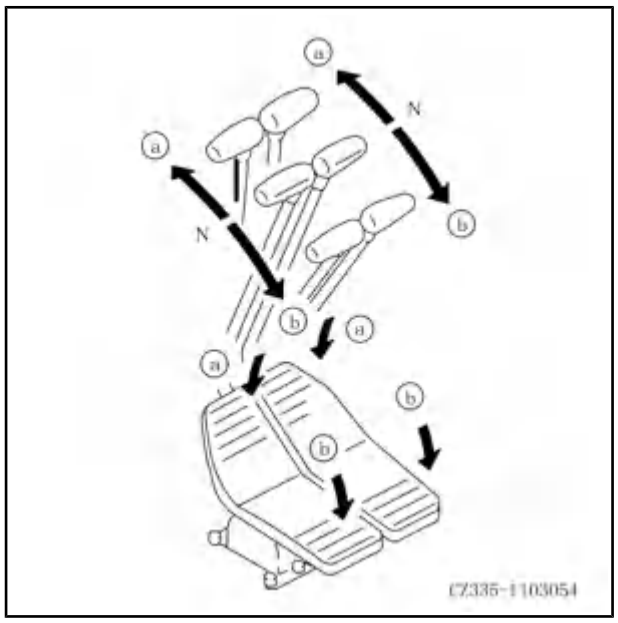


Fig 4-15

a. Forward b. Reverse

N. Stop the machine

4.3.4 Joystick

- Do not extend any part of your body out of the window. If you knock into the boom joystick accidentally or for other reasons, you may be hit by the boom. If the window is lost or damaged, it shall be repaired or replaced immediately.
- Before operation, be familiar with the position and function of each joystick to prevent injury caused by accidental movement of the machine.

The following is an example of the SAE mode. For details, please refer “” on page **to 5.1.5 “Control and operation of work equipment” on pages 5-23**.

Left joystick

Table 4–1

Action of the left joystick		
1	Front	Arm dumping
2	Rear	Arm digging
3	Left	Left swing
4	Right	Right swing

The diagonal movement of the joystick can realize two functions simultaneously and allow compound action.

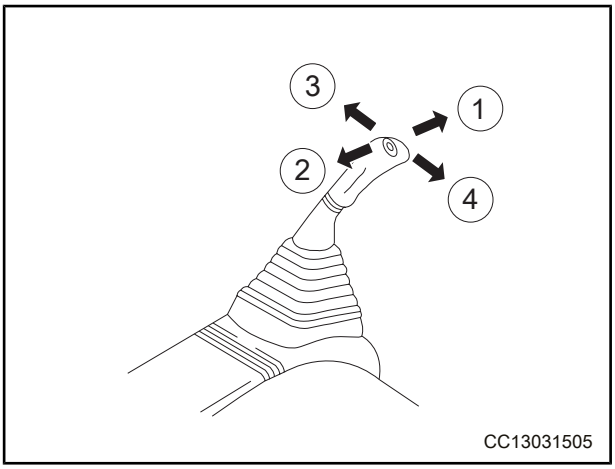


Fig 4-16

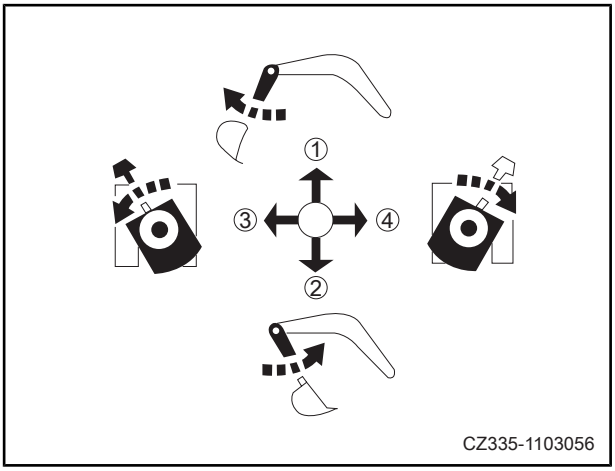


Fig 4-17

Right joystick

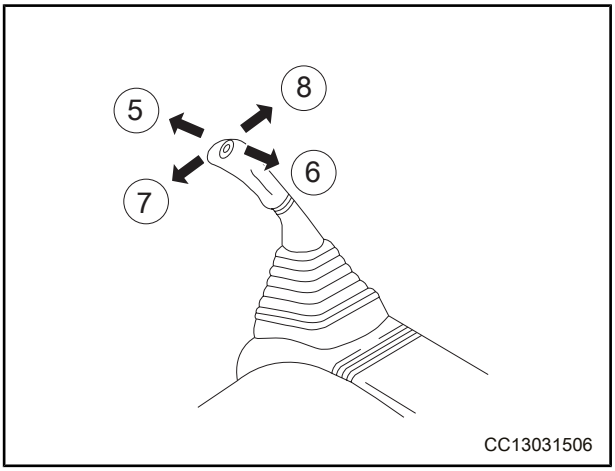


Fig 4-18

Table 4–2

Action of the right joystick		
5	Front	Boom lowering
6	Rear	Boom lifting
7	Left	Bucket digging
8	Right	Bucket dumping

- The diagonal movement of the joystick can realize two functions simultaneously and allow compound action.

NOTE :

-

Table 4–3

Note:
• When digging in the longitudinal direction, the travel motor shall be placed in the rear part to ensure that the stability and lifting capacity of the machine is the maximum. • When the traveling joystick and the joystick are released, it will automatically return to the neutral position and the machine function will be disabled.

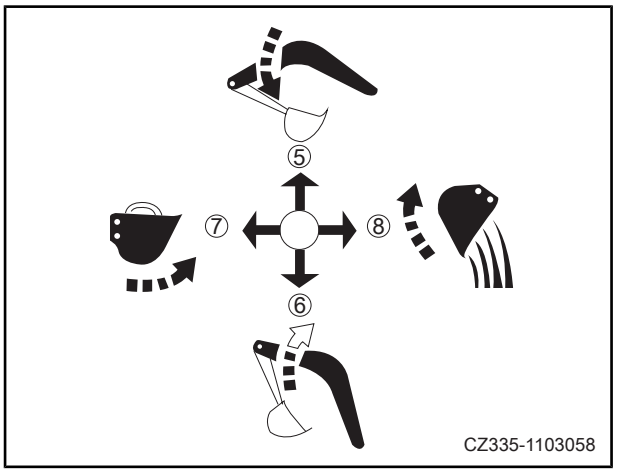


Fig 4-19

4.3.5 Dozer blade (track extend) joystick

Dozer blade

- When the switch [1] is in the [B] position, the joystick [2] controls the dozer blade. Push the joystick forward to lower the dozer blade, and pull the joystick backward to lift the dozer blade.
- [a] : orward (lower the dozer blade)
- [b] : backward (lift the dozer blade)

Track shoe extension

- When the switch [1] is in the [A] position, the joystick [2] controls the track shoe extension. Push the joystick forward to extend the track shoe to both sides, and pull the joystick backward to retract the track shoe to the middle.
- [a] : forward (extend the track shoe)
- [b] : backward (retract the track shoe)

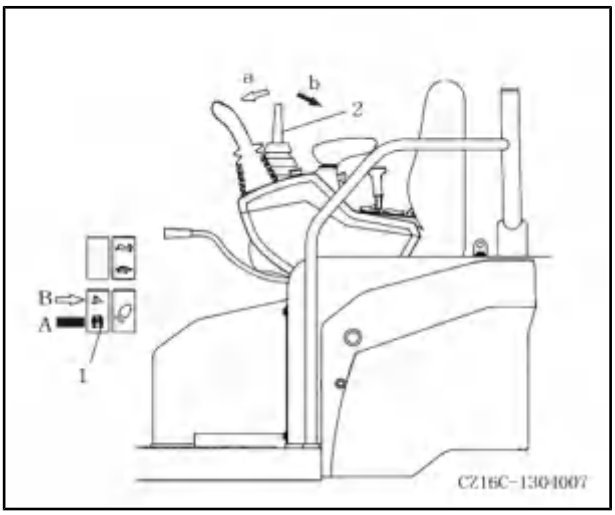


Fig 4-20

1. Dozer blade and chassis extension changeover switch
2. Joystick

A. Dozer blade position B. Chassis extension position

- In general, please keep the track shoe in state I to facilitate the stability of the excavator itself. Running the machine in state II will cause the machine to be unstable and prone to rollover accidents.
- If it must be used in state II, please lower the center of gravity of the machine as much as possible and keep the machine facing straight ahead.

Note: The specific function depends on the model.

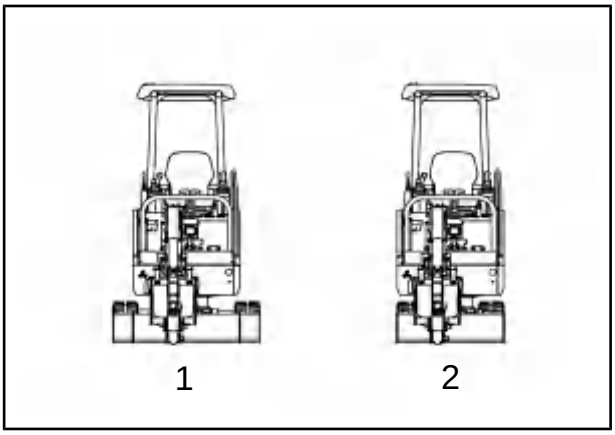


Fig 4-21

A. State I B. State II

4.3.6 Motor speed control knob

Rotating the speed control knob can change the speed of the motor with a total of 11 gears. The corresponding speeds are as follows

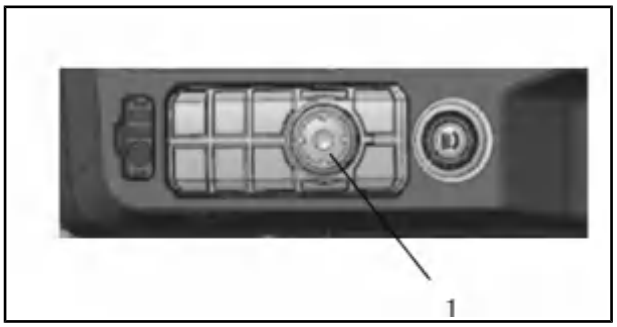


Fig 4-22

1. Motor speed control knob

Table 4–4

Gear	0	1	2	3	4	5
Speed	10-00	12-00	13-00	13-50	14-00	15-00
Gear	6	7	8	9	10	11
Speed	16-00	17-00	17-50	18-00	18-50	20-00

4.4 Lockable Lid

4.4.1 Overview

- For details of the lock cap and cover,“” on page **refer to 5.1.18**“” on page **“Locking” on pages 5-44** , “” on page 。
- Insert the key to the shoulder [A].

NOTE :

Note: Turning the key when it is not inserted at the bottom may cause breakage.

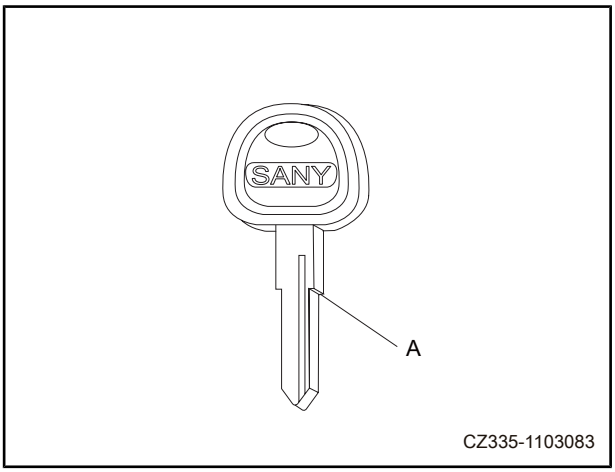


Fig 4-23

A. Key shoulder

4.4.2 Open and Close the Lock Cover

Open the cover(locked cover)

1. Insert the key into the key slot.

2. Turn the key counterclockwise and press the lock core inside and open the hood by pulling the right edge of the hood..

Position [1]: ON

Position [2]: Locked

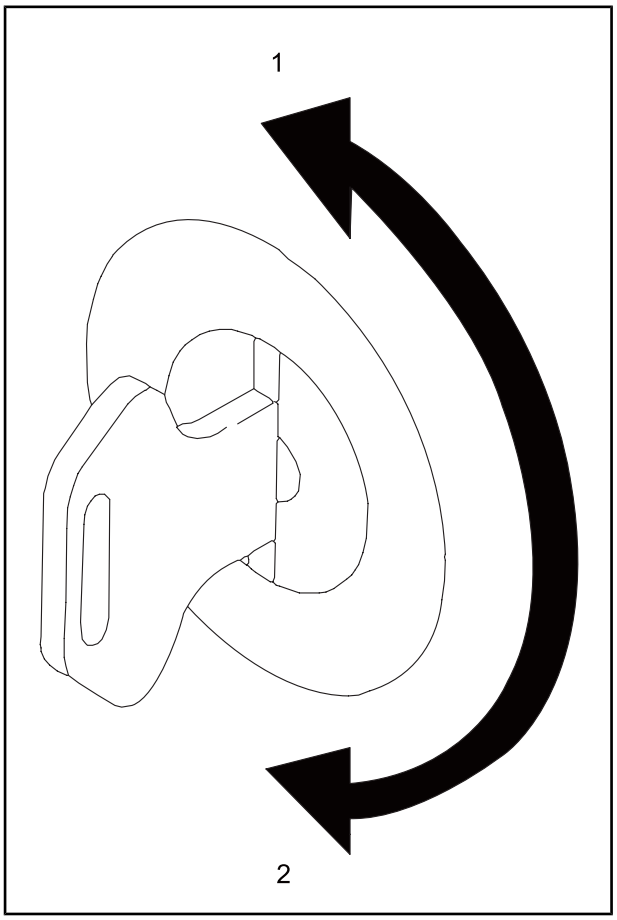


Fig 4-24

1. ON 2. Locked

Lock the cover

1. Close the cover, and insert the key into the key slot.

2. Turn the key clockwise and then remove it.

4.5 Fuse

If the electrical equipment does not work, first check the fuse. The box cover is affixed with fuse position and specification table.

Note: Be sure to turn off the start switch before replacing the fuse.

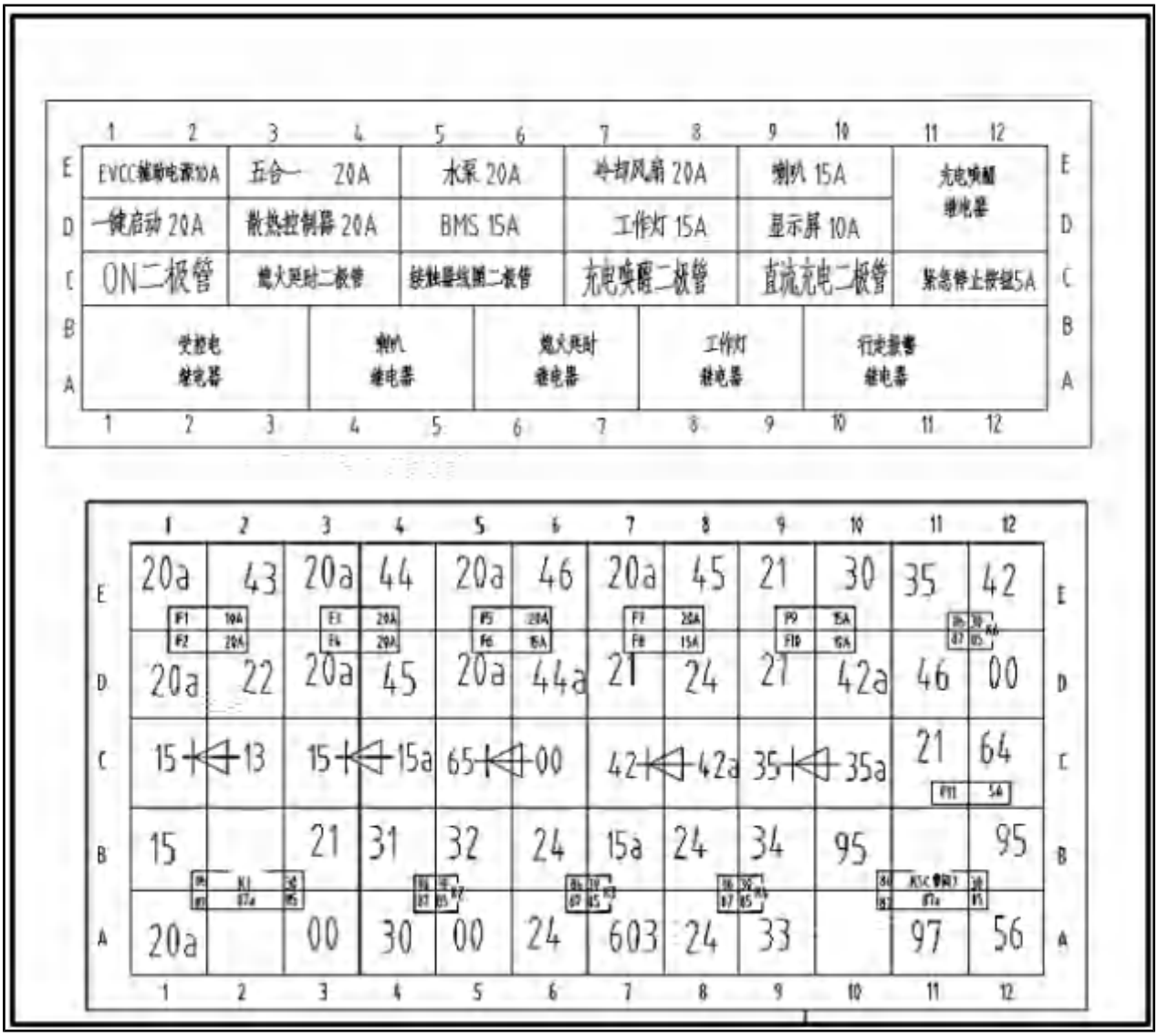


Fig 4-25

S/N	Fuse capacity	Circuit name
F1	10A	EVCC auxiliary power supply
F2	20A	Start circuit
F3	20A	Five-in-one power supply
F4	20A	Heat dissipation controller
F5	20A	Pump, Coolant
F6	15A	BMS power supply
F7	20A	Cooling fan
F8	15A	Work light
F9	15A	Horn
F10	10A	Display
K1		Controlled power relay

K2		Horn relay
K3		Flameout delay relay
K4		Work lamp relay
K5		Traveling alarm relay
K6		Charging wake up relay

4.6 Glove box

In order to facilitate the driver to put sundries, a glove box is provided in the cab.

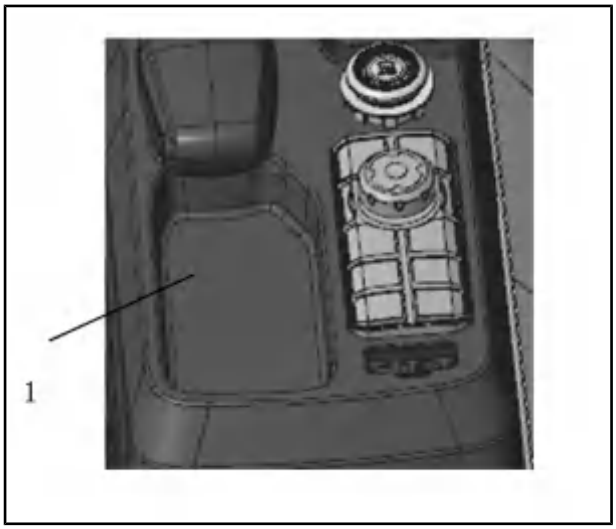


Fig 4-26

1. Glove box

4.7 Information pack

- The information pack is located on the back of the driver's seat back. The right Figure is the effect when the seat back is completely lowered down.
- The "Operation and Maintenance Manual" is placed in this pack, which can be read when necessary.

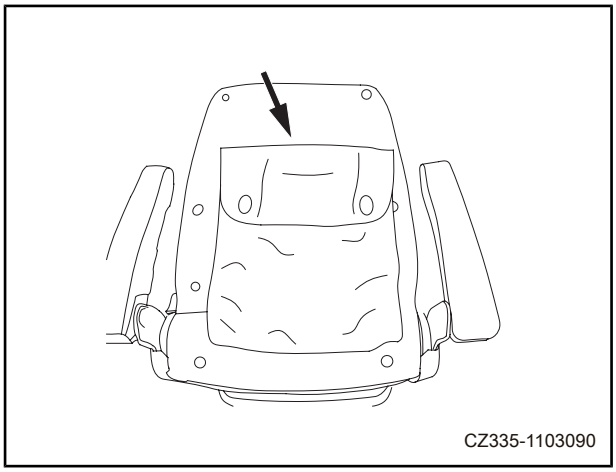


Fig 4-27

Operation

5.Operation

5.1 Operation and Control of the Machine

5.1.1 Before Starting the Motor

5.1.1.1 Routing inspection

Before power-up, check the machine and the part below it. Check whether bolts or nuts are loose, whether there is hydraulic oil, coolant leakage, and check conditions of the work equipment and hydraulic system. In addition, check whether the wires near the high temperature area are loose, and there are clearance and dust accumulation.

⚠ WARNING

- Remove the combustible materials around the battery or other high temperature parts, otherwise, it may cause fire.
- The leakage of hydraulic oil will cause the machine burning.

The following inspection and cleaning shall be performed before starting the motor every day:

1. Check whether the work equipment, cylinder, hose, etc. have cracks and excessive wear or looseness, and check whether the bucket and arm connections are damaged. If any problem is discovered, it shall be repaired or replaced.

2. Remove the dirt and debris around the motor, battery and radiator.
Check whether there is dirt around the motor and radiator. In addition, check whether there are combustible materials (dry leaves, twigs, etc.) around the battery or other high temperature parts. If dirt or combustibles are discovered, remove them.

3. Check whether cooling system has coolant leakage.

4. Check whether the hydraulic device, hydraulic tank, hose and adapter have oil leakage. Check for oil leakage. If any problem is discovered, repair the leaky oil part.

5. Check whether the lower body (track, sprocket, guide wheel, guard board) is damaged and worn, and whether bolts are loose or roller has oil leakage. If any problem is discovered, repair it.

6. Check whether the handrail and step are defective, and whether bolts are loose.
If any problem is discovered, repair it. Tighten loose bolts.

7. Check whether the instrument and monitor are defective.
Check whether the instrument and monitor inside the cab are defective. If any problem is discovered, replace the parts. Remove dirt from the surface.

8. Check seat belt and fixing clamp.

Check whether the seat belt and fixing clamp are damaged or worn. If damaged, replace the part with a new one.

9. Check whether the bucket with hook (if equipped) is damaged. Check whether the hook, guide plate, and hook seat are damaged. If any fault is discovered, please contact our authorized dealer for repair.

5.1.1.2 Checks before starting the motor

Always check the items in this section before starting the motor every day.

Cooling system coolant level - inspection/adding coolant

⚠ CAUTION

WarningAfter the motor is stopped, the coolant will be very hot and the radiator will be under high internal pressure. If the radiator cap is removed in order to discharge the coolant in this case, there is a danger of burns. Therefore, remove the radiator cap after the radiator is cooled down. Slowly rotate the cap to release the internal pressure.

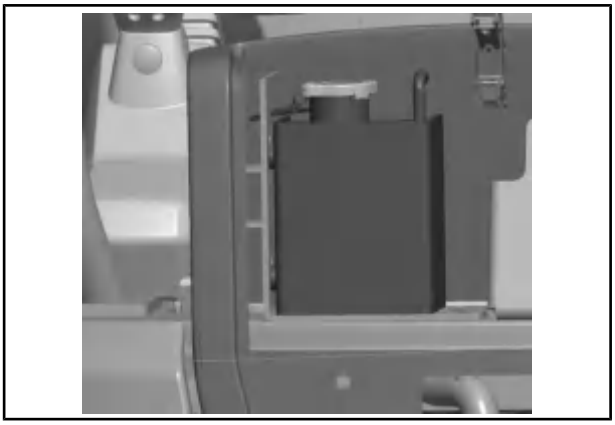


Fig 5-1

1. Open the hood to check whether the coolant in the reservoir [1] (shown in the right figure) is between FULL and LOW marks. If the coolant level is low, add coolant to the FULL level through the water inlet of the reservoir.

2. Tighten the cap firmly after adding the coolant.

3. If the auxiliary tank is empty, there may be a water leakage. Repair it immediately after inspection. If there is no abnormal condition, check the water level in the radiator. If the water level is low, fill the radiator and reservoir [1] with water.

4. Close the access door.

Hydraulic oil level - inspection/adding oil

⚠ CAUTION

Warning

- After the power is turned off, the parts and oil are still in a state of high temperature, which may cause burns. Start operation after they are cooled down.
- When the filler cap is removed, slowly rotate it to release the internal pressure and then remove it.

1. Adjust the work equipment to the position as shown in the right Figure, and then stop the motor.

2. Move the work equipment traveling joystick and traveling joystick in all directions during the whole trip within 15 s after power off to release the internal pressure.

3. Check the oil level gauge on the hydraulic tank. The oil level must be between the marks of the oil level gauge, otherwise hydraulic oil shall be added.

- Refueling steps:

  1. Open the left cover of the hydraulic tank, unscrew the bolt and open the filler cap.

  2. Slowly add hydraulic oil and check the level gauge again.

  3. When the oil level reaches the middle position of the level gauge, close the filler cap. Put the cover back in place.

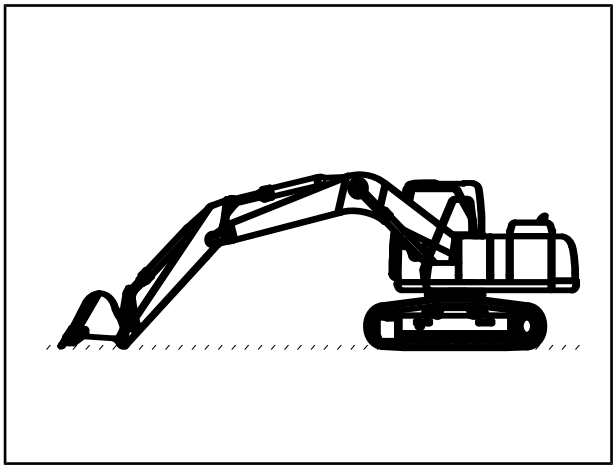


Fig 5-2

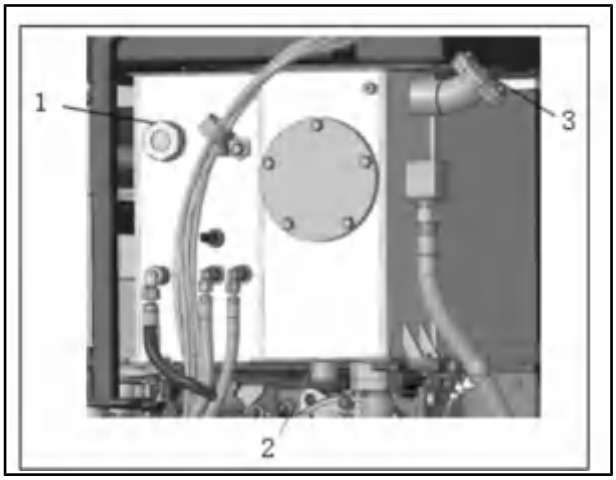


Fig 5-3

1. Level gauge 2. Drain hole
3. Filler hole

NOTE：

Note: Do not add the hydraulic oil above the level gauge scale. This will damage the hydraulic device and cause oil spraying. If the oil level exceeds the scale, turn off the motor, wait for the oil to cool, place an oil-receiving container under the drain hole at the bottom of the hydraulic tank, and then drain the excess oil from the drain plug.

[1] Level gauge

[2] Drain hole

[3] Filler hole

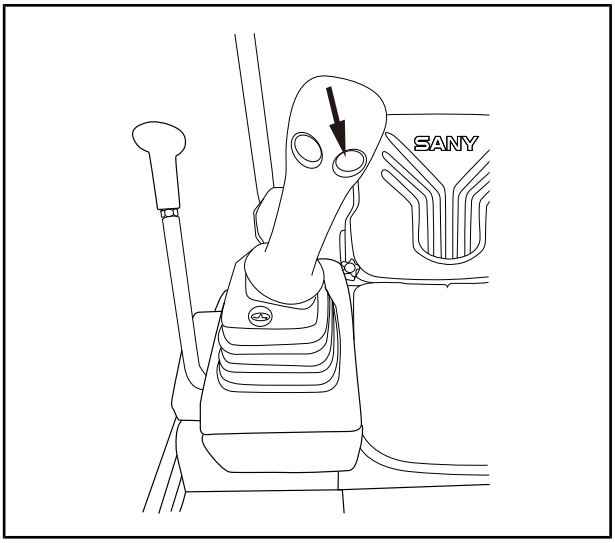


Fig 5-4

Check electrical wiring

⚠ CAUTION

- If the fuse is burnt frequently or if there is a short circuit in circuit, find the cause immediately and eliminate the fault, or contact the dealer authorized by Sany Heavy Machinery Co., Ltd. for repair.
- Keep the upper surface of the battery clean. Check the vents on the battery cover. If the vents are blocked by dirt or dust, flush the battery cover and clean the vents.

Check the fuse for damage or improper breaking capacity, check the circuit for signs of open or short circuits, check terminals for looseness and tighten any loose parts.

Special attention shall be paid to checking the circuit of the “battery”.

During patrol inspection or during inspection before starting the motor, be sure to check whether there is a flammable accumulation around the battery, and remove the flammable materials. For the investigation and correction of related causes, please contact the dealer authorized by Sany Heavy Machinery Co., Ltd.

Check the function of the horn: After the machine is started, when the horn button is

pressed, the horn shall honk immediately. If the horn does not honk, please contact the dealer authorized by Sany Heavy Machinery Co., Ltd.

5.1.1.3 Adjustment before operation

Seat adjustment

An all-direction adjustable seat is provided. It can be adjusted forward and backward, and tilted forward and backward by various angles, so as to ensure comfortable operation.

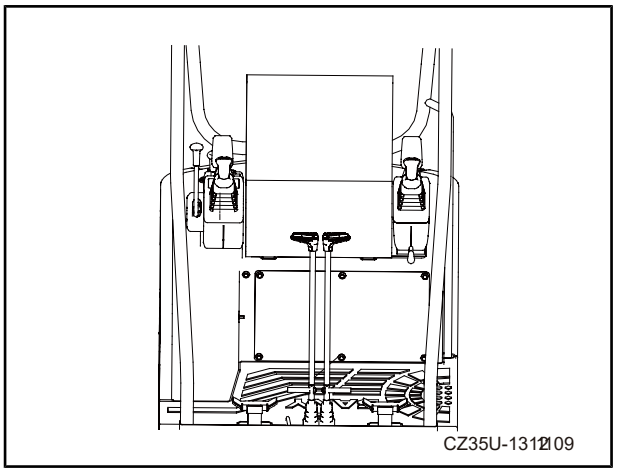


Fig 5-5

Depth adjustment of seat

The forward and backward position of the seat is adjusted by single-layer slide rail control. The operator can adjust the seat according to the body, so as to comfortably operate the machine to perform various actions. Sit on the seat, pull up the adjustment lever [1] in front of the seat, push and pull the seat forward and backward, adjust it to the appropriate position, and release the adjustment lever to fix the seat.

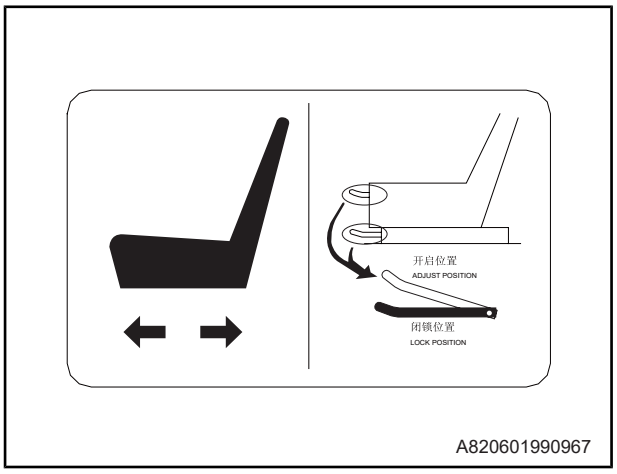


Fig 5-6

NOTE :

Note: The forward and backward adjustment stroke of the SY19E seat is 90/0mm respectively, with the increment of each gear of 15mm.

Adjustment of rear seatback

Pull up the adjustment lever [2] on the lower left side of the seat back, and adjust the seat back forward/backward to the proper angle by force. When the adjustment lever is released, the seat back is automatically fixed at the proper seat back angle.

[1] Forward/backward adjustment lever

[2] Backrest adjustment lever

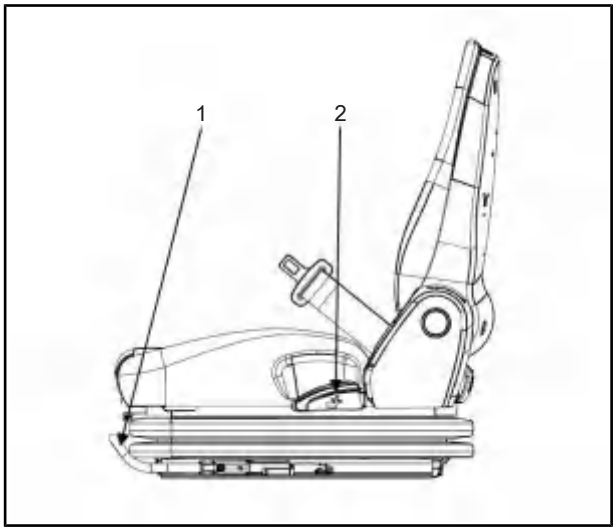


Fig 5-7

1. Forward/backward adjustment lever
2. Backrest adjustment lever

Seat belt

⚠ WARNING

Warning

- Before using the seat belt, check whether the seat belt and its mounting seat are defective, and replace them if worn or damaged.
- Even if the seat belt looks normal, it shall be replaced every 3 years. The production date of the seat belt is marked on its back.
- Wear seat belt during operation.
- The seat belt can't be twisted when it is fastened.

NOTE：

Note: The seat belt is supplied with a winding device, so it is unnecessary to adjust the length.

5.1.1.4 Operations before starting the motor

⚠ WARNING

Warning

- Before motor startup, check whether the safety lock control lever is firmly located at the Lock position.
- If the safety lock control lever is not firmly locked and it knocks with the traveling joystick or pedal during motor startup, the machine will move accidentally and cause serious accidents.
- When standing from the driver's seat, be sure to set the safety lock control lever to the Lock position regardless of whether the motor is running.

1. [1] Safety lock control lever

Check whether the safety lock control lever is located at the "LOCK" position.

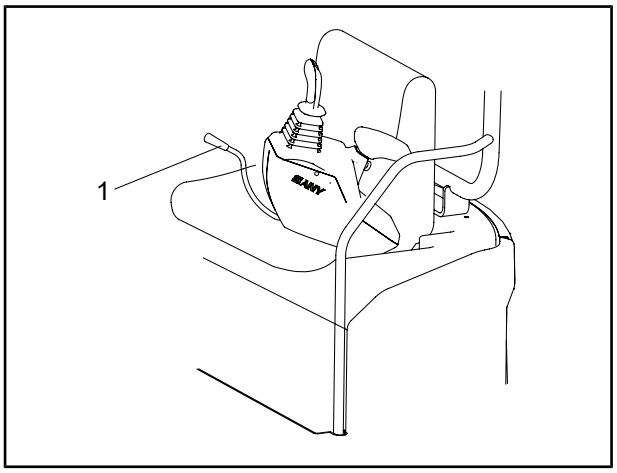


Fig 5-8

1. Safety lock control lever

2. Check whether the traveling joystick and pedal are in the "Neutral" position. If there is no contact with the traveling joystick or pedal, they shall be located in the "Neutral" position.

3. Turn the power knob to the [ON] position.

4. Click the start/stop button to monitor the state of the machine through the home page of the display screen. For details of the display, see the "Display Screen" section. Then carry out the following checks:

- Alarm prompt.
  After the start/stop button is pressed, the display screen goes on in the normal state.
  [1] Power switch
  [2] Start/stop button

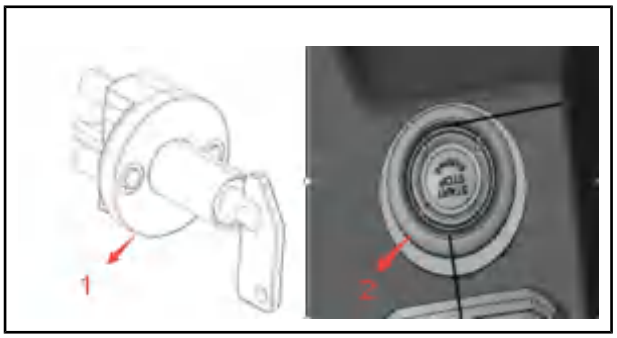


Fig 5-9

1. Power switch 2. Start/stop button

5.1.2 Starting the Motor

5.1.2.1 Normal start

⚠ WARNING

Warning

- Start the motor only when sitting in the driver's seat.
- Ensure that there are no personnel or obstacles in the surrounding area, and then make the horn sound and start the motor.

1. Check whether the safety lock control lever is located at the “LOCK” position. If the safety lock control lever is in the “Unlock” position, the motor cannot be started.

[1] Safety lock control lever

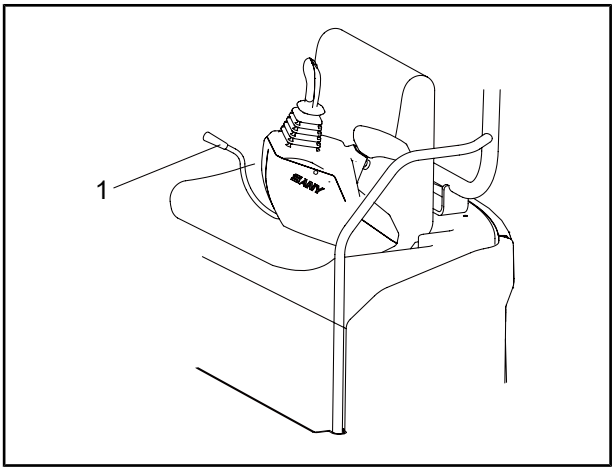


Fig 5-10

1. Safety lock control lever

2. Turn the speed control knob to the low speed position.

[1] Speed control knob

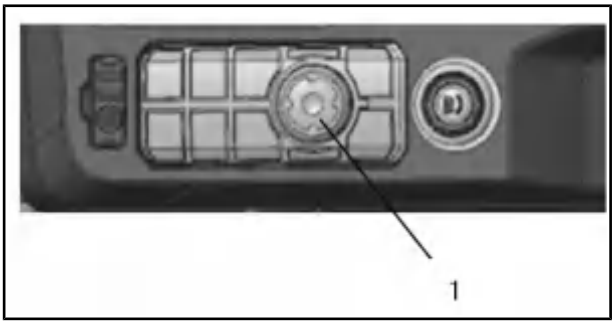


Fig 5-11

1. Speed control knob

3. Press the start/stop button to start the display screen, and press and hold it for 5s to start the motor.

[1] start/stop button

Fig 5-12

1. start/stop button

4. The password interface appears on the display, enter 4 digit pin code (the initial pin code:1,2,3,4)and enter into the user operation interface.

5. Press it for 5s to start the motor.

Honk the horn to check if the power supply is turned on and remind the people around you.

5.1.2.2 Starting the motor in cold weather

⚠ CAUTION

- Make sure there are no people or obstacles in the surrounding area, and then honk the horn and start the motor.

In cold weather, operate the machine in accordance with the following steps:

1. 1. Turn the power switch to the ON position.

2. After starting the motor, check whether the instruments and indicator lights are normal.

• In case of temperature below -18℃ or hydraulic function lag, it may take a longer preheating time.

5.1.2.3 After starting the motor

⚠ CAUTION

- If there is any condition or fault, you can press the start/stop button to shut down the machine, and the emergency stop button can be pressed in case of emergency.
- If the working device is operated when the machine is not preheated sufficiently, the response of the working device to the movement of the joystick will be slow, and the working device cannot move in accordance with the requirements of the operator. Therefore, warm-up must be carried out. Especially in cold areas, sufficient warm-up must be carried out.

5.1.2.4 Running-in of new machines

NOTICE

- Before delivery, Sany's machine has been thoroughly adjusted and tested. However, operating the machine under harsh conditions at the beginning will adversely affect the performance of the machine and shorten the service life of the machine.
- Be sure to run in the machine in the first 100 hours (as shown by the hour meter). During the running-in operation, follow the precautions required in this manual.

Pay attention to the following aspects when running in the machine:

1. After starting the motor, run it at idle speed for 15s. At this point, do not operate the joystick or throttle control lever.

2. Avoid heavy load operation or high speed operation.

3. Avoid sudden start, sudden acceleration, sudden turning and sudden stop except in emergency.

4. Carefully observe the operation of the motor, and limit the motor power to less than 80% of the full load only in an economical way to operate the machine.

5. Pay special attention in the first 50 hours until you can feel and are fully familiar with the sound of the new machine.

6. Avoid leaving the motor idle for a long time.

5.1.2.5 Warm-up operation

⚠ WARNING

- In an emergency, or when the motor is working abnormally, or when there are other faults, the start/stop button can be pressed, or the emergency stop button can be pressed to turn off the motor.
- When the hydraulic oil temperature is low, do not operate the traveling joystick or pedal suddenly. Be sure to carry out warm-up operation until the hydraulic oil temperature reaches the proper temperature.
- If no complete warm-up operation is carried out, the machine will have no reaction or sudden and quick action during operation, resulting in serious accidents. The complete warm-up shall be carried out especially in the cold region.

After starting the motor, do not start the operation immediately, and carry out the following operations and checks:

1. Make the excavator run at medium speed (1800 rpm), and then slowly operate the bucket back and forth for 5min.

2. Adjust the throttle knob to make the excavator run at high speed, and then operate the boom, arm and bucket for 5-10min.

3. Perform each action of the crawler hydraulic excavator completely for several times to finish its warm-up. Check whether the displays of the instruments are normal after preheating.

4. Check whether the noise, or vibration of the exhaust are abnormal. If abnormal, perform repair immediately.

5.1.3 Shutting down the motor

1. Park the machine on a level ground.

2. Lower down the bucket to the ground.

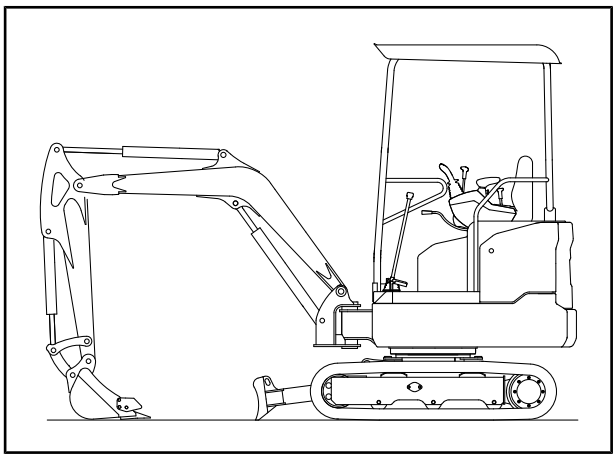


Fig 5-13

1. Press the start/stop switch [1] to turn off the motor.

Checks after the motor is turned off

1. Walk around the machine, to check the work equipment, outside and carrier, and check for leakage of oil or coolant. If any abnormality is found, repair the related parts.

2. Fully charge the battery pack.

3. Check the motor compartment for scraps of paper and debris, and remove them to avoid the risk of fire.

4. Remove dirt from the carrier.

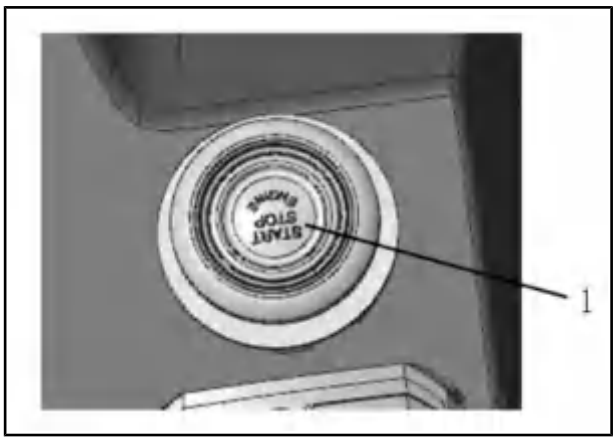


Fig 5-14

1. start/stop switch

5.1.4 Move the Machine

5.1.4.1 Precautions for machine movement

Before moving the machine, please check the SOC displayed. It takes about 20% of the power to drive for 1km. Please determine the required power according to the driving distance to avoid the machine breaking down due to the depletion of power.

Check the direction of the track frame before operating the traveling joystick.

If the sprocket is in the front, the traveling joystick is operated in reverse order.

⚠ WARNING

Warning

- Before moving the machine, check whether the area around the machine is safety and sound the horn.
- No one is allowed to enter the area around the machine.
- Remove any obstacles on the traveling path.
- There is a blind spot at the back of the machine, so pay special attention to it during reverse traveling.

⚠ CAUTION

- Before operating the traveling joystick or pedal, you must first make sure that the idler [A] is in the front of the machine and the sprocket [B] is in the tail [C] of the machine. If the sprocket is located in front of the machine, the driving direction of the machine will be opposite to the operation direction of the traveling joystick or the traveling pedal. (The front and rear traveling directions are opposite, and the left and right steering directions are also opposite)
- Be sure to check the position of the traveling motor before traveling.
- After travel of long distances, please take a 5 min break every 20 min traveling to avoid damage to the travel motor. For smooth operation, the traveling joystick is provided with a damper. In cold weather, the operating force of the traveling joystick will increase. At this point, the traveling joystick can be operated for several times first when the safety lock control lever is in the locked position.

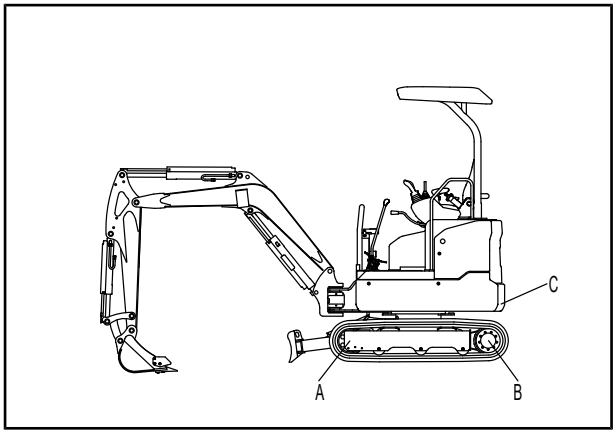


Fig 5-15

A. Idler B. Sprocket

C. Tail

[A] Idler

[B] Sprocket

[C] Tail

5.1.4.2 Preparation of moving machine

1. Adjust the speed control knob [1] to the appropriate gear to increase the speed of the motor.

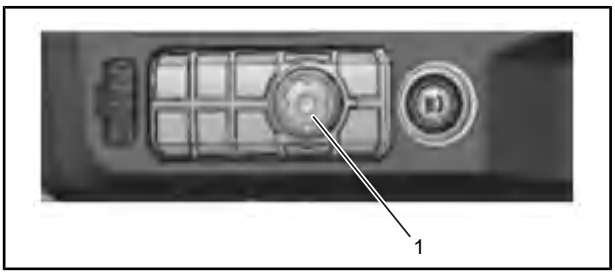


Fig 5-16

1. speed control knob

2. Turn the safety lock control lever to the “Unlock” position.

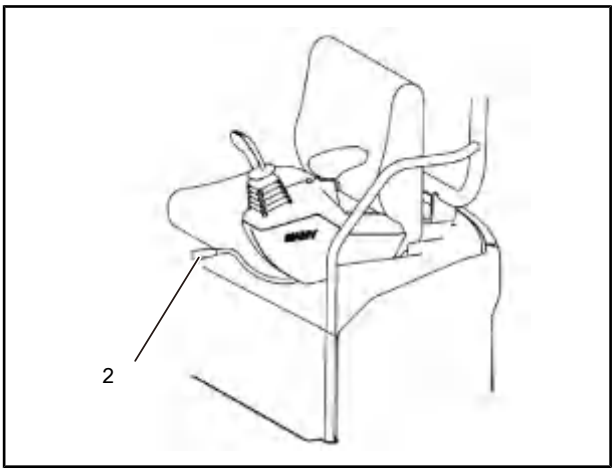


Fig 5-17

2. Safety lock control lever

3. Retract the work equipment and lift it up to [3] 20~30 cm from the ground. As shown above Figure.

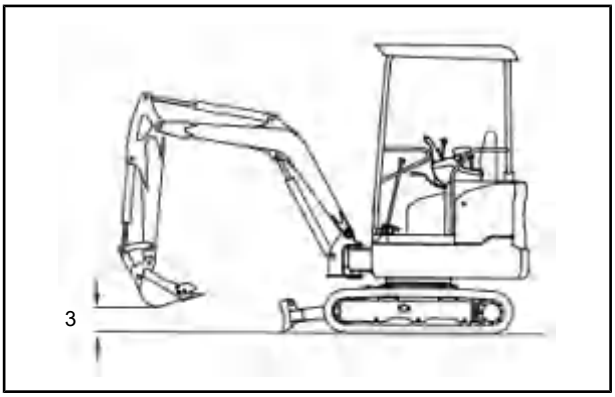


Fig 5-18

3. Ground clearance

5.1.4.3 Move the Machine

Forward

- Push the left and right joysticks forward together or depress the front of the left and right pedals at the same time to move the machine forward.

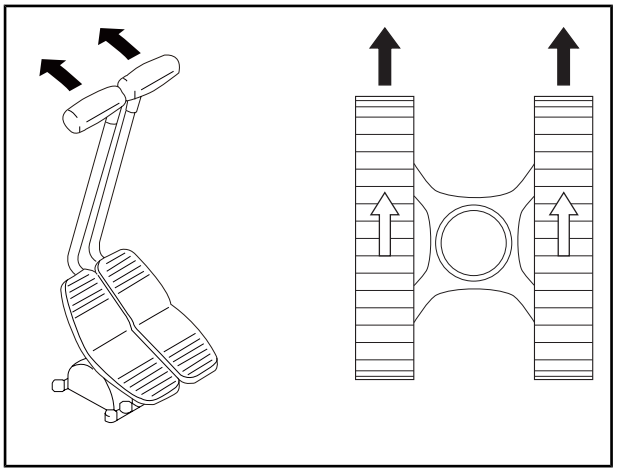


Fig 5-19

Backward

- Pull the left and right joysticks backward together or depress the rear of the left and right pedals at the same time to move the machine backward.

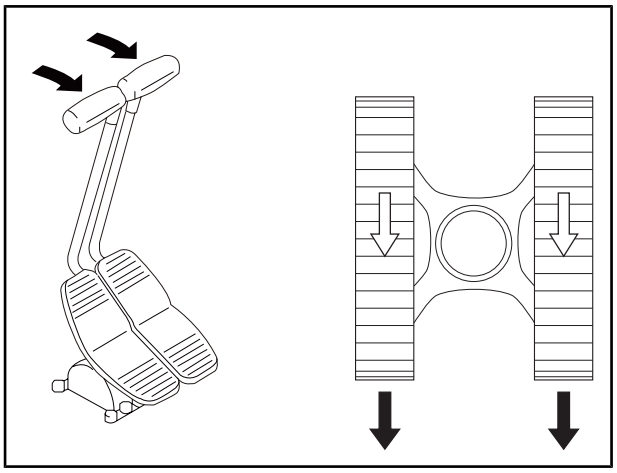


Fig 5-20

Turn left

- Push the right joystick forward or depress the front of the right pedal to turn the machine to the left.

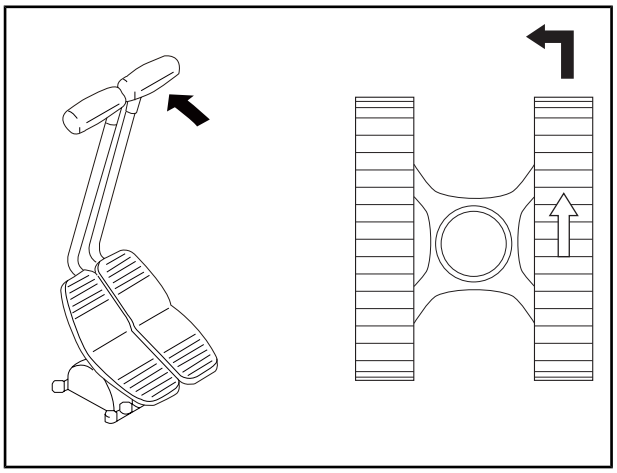


Fig 5-21

Turn right

- Push the left joystick forward or depress the front of the left pedal to turn the machine to the right.

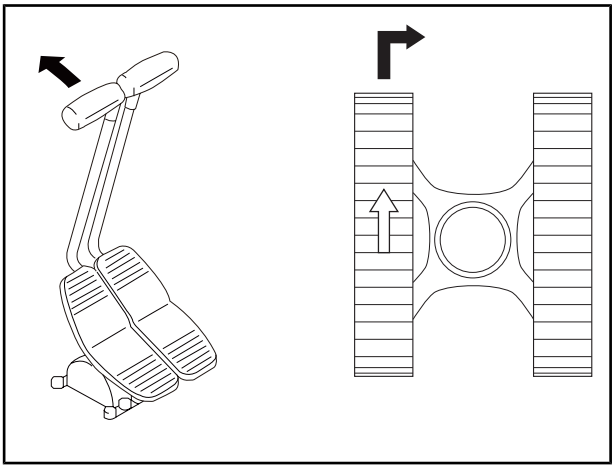


Fig 5-22

In-situ turning

- In-situ turning to the left: Push the right joystick forward or depress the front of the right pedal, and pull the left joystick backward or depress the rear of the left pedal at the same time to turn the machine to the left in situ.
- In-situ turning to the right: Push the left joystick forward or depress the front of the left pedal, and pull the right joystick backward or depress the rear of the right pedal at the same time to turn the machine to the right in situ.

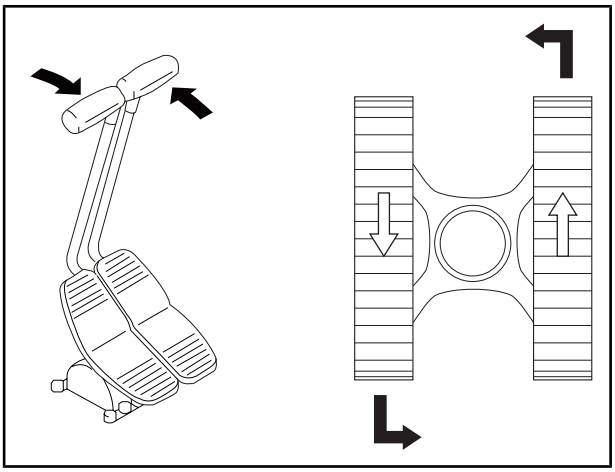


Fig 5-23

NOTE：

- If the drive wheel is located at the front of the machine, the driving direction of the machine will be opposite to the operating direction of the travel joystick or pedal.
- Operate the travel joysticks or pedals in the same direction and amplitude to ensure that the machine travels in a straight line.
- In cold temperature, if the travel speed of the machine is abnormal, warm the machine thoroughly. In addition, if the walking body is blocked by mud and the travel speed of the machine is abnormal, remove the mud from the walking body.

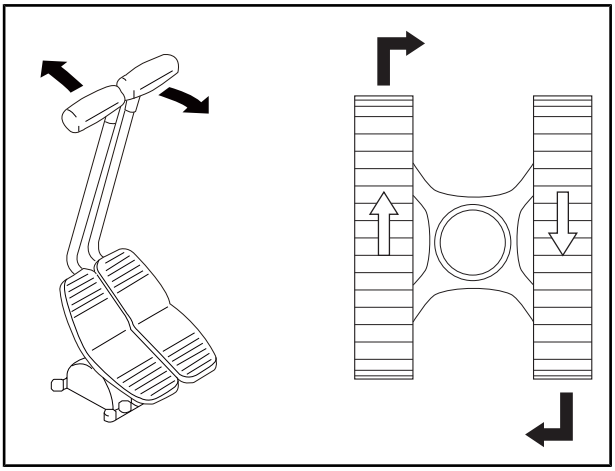


Fig 5-24

5.1.4.4 Stop the Machine

NOTE：

- Avoid stopping the machine suddenly.
- When stopping the machine, leave enough space for you to leave the machine.

Release the left and right travel joysticks or pedals together to stop the machine.

The travel joysticks or pedals will return to the neutral [N] position automatically once released.

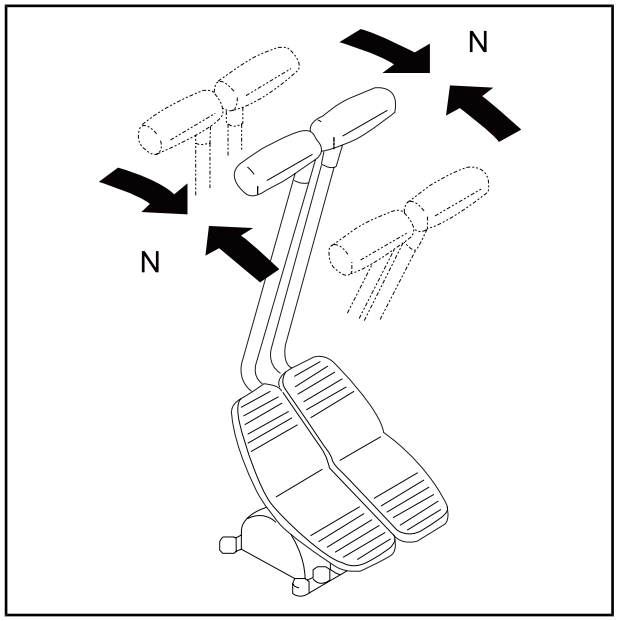


Fig 5-25

N. Neutral position

5.1.5 Control and operation of work equipment

The control and operation of the work equipment will be completed through traveling joysticks of the left and right work equipment.

When the traveling joystick is released, it will return to the neutral position, and the work equipment will also remain in that position.

- (a) Arm control

Operate the traveling joystick of the left work equipment forwards or backwards to control action of the arm.

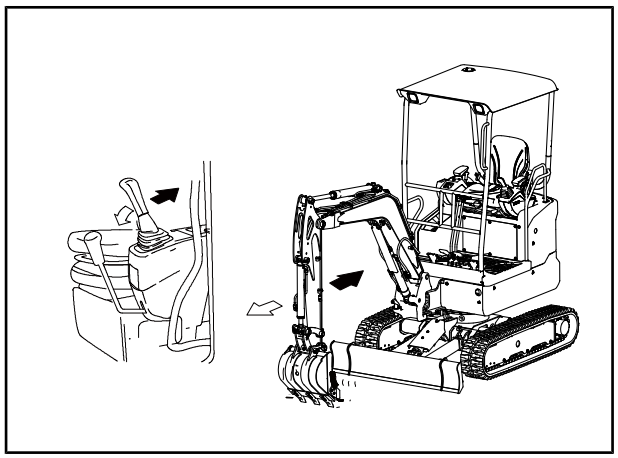


Fig 5-26

- (b) Swing control

Operate the traveling joystick of the left work equipment leftward or rightwards to control slewing of the upper body.

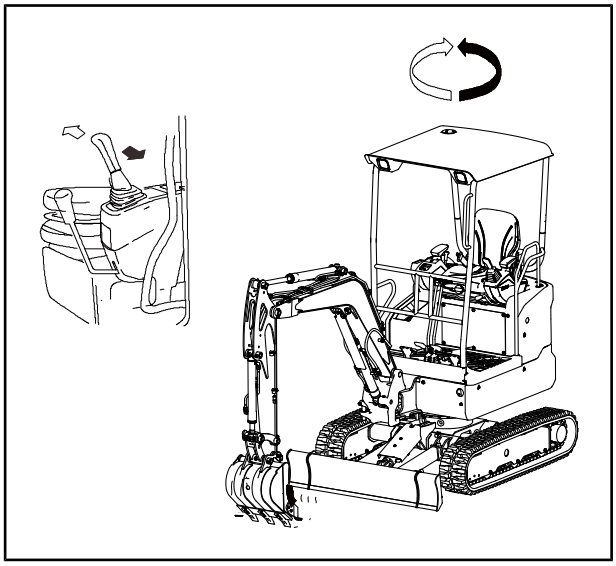


Fig 5-27

⚠ WARNING

- Before swinging, place the pin [1] in position A and unlock the swinging so that the machine can swing normally, otherwise it will damage the machine. If you find that the pin falls in the process of work, please stop the machine immediately and put the pin back in place.
- When the machine is not working or transporting, please place the pin [1] in position B and lock the swinging, otherwise accidental deflection of the machine may lead to an accident.

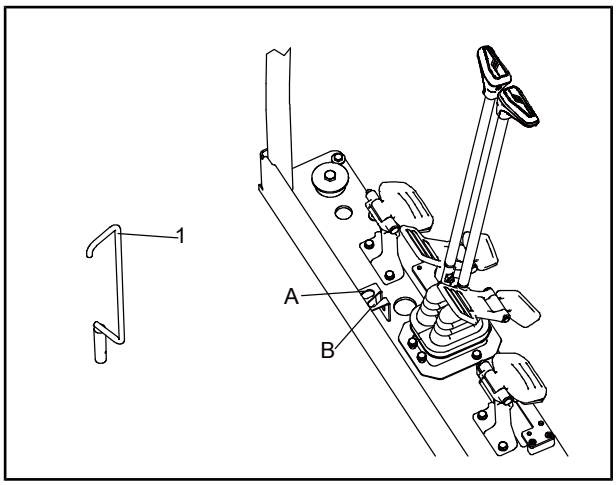


Fig 5-28

1. Pin
A. Position
B. Position

- (c) Boom control

Operate the traveling joystick of the right work equipment forwards or backwards to control action of the boom.

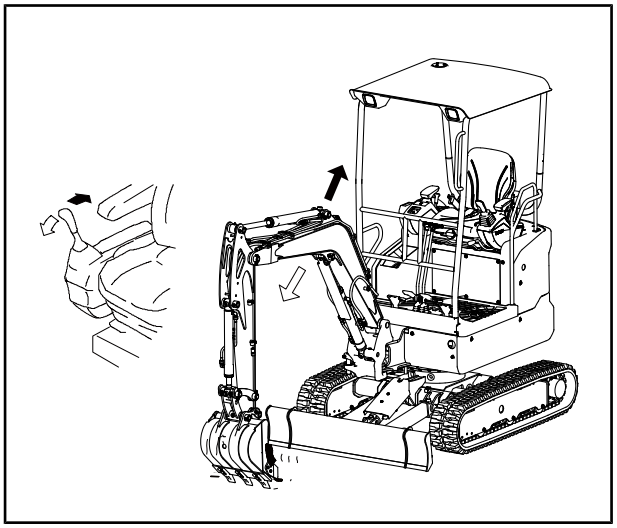


Fig 5-29

- (d) Boom deflection control

Depress the right deflection control pedal of the working device to the left or right to control the deflection of the boom.

Note: The specific function depends on the model.

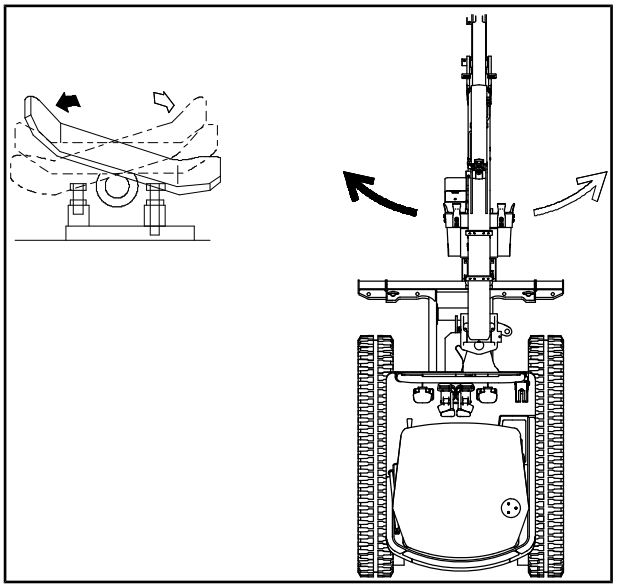


Fig 5-30

- (e) Bucket control

Operate the traveling joystick of the right work equipment leftwards or rightwards to control action of the bucket.

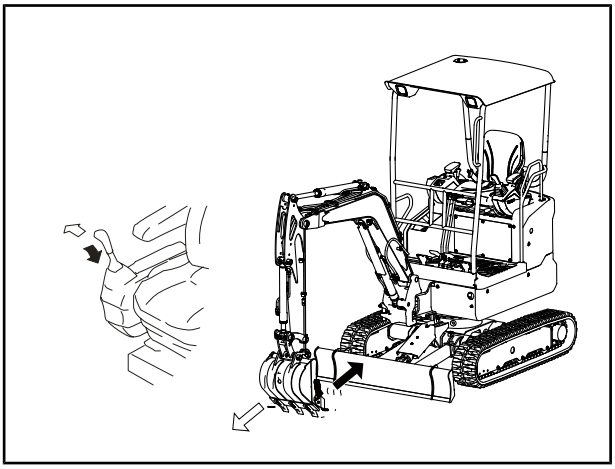


Fig 5-31

- (f) Dozer blade control

Push the dozer blade joystick forward or backward to control the dozer blade movement.

NOTE :

The control oil circuit of the machine is equipped with an accumulator. If the starting switch is turned on within 15s after the motor is turned off, and the safety lock control lever is placed in the “unlocked” position, even if the motor is stopped, the joystick can be operated to lower the working device to the ground.

This step can also be used to release the residual pressure in oil circuit of the hydraulic cylinder or to remove boom after the machine loaded onto the trailer.

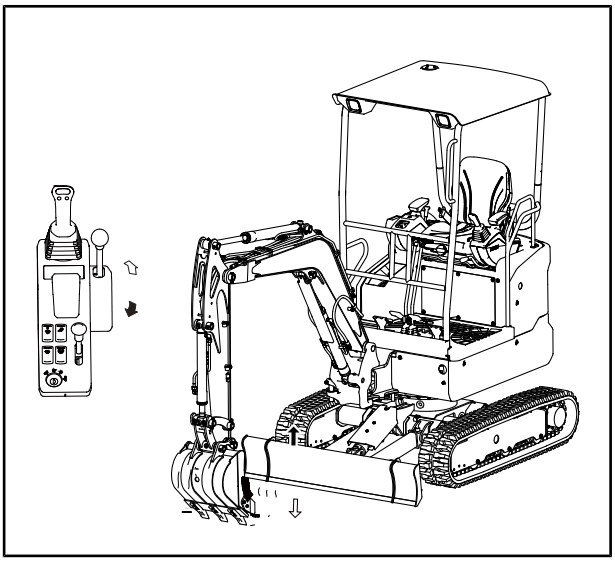


Fig 5-32

⚠ WARNING

- If the joystick of the working device must be operated while the machine is traveling, special care must be taken during operation.
- During traveling, lift the bucket off the ground about 20~30cm (8~12in).
- Do not reverse the machine downhill.

5.1.6 Prohibited Operations

NOTICE

Risk of machine damage!
Operating the joystick of the working device while the machine is in motion could cause damage to the machine and shorten its service life.

- When the machine is traveling, if it is necessary to operate traveling joystick of the work equipment, stop the machine and then operate the traveling joystick.

NOTE：
The consequences of any prohibited operation shall be borne by the customer.

The operation with slewing force is prohibited

- Do not compress the ground or break objects with slewing force. This will be dangerous, and will dramatically shorten the service life of the machine.

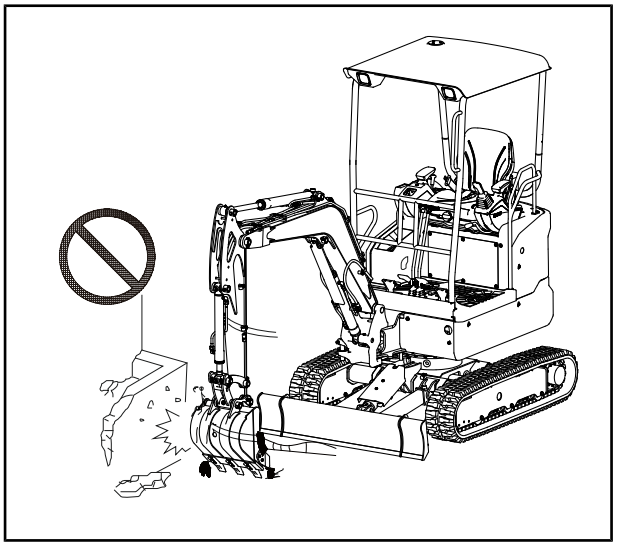


Fig 5-33

The operation with traveling force is prohibited

- Do not insert the bucket into the ground and use the traveling force for digging. This will damage the machine or the work equipment.

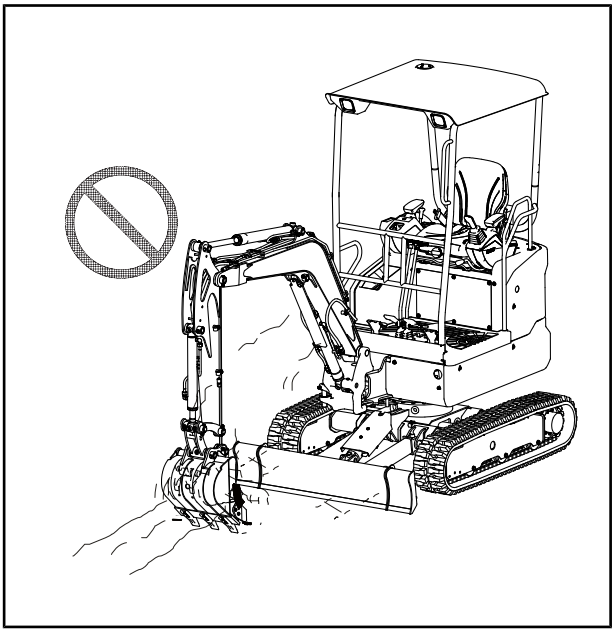


Fig 5-34

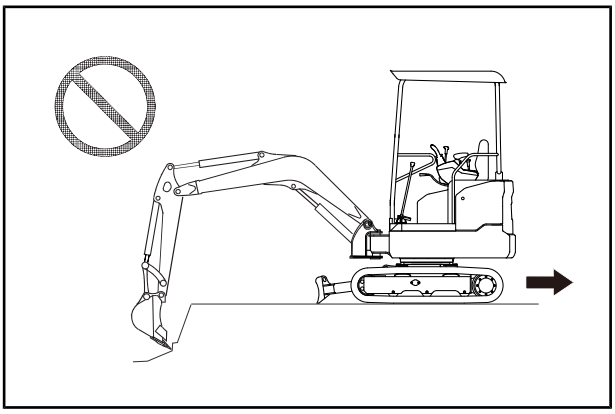


Fig 5-35

The operation when the hydraulic cylinder reaches the end of the stroke is prohibited

- If the cylinder piston rod is operated to the end of its stroke, the use of the work equipment and the impact of some external force will damage the hydraulic cylinder and cause personal injury. Avoid operation when the hydraulic cylinder is fully retracted or fully extended.

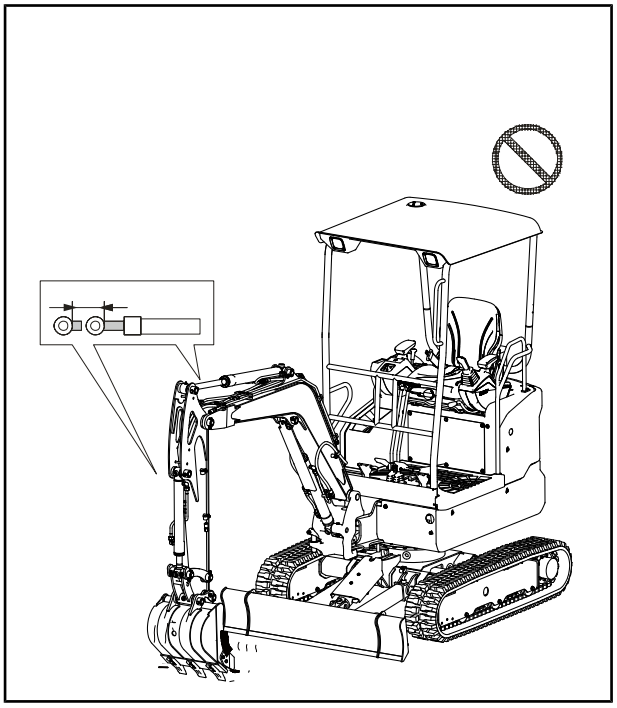


Fig 5-36

The operation with the bucket drop force is prohibited

- Do not use the drop force of the bucket for digging, crushing or piling. This will dramatically shorten the service life of the machine.
- To avoid damage to the hydraulic cylinder, do not hit the ground with a bucket or tamp it with a shovel when the bucket oil cylinder is fully extended (the bucket is fully retracted).

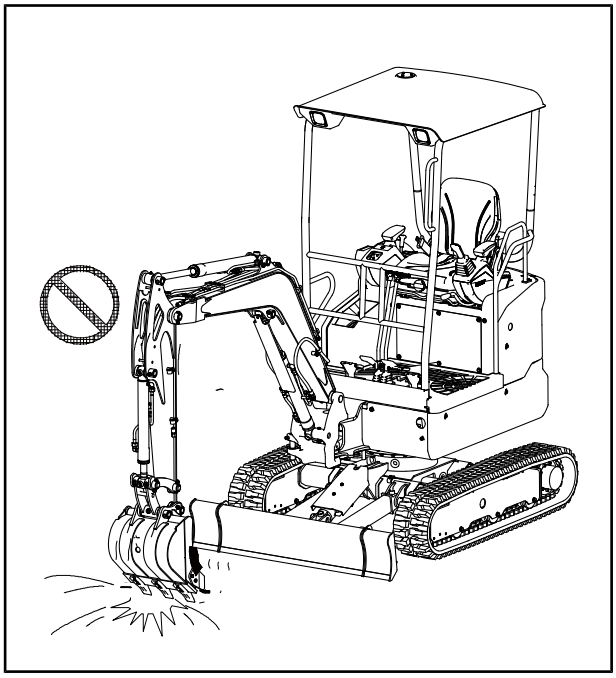


Fig 5-37

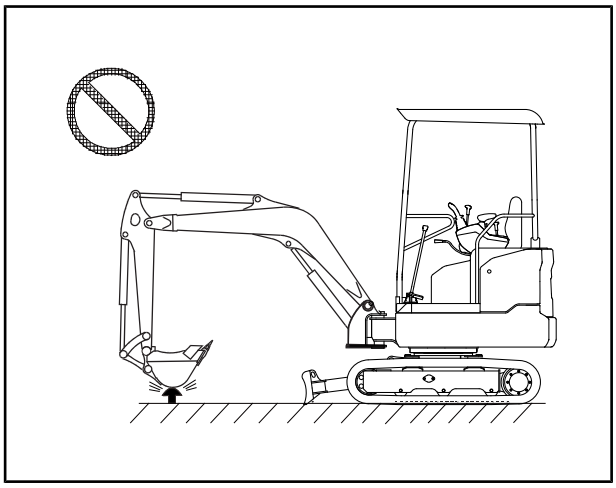


Fig 5-38

Digging of hard rock ground

- Do not try to dig the hard rock ground directly, and it is recommended to break it in other ways before digging. This will not only reduce the damage to the machine, but also be economical.

The operation with the deadweight of the machine is prohibited

- Do not use the drop force of the machine as an additional excavation force. This will lead to serious damage to the machine.

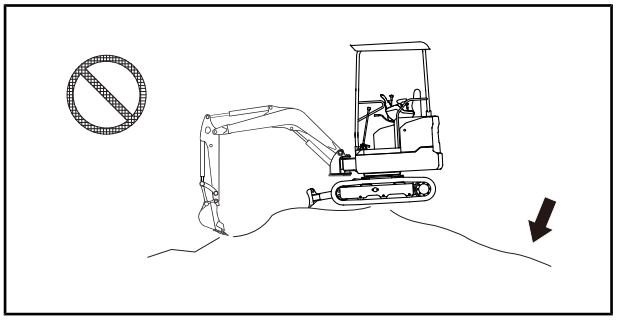


Fig 5-39

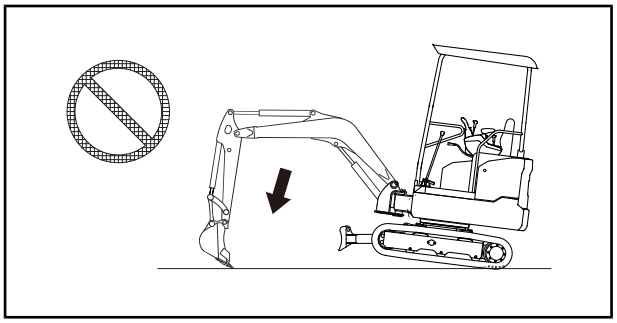


Fig 5-40

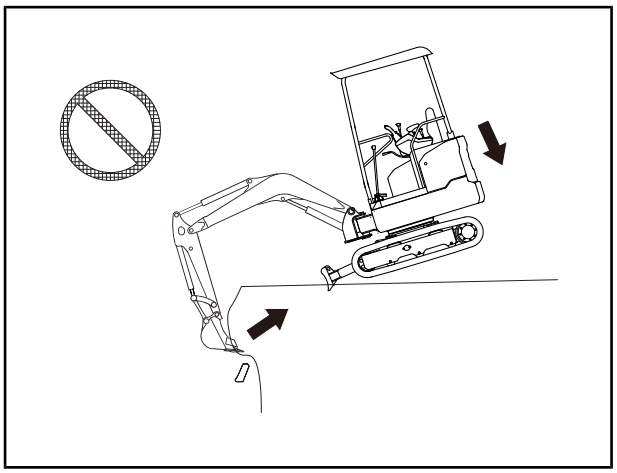


Fig 5-41

It is prohibited to suddenly switch the traveling joystick or pedal during traveling at high speed

- Prohibited operation [1]: Do not operate the traveling joystick or pedal suddenly to make the machine move quickly.
- Prohibited operation [2]: Do not suddenly switch the traveling joystick or pedal to the reverse [B] from forward [A] (or from reverse [B] to forward [A]).
- Prohibited operation [3]: Do not to suddenly release the traveling joystick or pedal during traveling at high speed to stop the machine.

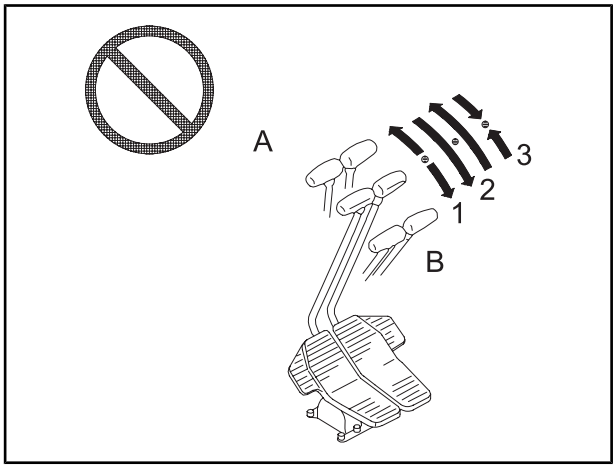


Fig 5-42

1. Prohibited operation 1	A. Forward
2. Prohibited operation 2	B. Backward
3. Prohibited operation 3	

It is prohibited to hit the dozer blade

- Be careful not to hit stone or road shoulder with a dozer blade, which will prematurely damage the dozer blade or hydraulic cylinder.

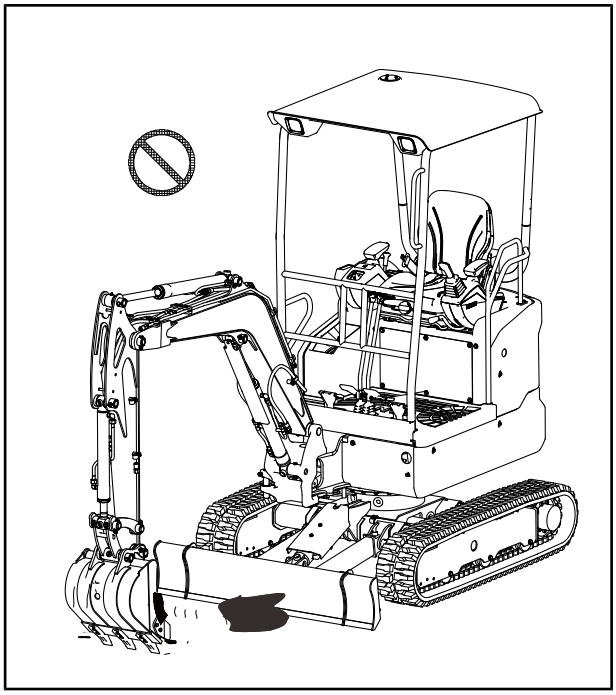


Fig 5-43

It is prohibited to support the dozer blade on one side

- When using a dozer blade as the outrigger, do not support the machine with only one end of the dozer blade.

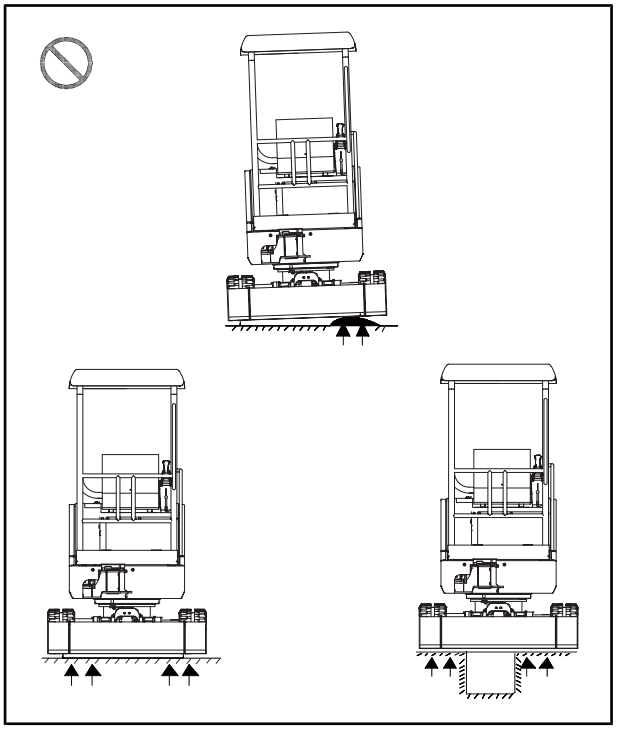


Fig 5-44

It is prohibited to work on a slope exceeding the specified angle

- Do not drive or work on a slope exceeding the specified angle of 25°, which will cause damage to the motor.

5.1.7 General Operation Instructions

5.1.7.1 Traveling

NOTE :

- Use a signalman when driving, swinging or operating the machine in a narrow area. Properly coordinate the signal before starting the machine.

Fig 5-45

- Before moving the machine, make sure whether the direction in which you are going to drive is consistent with the traveling control pedal/lever. When the traveling motor is in the rear, depress the traveling pedal or push the traveling rod forward, then the machine will travel forward.
- Select a flat ground as much as possible. Drive the machine in a straight line as much as possible, and change the direction slightly and gradually.

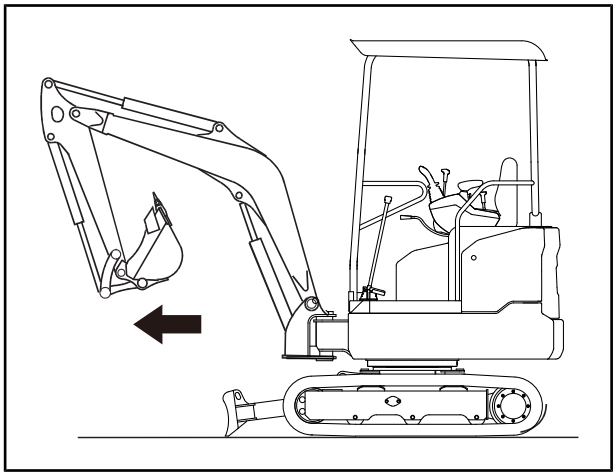


Fig 5-46

- Do not let the machine come into contact with the edges of wires and bridges.
- When crossing the river, measure the depth of the river with the bucket and cross the river slowly. Do not cross the river when the water level of the river exceeds the center of the carrier roller.
- When driving in uneven areas, reduce the speed of the motor. Select the low traveling speed. A slow speed will reduce the possibility of damaging the machine.
- Avoid operations that may damage the track shoe and its undercarriage parts.

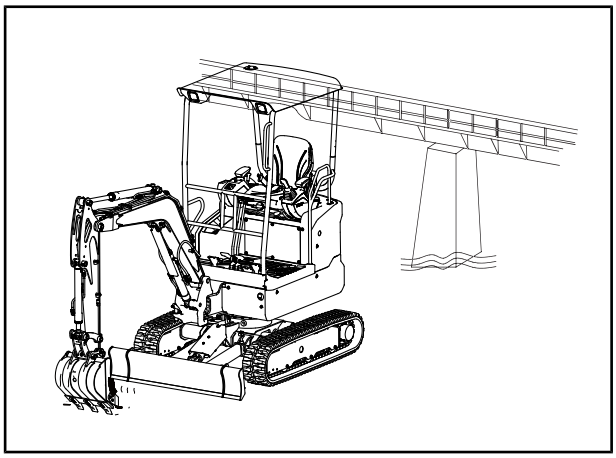


Fig 5-47

- If the machine is equipped with a rubber track shoe, it is prohibited to drive or swing the machine on a road covered with gravel, rough road, or a road covered with broken rebars and iron sheets, so as to avoid scratching or damaging the track shoe.

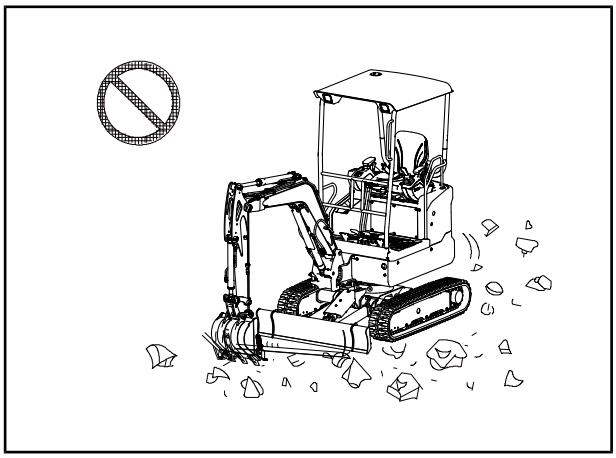


Fig 5-48

- If the machine is equipped with a rubber track shoe, it is prohibited to drive the machine on the riverbed or on the ground covered with soft stones, so as to avoid damage to the track shoe due to trackslip or stone sticking.
- It is prohibited to use the machine at the seaside. The salt in the sea water can corrode the track shoe.

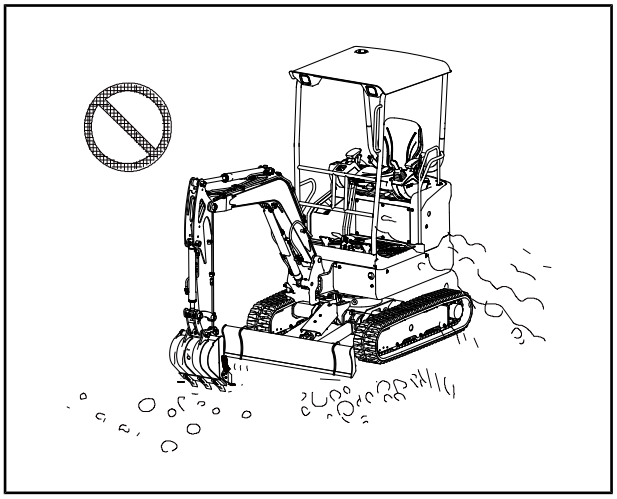


Fig 5-49

- Do not let the track shoe come into contact with fuel, oil, salt and chemical solvents. These substances will corrode the metal core and rubber surface of the track shoe, causing the track shoe to rust and peel off. As soon as these substances come into contact with the track shoe, they shall be washed off with water immediately.

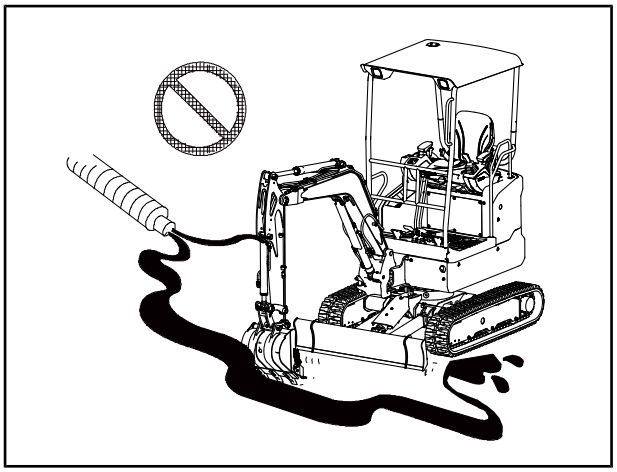


Fig 5-50

- It is prohibited to drive the machine on a road that has just been paved with asphalt, on a road with open fire, or on a steel plate that is hot due to exposure to the sun, so as to avoid abnormal wear or damage of the track shoe.
- It is prohibited to carry out the earthworks in the places where the rubber track shoe is easy to slip. This will accelerate the wear of the track shoe.

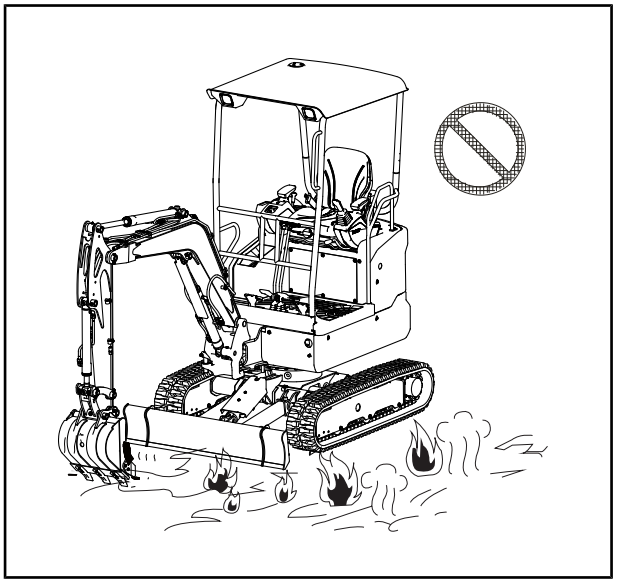


Fig 5-51

NOTE：

- Move the machine at a low speed on uneven subgrade, such as stone subgrade or uneven road with big stones. When moving at high speed, the guide wheel should be set in the forward direction.

5.1.7.2 Allowed water depth

NOTICE

Risk of machine damage!
When driving the machine to water, if the break Angle is more than 15 degrees, it may cause water into the electric excavator parts, causing damage to the machine.

- When the machine is driven out from the water, if the slope angle is larger than 15°, the rear part of the upper slewing platform will fall into the water, the motor fan will touch the water, and the fan will be damaged.

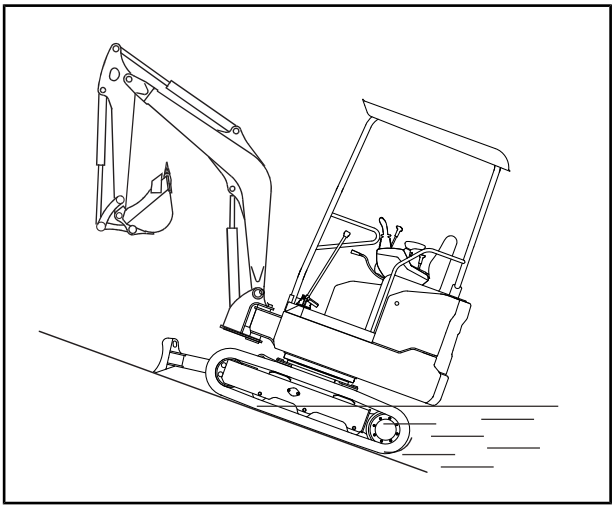


Fig 5-52

- Do not drive the machine into the water deeper than the center of the sprocket [1].
- Apply lubricating grease to the parts that have been immersed in water for a long time until the old lubricating grease is completely extruded from the bearing (especially around the bucket pin).
- The machine can be operated in water only when the work foundation of the machine has sufficient strength to avoid water depth higher than center of the sprocket in case of sinking of the machine.
- When operating in such environment, always check the location of the machine. The location of the machine can be changed if needed.
- Avoid immersion of the swing bearing, swing gear and hydraulic swivel.
- If the slewing support, the slewing gear and the center swivel joint are immersed in water, remove the drain plug to remove the

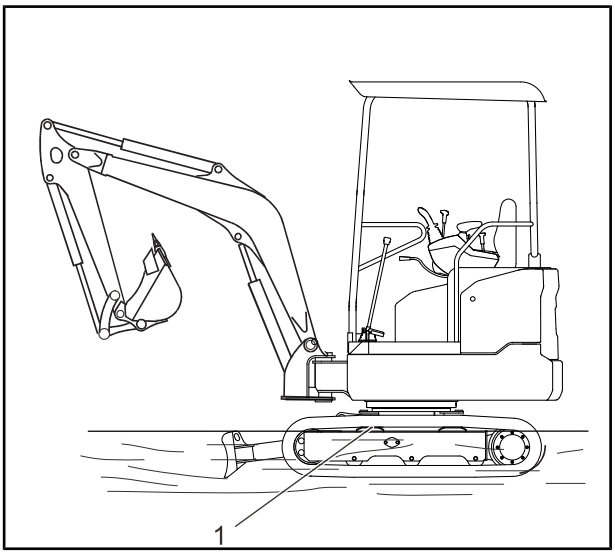


Fig 5-53

1. Carrier roller

muddy water, sweep the slewing area and install the plug. Lubricate the internal slewing mesh gear and slewing bearing.

5.1.8 Operation on the slope

5.1.8.1 Overview

⚠ WARNING

There is a risk of serious injury or death!
Operating the machine incorrectly may cause serious injury or death.

- Operate or travel the machine in the following correct way. Then, you can stop the machine safely at any time even if it slips or becomes unstable.

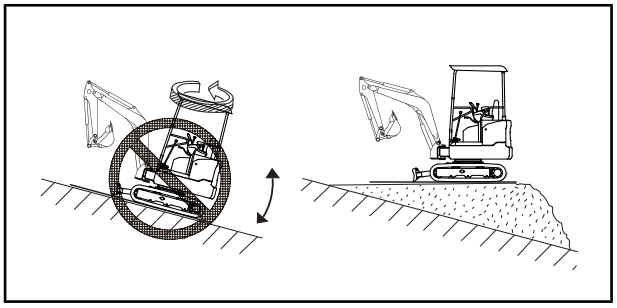


Fig 5-54

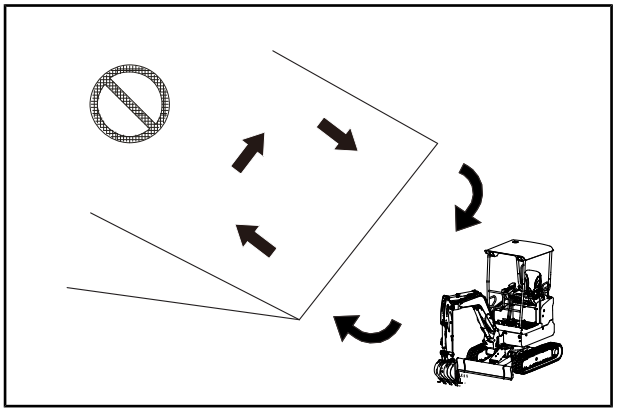


Fig 5-55

- On a slope, the machine may lose balance and tip over when turning a corner or operating a working device. Therefore, such operation should be avoided.
- When the bucket is loaded, it is very dangerous to turn downhill. If this kind of operation is needed, a platform should be piled up on the slope to keep the machine level during operation.
- Do not travel the machine on a slope or walk backwards downhill. Otherwise the machine may tip over.
- Do not turn a corner on the slope or cross the slope. Be sure to do it in a flat place. The distance may be longer but the safety is ensured.
- When walking uphill, if the track chain slips or cannot go uphill only by driving force, do not use the bucket rod to pull the machine uphill.
- When driving the machine uphill, if the track shoe slips or only the force of the track is available, the machine can't be driven uphill. Do not use the pull of the arm to help drive the machine uphill.

- The insufficient lubrication of the motor will be caused when the slope angle exceeds 25°.

1. When driving down a steep slope, use the travel joystick and fuel control knob to keep the travel speed low. When driving down a steep slope over 15°, adjust the working device to the posture shown in the figure on the right to make it 20-30 cm (8-12 in) from the ground [2], make the angle [1] between the boom and the bucket rod within the range of 90°-110°, and reduce the motor speed.

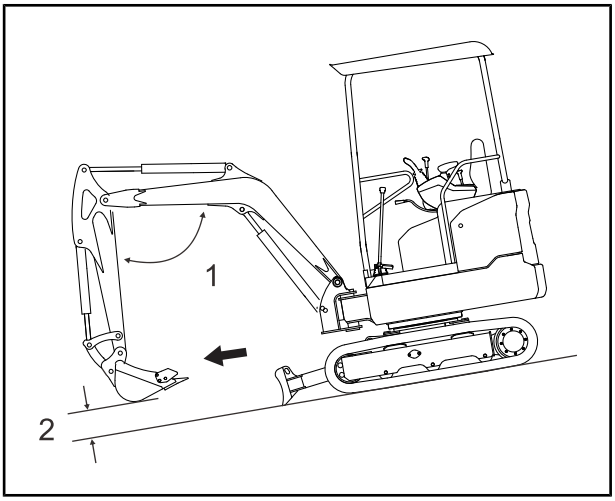


Fig 5-56

1. Angle range 2. Ground clearance

NOTE :

- When going downhill, the sprocket side is below. Otherwise, the belt track will loose, resulting in tooth jumping.

2. When driving on a steep slope, extend the working device to the front to ensure balance. Keep the working device 20-30 cm (8-12 in) from the ground [2], and move the machine at a low speed.

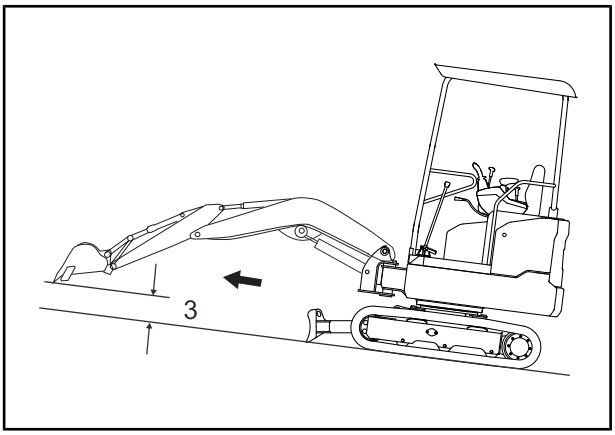


Fig 5-57

3. Ground clearance

NOTE :

- When walking downhill, to brake the machine, put the travel joystick in the neutral position, which will automatically apply the brake.
- When walking uphill, if the track chain slips or the machine cannot go uphill by driving force, use the bucket rod to pull the machine uphill.

5.1.8.2 Precautions for operation on the slope

The machine may tip over in uneven areas or slopes. To prevent rollover accidents, when operating on uneven areas or slopes:

- Reduce the motor speed.
- Select the low speed traveling mode.
- Operate the machine slowly and pay attention to the movement of the machine.

- Never try to use a bucket to carry materials or hang objects while driving the machine on a slope.
- The insufficient lubrication of the motor will be caused when the slope angle exceeds 25°.

Never try to go up and down a slope greater than 30°, and never try to cross a slope greater than 15°.

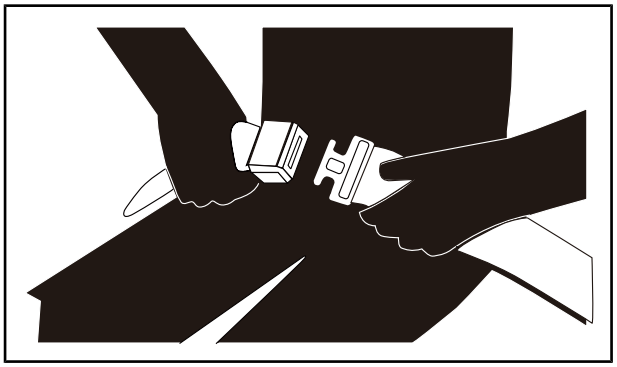


Fig 5-58

Buckle up the seat belt.

Do not try to turn on the slope. The machine may slip or tip over. Only turn on a very gentle and firm slope.

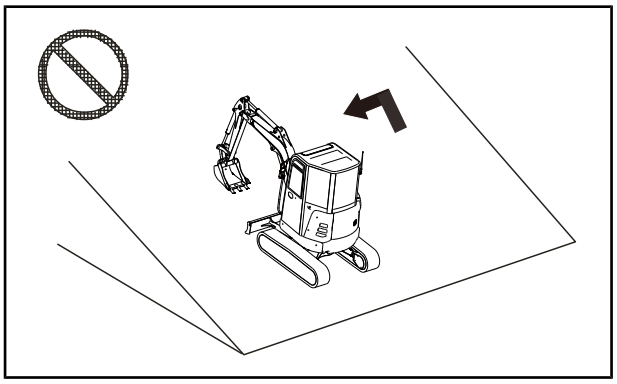


Fig 5-59

Try to avoid crossing the slope; otherwise, the machine may slip or tip over.

Avoid turning on the slope and never try to turn the superstructure downhill. The machine may tip over. If you must turn downhill, carefully operate the superstructure and the boom at a low speed.

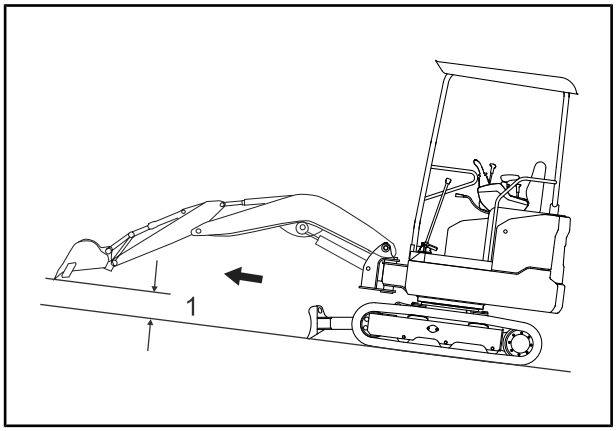


Fig 5-60

1. Ground clearance

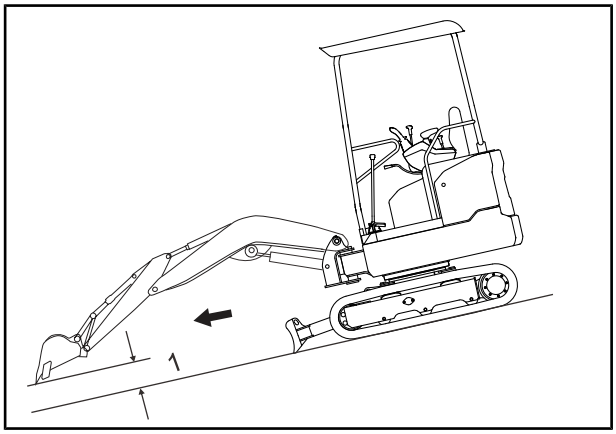


Fig 5-61

1. Ground clearance

If the motor stops on the slope, immediately lower the bucket to the ground and return all control levers to the neutral position before restarting the motor.

Always warm up the machine sufficiently before going up a steep slope. If the hydraulic oil is not preheated sufficiently, the performance of the machine may not be fully developed.

Avoid crossing slopes. When the machine travels on a slope, the track shall face the uphill direction. When the machine is going uphill and downhill, keep the bucket facing the travel direction and about 200 to 300mm [1] off the ground, as shown in A. If the machine begins to slip or becomes instable, immediately lower the bucket.

5.1.8.3 Motor flameout on the slope

- If the motor is stopped during the uphill traveling, turn the traveling joystick to the neutral position, lower down the bucket to the ground, stop the machine, and then restart the motor.
- If the motor is stopped when the machine is on the slope, do not use control lever of the left work equipment for swing. The superstructure will rotate with its own weight.

5.1.9 Operation on soft ground

NOTICE

Risk of machine damage!
The use of wide belt track shoes on rough ground could cause the belt track to bend or relax, and damage other belt tracks.

- Do not use wide belt track shoes on rough ground of rocks, sand piles or gravel. Wide belt track shoes are designed for soft ground.
- Regularly check the tightness of belt track shoe bolts.

1. Do not operate on very soft ground with insufficient strength to support the machine.

2. When operating the machine on soft ground, select the appropriate belt track shoes. Soft ground may collapse, causing the machine to tip over. When working on soft ground, be sure to reinforce the ground with large steel plates to support the machine.

3. If the machine works on a very soft ground or gets stuck, clean the belt track frame.

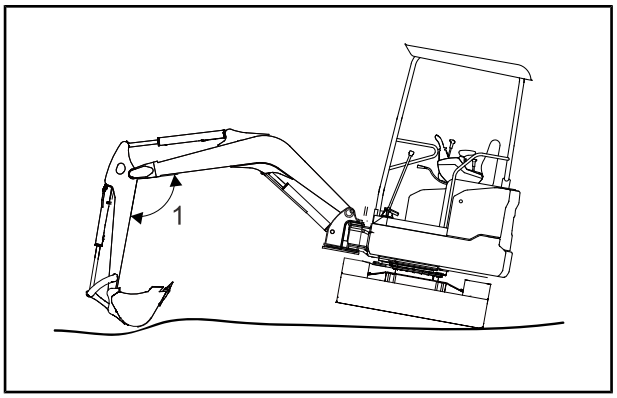


Fig 5-62

1. Angle range

NOTE：

- Lift the belt track of one side from the ground by slewing the upper carriage and lowering the bucket. Keep the angle [1] between the boom and the bucket rod within the range of 90°-110° [1] and place the circular arc of the bucket on the ground.
- Swing the lifted track back and forth to remove the dirt on it. After placing the track on the ground, reduce the traveling speed and carefully move the machine to a solid ground.
- Drag the machine onto the sturdy ground by using the boom and arm.
- If the machine is trapped but the motor still works, the machine can be dragged out. Be sure to install the towrope correctly.

5.1.10 Lifting up the track of one side by using the boom and arm

1. Keep the angle [1] between the boom and the bucket rod within the range of 90°-110° and place the circular arc of the bucket on the ground.

2. Lift the belt track of one side from the ground by slewing the upper carriage by 90° and lowering the bucket. When using the reverse bucket, do not dig the bucket teeth into the ground.

3. Place blocks under the track frame to support the machine.

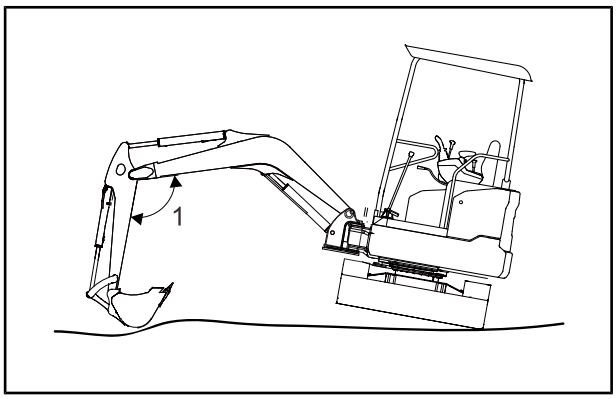


Fig 5-63

1. Angle range

5.1.11 Driving the machine out of the mud

5.1.11.1 Overview

Be careful to avoid getting stuck in the mud. If the machine is stuck in the mud, drive it out as follows.

5.1.11.2 Track on one side gets stuck in the mud

When using the boom or bucket rod to jack up the machine, be sure that the bottom of the bucket is in contact with the ground. Keep the angle [1] between the boom and the bucket rod within the range of 90°-110°.

The same applies when using a bucket mounted in reverse.

When only one belt track sinks in the mud, use the bucket to lift the belt track. Then, lay down a board or log and drive the machine out.

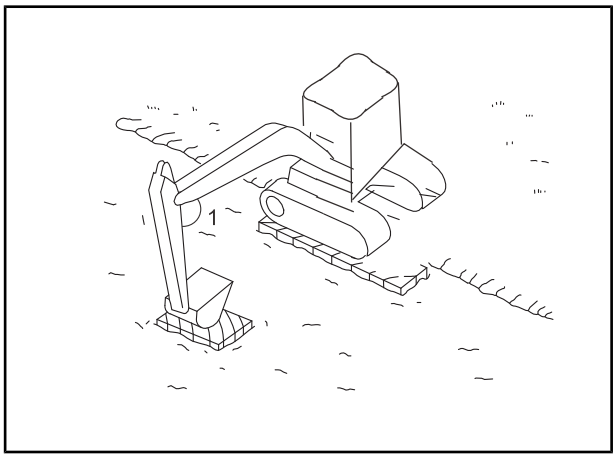


Fig 5-64

1. Angle range

5.1.11.3 Tracks on both sides get stuck in the mud

When the belt tracks on both sides are stuck in the mud and the machine cannot move due to skidding, lay wooden boards according to the above method, and dig the bucket into the ground ahead. Then, according to the normal excavation operation, retract the bucket rod and put the travel joystick in the "forward" position to drive the machine out.

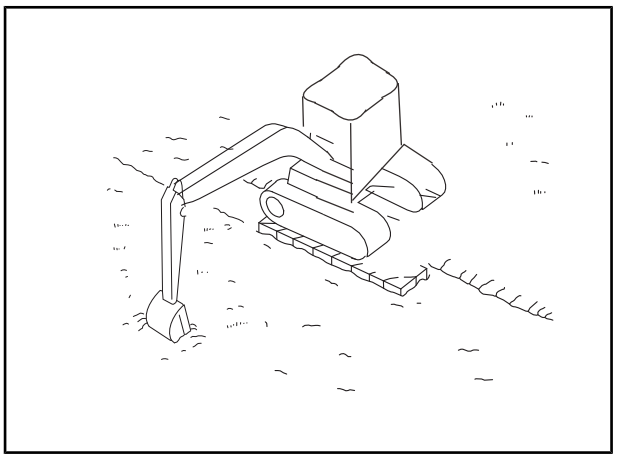


Fig 5-65

5.1.12 Recommended Operations

5.1.12.1 Note

In addition to the following uses, the machine can be used for additional purposes when equipped with various accessories.

NOTE：

- Do not stop the machine suddenly when lowering the boom. Otherwise, the machine may be damaged due to the impact load generated.
- When operating the bucket rod, do not extend the hydraulic cylinder to the maximum length; otherwise, the hydraulic cylinder may be damaged.
- When digging at an angle, avoid the bucket teeth hitting the belt track.
- When digging a deep ditch, prevent the boom or bucket hydraulic cylinder hose from colliding with the ground.

5.1.12.2 Trenching Operation

1. By installing a bucket that matches the excavating operation and adjusting the belt track to be parallel to the line of the trench to be excavated, the trenching operation can be performed effectively.

2. When excavating a wide trench, excavate the earthwork on both sides first, and then remove the central part.

3. When excavating in the longitudinal direction, place the travel motor at the rear to maximize the stability and lifting capacity of the machine.

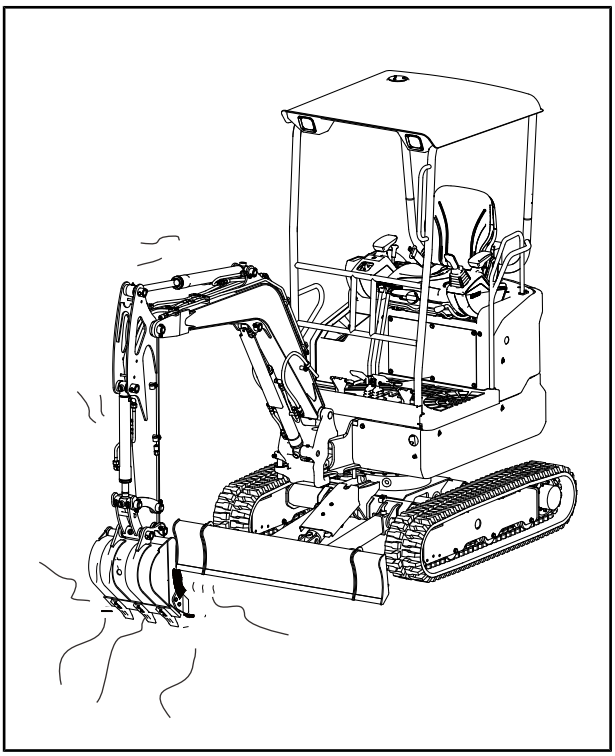


Fig 5-66

4. When excavating, adjust the belt track to be at right angles to the shoulder or cliff and the drive wheels are behind the cab, so that the machine can be easily evacuated in case of abnormal conditions.

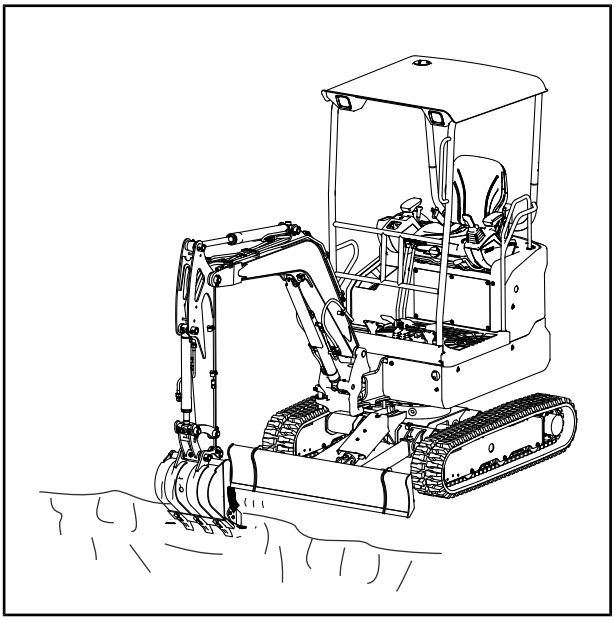


Fig 5-67

5. By using the deflection function of the boom, the side trench can be excavated.

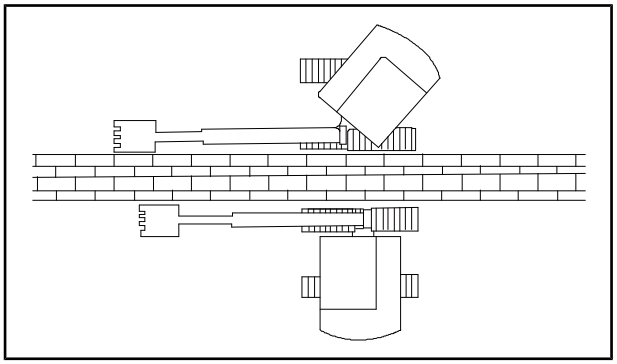


Fig 5-68

5.1.12.3 Loading Operation

1. In a place with a small slewing angle, parking the dump truck at a place highly visible to the driver can improve the work efficiency.

2. It is more convenient to load from the rear of the dump truck body than from the side, and the loading capacity is larger.

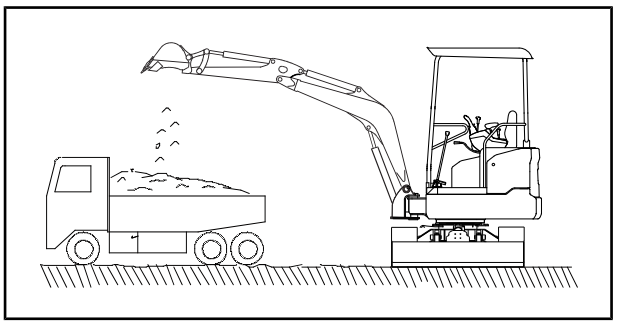


Fig 5-69

5.1.12.4 Leveling Operation

1. When finishing work is needed, select the low gear. As shown in the figure, turn the bucket and place it at the slightly front position of the bucket rod.

2. Retract the boom while slowly lifting it. Once the bucket rod moves beyond the vertical position, slowly lower the boom to keep the bucket moving horizontally.

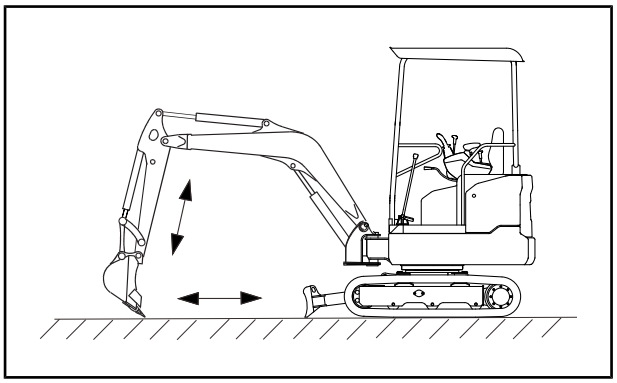


Fig 5-70

NOTE :

- Do not use bucket to pull or push mud when walking.

5.1.13 Precautions for Operation

1. When operating the machine, be sure to wear safety articles such as tights and safety helmets suitable for work.

2. Ask all personnel leave the range of operation and machine movement, and remove all obstacles. Always pay attention to the surrounding during operation. When working in a narrow area surrounded by obstacles, do not let the upper carriage hit the obstacles.

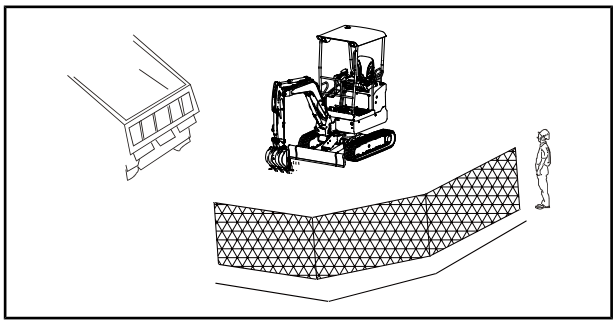


Fig 5-71

3. When loading the front of the truck, lift the bucket from the rear side of the truck above the front of the truck. Do not pass the bucket over the cab of the truck or over anyone's head.

4. Ensure that the job site has enough strength to firmly support the machine. When working in a ditch or shoulder, operate the machine with the belt track perpendicular to the wall and the traveling motor behind, so that the machine can be easily evacuated even if the wall collapses.

5. If you need to work under cliff or high bank, ensure there is no danger of cliff or bank collapse.

6. When digging, do not let the bucket hit the belt track.

7. Never try to move stones and break walls by slewing.

8. Adjust the length and depth of each excavation so that the bucket is fully loaded during each excavation.

9. The earth volume is greater in the full-load mode than in the half-load mode.

10. To increase the production capacity, give priority to full load and then speed.

11. Once the trench has been dug, you can dig out rocks of one layer or two layers by embedding the bucket under the soil layer. Dig out the top soil first.

12. Do not let the bucket bear the side load. For example, do not slew the bucket to level the material or hit the object from the side with the bucket.

5.1.14 Replacement and Adjust of the Bucket

⚠ WARNING

There is a risk of serious injury!
Serious personal injury may occur if the bucket is replaced improperly.

- When striking the pin with a hammer, metal fragments can fly up and cause serious injury. When doing this, always wear protective goggles, a safety helmet, protective gloves and other protective devices.
- When striking the pin with strong force, the pin will fly out and injure the surrounding people. Ensure that the surrounding area is clear before starting the operation.
- When removing the pin, do not stand under the bucket; and when working on one side, take special care not to put your feet under the bucket.
- When removing or installing pins, be careful not to jam your fingers.
- When aligning the holes, do not put your finger in the pin hole.

1. Park the machine on solid and level ground. When conducting connection work, designate a signalman and follow his or her directions and commands to ensure safety.

2. Park the machine on a flat ground, lower the bucket to the ground, and position its plane on the ground. Ensure that the bucket does not roll after the pin is removed.

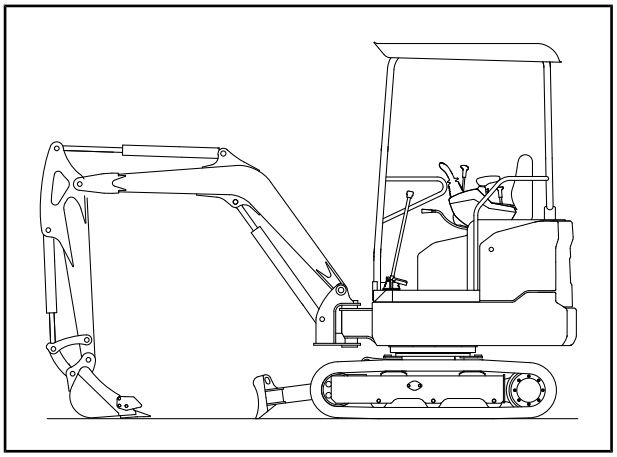


Fig 5-72

3. Slide out the O-ring [1] as shown in the figure.

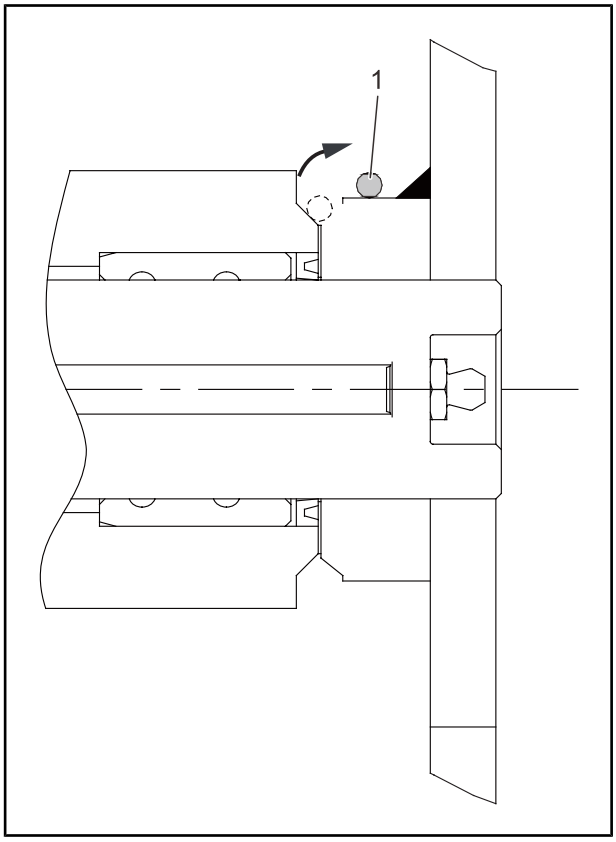


Fig 5-73

1. O-ring

4. Remove the fixing bolt and stop pin, remove the bucket pins [A] and [B], and separate the bucket rod from the bucket. Clean the pins and pin holes, and apply enough lubricant to them.

5. Align the bucket rod with the new bucket. Ensure that the bucket does not roll.

6. Install bucket pins [A] and [B].

7. Install fixing bolts or stop pins to bucket pins [A] and [B].

8. Lubricate the bucket pins [A] and [B].

9. Start the motor, and allow it to run at a low speed. Operate the bucket and rotate the bucket slowly in both directions, to check any interference with bucket movement. Do not use the machine with any interference.

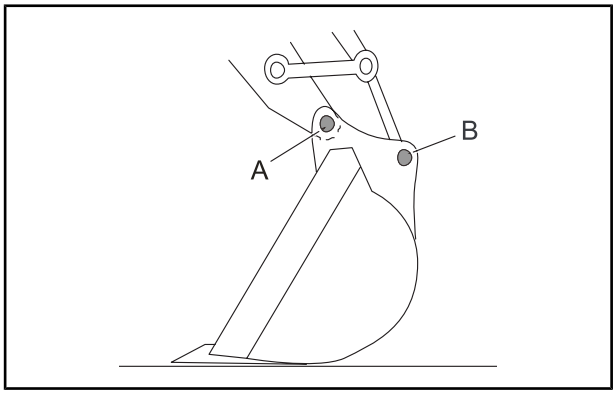


Fig 5-74

A. Bucket and arm pins

B. Bucket and link pins

NOTE：

- Eliminate interference if any.

5.1.15 Adjust the Width of the Dozer Blade

You can widen the dozer blade when needed.

1. Lift the pin [1] and align and place the widened arc plate [2].

2. Insert the pin [1] to fix the widened arc plate [2].

NOTE：

- The specific configuration depends on the model.

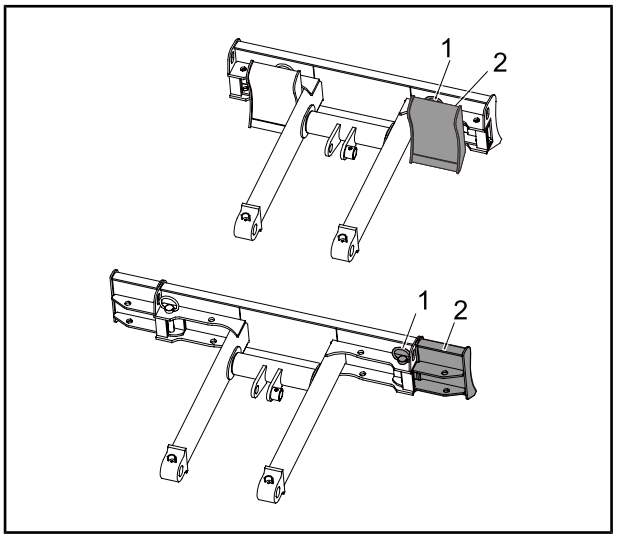


Fig 5-75

1. Pin 2. Widened arc plate

5.1.16 Park the Machine

Park in normal areas

1. Drive the machine to a place with no falling stones or floods and park it on a firm and level ground.

2. Lower down the bucket to the ground.

3. Push the throttle control lever to the foremost (low speed no-load position). Let the motor run about 5 min to gradually cool it down.

4. Turn the safety lock control lever to the “LOCK” position.

5. Turn the key switch to OFF and take off it from the ignition switch.

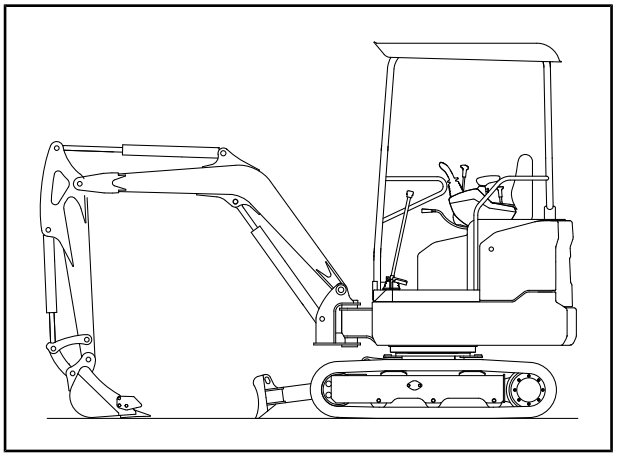


Fig 5-76

Park the machine on a slope

If it is inevitable to park the machine on a slope:

1. Insert the bucket teeth into the ground.

2. Return each lever to the neutral position and pull the pilot control switch to the LOCK position.

3. Hold the tracks on both sides with stoppers.

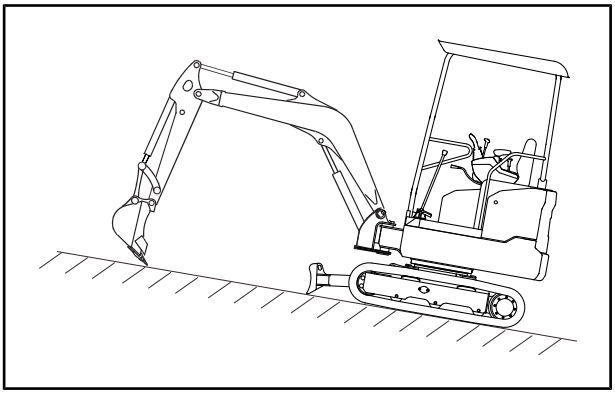


Fig 5-77

NOTE：

- Do not park the machine on slopes whenever possible, in order to prevent the machine from rollover and causing casualties!.

5.1.17 Machine inspection after daily work

- Check the machine and the work equipment, outside and lower body for leakage of oil or coolant. If any problem is discovered, repair it.
- Check the motor compartment for scraps of paper or other debris. Remove paper or other impurities to avoid fire hazard.
- Remove dirt from the lower body.
- If the ambient temperature is lower than -35℃, be sure to drain coolant in the radiator and motor (the freezing point of antifreeze used for SANY Heavy Machinery is -35℃). After drainage of cooling water, be sure to clearly affix a mark reading “No water in radiator”.

5.1.18 Lock

Be sure to lock

- [1] Right door of the machine.
- [2] Rear hood door of the machine.

NOTE :

- Lock and unlock these positions with the ignition switch key

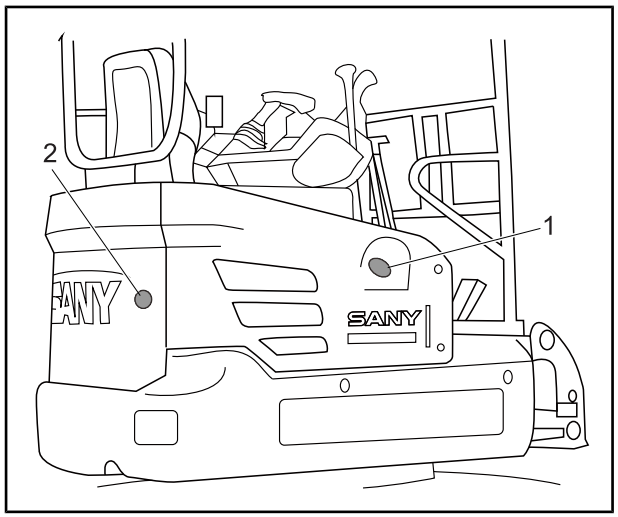


Fig 5-78

1. Right door lock 2. Rear door lock

5.1.19 Operation in Cold Weather

5.1.19.1 Description of Operation in Cold Weather

Inspection in cold weather

Inspection for machine in cold areas where construction is stopped:

- Keep the whole machine clean.
- Motor: Check the antifreeze level. Since the ratio of antifreeze at the delivery from factory is 50%, the antifreeze can adapt to the minimum temperature of -30℃ (according to the local temperature and the attached table). Replace the antifreeze with oils of grades suitable for the local temperature.
- Hydraulic system Check whether there is leakage at each motor, cylinder, main pump, pipeline and joint, and check whether any cylinder rod is scratched or corroded. Grease the exposed part of the cylinder rod for protection.
- Electrical system: Remove the battery and place it indoors after it is fully charged.
- Carry out the antirust operation once a month.

Routine inspection:

- Remove the oxide on the battery terminals with boiled water, wipe it clean and apply a coat of grease to protect the terminals. For wet cell batteries, check the specific gravity of the electrolyte, and add distilled water or electrolyte as appropriate.

Inspection before starting:

- Check the oil and liquid levels of the equipment before starting the machine each time.
- For the high-voltage battery, the allowable discharge temperature is -20℃-55℃ and the charging temperature is 0℃-55℃. When the ambient temperature is lower than -20℃, start the machine and wait until the cell temperature reaches -20℃ (Note: in case of SOC<20%, the driving heating function is turned off, and the battery needs to be charged before working).
- Start the machine. After the motor runs at idle speed for 5-10 min, operate the cylinder with no load for various movements to increase the hydraulic oil temperature to 40℃, and then carry out the construction.
- In freezing weather, when there is dirt on the frame, before operating the machine to travel, turn the superstructure to the 90° position first, jack up the tracks and rotate them forward and backward a few turns to remove the dirt impurities around the carrier roller plate and the track roller idler. (For machine working in mud site, it is recommended that the operator shall clear the soil near the carrier roller plate and the track roller idler with an iron shovel after work every day to prevent freezing in the next day).

Coolant of cooling system

⚠ WARNING

Risk of serious injury or death!
Antifreeze is toxic and flammable. Improper handling of antifreeze could cause serious injury.

- The antifreeze is poisonous. Be careful not to get it on your eyes or skin. If your eyes or skin are stained with it, rinse with plenty of water and see the doctor immediately.
- When replacing coolant or processing coolant containing antifreeze during radiator repair, please contact the authorized agent of SANY Heavy Machinery or professional company for processing. The antifreeze is toxic, and do not drain it into the sewer or spill it on the ground.
- The antifreeze is flammable. Do not get close to open fire. Do not smoke when dealing with antifreeze.
- Do not use methanol, ethanol or propanol-based antifreeze.
- Never use any leakproof agent, either alone or in combination with the antifreeze.
- Do not mix the antifreezes of different brands.

NOTE：

- In regions where permanent antifreeze is not available, only glycol antifreeze not containing preservatives can be used during cold seasons. In this case, the cooling system shall be cleaned twice a year (respectively in spring and autumn). When filling the cooling system, add the antifreeze in autumn, not in spring.
- Please use SANY pure antifreeze as coolant. In principle, we do not recommend using any other coolant other than the pure full-effect antifreeze of SANY Heavy Machinery.

For details on the mixing ratio of the antifreeze during coolant replacement, see“Recommended coolant and lubricating oil” on page 7-11.

Battery

When the ambient temperature drops, the battery capacity will also be reduced. Keep the battery capacity as close to 100% as possible. Do not keep the storage at a low temperature for a long time to avoid difficult start of the machine.

Because the battery capacity will drop at low temperature, it is necessary to cover the battery, or remove it from the machine, store it in a warmer site, and then reinstall the battery when using the machine.

NOTE：

- The battery generates flammable gas. Do not let fire or sparks get close to the battery. Battery electrolyte is dangerous. If the electrolyte splashes into eyes or on skin, flush it with plenty of water and see a doctor immediately.
- The battery electrolyte can dissolve paint. If the electrolyte spills on the machine body, rinse it immediately with water.
- If the battery electrolyte freezes, do not use a different power source to charge the battery or start the motor, which may cause the battery to explode.
- Since the battery capacity will drop dramatically at low temperature, it is required to wrap the battery, or remove it from the machine and store it in a warm place, and then reinstall the battery to the machine the next morning.

5.1.19.2 After Daily Work

⚠ WARNING

Risk of serious injury or death!
Idling the belt track is dangerous and could cause serious injury.

- It is dangerous when the track is running idly, and the personnel shall keep a certain distance from the track.

In order to prevent movement failure of the machine on the next day due to frozen mud and water on the lower body, the following precautions shall be observed:

- Remove all mud and water from the body. In particular, the hydraulic cylinder piston rod shall be cleaned to prevent mud, dirt or water on the piston rod from entering the seal and damaging it.
- The machine shall parked on a hard, dry ground. If possible, park the machine on the board and prevent the track from freezing on the ground to ensure that the machine can be moved on the next day.
- After operation in the water or in the mud, remove the water on the lower body according to the following instructions to extend the service life of the lower body.

1. When the motor runs at idle speed, rotate the superstructure by 90° to locate the work equipment in the side of the track.

2. As shown in the Figure, lift the machine and lift the track slightly off the ground and idly run the track. Repeat this operation on both left and right tracks.

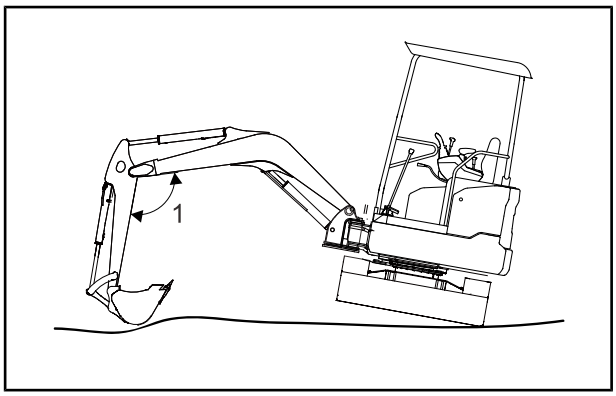


Fig 5-79

1. Angle range

5.1.19.3 After the Cold Season

When the seasons change and it becomes warmer, operate according to the following content:

- Replace the lubricant with the oil of a specified viscosity.
- If the permanent antifreeze cannot be used for some reason, it can be replaced with ethylene glycol-based antifreeze (for one season, i.e., winter), or if there is no antifreeze, completely drain the cooling system, then thoroughly clean the inside of the cooling system and add fresh soft water.

For details, see“Recommended coolant and lubricating oil” on page 7-11.

5.1.20 Charging requirements

5.1.20.1 Selection of charging voltage platform

1. Selection if charging voltage platform:

- SY19E can be charged through 230VAC mains supply.
- SY19E can be charged through 400VAC industrial power.
- SY19E can be charged through a DC charging pile.

5.1.20.2 Charging operation

1. Charging operation：

- The European standard charging port as shown in the figure 5-80 is an AC/DC integrated charging socket. The upper part is for AC charging, which can support 400VAC and 230VAC charging, and the lower part is for DC charging, which can support DC charging through a charging pile.
- DC charging is fast charging, while AC charging is slow charging.

Fig 5-80

5.1.20.3 Precautions

NOTICE

Failure to operate according to specifications will damage the battery.

Charging precautions

- The machine is high voltage off before charging to ensure that the motor is not in the running state.
- Ensure that the low voltage battery switch is in the ON position.
- The electronic lock gives a locking sound after the charging gun is plugged into the charging port.
- The charging connector icon is shown on the display.
- If the display shows a fault code, the charging is not successful.
- Check that there is no ponding water in the charging gun and the charging port before charging.
- For charging failure, manually toggle the electronic lock switch to unlock it, and then unplug the charging gun.

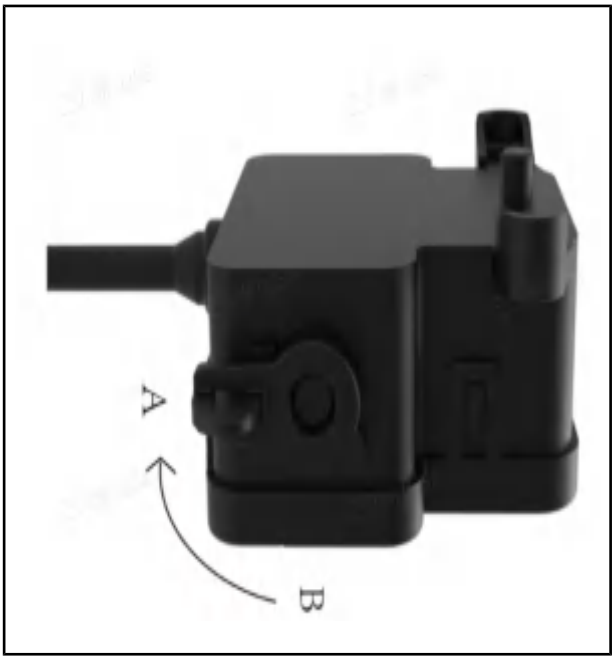


Fig 5-81

A. Unlock

B. Lock

NOTICE

Failure to operate according to specifications will damage the battery.

Charging gun plugging/unplugging requirements

- Check whether there are any water stains or foreign bodies in the charging gun and the charging base before and after charging. If so, please clean them with insulating gloves and keep the charging port dry and clean at all times.
- When plugging the charging gun, ensure that the charging gun is locked properly.
- For AC charging, if it is not fully charged and you want to stop charging, press and hold the Unlock button on the display screen, during which the electronic lock on the charging gun will be opened with a snap, indicating that charging is over.
- Unplug the charging gun 10s after ensuring that the charging is stopped and the electronic lock is opened. Forcibly unplugging the charging gun, unplugging the charging gun while shaking it and other acts of damaging the charging gun are prohibited.
- After charging is completed or fails, start the machine 40s after unplugging the charging gun.
- The machine shall be fully charged once a week.

5.1.20.4 Charging with 230V mode2 charging cable

1. Connect the charging cable

- Connect the charging cable plug to the socket, align the plug with the socket and complete the assembly.
- Confirm that SY19E is shut down.

Fig 5-82

2. Confirm the switch status

- Confirm that the power switch is on.
- Confirm that the E-stop switch is on.

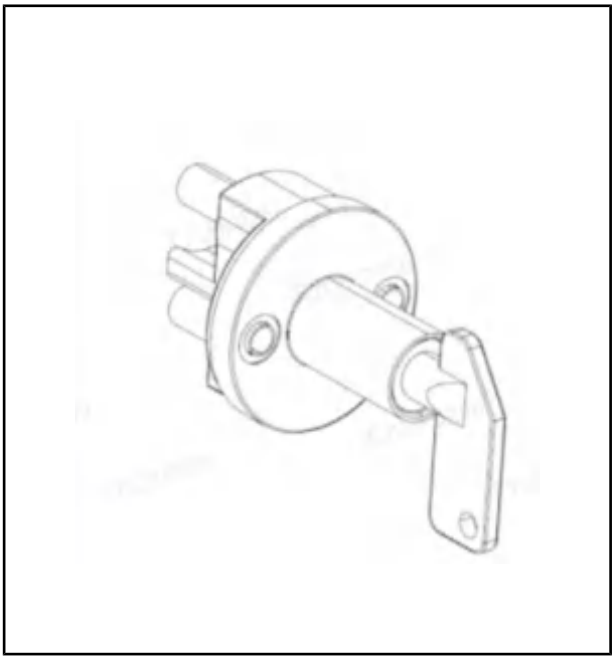


Fig 5-83

3. Turn on the charging gun

- Open the charging cover with the key.
- Pull out the rubber plug of the AC charging base.
- Power up the charging gun.

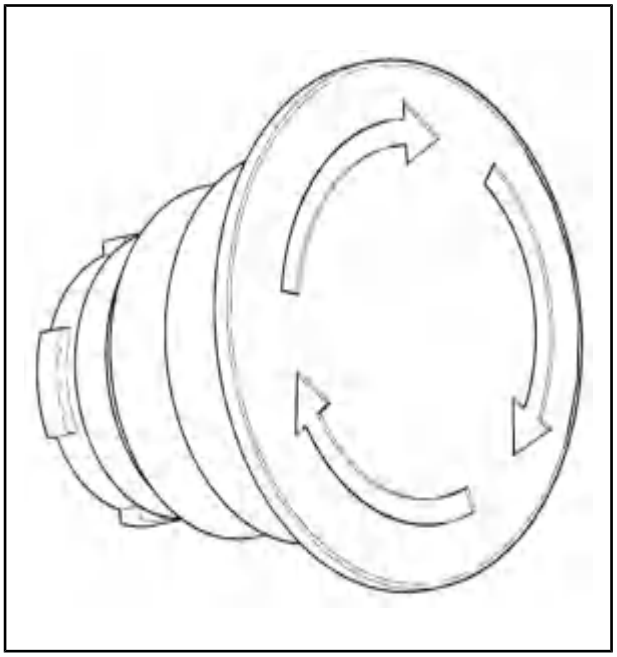


Fig 5-84

4. Insert the charging gun into the socket

- Insert the charging gun into the charging socket, and then select the working power of the charging gun.
- The display and control screen will be lit in 3 seconds.

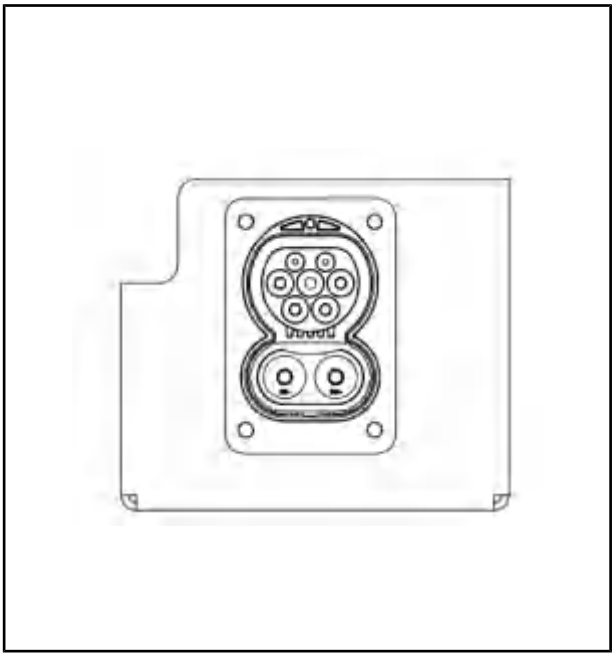


Fig 5-85

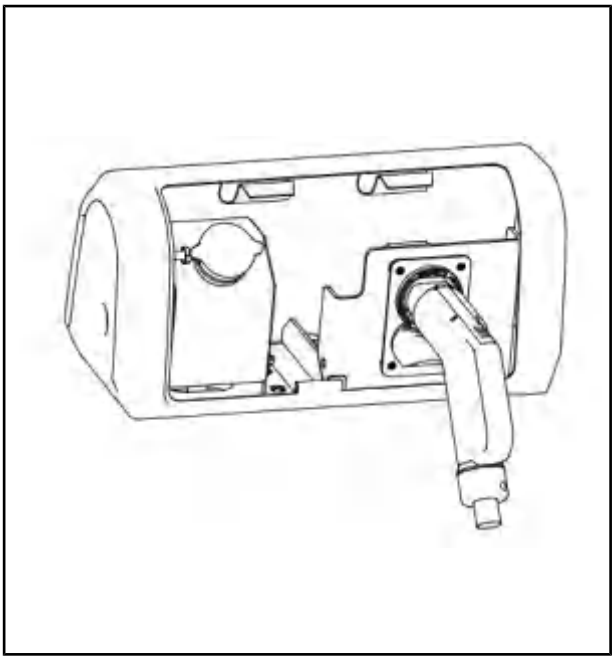


Fig 5-86

5. Enter the initial password to boot it up

- Enter a four-digit password (initial password: 1234) to enter the user interface.
- The charging icon is illuminated, and the battery icon jumps from 0 to full charge.

Fig 5-87

Fig 5-88

6. Unlock and lock

- During charging, press and hold the Unlock button of the electronic lock, and the unlocking animation will appear at this time. And then the electronic lock will give a “click” sound, indicating that unlocking is successful, and charging exits.
- After charging is completed, SY19E is turned off and the display and control screen is turned off.
- Turn off the AC charging socket, pull out the charging gun and close the rubber cover of the AC charging base.
- Close the charging cover lock.

Fig 5-89

5.1.20.5 Charging with 400V mode2 charging cable

1. Charging with 400V charging cable:

- Connect the three-phase charging cable plug to the socket, align the plug with the socket and complete the assembly.
- Confirm that SY19E is shut down.
- Confirm that the power switch is on.
- Confirm that the E-stop switch is on.
- Open the charging cover with the key.
- Pull out the rubber plug of the AC charging base.
- Power up the charging gun.
- Insert the charging gun into the charging socket, and then select the working power of the charging gun.
- The display and control screen will be lit in 3 seconds.
- Enter a four-digit password (initial password: 1234) to enter the user interface.
- The charging icon is illuminated, and the battery icon jumps from 0 to full charge.

Fig 5-90

- During charging, press and hold the Unlock button of the electronic lock, and the unlocking animation will appear at this time. And then the electronic lock will give a “click” sound, indicating that unlocking is successful, and charging exits.
- After charging is completed, SY19E is turned off and the display and control screen is turned off.
- Turn off the AC charging socket, pull out the charging gun and close the rubber cover of the AC charging base.
- Close the charging cover lock. For specific operation, please refer to “Charging with 230V mode2 charging cable” on page 5-54.

5.1.20.6 Charging with DC charging spots

Description:

- Confirm that SY19E is shut down.
- Confirm that the power switch is on.
- Confirm that the E-stop switch is on.
- Open the charging cover with the key.
- Pull out the rubber plug of the DC / AC charging base.
- Insert the DC charging gun.
- Select 12V DC on the charging pile to start charging (refer to the charging pile operation of new energy vehicles).
- The display and control screen will be lit in 3 seconds.
- Enter a four-digit password (initial password: 1234) to enter the user interface.
- Check the charging status, the voltage and current are displayed on the DC charging pile.
- After charging is completed, SY19E is turned off and the display and control screen is turned off.
- Confirm charging is completed. Pull out the charging gun and close the rubber cover of the DC/AC charging base.
- Close the charging cover lock. For specific operation, please refer to“Charging with 230V mode2 charging cable” on page 5-54.

5.1.21 Long-term storage (add power battery requirements)

5.1.21.1 Before Storage

When the machine is stored (for more than 1 month), it shall be changed to the position as shown in the right Figure to protect the cylinder piston rod and prevent it from rusting.

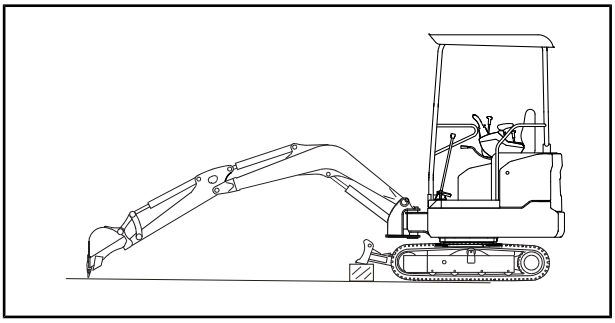


Fig 5-91

When the machine is stored for a long time (for more than 1 month), operate according to the following content:

- Clean and flush all the parts, and then store the machine indoors. If the machine has to be stored outdoors, choose a flat ground and cover the machine with canvas.
- Apply lubricating grease to the exposed part of the piston rod of the hydraulic cylinder.
- Disconnect the negative terminal of the battery and cover it, or remove the battery from the machine and store it separately.
- For machines equipped with accessories, the accessory control pedal shall be turned to a Lock position.

5.1.21.2 During Storage

⚠ WARNING

Risk of serious injury or death!
When the machine is indoors, if rust prevention is required, toxic gas could cause poisoning, injury or death.

- When the machine is indoors and it needs to anti-rust operation, open doors and windows to improve ventilation and prevent gas poisoning .
- If the machine has been parked for more than 6 months, please follow the “Super long prototype - maintenance”.

- During storage, the machine shall be operated once a month and shall be driven in a short distance, and the parts shall be coated with a new oil film. In addition, the battery shall be charged.
- Wipe off all lubricating grease on the piston rod of the hydraulic cylinder prior to the work equipment operation.

For the machine not used for a long time, the best SOC range for battery storage is 50%-70%, and every three months, the machine shall be subject to

- Battery maintenance for one cycle charge and discharge. The battery maintenance is as follows: Fully charge the machine to 100% SOC automatically, then adjust the SOC to 50-70%, keep the machine powered on (with the key at ON) for more than 12 hours, during which, there is no need to watch it over.
- If the machine is stored for a long time, but it is not subject to anti-rust operation every month, please contact our authorized dealer before reuse. When reusing the machine after long-term storage, please observe the following content before use:
- Wipe off lubricating grease of the piston rod of the hydraulic cylinder.
- Fill all lubricating parts with oil and lubricating grease.

5.1.21.3 After Storage

If the machine is stored for a long time, but it is not subject to anti-rust operation every month, please contact our authorized dealer before reuse. When reusing the machine after long-term storage, please observe the following content before use:

- Wipe off lubricating grease of the piston rod of the hydraulic cylinder.
- Fill all lubricating parts with oil and lubricating grease.

5.2 Transportation

5.2.1 Note

- When transporting machines, comply with all relevant laws and regulations, and pay attention to safety.
- When transporting the machine by a trailer, the length, width, height and load capacity of the trailer must be confirmed first.
- Check the status of the transport route in advance, such as size, weight restrictions and traffic regulations.
- Sometimes it is required to disassemble the machine to meet local regulations for size or weight restrictions.
- Please consult with your local government for detailed transportation regulations.

NOTE：

- The weight and size may vary depending on the track type and work equipment installed.

5.2.2 Transportation Methods

- Select a transportation method that matches the weight and dimensions provided in the "Technical Specifications" section.
- The weights and dimensions provided in the "Technical Specifications" section may vary with the type of track shoe, bucket rod, or other accessories.

- For the transportation of a machine with a cab protective cover, contact authorized agents of SANY Heavy Industry for details.
- Please consult local government for detailed transportation regulations.

5.2.3 Machine loading and unloading machine with trailer

5.2.3.1 Note

Be sure to observe the following items of the access board and trailer platform:

- When loading and unloading the machine, be sure to turn off the automatic idle switch to avoid sudden increase in machine speed caused by accidental operation of some lever.
- Adjust the speed knob to the MIN speed position to avoid danger caused by high-speed operation of the machine.
- Load and unload the machine on a solid and flat ground. Keep a safe distance from the curb.
- For loading or unloading of the machine with a ramp, the ramp shall be of sufficient width, length, thickness and strength, the slope at most 15°. For loading or unloading of the machine by using a piled soil slope, the soil shall be completely compacted and measures be taken to prevent the slope from collapsing.
- When driving up or down the ramp, avoid steering. If necessary, return to the ground or the flat bed of trailer first, then correct the travel direction and pass the ramp.
- Since the intersection of the top of the ramp and the flat bed of the trailer is protruding, driving shall be careful here.
- Prevent the machine overturn and arising injuries when the superstructure is swinging. Retract and lower the arm and slowly swing the superstructure to achieve optimum stability.

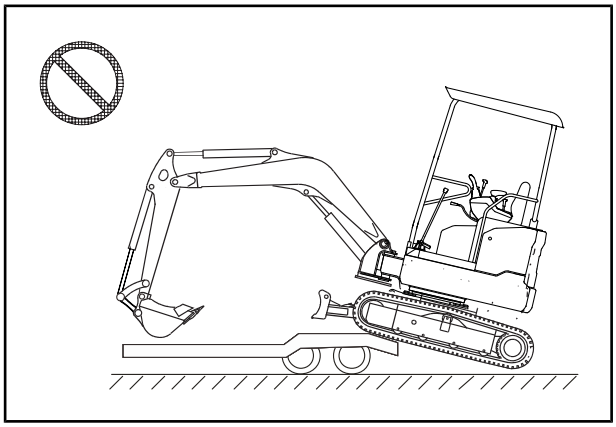


Fig 5-92

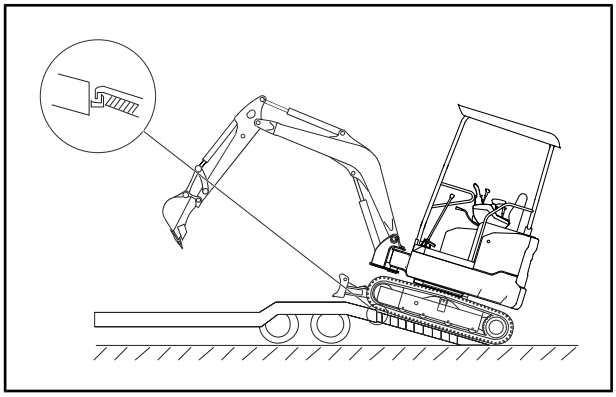


Fig 5-93

- When the machine is traveling on a ramp, do not operate any control lever except the travel control lever.
- Thoroughly clean the ramp or the loading/ unloading platform and the flat bed of the trailer before loading and unloading. Ramps, loading/unloading platforms and the flat bed of a trailer with oil stains, dirt or ice may be slippery.

5.2.3.2 Machine Loading

NOTICE

Risk of machine damage!
When driving the machine on or off the trailer, the electric motor speed will change drastically if the automatic idling function is enabled, which could damage the machine.

- When driving the machine on or off the trailer, disable the automatic idling function.
- When driving the machine on or off the trailer, keep the travel speed in the "low speed" mode. Do not arbitrarily switch the travel speed.

⚠ WARNING

Risk of serious personal injury or death!
If you turn the machine or operate any joystick other than the travel joystick, the machine could tip over, causing personal injury.

- Do not turn the machine or operate any joystick other than the travel joystick. Instead, Drive the machine to a flat ground or onto the trailer and then adjust the direction.

1. It can only be loaded and unloaded on a solid and flat ground. Keep a safe distance from the roadside.

2. Apply brake to the trailer and then place a block [1] under the tire to prevent the trailer from moving.

3. Place the left and right ramps [2] so that they are parallel to each other and the distance between them and the left and right sides of the trailer center [3] is equal. The maximum installation angle [4] is 15°. If the ramp bends significantly due to the weight of

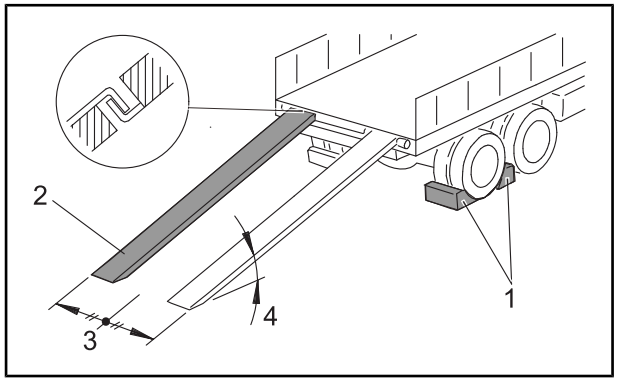


Fig 5-94

1. Block
2. Ramp
3. Trailer center
4. Installation angle

the machine, place a block under the ramp to prevent the ramp from bending.

4. Switch the traveling speed to the low speed status by using the button switch.

Fig 5-95

5. Adjust the throttle link to the minimum speed position.

6. If the machine is equipped with a working device, place the working device in the front and drive forward on the ramp. If there is no working device, move backward to drive onto the ramp. As soon as you get on the ramp, support the bucket on the trailer. When moving backward, be sure to follow the instructions and signals of the person in charge. The ramp angle [5] should be 15°.

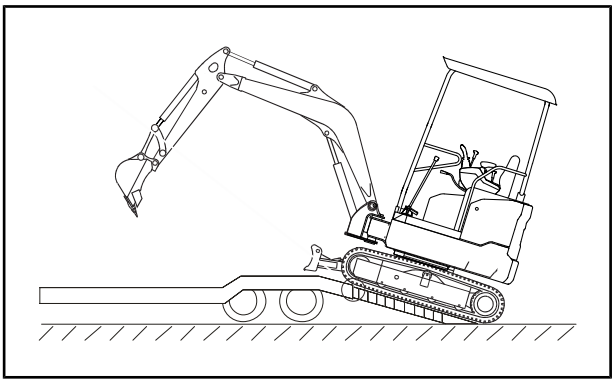


Fig 5-96

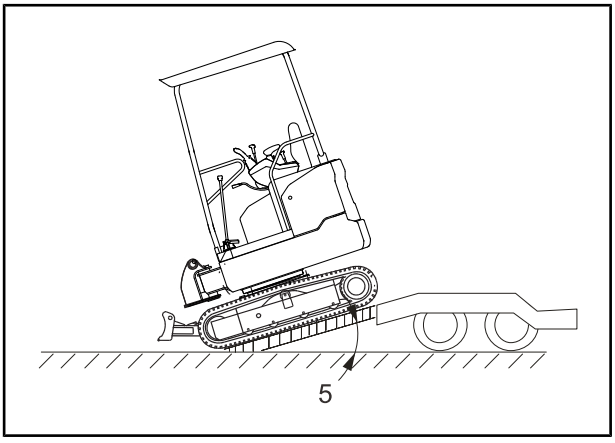


Fig 5-97

5. Angle range

7. Before driving onto the ramp, ensure that the machine is in line with the ramp and that the centerline of the machine corresponds to the centerline of the trailer. Align the direction of movement with the ramp and move slowly.

Keep the working device as low as possible without causing any impact.

8. Move forward slowly until all the belt tracks are on the trailer and are firmly in contact with the flat plate.

9. When the machine drives over the rear wheels of the trailer, the machine tilts forward. At this time, move slowly and carefully, making sure not to touch the chassis of the trailer.

10. Lift the bucket slightly, retract the bucket rod and keep it pointed down, and then slowly turn the upper-carriage 180°. Lower the dozer blade.

11. Fully extend the bucket and bucket rod cylinders, and then slowly lower the boom.

12. Place a wooden block on one end of the bucket cylinder to prevent it from hitting the bottom plate and damaging the cylinder.

13. Shut down the electric motor and remove the key from the switch.

14. Operate the joystick several times until the pressure inside the hydraulic cylinder is completely released.

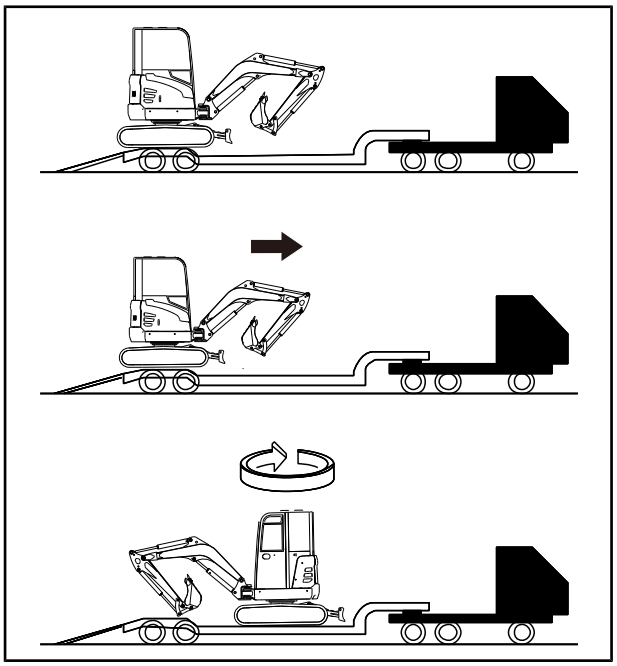


Fig 5-98

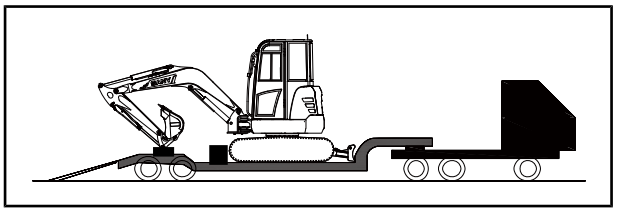


Fig 5-99

15. Put the safety lock lever in the locked position [1].

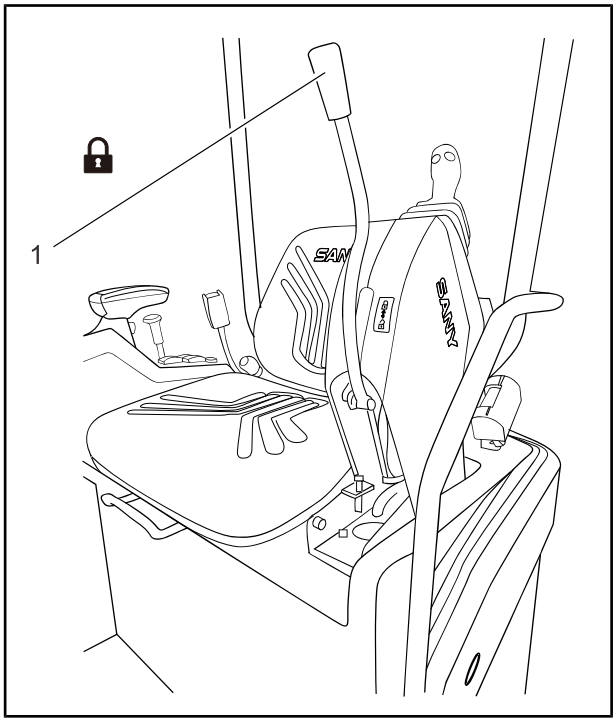


Fig 5-100

1. Locked position

16. Close the windows and doors of the cab, and block the vent to prevent entry of wind and rain.

5.2.3.3 Fix the Machine

- To prevent damage to the bucket cylinder during transportation, place a wood block under the top of the bucket link to prevent the bucket cylinder from directly touching the ground.
- Check that the hood latch is locked. If the hood is not locked, it may open during transportation.

Secure the machine to the trailer as follows:

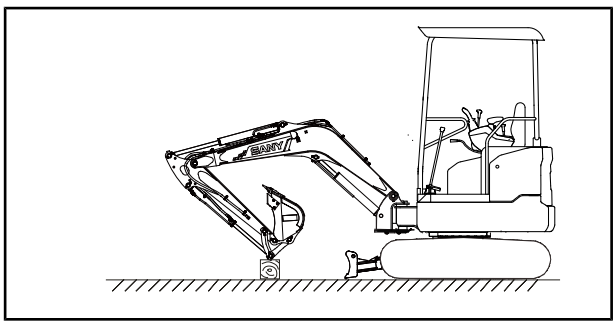


Fig 5-101

1. 2.Fully extend the bucket and bucket rod cylinder, and then slowly lower the boom.

2. Put the safety lock lever in the locked position [1].

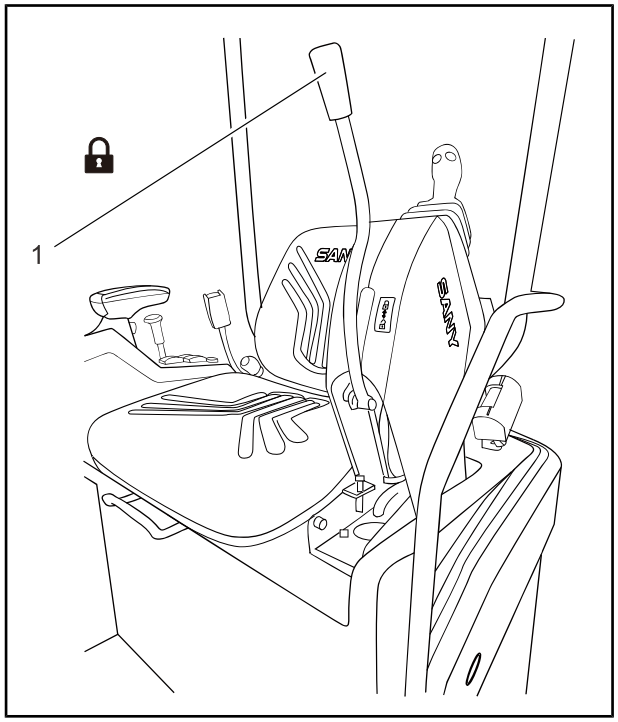


Fig 5-102

1. Locked position

3. Shut down the electric motor and remove the key from the start switch.

4. Lock hoods.

5. Place blocks at both ends of the belt track to prevent the machine from moving during transportation, and secure the machine with iron chains or wire ropes of suitable strength. Take special care to secure the machine in place so that it cannot slide sideways.

NOTE :

- Tie the chain or rope to the frame of the machine. Do not cross or press the chain or rope on the hydraulic pipeline or hose.

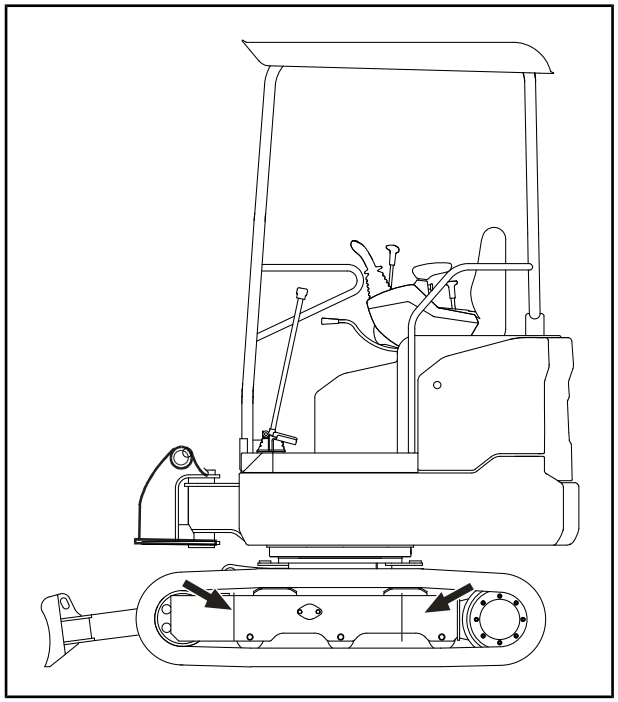


Fig 5-103

5.2.3.4 Unloading

1. Only load and unload the machine on solid and level ground. Keep a safe distance from the edge of the road.

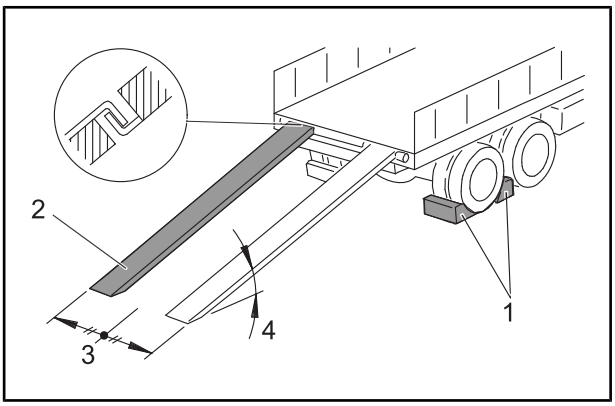


Fig 5-104

1. Block
2. Ramp
3. Trailer center
4. Installation angle

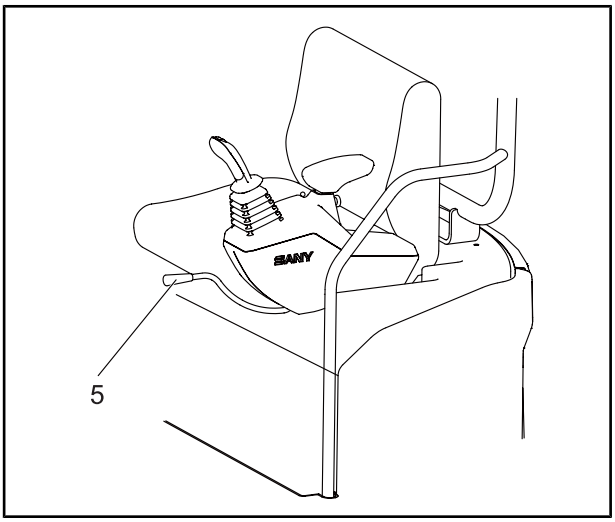


Fig 5-105

5. Unlocked position

2. Apply brake to the trailer and then place a block [1] under the tire to prevent the trailer from moving.

- Place the left and right ramps [2] so that they are parallel to each other and the distance between them and the left and right sides of the trailer center [3] is equal. The maximum installation angle [4] is 15°. If the ramp bends significantly due to the weight of the machine, place a block under the ramp.

3. Remove the chains and wire ropes that fasten the machine.

4. Start the electric motor and fully warm it up.

5. Put the safety lock lever in the unlocked position [5].

6. Press the button to switch the travel speed to the low speed status.

⚠ WARNING

There is a risk of machine damage!
When driving the machine on or off the trailer, the electric motor speed will change drastically if the automatic idling function is enabled, which may damage the machine.

- When driving the machine on or off the trailer, keep the travel speed in the "low speed" mode. Do not arbitrarily switch the travel speed.
- When driving the machine on or off the trailer, disable the automatic idling function.

7.Turn the gear knob to first gear.

Fig 5-106

8. Raise the working device, retract the bucket rod under the boom, and then slowly start the machine.

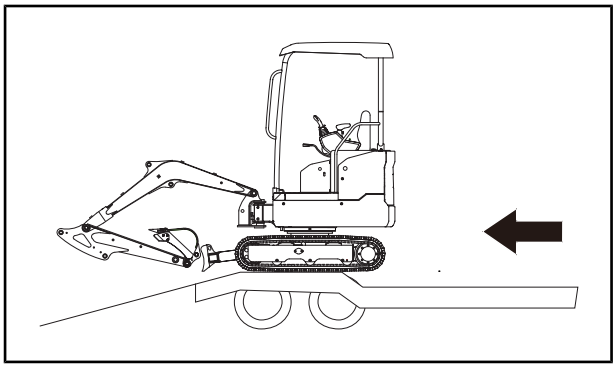


Fig 5-107

9. Stop the machine when it reaches the upper part of the rear wheel of the trailer and is level.

NOTE :

- When unloading the machine, keep the angle [6] between the bucket rod and the boom within the range of 90°-110°.
- If the machine is unloaded with the bucket rod retracted, the machine may be damaged.
- When driving on the ramp, do not insert the bucket into the ground. This may damage the hydraulic cylinder.

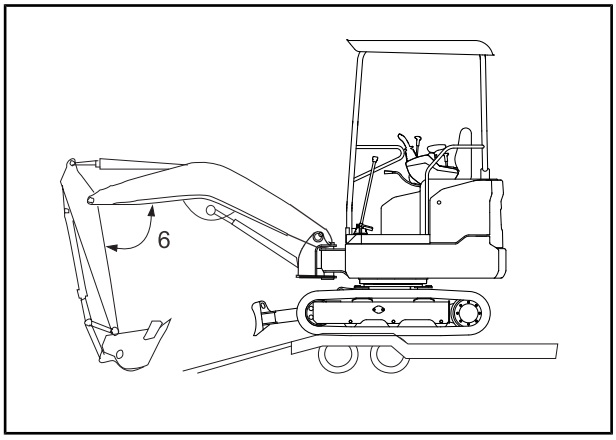


Fig 5-108

6. Angle range

10. When driving on the ramp, adjust the angle between the bucket rod and the boom to 90°-110°, drop the bucket to the ground, and then move the machine slowly.

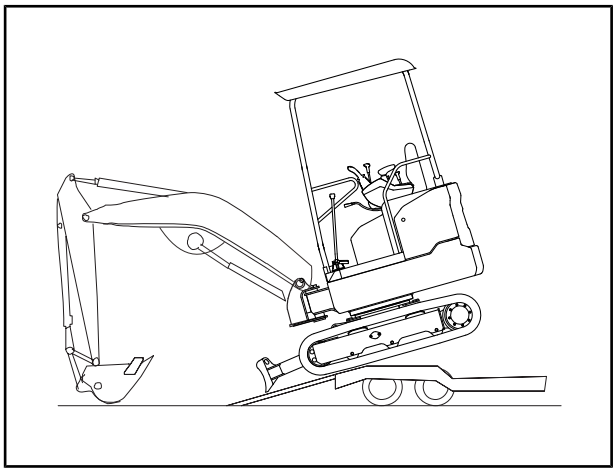


Fig 5-109

11. When driving the machine off the ramp, slowly operate the boom and bucket rod, and carefully drive down until the machine completely leaves the ramp.

5.2.4 Transportation requirements of power batteries

1.During the transportation of the battery, protect the electrical interfaces from water and dust;

2. When transporting the battery, keep the battery facing upward, with no more than two layers stacked on it;

3.During transportation and storage of the battery, protect it from the sun, keep it away from heat sources, and prevent the battery pack from vibration, collision and falling;

4.During transportation and storage of the battery, such fire-fighting facilities as carbon dioxide fire extinguishers, etc. shall be provided;

5.The best storage capacity of the battery box is 50%-80%SOC;

6.For battery storage, it is necessary to ensure effective packaging, keep dry, control the humidity at (65 ±20)% RH, avoid such chemicals as acids, alkalis and salts, avoid harmful gases, dust and smoke, and pay attention to ventilation;

7.If the outer packaging of the battery is damaged during transportation and storage, it is necessary to contact professionals to check the battery and repack the battery after confirming that there is no abnormality.

5.3 Hoist

⚠ WARNING

Risk of serious injury or death!

The crane can be operated only by the qualified and experienced operators with official licenses (according to local laws).

- Do not hoist the machine when there are people on it.
- Do not let anyone enter the area below or around the hoisted machine.
- Ensure that the wire rope used for hoisting is strong enough to carry the weight of the machine. Do not use damaged or aged wire ropes or hoisting tools.
- Do not hoist the machine while the upper carriage is slewing to the side of the machine. Before hoisting, turn the working device to the drive wheel end and make the undercarriage parallel to the longitudinal centerline of the upper carriage.
- Before hoisting, put the safety lock lever in the locked position to prevent the machine from moving accidentally.
- Keep the machine horizontal during hoisting.
- Do not hoist the machine rapidly. Otherwise, the wire ropes or tools will be overloaded, possibly causing them to break.
- Do not hoist the machine in any other posture or use any lifting device other than those provided in the following steps. Otherwise, the machine may loss balance.

Selection of wire rope

- The hoisting procedure applies to machines with standard specifications. For details about the machine weight, see the section "Technical Specifications".
- According to the weight of the excavator, choose the appropriate size of wire rope. See the table below.

Wire rope

(Standard "Z" stranded rope without zinc coating)

Wire rope Nominal diameter	Allowed load	
mm	kN	Ton
10	8.8	0.9
12	12.7	1.3

Wire rope

(Standard "Z" stranded rope without zinc coating)

Wire rope Nominal diameter	Allowed load	
14	17.3	1.7
16	22.6	2.3
18	28.6	2.9
20	35.3	3.6
25	55.3	5.6
30	79.6	8.1
40	141.6	14.4
50	221.6	22.6
60	318.3	32.4

NOTE：

- The allowable load is estimated at 1/6 or 1/7 of the breaking strength of the wire rope used. Hoisting methods may vary with the actual accessories and options installed on the machine. For suitable hoisting methods, contact authorized agents of SANY.

When lifting the machine, follow the steps below on a level ground:

1.Start the motor and raise the dozer blade.

2.Then swing the superstructure to locate the work equipment on the side of the sprocket [1].

3. Fully extend the bucket rod and bucket hydraulic cylinder, and lift the boom to an appropriate position.

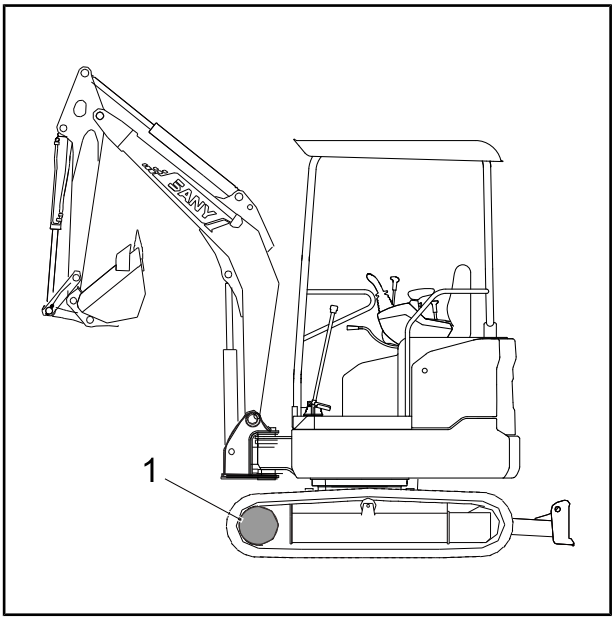


Fig 5-110

1. Drive wheel

4. Put the safety lock lever in the locked position [2].

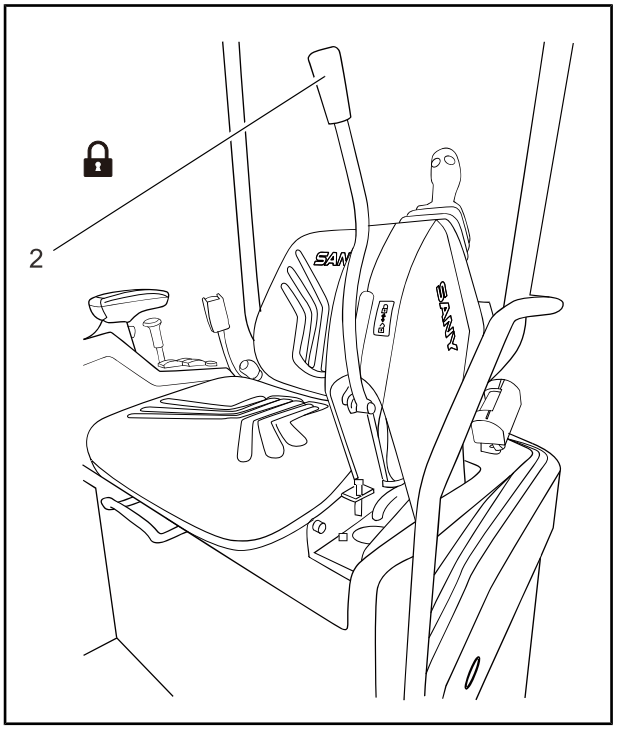


Fig 5-111

2. Locked position

5. Stop the motor, check whether there are obstacles around the cab, remove the key and then leave the machine. Close doors and windows of cab.

6. Use long enough wire rope and support rod so that they do not touch the machine during hoisting. Wrap protective materials around the wire rope and support rod to avoid damage to the machine.

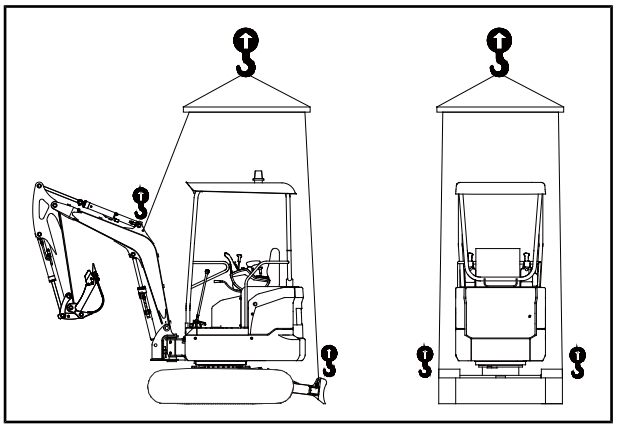


Fig 5-112

7. Drive the crane to a proper hoisting position.

8. Hoist the whole machine according to the state shown in the right figure. After the machine leaves the ground, carefully check whether the machine is balanced. If not, adjust the boom and dozer blade position and then slowly hoist the machine.

9. Use a crane over 6T and wire rope for hoisting.

⚠ WARNING

Risk of serious injury or death!

- If the wire rope is too close to the hook, it will slip off the hook during hoisting, causing serious accidents. The middle part of the hook has the highest strength.
- Do not hoist heavy objects when the hanging angle between the wire rope and the hook is large. If two or more wire ropes are used to hoist a heavy object, the force that each wire rope can bear will increase with the increase of the hanging angle.
- Hoisting with a single wire rope may cause the load to rotate during hoisting, and the wire rope may untie or slip from the original winding position on the load, which may lead to dangerous accidents.

Troubleshooting

6.Troubleshooting

6.1 Special Instructions

Situations described below, if occurred during operation, are normal and in line with industry standard, and thus please feel relieved to use.

- A function is not included in product design, but you consider it as a fault due to your misunderstanding of product functions. (For example, the device is not suitable for use in high altitude of 4,000 meters or above.
- Poor operation stability, grade ability, offset travel and slow movement occurs due to your unskilled operation and unfamiliarity with the working condition, but all the parameters are proved by the field test in the normal range specified by the manufacturer (for example: the tail of the counterweight is up, climbing the grade greater than 35°, etc.).
- Unusual noise comes up in process of oil return of the hydraulic system (such as unusual noise in oil return and from pipelines), but it is checked that the hydraulic system is normal and the return oil filter is free of impurities as iron chips, cooper chips and aluminum chips such that no affect will be exerted to the normal operation of the device.
- Common phenomena in the industry, such as discoloration or blackening of piston rod, reverse or automatic movement of cylinder, and start difficulty of the motor in chilly winter days.

6.2 Preparation Before Troubleshooting

6.2.1 Inspection before Troubleshooting

Check item		Judgment criteria	Measures
Lubricant, coolant, and hydraulic oil	● Check the hydraulic oil level ● Check the hydraulic fluid filter ● Check the coolant level ● Check the hydraulic oil filter element	— — — —	● Refuel ● Clean or replace it. ● Add coolant. ● Replace it.
Electrical system or devices	1. Check the looseness and corrosion of battery terminals and wires	—	Tighten or replace it

Check item		Judgment criteria	Measures
Hydraulic devices	1. Check for abnormal noises and odors 2. Check for oil leakage 3. Bleed the air	— — —	Repair it Repair it Air exhaust
Electricity and electric equipment	1. Check the battery voltage (with motor shut down) 2.Check for discolored, burnt or peeled wires 3. Check for falling clamps or hanging wires 4. Check whether the wire is wet (check connectors or terminals carefully) 5. Check whether the fuse is fused or corroded	8-11.5V — — — After running for a few minutes: Below 12.5 V	Charge the battery Replace it Replace it Remove the connector and blow it dry Replace it Check the generator circuit

6.2.2 Precautions during troubleshooting

⚠ WARNING

Risk of serious injury or death!

Pay attention to the following points during troubleshooting:

- Park the machine on the horizontal ground, and confirm the function of safety pin, cushion block and parking brake.
- During the collaborative operation, the signal shall be strictly unified and no irrelevant personnel can be allowed to be close to it.
- If the radiator cap is removed when the motor is hot, hot water will be sprayed and cause burning, so maintenance shall be carried out after the motor is cooled down.
- Do not touch any hot parts or hold any rotary parts.
- Always dismantle the negative terminal [-] first.
- When removing the internal oil pressure, water pressure or air pressure plug or cap, release the internal pressure first.
- When installing the measuring equipment, ensure that the connection is correct.

- The fault diagnosis is intended to determine the root cause of the fault accurately, repair it quickly and prevent it from reoccurrence.
- During fault diagnosis, it is important to understand the structure and function.

- In order to conduct effective fault diagnosis, turning to operators to get a general knowledge of the possible fault causes is also one of the shortcut for fault diagnosis.

1. 1. Do not disassemble parts immediately during fault diagnosis.

If parts are disassembled immediately, it may cause:

- The parts that are disassembled are irrelevant to the fault, or the parts have been disassembled unnecessarily.
- The fault cause cannot be found out.

Therefore, during fault diagnosis, it is necessary to check in advance and make fault diagnosis according to the specified procedures.

2. Check other inspection items.

- Check for oil leakage from pipelines or hydraulic devices.
- Check the lever travel.
- Check the spool travel of the control valve.
- Other daily maintenance items can be inspected from the appearance, so only those deemed necessary can be checked.

3. Confirm the fault

- Confirm the fault, and determine whether it is a true fault, whether there are problems in use and operation, etc.
- When the machine is operated and the fault phenomenon reoccurs, no inspection or measurement which will make the problem more serious shall be carried out.

4. Troubleshooting

- Conduct the inspections and tests according to item 2~4 to narrow the scope of fault causes, then identify the faulty point according to the fault diagnosis flow chart.
- The basic procedure of fault diagnosis is as follows:

1) 1) Start with the easy problem.

2) 2) Start with the most possible problem.

3) 3) Check other relevant content.

5. Method of eliminating root cause of fault

- Even if the troubleshooting is done but the root cause is not eliminated, the same fault will occur again. Therefore, it is necessary to find out the cause of the fault and eliminate the root cause.

6.2.3 Precautions for Diagnosing Circuit Faults

1. Be sure to turn off the power supply before disconnecting or connecting the connectors.

2. Before troubleshooting, check whether all relevant connectors have been connected correctly.

- Disconnect and connect relevant connectors several times for confirmation.

3. Connect all disconnected connectors before proceeding to the next step.

- If the power is turned on while the connector is still disconnected, unnecessary abnormal display will occur.

4. When diagnosing circuit faults (measuring voltage, resistance, connectivity or current), move related wires and connectors for several times and check whether the readings on the instruments change.

- If the reading changes, there may be a contact fault in the circuit.

6.2.4 Precautions for Handling Hydraulic Components

Due to the increase of pressure and accuracy of hydraulic components, most faults are caused by the oil sludge (foreign objects) in the hydraulic oil circuit. You must take extra care when filling hydraulic oil, or when disassembling or assembling hydraulic components.

1. Pay attention to the operation environment

Avoid filling hydraulic oil, replacing filters or repairing the machine in the rain, strong wind, or places with a lot of dust.

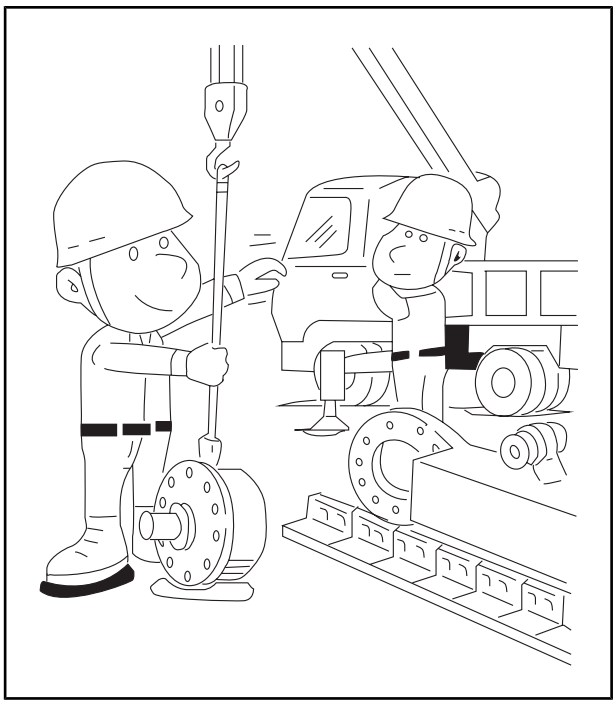


Fig 6-1

2. On-site disassembly and maintenance.

On-site disassembly and maintenance of hydraulic components may cause ingress of dust. It is also difficult to check the performance after repair, so you'd better replace with an assembly unit. Disassembly and maintenance of hydraulic components shall be carried out in a specially prepared dust-proof workshop, and the performance shall be checked by special test equipment.

3. Fill the hydraulic oil

When filing the hydraulic oil, do not let oil sludge or dust mix in. Always keep the filter elements and their surrounding areas clean with the use of sanitary pumps and oil containers. The use of oil cleaning device is a more effective way to filter the oil sludge accumulated during storage.

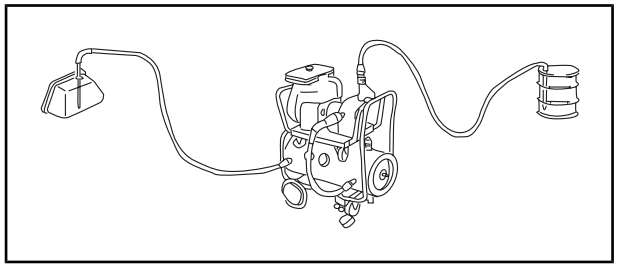


Fig 6-2

4. Replacement of hydraulic oil at high temperature

Hydraulic oil or other oil is easy to move when kept warm. Besides, sediments may be easily expelled from the oil circuit together with oil. Therefore, it is best to replace the oil while hot. During replacement, drain the used hydraulic oil as much as possible. (Drain from hydraulic oil tank; and drain from the filter and the drain plug in the oil circuit.) The impurities and sediments in the used oil, if any, will be mixed with the new oil and thereby shorten the useful life of hydraulic oil.

5. Flushing

When disassembling and reassembling the device or changing the oil, remove the impurities, sediments and old oil in hydraulic lines. Normally, flushing is required to be carried out twice: use flushing oil for primary flushing, and designated hydraulic oil for secondary flushing.

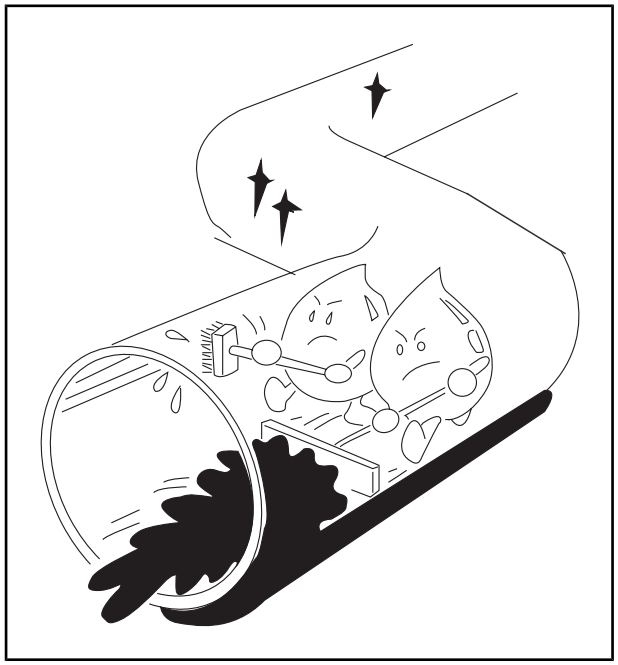


Fig 6-3

6. Cleaning

The sediments and impurities in the hydraulic lines need to be cleaned after repairing the hydraulic components (pump, control valve, etc.) or during the operation of the machine. Oil cleaning device can clear up fine particles (about 3 μ), and can effectively clean the oil lines without dismantling the built-in filter of the hydraulic components.

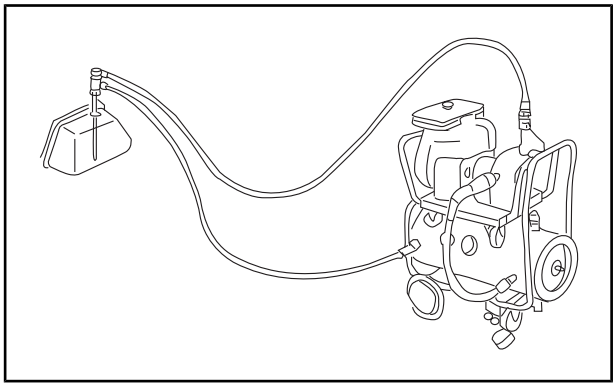


Fig 6-4

6.3 Non-fault Phenomenon

6.3.1 Note

The following are not faults:

- When the bucket rod joystick is in the IN (dig) position and the working device falls from a height without load, the moving speed drops instantaneously when the bucket rod exceeds or is less than the vertical position.

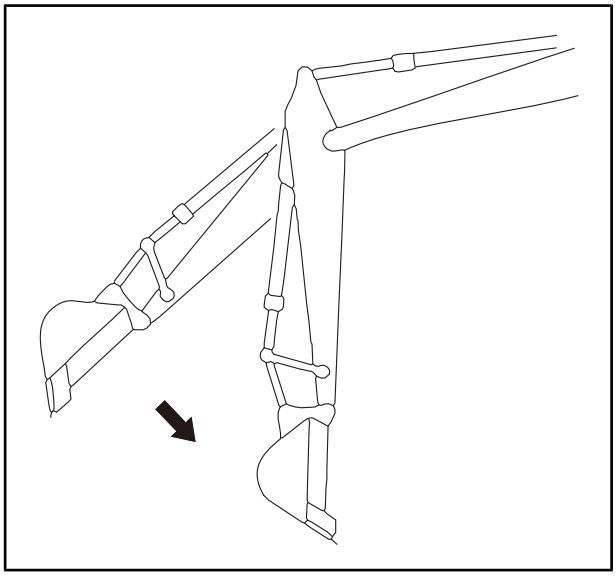


Fig 6-5

- When the bucket joystick is in the CURL (dig) position and the working device falls from a height without load, the moving speed drops instantaneously when the bucket tooth exceeds or is less than the vertical position.
- The brake valve generates noise when you start to turn or stop turning the machine.

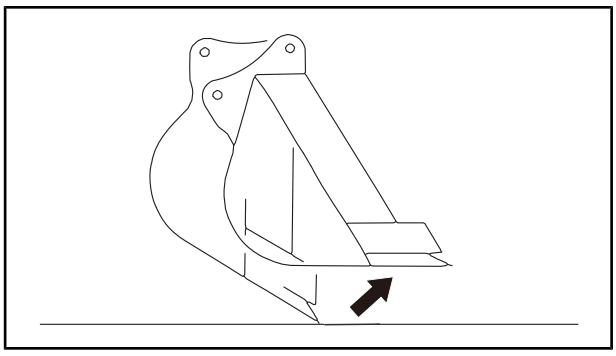


Fig 6-6

- The traveling motor generates noise when you drive the machine downhill at a low speed.
- The bucket or bucket rod vibrates when you dig something under heavy load.

6.3.2 Tow the Machine

⚠ WARNING

Risk of personal injury!
If the strength of the wire rope for towing the machine is insufficient, the wire rope could break, causing personal injury.

- In the process of towing, do not use rope with breakage [A], decreased diameter [B] or twist [C], in case the rope would be broken.
- Always wear protective gloves to handle the rope
- Don't tow the machine on a slope.
- In the process of towing, do not stand between the towing machine and the towed machine
- Operate the machine slowly, and do not apply load suddenly to the rope.

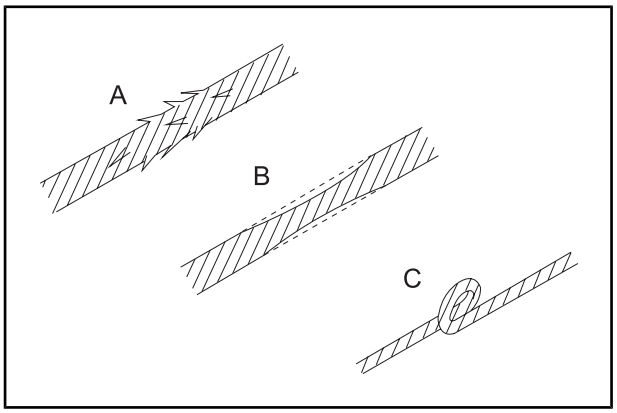


Fig 6-7

A. Broken wire C. Knotting

B. Reduced diameter

NOTE :

- Allowable traction is 12 kN. Be sure to perform the towing operation within the maximum traction.
-
- If the machine is stuck in the mud and cannot drive out by its own power, or the traction of the excavator is used to tow heavy objects, the wire rope can be used as shown in the figure on the right.
- Place wooden blocks or other protective materials on the contact positions between the wire rope and the machine to prevent

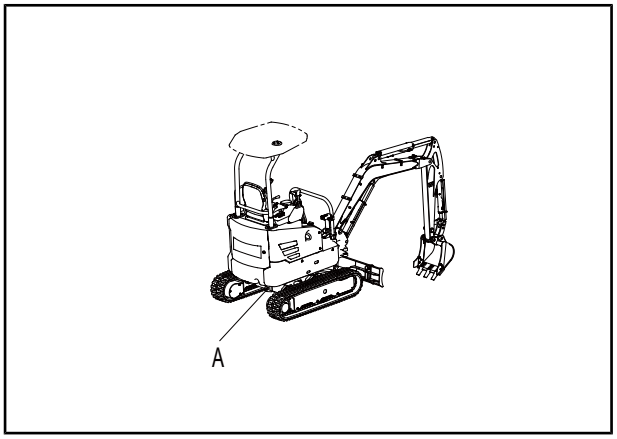


Fig 6-8

A.Towing hole

the wire rope and the machine from being worn.

- Keep the wire rope level, and make it in the same direction as the belt track frame.
- When towing the machine, tow the machine to a place suitable for repair at a speed of less than 1 km/h. Do not travel a long distance.
- Towing the machine to travel can only be used in emergency situations.

⚠ WARNING

Risk of personal injury!
Do not use this light load towing hole to tow the weight of the whole machine.

6.3.3 Coolant Temperature Too High

⚠ CAUTION

Be careful of machine and personnel injury hazards
Please do not stop the motor immediately

- When the machine is in operation, do not open the lid of the expansion tank to prevent coolant from flowing out.
- Please add water slowly multiple times to prevent sudden addition of cold water from causing motor cracking

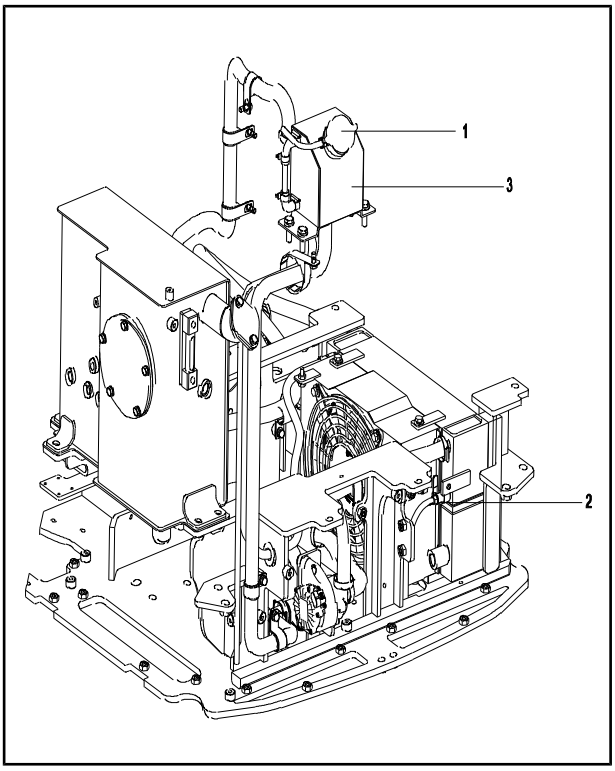


Fig 6-9

1.Expansion tank 2.Drain valve
3.Expansion tank

1. 1. If the water temperature exceeds 65 ℃, the warning light on the display will light up, indicating that the radiator water temperature is in an over limit state.

2. 2. Check the water level of the coolant. Add coolant when insufficient. Unscrew the expansion tank cap [1] and add coolant until the cap is closed. After supplementation, please tighten the expansion tank cover firmly when the liquid level reaches the maximum mark of the expansion tank.

3. 3. Check if there are any debris in the front of the radiator.

4. 4. If there is coolant leakage or frequent radiator water temperature exceeding the limit, it indicates a malfunction in the cooling system. At this time, it is necessary to check whether the fan rotates normally or whether there are obstructions in the radiator inlet and outlet.

⚠ CAUTION

Risk of scalding!
Opening the radiator cover when the coolant is at a high temperature will spew out water vapor, which could cause scalding.

- Do not open the radiator cover when the coolant is hot. Otherwise, the hot water or water vapor will spew out, causing scalding. When the coolant temperature drops, slowly open the cover with a thick cloth.

6.4 Motor Faults

6.4.1 Faults diagnosis table of motor

Don’t disassemble and repair the motor without permission!

In case of a fault, check as described in the following table, and contact authorized agents of SANY for repair.

There are many causes for motor failure, sometimes a failure is caused by several causes, and one cause may also lead to several failures. The following table lists only the common causes. In case of failure, please contact the authorized dealer of SANY Heavy Machinery for repairs.

S/N	Fault phenomenon	Fault cause	Handling method
1	The motor cannot be started under no load	● Power cord disconnected	●Check the switch, contactor contact and motor lead wire, and repair them after finding out the fault
		● Wrong wiring of control equipment	●Check wiring
		●● Stator winding fault (short circuit, open circuit, wrong grounding and connection, etc.)	●Check the stator winding and find out the fault

		● Too low power supply voltage	●Check the power supply voltage and each connection
2	After the motor is powered on, the motor does not start and makes a buzzing sound	●Open circuit of stator and rotor windings	●Check the open circuit contact and repair it
		●The beginning and end terminals of the winding lead wire are connected incorrectly or the winding is connected reversely	●Connect DC in the stator winding, check the polarity of the winding (with a compass) to determine whether the beginning and end terminals of the winding are correct
		● ●Motor overloaded or stuck	●Check the equipment and conduct trouble shooting
		● Power supply not fully connected	●Tighten the loose screws of the terminal block, check the disconnection or false connection of one phase of the power line with a multimeter, and then repair it
3	Motor stays at a low speed	●One phase of stator winding connected reversely	● Correct wiring
		● Incorrect span of stator winding	● Check the span of stator windings
4	Stator overheating	●One phase of the power transmission line is broken, or one phase of the stator winding is open-circuited, resulting in a single phase	● Check it for 1 (1) and (3)
		●Overload	● Reduce load or increase capacity
		●Wrong winding turns	● Check winding resistance
5	Low insulation resistance	●The winding is damp or wet with water	●Heat and dry
		●Winding insulation is covered with dust and oil dirt	●Remove oil dirt from the winding, and dry and dip it in paint
		●Lead wire insulation aging and cracking	●Wrap lead wire insulation again
		●Winding insulation aged	●If it is identified to be used again, it can be cleaned and repainted; If the insulation is aged and cannot be operated safely, it is necessary to replace the insulation.

6	Motor vibration	●The bearing is worn and the clearance is unacceptable	●Check the bearing clearance which shall meet the design requirements
		●Uneven air gap	●Adjust the air gap
		●Rotor unbalance	●Recalibrate dynamic balance
		●Stator winding fault (short circuit, open circuit, wrong grounding and connection, etc.)	●Find out the winding fault point and repair it
		●Swing shaft bending	●Straightening the shaft
		●Core deformation or looseness	●Correct or reassemble the core
7	When the motor runs under no load, the no-load current is unbalanced and varies greatly	●Beginning and end terminals connected improperly	● Conform the beginning and end terminals are corrected, and then start the motor test.
		● Unbalanced power supply voltage	● Measure the power supply voltage, find out the cause and clear the fault
		● Winding fault (inter-turn short circuit, reverse connection of a coil assembly, etc.)	● Disassemble the motor, check the winding polarity and fault, and correct and clear the fault
8	There is noise when the motor is running	● Worn and faulty bearing	● Overhaul and replace the bearing
		● Loose stator and rotor cores	● Check the cause of vibration and press fit the iron core again
		●Unbalanced voltage	● Measure the power supply voltage, check the cause of voltage imbalance and repair it
		● Winding fault (such as short circuit, wrong connection, etc.)	●Check and clear winding faults
		● The air gap is uneven, and the stator and rotor rub against each other	● Adjust the air gap and improve assembly quality
9	Bearing heating exceeds the specified value	● The fit between the bearing and the shaft is too loose or too tight	●Take measures to keep the fit between the bearing and the shaft meet the requirements
		● The fit between the bearing and the end cap is too loose or too tight	●Take measures to keep the fit between the bearing and end cap meet the requirements
		●Bearing fault, wear, and inclusion of debris	● Replace the damaged bearing

		● The bearing clearance is too large or too small	●Replace it with a new bearing

6.5 Faults of batteries

6.5.1 Faults diagnosis table of batteries

When a fault occurs, please conduct inspections according to the table below, and contact Sany authorized dealer to carry out repairs.

Fault content	Fault analysis	Measures
Cell overvoltage alarm - slight	Umax≥3.65V	Stop the charging process normally
Cell overvoltage alarm - slight	Umax≥3.7V	Stop the charging process normally
Cell overvoltage alarm - serious	Umax≥3.75V	Stop the charging process normally
Cell undervoltage alarm - slight (No request for high voltage in charging mode)	Tmin≥0℃：Umin≤3.0V Tmin<0℃：Umin≤2.5V	No treatment for BMS
Cell undervoltage alarm - general (No request for high voltage in charging mode)	Tmin≥0℃：Umin≤2.5V Tmin < 0℃：Umin≤2.3V	Limit the power to 50%
Cell undervoltage alarm - serious (No request for high voltage in charging mode)	Tmin≥0℃：Umin≤2.4V Tmin < 0℃：Umin≤2.2V	Limit the power to 0%, and request for high voltage
Cell overdischarge fault	Umin≤1V	Limit the power to 0%, and request for high voltage
Total voltage over-voltage alarm - slight	Vbat≥3.65V*N	Stop the charging process normally
Total voltage over-voltage alarm - slight	Vbat≥3.7V*N	Stop the charging process normally

Total voltage over-voltage alarm - serious	Vbat≥3.75V*N	Stop the charging process normally
Total voltage undervoltage alarm - slight (No request for high voltage in charging mode)	Tmin≥0℃：Ubat≤3.0V*N Tmin < 0℃：Ubat≤2.5V*N	Limit the power to 50%
Total voltage undervoltage alarm - general (No request for high voltage in charging mode)	Tmin≥0℃：Ubat≤2.5V*N Tmin < 0℃：Ubat≤2.3V*N	Limit the power to 0%
Total voltage undervoltage alarm - serious (No request for high voltage in charging mode)	Tmin≥0℃：Ubat≤2.4V*N Tmin < 0℃：Ubat≤2.2V*N	Limit the power to 0%, and request for high voltage
Cell high temperature alarm - general	Tmax > 50℃	Limit the power to 50%
Cell high temperature alarm - serious	Tmax > 55℃	Limit the power to 0%
Cell high temperature alarm - serious	Tmax > 60℃	Limit the power to 0%, and request for high voltage
Cell low temperature alarm	Tmin < -20℃	Limit the power to 0%, and request for high voltage
Excessive temperature difference alarm - slight	⊿T≥10℃	No treatment for BMS
Excessive temperature difference alarm - slight	⊿T≥15℃	No treatment for BMS
Excessive temperature difference alarm - general	⊿T≥20℃	Limit the power to 50%
Battery pack fire alarm	Fire alarm fault sign position 1	Limit the power to 0%, and request for high voltage

Discharging current over-limit alarm - slight	≥I*105%	Limit the power to 50%
Discharging current over-limit alarm - slight	≥I*110%	Limit the power to 50%
Discharging current over-limit alarm - serious	≥I*120%	Limit the power to 0%, and request for high voltage
Recharging current over-limit alarm - slight	≥I*105%	Recharge for driving, with the power limited to 50%
Recharging current over-limit alarm - slight	≥I*110%	Recharge for driving, with the power limited to 0%
Recharging current over-limit alarm - serious	≥I*120%	Recharge for driving, with the power limited to 0%
Current sensor fault	Current sensor fault sign position 1	Limping
BMS low voltage supply voltage abnormality alarm	24Vsystem: BMS supply voltage ≥ 32V or BMS supply voltage ≤ 18V 2Vsystem: BMS supply voltage ≥ 16V or BMS supply voltage ≤ 9V	Limit the power to 0%, and request for high voltage
Excessive SOC difference alarm	Excessive SOC difference fault sign position 1 Difference between real SOC and displayed SOC > 5%	No treatment for BMS
SOC switching fault alarm	SOC switching fault sign position 1 Switching of 10% within 5S under the calibration by non-technical personnel	No treatment for BMS
Low battery SOC alarm - slight	SOC≤20%	No treatment for BMS
Low battery SOC alarm - general	SOC≤10%	Limit the power to 50%
Low battery SOC alarm - general	SOC≤5%	Limit the power to 50%
Heating film heating circuit fault	Heating rate abnormity When the heating starts, record the lowest temperature T1 at the start time. When the heating lasts for 30	Do not heat the heating film

	min, record the lowest temperature T2 at this moment. In case of T2-T1 < 5℃, judge that the heating rate is abnormal or the cell temperature reaches 40℃ during the heating process	
Battery pack self-protection fault	Limit overvoltage, limit overtemperature and limit undervoltage (limit undervoltage is not determined during charging)	Limit the power to 0%, and request for high voltage
Main circuit precharge or pre-test fault	Precharge timeout, precharge load short circuit, precharge overcurrent and pre-test fault	Before applying high voltage: Do not apply high voltage After applying high pressure: The contactor does not disconnect automatically
Auxiliary circuit precharge or pre-test fault	Precharge timeout, precharge load short circuit and pre-test fault	Before applying high voltage: Do not apply high voltage After applying high pressure: The contactor does not disconnect automatically
Excessive low driving insulation alarm - slight	R≤500Ω/V; alarm only in non-charging mode R: System insulation resistance	Limit the power to 50%
Excessive low driving insulation alarm - general	R≤300Ω/V	Limit the power to 50%
Excessive low driving insulation alarm - serious	R≤100Ω/V	Limit the power to 0%, and request for high voltage
ACAN communication fault	ACAN communication fault sign position 1 Life frame of VCU not received for a long time (5S)	Limping
BMS internal communication fault	Internal communication fault sign position 1	Limping
Branch open circuit fault alarm	Branch open circuit fault sign position 1 The branch current is 0 or the absolute value of the current difference between the branch and the main is less than 10A;	Limping
High voltage interlock fault alarm	Hard wire high voltage interlock fault sign position 1	Limping

Alarm of failure to close the heating film or TMS contactor	Contact open circuit fault sign position 1 >2s after closing command; voltage difference tested between the front and rear ends of the relay: ≥ 5%	Heating film contactor fault: Do not heat the heating film TMS contactor fault: Do not heat/cool the TMS
Alarm of failure to disconnect the heating film or TMS contactor	Contact adhesion fault sign position 1 When the main negative relay is closed, the heating relay is not closed by BMS, and the total pressure detected by the insulation detection extension is ≥95% of the total battery pressure, the heating relay is judged to be adhered. Otherwise, no adhesion	Heating film contactor fault: Do not heat the heating film TMS contactor fault: Do not heat/cool the TMS
Alarm of failure to close the main negative contactor	Contact open circuit fault sign position 1 >2s after closing command; voltage difference tested between the front and rear ends of the relay: ≥ 5%	No treatment for BMS
Alarm of failure to disconnect the main negative contactor	Contact adhesion fault sign position 1 When the main negative relay is not closed, and the total pressure detected by the insulation detection extension LINK- is ≥95% of the total battery pressure, the main negative relay is judged to be adhered. Otherwise, no adhesion. For items shared by the main negative relay and the charging relay, stop charging	Limping
Alarm of failure to close the DC charging A positive contactor	Contact open circuit fault sign position 1 >2s after closing command; voltage difference tested between the front and rear ends of the relay: ≥ 5%	Stop the charging process normally
Alarm of failure to disconnect the DC charging A positive contactor	Contact adhesion fault sign position 1 When the main negative relay is closed, the charging relay 1 is not closed by BMS, and the total pressure detected by the insulation detection extension HV2 is ≥95% of	Stop the charging process normally

	the total battery pressure, the charging relay 1 is judged to be adhered. Otherwise, no adhesion	
Charger connection signal abnormality	Charger connection signal abnormality	Stop the charging process normally
Rechargeable energy storage system mismatching fault alarm	System mismatching detection fault sign position 1	No treatment for BMS
Charging current over-limit alarm	AC current over-limit fault sign position 1 ≥I*105% (not judged below 20A)	Stop the charging process normally
Charger socket NTC fault	Charger socket NTC open circuit or short circuit fault; alarm only in charging mode	Stop the charging process normally
Charger socket over-temperature alarm - slight	Charger socket temperature ≥85℃	No treatment for BMS
Charger socket over-temperature alarm - slight	Charger socket temperature ≥90℃	Limit the power to 50%
Charger socket over-temperature alarm - general	Charger socket temperature ≥95℃	Stop the charging process normally
Poor consistency of battery cells - slight	Umax-Umin≥400mV	No treatment for BMS
Poor consistency of battery cells - slight	Umax-Umin≥500mV	Limit the power to 50%
Poor consistency of battery cells - general	Umax-Umin≥600mV	Limit the power to 0%, and request for high voltage
High SOC fault	SOC≥101%	No treatment for BMS
Electronic lock	Electronic lock fault position 1	At initial charging stage: Exit the charging process. During charging: Limit the charging current to 0 and do not exit the charging process, which can make the system restored from the fault

6.6 Electrical System Faults

6.6.1 Troubleshooting table of electrical system

When a fault occurs, please conduct inspections according to the table below, and contact Sany authorized dealer to carry out repairs.

Fault content	Fault analysis	Measures
The motor cannot be started	• Low battery • Fault of one-key startup button • Pilot switch fault • Open circuit of start signal circuit • Fuse F1 fault • Short circuit of wire (grounding fault) • Internal fault of AC motor • Starter relay fault • Integrated controller fault	• Charge or replace the battery • Replace it • Repair or replace it • Inspect and repair it • Replace it • Inspect and repair it • Repair or replace it • Replace it • Repair or replace it
The motor speed is irregular	• Open circuit of wire harness • Resolver fault • Short circuit of wire (grounding fault)	• Inspect and repair it • Replace it • Inspect and repair it
The complete vehicle can't be powered off	• Battery relay adhesion • Fault of one-key startup button	• Replace it • Replace it
No equipment works	• Safety lock switch fault • Short circuit of wire (grounding fault)	• Repair or replace it • Inspect and repair it
No display on the instrument	• Fuse fault • Wire disconnection fault • Short circuit of wire (grounding fault) • Instrument fault	• Replace it • Inspect and repair it • Inspect and repair it • Replace it
The high/low traveling speed function is disabled	• Fault of high/low speed traveling solenoid valve • Wire disconnection fault • Short circuit of wire (grounding fault)	• Replace it • Inspect and repair it • Inspect and repair it
Inaccurate display of motor coolant temperature	• Coolant temperature sensor fault • Wire disconnection fault • Short circuit of wire (grounding fault) • Wire short connected with 12V	• Replace it • Inspect and repair it • Inspect and repair it • Inspect and repair it

6.6.2 Battery

6.6.2.1 Description

⚠ WARNING

- It is dangerous to charge the battery when the battery is mounted in the machine. Always disassemble the battery from the machine before charging.
- When checking or handling the battery, always turn the ignition key
- to OFF to shut down the motor.
- When handling the battery, always wear goggles and rubber gloves.
- When disassembling the battery, disconnect earthing cable (negative terminal [-]) first. When mounting, first mount the positive terminal[+]. Be careful not get the tool touching the positive terminal and chassis; otherwise, fire hazard may ensue.
- Loose contact of terminal may generate sparks, causing explosion.
- When disassembling or assembling terminals, test which is the positive terminal [+], and which is the negative terminal[-].

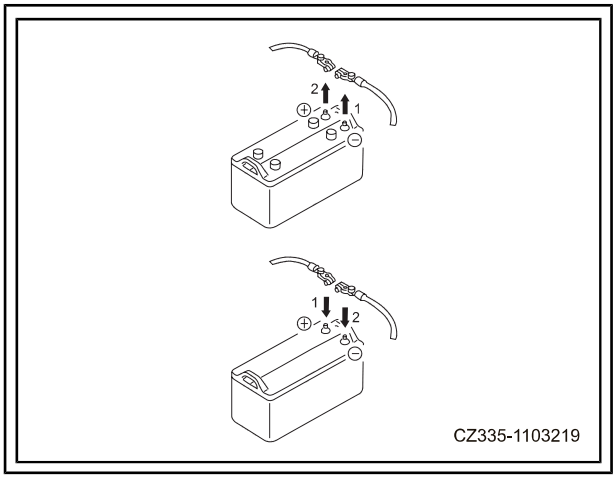


Fig 6-10

6.6.2.2 Removal and refitting of battery

- Before disassembling battery, always disassemble earthing cable (normally connected to negative terminal [-]) first.
- If the tool touches between the positive terminal and chassis, fire disaster may occur.
- Use clamp to fix the battery when changing battery.
- Order of connecting battery wires: first connect the battery positive wire, then connect the battery negative wire.
- Order of disconnecting battery wires: first disconnect the battery negative wire, then disconnect the battery positive wire.

6.6.2.3 Battery Charging

When charging the battery, any improper operation may lead to explosion. Always operate according to the battery and charger specifications, and do as follows:

- Adjust the charger voltage to match the battery. If the wrong voltage is selected, the charger may go overheating, and cause explosion.
- Connect the charger positive terminal [+] to the battery positive terminal [+], and connect the charger negative terminal [-] to the battery negative terminal [-]. Always fix the clamp.
- Adjust the charging current to the 1/10 of the rated battery capacity; in case of fast charging, tune down the charging current under rated battery capacity. Overcurrent may lead to electrolyte leakage or vaporization, which will cause battery on fire or exploding.
- If the battery electrolyte freezes, do not charge the battery or use different power supply to start the motor. Otherwise it will ignite the battery electrolyte and result in battery explosion.

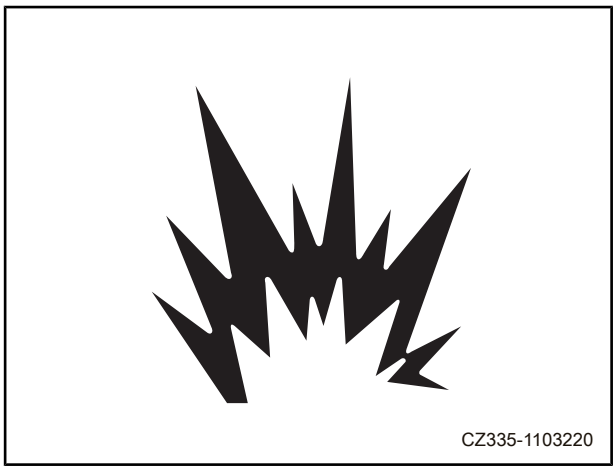


Fig 6-11

6.6.2.4 Starting the motor with auxiliary wire

⚠ WARNING

Connect and disconnect auxiliary wire！

- When connecting the wires, do not let the positive terminal [+] contact the negative terminal [-].
- Avoid the contact between normal machine and failed machine, so as to prevent sparks being generated around the battery igniting the hydrogen released from the battery.
- Be careful not to make mistakes in connecting auxiliary wires. At the end of connection (i.e. connection with upper frame), sparks will come up, so you need to connect the wire as far away from the battery as possible. (But always avoid work equipment since it is not good conductor)
- When removing the auxiliary wire, be extremely careful not to let the wire clamps touch each other or contact the chassis.

Note:

The starting system adopts 12V voltage, is normally supplied by two 12V battery in series.

The specification of auxiliary wire and clamp should conform to the battery specification.

The battery should have the same capacity with the motor which it will start.

Check whether the wires and clamps are broken or corroded.

Make sure the wires and clamps fixed well.

Check whether the safety lock control lever of the two machine both at the “LOCK” position.

Check whether all levers stay at the middle.

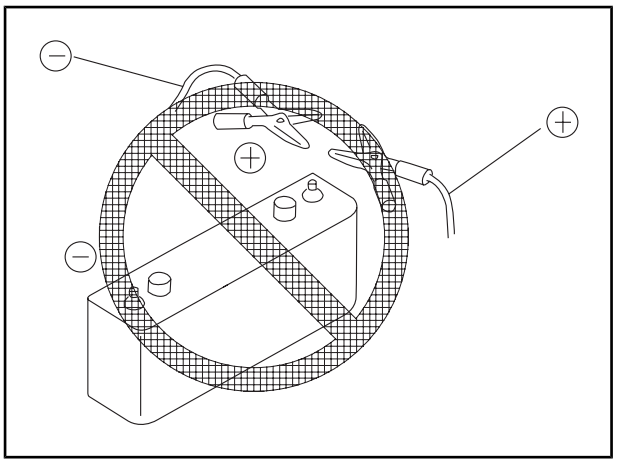


Fig 6-12

Auxiliary wire connection

Keep the ignition switches of normal machine and failed machine at OFF.

Connect the auxiliary wire according to the number order marked on the picture.

1) Connect the clamp of auxiliary wire [A] to the positive terminal [+] of the failed machine battery.

2) Connect the other clamp of auxiliary wire [A] to the positive terminal [+] of the normal machine battery.

3) Connect the other clamp of auxiliary wire [B] to the negative terminal [-] of the normal machine battery.

4) Connect the other clamp of auxiliary wire [B] to the failed machine swing frame [E]

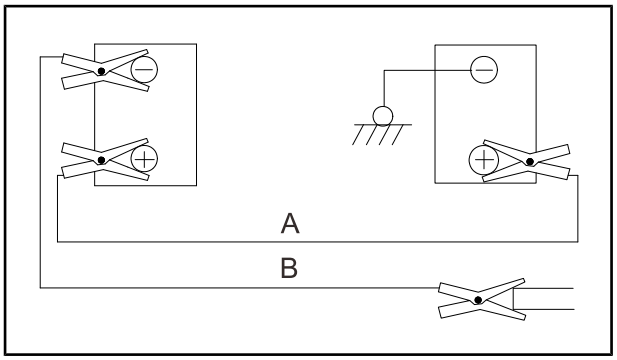


Fig 6-13

A. Cable B. Cable

Start the motor

⚠ WARNING

- No matter when the machine is operating normally or has failed already, always check the machine, and keep the safety lock control lever at the “LOCK” position, and check whether all levers stay at the neutral position.

1. Make sure that the clamps and battery terminals connected firmly.

2. Start the motor of a normal machine and run it at high idle speed.

3. Turn the ignition switch of the failed machine to the “START” position and start the motor. If the motor fails to be started in first time, try again 2 minutes later.

Auxiliary wire disconnection

After the motor startup, disconnect the auxiliary wires in the reverse order of connecting them.

1) Disassemble a clamp of auxiliary wire [B] from swing frame of the failed machine.

2) Disassemble the clamps of auxiliary wire [B]from the battery negative terminal [-] of the normal machine.

3Disassemble the clamps of auxiliary wire [A] from the battery positive terminal [+] of the normal machine.

4) Disassemble the clamps of auxiliary wire [A]from the battery positive terminal [+] of the failed machine.

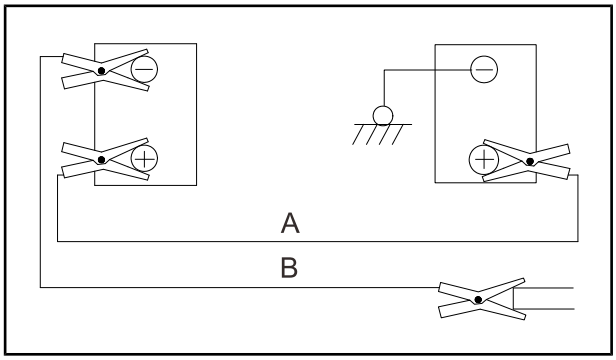


Fig 6-14

A. Cable B. Cable

6.7 Hydraulic system failure

- When a fault occurs, please conduct inspections according to the table below, and contact Sany authorized dealer to carry out repairs.
- Set the excavator to the highest speed for fault diagnosis.

Fault content	Fault analysis	Measures
The work equipment moves slowly, or it has low traveling and rotation speed	• The main relief valve is improperly adjusted or fails • Pilot relief valve failure • Regulator fault • Piston pump fault	Contact the dealer for replacement • Contact the dealer for replacement • Contact the dealer for repair and replacement • Contact the dealer for inspection and repair
Work equipment, travel or swing failure	• Pilot safety valve fault • Fault of pilot pump relief valve • Hydraulic pump fault • Coupler fault	• Contact the dealer for repair and replacement • Contact the dealer for replacement • Contact the dealer for inspection and repair • Contact the dealer for inspection and repair
The hydraulic pump has unusual noise	• The hydraulic oil level drops • The hydraulic oil is poor • Blocking of filter screen of the hydraulic tank • Piston pump fault	• Feeding with hydraulic oil (refer to 5.1.1.2) • Filling with hydraulic oil (refer to 5.1.1.2) • For cleaning or replacement, see 7. 9. 7. 2 and 7.9.8.3) • Contact the dealer for inspection and repair
Slow boom movement	• Right pilot valve (boom oil line) failure • Boom control valve (spool) failure • Boom control valve (holding valve) failure • Boom control valve (safety valve and refilling valve) failure or seal failure • Boom cylinder fault	• Contact the dealer for inspection and repair • Contact the dealer for repair and replacement • Contact the dealer for repair and replacement • Contact the dealer for repair and replacement

Fault content	Fault analysis	Measures
		• Contact the dealer for inspection and repair
Slow arm movement	• Left pilot valve (arm oil line) failure • Arm control valve (spool) failure • Arm control valve (safety valve and refilling valve) failure or seal failure • Arm cylinder fault	• Contact the dealer for inspection and repair • Contact the dealer for repair and replacement • Contact the dealer for repair and replacement • Contact the dealer for inspection and repair
Slow bucket movement	• Right pilot valve (bucket oil line) failure • Bucket control valve (spool) failure • Arm control valve (safety valve and refilling valve) failure or seal failure	• Contact the dealer for inspection and repair • Contact the dealer for repair and replacement • Contact the dealer for repair and replacement
The single cylinder of the work equipment has no movement	• Pilot valve failure • Work equipment control valve (spool) failure	• Contact the dealer for inspection and repair • Contact the dealer for repair and replacement
The cylinder drift of the work equipment is too large	• Work equipment cylinder failure • Holding valve (boom) fault • Work equipment control valve (safety valve and refilling valve) seal failure • Work equipment valve spool failure	• Contact the dealer for repair and replacement • Contact the dealer for repair and replacement • Contact the dealer for repair and replacement • Contact the dealer for repair and replacement

Fault content	Fault analysis	Measures
The work equipment moves slowly	• Failure of the control valve (safety valve and refilling valve)	• Contact the dealer for repair and replacement
Other work equipment moves when a single oil line has an overflow	• Failure of seal of the control valve	Contact the dealer for replacement
The machine has off-tracking during traveling	• Travel pilot valve failure • Failure of pilot relief valve • Regulator fault • Seizure of traveling valve spool • Hydraulic swivel stuck • Travel motor failure	• Contact the dealer for repair and replacement • Contact the dealer for replacement • Contact the dealer for repair and replacement • Contact the dealer for repair and replacement • Contact the dealer for repair and replacement • Contact the dealer for repair and replacement
Machine traveling slowly	• Travel pilot valve failure • Failure of pilot relief valve • Failure of traveling control valve (spool) • Failure of traveling control valve (refilling valve) • Travel motor fault	• Contact the dealer for repair and replacement • Contact the dealer for replacement • Contact the dealer for repair and replacement • Contact the dealer for repair and replacement • Contact the dealer for repair and replacement • Contact the dealer for inspection and repair
The machine is hard to turn or powerless	• Traveling pilot valve failure • Failure of traveling control valve (spool) • Failure of traveling control valve (refilling valve) • Failure of travel motor (safety valve) • Failure of travel motor (check valve)	• Contact the dealer for repair and replacement • Contact the dealer for repair and replacement

Fault content		Fault analysis	Measures
			• Contact the dealer for repair and replacement • Contact the dealer for repair and replacement • Contact the dealer for repair and replacement
The traveling speed cannot be shifted		• Failure of high/low speed changeover solenoid valve • Travel motor fault	• Contact the dealer for replacement • Contact the dealer for inspection and repair
It cannot travel (only on one side)		• Travel base valve failure • Travel motor safety valve failure • Travel motor balance valve failure • Travel motor fault	• Contact the dealer for repair and replacement • Contact the dealer for repair and replacement • Contact the dealer for repair and replacement • Contact the dealer for inspection and repair
The machine cannot swing	Swing failure to left and right	• The swing valve (safety valve) is improperly adjusted or fails • swing motor fault • Swing mechanism failure	• Contact the dealer for adjustment and replacement • Contact the dealer for inspection and repair • Contact the dealer for inspection and repair
	Swing failure in single direction	• Pilot valve failure • Failure of the swing control valve (spool) • Failure of seal of the swing motor (refilling valve)	• Contact the dealer for repair and replacement • Contact the dealer for repair and replacement • Contact the dealer for replacement

Fault content		Fault analysis	Measures
Slow swing	Poor acceleration performance or slow swing	• The swing valve (safety valve) is improperly adjusted or fails • swing motor fault	• Contact the dealer for adjustment and replacement • Contact the dealer for inspection and repair
	Poor acceleration performance in single direction, or slow swing	• Pilot valve failure • Failure of swing motor (pressure compensation valve) • Failure of seal of the swing motor (refilling valve)	• Contact the dealer for repair and replacement • Contact the dealer for repair and replacement • Contact the dealer for replacement
The overrunistoolargewhen swing stops	Overswing in two directions	• The swing valve (safety valve) is improperly adjusted or fails • Swing motor fault	• Contact the dealer for adjustment and replacement • Contact the dealer for inspection and repair
	Overswing in single direction	• Pilot valve failure • Failure of the swing control valve (spool) • Failure of seal of the swing motor (refilling valve)	• Contact the dealer for repair and replacement • Contact the dealer for repair and replacement • Contact the dealer for replacement
The impact is too large when swing stops		• Swing pilot valve failure • Failure of swing relief valve	• Contact the dealer for repair and replacement • Contact the dealer for repair and replacement
The unusual noise is too loud when swing stops		• Failure of the swing valve (safety valve) • Failure of swing motor (refilling valve) • Swing mechanical device fault	• Contact the dealer for repair and replacement

Fault content		Fault analysis	Measures
			• Contact the dealer for repair and replacement • Contact the dealer for inspection and repair
Excessive swing	When applying swing parking brake	• Fault of the swing brake control pipe • Swing motor (parking brake)	• Contact the dealer for inspection and repair • Contact the dealer for repair and replacement
	When applying swing parking brake failure hydraulic drifting	• Failure of the swing control valve (spool) • Fault of the swing motor (relief valve) • Fault of the swing motor (refilling valve)	• Contact the dealer for repair and replacement • Contact the dealer for repair and replacement • Contact the dealer for repair and replacement

6.8 Other common faults

Fault conten	Fault analysis	Measures
Noisy structural member	• Abnormal noise caused by loose fasteners • Increasing end clearance between bucket and arm due to abrasion	• Check and tighten up again • Adjust the clearance to 1mm
Bucket tooth dropping in operation	• Deformation and weakness of bucket tooth pin spring after long-term use • Mismatching of bucket tooth pin with tooth base	• Replace the bucket tooth pin
Track twist under the excavator	• Loose track • Sprocket running fast in front on the bumpy road	• Tighten the track • Guide wheel running slow in front on the bumpy wheel

Fault conten	Fault analysis	Measures
Fan fails to rotate	• Poor contact of electrics or connector • Blowing rate switch, relay or temperature control switch damage • Fuse breakage or low battery voltage	• Replug the connector • Replace the blowing rate switch, relay or temperature control switch • Contact the dealer for repair
Small air volume with fan running normally	• Obstacle at intake side • Poor heat transfer due to blockage of radiator fin • One of the fan impeller stuck or damaged	• Clean the obstacles at intake side • Carefully clean the fin blockage • Contact the dealer to replace the fan

Maintenance

7.Maintenance

7.1 Maintenance Guidelines

Do not perform any inspection and maintenance not described in this manual.

Hour meter reading

Check the hour meter reading daily to determine whether maintenance must be performed.

Sany Heavy Machinery’s genuine wear parts

Use Sany Heavy Machinery’s genuine parts specified in the parts manual for replacement.

Sany Heavy Machinery’s genuine lubricating oil

Use the original lubricating oil of Sany Heavy Machinery Co., Ltd. Select the appropriate and grease according to the ambient temperature.

Clean lubricating oil

Use clean grease. Keep the oil and grease containers clean and prevent foreign matters from getting into such oil and grease.

Check drained hydraulic oil and used oil filter element

After changing the hydraulic oil or the hydraulic oil filter element, check the used oil and filter element for metal chips and foreign matters. If you find a lot of metal chips and foreign matters, report this to the service staff and take appropriate measures.

Warning signs

Before maintaining the machine, hang a “Do Not Operate” sign or a similar warning sign on the ignition switch or direction control to warn others that the machine is under maintenance. If necessary, an additional warning sign can be attached around the hydraulic excavator.

Welding instructions

- urn off the excavator starting switch for about one minute and then disconnect the negative (-) terminal of the battery.
- Connect the grounding cable at more than 1 m away from the welding position. If the grounding cable is connected to instruments, connectors, or other accessories, such meters will malfunction. If there is a seal or bearing between the welding position and the grounding point, the grounding point shall be changed to keep away from such parts.

- Do not select the grounding point in the area around the work equipment pins or hydraulic cylinders.
- Do not use voltages greater than 200 V continuously.

Prevent items from falling into the machine

- When opening the inspection hatch or the fuel tank filler for inspection, take care to prevent nuts, bolts, or tools from falling into the machine. If they falls into the machine, they will damage the machine and cause malfunctions and accidents. Therefore, such items shall be taken out immediately after they falls into the machine.
- The items necessary for inspection can be put into your pockets only.

Dusty sites

When working in dusty sites, you shall follow these steps:

- When checking the machine or replacing the oil, stop the machine in a dust-free place to prevent dust from entering the oil.
- Clean the filter element in a timely manner when the blocking alarm on the air filter gives an alarm.
- Clean the radiator fins and other parts of the heat exchanger devices frequently and be careful not to block such fins.
- Clean and replace the fuel filter frequently.
- Clean the electrical components, especially key parts such as motors and alternators, to prevent dust accumulation.

Avoid mixing lubricating oil

Do not mix different brands or grades of oil. If you need to add different brands or grades of oil, drain the old oil and then replace it with new oil.

Lock inspection cover

When opening the inspection cover for maintenance, use the locking lever to firmly lock the cover on the designated position. If the inspection or maintenance is performed without locking such cover, the cover may suddenly close due to wind and cause personal injuries.

Hydraulic system bleeding

When the hydraulic equipment is repaired or replaced, or the hydraulic lines are disassembled and installed, the air in the oil lines must be discharged.

Installation of hydraulic hoses

- When removing parts at the positions sealed with O-rings or gaskets, clean the mounting surface and replace them with new ones. Be careful not to forget to install O-rings and gaskets.
- Do not twist or bend the hoses during installation. This will damage the hoses and significantly shorten their service lives.

Inspection after inspection and maintenance

If the inspection is not performed after inspection and maintenance, an unexpected malfunction may occur, resulting in serious injuries or damages. Be sure to follow the steps below: :

- Check the relevant items when the motor run. For details on checking the relevant items when the motor runs.“” on page (see **2.4.7 “**Maintenance during motor running” on pages 2-46 and be careful.
  - Check whether the inspected and maintained items are working properly.
  - Check for oil leakage when the motor speed rises and the load is applied on the oil.
- Check the relevant items after the motor stops running.
  - Check whether you have forgotten any inspection or maintenance position.
  - Check whether you have finished all inspection and maintenance items correctly.
  - Check whether there is any tool or part that has fallen into the machine. It is very dangerous if the part falls into the machine and snaps into the linkage mechanism.
  - Check whether water or oil leakage occurs and whether all bolts are tightened.

Close the access door tightly

When closing the access door after inspection and maintenance, hold the handle and lift the access door slightly to check whether the lock tongue is firmly locked. If the access door is not locked, it may open, thus causing dangers.

Maintenance of power battery, drive motor and electric control system

Before each maintenance, make sure that the maintenance operators have received relevant technical training.

- This series of electric excavators contain high voltage components (the orange harness is the high voltage wire), so except for high voltage measurement, all operations shall be carried out under the high voltage off condition, and the low voltage power supply of the vehicle shall be disconnected before the high voltage is disconnected.

- Do not directly contact the interior of high voltage wires and high voltage devices with hands or other non-insulators at any time. Do not open high voltage components at any time to avoid failure unless professional technicians or professionally trained personnel are present.
- When cleaning the excavator, avoid directly flushing any high voltage components or cabin , so as to avoid abnormal condition of or damage to the product caused by water ingress into the components.
- Before any welding operation, disconnect the power supply of the 12V or 24V battery and all controllers and high voltage wires. Otherwise, it may cause the electrical components to burn out.

7.2 Lubricating oil and coolant

7.2.1 Lubricating oil

- The lubricating oil in the hydraulic equipment will continuously deteriorate in use due to extremely harsh working conditions (high temperature and pressure).
- Be sure to use the oil recommended in this manual and matching the highest and lowest ambient temperatures.
- The oil shall be changed within the specified oil change interval even if it is not dirty.
- As the blood in the human body, lubricating oil shall be treated with care to prevent foreign matters (water, metal particles or dust) from entering.
- Most of the machine’s failures are caused by the ingress of foreign matters. During storing or filling oil, special care shall be taken to prevent any foreign matter from getting into the oil.
- The oil shall be filled according to the specified amount of oil, otherwise it will cause abnormality.
- Do not mix different grades or brands of oil.
- If the oil in the work equipment is not clean, there is water in the oil, or the air gets into the oil lines, please contact our authorized dealer.
- In order to check the condition of the machine, it is recommended that oil analysis shall be performed regularly. If you need this service, please contact our authorized dealer.
- During oil change, be sure to replace related filter elements.
- Please use the oil recommended by Sany. Do not use unrecommended hydraulic oil because it may block the filter element once you use it.
- When changing the hydraulic oil, drain the residual oil in the lines and the cylinder as far as possible. It is allowed to mix a small amount of two types of oil.

7.2.2 Coolant in the cooling system

- River water contains a lot of calcium and other impurities. If river water is used, scale will adhere to the motor and radiator, resulting in heat exchange failure and overheating.
- Be sure to observe the precautions for usage of antifreeze in the "Operation and Maintenance Manual".

- The machine is delivered by Sany with its genuine antifreeze in the coolant.
- Sany antifreeze can effectively prevent corrosion of the cooling system.
- Sany antifreeze can be used continuously for two years or 4000 hours. Therefore, this antifreeze can be used even in hot areas.
- The antifreeze is flammable, so keep it away from open fire.
- The mixing ratio of water and antifreeze varies with the different ambient temperature.
- Fill the coolant after the equipment is shut down and cools down.
- Insufficient cooling water will cause corrosion of the cooling system due to air entry.

7.2.3 Grease

- Grease is used to prevent twisting at the connections and noise.
- Fill grease if any part becomes inflexible or produces noise after used for a long time.
- Be sure to use the recommended grease, and select grease in accordance with the replacement cycle and ambient temperature recommended in this manual.
- Sany antifreeze can effectively prevent corrosion of the cooling system.
- When filling grease, wipe away the old grease that has been squeezed out.
  Be sure to wipe away the old grease that has been stained with sand and dirt, otherwise it will cause wear of the rotating parts.
- The antifreeze is flammable, so keep it away from open fire.
- The mixing ratio of water and antifreeze varies with the different ambient temperature.
- Fill the coolant after the equipment is shut down and cools down.
- Insufficient cooling water will cause corrosion of the cooling system due to air entry.

7.2.4 Hydraulic filter element

- The filter element is an extremely important safety component that prevents foreign matters in the oil and air lines from getting into important devices and causing malfunctions.
- Replace all filter elements regularly.
- When used under harsh conditions, the filter element shall be replaced within a short period based on the sulfur content in all lubricating oil and fuel.
- Do not reuse cleaned filter element but replace it with a new one.
- Check whether metal particles are adsorbed on the old filter element when replacing it. If you found metal particles, please contact our authorized dealer.
- Do not unpack the spare filter elements before use.
- Use Sany Heavy Machinery’s genuine filter elements.

7.3 Electrical system maintenance

- The damp electrical equipment or the damaged wire insulating layer is very dangerous, causing electric leakage and machine failure. Do not flush the cab with water.

- When rinsing the machine, take care to prevent water from getting into the electrical components
- Check whether the harnesses are damaged, whether the bellows are intact, whether the connectors are loose and whether the fixing points of each harness are firm.
- Do not install any electrical component other than those specified by Sany Heavy Machinery Co., Ltd.
- External electromagnetic interference may cause malfunction of the controller in the control system. Contact our authorized dealer when you install radio receivers or other wireless devices.
- When working on a beach, carefully clean the electrical system to prevent corrosion.
  Do not connect the optional power supply to the fuse, starter switch or battery relay.
- The cab cooling fan or other electrical equipment shall be connected to a special power connector. Do not connect the optional power supply to the fuse, starter switch or battery relay.
- The main power switch of the machine that has not been used for a long time shall be disconnected and such machine shall be placed in a cool and dry place. The battery must be recharged within 35 days and the power battery must be recharged within 3 months.
- Proper torques shall be ensured for electrical connection. Excessive torques will damage the coating on the terminal surface, and too small torques will lead to loose connection and increased contact resistance. Refer to the following table for specific torque values:

Bolt Specification (mm)	Torque (N·m)
M8	8.8-10.8
M10	17.7-22.6
M12	31.4-39.2
M14	51.0-60.8
M16	78.5-98.1
M18	98.0-127.4
M20	156.9-196.2
M24	274.6-343.2

7.4 Wear parts

- Wear parts (such as filter elements, and bucket teeth) shall be replaced during regular maintenance or before reaching their wear limits.
- In order to use the machine economically, wear parts shall be replaced correctly.
- Sany Heavy Machinery’s high-quality genuine parts shall be used for replacement.
- When ordering such parts, check the part numbers in the part manual.

Wear parts

Item	Part name	Qua-ntity	Replacement interval
Hydraul-ic	Oil suction filter element Return filter element (O-ring)	1 1 (2)	Every 2000 h Every 1000 h —
Bucket	Bucket teeth Bucket tooth base Tooth pin Seal ring	3 3 3 2	—
	Left side teeth Right side teeth (Bolt) (Nut)	1 1 (6) (6)	
Travel system	Carrier plate (Bolt)	4 (8)	—

NOTE：

Note: Parts in brackets shall be replaced at the same time.

7.5 Recommended coolant and lubricating oil

- In order to keep the best condition of the machine for a long time, it is essential to follow the oil operation and maintenance instructions in this manual. Failure to do so may result in excessive wear of the drive system, cooling system, and other parts, thus shortening their service lives.
- Commercially available lubricating oil additives may cause damage to the machine. Sany Heavy Machinery Co., Ltd. does not recommend any lubricating oil additive.
- The specified capacity means the total amount of oil in the tank and lines. The adding capacity means the amount of oil that needs to be added to the system during inspection and maintenance.
- Use the recommended oil according to the ambient temperature in the table below.

Fuel and coolant

Vessel	Liquid type	Environmental temperature								
		-22 -30	-4 -20	-14 -10	32 0	50 10	68 20	86 30	104 40	12-2℉ 50℃
Track roller	Gear oil									

Fuel and coolant

Vessel	Liquid type	Environmental temperature								
		-22 -30	-4 -20	-14 -10	32 0	50 10	68 20	86 30	104 40	12-2℉ 50℃
Idler Travel gearbox		SAE 30								
Hydraulic system	Hydraulic oil	SAE 10W								
		SAE 10W-30								
		SAE 15W-40								
		ISO VG32								
		ISO VG46								
		ISO VG68								
Fitting, Grease	Lubricating grease	NLGI No.2								
Cooling system	Coolant	TEEC-L35								

Capacity table

Specified capacity		Hydraulic tank	Cooling system	Travel reducer lubricating oil
Capacity table	L	20	4.1	2×0.33

7.6 Tightening torque

NOTICE

- If the nuts, bolts, or other parts are not tightened to the specified torques, the tightened parts may become loose or damaged, causing the machine faults or problems during operation.
- Be careful when tightening the parts.

Unless otherwise specified, the metric nuts and bolts shall be tightened to the torques shown in the table below.

If the bolts or nuts need to be replaced, they shall be replaced with the same sizes of Sany Heavy Machinery's genuine parts.

[a]Thread diameter

[b] Widths across flats

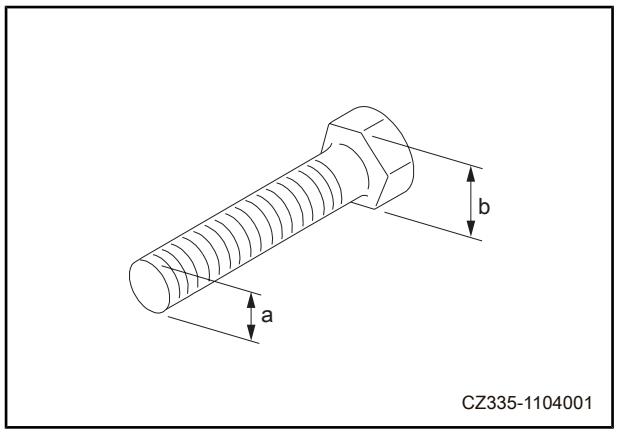


Fig 7-1

Table of tightening torque

Diameter of thread, a (mm)	Width across flats b (mm)	Tightening torque			
		Target value		Service limit	
		N·m	kgf·m	N·m	kgf·m
6	10	13.2	1.35	11.8 ~ 14.7	1.2 ~ 1.5
8	13	31	3.2	27 ~ 34	2.8 ~ 3.5
10	17	66	6.7	59 ~ 74	6.0 ~ 7.5
12	19	113	11.5	98 ~ 123	10.0 ~ 12.5
14	22	206	21	187 ~ 225	19.0 ~ 23.0
16	24	279	28.5	245 ~ 309	25.0 ~ 31.5
18	27	382	39	343 ~ 425	35.0 ~ 43.5
20	30	549	56	490 ~ 608	50.0 ~ 62.0
22	32	745	76	662 ~ 829	67.5 ~ 84.5
24	36	927	94.5	824 ~ 1030	84.0 ~ 105.0
27	41	1320	135	1180 ~ 1470	120.0 ~ 150.0
30	46	1720	175	1520 ~ 1910	155.0 ~ 195.0
33	50	2210	225	1960 ~ 2450	200.0 ~ 250.0
36	55	2750	280	2450 ~ 3040	250.0 ~ 310.0
39	60	3280	335	2890 ~ 3630	295.0 ~ 370.0

1. [a] Thread diameter

[b] Widths across flats

- Use the following table for hydraulic hoses

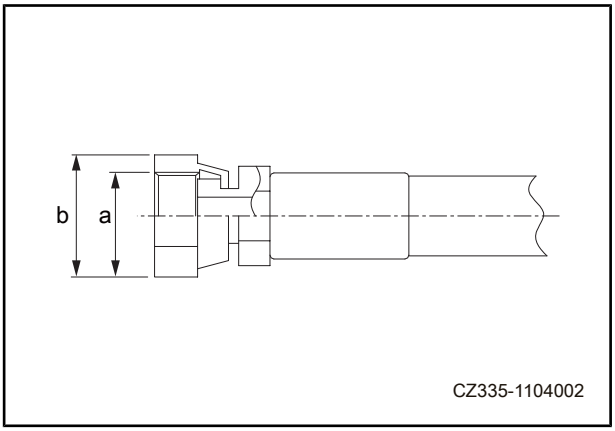


Fig 7-2

Nominal No. of thread (a)	Width across flats (b) (mm)	Tightening torque			
		Target value		Allowable range	
		N·m	kgf·m	N·m	kgf·m
M12	14	20	2.0	17.5 ~ 22.5	1.75 ~ 2.25
M14	17	24.5	2.5	19.5 ~ 29.5	2.0 ~ 3.0
M16	19	29.5	3.0	24.5 ~ 34.5	2.5 ~ 3.5
M18	22	51	5.2	43 ~ 59	4.4 ~ 6.0
M22	27	74	7.5	60 ~ 88	6.1 ~ 8.9
M30	36	135	13.8	115 ~ 155	11.8 ~ 15.8
M36	41	166	16.9	140 ~ 192	14.2 ~ 19.6

7.7 Regular replacement of safety critical parts

When operating or driving the machine, the user must regularly maintain the machine in order to always ensure safety. In addition, in order to further improve safety, the user shall periodically replace the parts listed in the table. These parts are closely related to safety and fire protection.

As the safety critical parts will become easily worn or deteriorated or their materials will also change over time, it is difficult to completely judge the conditions of such parts through regular maintenance. Therefore, they shall be replaced regardless of their conditions once the specified time expires. This can effectively guarantee the functions of these parts.

The safety critical parts, if have any abnormality before the end of their replacement cycles, must be repaired or replaced immediately.

If the hoses clips are deteriorated (such as deformation or cracks), they shall be replaced together with the hoses. O-rings, gaskets, and other similar parts must be replaced while you replace the hoses.

Contact our authorized dealer to replace the safety critical parts.

List of Safety Critical Parts

S/N	Regular Replacement of Safety Critical Parts	Quantity	Replacement interval
1	Pump outlet hoses (pump - control valve)	4	Every 2 years or 4000 hours (whichever occurs first)
2	Work equipment hoses (boom cylinder inlet)	2	
3	Work equipment hoses (bucket cylinder line - boom root)	2	
4	Work equipment hoses (bucket cylinder inlet)	2	
5	Work equipment hoses (arm cylinder line - boom root)	2	
6	Work equipment hoses (arm cylinder inlet)	2	
7	Additional line hose (root of boom)	1	
8	Additional line hose (end of boom)	4	
9	Additional line hose (swing motor inlet)	4	
10	Travel line hoses (control valve - swivel joint)	1	
11	Travel line hose (swivel joint - travel motor)	1	
12	Seat Belt	1	Every 3 years

7.8 Maintenance schedule

The standard calendar time or operation time is used as inspection and maintenance time, whichever occurs first.

In case the machine is equipped with a hydraulic breaker, the maintenance schedule for some parts is different, “” on page refer to 7.9.12 “Maintenance period when “” on page hydraulic breaker is applied” on pages 7-39.

Maintenance Schedule

Perform the following maintenance as required:

Checks before startup

7.9 Maintenance Procedures

7.9.1 Maintenance as demanded

7.9.1.1 Coolant in the cooling system - replacement

⚠ DANGER

Machine damage and casualties.
Improper operation can seriously cause machine damage and personnel injury danger, and strict adherence to standard operations is required.

- Remove the expansion tank cover and power off the entire vehicle to prevent coolant from spraying out.
- After turning off the equipment, the internal pressure of the hydraulic part of the radiator is still high and the temperature is too high. After cooling, disassemble the radiator.

Prepare a piece of water hose and a container with a minimum capacity of 6L for collecting the drained coolant.

1. Slowly turn the radiator cap [1] and then remove it after the electric excavator stops.

2. Remove the bottom cover, and then place a container under the drain valve to collect coolant. Remove the drain plug [2] on the radiator and to drain coolant.

3. After draining the coolant, close the drain valve [2] and add tap water. When the liquid level in the expansion tank is filled to above the lowest line of the observation column, start the motor and run it from low speed, then continue to run for about 15 minutes.

4. Shut down the motor and remove the drain plug [2] to drain water.

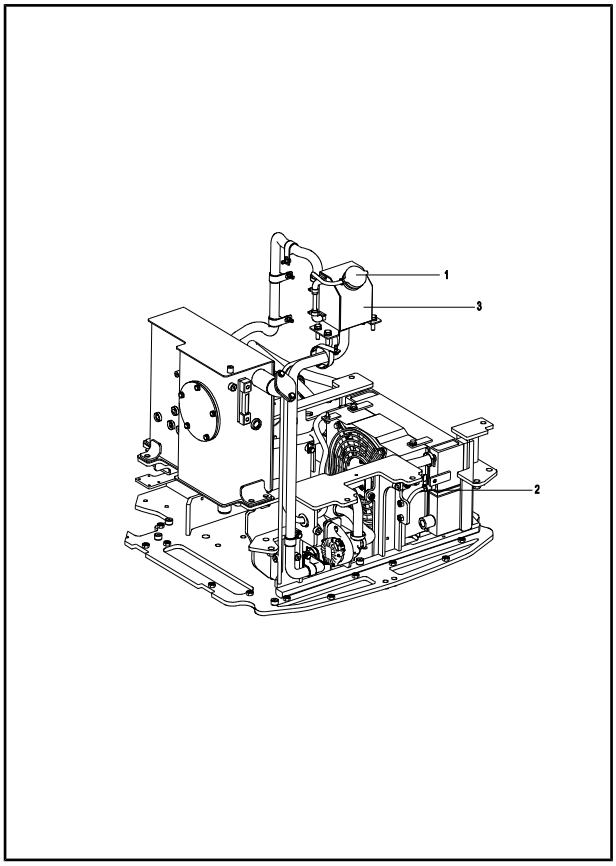


Fig 7-3

[1] Radiator cover [2] Drain plug
[3] Water tank

5. After draining the water, clean the radiator with anti-scaling agent. For cleaning method, please refer to the instructions for anti-scaling agent.

6. Use a coolant injector to add coolant via the coolant inlet.

7. The motor runs at a low speed for about 5 min and then at a high speed for 5 min to bleed the air in the coolant. (at this time, the radiator cap has been removed).

8. After draining the coolant in the coolant tank [3] and clean the interior of the coolant tank. Add coolant until the coolant level is between H and L marks 3min later, and then tighten the radiator cap.

7.9.1.2 Checking and tightening track shoe bolts

If the machine is used with the loose track shoe bolts [1], you must tighten the loose bolts immediately because they will break.

Tighten three-rib track shoes

Tighten to 50 ±5N·m with a torque wrench, and then check if the nuts and track shoes are in close contact with the link faces.

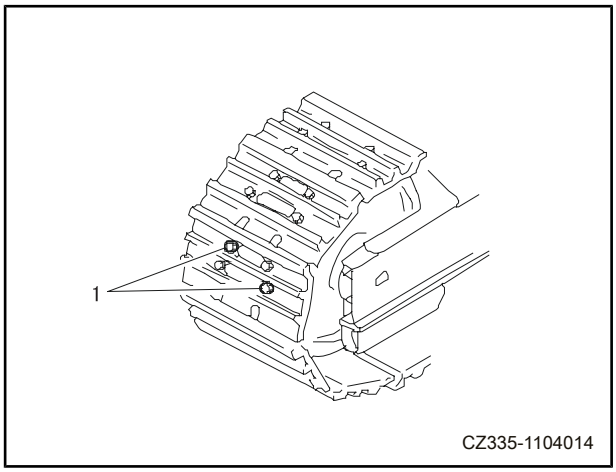


Fig 7-4

[1] Track shoe bolt

Tightening sequence

Tighten the bolts in the order shown on the right figure. After tightening, check whether the mating surfaces between the nuts and the track shoes and the links are in close contact.

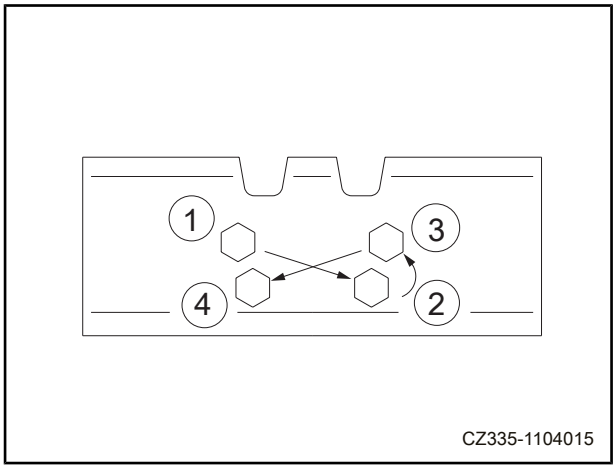


Fig 7-5

7.9.1.3 Track tension - inspection/adjustment

1. [H] The sag between the middle track roller tread and the track link rail surface

The wear of the pins and their bushings on the lower body part varies with the work conditions and soil types. Therefore, the track tension shall always be checked to maintain the standard tension.

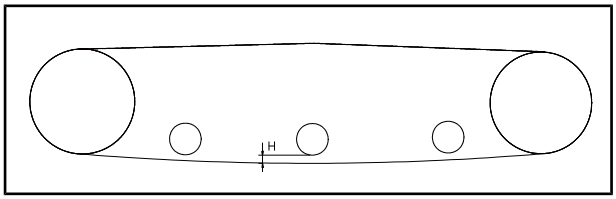


Fig 7-6

Stop the machine on a flat, solid ground to check and adjust the track shoes.

Inspection

1. Drive forward for more than 3m on the flat hard ground.

2. The bucket is supported on the ground laterally and the track shoe on one side is suspended.

3. The sag between the middle track roller tread and the track link rail surface is measured with a straight edge.

When the excavator is equipped with rubber tracks, the standard value of “H” shall be 10~20mm. If the value is greater than 25mm, the track needs to be adjusted.

When the excavator is equipped with steel tracks, the standard value of “H” shall be 20~30mm. If the value is greater than 35mm, the track needs to be adjusted.

Adjustment

If the track tension is not standard, adjust it as follows.

⚠ WARNING

- Do not loosen the screw plug [1] for more than one turn to prevent flying out under high pressure and danger.
- Do not loosen any part other than the screw plug [1]. Do not face the installation direction of the screw plug [1].
- Never attempt to remove the track or the track adjuster because the high-pressure grease in the track adjuster can be dangerous.

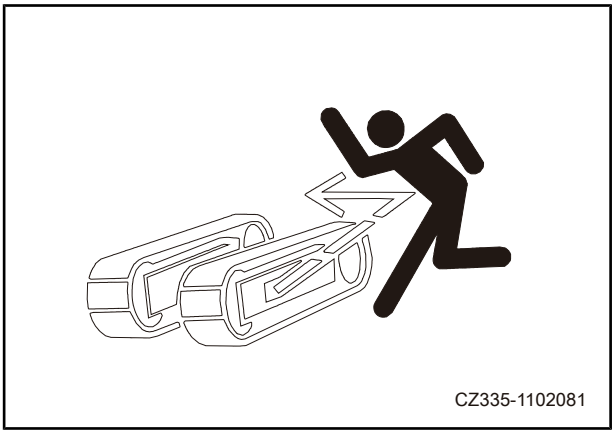


Fig 7-7

Increase the track tension.

Prepare a grease gun.

1. Use the grease gun to fill grease through the grease fitting [2].

2. Slowly move the machine 7 to 8m (23ft-26ft3in) forward when checking the track tension.

3. Check the track tension again. Readjust it if the tension is inappropriate.

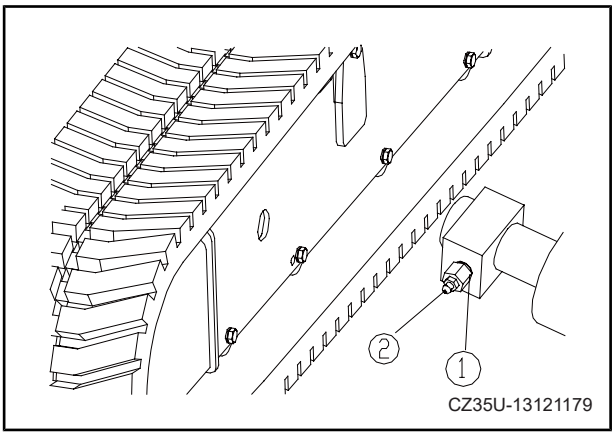


Fig 7-8

[1] Valve

[2] Lubricating grease nozzle

Decrease the track tension.

- Slowly loosen the valve [1], otherwise the lubricating grease in the track tension cylinder will spray out. When loosening the valve [1], do not face the valve [1] with your body and face.
- Do not loosen the lubricating grease nozzle [2].
- Gravel or soil between the sprocket and the track chain shall be removed before loosening of the tracks.

1. When loosening the track, slowly rotate the valve [1] counterclockwise with a 24mm long socket wrench to release grease.

2. Turn the valve [1] for 0.5-1 turn to loosen the track shoe.

3. After obtaining a proper track sag, tighten the valve [1] clockwise to 60~80N·m (6~8kgf·m).

⚠ WARNING

It is abnormal that the track is still too tight after turning the valve [1] counterclockwise, or the track is still too loose after adding grease to the grease nozzle [2]. Never attempt to remove the track or the track adjuster because the high-pressure grease in the track adjuster can be dangerous. Contact your designated dealers and the dealers authorized by Sany Heavy Machinery Co., Ltd.

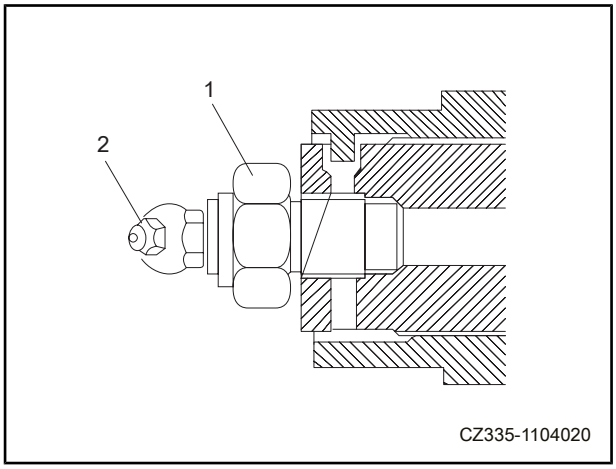


Fig 7-9

[1] Valve

[2] Lubricating grease nozzle

7.9.1.4 Bucket teeth - replacement

⚠ WARNING

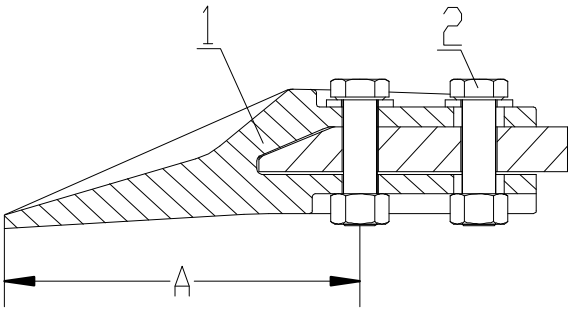
- Before replacing the bucket teeth, keep the work equipment in a stable state, shut down the excavator and lock all traveling joysticks and control handles securely. Otherwise, this may cause danger due to misoperation.
- If you knock out the lock pin with excessive force, there is a danger that the pin will fly off. Check and make sure that there is no person in the surrounding area.
- You must wear safety glasses, gloves and other protective equipment because fragments may fly off during replacement..

Replace the bucket teeth before the bucket teeth base is worn.

⚠ WARNING

- If the wear of bucket teeth exceeds the design use limit [A] shown below, replace bucket teeth [1].

New dimension of A (mm)	Use limit of A (mm)
114	50



[1] Bucket teeth [2] Bolt [A] design use limit

1. Check and make sure that the work equipment is in a stable state and then place the safety lock control lever on the “Lock” position. Place the bottom of the bucket horizontally.

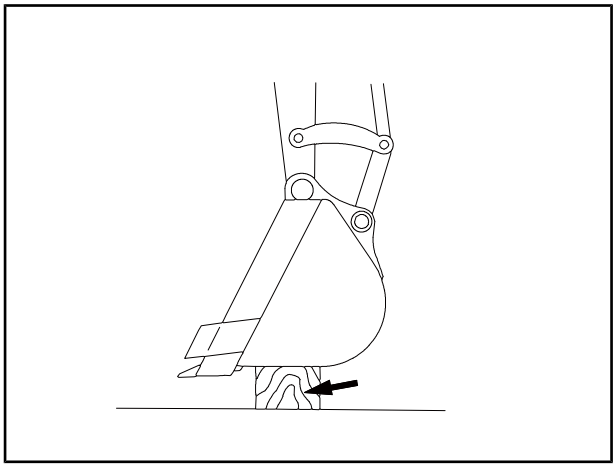


Fig 7-10

S/N	Name	S/N	Name
1	Nut	6	Washer
2	Side teeth	7	Bucket teeth
3	Bolt	8	Washer
4	Bucket body	9	Bolt
5	Nut		

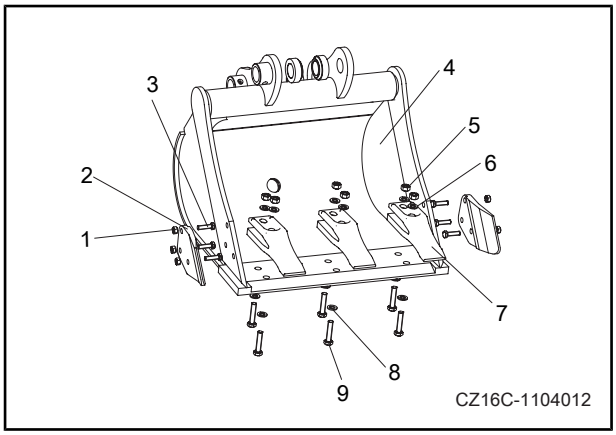


Fig 7-11

7.9.1.5 Battery maintenance

Maintenance site requirements: The site is spacious, flat and safe, with charging equipment.

Maintenance procedure:

1. Adjust the state of charge (SOC) of the battery between 25% and 40%.

2. When the vehicle stops stably, turn off the power supply, and turn off the on-board electrical equipment. Keep the vehicle powered on for 12~15 hours, during which, there is no need of person to be on duty.

3. A full charge is required after the resting time.

7.9.2 Checks before startup

For details on the following items,“Inspection before starting the motor” on page 2-29

- Cooling system coolant level - inspection/adding coolant

- Hydraulic oil level - inspection/adding oil
- Check electrical wiring
- Check and drain out water and sediment in water separator

7.9.3 Maintenance Every 50 hours

7.9.3.1 Lubricating work equipment and dozer blade

NOTICE

- If there is abnormal noise at the lubrication positions, perform other lubrication in addition to the lubrication during maintenance period.
- The machine shall be lubricated every 10 hours in the first 50 hours of operation.
- After excavating in water, lubricate the pins that are immersed in water.
- Carry out the lubrication every 10 h in case of heavy-duty operations, such as hydraulic breaker operation.。

Set the work equipment to the lubrication positions shown in the figure below,

1. Then lower the work equipment to the ground and shut off the motor.

2. Use a grease gun to add grease via the arrowed grease filler hole.

3. After adding the grease, wipe off the old grease that has been squeezed out.

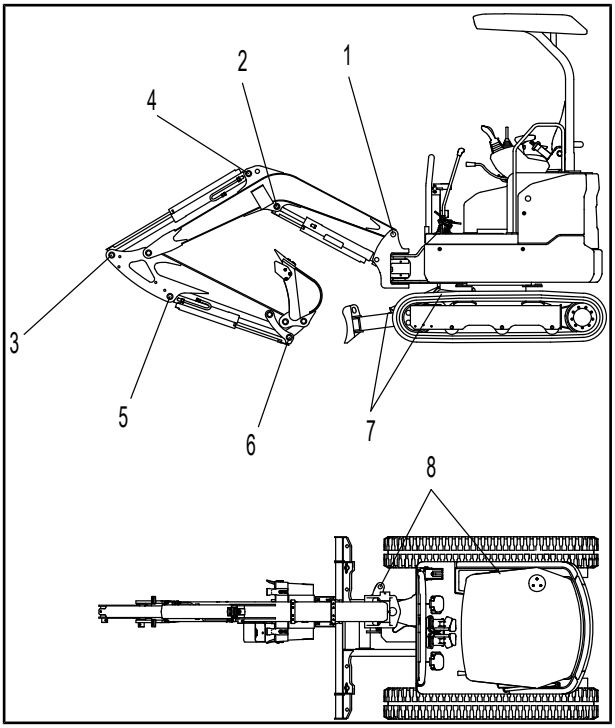


Fig 7-12

[1] Boom root pin

[2] Boom cylinder connecting pin

[3] Boom-arm connecting pin

[4] Arm cylinder connecting pin

[5] Bucket cylinder connecting pin

[6] Bucket-link connecting pin

[7] Dozer blade connecting pin

[8] Dozer blade cylinder connecting pin

1. Boom root pin (1 pc)

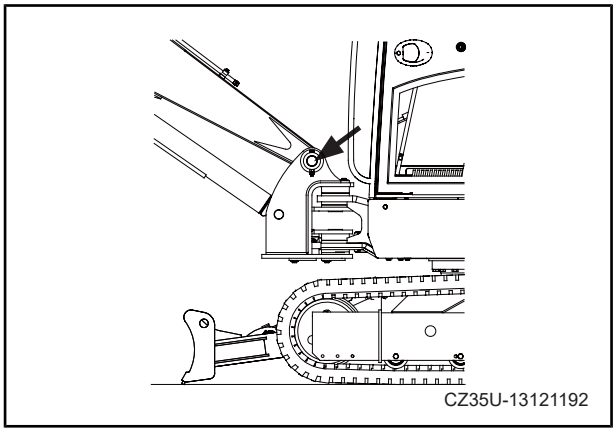


Fig 7-13

2. Boom cylinder connecting pin (2 Nr.)

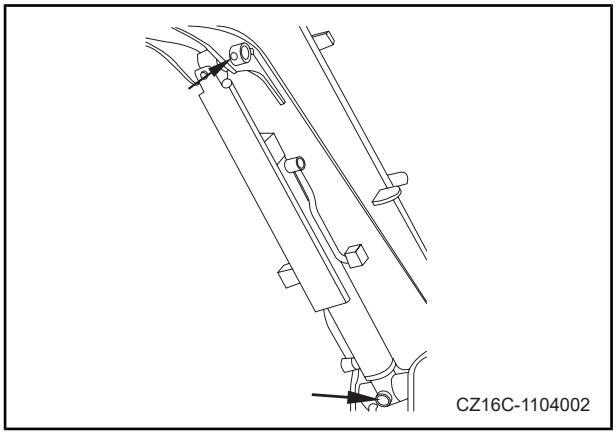


Fig 7-14

3. Boom-arm connecting pin (2 Nr.)

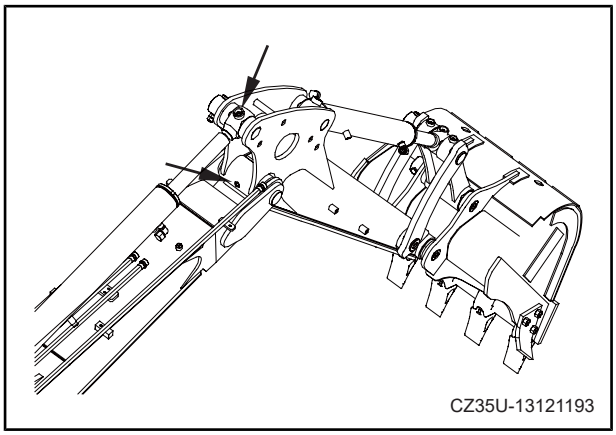


Fig 7-15

4. Arm cylinder connecting pin (1 Nr.)

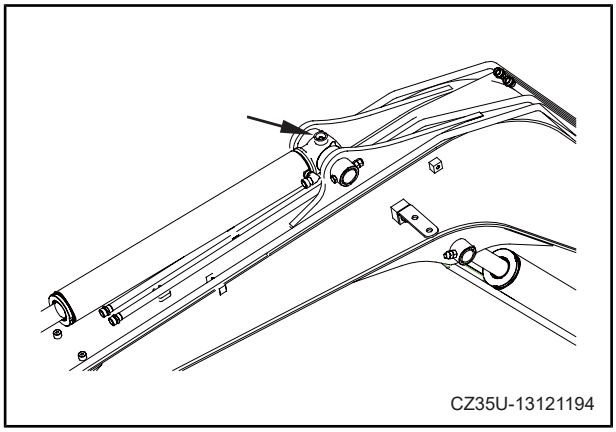


Fig 7-16

5. Bucket cylinder connecting pin (1 Nr.)

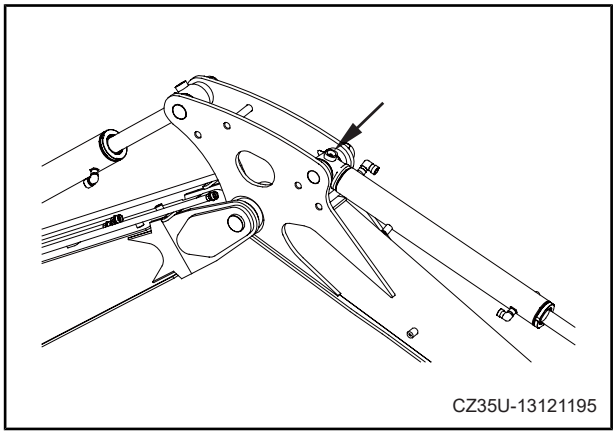


Fig 7-17

6. Bucket-link connecting pin (6 Nr.)

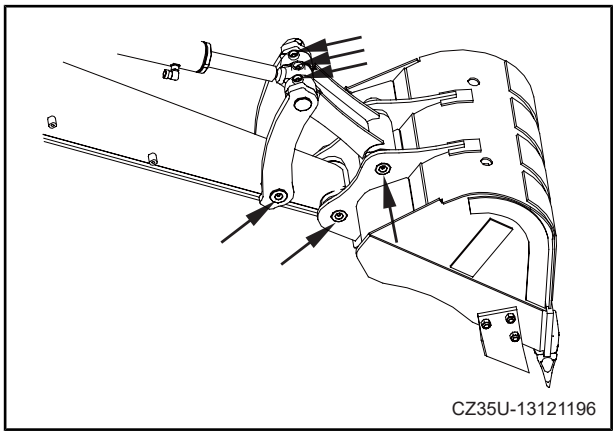


Fig 7-18

7. Dozer blade connecting pin (2 Nr.)

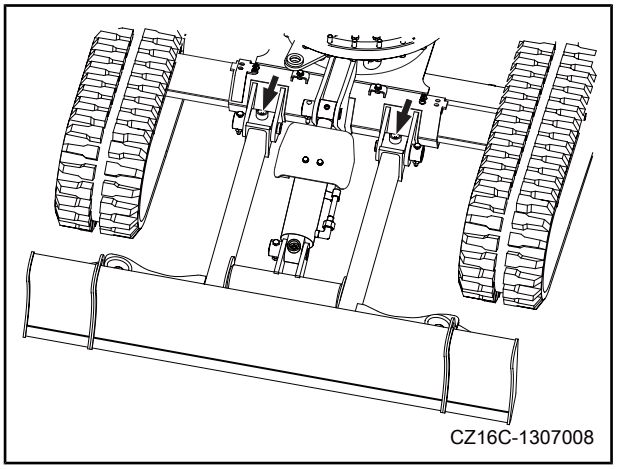


Fig 7-19

8. Dozer blade cylinder connecting pin (2 Nr.)

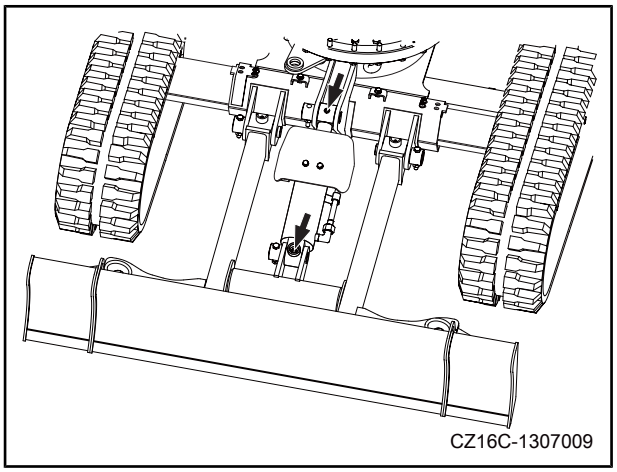


Fig 7-20

7.9.4 Maintenance Every 100 hours

7.9.4.1 Note

Conduct 50-hour periodic maintenance simultaneously.

7.9.4.2 Lubricate the Deflection Head and Deflection Cylinder

1. Lower the working device and dozer blade onto the ground, make them enter the lubrication posture as shown in the figure, and shut down the motor.

2. Use a grease gun to apply grease from the marked grease nipples.

3. After adding the grease, wipe off the grease that has been squeezed out.

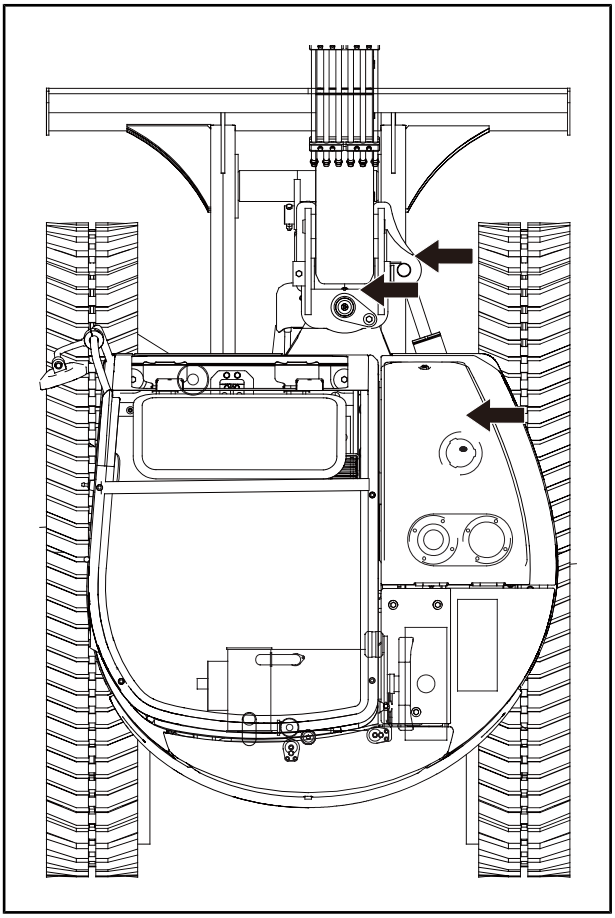


Fig 7-21

7.9.5 Maintenance Every 500 hours

7.9.5.1 Note

Maintenance task scheduled for every 100 hours should be carried out simultaneously..

7.9.5.2 Lubricate the Slewing Pinion and Slewing Bearing

⚠ WARNING

Risk of serious injury!
Serious personal injury could occur if the grease is applied to the gear ring of the slewing bearing improperly.

- It is dangerous to fill grease on the gear ring of the swing bearing. It is strictly prohibited to fill grease while it is rotating.
- The lubrication of the swing bearing, gear and superstructure must be done by a single person only. Keep all the people around away from the site before lubricating the swing bearing.

1. ower the work equipment to the ground, shut off the motor and then pull the safety lock lever to the “lock” position.
Park the machine on a level ground;
Lower the bucket to the ground;
Adjust the throttle lever position to MIN;
The motor runs at a low idle speed for 5 min.
Press the start button to stop the whole machine.

2. Fill grease to both grease fittings while the machine is in a stable state.

3. Start the motor, pull the safety lock lever to the “Unlock” position, lift the bucket 20 to 30 mm above the ground, swing the superstructure 45°.

4. Lower down the bucket to the ground.

5. Complete the greasing in steps from 3 for 3 times.

6. Add grease to the swing bearing until grease exudes from the swing bearing seal. Filling amount of grease: 0.3L. Do not add excessive grease.

Lubricating grease

NOTE :

- Change the grease if it is contaminated.
- Grease is used to prevent twisting at the connections and noise. Fill grease if any part becomes inflexible or has noise after used for a long time.
- The old grease extruded during grease filling shall be wiped away, and sand or dust adhering to the grease will cause wear of rotating parts.

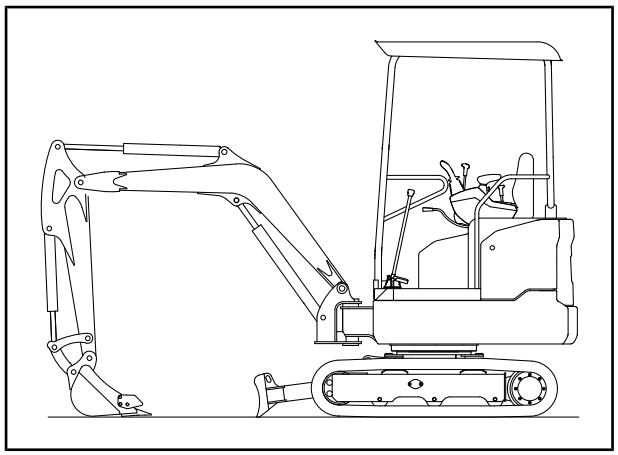


Fig 7-22

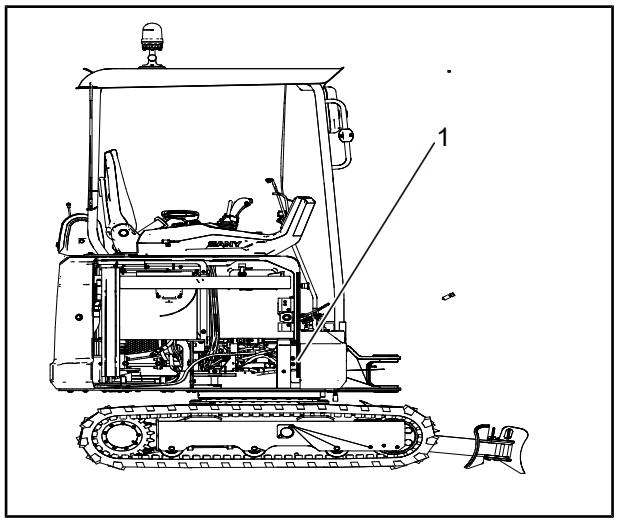


Fig 7-23

1. Lubrication port

7.9.5.3 Check the Oil Level in the Traveling Reduction Gearbox and Refill Oil

⚠ WARNING

Risk of serious injury!
Serious injury could occur if the oil level in the traveling reduction gearbox is checked improperly.

- When the machine is shut down, the hot oil may cause burns. Don't operate until the oil is cooled.
- If there is residual pressure in the box, the oil or plug will burst out. Slowly loosen the plug to release pressure.
- When loosening the plug, do not stand in front of it.

1. Park the machine on a level ground.

2. Rotate the travel motor until the drain plug [1] is at the lowest position.

3. Lower the bucket to the ground.

4. Turn the throttle control knob to MIN position.

5. The motor runs at a low idle speed for 5 min.

6. Stop the motor.

7. Turn the safety lock control lever to the “LOCK” position. Remove the dust in hexagon socket head plug with a suitable screwdriver to avoid damage. Check the oil level after 10min.

8. After the gear oil cools, slowly loosen the oil filler hole (FILL/LEVEL) plug [2] to release pressure.

9. Check the oil level via the oil filler hole, which must be at the lowest position of the hole.

10.If necessary, add oil until the oil flows out of the oil level check plug hole.

11.Wrap the thread of the plug with sealing tape, install the plug [2] and then tighten the plug [2] to 17N·m.

12.Check the gear oil of another travel reducer.

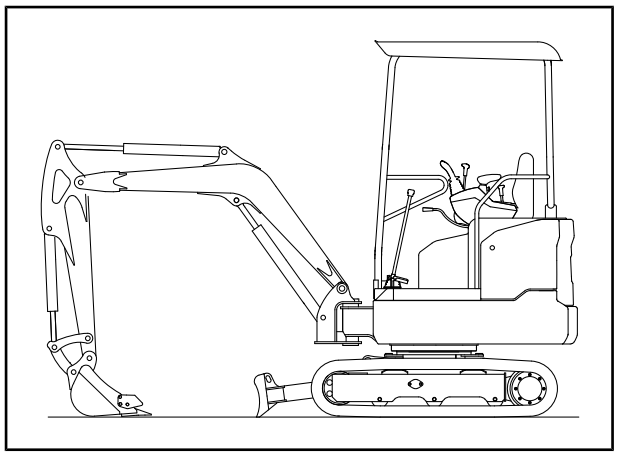


Fig 7-24

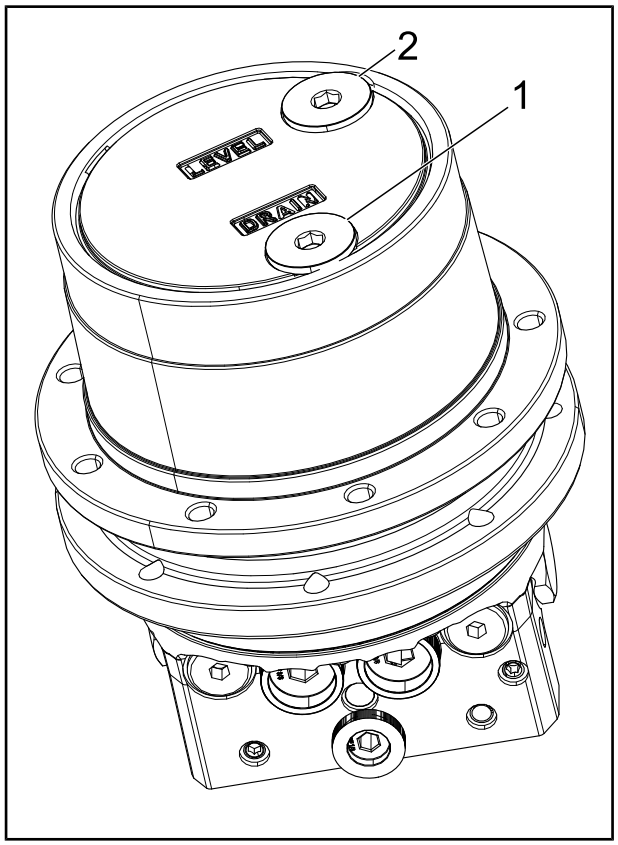


Fig 7-25

1.Drain plug 2.Oil level plug

7.9.5.4 Clean and Check Radiator Fins

⚠ WARNING

Risk of serious injury!
When you clean or check the radiator and cooler fins, if the compressed air, high-pressure water, or steam directly hits human body, or if such things are used to blow away dust or dirt, there could be a risk of serious personal injury.

- When cleaning or checking the radiator and cooler fins, be sure to wear protective goggles, dust shield, or other protective devices.

- If the compressed air nozzle is placed too close to the radiator fins during use, the radiator fins may be damaged, resulting in water leakage and overheating. Keep a suitable distance between the nozzle and the radiator fins during cleaning to prevent the radiator fins from being damaged.
- Do not spray onto the radiator core directly. Damage to the radiator fin can cause water leakage and overheating. Carry out this inspection every day in case the work site is dusty, regardless of the maintenance period.

Open the rear door and the right hood of the excavator.

2. Check the radiator fins. If there is dirt, dust and leaves, remove with compressed air or high-pressure water in the opposite direction of air flow.

- For high pressure water, the hydraulic giant shall have lower spraying pressure and set to mist at a distance of about 30 cm from the radiator fins. Otherwise, they may be deformed, causing premature clogging and cracking.

3.After cleaning, check the radiator fins for deformation, holes and cracks. If yes, make an immediate adjustment and replacement. Check the rubber hose for cracks or aging, if any, replace with a new one; check and tighten the hose clamp.

4. Remove the dust, dirt, dry leaves from the bottom plate of the platform.

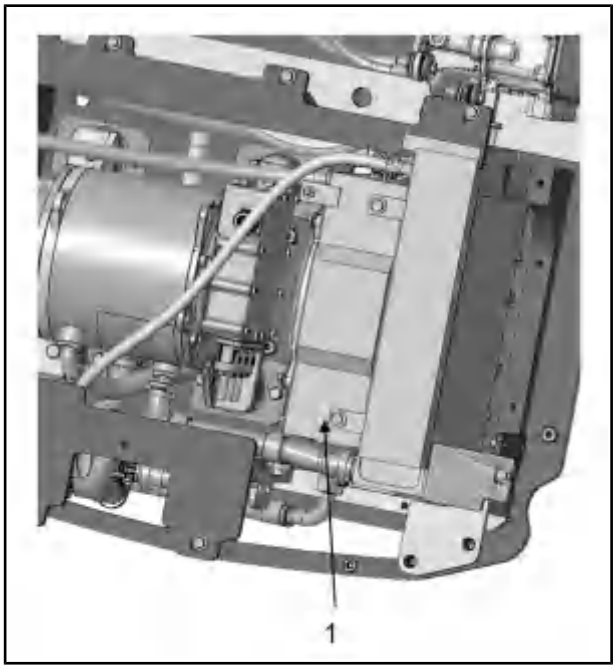


Fig 7-26

1.Radiator fin

7.9.5.5 Maintenance of battery box

In order to ensure the best performance and safety of the battery, the battery system needs to be fully maintained at least every 500h, with the specific items as follows:

1. Check whether the high and low voltage harnesses and connectors of the battery system are scratched, damaged or loose.

2. Check whether the battery box or high voltage box is free of sludge, cracks, deformations, peculiar smells or bulging.

3. Check whether the air pressure balancing valve or explosion-proof valve of the battery box is damaged.

4. Check whether the battery box and high voltage box are firmly connected with the frame, and whether the MSD is free of looseness and ablation.

5. The batteries of long-term non-occupied vehicles shall be charged and discharged circularly every three months to prevent battery damage.

7.9.6 Maintenance Every 1000 hours

7.9.6.1 Description

Maintenance task scheduled for every 100 and 500 hours should be carried out simultaneously.

7.9.6.2 Replace the Hydraulic Oil Return Filter Element

⚠ WARNING

Risk of serious injury!
During the replacement of the hydraulic oil return filter element, if the parts and oil are hot, it could cause scalding and serious injury.

- When the excavator has just been shut down, the parts and oil are still hot, which may cause burns. Do not conduct operation until they are cooled.
- When the filler cap is removed, oil may be ejected. So slowly rotate the cap to release the internal pressure and remove it gently.

NOTE：
If the machine is equipped with hydraulic hammer, the hydraulic oil will deteriorate faster than the normal bucket operation. For details of maintenance, see“Maintenance period when hydraulic breaker is applied” on page 7-40.

1.Place the machine on solid and flat ground, with the work equipment placed as shown in the figure. Lower the work equipment to the ground and shut off the motor.

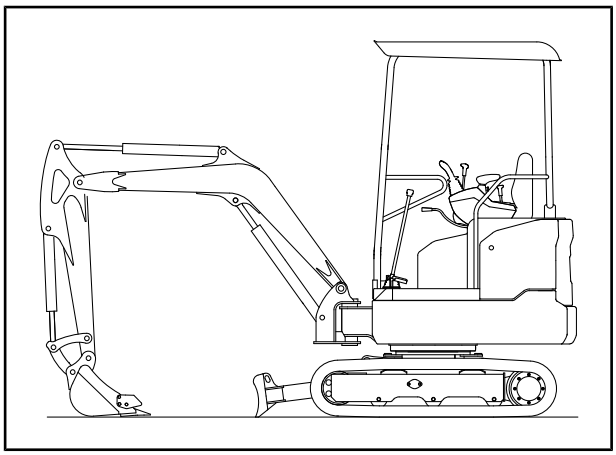


Fig 7-27

2.Open the screw plugs [6] and [4] to drain the hydraulic oil from the oil tank.

3. Remove the bolt [1] and the oil return cover [2].

4. Unscrew the oil return filter element [3] from the oil return cover.

NOTICE

Risk of machine damage!
If there are metal particles and debris at the bottom of the filter tank when replacing the hydraulic oil return filter element, the machine could be damaged.

- Remove the filter element and check the bottom of the filter tank for metal particles and debris. Excessive bronze and steel particles indicate that the hydraulic pump, motor and valve are damaged or will be damaged. Rubber debris indicates that the seal of hydraulic cylinder is damaged.

5. Discard the old oil return filter element [3] and install the new oil return filter element on the oil return cover [2].

6. Install the oil return cover [2] (ensure the O-ring is still on the oil return cover) and tighten the bolts [1] to (31±3) N·m.

7. Install the screw plugs [6] and [4], open the oil filler cap [5], and fill hydraulic oil to the appropriate level of the liquid level meter..

8. Start the excavator, and after working for one cycle, keep the working device oil cylinder in the fully extended state.

9. Close the equipment and install the filler cap [5].

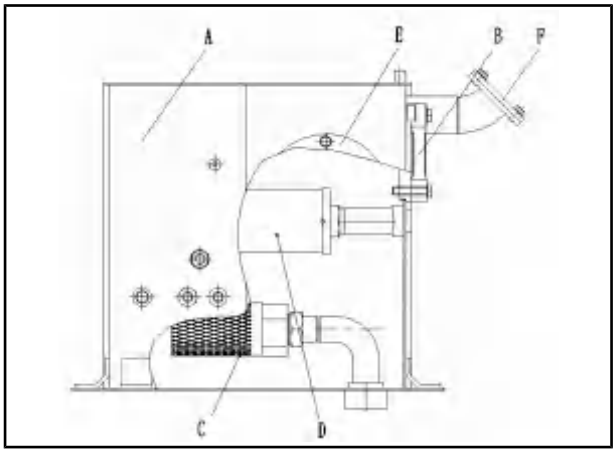


Fig 7-28

A.Reservoir	D.Return filter element
B.Liquid level meter	E.Return cover
C.Oil suction filter element	F.Suction cover

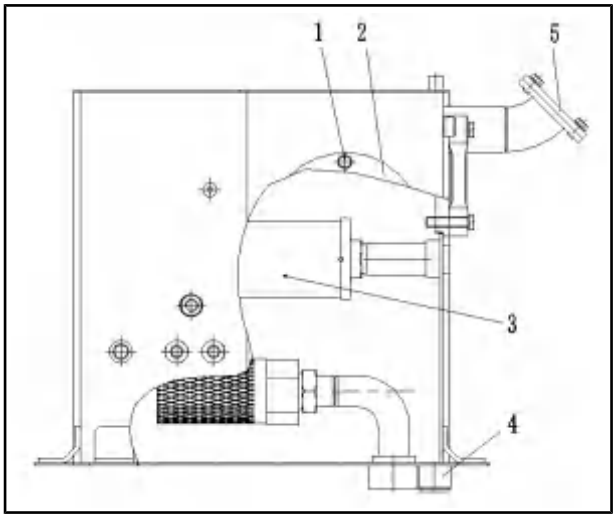


Fig 7-29

1.Bolt	2.Return cover
3.Return filter element	4.Screw plug
5.Filler cap	6.Screw plug

7.9.7 Maintenance Every 2000 hours

7.9.7.1 Description

Maintenance task scheduled for every 100, 500 and 1,000 hours should be carried out simultaneously.

7.9.7.2 Replace Oil in the Traveling Reducer

⚠ WARNING

Risk of serious injury!
Serious personal injury could occur if the oil in the traveling reducer is replaced improperly.

- After the motor is shut down, the parts and oil are still hot, which may cause scalding. Wait until they are cooled down before operation.
- If there is residual pressure inside the box, the oil or plug will fly out, causing injury. Slowly loosen the plug to release the pressure. Do not stand in front of the plug.

1.Place the machine on flat ground with the oil drain plug [1] downwards. Then shut off the motor and set the safety lock level in "LOCK" position.

2. Remove the dust in hexagon socket head plug with a suitable screwdriver to avoid damage.

3. Put an oil container under the oil drain plug [1], slowly loosen the oil level plug [2] and oil drain plug [1] to drain oil.

4. After the gear oil is completely discharged, clean the oil drain plug [1] with diesel and install it.

5. Unscrew the filler plug [2] and add the specified volume of gear oil through filler until the oil flows out of the plug hole [2].

6. Before installing, clean the plug with diesel.

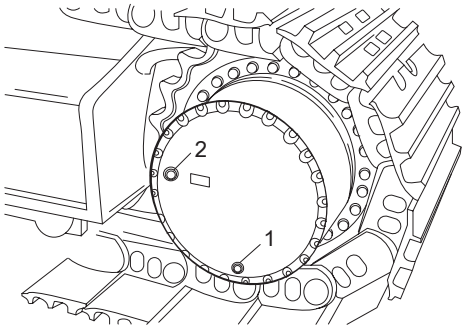


Fig 7-30

1. Screw plug 2.Screw plug

NOTE：

- Check the O-ring on the plug. Replace the damaged O-ring in time.

Routine maintenance

Always check lubricant leakage and bolt looseness, check and solve these problems as soon as possible to prevent damage to the motor. It is recommended to make checklist.

7.9.7.3 Clean or Replace the Hydraulic Suction Filter Element

⚠ WARNING

Risk of serious injury!
During the cleaning/replacement of the hydraulic suction filter element, the oil and parts are hot, which could cause scalding and serious injury.

- After the motor is shut down, the parts and oil are still hot, which may cause scalding. Wait until they are cooled down before operation.

Park the machine on level ground, and lower the work equipment to the ground. Stop the excavator and turn the safety lock control lever to the LOCK position.

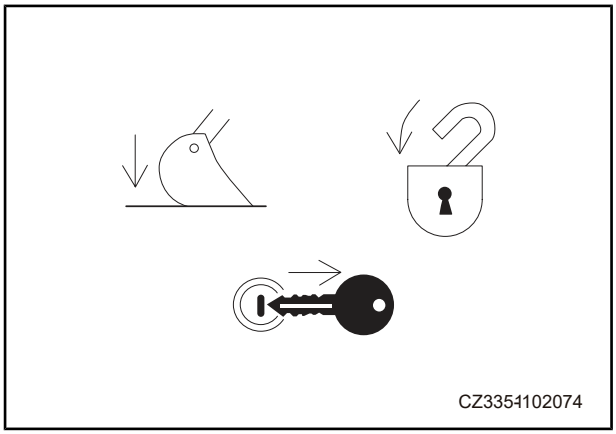


Fig 7-31

Unscrew the screw plug [1] and drain the hydraulic oil

3. Unscrew 5 bolts and take [2] out.

4.Take [2] out and unscrew [3] with a wrench.

5. Remove all dirt from the filter element [3], and then rinse it with clean diesel or flushing oil. If the filter element is damaged, replace it with a new one.

6. Screw [3] on [4] with a wrench, then install [2] and tighten [5] bolts. Tighten [1], open [5], fill hydraulic oil and check oil level gauge [6]. Start the excavator, keep the oil cylinder fully extended after the work equipment runs for one cycle, shut down the excavator, and then tighten [5] with bolts.

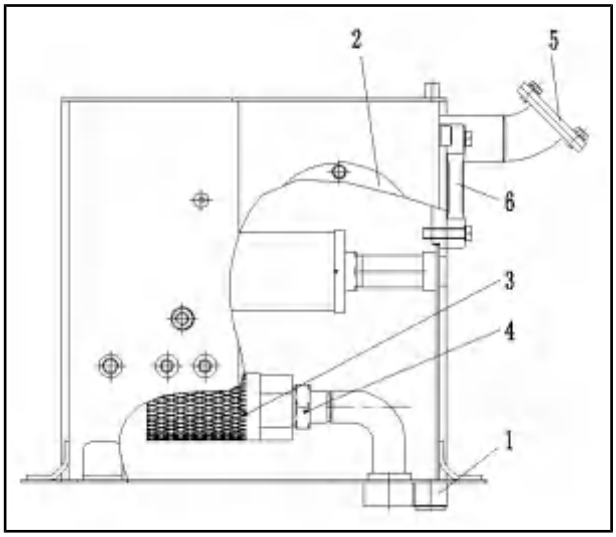


Fig 7-32

1.Bolt	4.Screw plug
2.Return cover	5.Filler cap
3.Return filter element	6.Screw plug

7.9.8 Maintenance Every 4000 hours

7.9.8.1 Description

Maintenance task scheduled for every 100, 500, 1,000 and 2,000 hours should be carried out simultaneously.

7.9.8.2 Check the Water Pump

The pulley may have oil and water leakage, clogging the drain port. In this case, contact authorized agents of SANY Heavy Industry for inspection, repair, or replacement.

7.9.8.3 Replacing the oil in hydraulic tank

NOTE：

- If the machine is equipped with hydraulic hammer, the hydraulic oil will deteriorate faster than the normal bucket operation. For details of maintenance“Maintenance period when hydraulic breaker is applied” on page 7-40.

⚠ WARNING

Risk of serious injury!
Serious personal injury could occur if the oil in the hydraulic fluid reservoir is replaced improperly.

- After the motor is shut down, the parts and oil are still hot, which may cause scalding. Wait until they are cooled down before operation.
- When removing the suction port cover, press the exhaust button of the breather valve first to release the internal pressure.

Inspection of liquid level

1. Before starting the excavator, the oil volume and level of the hydraulic tank must be checked with the liquid level gauge [1] on the hydraulic tank.

2. When the excavator is placed horizontally, the hydraulic oil shall reach the certain oil level mark on the liquid level gauge.

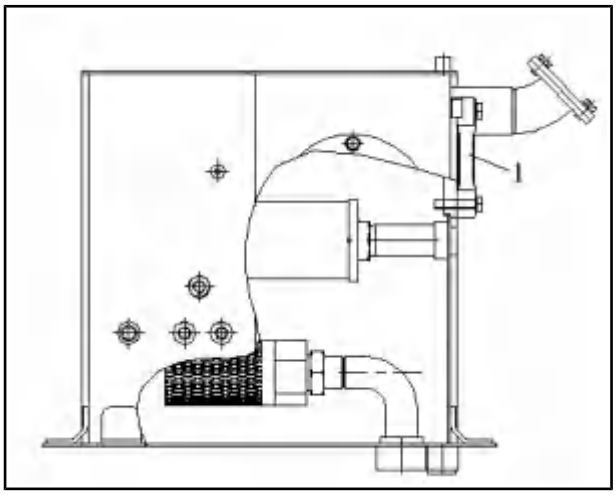


Fig 7-33

1.Level gauge

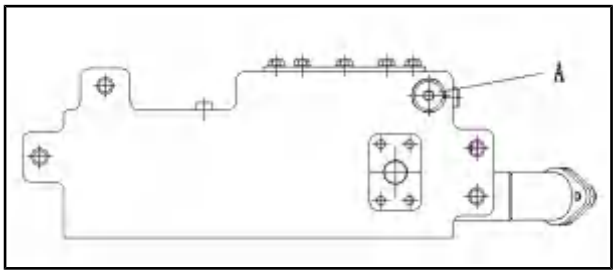


Fig 7-34

A. Oil outlet

Change of hydraulic oil

- If any abnormality is found in the hydraulic oil during inspection, the hydraulic oil must be changed, regardless of the operating time of the machine. If the hydraulic oil is contaminated or deteriorates too fast, identify the cause and then change the oil.
- If the hydraulic oil is found to be insufficient during maintenance and repair, add the hydraulic oil of the same grade as the original oil grade and the quantity specified by the oil standard.
- Pay attention to environmental protection when handling hydraulic oil.
- Always place the excavator horizontally when changing the hydraulic oil.

1. Drain the hydraulic oil into the appropriate container via the oil outlet at the bottom of the tank.

2. Clean the hydraulic tank and seal the [A] oil outlet.

3. Unscrew the screw, remove the oil suction port cap and add new hydraulic oil to the standard line on the liquid level gauge.

7.9.9 Super long prototype - maintenance

As the excavator has been in stock for a long time, some parts will deteriorate. In order to ensure the quality of the excavator parked for a long time, it will be maintained and repaired at regular intervals according to the following table:

Item	6 months-1 year (exclusive)	1-2 years (exclusive)	More than 2 years	Remarks
Grease the pin of the work equipment	○	○	○	Remove the spilled butter
Replace the hydraulic oil return filter		○	○	
Replace antifreeze			○	

7.9.10 Maintenance period when hydraulic breaker is applied

The operation of hydraulic crushing hammer accelerates contamination of the hydraulic system and deterioration of the hydraulic oil. Therefore, the hydraulic oil and hydraulic fluid reservoir filter element need to be changed frequently compared to the bucket equipped machines. Otherwise there is a risk of damage to the hydraulic crushing hammer, hydraulic oil pump and other components of the hydraulic system. The recommended replacement interval is as follows: (For the replacement methods of filter and oil, see the Maintenance Plan) Replacement interval (unit: hours)

	Machine with hydraulic crushing hammer	Machine with ordinary bucket
Hydraulic oil	1,000	4,000
Filter element	100	1,000

NOTE：

- The data in the table above are based on the 100% operation time of the hydraulic breaker. When the operation time of the hydraulic breaker declines, the replacement interval could be prolonged as shown below.
- After continuous operation of the hydraulic breaker for 100 hours, the filter element must be replaced.

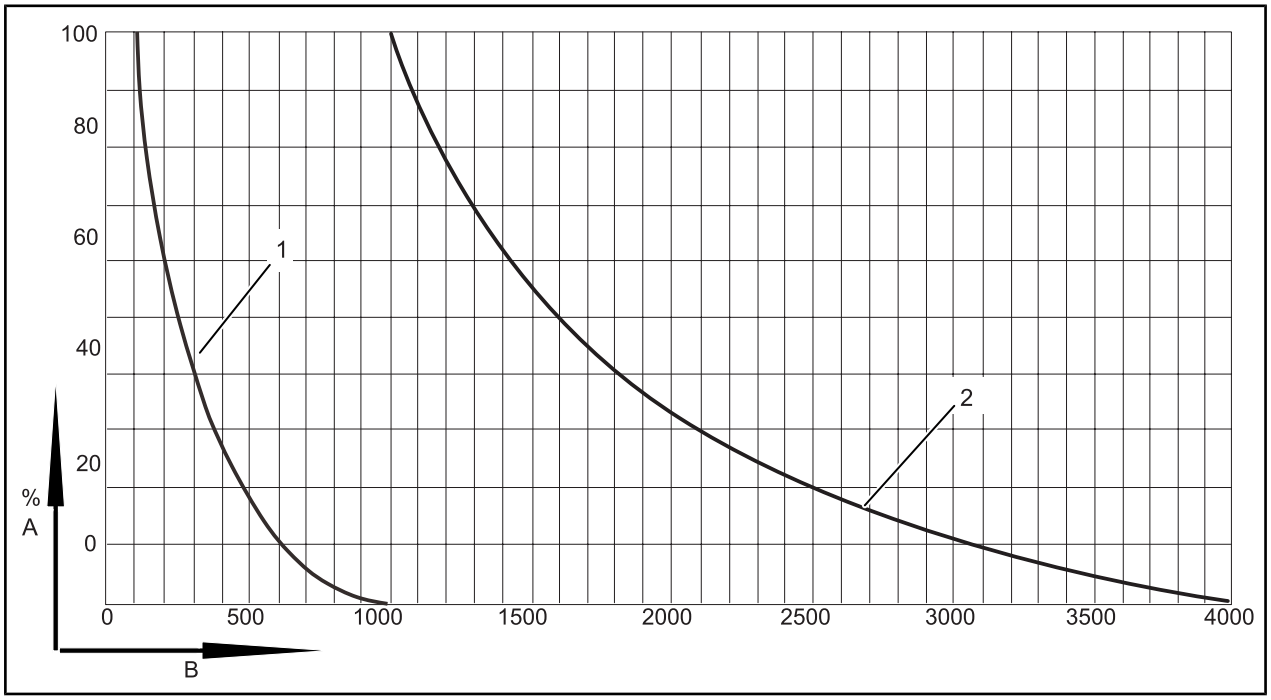


Fig 7-35

1. Replacement interval of the filter element
2. Hydraulic oil change interval

A. Average operating rate of hydraulic crushing hammer
B. Excavator operating hours

7.10 Maintenance of battery system_

7.10.1 Safety instructions

For your personal safety, please carefully read and abide by the following safety instructions:

- • It is strictly prohibited to damage the battery system by squeezing, piercing or burning the battery artificially.
- • The working environment of the battery system shall be free from corrosive, explosive and insulation damaging gases or conductive dust, and shall be kept away from heat sources.
- • When cleaning the vehicle, avoid high-voltage components and avoid adverse consequences after contact with water.
- • The maintenance personnel must hold the qualified electrician certificate and battery supplier-maintenance authorization certificate issued by the State Administration of Work Safety before carrying out maintenance operations.
- • It is strictly forbidden to touch anodes and cathodes of the battery pack with both hands at any time.
- • You should wear insulating gloves when operating and maintaining the battery system. It is strictly prohibited to wear metal ornaments such as watches.

7.10.2 Battery terminology interpretation and temperature characteristics_

7.10.2.1 Terms and interpretation

Normal commercial vehicles: refer to vehicles that are in operation and charged and discharged every day.

Motor commercial vehicles: refer to vehicles whose monthly operation frequency is not fixed and cannot be charged and discharged every day.

Long-term non-occupied vehicles refer to vehicles that have been continuously stored for more than 15 days.

SOC: refer to the state of charge.

7.10.2.2 Battery temperature characteristics

Operating ambient temperature℃	Storage environment temperature	
	Storage within one month	Long-term storage
–30~60	—20~45	0~45
Discharging temperature℃	Charging temperature℃	Optimum operating temperature℃
–30~60	0~55	20~40

7.10.3 Battery instructions_

7.10.3.1 Daily inspection

Check the vehicle instrument panel

- 1.Confirm that the battery system is in a normal status without any alarm information.
- 2.If SOC > 50%, OK; fully recharge it if conditions permit.
- 3.If SOC < 30%, low battery, recharge it in time.

If the vehicle is used in rainy seasons, it is recommended to check the battery pack/ high-voltage pack every month to confirm that the pack is free of sludge, cracks, deformations, peculiar smells, bulging, etc.

7.10.3.2 Regular maintenance

The water chiller unit shall be inspected at least once before the coming of summer every year. The specific items to be inspected are as follows:

- 1.Check whether the level of the expansion tank is normal (more than 2/3 of the liquid level). If the tank is insufficient, please refill, and then power on to check whether the water circulation is normal.

- **Reminders:** For the model equipped with the water chiller unit, if the maximum temperature of the battery exceeds 50 ℃ during high temperature operation in summer, which is abnormal, you should check the water chiller unit as required. If the fault still cannot be eliminated, please contact the after-sales service department or service station for help.
- 2. Check whether an air duct inlet of the unit is blocked, and clean foreign matters (if any) in a timely manner and wipe the filter screen with a clean cloth.
- 3.It is recommended to replace the antifreeze every two years to ensure the liquid cooling effect.
- **Reminders:** Under high temperature weather conditions in summer, the number of charging during the day shall not exceed 2, and each charging time shall not exceed 30 minutes; If the charging time exceeds 30 minutes, only one charging is allowed to avoid the normal operation affected by the high temperature of the battery.。

The vehicle shall be thoroughly inspected and maintained regularly. The specific inspection items and frequencies are shown in the table below:

Component	Inspection Item	Frequency		
		New vehicle	Normal/Motor commercial vehicles	Long-term non-occupied vehicles
Battery pack/ high voltage pack	Confirm that the pack is free of sludge, cracks, deformations, peculiar smells, bulging, etc.	3 months or 20,000 km/time (whichever occurs first)	6 months or 50,000 km/time (whichever occurs first)	6 months/time
Battery pack/ high voltage pack	Check and confirm that the box is firmly connected with the frame, and MSD is free of looseness and ablation.	3 months or 20,000 km/time (whichever occurs first)	6 months or 50,000 km/time (whichever occurs first)	6 months/time
Battery pack	Check and confirm that the balance valve/explosion-proof valve of the battery pack is free of looseness, damage and other defects.	3 months or 20,000 km/time (whichever occurs first)	6 months or 50,000 km/time (whichever occurs first)	6 months/time
Harness	Check and confirm that the harness connector is not loose, the fixing buckle/tie is not loose, the harness is not scratched or damaged, and the metal parts are not oxidized or ablated.	3 months or 20,000 km/time (whichever occurs first)	6 months or 50,000 km/time (whichever occurs first)	6 months/time

7.10.3.3 Driving requirements

1.Carry out daily inspection before driving according to 7.10.3.1.

2. In order to better maintain the battery performance, please keep good driving habits when driving.

3. The vehicle shall be thoroughly inspected and maintained regularly. The specific inspection items and frequencies are shown in the table below:

Component	Inspection Item	Frequency		
		New vehicle	Normal/Motor commercial vehicles	Long-term non-occupied vehicles
Battery pack/ high voltage pack	Confirm that the pack is free of sludge, cracks, deformations, peculiar smells, bulging, etc.	3 months or 20,000 km/ time (whichever occurs first)	6 months or 50,000 km/ time (whichever occurs first)	6 months/ time
Battery pack/ high voltage pack	Check and confirm that the box is firmly connected with the frame, and MSD is free of looseness and ablation.	3 months or 20,000 km/ time (whichever occurs first)	6 months or 50,000 km/ time (whichever occurs first)	6 months/ time
Battery pack	Check and confirm that the balance valve/explosion-proof valve of the battery pack is free of looseness, damage and other defects.	3 months or 20,000 km/ time (whichever occurs first)	6 months or 50,000 km/ time (whichever occurs first)	6 months/ time
Harness	Check and confirm that the harness connector is not loose, the fixing buckle/tie is not loose, the harness is not scratched or damaged, and the metal parts are not oxidized or ablated.	3 months or 20,000 km/ time (whichever occurs first)	6 months or 50,000 km/ time (whichever occurs first)	6 months/ time

7.10.3.4 Charging requirements

1BEVs are fully charged at least once every three days.

2.It is recommended that the daily accumulated charging capacity should not exceed 1.5 times the rated capacity.

3. The batteries of long-term non-occupied vehicles shall be charged and discharged circularly every three months to prevent battery damage.

7.10.3.5 Charger requirements

1.A charging machine that meets national standards must be used.

2. Please use the "automatic charging" function, and don't use the "manual charging" function or pull out the charger under load.

3. The charging operation shall be performed by special operators. During charging, ensure that the plug and socket are in good contact, the charging equipment works well, and all connection points of the battery system are in good contact. In case of any abnormality, the battery shall be repaired before charging.

Reminders: In case of a fire caused by abnormal charging, turn off the charging power supply on the premise of ensuring your safety, and then put out the fire.

7.10.3.6 Storage requirements

1. The battery system must be stored in a ventilated and dry place free from direct sunlight, rain, and heat sources.

2.For long-term non-occupied vehicles, the best SOC range for battery storage is 50% ~ 70%, and the cyclic charging and discharging operations shall be performed every three months.

7.10.3.7 Manual maintenance switch instructions

Functions of manual maintenance switch

- 1.Manual maintenance switch is used to manually cut off the high voltage lines, which protects the electrical appliances
- 2.Before maintaining the vehicle, turn off the manual maintenance switch. After the maintenance is complete, ensure that the manual maintenance switch is properly installed.

7.10.3.8 Battery maintenance

The battery maintenance is as follows: Fully charge the vehicle to 100% SOC automatically, then adjust the SOC to 50-70%, keep the vehicle powered on (with the key at ON) for more than 12 hours, during which, there is no need of person to be on duty.

7.10.4 Emergency handling_

7.10.4.1 Handling of impact accidents

In case of an impact accident, open the door, pull out the start key, turn off the power switch, and disconnect the manual maintenance switch on the premise of ensuring safety. Inform the battery

supplier after-sales department and prohibit the vehicle from being used again until the battery supplier after-sales department gives the battery safety judgment results.

7.10.4.2 Handling of fire accidents

In case of fire, personnel shall leave the vehicle quickly and dial the alarm telephone as the case may be.

Under the condition of ensuring personal safety, the following operations shall be performed if possible:

- 1.If the harness catches fire, spray it with a carbon dioxide or dry powder fire extinguisher.
- 2.If the battery catches fire, use a HP water torch to extinguish the fire at a safe distance.
- 3. If you inhale dense smoke accidentally, please evacuate and see a doctor as soon as possible.

Notify Sany dealers to obtain further vehicle handling opinions.

7.10.4.3 Notes for wading

If the vehicle is driving on the road with stagnant water, the following precautions shall be taken:

Fording depth	Speed	Time
≤35 cm or The fording depth is lower than the installation height of the battery pack and high-voltage pack	≤ 10 km/h	≤ 10 min

Note: If the water depth of the road is more than 35cm or the water depth exceeds the installation height of the battery pack and high-voltage pack, the vehicle shall not be allowed to pass through the road.

7.10.4.4 Notes for soaking

If the vehicle falls into the water or is soaked in ponding accidentally, the following precautions shall be taken:

1.No power on

- **Reminders:**If the vehicle is soaked in ponding due to weather or special reasons, it is forbidden to power on the vehicle, otherwise safety risks or secondary damage to the vehicle may occur.

2.Notify Sany dealers.

7.11 Maintenance of motor_

7.11.1 General

- Before leaving the factory, each motor will be strictly inspected according to the technical conditions and relevant requirements of the test program, and can be sent to the user only after passing the inspection.
- The motor has been subject to idling test before leaving the factory, so it is not necessary to carry out idling test before being installed on the working platform. Idling is only required when the motor has been stored for a longer period of time. In places where it is possible, a running-in test can be performed after the coupling has been installed, but the motor must first be allowed to run at a low speed. After running at a low speed for about 15 minutes, the speed can be slowly increased.
- In order to ensure long-term safe and reliable operation of the motor, it is recommended that users should conduct regular inspections and maintenance.

7.11.2 Maintenance and inspection items at each maintenance stage

The maintenance intervals given in this manual are for reference only. In case of motor failure, stop the operation immediately. Do not disassemble the motor without permission. Please contact Sany's authorized dealer for handling.

Daily maintenance

Check whether the water inlet and outlet of the motor are unblocked.

Check whether the grounding connection is reliable and whether the grounding mark is clear.

Check whether there is any abnormal noise during the motor operation.

Monthly maintenance

All contents of daily maintenance.

Clean the dust on the motor surface.

Check all fastening bolts of the motor. If they are loose, tighten them.

Check whether the three-phase cable and resolver harness of the motor are damaged. If they are damaged, they shall be repaired. If they cannot be repaired, they shall be replaced.

Yearly maintenance

All contents of monthly maintenance.

7.12 Maintenance of controller_

7.12.1 General

- Installation, wiring, maintenance, inspection or part replacement of equipment by non-professional personnel is strictly prohibited.
- Before wiring, disconnect the power supplies of all equipment.
- Please carry out wiring, remove the product cover or touch the circuit board with the power cut off; otherwise there will be a risk of electric shock.
- Please ensure that the equipment and products are well grounded; otherwise there may be a risk of electric shock.
- It is strictly forbidden to connect the input power to the output of the equipment or product; otherwise it will cause damage to the equipment or even cause a fire.
- It is strictly forbidden to open the product cabinet door or product protective cover, touch any terminals of the product, disassemble any device or parts of the product in the energized state; otherwise there will be a risk of electric shock.
- Before energizing, make sure that there are no people around the product, the motor and the machinery; otherwise it may lead to injury or death.
- It is strictly forbidden for non-professionals to run the product; otherwise it will lead to a risk of injury or death.
- It is strictly forbidden to touch any terminals of the equipment, disassemble any devices or parts of the equipment and products in the operating condition; otherwise there will be a risk of electric shock.
- It is strictly forbidden to touch the equipment casing, fan or resistor to test the temperature; otherwise it may cause burns.
- It is strictly forbidden to carry out maintenance of the equipment in the energized state; otherwise there will be a risk of electric shock.
- After disconnecting the power to all equipment, please wait for at least the time specified on the warning label of the product before performing maintenance and other operations on the equipment.
- When using a PM motor, even if the product's power is turned off, an induced voltage will be generated at the motor terminals during motor rotation. Do not touch the motor terminals; otherwise there may be a risk of electric shock.
- Please follow the equipment maintenance requirements for daily and periodic inspection and maintenance of equipment and products, and keep maintenance records.

7.12.2 Routine maintenance

- There is no abnormal sound during the operation of the equipment.
- There is no strong vibration during the operation of the equipment.
- The equipment is not overheated.
- The screws in the equipment are not loose.

- The low-voltage signal terminal is in good contact and the high-voltage power terminal is in good contact.
- High and low voltage cables are not damaged.
- The grounding terminal can be 360° reliably grounded.
- The coolant is sufficient without leakage.
- The water pipe and clamp shall be free of damage and looseness.
- The equipment is free of dripping and soaking (especially in heavy rain such as thunderstorms).

7.12.3 Cleaning of controller

- The dust on the surface of the equipment is removed effectively to prevent dust from entering the equipment, especially metal dust.
- The liquid and oil stains on the equipment surface are removed effectively to prevent the pollutants from retaining on the equipment surface for a long time and corroding the structural parts.
- For cleaning the equipment, please disconnect the high-voltage quick breaker at the battery terminal and clean it with a pneumatic gun or dry rag.

7.12.4 Regular inspection

- Conduct regular inspection every three months.
- Including daily inspection items.
- Check the signal terminal: No water stains, needle retraction or hole enlargement. After power on, check whether the signal is normal.
- Check the tightness: Tighten the power line connection port, the junction box cover plate screw, the signal terminal screw, and the upper cover plate screw.
- Check the breather valve for damage, blockage and aging.
- Check the harnesses, and make sure they are not loose or damaged.

Accessories and Options

8.Accessories and Options

8.1 Safety Precautions

Be attentive to safety when installing accessories or options on the machine. When selecting, installing, and using accessories or options, strictly observe the following precautions:

Precautions for Selection

- Before installing accessories or options on the machine, consult authorized agents of SANY Heavy Industry first. Depending on the type of accessory or option to be installed, you may need to install a front protection plate, overhead protection plate, or other safety structures on the machine.
- Only install accessories or options approved by SANY Heavy Industry. Sany is not liable for any accident, damage, or fault caused by accessories or options not approved by SANY.

Carefully Read User Manuals

- Before installing or using any accessories or options, you must carefully read and understand the contents of the user manuals for the accessories or options.
- If the user manual is lost or damaged, be sure to request a new manual from the accessory manufacturer or SANY authorized agent.

Precautions for Removal or Installation

Ensure safety when removing and installing accessories or options. Observe the following precautions:

- Perform removal or installation on flat and solid ground.
- When the work is performed by two or more persons, select one of them as the person in charge and obey his or her commands.
- Use a crane to move heavy objects (with a weight of more than 25 kg). (The crane can be operated only by the qualified and experienced operators with official licenses.) Never stand under the heavy objects lifted by the crane.
- Do not operate the machine when heavy objects are being hoisted by the crane during removal and installation. If necessary, use a bracket to prevent heavy objects from falling.
- When removing heavy parts, consider the impact on the balance of the machine after removal. To prevent the machine from tipping over, support the machine before removing heavy parts if needed.
- Before installing or removing an accessory or option, ensure that the accessory or option is stable and will not tip over.
- For detailed removal or installation instructions, contact authorized agents of SANY Heavy Industry.

Precautions for Usage

Observe the following precautions when installing large or heavy accessories or options.

- Before operation, move the machine to a safe site for trial operation and ensure that you are fully aware of the machine's motion, center of gravity, and operating range.
- If the machine is inclined, do not slew it; otherwise, the machine may tip over.
- During operation, ensure a safe distance from surrounding obstacles.
  Observe the following precautions when installing heavy accessories or options:
- Heavy accessories or options may have a larger slew range. Inaccurately calculating the slew range can lead to a risk of collision with other objects. Be sure to reserve sufficient space when slewing.
- To prevent the machine from tipping over, never slew, drop, or stop it suddenly.
- To prevent impact that may cause the machine to tip over, never suddenly extend or retract the boom cylinder.

8.2 Recommended Accessory Operations

8.2.1 Overview

During operation of the hydraulic excavator equipped with accessories, following specifications must be complied with.

NOTE：

- The type of applicable accessories or the model of special accessories depends on the model of the hydraulic excavator. Therefore, as for the selection of the related accessories, please contact our authorized dealer.

8.2.2 Hydraulic breaker

Main purposes:

- Rock crushing
- Demolition
- Road construction

This accessory is widely used for removing buildings, crushing road or slag, tunnel operation, rock crushing and the crushing operation in quarry.

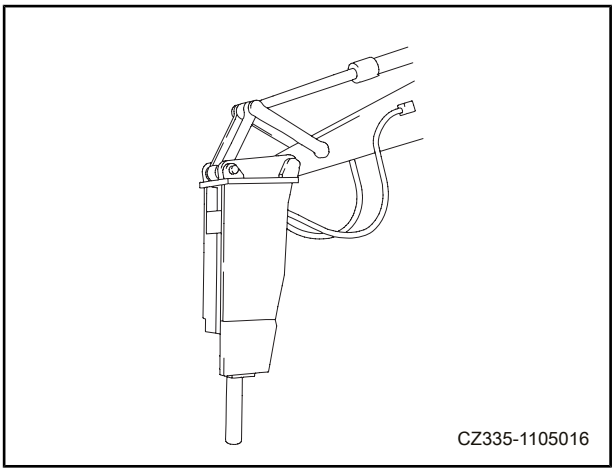


Fig 8-1

8.2.3 Operation of hydraulic breaker

1. When conducting crushing operation, tightly press the drill rod vertically on the surface of the target object.

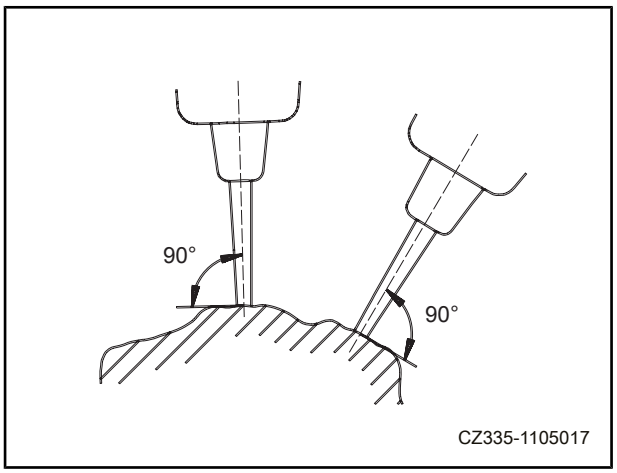


Fig 8-2

2. When applying impact, press the drill rod on the impact surface, leaving the forepart of the lower structure about 5 cm (2 in) above the ground, as shown on the right. Don't leave the machine more than that value above the ground.

NOTE :

Note: Don't lift the excavator too high.

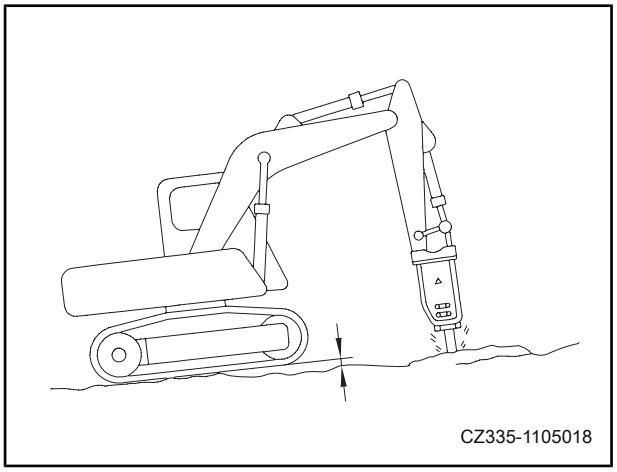


Fig 8-3

3. Tread the left pedal control valve to allow the drill rod to hit the object repeatedly. Caution: during application of continuous impact to the same surface, if the drill rod is unable to pierce or crush the surface in one minute, change the impact part and conduct crushing again on the part near the edge.

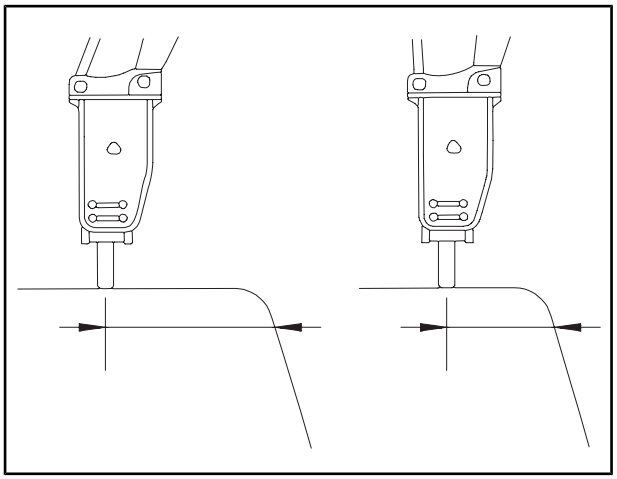


Fig 8-4

4. The piercing direction of the drill rod will gradually be out of line with the direction of the body of the hydraulic breaker. Adjust the bucket cylinder to align them.

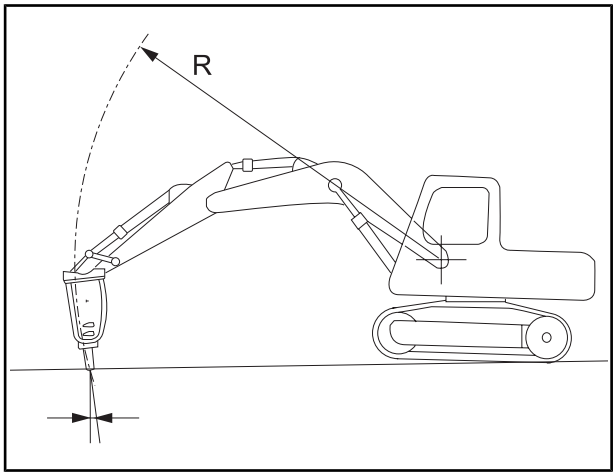


Fig 8-5

R. Working radius of drill rod

5. Consistently press the drill rod on the impact surface properly to prevent the impact without resistance.

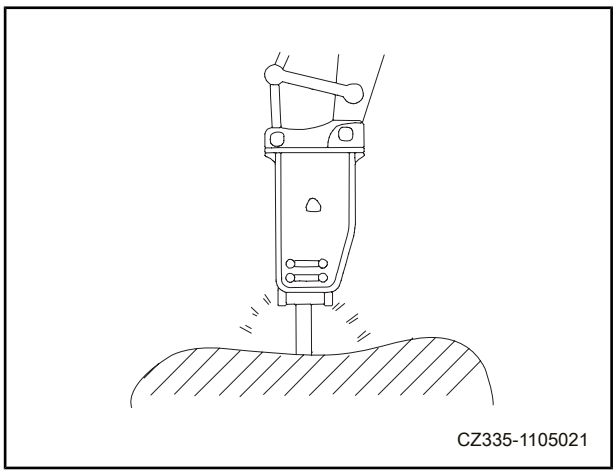


Fig 8-6

8.2.4 Forbidden operation

To ensure long service life and safe operation of the machine, do not operate the machine as the following.

- Do not operate all the cylinders to the end of the stroke. Make sure to keep a distance of about 5cm (2 in).

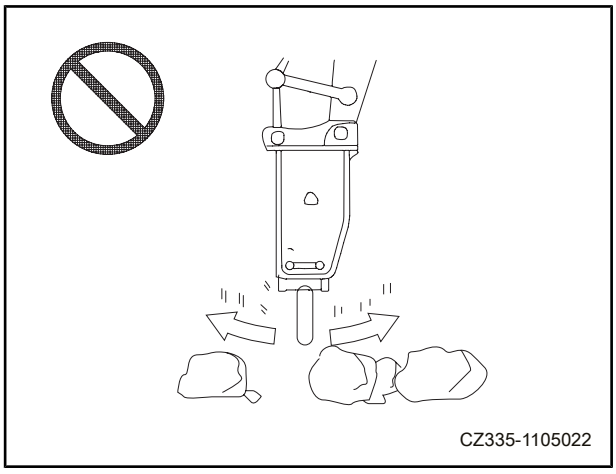


Fig 8-7

1. Accumulate the rocks and stones by the hydraulic breaker.

2. Operate with swing force.

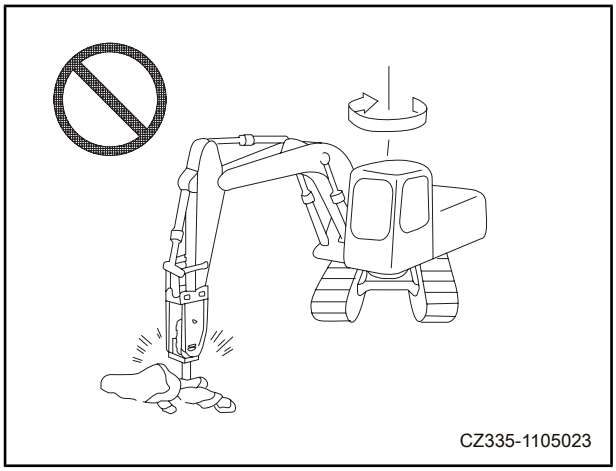


Fig 8-8

3. Move the drill rod during application of impact.

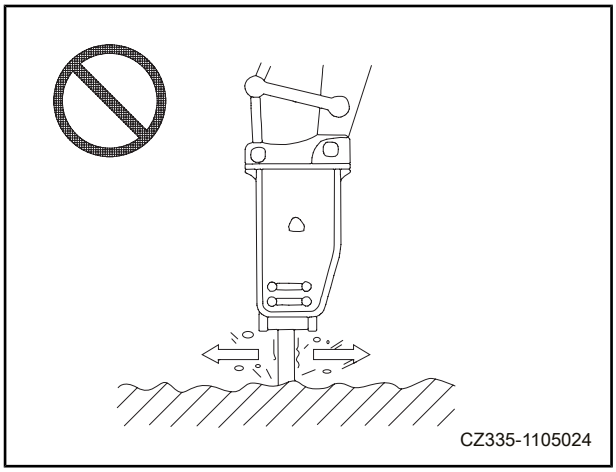


Fig 8-9

4. Keep the drill rod horizontal or upward during application of impact.

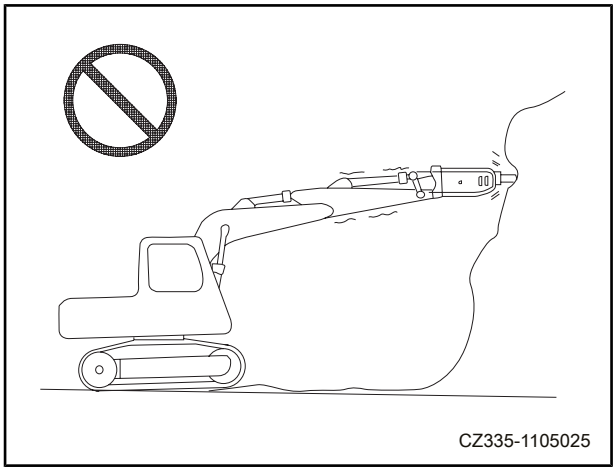


Fig 8-10

5. Swing the drill rod when the rock has been pierced.

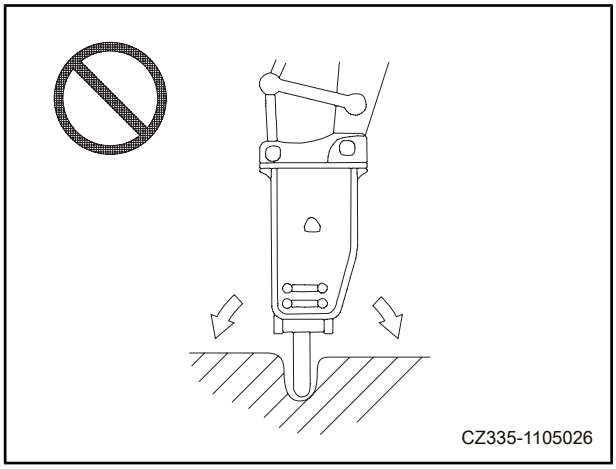


Fig 8-11

6. Pecking operation

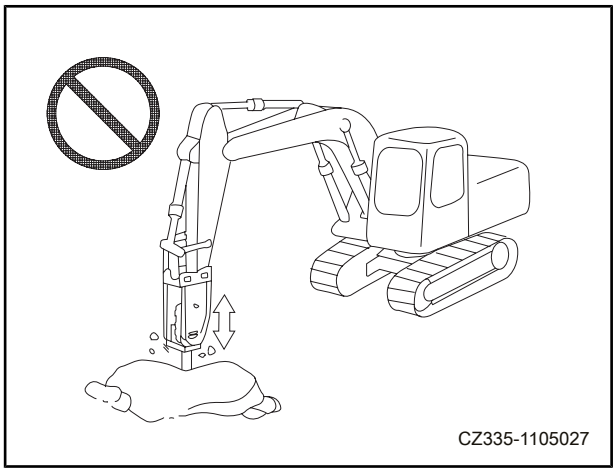


Fig 8-12

7. Lift the machine away from the ground by totally extending the bucket cylinder.

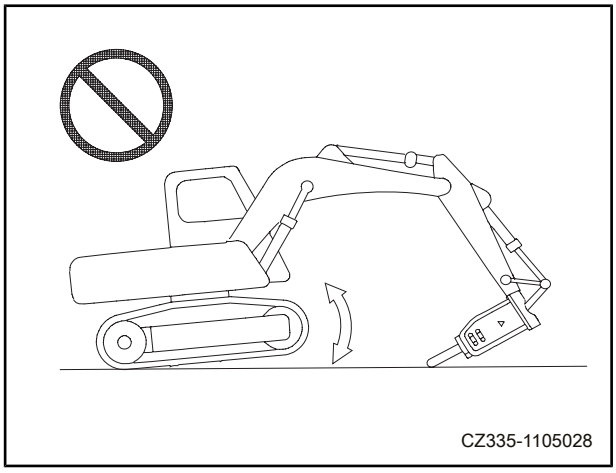


Fig 8-13

8.2.5 Greasing of hydraulic breaker

Add grease to the hydraulic breaker on the right place (as shown).

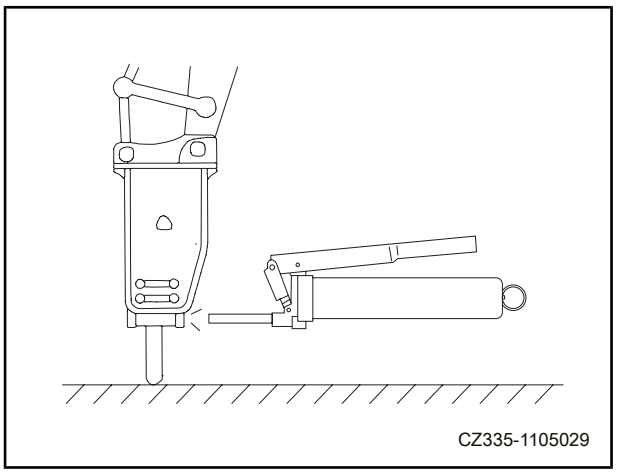


Fig 8-14

NOTE :

- Incorrect greasing operation may cause excessive grease. As a result, soil and sand will enter the hydraulic lines, such that, during operation of hydraulic breaker, the hydraulic parts will be damaged.
- Therefore, make sure to add grease to the breaker kept in right position.

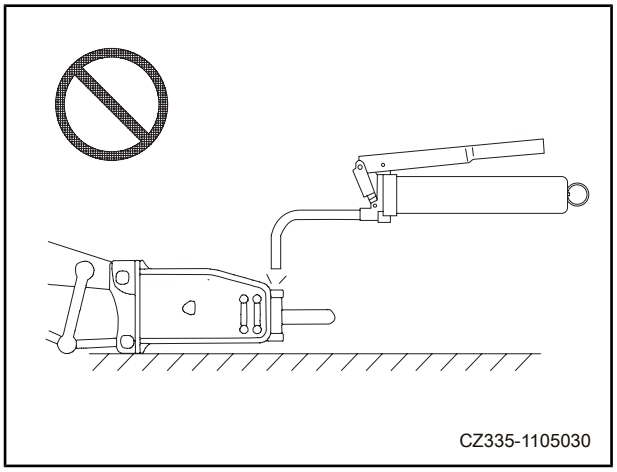


Fig 8-15

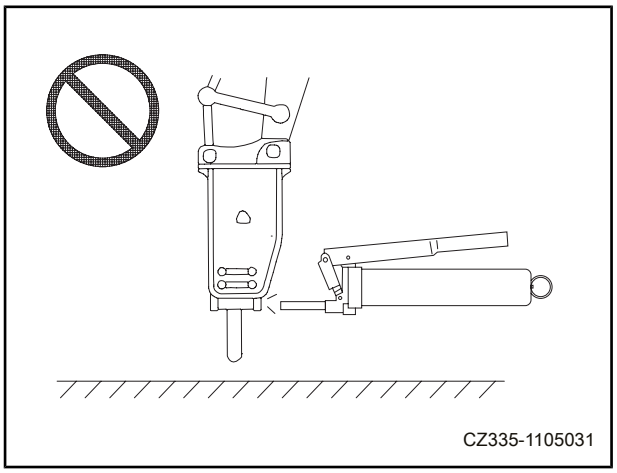


Fig 8-16

Appendix

9.Appendix

9.1 References

You can buy additional informative materials about your product from a local authorized agent of SANY Heavy Industry. Use the product name, sales model, and serial number to obtain correct information about your product.

9.2 Scrapping and Disposal of the Machine

When the product is no longer in use, the local regulations for scrapping products are different in different regions. The disposal of products varies with local regulations.

Improper disposal of waste will threaten the environment. Comply with all local regulations on retirement and scrapping of materials.

Use correct personal protective devices when retiring and scrapping products.

Please consult the nearest authorized agents of SANY Heavy Industry for more information, including the information about re-manufacturing and recycling of components.

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