ORIGINAL INSTRUCTIONS - *according to Directive 2006/42/EC, Annex I 1.7.4.1 and according to Supply of Machinery (Safety) Regulations 2008, Annex I 1.7.4.1*

TL100

Mini Track Loader

OPERATOR'S MANUAL

Part Number 92187327
1st edition English
October 2023

CASE CONSTRUCTION

COMMISSIONING

Fill-in before commissioning of the equipment:

Machine model: .....

Machine serial no./PIN: .....

Engine Serial No.: .....

Year of construction: .....

Commissioned on: .....

Dealer:

1 - INTRODUCTION

1.1 - Regarding this manual

This booklet is a manual containing the use and maintenance instructions for the operator, relating to a **Mini Track Loader** :

- model **TL100**.

This manual will help you to understand how to set your machine up, prepare it for work, perform normal operations and carry out the routine maintenance operations. Additionally, it contains indications that contribute to increasing the degree of reliability and the duration of the machine.

This manual contains information required for a safe and correct use of the equipment.

All operators must be trained and competent; they must have read and understood the instructions indicated in this manual.

The reading of this manual, careful study and verification that it has been understood by the operator, with particular attention to the safety provisions, must be part of the training and education programme.

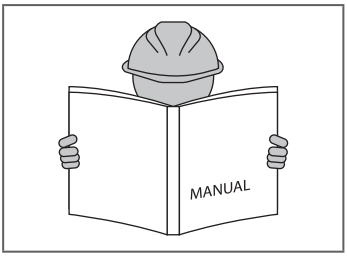
For more information see section *"2.3 - Safety signs and operation related labels" to page 2-5*.

Failure to read and comply with the instructions preceded by a safety-related warning symbol can cause death or serious injury.

This is the danger symbol. It is used in this manual to warn the user of a potential risk of personal injuries. Comply with all the safety notices referred to this symbol to prevent the risk of serious injuries or death.

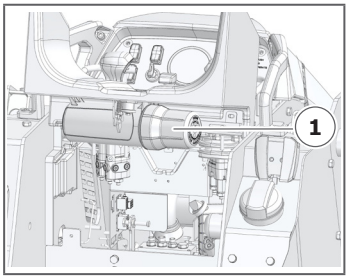
The use and maintenance manual is an integral and essential part of the machine and must be delivered to the user.

This manual must always be kept on board the machine or in any case available to operators and must accompany the machine upon resale.



It must be kept safely in the appropriate lockable housing (**1**) and referred to carefully as it contains important directions for operator safety, proper working operation and correct maintenance.

The machine must be used only as expressly indicated. Any other use is to be considered inappropriate and therefore hazardous.



The manufacturer is excluded from any contractual and non-contractual liability for damages caused by errors in the use and handling of the machine or by the failure to observe the instructions provided by the manufacturer.

The maximum expected life span of this machine is deemed to be 10 years or 10.000 working hours. Said duration is subject to the regular carrying out of all the control and maintenance operations as indicated in the relevant manual. Upon expiry of one of the above periods, the machine must be subjected to extraordinary servicing by the manufacturer or by workshops authorised by the same in order to assess the conditions of use and to determine the residual life. Otherwise it must be taken out of service.

NOTICE

The MANUFACTURER reserves the right to modify the product and amend the associated technical documentation without constituting any form of obligation towards third parties.

This version of the use and maintenance manual describes the characteristics of the standard machine, at the time of going to print.

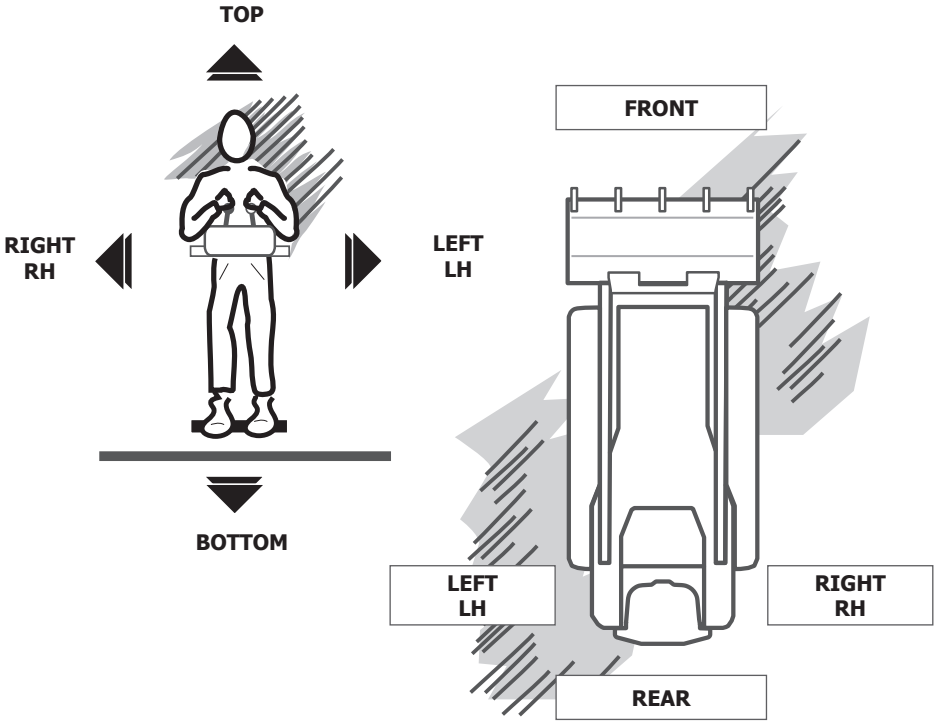
If the use and maintenance manual is lost or damaged, please contact the *Service Centre* to request a new one.

Copyright

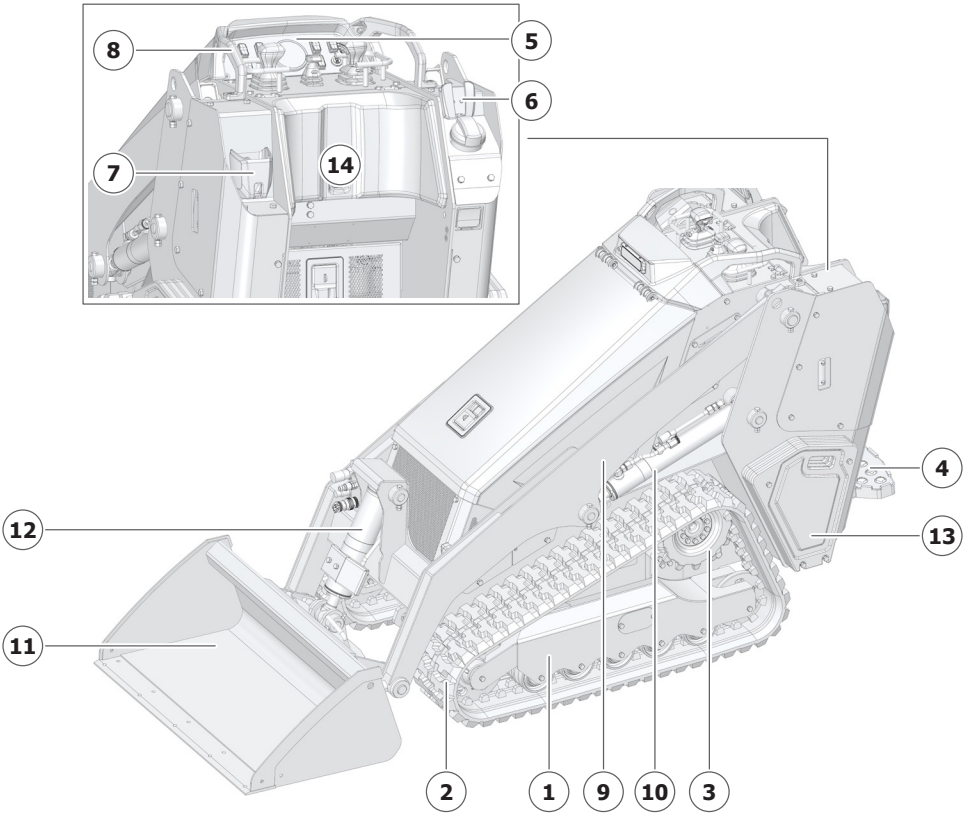
1.1.1 - Manual consultation and terminology

The manual has been made up using terminology that is indicated below:

- "**left**" abbreviated as "**lh**" refers to the left side of the operator when sitting in the driver's seat;
- "**right**" abbreviated as "**rh**" refers to the right side of the operator when sitting in the driver's seat;
- "**top**" or "**above**" always refers to the part of the machine located above the operator when sitting in the driver's seat;
- "**bottom**" or "**underneath**" always refers to the part of the machine located below the operator when sitting in the driver's seat;
- "**front**" is always the part of the machine where the equipment is located;
- "**rear**" is always the part of the machine opposite to where the equipment is located.



For ease of use and maintenance, the following are the names of some of the machine parts, which will be referred to in the descriptions provided in the manual.



Key:

1	Undercarriage	**8**	Holding handles
2	Tracks	**9**	Boom
3	Travel motors	**10**	Lifting Cylinders
4	Operator foot board (driver's seat)	**11**	Bucket
5	Control dashboard and joysticks	**12**	Bucket Cylinder
6	Mobile phone holder	**13**	Counterweights
7	Storage compartments	**14**	Operator support cushion

NOTICE

The pictures in this manual may NOT correspond to the machine for the following reasons:

- *technical modifications made after the date when this publication was printed;*
- *presence of accessories and/or optional equipment;*
- *installed equipment that differs from that shown in the pictures.*

These differences do not compromise the safety of the operator and of the machine; read and always follow the instructions given.

Contact the Service Centre if any part of the manual is not clear.

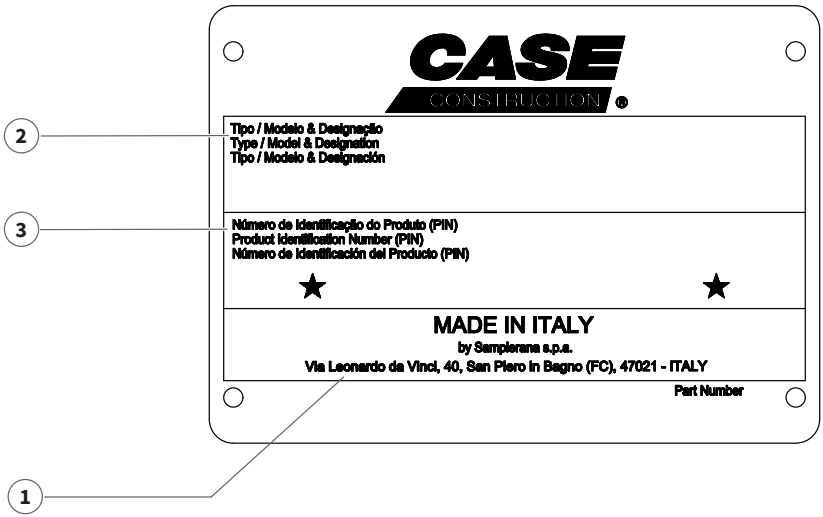
1.2 - Machine identification data

The machine identification plate contains the machine type and serial number. This plate and that on the engine are necessary to request spare parts or to indicate technical problems to the *After-sales Centre*.

NOTICE

Under no circumstances must the information shown on the plates be altered.

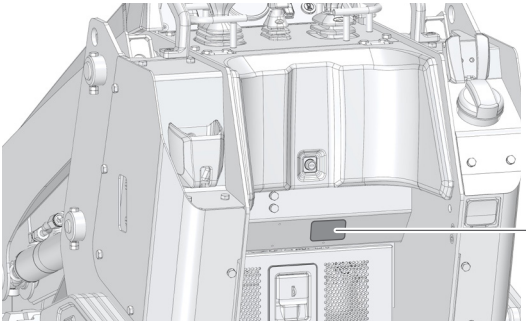
FACSIMILE OF THE MACHINE PLATE



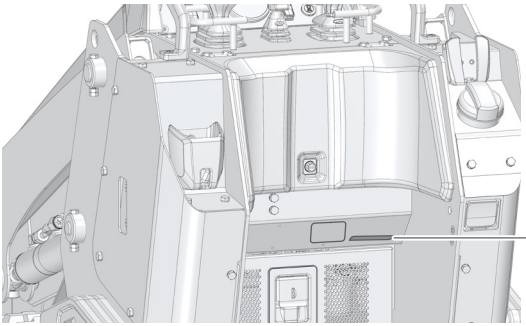
Key:

1	Business name or manufacturer's full address
2	Type / Model & designation
3	Serial number/machine identification number (product identification number - PIN)

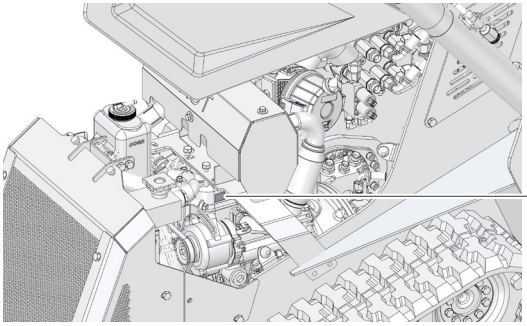
POSITION OF THE MACHINE CE PLATE



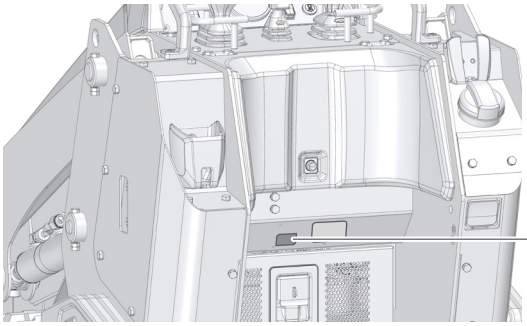
POSITION OF MACHINE PUNCHING PINS



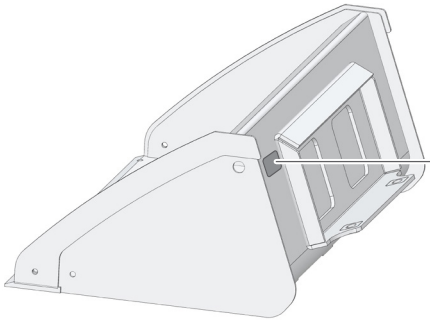
POSITION OF THE ENGINE PLATE



POSITION OF THE ENGINE EMISSIONS PLATE



POSITION OF BUCKET PLATE



1.3 - Manufacturer

The **Mini Track Loader** is manufactured exclusively by:

SAMPIERANA s.p.a.

Via Leonardo da Vinci, 40

47021 S. Piero in Bagno (FC)

1.3.1 - Contact the after-sales network

For any communication contact the after-sales network by providing the following information:

- machine model;
- serial number/machine identification number (product identification number - PIN);
- year of manufacture;
- date of purchase;
- model and serial number of the engine;
- detailed information concerning problems detected.

1.3.2 - Spare Parts

Our company also boasts top quality original spare parts and a *Service Centre*. However, this manual is not a spare parts catalogue and must not be used to order spare parts.

Only the spare parts catalogue, which can be consulted on-line via serial number/ machine identification number (product identification number - PIN), is a valid source of codes and descriptions of the spare parts for your machine.

With the perspective of continuous improvement of product design, several parts may be modified in the future. The only way to have the most updated information regarding spare parts is the on-line catalogue.

The *Service Centre* is at the customers' disposal to assist with any technical problems and spare parts orders.

For replacement of spare parts of the equipment, it is recommended to use original parts; the *MANUFACTURER* **declines all liability with regard to a possible drop in performance of the equipment or damage to the machine and/or personal injuries resulting from the use of non-original spare parts. Please note that some of the parts that compose the machine were produced in PRC.**

For maintenance operations that cannot be easily performed with the means that are ordinarily available to an individual, please consult our *Service Centre* **that is able to provide skilled staff, adequate equipment and original spare parts.**

The *Service Centre* **is available to provide any required explanations and advice, or to intervene with the company's own specialised technicians if there are any doubts regarding machine performance.**

1.4 - Information to the owner of the machine

The safety of users that operate the machine is of essential importance for the *MANUFACTURER*.

To communicate important information about the machine the *MANUFACTURER* uses **TECHNICAL INFORMATION** (INFO TECH) which is transmitted to the dealers and owners of the machine.

The information contained in the technical information is related to the machine using the model and serial number/PIN.

The distribution of technical information is based on the personal information data of the most recent owner, associated with the dealer, available in the *MANUFACTURER's* archives.

It is important to keep your contact information up-to-date.

In order to guarantee the safety of the machine, the owner must ensure that the specifications indicated in all the technical information are observed.

1.5 - Intended use

The machine, with standard equipment (bucket) is designed for earthmoving operations, specifically:

- digging operations;
- transport operations;
- surface levelling operations;
- pushing operations;
- loading operations.

The machine can be fitted with interchangeable equipment or accessories which, however, must have the features indicated in chapter *"7 - Recommended optional equipment" to page 7-1*.

In the event that the user installs unauthorised equipment, the *MANUFACTURER* declines all responsibility for this combination.

After installing approved interchangeable equipment or accessories, the machine can be used for jobs corresponding to the function of the equipment or accessory itself.

Strictly observing the instructions given in this manual and performing the maintenance operations at the frequency indicated is also part of the intended use.

Always observe the instructions reported in the use and maintenance publications supplied by the manufacturer of the equipment or interchangeable accessories.

No changes can be made to the machine without the *MANUFACTURER's* authorisation, as the change could be dangerous.

1.6 - Prohibited use

The machine has been designed and built according to the work for which it is intended. Therefore the technical specifications must be understood as binding for use of the machine depending on the relevant intended use.

Any use of the machine, which does not follow the indications given in the section *"1.5 - Intended use" to page 1-12* IS FORBIDDEN.

⚠ DANGER

This machine has been designed and manufactured to be used exclusively as indicated in the previous chapter, therefore use of the machine to perform operations different to those described is strictly prohibited.

This section lists some uses considered improper or unauthorised; as it is impossible to foresee all potential improper uses, if particular situations of machine use arise, before commencing work contact the *Service Centre* ***for more information.***

⚠ WARNING

No changes can be made to the machine without the written authorisation of the manufacturer, as the modification could be dangerous.

It is nevertheless necessary to adhere strictly to the safety regulations contained in this manual.

The *MANUFACTURER* is RELEASED of all liability in the event of any other use or failure to observe the instructions provided by the manufacturer itself.

DO NOT allow the machine to be used by minors or unskilled persons.

DO NOT operate the ground controls. The control devices must only be operated from the driving position.

DO NOT transport flammable or otherwise hazardous materials.

DO NOT use the machine to lift or transport people.

NEVER use the machine in closed environments, unless there is an effective system for the suction and discharge of the combustion gases.

DO NOT use the machine to tow other vehicles or trailers.

DO NOT use the machine if it is not in a suitable condition for work, if it has malfunctions in operation or if the controls do not respond perfectly.

DO NOT use the machine at an ambient temperature lower than -15°C if adequate modifications are not made as indicated in the section relating to low temperatures.

DO NOT use the machine at an ambient temperature higher than +45°C.

DO NOT use the machine in:

- fire risk areas;
- corrosive atmospheres;
- explosive atmospheres;
- atmospheres with dust harmful to the health of the operator;
- contaminated or unhealthy environments;
- in busy areas (town centres, etc.) without having taken the appropriate and necessary safety measures.

DO NOT use the bucket as a pile-driver or as a pile-extractor.

When possible, AVOID large obstacles, highly uneven ground, stones, fallen logs, steps, ditches, etc., which can cause the tip-over or roll-over of the machine.

WARNING

The** MANUFACTURER **cannot accept any responsibility in the event of accidents involving persons or property caused by non-compliance with the regulations and instructions listed in this manual and by failure to comply with safety regulations and accident prevention rules.

WARNING

If the machine is used in an improper manner, the operator is personally responsible for his own safety and that of any other persons involved.

WARNING

It is strictly prohibited to drive the machine on public roads, since the machine is not approved for this purpose. Therefore, it is only possible to operate in private spaces and/or building sites NOT open to the public.

1.7 - Emissions overview

KUBOTA Corporation

FEDERAL & CALIFORNIA EMISSION CONTROL SYSTEMS

LIMITED WARRANTY for NON-ROAD ENGINES (CI)

The U.S. Environmental Protection Agency (EPA), the California Air Resources Board (CARB), and KUBOTA Corporation (KUBOTA) are pleased to explain the Federal and California Emission Control System Warranty on your non-road engine or marine engine. In California, new 2017 model year heavy duty off-road engines must be designed, built and equipped to meet California's stringent anti-smog standards adopted by the Air Resources Board pursuant to its authority in Chapter 1 and 2, Part 5, Division 26 of the California Health and Safety Code. In other states of the U.S.A., new non-road engines subject to the provisions of 40 CFR 1039 subpart A and new marine engines subject to the provisions of 40 CFR 1042 subpart A must be designed, built and equipped, at the time of sale, to meet the U.S. EPA regulations.

KUBOTA must warrant the emission control system on your Compression Ignition engine for the period of time listed below provided there has been no abuse, vandalism, neglect, improper maintenance or unapproved modifications to your engine. This emission warranty is applicable in all states of the U.S.A., its provinces and territories regardless of whether an individual state, province, or territory has enacted warranty provisions that differ from the Federal warranty provisions. This emission warranty is also applicable in all provinces and territories of CANADA.

Your emission control system may include parts such as the fuel injection system and the air induction system. Also included may be hoses, belts, connectors and other emission-related assemblies

Where a warrantable condition exists, KUBOTA will repair your engine at no cost to you, including diagnosis (if the diagnostic work is performed at an authorized dealer), parts and labor.

EMISSION DESIGN AND DEFECT WARRANTY COVERAGE

The emissions warranty period for the engine begins on the original date of sale to the initial purchaser and continues for each subsequent purchaser for the period mentioned below.

If any emission related part on your engine is defective, the part will be repaired or replaced by KUBOTA free of charge.

1. For non-road engines

   The emissions warranty period for all engines rated under **19 kW** (**25 Hp**) is 2000 hours of operation or two (2)years of use, whichever first occurs.

   The emissions warranty period for constant speed engines rated under **37 kW** (**50 Hp**) with rated speeds greater than or equal to **3000 RPM** is 2000 hours of operation or two (2) years of use, whichever first occurs.

2. For marine engines (commercial Category 1)

   The emissions warranty period for all engines rated under **19 kW** (**25 Hp**) is 1500 hours of operation or two and a half (2.5) years of use, whichever first occurs.

   The emissions warranty period for all engines rated at or above **19 kW** (**25 Hp**) and under **37 kW** (50 Hp) is 2500 hours of operation or three and a half (3.5) years of use, whichever first occurs.

The emissions warranty period for all engines rated at or above **37 kW** (**50 Hp**) is 5000 hours of operation or five (5) years of use, whichever first occurs.

OWNER'S WARRANTY RESPONSIBILITIES

A. As the engine owner, you are responsible for the performance of the required maintenance listed in your KUBOTA operator's manual. KUBOTA recommends that you retain all receipts covering maintenance on your engine, but KUBOTA cannot deny a warranty claim solely for the lack of receipts or for your failure to ensure the performance of all scheduled maintenance.

B. As the engine owner, you should be aware, however, that KUBOTA may deny your warranty coverage if your engine or a part has failed due to abuse, vandalism, neglect, improper maintenance or unapproved modifications.

C. Your engine is designed to operate on Ultra Low Sulfur Diesel Fuel only. Use of any other fuel may result in your engine no longer operating in compliance with Federal or California's emissions requirements.

D. You are responsible for presenting your engine to the nearest dealer or service station authorized by KUBOTA when a problem exists. The warranty repairs should be completed in a reasonable amount of time, not to exceed 30 days.

E. If you have any questions regarding your warranty rights and responsibilities or the location of the nearest authorized dealer or distributor, you should contact:

KUBOTA ENGINE AMERICA CORPORATION, Service Department at 1-800-532-9808, kea_g.eewri@kubota. com or KUBOTA TRACTOR CORPORATION, National Service Department at 1-800-558-2682, KubotaEmissionsWarranty@ kubota.com or KUBOTA CANADA LTD at (905) 294-7477.

COVERAGE

KUBOTA warrants to the initial purchaser and each subsequent purchaser that your engine will be designed, built and equipped, at the time of sale, to meet all applicable regulations. KUBOTA also warrants to the initial purchaser and each subsequent purchaser that your engine shall be free from defects in materials and workmanship which cause the engine to fail to conform to applicable regulations for the period mentioned above from the original date of sale.

KUBOTA shall remedy warranty defects at any authorized KUBOTA engine dealer or warranty station. Any authorized work done at an authorized dealer or warranty station shall be free of charge to the owner if such work determines that a warranted part is defective. Any KUBOTA approved or equivalent replacement part (including any KUBOTA approved aftermarket part) may be used for any warranty maintenance or repairs on emission related parts, and must be provided free of charge to the owner if the part is still under warranty.

KUBOTA is liable for damages to other engine components caused by the failure of a warranted part still under warranty. The use of replacement parts not equivalent to the original parts may impair the effectiveness of your engine emission control system. If such a replacement part is used in the repair or maintenance of your engine, and KUBOTA determines it is defective or causes a failure of a warranted part, your claim for repair of your engine may be denied.

Listed below are the parts covered by the Federal and California Emission Control Systems Warranty. Some parts listed below may require scheduled maintenance and are warranted up to the first scheduled replacement point for that part. The warranted parts are (if applicable):

1. Air-Induction System
   A. Intake Manifold
   B. Turbocharger System
   C. Charge Air Cooling System (Intercooler)
2. Catalyst or Thermal Reactor System
   A. Catalytic converter
   B. Exhaust manifold
3. Fuel Injection System
   A. Fuel Supply Pump (Common Rail System)
   B. Injector
   C. Injection Pipe
   D. Common Rail
   E. Smoke Puff Limiter
   F. Speed Timer
   G. Cold Advance Timer
   H. Injection Pump
4. Electronic Control System
   A. ECU
   B. Engine Speed / Timing Sensor
   C. Accelerator Position Sensor
   D. Coolant Temperature Sensor
   E. Atmospheric Pressure Sensor
   F. Intake Pressure Sensor
   G. Intake Manifold Temperature Sensor
   H. Intake Air Flow Sensor
   I. Common Rail Pressure Sensor
5. Exhaust Gas Recirculation System
   A. EGR Valve
   B. EGR Cooler
   C. EGR Valve Opening Rate Sensor
6. Particulate Controls
   A Any device used to capture particulate emissions.
   B. Any device used in the regeneration of the particulate control device.
   C. Control Device Enclosures and Manifolding
   D. Diesel Particulate Filter Temperature Sensor
   E. Differential Pressure Sensor
7. Advanced Oxides of Nitrogen (NOx) Controls
   A. Selective Catalytic Reduction (SCR) Catalyst
   B. Reductant (urea) Containers
   C. Dispensing Systems
   D. NOx Sensor
   E. SCR Temperature Sensor
   F. Any Sensor for Diesel Exhaust Fluid
8. Miscellaneous Items
   A. Closed Breather System
   B. Hoses*, Clamps*, Fittings, Tubing*
   C. Gaskets, Seals
   D. Kubota supplied engine Wiring Harnesses
   E. Kubota supplied engine Elec. Connectors
   F. Air Cleaner Element*, Fuel Filter Element*
   G. Emission Control Information Labels

*Warranty period is equivalent to manufacturer's recommended first replacement interval as stated in the applicable model's operator's manual and/or service (workshop) manual.

MAINTENANCE REQUIREMENTS

The owner is responsible for the performance of the required maintenance as defined by KUBOTA in the operator's manual.

LIMITATIONS

This Emission Control System Warranty shall not cover any of the following;

A. Repair or replacement required because of misuse or neglect, improper maintenance, repairs improperly performed or replacements not conforming to KUBOTA specifications that adversely affect performance and/or durability, and alteration or modifications not recommended or approved in writing by KUBOTA.

B. Replacement of parts and other services and adjustments necessary for required maintenance at and after the first scheduled replacement point.

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2 - SAFETY

2.1 - Safety symbol

This is the danger symbol. It is used in this manual to warn the user of a potential risk of personal injuries. Comply with all the safety notices referred to this symbol to prevent the risk of serious injuries or death.

2.2 - General safety

There are many risks linked to work with a **Mini Track Loader**.

It is recommended that the machine is only used by staff trained specifically for this purpose. The employer is responsible for checking that all safety regulations in force in the place of use of the machine are respected before starting any activity. Safety plates are positioned on the machine to indicate possible hazards.

- The machine must only be used by authorised, skilled, qualified and trained persons.
- Read the instruction manual before using the machine.
- Wear clothing suitable for work on a construction site.
- Inspect the machine thoroughly every day or at every shift, performing a thorough external control before starting it in order to prevent injury or damage to persons.
- Only operate the machine from the driver's seat with both feet on the operator's foot board and hands on the control panel, avoid leaning out.
- Learn the location and use of all control levers, instruments and warning indicators.
- Top up the fuel and oil with the engine turned off and in well-ventilated areas suitable for this purpose.
- Perform all controls indicated.
- Never drive the machine under the effect of alcohol, medicines or other drugs.

- Make sure there are no persons in the machine's radius of action before starting it.
- When getting in and out always face the machine and use the handles. DO NOT JUMP DOWN!
- Never try to climb onto or off of the machine when it is moving.
- Do not use the commands as a handle to get on and off the machine.
- Ensure that the operator's foot board and holding handles are not slippery when getting in or out of the machine.
- Perform a risk assessment of the work area and reduce all risks identified before starting work.

⚠ WARNING

It is forbidden to make any modifications to the machine.

- The machine must not be modified without the *MANUFACTURER*'s permission.
- The realisation of modifications without said consent will lower the level of safety, thus increasing any dangers. Modifications not only worsen the machine functions, but also reduce their duration.
- We are not liable for any accidents or faults due to modifications made without our consent.
- Should you decide to intervene on the machine, it is necessary to submit a written request to the *MANUFACTURER*.

⚠ WARNING

Anticipate any precautions with regard to optional parts and accessories.

- Do not install any components or accessories that have not been approved by the *MANUFACTURER*.
- The use of components or accessories not approved by the *MANUFACTURER* may determine a reduction in the level of safety, thus increasing the possible hazards.
- We are not liable in any way for any injuries, accidents or machine faults due to the use of components or accessories not approved by the *MANUFACTURER*.

2.2.1 - Manual safety sign consultation

To ensure a safe use of the machine, this manual provides all the information on safety precautions in order to highlight potential hazards and the relevant methods to be adopted to avoid them.

The following words are used to provide indications regarding potential hazardous situations that could cause injury and/or damage to property.

They are highlighted by the wording: **DANGER**, **WARNING** and **CAUTION**.

DANGER

Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

WARNING

Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION

Indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury.

In addition to those listed above, the following indication words are used to recommend precautions to be taken to protect the machine or to provide useful information.

NOTICE

Indicates information considered important, but not hazard related (e.g., messages related to property damage).

Indicates information considered important to protect the environment, indicating the correct disposal of waste based on the Laws in force in the country where the machine is used.

The manufacturer cannot anticipate all possible circumstances involving potential hazard during operation or maintenance. As a result the safety messages shown in this manual or on the machine may not include all possible safety precautions.

When performing procedures or operations that are not explicitly recommended or permitted in this manual, it is necessary to take all necessary safety precautions to avoid potential hazards.

Under no circumstances must actions be taken or operations performed that are expressly prohibited in this manual.

If you are unsure of the safety requirements for some of the procedures, contact the *MANUFACTURER* or the *Service Centre*.

Meaning of the symbols used:

	***Correct, Allowed.***
	***Incorrect, Forbidden.***
	***Be Careful!***
	***Direction of operation or Direction of movement.***
	***Closed, Locked.***
	***Open, Released.***
	***Manual Operation.***

2.3 - Safety signs and operation related labels

Affixed to the machine are **safety signs** with warning and safety symbols for the operator and those who operate near the machine itself; there are also **operation related labels** which provide the instructions for operation and maintenance.

Each type of sign is placed near the part of the machine that may be a hazard source or that requires operating instructions.

The safety signs and the operation related labels are attached to the machine in the form of stickers; they can be divided into three different types:

- **safety signs**;
  - these are yellow with a black border and lettering to indicate warning;
  - these are yellow with a red border and black lettering to indicate prohibition;
- **operating instructions**;
  - these are white or transparent with a black border and lettering;
- **maintenance instructions;**
  - these are white or transparent with a black border and lettering.

Read carefully and become aware of the symbols and their message before using the machine.

Check the presence and legibility of the safety signs and operating instructions daily; repair or replace them immediately whenever they are damaged or missing.

DANGER

Make sure that the safety signs and operating instructions are always legible and in the correct position; if necessary, ask the Spare Parts Service for replacements.

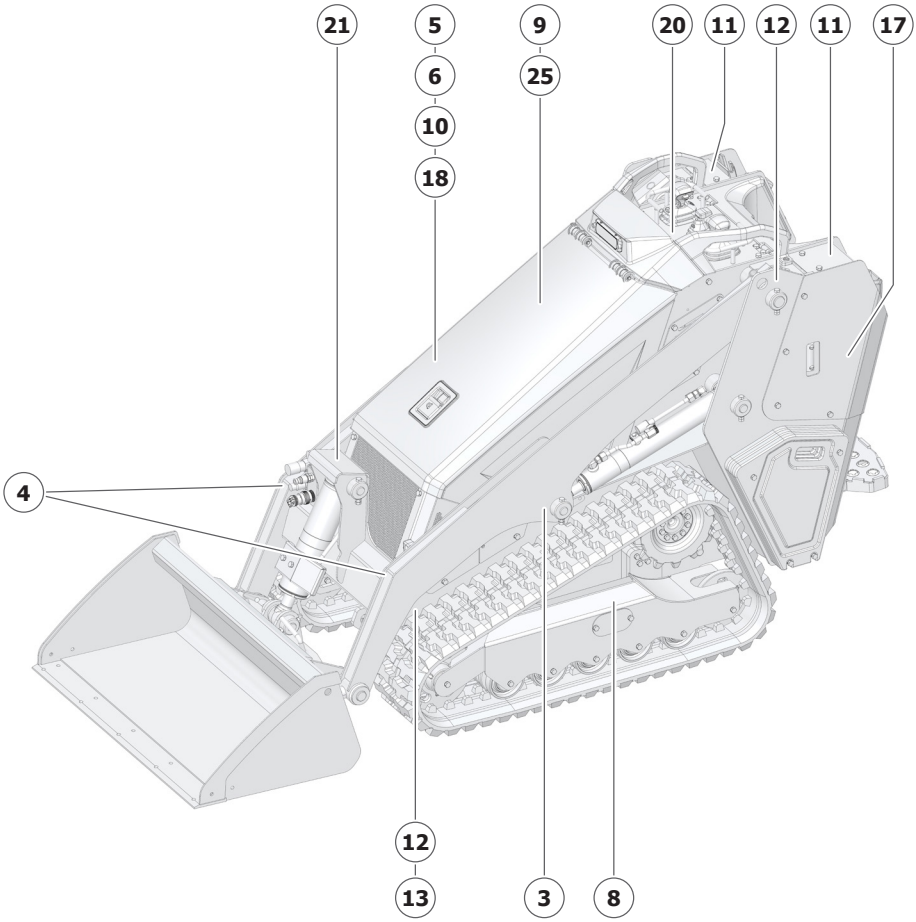
The manufacturer declines all responsibility for damage to persons or property due to non-compliance with the warnings and instructions reported by the safety signs and operation related labels or by their imperfect preservation.

- Wash the labels with soap and water and dry them with a soft cloth.
- When washing the machine using water sprays, keep a distance of at least one metre from the surface to avoid damaging the labels.
- Replace any damaged or missing labels with original stickers obtained from your *Service Centre*.

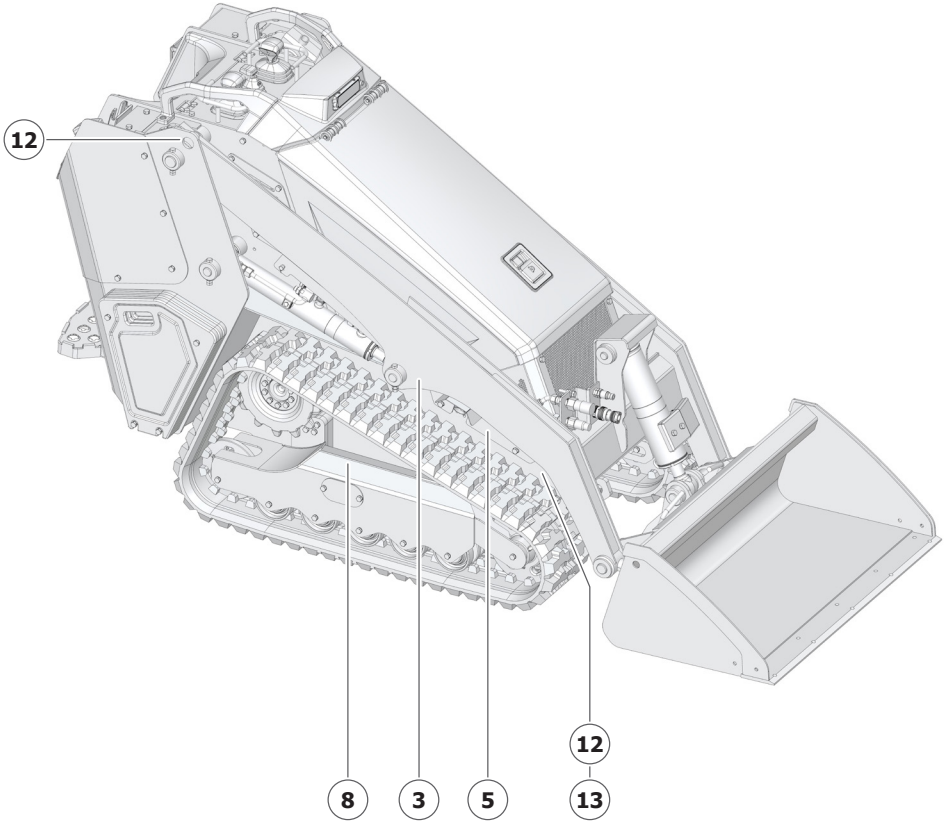
- Should it be necessary to replace a component displaying stickers, make sure that the new component has the same labels.
- When replacing labels, make sure that the base is clean, dry and free from oil or grease. Press any air bubbles towards the outer edges.

Below is a series of images indicating the positioning of the safety signs and operation related labels.

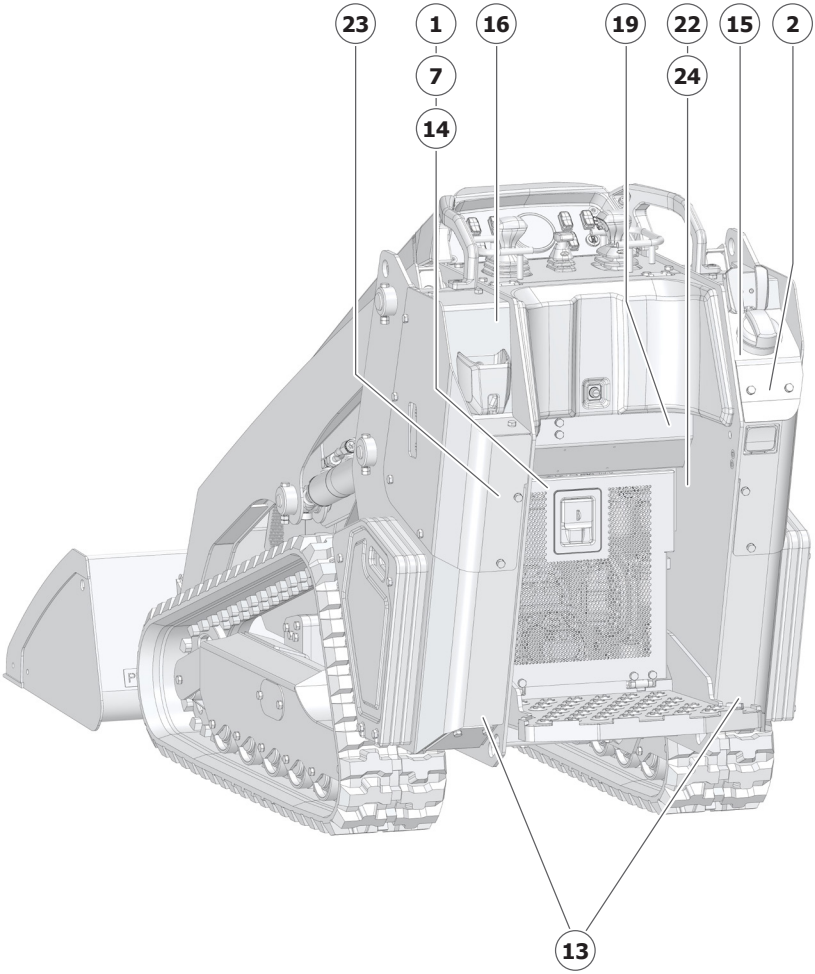
SAFETY SIGNS AND OPERATION RELATED LABELS



SAFETY SIGNS AND OPERATION RELATED LABELS



SAFETY SIGNS AND OPERATION RELATED LABELS



Safety Sign Key:

1 Risk of damage caused by wrong operations and maintenance

Read and acquire the information contained in the use and maintenance manual before starting the machine to prevent all risk of injury.

2 Risk of fire and explosion caused by the fuel

Do not get close the fuel tank with inflammable material, naked flames or other heat sources.

Stop the engine during replenishment.

3 Risk of damage caused by the boom falling

Always lock the boom when it is raised.

4 Risk of damage caused by the moving machine

Stay at a safe distance from the machine while it is operating to prevent all risk of injury.

5 Risk of burns caused by hot surfaces

Do not touch hot surfaces.

Wait for the machine to cool before carrying out any maintenance intervention.

6 Risk of having the limbs crushed in the rotating parts

Shut down the machine and remove the key prior to carrying out any maintenance intervention.

7 Risk of damages/burns caused by the explosion of the battery or by the contact with the battery acid

Never use open flames, do not generate sparks.

Wear personal protective equipment.

Follow the operating instructions.

8 Risk of damages caused by the projection of objects while adjusting the track tension

Read and understand the use and maintenance manual.

9 Risk of damage caused by pressurised containers

Release the pressure before performing maintenance.

Do not weld the pressure accumulators.

Keep the pressure accumulators away from flames or other heat sources.

10 Risk of burns caused by hot or pressurised liquids

Do not unscrew the radiator cap when it is hot.

Wait for the machine to cool before carrying out any maintenance intervention.

11 Risk of crushing/shearing hands during work

During work, keep both hands on the support bar or on the handles.

Legend of Operation Related Labels for operation and maintenance:

12 Lifting point

Indicates the points to be used to lift the machine.

13 Anchorage point

Indicates the points to be used to anchor the machine during transport.

14 Battery cut-off

Indicates the position of the battery cut-off.

15 Fuel tank cap

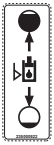
Indicates the position of the cap for topping-up the fuel.

16 Hydraulic oil tank cap

Indicates the position of the cap for topping-up the hydraulic oil.

17 Hydraulic oil MIN-MAX level

Indicates the position of the MIN-MAX level indicator of the hydraulic oil.



18 Cooling liquid level

Indicates the MIN and MAX level of the cooling liquid in the overflow tank.

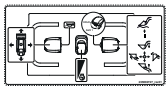
Read and understand the use and maintenance manual to learn about the specifications of the cooling liquid.

19 AUX 1 plant single/double acting switch

Indicates how to modify the functioning of the AUX 1 hydraulic plant.

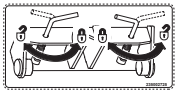
20 Controls

Indicates the position and functioning of the machine controls.



21 Quick-coupling attachment

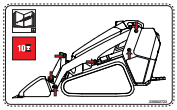
Indicates the lock/release position of the quick-coupling.



22 Lubrication points

Indicates the points where lubrication must be performed.

Indicates lubrication intervals.

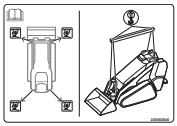


23 Sound emission (EU Market only)

Indicates the value in decibels Lwa of the sound emitted by the machine (read the value on the label located on the machine).

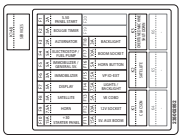
24 Lifting and anchorage for transport

Indicates where the lifting and anchorage points for transport can be found on the machine.



25 Fuse and relay box

Indicates the layout and relative functions of the fuses and relays.



2.4 - Machine driver

The driver must be a **skilled operator**. This term means a skilled and trained person, appointed to move and manoeuvre the machine.

The use of the machine by a **skilled operator** lies within the normal conditions of use.

From here on the skilled operator will be indicated as **operator**.

The employer must provide the training and education necessary, especially on the introduction of new work equipment (in Italy the obligation is indicated in Legislative Decree 626 art. 22 par. C).

Machine functioning safety is entrusted directly to those operating daily on the same.

Operation and maintenance of the machine must be **limited to** those persons who:

- are at least 18 years of age;
- are physically and mentally fit for work, are able to address the requirements associated with operation of the machine at its most intense use;
- have been trained to operate the machine and perform maintenance, are familiarised with the technical features, the overall dimensions, the performance and the relevant limitations;
- know the rules and regulations relating to workplace safety;
- prove their ability;
- are qualified, according to the standards in force, to drive the machine on public roads (only if used on public roads and only if the machine is authorised for road use).

These persons must be assigned to this task by the legal representative of the company that owns the machine.

The operator is also responsible for:

- stopping anyone approaching during use of the machine;
- preventing use of the machine by unauthorised and untrained staff;
- following on a daily basis the safety procedures learned during the training course;
- identifying and avoiding potential risks at the workplace;
- understanding and complying with the indications of the safety signs and operating labels;
- inspecting the machine and checking for correct operation before starting the work shift;
- communicating every problem related to operating detected before or during operation of the machine;
- avoiding careless or reckless actions that could endanger their own or others' safety;
- always using common sense and always giving priority to absolute safety.

For any further questions on the use of the machine call the *Service Centre* which will provide all the necessary information.

⚠ DANGER

The purchaser and the operator of this machine must carefully read the user manual the first time they use it.

If the machine is supplied with a user or hire contract, it is responsibility of the owner to ensure that the new user reads and accepts the user manual. In addition, ensure the new operator has performed an inspection around the machine and that they have become familiar with all safety signs and equipment in addition to trying out the correct use of all the commands.

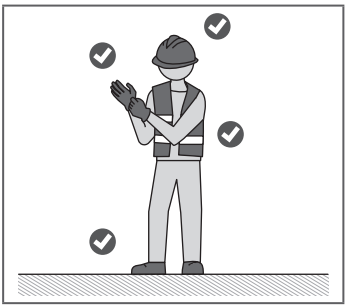
At the time of first sale, the seller informs the purchaser about safe use and operation of the machine. In the event the machine is to be used by someone other than the original purchaser, for example by an employee or it is to be rented, lent or sold to someone other than the purchaser, make sure the new operator reads and accepts the **User Manual** for the **Mini Track Loader** supplied with the machine, before using it for the first time.

2.4.1 - Personal Protective Equipment (PPE)

WARNING

Operators must ALWAYS wear suitable clothing for construction work. Clothes must not be greasy or soaked with oil.

Long hair must be gathered, avoid wearing chains, clothes with dangling parts, ties, or any other object that could get caught in the moving parts of the machine.



The PPE to be used during **use of the machine** is listed below:

- safety footwear;
- high visibility clothing.

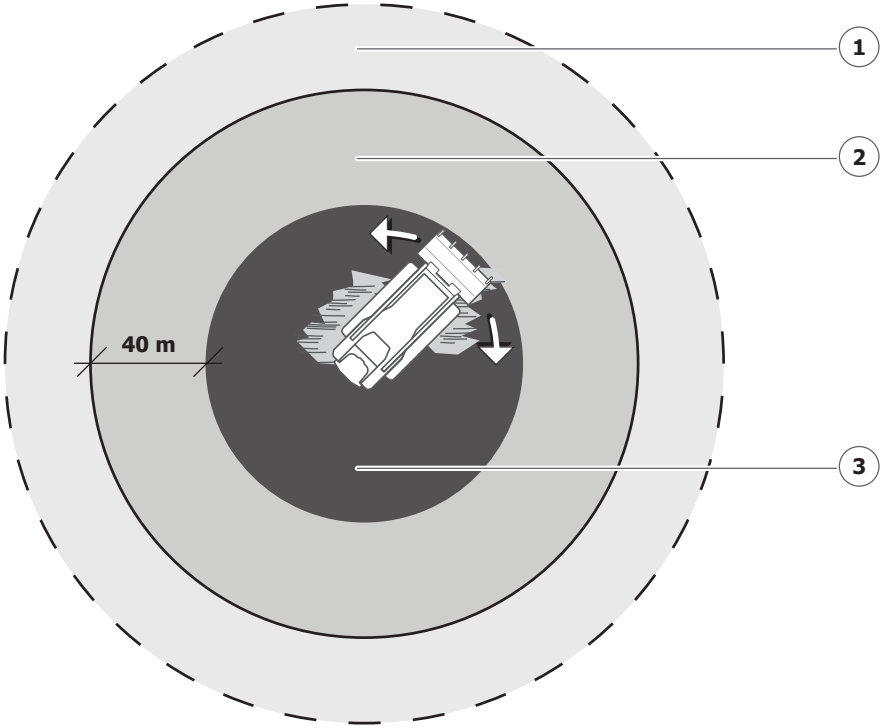
The PPE to be used during **maintenance of the machine** or **assembly/disassembly of optional equipment** is listed below:

- a safety helmet;
- safety footwear;
- safety goggles;
- protective gloves;
- ear defenders;
- high visibility clothing.

2.5 - Work Area - Hazard Zone - No Entry Zone

DANGER

Nobody must stand in the NO ENTRY ZONE and/or in the HAZARD ZONE.



Key:

1	Work Area
2	Hazard Zone
3	No Entry Zone

1 - WORK AREA

This is the area surrounding the hazard zone. The machine may enter this area; when this happens, the work area becomes a hazard zone.

Only authorised people, aware of the operating capacity of the machine, may stand in this area.

2 - HAZARD ZONE

This is the area near the machine where the operating equipment is never present but there is a constant hazard due to the projection of material, the oscillation of the load or the tip-over or roll-over of the machine.

Nobody must stand in this area.

3 - NO ENTRY ZONE

This is the area surrounding the machine. In this area you may be hit by the operating equipment, by the load falling from a height, or reached by the moving machine.

Nobody must stand in this area.

The Safety Manager at the work area must assess the hazards prior to commissioning the machine.

The work area must be appropriately indicated, even if working at a site that has already been delineated.

Nobody must stand in the NO ENTRY ZONE and/or in the HAZARD ZONE.

The driver of the machine may operate only when **NOBODY is in the NO ENTRY ZONE and in the HAZARD ZONE**.

Before starting work, the driver must warn any the people near the machine of the possible hazards and wait for them to move away. This usually occurs by using the horn or simply by telling them.

Stop the machine immediately if someone enters the **HAZARD ZONE**, warn them of the risk and make sure they move away before proceeding with the operations.

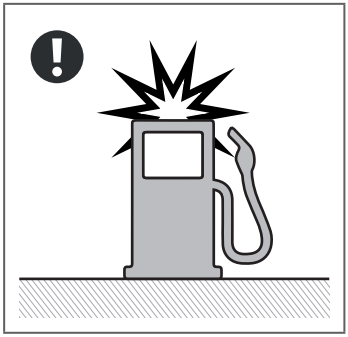
To avoid any bruises or accidental contact it is advisable, in the presence of scaffolding or unstable structures, to maintain a safe distance (at least 0.5 m) such that even during accidental manoeuvre, there is no danger of contact with these structures.

2.6 - List of Residual Risks

Below is a description of the operations or situations that may expose people to danger or risks.

DANGER

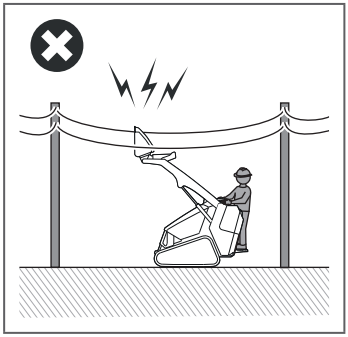
RISK OF FUEL EXPLOSION



The fuel used for the engine is flammable and may therefore cause fires and/or explosions. Avoid hazardous situations by keeping sparks, naked flames and materials for smokers away from the machine and from the fuel when filling the tank or when servicing the fuel system. Find out where the work-site fire extinguishers are situated and how to use them.

DANGER

RISK OF ELECTROCUTION CAUSED BY HIGH ELECTRIC VOLTAGE



Pay attention to overhead power lines, contact or approach may expose the operator to electrical shocks.

Ensure that the boom or equipment is always at a suitable distance.

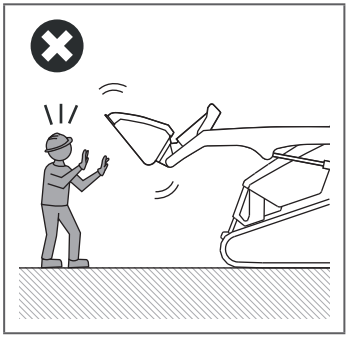
If the machine enters into contact with the electrical lines:

- DO NOT leave the driver's seat and DO NOT touch the metal parts;
- if possible, move the vehicle away from the hazard zone;
- avoid other people approaching;
- ask other people to cut the power supply to the electrical supply lines.

DANGER

RISK OF INJURIES TO PERSONS NEAR THE MACHINE

During the work phases do not allow unauthorised persons to approach the machine.

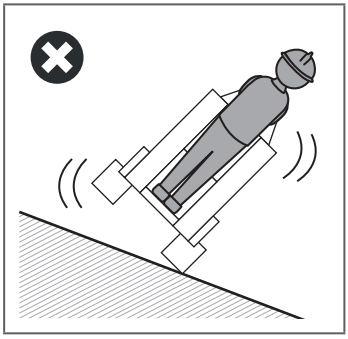


WARNING

RISK OF TIP-OVER OR ROLL-OVER

The machine centre of gravity changes depending on the size and position of the load, the slope of the ground and the movement of the machine.

Analyse and record the topography and geological characteristics of the place in order to take appropriate measures to prevent the tip-over or roll-over of the machine, against landslides or mudslides.



Level the ground in the machine's work area.

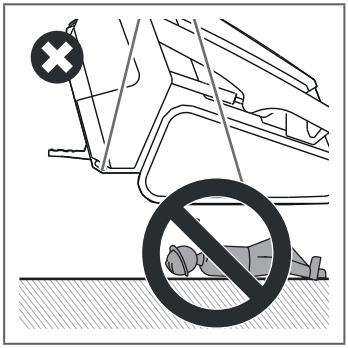
Careless use and driving that does not comply with this type of machine could cause the tip-over or roll-over of the machine.

Never exceed the nominal lifting capacity of the machine.

WARNING

RISK OF FALLING OBJECTS/CRUSHING

When handling the machine pay particular attention to people, animals or objects around the work area.



Do not stand under the lifted parts.

- No persons are permitted to stand beneath the operating equipment when it is lifted.
- When the machine is lifted by means of the work equipment, under no circumstances stand under the raised parts.

Lowering the raised parts may cause serious accidents with possible injuries or even death.

WARNING

RISK OF CARBON MONOXIDE POISONING

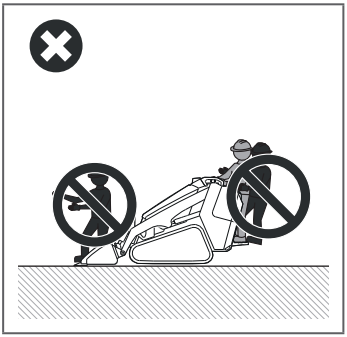
The combustion fumes produced by the engine of the machine, if inhaled directly and continuously, can be very dangerous and/or lethal to the organism. If work must be carried out in enclosed areas, take all possible precautions to ensure the circulation of fresh air and protect the respiratory tract by wearing a suitable mask.

WARNING

RISK OF INJURY TO TRANSPORTED PERSONS

The machine cannot be used for the transport of persons; only the operator must drive it himself.

Do not allow anyone else to get in the driver's seat, to climb on the tracks or on the work equipment.



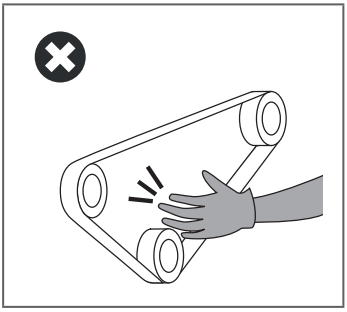
WARNING

RISK OF ENTANGLEMENT

In some parts of the machine there are parts that can cause serious injury to the limbs.

It is strictly forbidden to insert parts of the body into these parts with the machine switched on.

Use suitable clothing which cannot become caught in the moving parts of the machine.



WARNING

RISK OF FALLING

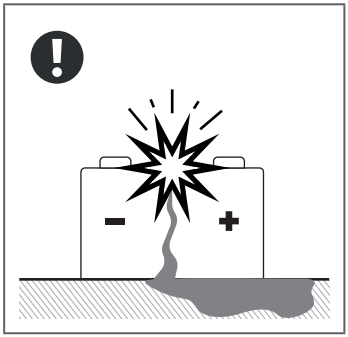
Ensure that the operator foot board and handles are checked. If damage or other faults are found, carry out the necessary repairs.

If slippery material such as mud, oil or lubricant are present on the foot board or handles, remove them fully.

WARNING

RISK OF BURNS CAUSED BY THE ACID CONTAINED IN THE BATTERY

Attention to inhalation or contact with battery acids that are highly toxic and can cause severe burns.



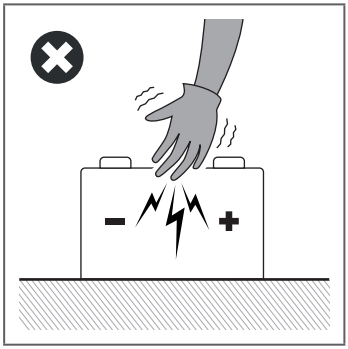
WARNING

RISK OF ELECTRIC SHOCK

Any work on the electrical system or on the battery must be carried out by a skilled, authorised person.

Before working on the electrical system, disconnect the battery, starting with the earth terminal.

Ensure that the cables and electrical connection terminals show no signs of corrosion, cracks or burns; if this is not the case, immediately contact *Service Centre*.

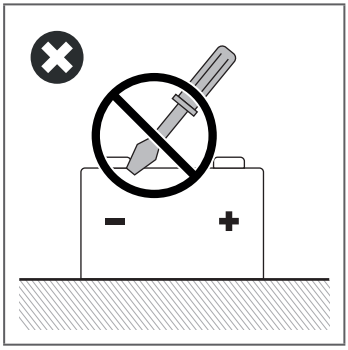


WARNING

RISK OF CRUSHING AND ELECTROCUTION

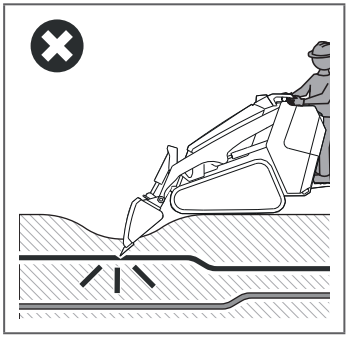
Starting the machine by hot-wiring is prohibited.

- Under no circumstances start the engine by placing in short circuit the terminal of the starter engine or the battery.
- The machine could move suddenly causing a hazardous situation. The electrical system could also become damaged.



WARNING

RISK OF DAMAGE DURING EXCAVATION



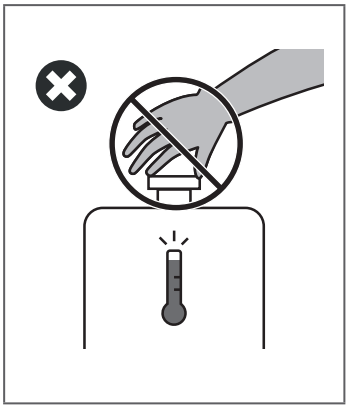
Before starting work in a new area, check for the presence of any electrical power lines, pipelines and telephone lines.

All these elements are a hazard source for the operator and damage to them a safety risk and a potential economic cost.

Before starting the excavation, contact the site manager of the work area or the authorities to locate all utilities present in the subsoil.

WARNING

RISK OF BURNS



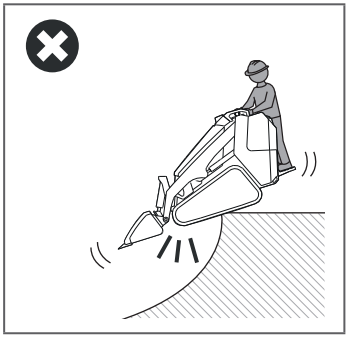
Do not unscrew the radiator cap when it is hot. The radiator cap must be removed only after the hot liquid has cooled, otherwise it could become a cause of injuries.

Do not touch the exhaust immediately after turning off the engine: a very hot exhaust can cause injuries.

Do not carry out maintenance interventions of the hydraulic plant or engine right after the machine was stopped, the oil temperature will be very high. The hot oil could cause serious injuries; have it cool before intervening.

WARNING

RISKY WORKING CONDITIONS



Find out about any dangers that may be present in the work area.

Proceed with care when working along basins, embankments and slopes; keep away from the edges.

Be careful when working under protrusions that the top part of the machine might hit.

Pay attention to falling rocks and to landslides.

Be careful during filling operations. Do not get too close to the edge because the weight of your equipment may cause subsidence in the soil and the machine may overturn or tilt.

WARNING

RISK OF HIGH PRESSURE JETS

The hydraulic system is under pressure when the engine is running and can maintain the pressure even after it has been switched off.

In the event of a fault or maintenance intervention, the operator may be exposed to high-pressure fluid jets.

Fluid escaping under high pressure could enter the skin or eyes and cause serious injury or death.

Pressurised fluid leaks may be invisible. **DO NOT** use hands to check for leaks. Use a piece of cardboard or paper to this purpose.

If oil leaks are found, stop the machine immediately and make the necessary repairs.

Wear appropriate personal protective equipment, as indicated in the specific section, during maintenance work.

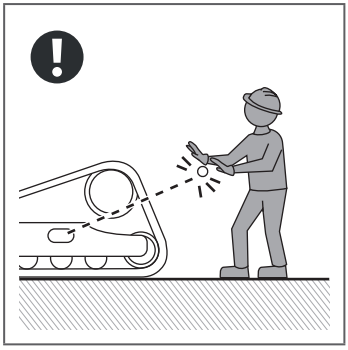
DO NOT attempt to repair or tighten hydraulic lines or fittings when the machine's hydraulic system is under pressure.

In the event of a hydraulic component failure, place the machine on firm level ground, lower the equipment to the ground, stop the machine and release any residual pressure as described in section *"6.19 - Discharge residual pressure in the hydraulic system" to page 6-39*.

Should anyone suffer injury due to contact or to the penetration of hydraulic oil or grease into the skin, seek a doctor immediately. Failure to summon a doctor could lead to the emergence of other serious injuries.

⚠ WARNING

RISK OF OBJECTS/LIQUIDS PROJECTION



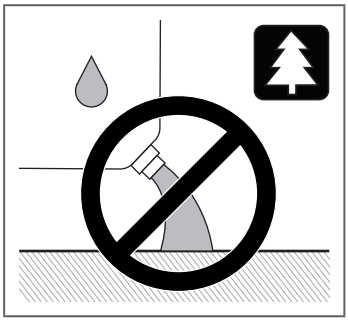
Use caution when greasing the belt tensioner; parts of the belt tensioner or jets of high-pressure grease could be projected toward the operator, risking serious injuries or death.

The cylinder that adjusts the track tension is filled with grease; therefore the grease itself may be under high pressure. Under this circumstance, if the plug is loosened carelessly, both the plug and the lubricant may get pushed out causing a dangerous situation.

For operations on the track tensioner, refer to the dedicated section.

NOTICE

RISK OF ENVIRONMENTAL POLLUTION



The improper disposal of waste fluids may cause serious damage to the environment. Before disposing of waste fluids, contact the competent local bodies for information regarding the correct procedures.

Use suitable containers. Never use empty containers to store food.

NEVER pour waste fluids on the ground, into drain lines, into courses or water basins. **Always observe the environmental protection regulations** in force when discharging the following substances:

- oils or lubricant grease;
- filters;
- battery;
- cooling liquids;
- containers or absorbent materials impregnated with these substances.

2.7 - Safety procedures

WARNING

UNAUTHORISED MODIFICATIONS

No modification can be made to the machine without the permission of the manufacturer.

Consult the *Service Centre* before making any modifications. The *MANUFACTURER* denies all liability for any injuries or damage caused by unauthorised modifications.

WARNING

CHECK FOR ADEQUATE VISIBILITY BEFORE STARTING TO OPERATE

Make sure there is proper visibility for work purposes.

DO NOT operate in conditions of poor visibility (e.g. fog, strong storms, etc...).

Clean the work lights to ensure good visibility.

WARNING

CHECKING THE SAFETY DEVICES

Check all safety devices and guards to ensure their proper installation, operation and the presence of any damage. If faults are found, carry out the necessary repairs. Misuse of safety devices could cause serious accidents with a potential risk of injury or death. Make sure to correctly use the safety devices.

WARNING

EXAMINATIONS PRIOR TO THE START UP

Before commissioning, carry out all verifications envisaged. If failures are found, repair the machine immediately. Using the machine when faulty could cause accidents.

WARNING

CHECK THE SURROUNDING AREA BEFORE COMMISSIONING

Prior to using the machine carry out a visual inspection of the surrounding area to make sure the safety conditions are met.

WARNING

ALERTS PRIOR TO THE START UP

Before starting the machine, use the horn to signal.

WARNING

SAFETY ASPECTS DURING OPERATION

Before starting to travel, use the horn to signal.

WARNING

MACHINE ASCENT/DESCENT

Step onto and off the machine, only at the location of holding handles and the operator foot board.

Before getting in the machine, clean the operator foot board and handles if any oil, grease or mud is present, check their state of wear; if they are not in good condition, repair them.

Both for the upward movement and downward movement, always keep, if possible, **three contact points** (gripping or supporting), **two hands and one foot or two feet and one hand,** to be sure not to lose your balance and fall.

Always face the machine when climbing on or off.

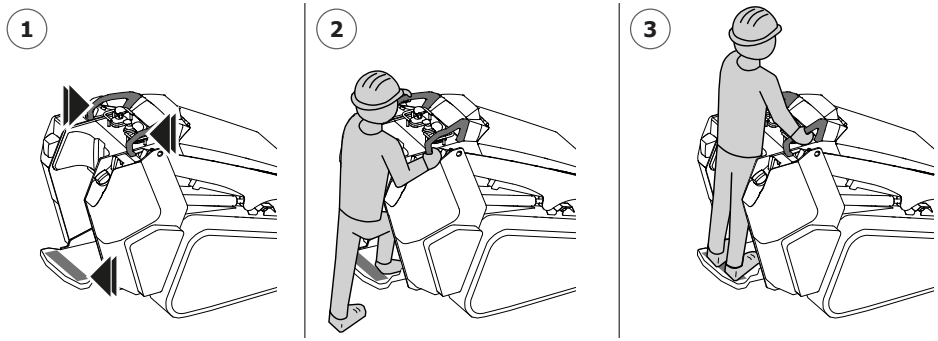
Get on and off the machine slowly and carefully, DO NOT carry tools or other items, always keep your hands free and able to grip the handles.

Do not jump on or off the machine.

Do not try to climb on or off the machine when it is moving.

Do not climb on or off the machine by gripping the control levers.

Get on facing the machine as shown in the figure (from **1** to **3**).



Before getting off the machine, **ALWAYS** perform the following operations:

- lower the equipment to the ground;
- stop the engine and remove the ignition key.

Get off looking at the machine as shown in the figure observing the described procedure in reverse order.

⚠ WARNING

CHEMICAL HAZARDS

EMISSIONS

Fumes from the engine exhaust could lead to injury or death.

DO NOT OPERATE THE MACHINE in an enclosed area without a ventilation system able to extract the hazardous fumes.

BATTERY

The following NOTICE is intended to supplement rather than replace the notices and information provided on the battery by the battery manufacturer.

In case of jump-starting of the machine or battery charging, carefully follow the instructions provided in section *"6.8 - Engine jump-starting procedure" to page 6-14* of this manual.

This machine is equipped with a lead-acid battery. Batteries of this type contain an acid electrolyte and generate explosive gases. Never create sparks or flames, or smoke near the battery. Incorrect procedures may lead to contact with the battery electrolyte and result in serious chemical burns to the eyes and skin, or damage to clothing.

Always wear safety goggles and proper protective clothing when performing any maintenance work or servicing the battery.

FIRST AID FOR BATTERY ELECTROLYTE

- EXTERNAL CONTACT - Rinse with water.

- EYES - Rinse with water for at least 15 minutes and seek medical attention immediately!

- INGESTION - Drink plenty of water, then milk of magnesia or vegetable oil, DO NOT drink vomit-inducing fluids!

Seek medical attention immediately!

⚠ WARNING

RISK DUE TO MOVING PARTS

DO NOT place the limbs or other parts of the body close to the moving or rotating parts of the machine during operation. Failure to comply with this warning may lead to serious injury or death due to crushing or amputation.

STOP the engine and wait for all moving parts to come to a standstill before carrying out maintenance work.

⚠ WARNING

MACHINE INSPECTIONS AND MAINTENANCE

Stop the machine before starting inspection and maintenance work on the machine.

It is extremely risky to carry out checks or maintenance operations with the machine in operation. Make sure that you have already stopped the machine. Only commence with the task after every device in the engine compartment has cooled down.

⚠ WARNING

PREPARATION AND PREVENTION

Know the location and function of all machine controls. Before starting the machine, make sure that no one is in the work area.

Holes, obstacles, rubble and other hazards associated with work areas could cause bodily harm or death. Always inspect the work area, taking care to identify the hazards before operating the machine.

Avoid hazards when driving the machine around the work site. Get informed on the movement of persons and vehicles around the site. Comply with all signals and signs.

DO NOT use the machine unless:

- all equipment is present and in good condition;
- all covers and guards are in place;
- all safety signs and labels are applied and readable.

Repair or replace any missing and/or damaged parts.

⚠ WARNING

RISK OF TIP-OVER OR ROLL-OVER

Tipping over or rolling the machine over can cause severe injury to the operator or even death.

Always keep the heaviest part of the machine upstream.

Travelling with the boom raised is hazardous and may cause the machine to tip or roll over. Keep the boom and equipment as close to the ground as possible while moving.

The stability of the machine decreases when it is used on uneven ground or on slopes.

When travelling, plan the direction in which the machine is to move. Avoid making any jerky turns, starts, or stops. Travel with extreme caution and at the slowest possible speed.

DO NOT exceed the nominal load capacity of the machine, as the non-observance of the suggested values may cause instability and dangerous operating conditions for the machine and for the operator.

⚠ WARNING

MACHINE STABILITY

When the boom and equipment are raised to maximum height, the stability of the machine is at a minimum, in this position greater care must be taken to avoid the risk of tipping or rolling over.

⚠ WARNING

TRAVELLING AND WORKING ON SLOPES

Always keep the heaviest part of the machine upstream.

Below are a number of guidelines to evaluate the stability of the machine.

- If the machine is not fitted with equipment, the heaviest part is the rear;
- if the machine is fitted with equipment for loading material (e.g. bucket or pallet forks) and is empty, the heaviest part is the rear;
- if the machine is fitted with equipment for loading material (e.g. bucket or pallet forks) and is fully loaded, the heaviest part is the front;
- if the machine is fitted with equipment that does not load material (e.g. shredder head), the heaviest part is the front.

Each situation must always be evaluated by the operator before travelling on slopes.

When the machine is used in conditions other than those indicated in the manual (for instance, on a surface which is not compact, but rough or slippery, or on a slope, etc.), the operator must take into account the new conditions that reduce the machine's stability and capacity. The operator must therefore work at lower speeds and with lighter loads so as to ensure the stability of the machine.

All indications supplied in the manual refer to the use of the machine on a flat and stable surface.

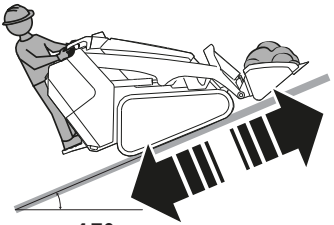
Travelling or working on a slope is riskier than travelling or working on flat ground.

If it is not possible to avoid slopes, take the following precautions.

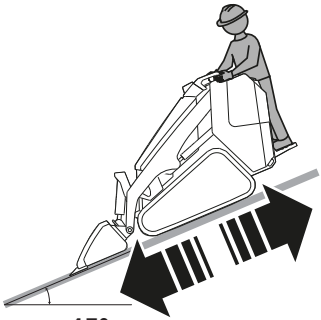
Ascend or descend slopes slowly and cautiously. Unexpected obstacles or changes in slope can cause loss of machine control that may result in tip-over or roll-over.

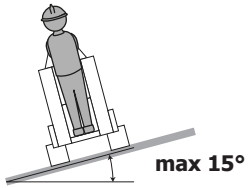
Maximum slopes permitted for travel

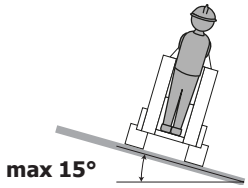
MACHINE AT FULL LOAD



MACHINE WITH NO LOAD





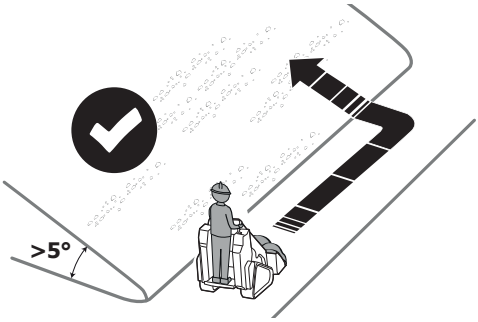


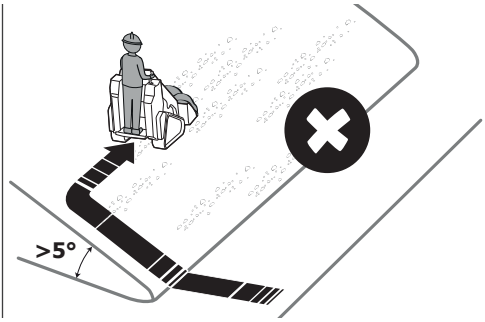
When travelling on a slope with a gradient lower than 5°, always reduce the machine speed and maintain a slow, steady motion. Apply braking by smoothly returning both travel control levers to the NEUTRAL position (N).

When travelling on steep ground with a gradient greater than 5°, take the following additional precautionary measures:

- descend or ascend only and NEVER drive the machine across steep slopes;
- keep the boom and equipment as close to the ground as possible.

Changing direction on slopes is allowed only if the gradient is less than 5°.





⚠ WARNING

TRAVELLING ON UNEVEN GROUND AND WHERE KERBS ARE PRESENT

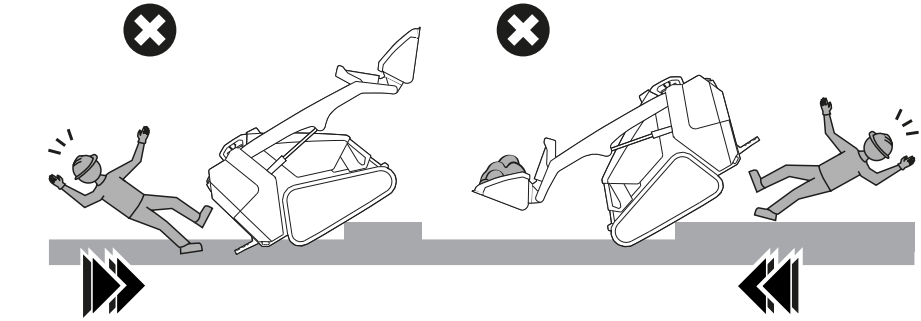
If possible, avoid uneven ground and kerbs. If this is not possible, follow the instructions below.

Always keep the heaviest part of the machine upstream.

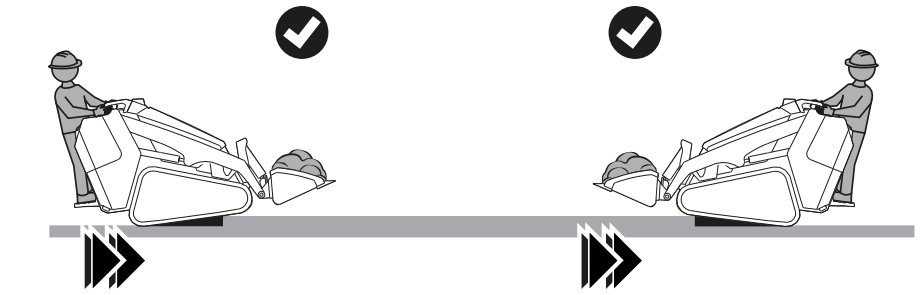
Travel slowly over uneven terrain. Keep the boom and equipment as close to the ground as possible while moving.

As the machine goes over a kerb or hump and the centre of gravity goes over the obstacle, the machine tilts forwards or backwards very quickly, proceed slowly and brace yourself using the holding handles.

Do not travel over a kerb or hump in reverse with no load or in any event with the boom raised.



When travelling over a kerb or hump must be repeated several times, build a ramp using the soil in order to make it a more gradual obstacle.



WARNING

USE ON DECKS OR RAISED FLOORS

Check always the space within which the machine is operated and all limitations regarding size and scope of the working area. When working on a deck or a raised floor, always check their bearing capacity.

WARNING

LIFTING OF THE MACHINE

Follow all the instructions given in section *"4.4 - Lifting the machine" to page 4-6*.

WARNING

RISKS WHILE TRANSPORTING PASSENGERS

DO NOT allow anyone to ride on the machine with the operator.

DO NOT use the machine as a lift or working platform for people.

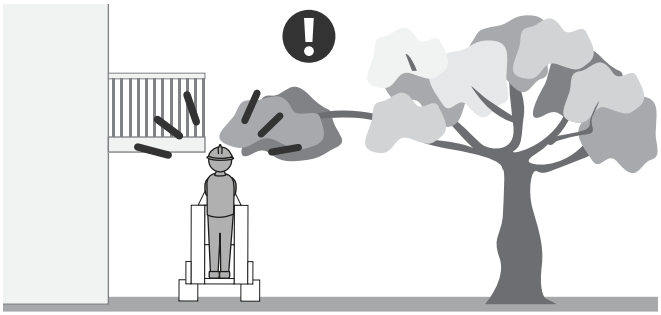
DO NOT allow anyone to climb onto the operating equipment.

There is the risk of falling and of being seriously injured.

WARNING

DISTANCES

Always check the space available above and to the side before turning around or travelling under and/or near structures (e.g. buildings, bridges, scaffolding, etc.) or vegetation.



⚠ WARNING

RISKS RELATED TO THE SUBSOIL

Get informed on the location of all underground dangers before operating the machine in a new work area. Contact with electrical cables, telephone lines, gas or water pipes, sewers, or other underground utilities could lead to injury or death. Before starting work, contact your local telephone service supplier and request them to locate and mark these utilities.

⚠ DANGER

RISK OF ELECTROCUTION CAUSED BY HIGH ELECTRIC VOLTAGE

When operating near any overhead power lines, either barricade them off or apply insulating guards around them. It is also very risky to operate near high voltage lines: the lines can be dangerous even when the machine is NOT in direct contact with the line.

In case of operations at a distance lower than those indicated, contact the company that owns the electrical line to disable the voltage in the work area line section.

NEVER operate this machine in an area where there are overhead or underground power lines, cables, or other power sources, without first requesting that the appropriate power or utility companies isolate the lines or taking other adequate precautions.

Maintain a safe distance from the power lines according to the indications below:

CABLES VOLTAGE	MINIMUM PERMITTED DISTANCE
from 0 to 50 kV	3.0 m
from 50 to 200 kV	4.6 m
from 200 to 350 kV	6.1 m
from 350 to 500 kV	7.6 m
from 500 to 750 kV	10.7 m
from 750 to 1000 kV	13.7 m
more than 1000 kV	Ask the company in charge of the electrical power line for information regarding the minimum distance to be kept from the cables.

⚠ WARNING

OBSTRUCTED VISIBILITY

Dust, smoke, fog, etc. can decrease vision and cause an accident.

Always stop or slow the machine down until the obstruction clears and the work area is once again clearly visible.

⚠ WARNING

MOVING ON A FROZEN OR SNOW-COVERED SURFACE

If work must be performed on surfaces coated with ice or frozen snow, reduce the speed and avoid making any jerky movements. Sideways slipping could easily occur while the machine functions become more sensitive.

When a large amount of snow has fallen, the road edges and any equipment provided are difficult to see. Exercise extreme caution in such situations.

Frozen ground will often get softer as the temperature rises. Exercise extreme caution in such situations.

⚠ WARNING

WORKING NEAR WATER COURSES

Near water courses, lakes or seas, pay attention to the immersion depth of the machine.

Do not immerse the machine in water beyond the permissible depth (lower part of the frame).

Immersing the machine over the permitted limit can cause drowning of the operator and/or serious damage to the machine.

If there are any lubrication points in parts of the partly completed machinery that have remained under water for a long time, grease them using the relative grease nipple until grease seeps out from the junctures.

⚠ WARNING

WORK SITE CONDITIONS

Prior to start working, assess and record thoroughly the topography and geological characteristics of the place in order to take appropriate measures to prevent the tip-over or roll-over of the machine, against landslides or mudslides.

Other conditions may also generate effects at the workplace. People can enter the area, equipment and materials can be moved or added. Always be aware of the existing conditions on the work site and always look in the intended direction before starting any movement.

Do not start working if the necessary safety conditions are not met.

⚠ WARNING

VENTILATION

Good ventilation of the work area is very important for the operation of the machine. The sparks coming from the engine exhaust may cause explosions. Carbon monoxide fumes from the engine exhaust can cause suffocation in an enclosed area. DO NOT operate the machine in an area containing flammable dust or fumes. Provide good ventilation and wait until the hazard has been eliminated.

☞ *NOTICE*

ABNORMAL NOISE PRODUCED BY THE MACHINE

While working, pay attention to any unusual noises coming from the engine, the hydraulic devices, the components of the transmission, working equipment etc.

Find below a list of possible abnormal noises.

- Do you hear a squeak caused by poor lubricating oil quantity?
- Do you hear friction noise?
- Do you hear an abnormal vibration or tinkling?
- Do you hear an uneven sound?

- Do you hear a strange noise coming from the hydraulic devices?
- Do you hear beats at determined intervals?

If any of these noises are detected, stop the machine immediately and carry out a check.

⚠ WARNING

KEEP THE AREA AROUND THE DRIVER'S SEAT CLEAN

Always keep the operator's seat and foot board clean.

Do not climb with dirty, muddy or greasy shoes.

Do not place any objects on the foot board.

Do not hang any objects on the control levers. These control levers may be engaged accidentally, causing the machine to move or the work equipment to be activated, which may result in dangerous situations.

Stow away any items not required for the current operations in their proper places.

☞ *NOTICE*

The electrical components have extremely limited resistance to water. The infiltration of water into the various sensors, connectors or electrical system components may result in malfunctions. Do not clean using steam and water.

⚠ WARNING

PRECAUTIONS DURING MAINTENANCE

Before starting maintenance, always deactivate the machine as indicated in section *"8.1.1 - Putting the machine out of service for maintenance" to page 8-4*.

Never re-use broken, damaged or badly worn parts.

Tighten all bolts, unions and accessories to the torques specified in the specific sections.

Replace all protections and guards, lock all hoods and covers with a key (if present).

⚠ WARNING

REPAIRS REQUIRING WELDING

All welding operations on the machine are **prohibited**.

If welding repair is required, contact the *Service Centre*.

⚠ DANGER

PREVENTION OF FIRE CAUSED BY FUEL OR OIL

Fuel, oil and some types of cooling liquids are easily flammable if they come into contact with flames or a spark; fuel is particularly flammable and it is therefore necessary to be very careful when using these fluids.

Follow the precautions listed below:

- keep away the open flames from flammable fluids;
- turn off the engine and do not smoke while refuelling;
- refuel and fill the oil only when the engine is shut down, in a well-ventilated area;
- refuel and top up in a well delimited area, and do not allow access to unauthorized persons;
- when filling up with fuel, keep a firm grip on the spout and always keep it in contact with the slot until filling is complete, so as to prevent any sparks due to static electricity;
- after having refuelled tighten carefully the safety caps of fuel and oil tanks;
- do not fill the tank completely; leave the space necessary for fuel expansion;
- wipe immediately the possible fuel leaks;
- do not heat the fuel tank or the hydraulic devices, nor allow flames to get near them: there is danger of fire;
- keep fuel and oil in appropriate containers and store them in a safe place, with access restricted solely to persons authorised to handle these materials.

⚠ WARNING

DECOMMISSIONING

Park the machine on a flat surface.

Before leaving the machine, lower the equipment to the ground.

Stop the machine, remove the key and close all doors and covers.

⚠ WARNING

RESIDUAL PRESSURE IN THE HYDRAULIC SYSTEM

Before carrying out any maintenance work on the hydraulic system, the residual pressure must be released, see section *"6.19 - Discharge residual pressure in the hydraulic system" to page 6-39*.

Please contact the *Service Centre* for more details.

⚠ WARNING

PRECAUTIONS TO BE TAKEN WHILE OPERATING

Never carry out excavations on overhang areas, the edges might collapse or the soil could slide, causing serious injury or fatal accidents.

Do not place the equipment above people or above the cab.

Falling of the loads from the bucket or impacts against the bucket can cause serious injury or damage to the machine.

2.8 - Safety devices

2.8.1 - Control cut-out button

The control cut-out button (**1**) is located on the dashboard.

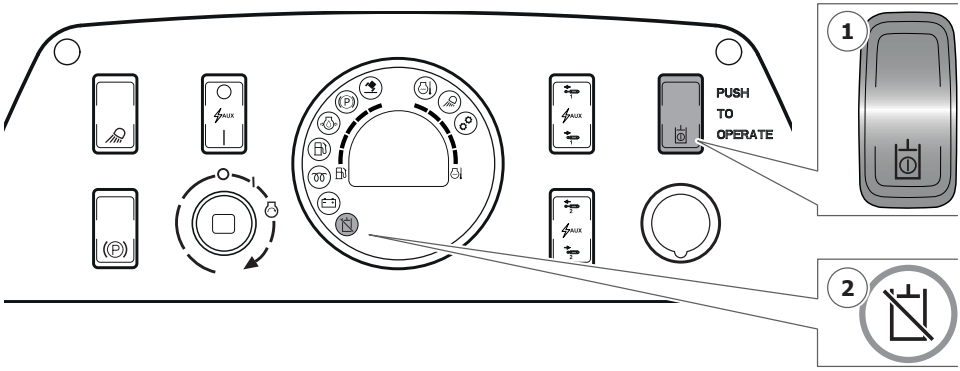
After starting the engine, the controls are locked and the parking brake is engaged.

Press the button (**1**) to enable/disable the controls whenever necessary; during this operation, the operator must be in the driver's seat (foot board).

With the controls unlocked, if the operator leaves the driver's seat, the controls are disabled; when the operator returns to the driver's seat, the button (**1**) must be pressed again to enable the controls.

The control cut-out indicator light (**2**) shows:

- **light on**: machine controls locked/disabled;
- **light off**: machine controls unlocked/enabled.



The control cut-out button also automatically activates the parking brake.

NOTICE

For the procedure that temporarily activates the controls with the operator not detected in the driver's seat, refer to section "6.23 - Procedure for the temporary activation of the controls with the operator not detected in the driver's seat" to page 6-52.

2.8.2 - Parking brake button

WARNING

The parking brake must be engaged during work operations that do not require that the machine travel.

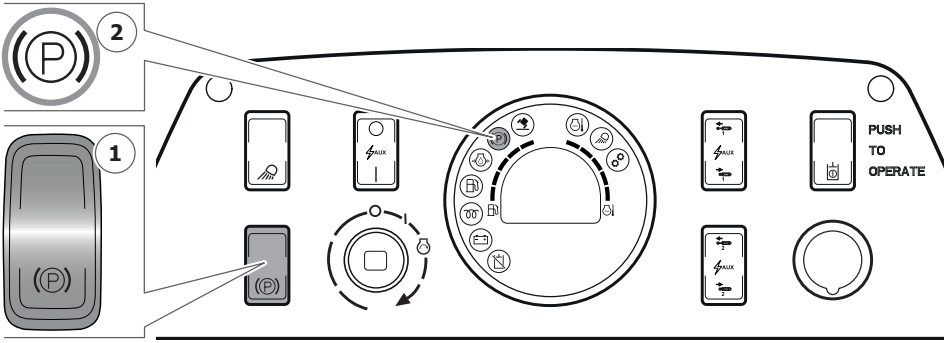
The parking brake button (**1**) is located on the dashboard.

Press button (**1**) to enable/disable the parking brake whenever necessary.

The parking brake indicator light (**2**) shows:

- **light on**: parking brake engaged and machine travel controls disabled;
- **light off**: parking brake disengaged and machine travel controls enabled.

When the engine stops, the parking brake engages automatically.



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3 - TECHNICAL DATA

3.1 - General data

MODEL		TL100
Operating weight ISO 6016 (with bucket and operator)	kg	1,740
Specific ground pressure	kg/cm^2	0.37
Travel speed	km/h	from 0 to 7.5

The weights considered for the calculation of the operating weight are:

- bucket 83 kg;
- operator 75 kg.

If the installed equipment differs from that indicated, the weight of the machine may vary.

The operating weight indicated is referred to the machine with a standard configuration; always take into account the weight of the various accessories installed.

3.2 - Engine

MODEL		TL100
Brand		KUBOTA
Model		D1305
Level of pollutant emissions		EU Stage V EPA Tier 4 Final
Power	kW CV HP rpm	18.2 24.7 24.4 2,600
Displacement	cc	1,261
Number of cylinders	no.	3
Cooling		Liquid
Fuel supply		Diesel
UNLADEN minimum speed	rpm	1,850
UNLADEN maximum speed	rpm	2,800
LOADED maximum speed	rpm	2,600

NOTICE

With regard to the more specific description and operation of the internal combustion engine (fuel injector pump, alternator, starting equipment) refer to the engine user and maintenance manual that is supplied with the machine.

3.3 - Hydraulic system

MODEL		TL100
Plant type		Open centre
Transmission type		Hydrostatic with tandem hydraulic pump and radial piston motors
Pump type		1 tandem pump 1 gear pump
Pump displacement	cc	17+17 tandem 19 gear
Total flow rate gear pump	l/min	48
Max. system calibration pressure	bar	190
Hydraulic servo-controls for operation		2 Joysticks

For the data of the auxiliary hydraulic systems, refer to section *"6.20 - Auxiliary hydraulic systems" to page 6-40.*

3.4 - Performance

MODEL		TL100
Tip-over load ISO 14397	daN	1,310 tracks 250 mm 1,250 tracks 180 mm
Operating load ISO 14397 (no more than 35% of the tip-over load)	daN	460 tracks 250 mm 440 tracks 180 mm
Bucket breakout force ISO 14397	daN	1,760
Bucket capacity	m3	0.14 (1,050 mm) 0.12 (914 mm)
Bucket width	mm	1,050 - 914
Tractive force	daN	1,570
Maximum slope		27% - 15°

3.5 - Counterweight

MODEL	TL100
Supplementary counterweight weight kg	22
Number of counterweights with wide tracks - standard	3 + 3
Number of counterweights with narrow tracks - optional	1 + 1

3.6 - Undercarriage

MODEL	TL100
Lower rollers	5 rh + 5 lh in oil bath
Upper rollers	not present
Track tensioner	hydraulic adjustment with grease
Rubber tracks	250 x 72 x 45 180 x 72 x 45

3.7 - Fluid capacities

Refer to section *"8.7.1 - Refilling quantity table" to page 8-13.*

MODEL	TL100
Fuel tank l	30
Hydraulic oil tank l	17
Hydraulic system l	20
Cooling system l	3.5
Engine oil with replaceable filter l	4.5
Travel gear motors	0.15 l x 2

3.8 - Electrical system

MODEL		TL100
Electrical system		12 V d.c. ground on negative
Lead battery with liquid electrolyte	V - Ah	12 - 62
Alternator	V - A	12 - 40
Starter motor	V - kW	12 - 1.4

3.9 - Brakes

MODEL	TL100
Service brake on travel	**Type**: hydrostatic. **Brake activation**: it is activated automatically when the movement control lever is released (the transmission pump disc returns to the neutral position, closing the oil passage completely or partially). **Brake deactivation**: it is deactivated automatically when the movement control lever is moved (the transmission pump disc moves from the neutral position, opening the oil passage).
Secondary and parking brake on travel	**Type**: negative mechanical spring on drive wheel. **Brake activation**: activates immediately when the brake button or the control cut-out button is pressed, when the engine is stopped or when the operator leaves the foot board (the pressure that performs the disengaging function is removed and the spring releases the pin, which mechanically blocks the rotation of the drive wheel). **Brake deactivation**: deactivates when the brake button or control cut-out button is pressed (pressure is applied via the brake valve, which opposes the force of the spring and causes the pin to retract, thereby releasing the rotation of the drive wheel). The deactivation is instantaneous.

3.10 - Operating load

The **operating load** is the weight of material that the machine, combined with the equipment, can lift and transport.

The operating load is calculated according to standard **ISO 14397-1**, and refers to:

- equipment used to load and transport material;
- machine positioned on sound, firm and level ground;

The **tip-over load** is the limit weight above which the machine loses stability (tips over), it is provided ONLY as a reference and **NEED NOT** be considered for work operations.

WARNING

When the machine is used in conditions other than those indicated in the manual (for instance, on a surface which is not compact, but rough or slippery, or on a slope, etc.), the operator must take into account the new conditions that reduce the machine's stability and capacity. The operator must therefore work at lower speeds and with lighter loads so as to ensure the stability of the machine.

NOTICE

The weight of the material loaded must not exceed the value of the operating load indicated.

For bucket application, calculate the weight as follows:

Weight of material = capacity x material density.

The specific weight considered "standard" for soil and rubble is 1800 kg/m^3.

Always take into consideration the specific weight suitable for the material handled.

For the pallet fork application, the weight of the material to be handled must be known.

For other applications in addition to those described, see section *"7 - Recommended optional equipment" to page 7-1*.

For details of the operating load of equipment NOT indicated in this manual, contact the *Service Centre*.

3.10.1 - Bucket

The data provided refers to original buckets provided by the manufacturer of the machine.

Combinations of buckets and counterweights that are not specified are PROHIBITED.

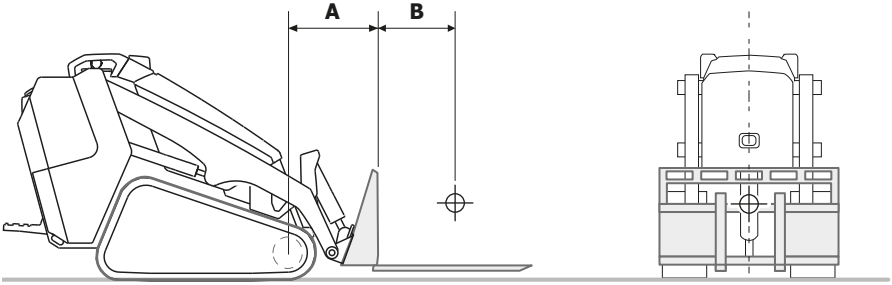
BUCKET WIDTH 1,050 mm			
VERSION / CODE		**B703000348**	
BUCKET WEIGHT (kg)		**83**	
CAPACITY (m^3)		**0.14**	
TRACK WIDTH (mm)	**NUMBER OF COUNTER-WEIGHTS (n.)**	**OPERATING LOAD (kg)**	**TIP-OVER LOAD (kg)**
250	3 + 3	460	1,310
180	1 + 1	430	1,220

BUCKET WIDTH 914 mm			
VERSION / CODE		**B703000350**	
BUCKET WEIGHT (kg)		**76**	
CAPACITY (m^3)		**0.12**	
TRACK WIDTH (mm)	**NUMBER OF COUNTER-WEIGHTS (n.)**	**OPERATING LOAD (kg)**	**TIP-OVER LOAD (kg)**
180	1 + 1	440	1,250

3.10.2 - Pallet forks

The pallet forks must comply with the indicated sizes.

The capacity indicated by the manufacturer of the forks must be equal to or higher than the operating load of the machine.



Key:

A	Outreach (distance from wheel front idle wheel to fork plate shoulder)
B	Barycentre of load

PALLET FORKS			
Max. WEIGHT (kg)		**135**	
A max (mm)		**1,010**	
B max (mm)		**610**	
TRACK WIDTH (mm)	**NUMBER OF COUNTER-WEIGHTS (n.)**	**OPERATING LOAD (kg)**	**TIP-OVER LOAD (kg)**
250	3 + 3	230	650
180	1 + 1	210	600

3.11 - Standard / optional equipment

The following table indicates the different equipment available for the machine.

Equipment key:

● STANDARD	○ OPTIONAL	/ NOT AVAILABLE

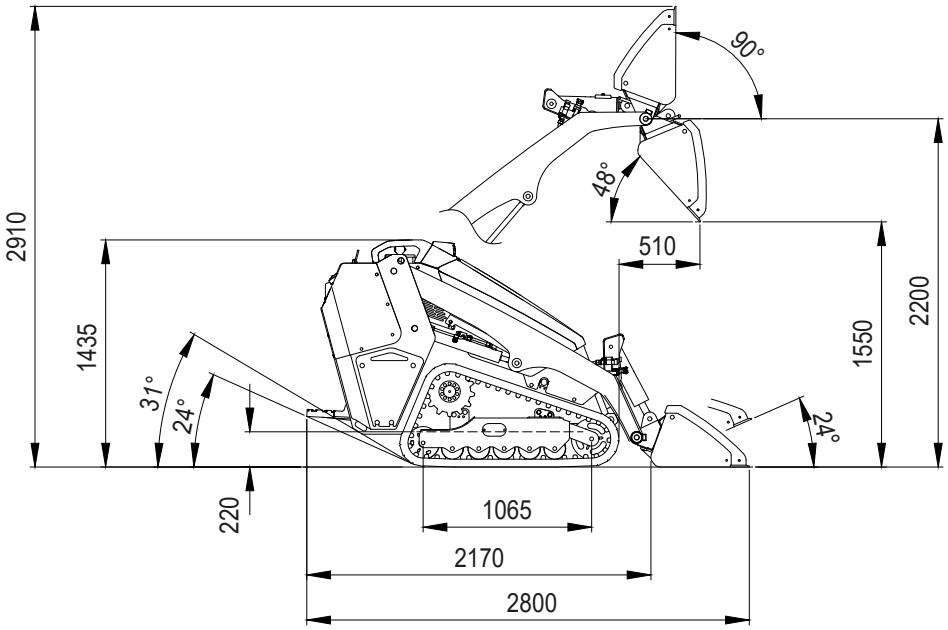
EQUIPMENT	TL100
Rubber tracks standard	●
Rubber tracks optional	○
Bucket cylinder guard	●
Boom floating control	●
Supplementary counterweights (refer to section *"3.5 - Counterweight" to page 3-4*)	●
Auxiliary hydraulic system on AUX1 boom	●
Drainage line on boom towards hydraulic oil tank	○
Single-acting/double-acting mechanical switch on AUX1 auxiliary hydraulic system	●
Mechanical adjustment of maximum AUX1 auxiliary hydraulic system flow rate	●
LED work light on engine hood front end	●
LED work light on rear end	●
Auxiliary power socket at the driver's seat	●
Geo-localisation system	○
Auxiliary power socket on boom	○
Engine shut-down device in the event of tip-over	○
Reclining, dampened operator foot board (driver's seat)	●
Use and maintenance manual	●
Document glove box	●
Interchangeable mechanical equipment quick coupler type CII	●
Interchangeable equipment to be fitted to the second boom (refer to section *"7.2 - Specifications on authorised equipment" to page 7-4*)	○

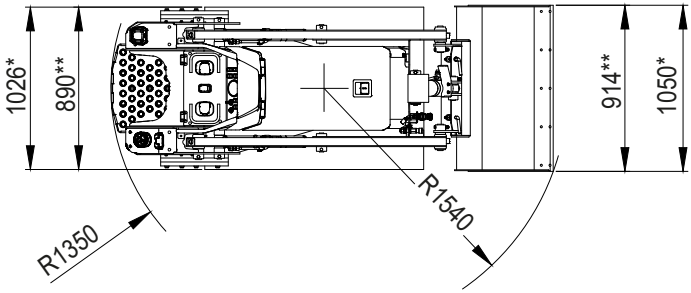
3.12 - Overall dimensions

The overall dimensions are indicated in **mm** for machines with standard bucket.

The symbol * refers to a machine equipped with **250 mm track**.

The symbol ** refers to a machine equipped with **180 mm track**.





4 - TRANSPORTING THE MACHINE

⚠ WARNING

Make sure that the truck used to transport the machine has an adequate load capacity.

Before loading the machine, make sure the truck bed and/or the loading ramps are clean and free of any traces of grease, oil, soil, ice or other slippery residues.

A non-slip mat with a friction coefficient of at least 0.6 is required, to be placed between the tracks and the loading platform.

Do not change direction on the ramps. Align the machine with the ramps before getting on and travel in a straight line.

During transportation, the machine must be anchored to the means of transport; to anchor it use the appropriate anchor points.

Observe the current standards regarding width, height, weight and transport speed permitted.

4.1 - Transportation dimensions

The dimensions of the machine are indicated in section *"3.12 - Overall dimensions" to page 3-10.*

The weight of the machine is indicated in section *"3.1 - General data" to page 3-1*.

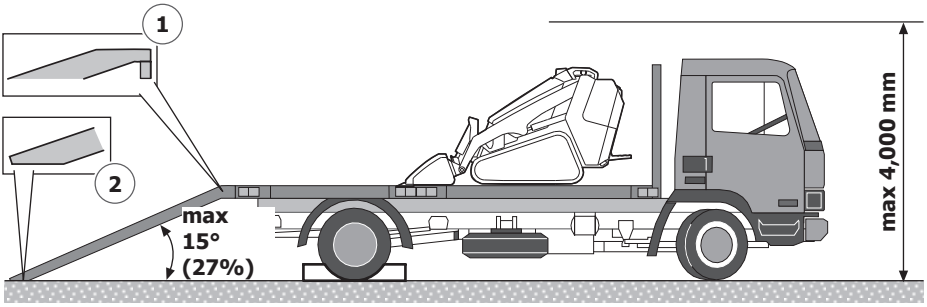
4.2 - Loading/unloading operations

It is recommended to use a special platform while loading and unloading the machine from the means of transport.

However, it is permitted to use loading ramps, in this case also consult the use and maintenance manual provided by the manufacturer of the ramps.

Before using ramps to load or unload the machine:

- perform loading/unloading operations on flat and compact ground, keep a safe distance from the edges of canals or roads;
- ensure that the nominal load capacity of the ramps is adequate for the weight of the machine and that each ramp is at least as wide as the track;
- ramps **MUST NOT** form an angle greater than 15° (27% slope);



- fit the ramps so that the axis of the machine is aligned to the track axis;
- the ramps must be rigidly connected (**1**) to the truck deck to avoid possible disconnection while the machine is being loaded;
- at the contact zone of the track with the ground (**2**) do not allow a level difference greater than 50 mm; therefore choose ramps with bevelled support;
- make sure the parking brake of the means of transport is engaged;
- apply wedges to block the wheels of the means of transport;
- place a non-slip mat on the loading platform of the truck, in the area where the machine will be placed;
- if necessary, remove the bucket or equipment to suit the size or maximum capacity of the means of transport. They can be transported in an appropriate manner.

NOTICE

At low temperatures (below +5°C), follow the instructions given in the relevant section before starting the loading/unloading manoeuvres.

WARNING

To reduce the risk of personal injury caused by the machine tipping over or rolling over, DO NOT attempt to change the machine direction and DO NOT activate any lever other than the travel lever while the machine is on a loading ramp.

Load the machine according to the indications:

1 - point the heaviest part of the machine upstream, for more details see *"TRAVELLING AND WORKING ON SLOPES" to page 2-32;*

2 - Align the machine to the means of transport.

3 - Load the machine slowly and ensure that an observer views loading/unloading operations from a safe distance, to warn the operator of any hazardous conditions that are not visible from the driver's seat.

WARNING

When reversing, pay attention to the direction of the controls which may not be intuitive, see section *"6.16.2 - Forward and reverse travel" to page 6-27* ***and*** *"6.16.4 - Rotation while reversing" to page 6-29****.***

4 - When loading, if the machine is not aligned during the loading procedure, stop, return to the initial position, carry out alignment and resume the loading procedure. Avoid steering on loading ramps.

WARNING

As the machine passes over the top of the ramps during loading, it will pivot on the centre of its tracks towards the level of the truck or deck of the means of transport. Maintain a slow, steady movement until the machine completes this rotation movement and both tracks are in full contact with the deck of the means of transport.

5 - Park the machine according to the indications given in section *"6.13 - Stopping and parking the machine" to page 6-22*;

6 - make sure that the machine tracks are on the non-slip mat, for the entire surface; if not, reposition the machine correctly;

7 - secure the machine to the deck of the means of transport as indicated in the following section.

To unload the machine, follow the procedure above in reverse order.

⚠ WARNING

During unloading operations, the machine will pivot again as it crosses over the top of the ramp. Maintain slow, steady progress until the machine completes this pivoting movement and both tracks are fully in contact the ramps.

4.3 - Securing the machine on the mean of transport

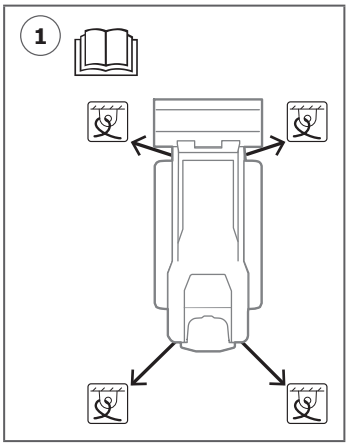
Before loading the machine, see the identification plate attached to it to know the weight and make sure that the truck used to transport it has an adequate load capacity.

After having loaded the machine onto the truck, position it and secure it as indicated below and on the special operation label (**1**).

Lower the boom fully and place the equipment on the loading bed, paying particular attention to the maximum height and any rear overhang on the transport vehicle.

If bulky equipment is installed, remove it and transport it separately, taking care to secure it as indicated by its manufacturer.

Position any equipment installed in such a way that it cannot move during transportation. If necessary, secure it using dedicated fastening elements.



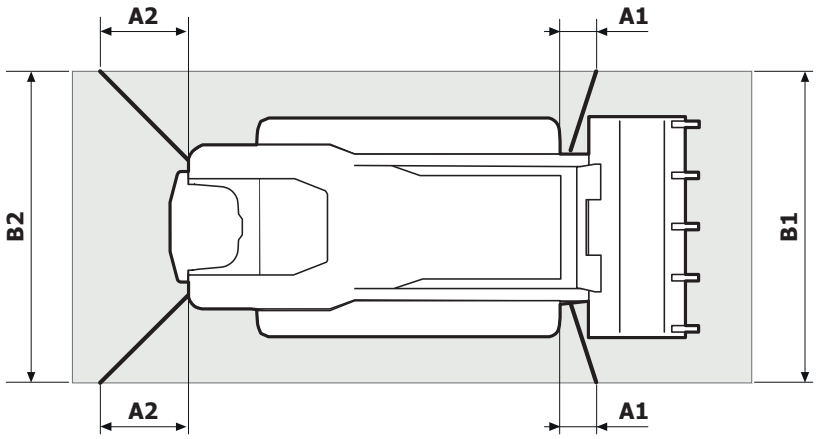
To avoid damage to the anchoring elements and/or to the anchor points of the machine, use guards for sharp edges.

The accessories used to secure the machine and the fixing points of the means of transport must have suitable capacity.
Check and follow the Standards in force in the country the transport is carried out.

⚠ WARNING

The anchoring accessories must not come into contact with parts of the machine or with other objects. These must only be connected to the anchoring points of the machine and to the anchoring points of the means of transport.

The machine can be anchored as shown in the figure:



FRONT anchor points		
Allowed range of values		**TL100**
A1	mm	125 ÷ 825 mm
B1	mm	1,030 ÷ 2,500 mm

REAR anchor points		
Allowed range of values		**TL100**
A2	mm	100 ÷ 1,000 mm
B2	mm	1,030 ÷ 2,500 mm

Anchoring capacity of the fastening system	
Minimum value	**TL100**
LC (Lashing Capacity) Front	1,680 daN
LC (Lashing Capacity) Back	3,180 daN

4.4 - Lifting the machine

DANGER

When lifting the machine, comply with the Standards in force in the machine's country of use.

Before lifting the machine, make sure that the lifting device has a suitable capacity in relation to the weight of the machine.

Use clean, undamaged lifting accessories (cables, ropes, track chains, shackles, etc.) of adequate capacity.

Use only the anchorage points indicated in the specific label.

Never lift the machine with the operator on board.

Do not lift the machine if it is blocked by mud, debris or ice.

Do not allow access near the machine.

While lifting, keep the machine in horizontal position.

Nobody must stand under the machine when it is lifted from the ground.

Lift the machine ONLY as indicated by the procedure; other methods are risky and therefore forbidden.

For lifting, use ONLY the attachment points indicated and labelled for this purpose.

In order to reduce the risk of accidents and serious damage to people as much as possible, all staff in charge of operating the lifting device and the relative operations must be specialised and must have been appropriately trained. It is their responsibility to ensure that proper equipment is used to lift the machine.

NOTICE

For details on the weight of the machine, see section "3.1 - General data" to page 3-1.

The lifting procedure is valid for the machine with standard equipment (bucket) or without equipment. If the machine features different equipment, remove it before starting the lifting procedures.

If in doubt, contact the Service Centre.

4.4.1 - Lifting procedure

The machine must be lifted on a flat and compact surface via the following procedure:

1 - if the machine features equipment other than the original bucket, remove it first before lifting;

2 - always check the weight of the machine before lifting, see section *"3.1 - General data" to page 3-1;*

3 - lower the boom completely;

4 - fully close the bucket (if present) or the quick-coupling;

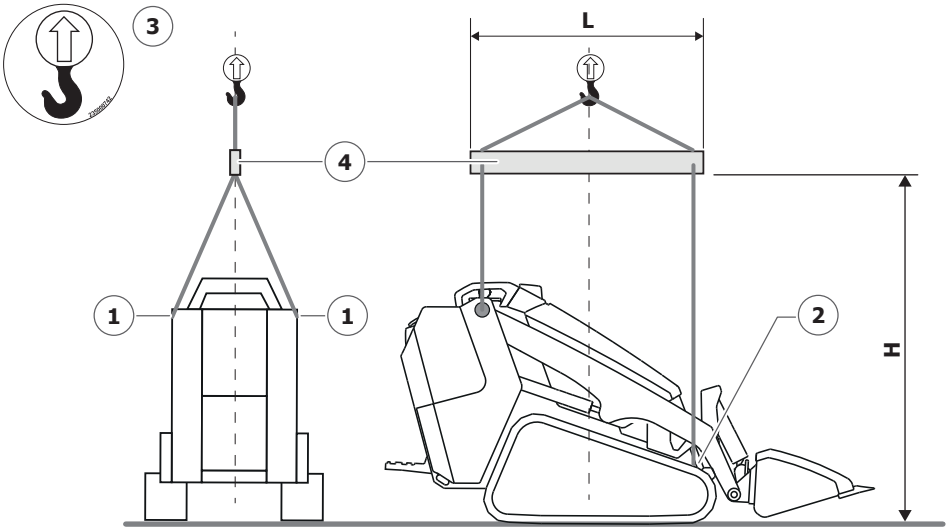
5 - stop the engine, remove the ignition key, then get out of the machine;

6 - attach the lifting accessories to the points of the machine intended for that purpose, as shown in the figure (these points are identified on the machine by means of special labels - **3**):
- one on each side to the left and right of the control levers (**1**);
- one on each side to the left and right of the lower part of the front of the frame (**2**);

7 - connect the cables to the lifting accessory (bar) (**4**), respecting the dimensions indicated in the figure;

8 - respect the minimum height indicated in the figure to avoid contact between the lifting accessories and the machine, a greater height is allowed;

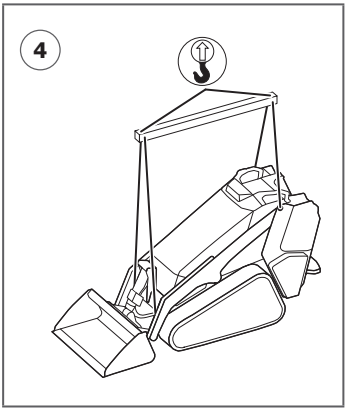
9 - lift the machine slowly.



H	Minimum height from ground of the lifting accessory	2,000 mm
L	Length of lifting accessory	1,000 ÷ 1,700 mm

The lifting instructions are given in a simplified manner on a special label (**5**) applied to the machine.

When the machine has been lifted from the ground, stop the lifting operations and make sure that the machine is in a **HORIZONTAL POSITION**; if the position is not correct, adjust the length of the accessories, then continue with the lifting operations;



10 - move the machine to the desired location and lower it slowly, the supporting surface must be flat, compact and have an adequate load-bearing capacity;

11 - when the machine is completely resting on the ground, disconnect the accessories.

4.5 - Recovering and towing the machine

WARNING

When towing the machine, comply with the Standards in force in the machine's country of use.

Before towing the machine, make sure that the towing vehicle has adequate braking power and capacity to control both machines.

Use a rigid tow bar, with a capacity of at least 150% of the weight of the towed machine. The bar must be clean and free of damage. Comply with the safety instructions given by the manufacturer of the same.

Use only the anchorage points indicated in the specific label.

No persons are permitted to be in the vicinity during towing; only the operator on board the towing vehicle may be present. Since it is not possible to control the towed machine completely, other people may get crushed resulting in serious injuries.

Tow the machine ONLY as indicated by the procedure; other methods are risky and therefore forbidden.

NOTICE

It is forbidden to tow the machine with other mechanical means for long distances; there is a risk of damaging the travel system.

Towing must be performed only when strictly necessary.

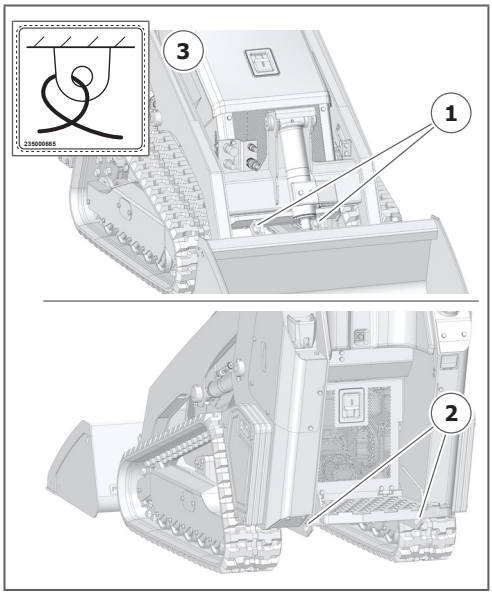
These instructions refer to moving the machine when it has broken down or is stuck in the ground.

If the machine has broken down, try to repair it on site if possible, thus avoiding towing operations. If this is not possible (e.g. machine stuck on a road full of traffic) proceed with towing.

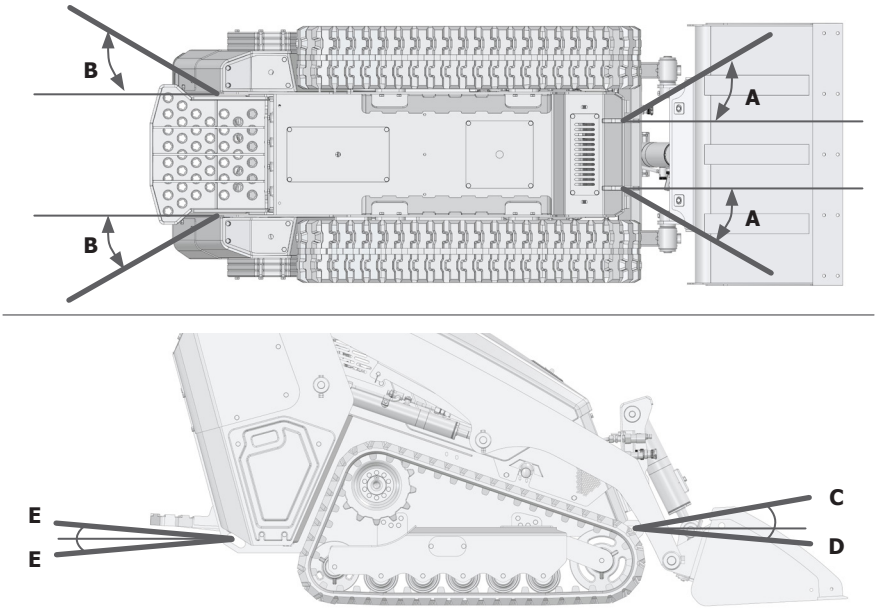
If the machine is stuck in the ground (e.g. muddy ground), proceed with recovery by towing it only as much as necessary to pull it out.

When towing, meet the following conditions:

- while towing, the operator **MUST NOT** be on the towed machine;
- tow the machine on flat surfaces only;
- the distance towed should be as short as possible; for long distances, load the machine on a truck;
- tow at a maximum speed of **1 km/h**;
- maintain a sufficient distance to avoid contact between the machine and the towing vehicle; this distance must be under **3 m**;
- while towing, do not allow anyone to access the space between the towing vehicle and the machine;
- connect a tow bar to the dedicated tow hook of the frame on the front side (**1**) or on the rear side (**2**), the hooks are indicated by the dedicated labels (**3**).
- **DO NOT** use other anchorage points (e.g. boom, bucket or any accessory installed);



- the tow bar must be positioned as indicated below;



A	Maximum horizontal pull angle, front end	± 30°
B	Maximum horizontal pull angle, rear end	± 30°
C	Maximum upper vertical pull angle, front end	10°
D	Maximum lower vertical pull angle, front end	5°
E	Maximum vertical pull angle, rear end	± 5°

- **NEVER** continue towing unless both tracks are fully in contact with the ground.

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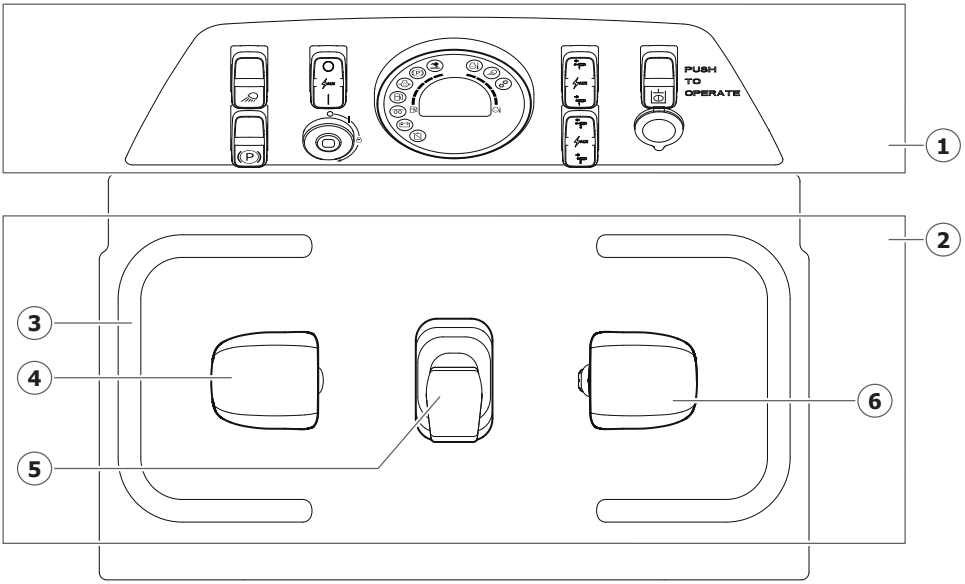
5 - CONTROLS AND INSTRUMENTATION

The function of each control and tool is described in detail in chapter *"6 - Using the machine" to page 6-1.*

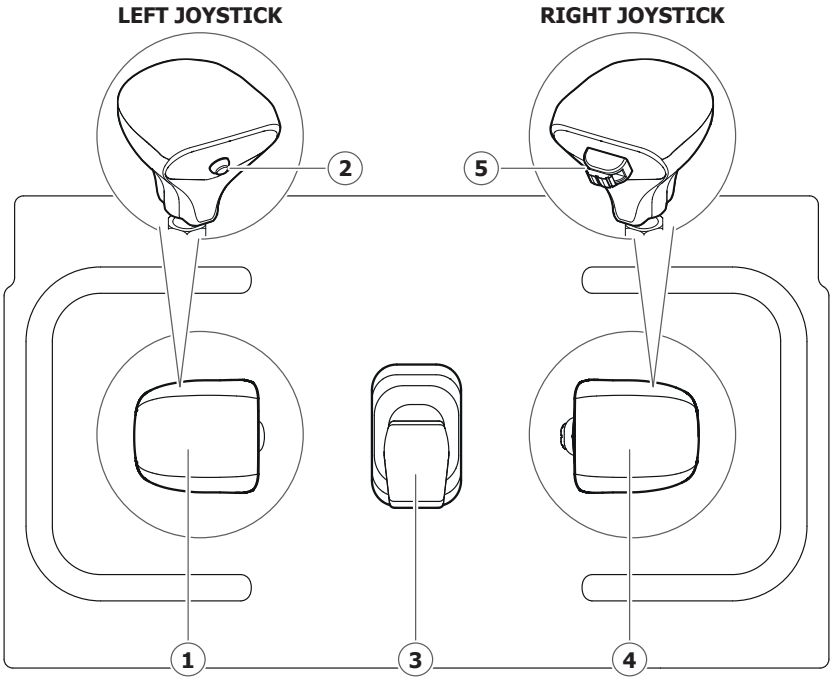
5.1 - Description of controls



Key:

1	Dashboard	**4**	Left joystick (machine travel)
2	Control levers	**5**	Throttle lever
3	Support bars	**6**	Right joystick (equipment handling)

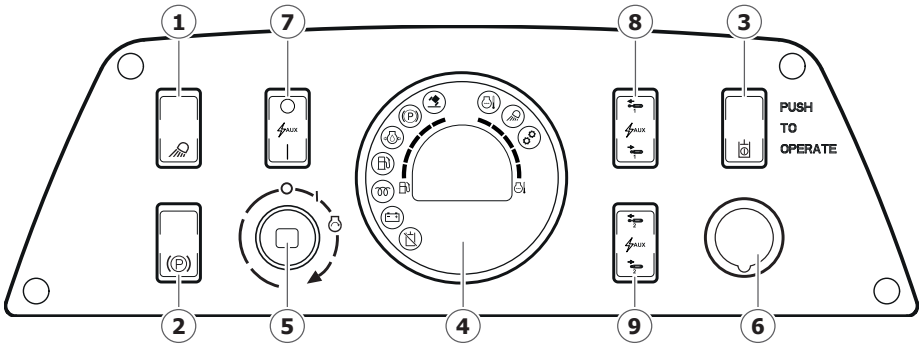
5.2 - Description of control levers



Key:

1	Left joystick (machine travel)	**4**	Right joystick (equipment handling)
2	Horn button	**5**	Roller AUX1 hydraulic system
3	Throttle lever		

5.3 - Description of dashboard



Key:

1	Work lights switch	**6**	12V current tap
2	Parking brake button	**7**	Electrical system 0-1 switch (**optional**)
3	Control cut-out button	**8**	Electrical system 1 button (**optional**)
4	Control panel	**9**	Electrical system 2 button (**optional**)
5	Starter switch		

5.4 - Roller operation

The rollers are proportional electric controls, not retained, which control hydraulic functions; depending on the installation, they can turn to the right/left or up/down.

A greater movement of the roller gives a proportionally quicker response from the associated function.

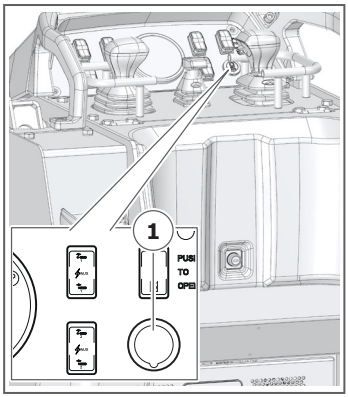
NOTICE

The rollers are very sensitive, so take care when working not to touch them by accident, an unwanted hydraulic function could occur compromising the safety of the operator and anyone nearby.

5.5 - Auxiliary power socket on console

An auxiliary socket is located on the dashboard (**1**). The socket is of the ISO 4165 standard two-pin type, powered by 12V.

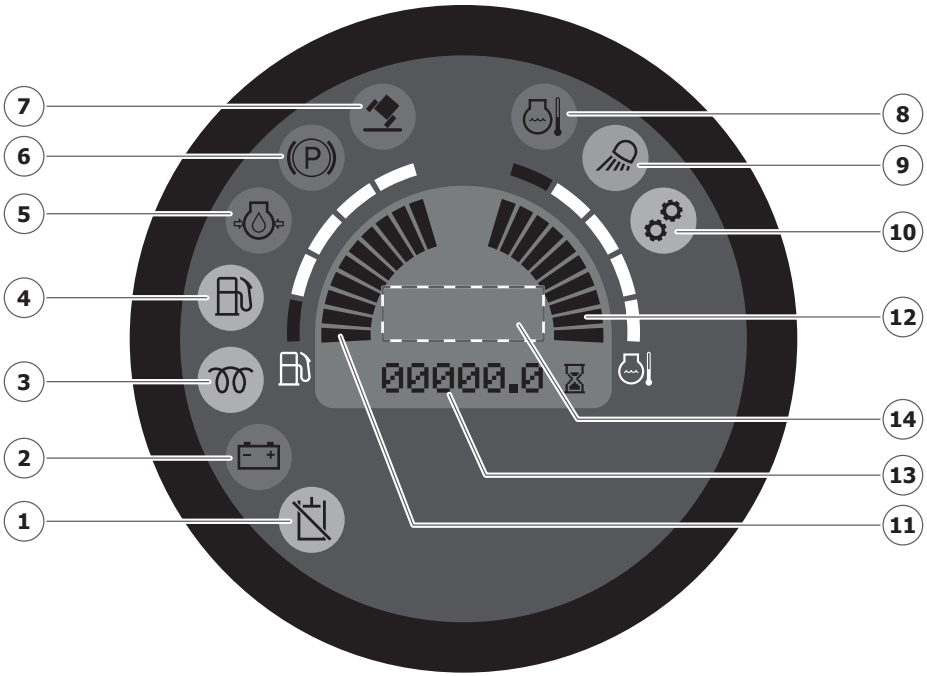
The socket is *locked*; it is powered only when the key in the starting equipment switch is in the IGNITION position.



NOTICE

When the socket is not used, close the cover (if present) to protect it from the elements, which could cause faults.

5.6 - Control panel



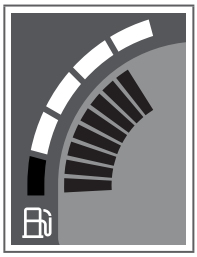
Key:

1	Controls cut-out light	**8**	Coolant temperature light
2	Alternator light	**9**	Work lights light
3	Pre-heat light	**10**	Auxiliary hydraulic system indicator light AUX1 (if present)
4	Fuel level indicator light	**11**	Fuel level indicator
5	Engine oil pressure warning light	**12**	Coolant temperature indicator
6	Parking brake indicator light	**13**	Hour meter
7	Machine inclination indicator light	**14**	Message area

FUEL LEVEL INDICATOR

Indicates the level of the fuel in the tank.

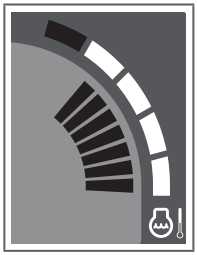
During work, the last section of the indicator must be in the white zone.



COOLANT TEMPERATURE INDICATOR

This indicates the temperature of the engine cooling liquid.

During work, the last section of the indicator must be in the white zone.



HOUR METER

This area displays the total hours of the machine.

Read daily.

Use the hour meter to identify the intervals for maintenance interventions.

MACHINE INCLINATION INDICATOR LIGHT

It lights up when the machine's inclination exceeds the permissible limit; the engine is automatically shut down.

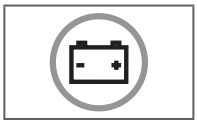
Function active only if the optional is present: automatic engine shutdown in case of tip-over.

AUXILIARY HYDRAULIC SYSTEM INDICATOR LIGHT AUX1 (if present)

Lights up when the AUX1 auxiliary hydraulic system is activated.

ALTERNATOR LIGHT

The starter circuit switches on under voltage and switches off when the engine reaches idle speed; if this light stays on even when the engine is running at full capacity, it indicates that the alternator is not working and therefore that the battery is not charging properly.



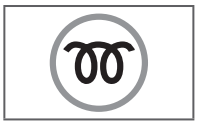
NOTICE

If the light remains off when the starting equipment switch has been turned to the IGNITION position, it means that the alternator is faulty or broken, so check the alternator and the tension on the belt.

GLOW PLUG INDICATOR LIGHT

When the starting equipment switch key is turned to the IGNITION position, this indicator light illuminates for 5 seconds.

Instead, if the engine is already warm, it does not light up at all.



FUEL LEVEL INDICATOR LIGHT

It turns on when the fuel level indicator is in the red area, meaning that the fuel level is low.

ENGINE OIL PRESSURE WARNING LIGHT

This comes on with the engine off when inserting the key into the starting equipment switch in the IGNITION position and switches off when the lubrication circuit of the engine is found under pressure.

If this light remains lit or switches on with the engine running, stop the machine immediately and investigate the cause of the fault.

NOTICE

In cold climates and with the engine just started, the light may remain lit for a short period of time.

If this phenomenon persists, stop the machine and investigate the cause of the fault.

CONTROLS CUT-OUT LIGHT

Lights up when the controls are cut out.

When this indicator light is on, no movements can be made with the machine.

PARKING BRAKE INDICATOR LIGHT

Lights up when the parking brake is engaged.

When this light is on, no travelling is possible.

COOLANT TEMPERATURE WARNING LIGHT

Illuminates when the coolant temperature indicator markings reach the red area, indicating that the temperature is too high.

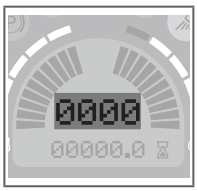
WORK LIGHTS INDICATOR LIGHT

It turns on when the work lights are activated via the dedicated button.

MESSAGE AREA

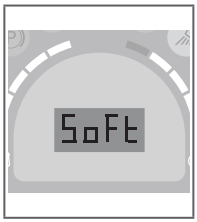
In the central part of the display, there is a message area where warning messages appear for the presence of machine alarms, such as electronic faults, etc.

If an alarm message is received, which is not expressly illustrated in this manual, contact the *Customer Service***.**



Indicators and warning lights are only operational once the starting equipment switch is in the IGNITION position.

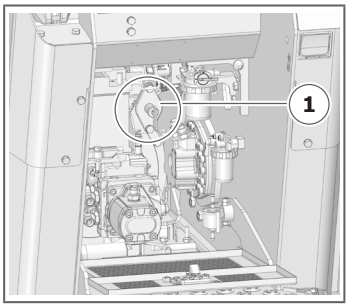
INITIAL DISPLAY CHECK



When the machine is started, the display activates all warning lights to allow the operator to check for any malfunctions. If a malfunction is found during the check, stop the machine and solve the problem.

After the check, the lights go out and the word "**SoFt"** appears in the message area, followed by one or more abbreviations, identifying the software version. This information is useful for any communication with the *Customer Service*.

5.7 - Battery isolator switch



The battery isolator switch (**1**) is located inside the battery compartment; for access refer to section *"8.3.3 - Lower compartment cover" to page 8-8*.

Power from the battery to the machine's electrical system can be cut off by turning the switch counter-clockwise.

For more information refer to section *"6.2 - Battery isolator switch" to page 6-3*.

5.8 - Geo-localisation system

NOTICE

*the CASE CONSTRUCTION **SiteWatch™** website (www.casesitewatch.com) will not be accessible until the CASE CONSTRUCTION **SiteWatch™** subscription for this machine is registred by an authorized CASE CONSTRUCTION dealer. Contact an authorized CASE CONSTRUCTION for details.*

This machine can be equipped with a telematics system. This is an asset-monitoring system that combines Internet, cellular, and GPS technologies. A transponder unit is mounted on the equipment that wirelessly communicates with the user interface CASE CONSTRUCTION **SiteWatch™** at www.casesitewatch.com. Using cellular technology, the transponder can send equipment data, including location, on/off status, usage and production metrics, diagnostic data, movement alarms, and unauthorized usage to the interface. The system will help cut costs and keep accurate records. See the furnished guide for operating your telematics system.

WARNING

Do not remove, repair, modify or move the communication terminal, the antenna or cables, as this could cause a breakdown or short-circuit in the equipment or to the machine itself.

The** Service Centre **will take care of equipment removal and installation. Prevent cables or wires from being crushed or damaged, do not pull cables or wires with undue force. Short-circuits or disconnected wires could lead to the equipment or the machine breaking down or catching fire.

NOTICE

The system absorbs a small amount of energy even when the machine is turned off. In the event of prolonged machine inactivity, carefully follow the instructions given in section "8.13 - Long inactivity periods" to page 8-76.

Because the system provides wireless communication, it does not guarantee operation in tunnels, underground, in buildings or in mountainous areas where radio waves cannot be received. Even when the machine is positioned outdoors, operation is not guaranteed in areas where the radio signal is weak or absent.

6 - USING THE MACHINE

⚠ WARNING

Safety is dependent on the operator's actions and attitude.

Incorrect use of the machine can be dangerous.

Before starting work, concentrate all your attention on what you are about to do, and take all the necessary precautions.

After ensuring the machine is safe and in good working order, remember that everyone using it must be suitably trained in regards to its use, must be well informed about the hazards deriving from the use of the machine and must be aware of all procedures to be followed to ensure a correct use.

6.1 - Commissioning

Carefully read through the information below and always comply with the requirements. Should any malfunctions occur with the operation of the machine, contact the *Service Centre****.***

⚠ DANGER

Do not check or top up the fuel tank, the hydraulic oil tank or other flammable liquids in the presence of open flames or sparks.

⚠ WARNING

Remove all dirt from the working lights and check to ensure that they switch on properly.

Check that no mud or dirt has accumulated around any of the moving parts and ensure that the controls are functioning properly.

Check that the warning lights are working properly and check the angle of the headlights and work lights.

Check that there are no people or obstacles on, under or anywhere in the vicinity of the machine.

Before moving the machine or operating the equipment, ensure no persons are present in the surrounding working area.

Acquaint yourself with the rules relating to the use of machines in the working area.

Always maintain a safe distance from other machines and obstacles in order to ensure ideal conditions of visibility.

When reversing, always look in the direction of movement. Pay attention to the presence of people in the area: should someone enter the manoeuvre area, stop the machine immediately.

Use only equipment that complies with the indications in chapter *"7 - Recommended optional equipment" to page 7-1****.***

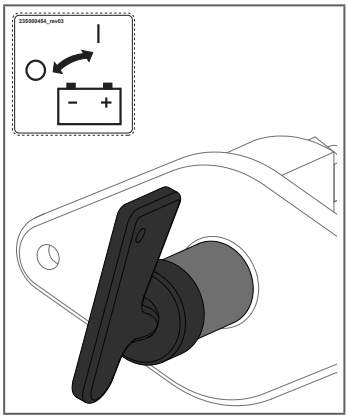
Follow the provisions of the machine lifting capacity tables and ascertain whether there are any load restrictions imposed by the ground, paving or ramps on which you are to work.

Do not leave the machine until you have completely lowered the bucket or equipment to the ground and switched it off.

Never leave the machine on without supervision, the operator is liable for the use of the machine by unauthorised persons.

While using the machine, avoid any sudden swerves, abrupt acceleration or braking and making sharp turns. If there is any doubt about the function of the controls, stop the machine and refer to the operation manual.

6.2 - Battery isolator switch



Before commissioning the machine, check its condition.

If the lever is in the "**0**" position the machine cannot be started, move the lever to position "**1**" to start the machine.

ALWAYS SWITCH OFF:

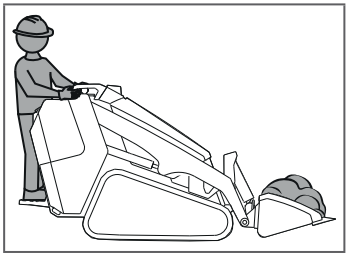
- before carrying out maintenance on the machine, so that it cannot be turned on accidentally by others;
- at the end of the working day before leaving the machine, to prevent any short circuits that could set fire to the machine.

When the switch is in the "**0**" position (Off) the lever can be removed by polling it towards you. When the key is removed from its housing, always remember to position the rubber protection.

NOTICE

Always cut off the power supply before performing operations on the battery or on the electrical system.

6.3 - Driver seat



The driver's seat is the position from which the operator can operate the machine's controls.

This machine has a driving position consisting of a foot board (platform) where the operator must stand.

The operator must stand on the foot board (platform), keep both hands on the support bars or holding handles and rest their body on the operator cushion.

WARNING

The control devices must only be operated from the driving position. Using the controls from the ground may cause serious injuries or death.

Maintain an upright position and avoid leaning.

6.4 - Control cut-out button

The control cut-out button activates or deactivates operation of all machine controls.

For more details, see section *"2.8.1 - Control cut-out button" to page 2-42.*

6.5 - Parking brake button

The parking brake button deactivates or activates the machine's travelling motion.

For more details, see section *"2.8.2 - Parking brake button" to page 2-43.*

6.6 - Visibility

During machine operation, constantly check the surrounding area in order to identify any potential hazardous s in advance as soon as they become visible.

Pay particular attention when moving. More information on how to configure the machine is provided below.

The employer must organise the construction site in such a way as to minimise risks caused by poor visibility.

Some events to pay attention to are listed below:

- well-defined routes for each vehicle;
- presence of personnel directing traffic;
- safety signs on the machine or vehicles;
- a communication system between machine operators;
- a communication system between personnel and operators of the machines.

Changes to the configuration of the machine by the operator, with consequent reduction of visibility, ARE FORBIDDEN.

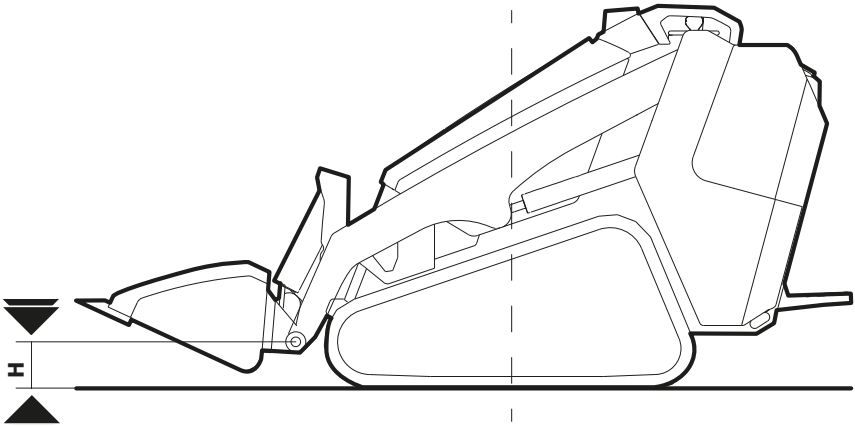
6.6.1 - Travel position

To move, keep the machine configured as indicated below.

- lower the boom completely;
- close the bucket completely;
- An illustrative image is shown below.

If it is not possible to follow the instructions provided with the equipment installed, it will be necessary to:

- adjust the position of the boom as closely as possible to the indications listed above, ensuring a distance of **approximately 250 mm** between the ground and the equipment itself;
- ensure that the site is properly organised to minimise the risks of limited visibility.



		TL100
H	Height from ground to centre of boom/quick-coupling pivot	~ 180 mm

6.7 - Starting the engine

⚠ WARNING

Never try to start the engine by short-circuiting the starter motor.

This can cause a fire and uncontrolled movements of the machine resulting in serious injuries or death.

PRECAUTIONS WHEN STARTING THE ENGINE

- Start up and run the machine exclusively from the driver's seat.
- On starting the engine, sound the horn to warn everyone.
- Do not allow unauthorised persons to get on the machine.

6.7.1 - Inspections prior to starting

Always perform all checks in this section before starting the machine.

Neglecting any of the checks may result in problems being experienced with the machine, including the hydraulic equipment.

⚠ CAUTION

Carry out checks and maintenance operations before starting the machine.

Keep unauthorised persons away from the machine while checking it.

The checks and inspections to be performed before starting the engine are:

1 PERIODIC MAINTENANCE

Read the hour meter to ascertain whether periodic maintenance is required, see section *"8.11 - Regular maintenance" to page 8-34*.

2 CHECKING THE MACHINE FOR LEAKS

Check the whole machine for any liquid leaks, even if slight.

Leaks can lead to malfunctions and machine breakdown.

All parts fitted must be inspected, including: pipes and hoses, hydraulic jacks, pumps and engines and the engine cooling system.

3 CLEANING THE MACHINE

Check the cleanliness of the machine so as to avoid any operating problems or faults occurring while the machine is working.

Clean away from the machine all material that has built up during use (e.g. dirt, dust, stones, grass, etc.), especially in the movement and articulation are.

Check the outside as well as the inside of the machine to avoid any manoeuvrability problems during operation.

4 CHECKING THE MACHINE FOR WEAR

Check the machine for any signs of worn or missing parts.

If so, replace or restore them prior to starting up the machine.

5 CHECKING THE TRACKS FOR WEAR

Check to ensure the tracks show no signs of cracks, breaks or excessive wear, and their tension is correct (see the section on maintenance for adjustment procedures).

6 STATUS OF EQUIPMENT

Check the equipment installed on the boom in order to ensure that it has been properly installed and fixed in place, as indicated in the manuals of the respective manufacturers.

Check the wear and inspect for signs of oil leaks or accumulation of debris on the equipment, in which case immediate action must be taken to repair the leaks and remove the debris to avoid machine malfunction.

6.7.2 - Procedure for starting the machine

Before starting the machine, learn the procedure described in the following pages.

Each command, indicator and indicator light involved in starting the machine and in checking the condition of the machine when it is started is listed in the order in which the operator encounters them.

⚠ WARNING

Before starting the machine, carefully study the safety indications and function of the controls described in this manual.

After starting the machine, the operator is directly responsible for any damage that may result from failure to comply with the instructions in this manual and with the laws in force.

Never try to start the machine by short-circuiting the starter motor. This can cause a fire and uncontrolled movements of the machine resulting in serious injuries or death.

Only start the machine when you are in the driver's seat.

Before starting the machine, check that there are no persons within the machine's operating range and then signal the starting with the horn.

The exhaust gases are highly toxic. When the machine is started in enclosed spaces, make sure that they are sufficiently ventilated.

☞ *NOTICE*

Do not attempt to start the machine with the accelerator fully pressed, because the engine parts could be damaged.

STARTING EQUIPMENT SWITCH

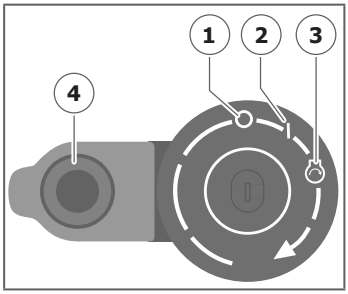
The starter switch and other locks used on this machine use the same key.

The starter switch has 3 positions:

1 - "OFF";

2 - "IGNITION";

3 - "STARTING EQUIPMENT".



1 - "**OFF**" POSITION:

The machine is switched off in this position and the key can be inserted or removed.

With the engine running and the key in the IGNITION position, when the key is turned to OFF, the engine switches off.

2 - "**IGNITION**" POSITION:

When the key is inserted and turned to this position, the following electrical circuits are supplied with power:

- dashboard lights and indicators;
- Engine pre-heating (bougies);
- horn;
- working lights.

3 - "**STARTING EQUIPMENT**" POSITION:

When the key is turned to this spring-loaded position, the engine starter engine will engage. When the engine starts, release the key and it will return to the "IGNITION" position.

NOTICE

The engine is fitted with an automatic device that disengages the starter after 8-10 seconds of activity to prevent overheating of the starter motor. Turn the key to the OFF position, wait 10-15 seconds and then repeat the start operation.

*Once the key has been removed, close the cover (**4**), if present, to protect the starter switch from the elements, which could cause faults.*

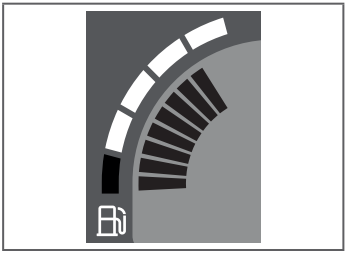
FUEL INDICATOR

This indicator indicates the approximate quantity of fuel in the tank.

Prior to engine start-up, briefly turn the starting equipment key to "**IGNITION**" to check the fuel level indicated.

If the last section of the indicator is in the red zone, it is necessary to top up.

If this warning light turns ON during operation, refill the fuel tank immediately.



Before starting work, always check the fuel level.

When working on slopes, the light might turn on and off again after a short time, top up as soon as possible; the engine might unexpectedly stop, thus causing a machine malfunction.

NOTICE

The machine engine must be operated using only suitable fuel, for the characteristics refer to section *"8.7 - Refilling" to page 8-13.*

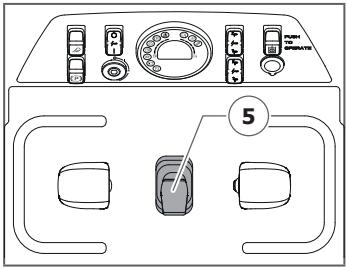
The machine should be refuelled at the end of each workday in order to reduce the formation of condensation inside the fuel tank, which is harmful to the fuel injection system.

LOW FUEL WARNING LIGHT

This warning light will switch on to alert the operator that the fuel tank requires refilling.

If this warning light turns ON during operation, refill the fuel tank immediately. After topping up, with the engine running, the indicator light goes off.

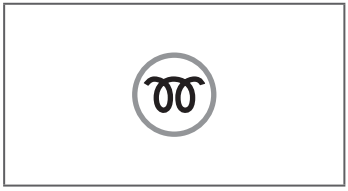
THROTTLE LEVER



This command (**5**) controls the engine speed.

A complete description of the operating principle is provided in section *"6.15 - Throttle lever" to page 6-25*.

PRE-HEATER



The bougies are electronically controlled, and are supplied with power whenever the starting equipment key is turned to the "**IGNITION**" position.

On the control panel, when the bougies are powered, a light turns on, which turns off as soon as warm-up is complete.

Before starting the engine:

- if the ambient air temperature is **10°C or lower**, it is necessary to wait for the bougie indicator light to go out before engaging the starter to start the engine;
- if the temperature is **higher than 10°C**, or the engine is warm following recent use, the starter can be engaged immediately.

After a cold engine start, set the accelerator hand grip to the mid-range position to allow the engine and the hydraulic system to warm up (without load) until they reach the normal operating temperature. As the various systems warm up, check all dashboard lights and gauges for any indication of a condition requiring any maintenance or service tasks to be performed.

ENGINE OIL PRESSURE WARNING LIGHT

When starting up the engine, this warning light will come on when the ignition key switch is turned to "**IGNITION**".

The light will go OFF within seconds after engine start-up.

NOTICE

*if the warning light **DOES NOT light up** when the ignition key switch is set to the "IGNITION" position, DO NOT continue attempting to start the engine.*

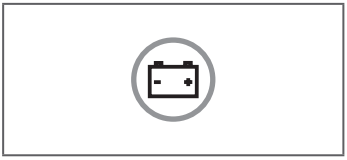
*If the indicator light **DOES NOT go off after start-up**, immediately shut down the engine.*

In all the cases listed above, contact the Service Centre, who will check the machine to eliminate any faults.

ALTERNATOR CHARGING LIGHT

When starting up the engine, this warning light will come on when the ignition key switch is turned to "**IGNITION**".

The light will go OFF within a few seconds after engine start-up.



NOTICE

if the warning light DOES NOT light up when the ignition key switch is set to the "IGNITION" position, DO NOT continue attempting to start the engine. If the indicator light DOES NOT go off after start-up, immediately shut down the engine. The cause of the warning light malfunction must be identified and eliminated before using the machine again.

COOLANT TEMPERATURE INDICATOR

This indicator indicates the temperature of the cooling liquid.

NOTICE

When starting the machine for the first time each day, do not accelerate abruptly. Before accelerating to the maximum, wait for the coolant temperature to reach 1/3 of the permitted scale value.

If the last section of the indicator is in the red zone, the temperature has exceeded the allowed limit.

NOTICE

If the last section of the indicator reaches the red zone, stop working and leave the engine idling. When the last section of the indicator is out of the red zone again, stop the engine and contact the Service Centre, which will carry out the necessary checks on the machine to resolve any anomalies.

COOLANT TEMPERATURE WARNING LIGHT

If the last section of the indicator reaches the red zone, this warning light will turn on; in this case the working temperature exceeds the allowed limit.

NOTICE

Stop work immediately and leave the engine running at the top speed.

When the light turns off, stop the engine and contact the Service Centre, who will check the machine to eliminate any faults.

STARTING EQUIPMENT

If all the previously indicated checks had a positive outcome, proceed to start the engine.

NOTICE

Allow the engine and hydraulic oil to warm up properly because, if they are not sufficiently warm before the control levers are activated, the machine will operate sluggishly, which may lead to accidents.

6.8 - Engine jump-starting procedure

If the engine does not start by following the procedures given in section *"6.7.2 - Procedure for starting the machine" to page 6-8*, check if the battery is charged. Replace the battery if necessary (refer to section *"8.8 - Battery" to page 8-28*).

If the battery charge is low, use the following procedure to start the engine.

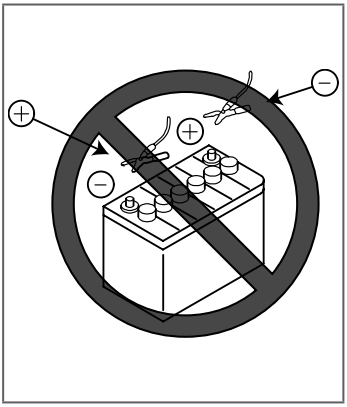
WARNING

When connecting the cables, prevent the positive (+) and negative (-) leads from touching each other.

When this procedure is performed, always wear safety goggles.

Be careful to avoid contact between the machine being started and the machine providing the current, to prevent sparks from being generated near the battery.

The sparks can cause explosion of the hydrogen produced by the batteries and cause serious damage and injury.



Be careful not to make any mistakes when connecting jump leads. During the final connection (to the turning frame) a spark is generated; connect therefore the cable as far away as possible from the battery (avoid work equipment, they are not good power conductors).

On disconnecting an extra cable, prevent the grapples from colliding against each other or against the machine frame.

⚠ WARNING

Before jump-starting, make sure the battery is not frozen.

If the liquid inside the battery is frozen, remove the battery from the machine, bring it in a warm environment (about 30°C) and wait until the liquid thaws before jump-starting or charging the battery.

Not following these indications can lead the battery to explode and cause injury or death.

☞ *NOTICE*

The size of the additional cable and of the related clamps must be suitable to the size of the battery.

The battery to be used for the starting should match the capacity of the engine to be jump-started.

The starter system on this machine is 12V.The machine providing the power for starting should therefore also have a 12V battery.

Make sure the leads and clips are not damaged or corroded.

Make sure the leads and clips are firmly attached.

Make sure the controls of both machines are LOCKED.

Make sure all levers are in NEUTRAL position.

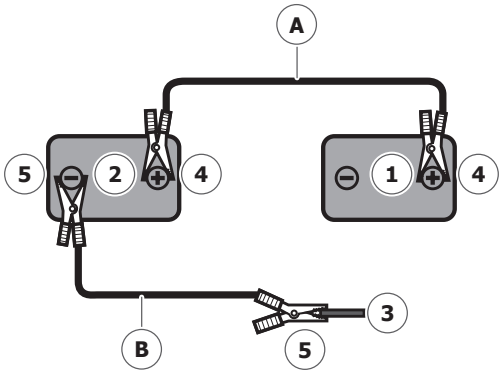
The machine used for the jump-start must be equipped with a 12 V negative earth system and a battery of at least 500 CCA (cold start amperes).

To access the battery and carry out the jump-start procedure, open the engine hood by following the procedure given in section *"8.3.1 - Engine hood" to page 8-7*.

6.8.1 - Connecting the additional cables

Make sure the Ignition keys of both machines are in the **OFF** position.

- Connect one clamp of the additional cable (**A**) to the positive (**+**) terminal of the machine to be started (**1**);
- connect the remaining clamp of the additional cable (**A**) to the positive (**+**) terminal of the machine that must provide power (**2**);
- connect one clamp of the additional cable (**B**) to the negative (**-**) terminal of the machine that must provide power (**2**);
- connect the remaining clamp of the additional cable (**B**) to the engine base (**3**) of the machine to be started (**1**).



Key:

A	Additional cable (+)
B	Additional cable (-)
1	Accumulator of the machine to be started low
2	Accumulator of the machine providing power charged
3	Base of the engine to start
4	Positive terminal (+)
5	Negative terminal (-)

6.8.2 - Starting the engine

Ensure the clamps are properly connected to the battery terminals.

Start the engine of the machine that must provide current and run it at maximum.

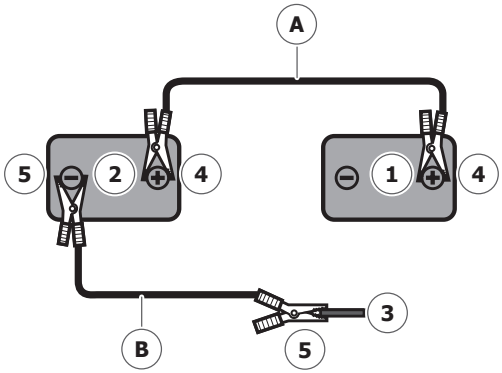
Turn the starting equipment switch of the machine to be started to the START position and start the engine.

If the engine does not start at the first attempt, try again after 2 minutes.

6.8.3 - Removing the additional cables

After the engine has started up, disconnect the additional cables by following the connecting operations in reversed order.

- disconnect one clamp of the additional cable (**B**) from the engine base (**3**) of the started machine (**1**);
- disconnect the remaining clamp of additional cable (**B**) from the negative (**-**) terminal of the machine that has provided power (**2**);
- disconnect one clamp of the additional cable (**A**) from the positive (**+**) terminal of the machine that has provided power (**2**);
- disconnect the remaining clamp of the additional cable (**A**) from the positive (**+**) terminal of the machine that has been started (**1**).



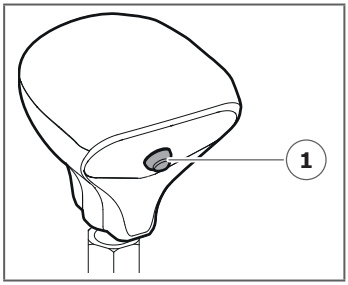
Key:

A	Additional cable (+)
B	Additional cable (-)
1	Accumulator of the machine to be started low
2	Accumulator of the machine providing power charged
3	Base of the engine to start
4	Positive terminal (+)
5	Negative terminal (-)

6.9 - Horn

The horn button (**1**) is located on the **left joystick** and is activated when the ignition key switch is set to the ON position.

Sound the horn every time you climb aboard and start working, use it especially when it is noticed that anyone in the vicinity is in danger.



6.10 - Work lights

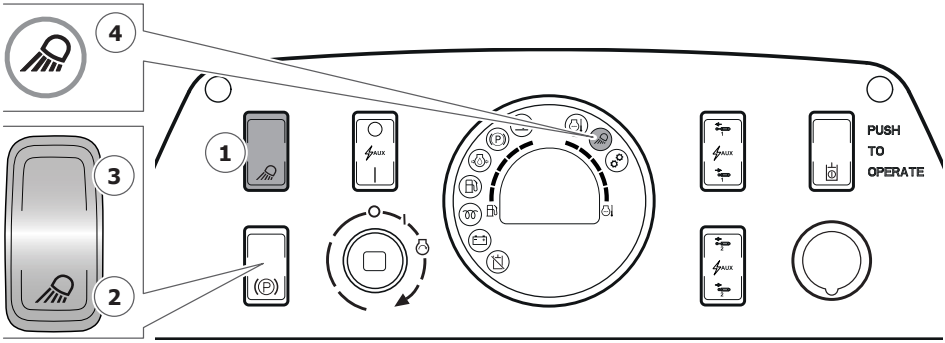
On the machine there are **work lights** that are to be used when visibility is low.

One work light is positioned in the centre of the engine hood and a second work light is positioned on the rear right-hand side.

The lights area controlled by means of the button (**1**):

- to **switch on** the lights, press the symbol (**2**):
  - **first click**: turns on the front work light;
  - **second click**: **also** switches on the rear work light;
- to **switch off** all work lights, press on the opposite side (**3**).

The indicator light (**4**) is activated when the lights are on.



6.11 - Operation at low temperatures or during winter

CAUTION

It is not possible to operate at temperatures below -30°C.

At low ambient temperature (below +5°C), the following situations occur:

- difficulty in starting the engine;
- the radiator water and the battery fluid may freeze;
- difficulty in using the machine straight after the first cold start-up.

It is important to prevent these situations by following the instructions given below.

NOTICE

When starting at low temperatures, work at low speed for 10 minutes, this allows the oil to reach normal operating temperature.

FUEL

Use fuel that is suitable for low temperatures, see section *"8.7.3 - Fuel" to page 8-16*.

COOLING LIQUID

Use a cooling liquid that is suitable for low temperatures, see section *"8.7.5 - Cooling liquid" to page 8-18*.

ENGINE OIL

Use oil that is suitable for low temperatures, see section *"8.7.4 - Engine oil" to page 8-17*.

HYDRAULIC OIL

Use oil that is suitable for low temperatures, see section *"8.7.6 - Hydraulic system oils" to page 8-20*

BATTERY

At low temperatures the battery capacity decreases, therefore the charging voltage may be insufficient to start the machine; moreover, the battery fluid could freeze.

In this case remove the battery from the machine, keep it in a warm place (temperature over 5°C) and fit it back when the machine has to be used again.

This operation also helps extending the life of the battery.

If the battery needs to be charged, proceed as described in section *"8.8 - Battery" to page 8-28*.

6.12 - Precautions during operation

⚠ WARNING

The control devices must only be operated from the driving position. Using the controls from the ground may cause serious injuries or death.

Learn the position and operation of: controls, instruments and indication lights, then check that they are working correctly. If abnormal operation occurs, stop the machine immediately and call the *Service Centre****.***

Do not use the equipment for lifting people or as a work platform.

Never transport other persons.

Avoid making sudden, sharp movements.

At low temperatures (below +5°C), follow the instructions given in the relevant section before starting the normal work operations.

When working on uneven ground, always proceed slowly and operate with the bucket or equipment as low as possible.

Carefully check the conditions of the area in which you will be working, in order to ascertain whether there are any anomalies in the terrain that could make the work hazardous.

If possible, level the ground of the work area, prior to starting operation.

Note the position of any overhead or buried pipes or electrical cables, as well as any open or filled trenches.

When travelling, move carefully near the edge of excavations or trenches, and exercise extreme caution in cramped working spaces, or when working on uneven or steeply sloping ground.

For operation indoors or in cramped spaces, ensure the area is well ventilated. The exhaust gases of the engine can be fatal.

Never try to start or use the machine unless you are sitting in the driver's seat.

Only use the controls when you are sure of the movement the machine will make and do not take any chances if you're unsure, especially in obligatory work conditions or in the presence of dangers for your safety or the safety of others.

⚠ WARNING

Use extreme caution when moving over uneven ground with kerbs or railway lines; drive slowly so as not to lose machine stability.

Do not use the bucket as battering ram. When working on slopes, always keep the bucket lowered.

Never stand under the raised bucket.

Do not attempt to crush concrete or blocks of rock using the bucket.

Do not lower the bucket at the maximum speed when digging.

Do not use this machine to lift or move materials under any circumstances, if not using appropriate and dedicated optional equipment, at all times following the specific warnings.

While reversing:

- ***before commencing any movement, check that there are no persons or obstacles in the surrounding area;***
- ***if there are areas where the operator has poor visibility, place a person in charge of reporting, this person must ALWAYS be in a safe area at an adequate distance from the machine;***
- ***take care not to hit other machines or people when moving the machine.***

During work, always check that the site conditions (e.g. weather conditions) do not change from what was initially checked, in which case, take appropriate precautions.

☞ *NOTICE*

After using the machine in mud, always clean and check the machine itself, as well as grease the pins of the bucket and all other parts that have been immersed.

Washing with water jets can only be carried out with hoods and covers closed. Keep a distance of at least one metre from the machine and direct the water spray towards the undercarriage.

Before starting work, always ensure that the installed equipment does not collide with the machine.

6.13 - Stopping and parking the machine

⚠ WARNING

Avoid as much as possible parking the machine on slopes.

Procedure for stopping and parking the machine:

- drive the machine on a flat, levelled surface;
- choose an area where no falling of rocks nor landslides are possible;
- choose an area where the machine does not block pedestrians or other means and however, in an area permitted according to the standards in force;
- fully lower the boom and lower the equipment to the ground;
- reduce the engine speed to minimum;
- turn the starting equipment switch key to the **OFF** position, remove the key and close the protective guard (if present);
- Get off the machine;
- deactivate the battery isolator switch as indicated in section *"6.2 - Battery isolator switch" to page 6-3;*
- lock all covers fitted, refer to section *"8.3 - Safety devices" to page 8-6.*

☞ *NOTICE*

It is not necessary to enable the parking brakes, they get enabled automatically.

Always protect electrical components from adverse weather conditions by using the guards provided.

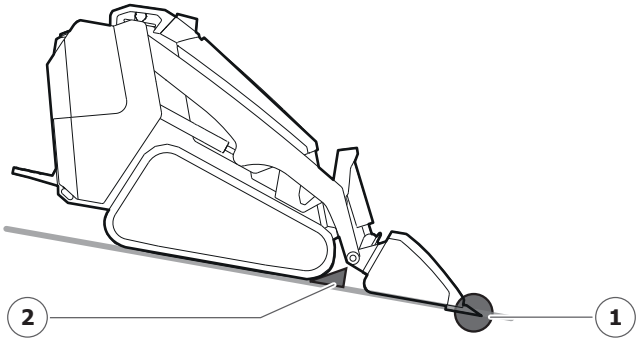
WARNING

Do not get off the machine with the equipment raised, always lower it to the ground.

Do not leave the machine turned on.

Should it be unavoidable to park the machine on a slope it is necessary to:

- it is necessary to check that the slope is **less than 10°**;
- position the bucket down the slope and make sure the teeth or blade of the bucket are dug in the soil (**1**), if no equipment that can be dug into the ground is present, just rest the bucket on the ground;
- appropriately block (by means of wedges **2**, not supplied) both tracks.



6.14 - Refuelling

DANGER

Do not expose the fuel to flames or sparks, as diesel fuel is an inflammable substance; this may cause a fire, with the risk of personal injuries and damage to the machine.

CAUTION

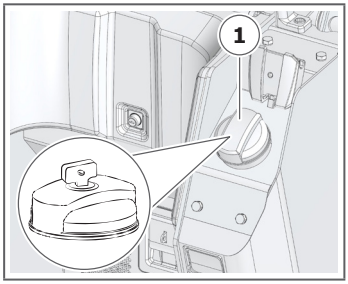
When topping up with fuel, take care not to spill any, clean up any spillage carefully.

Any traces of oil may start a fire or pose a risk of personal injury and damage to the equipment.

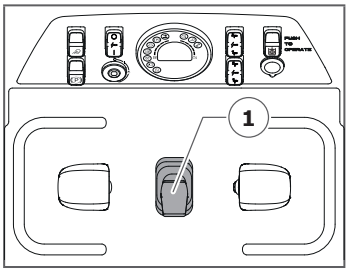
Fill the fuel tank at the end of each working day. It will prevent the formation of condensation in the tank.

To prevent dirt, water and other contaminants from entering the fuel system, proceed as follows:

- clean the area around the filler hole;
- unscrew and remove the fuel tank cap (**1**);
- add the fuel slowly to avoid spills;
- check the fuel level indicator on the control panel and stop refuelling when it has reached the maximum level;
- replace the cap (**1**).



6.15 - Throttle lever



This command (**1**) is used to mechanically control the engine speed.

Minimum position: the lever is pulled all the way back.

Maximum position: the lever is pushed fully forward.

Adjust the engine speed according to the type of work to be carried out:

- low engine revs for precision work;
- high engine revs for work where high power is required.

6.16 - Machine movement

⚠ WARNING

ALWAYS keep your wrist or palm resting against the joystick when using it, this allows for more precise movement control.

Keep your unused hand on the holding handle for extra stability.

Before reversing, turn your head to make sure the manoeuvring area is clear.

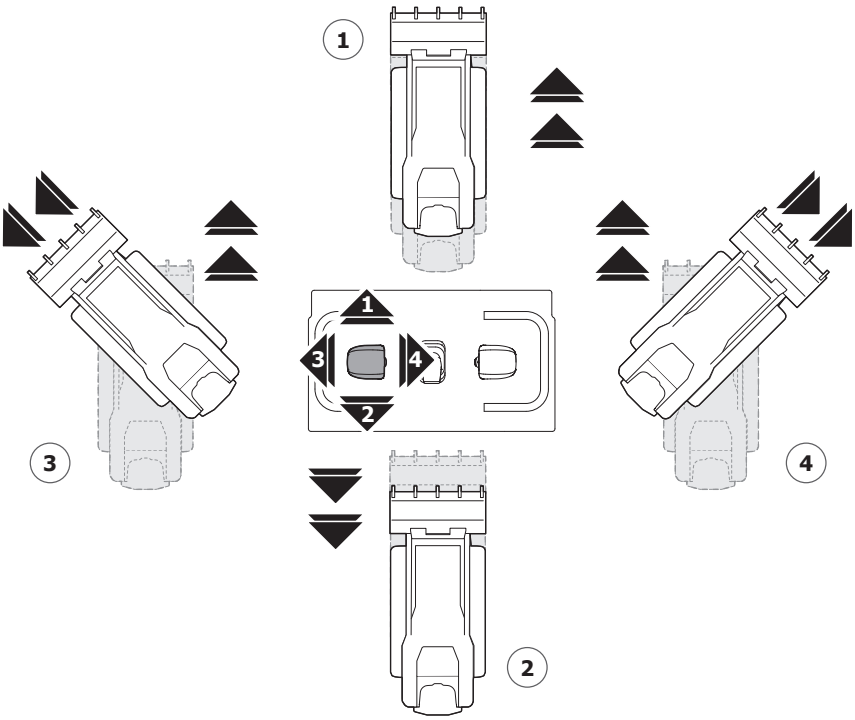
Pay attention to the presence of people in the area: should someone enter the manoeuvre area, stop the machine immediately.

⚠ CAUTION

The rapid return of the joystick to the NEUTRAL position causes an immediate response to stop the corresponding motion.

For safe control of the machine, always move the joystick slowly and gradually. Operators who are not familiar with the machine should initially operate the machine at 50% of its maximum speed until they master the control function and feel confident on the machine.

6.16.1 - Left Joystick



Functions of the joystick:

1 - push the lever **FORWARDS** to move forwards with the machine;

2 - pull the lever **BACKWARDS** to move backwards with the machine;

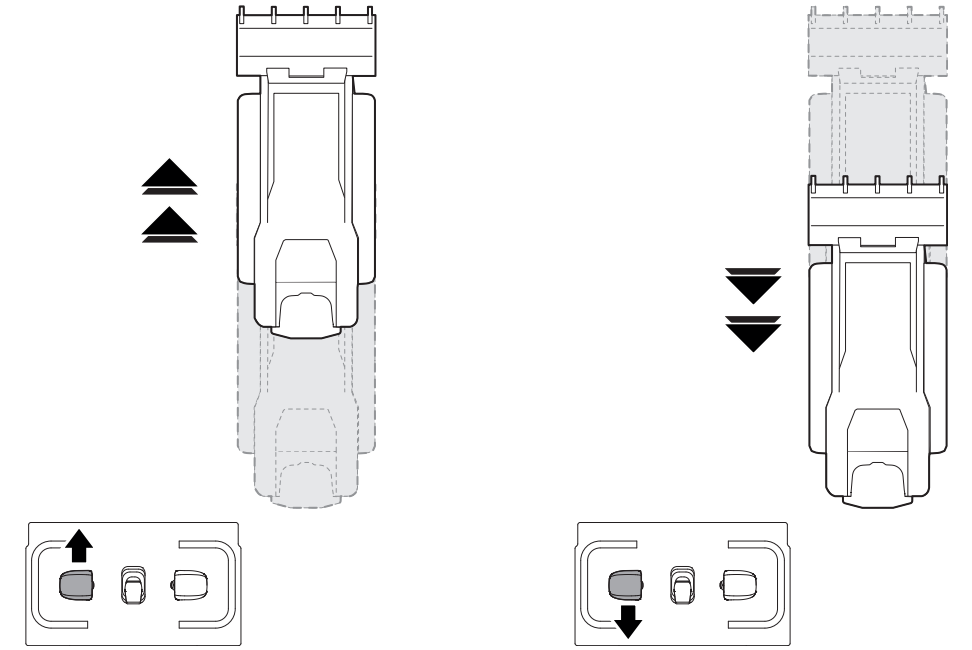
3 - move the lever to the **LEFT** to make the machine turn/steer to the left;

4 - move the lever to the **RIGHT** to make the machine turn/steer to the right.

When the joystick is released, it returns to the neutral position (centre) automatically and all motion is stopped.

If the joystick is moved diagonally, simultaneous movements are achieved, as two commands are activated at the same time. Speed of motion is proportional to the inclination of the joystick.

6.16.2 - Forward and reverse travel



To start moving **FORWARDS**, push the left joystick forwards.

As additional pressure is applied on the control levers, the machine speed will increase.

To **STOP** the machine, slowly return the joystick to the NEUTRAL position (N).

NOTICE

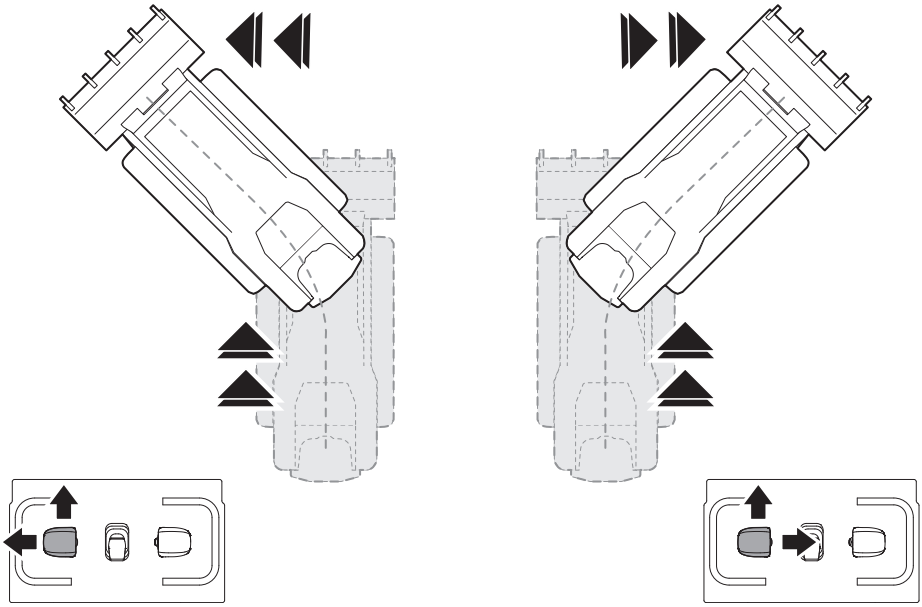
Rapid forced return of the joystick to the NEUTRAL position causes an immediate braking response by the tracks.

To start **REVERSE TRAVEL**, pull the left joystick backwards.

As additional pressure is applied on the control levers, the machine speed will increase.

To **STOP** the machine, slowly return the joystick to the NEUTRAL position (N).

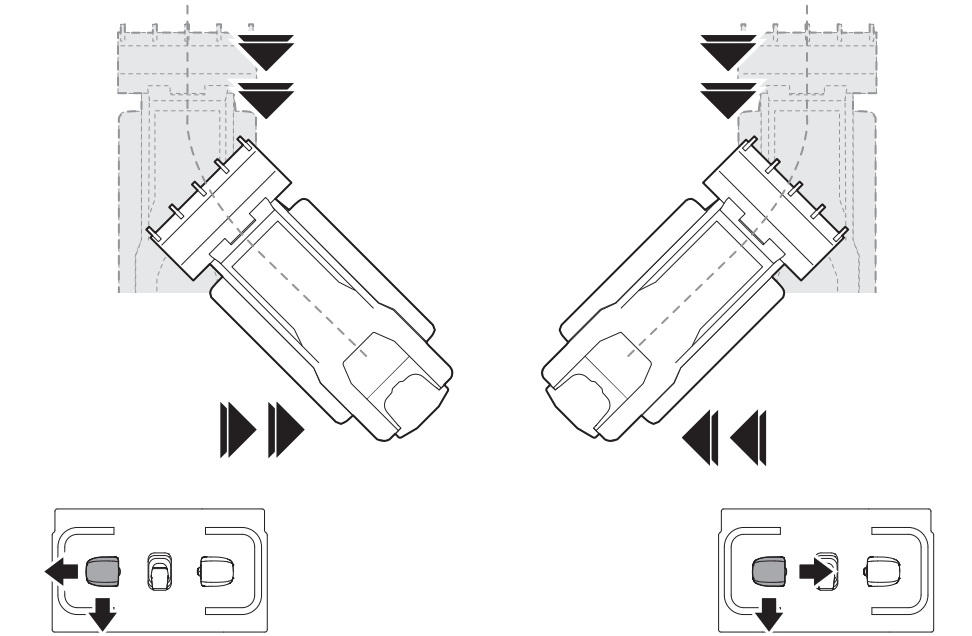
6.16.3 - Turning while moving forward



To turn to the **LEFT** while travelling **FORWARDS**, keep the left joystick pushed forwards and at the same time move it to the **LEFT**, thus reducing the speed of the left track. The machine will turn toward the LEFT.

To turn to the **RIGHT** while travelling **FORWARDS**, keep the left joystick pushed forwards and at the same time move it to the **RIGHT**, thus reducing the speed of the right track. The machine will turn toward the RIGHT.

6.16.4 - Rotation while reversing



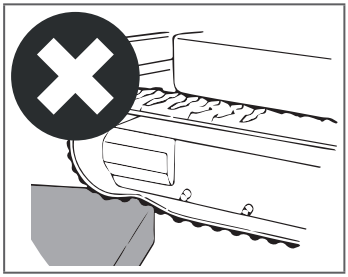
To turn to the **RIGHT** while travelling **IN REVERSE**, keep the left joystick pulled backwards and at the same time move it to the **LEFT**, thus reducing the speed of the right track. The machine will turn towards the RIGHT.

To turn to the **LEFT** while travelling **IN REVERSE**, keep the left joystick pulled backwards and at the same time move it to the **RIGHT**, thus reducing the speed of the left track. The machine will turn towards the LEFT.

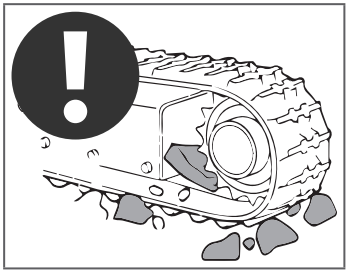
6.16.4.1 - Precautions during the operation of the tracks

When moving, **DO NOT** ride over or turn on any sharp edges or steps.

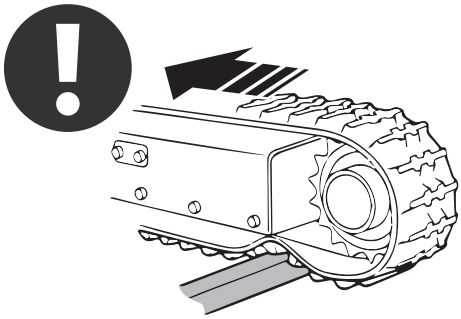
The machine will subject the track to an excessive load, resulting in the tread or internal rubber components breaking or splitting.

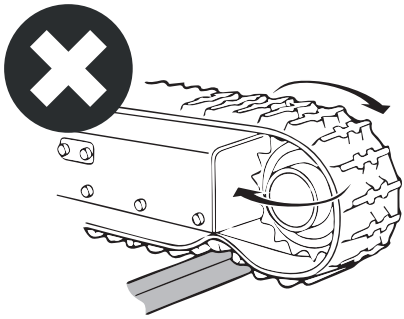


Avoid foreign bodies becoming trapped between the track and the frame or other components to prevent damage to the handling system.



Protruding bodies should be avoided, if possible. If this manoeuvre is not possible, proceed with care at low speed and moving in a straight direction without steering when the track is over the obstacle.





Do not steer abruptly when travelling over surfaces with a high coefficient of friction (e.g. concrete surfaces); this may cause excessive wear of the track.

Clean the tracks if fuel or hydraulic oil is spilled on them; this may cause corrosion and damage the track.

WARNING

The tracks can slip easily on wet, frozen surfaces or surfaces covered with snow. Be very careful when travelling and working in these conditions.

NOTICE

Any displacement or steering on protruding bodies or on uneven ground could cause local loosening of the track with the consequent probable displacement of the same.

6.17 - Operating the boom

WARNING

ALWAYS keep your wrist or palm resting against the joystick when using it, this allows for more precise movement control.

Keep your unused hand on the holding handle for extra stability.

CAUTION

The rapid return of the joystick to the NEUTRAL position causes an immediate response to stop the corresponding motion.

For safe control of the machine, always move the joystick slowly and gradually. Operators who are not familiar with the machine should initially operate the machine at 50% of its maximum speed until they master the control function and feel confident on the machine.

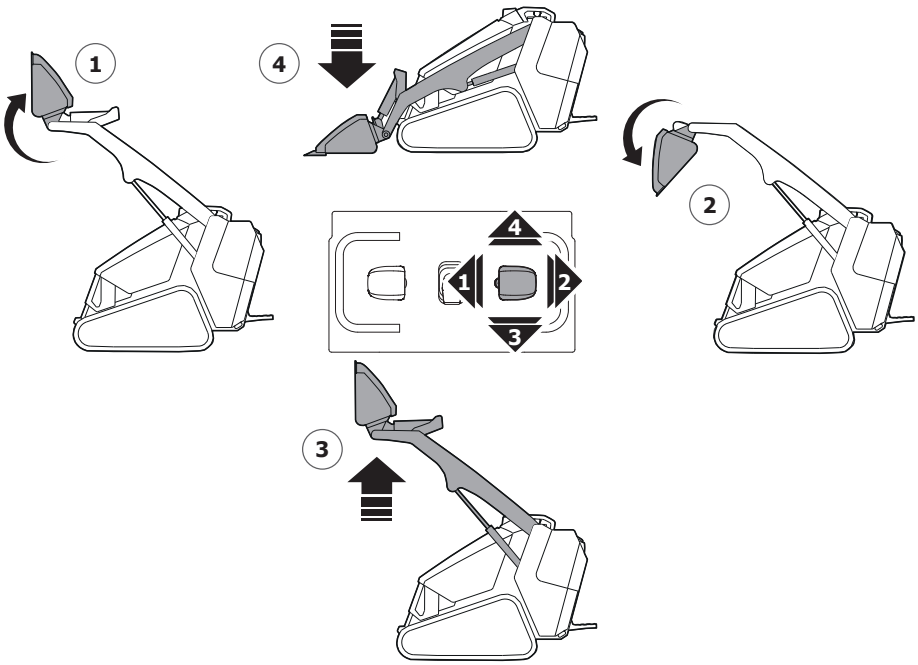
NOTICE

DO NOT leave any of the hydraulic controls engaged after the cylinder reaches its limit stop in any direction. This practice forces the hydraulic oil to pass through the main relief valve, causing a rapid build-up of heat in the system resulting in overheating and loss of power, in addition to reducing the component life.

6.17.1 - Right joystick

The right joystick controls boom ascent and descent, and performs bucket handling:

- Moving the right joystick to the LEFT will tilt the bucket to the closed position (**1**);
- moving the right joystick to the RIGHT will tilt the bucket to the open position (**2**);
- pulling the right joystick BACK raises the boom (**3**);
- pushing the right joystick FORWARD lowers the boom (**4**), bringing the joystick to the end of its stroke and imparting more force, activating floating mode, see section *"6.17.2 - Boom floating control" to page 6-34*.



Key:

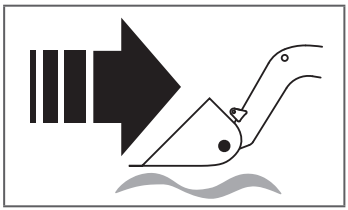
1	Closing the bucket
2	Opening the bucket
3	Raising the boom
4	Lowering the boom

6.17.2 - Boom floating control

The machine is equipped with floating boom control.

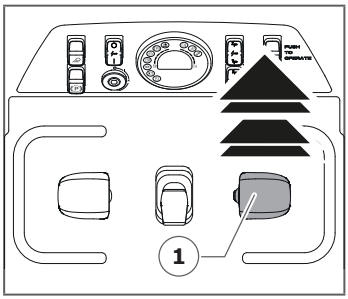
This counteracts the function of the boom lifting cylinders by short-circuiting the bottom and stem sides; in this state, the boom is free to rise and fall by following the unevenness of the ground and simply rests on the ground due to gravity.

The floating mode is useful for ground levelling operations performed in reverse. The weight of the machine is never borne by the bucket, so levelling is easier and faster.



Floating mode is **activated** via the **right joystick** (**1**):

- move the equipment towards the ground;
- push the joystick forward to the end of its stroke and apply more force to place the joystick in the floating position. It is possible to release the joystick that holds the position, floating mode is activated and the boom descends by the force of gravity, resting fully on the ground.
- To **deactivate** the function, return the joystick to the central (neutral) position.



NOTICE

Activate the floating command only when the bucket is near the ground, because as it drops suddenly, it may get damaged and/or it may damage the objects under it.

6.18 - Using the bucket

⚠ CAUTION

To prevent the machine from tipping over, do not exceed the allowed load capacity (see section *"3.10 - Operating load" to page 3-6**).***

When the bucket is loaded, never perform abrupt movements neither when starting nor when stopping, because the machine may overturn.

Do not use the bucket to lift or move objects or people.

The operator must have a good knowledge of the safety instructions and a good grasp of the machine's performance characteristics. Therefore, whilst working, the operator must be in a position to opt for the solution that is most appropriate to the existing conditions at any given time.

Before starting work, check that there is nobody standing within the machine's operating range. Signal the start of work by sounding the horn.

Perform slow movements of the boom and of the bucket in order to confirm that they are functioning correctly.

If visibility is poor or if there are obstacles of any kind, request assistance from another person on the ground and operate at a reduced speed.

Should it be necessary to work on rough terrain or with large obstacles, it is advisable to level the work area as best as possible.

The machine must work in a horizontal position, with stability and free of obstacles.

Keep a minimum safety distance of 0.5 m from scaffolding, walls or other obstacles.

The loading and transport method consists in a loading, transport and unloading cycle (in a different place, in a loading area, etc...).

Always keep the transfer path between the loading area and the unloading area in good conditions.

Choose the work method that is most appropriate to the workplace, or rather, the method that involves the minimum number of turns and movements.

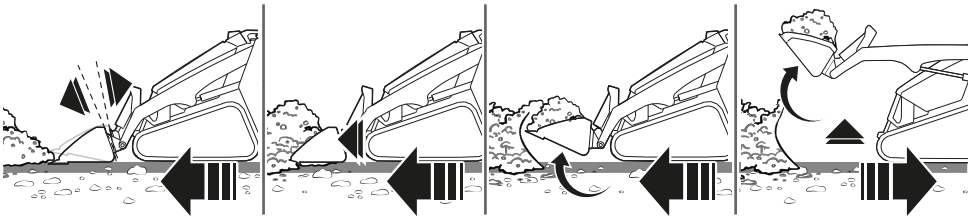
Loading heaps of soil

Move forwards slowly keeping the bucket parallel to the ground. Adjust the penetration force, accelerating when the bucket touches the material.

To avoid slippage, lift the bucket slightly and close it. To fill the bucket as much as possible when the material is compact, lift and close the bucket several times while digging into the material.

Try to keep the load in the middle of the bucket; if the material is on one side only, the load will be unbalanced.

When travelling with the bucket loaded, take care not to lift it more than necessary (about 20-30 cm above the ground) and keep it fully closed.



⚠ CAUTION

Always keep the work area levelled.

Do not start, steer or stop the machine abruptly when the boom is raised and the bucket is loaded.

Never stick the bucket into the material whilst moving with the machine at a high speed.

The machine may overturn, causing serious injuries.

☞ *NOTICE*

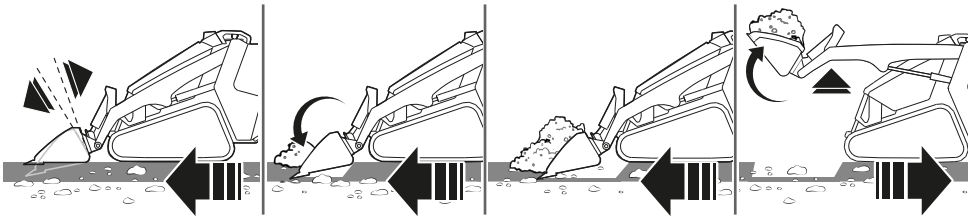
Do not shake the bucket too much so as to avoid damaging the mechanism and the hydraulic system.

Digging and loading operations on flat ground

When performing digging and loading operations on flat ground, tilt the edge of the bucket slightly downwards and move the machine forwards. To avoid an unbalanced load, always be careful not to load the material on one side of the bucket only.

Proceed slowly, keeping the bucket parallel to the ground or slightly tilted forward.

When the bucket is sufficiently full, close it and simultaneously lift the boom.

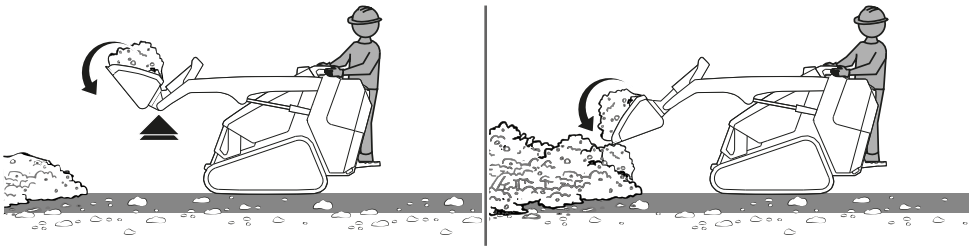


Emptying the bucket

When lifting the boom, open the bucket trying to keep the load level to prevent material from falling towards the operator.

To empty the bucket, lift it just high enough and open it to unload the material.

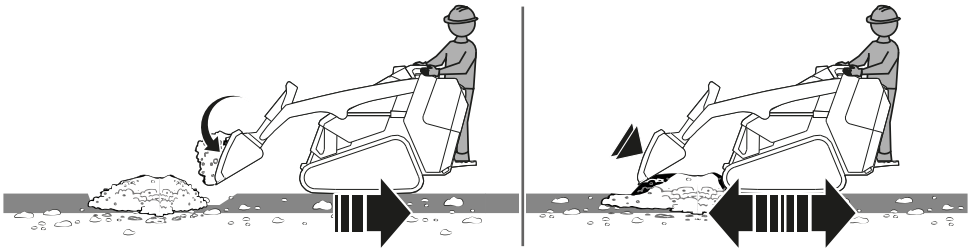
The means to be loaded must be positioned in such a way that they make the journey of the machine as short as possible.



Levelling the soil

Collect the soil in the bucket. Working in reverse, open the bucket so that the earth is spread a little at a time.

To level the ground, tilt the bucket forward keeping it slightly raised from the ground; at the same time, move the machine backwards and forwards.



Depending on the circumstances, the ground levelling operation can be performed by moving the boom and keeping the bucket parallel to the ground.

The boom floating mode is very useful for levelling operations, for activation instructions see the dedicated section.

6.19 - Discharge residual pressure in the hydraulic system

WARNING

The hydraulic system may remain under pressure even after the machine has stopped. Release the residual pressure before maintenance interventions.

To facilitate connection of the equipment to auxiliary hydraulic systems, the residual pressure must be released. This must also be done before servicing the hydraulic system.

To **release the residual pressure**:

- position the machine on flat, compact ground;
- lower the equipment to the ground;
- switch off the engine;
- position yourself correctly in the driver's seat;
- turn the ignition key to the IGNITION position (without starting the engine);
- press the control cut-out button;
- operate all the controls (joysticks and roller) to discharge the pressure;
- stop the machine and remove the starting equipment key;
- follow the steps below as required:

CONNECTING THE HYDRAULIC EQUIPMENT

- connect the equipment to the auxiliary hydraulic systems, see section *"6.20.1 - Connection of equipment to the hydraulic systems" to page 6-41*.

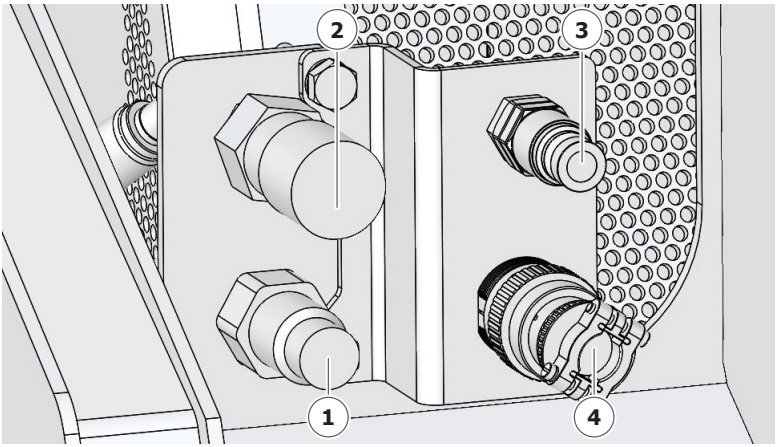
HYDRAULIC SYSTEM MAINTENANCE

- slowly unscrew the hydraulic oil filling plug, see section *"8.11.9 - Check of hydraulic oil level" to page 8-48*;
- proceed with the maintenance of the hydraulic system.

6.20 - Auxiliary hydraulic systems

On the front of the boom, on the left, are the end of some pipes that can be connected to optional equipment that require additional hydraulic functions.

Below are the available configurations and function of each pipe:



Key:

1	AUX1 (male quick-coupling)	**3**	Drain line (male quick-coupling - **optional**)
2	AUX1 (female quick-coupling)	**4**	Electrical connection (**optional**)

Auxiliary system	Max capacity (l/min)	Max pressure (bars)	Rapid connection type
AUX1	48	190	1/2" GAS
Drainage line	/	/	3/8" GAS

The quick-couplings are in accordance with ISO 16028.

To understand the operation of the systems in detail, see the following sections.

6.20.1 - Connection of equipment to the hydraulic systems

⚠ WARNING

Read the contents of the equipment instruction manual carefully before connecting to the machine.

Never connect any equipment to the hydraulic lines before it is properly installed from a mechanical point of view and locked on the machine boom.

Before carrying out any interventions on the hydraulic system, stop the machine and release any residual pressures.

All operations must be performed with the machine parked on flat and compact ground.

☞ *NOTICE*

When removing hydraulic connections, be very careful that impurities do not enter the pipes.

Clean immediately any oily area.

The pipes end with quick couplings that allow to rapidly connect the pipes of the equipment, isolate the hydraulic system from dirt entering and prevent oil leaks if no equipment is connected.

The equipment must be connected to the hydraulic systems using flexible rubber hoses with compatible quick-couplings.

To **connect** the equipment to the hydraulic system:

- mechanically install the equipment;
- place the machine on flat,, compact ground and lower the equipment to the ground;
- stop the machine;
- release the residual pressures of the system, see section *"6.19 - Discharge residual pressure in the hydraulic system" to page 6-39;*
- connect the equipment hoses to the quick-couplings on the boom, checking that the specifications and dimensions of the couplings correspond to those indicated.

NOTICE

As far as the threads and functions of the equipment connections are concerned, see the manufacturer's manual.

- After connecting the hoses, start the machine;
- lift the equipment off the ground and send pressurised oil for around ten times, alternately to the two connections, in order to purge any air left in the circuit;
- repeat the operation for each system used by the equipment;
- stop the machine and wait at least **5 minutes** before starting work operations. This will eliminate any air bubbles that have built up in the tank;
- make sure there are no oil leaks and clean up any oil spilled.

NOTICE

In the event of any uncertainty when connecting the equipment, consult the Service Centre.

If the equipment has reached the limit switch, do not keep the roller pushed for a long time; the hydraulic system will be stressed for no reason with the risk of overheating the oil.

6.20.2 - AUX1 Auxiliary hydraulic system

NOTICE

For the technical characteristics, see section "3.3 - Hydraulic system" to page 3-3.

The **AUX1** auxiliary hydraulic system can feature two operating modes:

- **single-acting** mode;
- **double-acting** mode.

Switching between the two modes takes place manually by means of a 3-way valve (if present); the operation is described in the next section. If the 3-way valve is **not** present, the system can only be used in double-acting mode.

For the operating details, refer to sections:

- *"6.20.2.2 - Single-acting mode AUX1" to page 6-44;*
- *"6.20.2.3 - Double-acting mode AUX1" to page 6-45;*
- *"6.20.2.4 - Auxiliary hydraulic system AUX1 latch with operator not in the driver's seat" to page 6-46.*

The single-acting auxiliary hydraulic system provides a continuous supply of hydraulic oil to a pipe, while the other is discharged directly into the tank, the system used for equipment such as demolition hammers.

The double-acting auxiliary hydraulic system provides pressure alternately to one of two outlets, the system used for equipment such as augers.

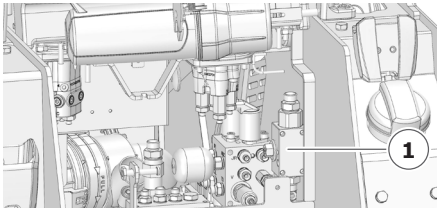
The oil flow can be regulated by acting on the accelerator hand grip; always observe the flow rate indicated by the manufacturer of the equipment.

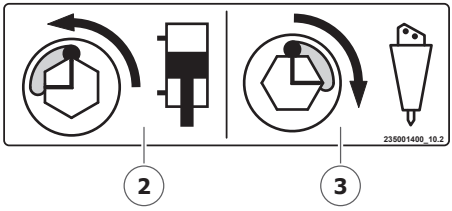
6.20.2.1 - Hydraulic system three-way switch AUX1

The three-way switch (**1**) allows to change the operating mode of the system **AUX1**.

To select the desired mode:

- turn the valve **clockwise** to select **double-acting** mode (**2**);
- turn the valve **counter-clockwise** to select **single-acting** mode (**3**).





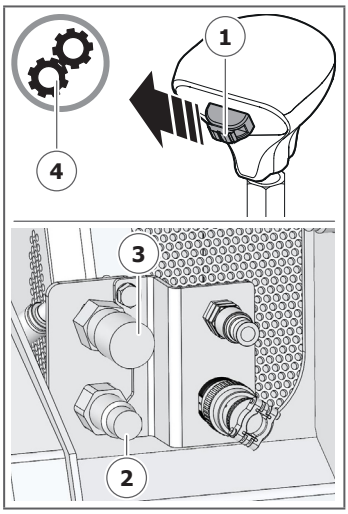
6.20.2.2 - Single-acting mode AUX1

This mode provides pressure flow only on male quick-couplings, while female quick-couplings stay in discharge.

To enable this mode, refer to section *"6.20.2.1 - Hydraulic system three-way switch AUX1" to page 6-43*.

To operate the **AUX1 single-acting control**:

- push and hold the roller (**1**) **FORWARD** to provide a constant flow of hydraulic oil to the **male quick-coupling** (**2**); the female quick-coupling (**3**) is always in discharge (directed to the tank) even if no controls are activated;
- release the roller to stop the flow;
- while the roller is pushed, the mechanical latch can be activated by pushing it even more. You can release the roller that holds the position and the control stays active;
- to deactivate the latch, return the roller to the central (neutral) position;
- no functions are activated by pushing the roller backwards.



When the hydraulic system is active, the light (**4** - if present) lights up on the display.

NOTICE

For details on the controls, refer to the label located on the driver's seat and to the instructions in this user manual.

If it is necessary to keep the auxiliary hydraulic system active without the operator being in the driver's seat, it is necessary to follow the instructions given in section "6.20.2.4 - Auxiliary hydraulic system AUX1 latch with operator not in the driver's seat" to page 6-46.

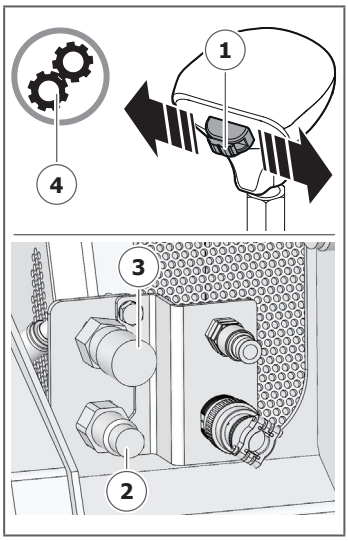
DO NOT keep the roller pushed back for long periods of time. The hydraulic circuit does not activate any function but is still under pressure and so there is the risk of the hydraulic oil overheating.

6.20.2.3 - Double-acting mode AUX1

This mode provides for the reversible control of the flow; while one of the two pipes is pressurised, the other is discharged.

To enable this mode, refer to section *"6.20.2.1 - Hydraulic system three-way switch AUX1" to page 6-43*.

To operate **AUX1 double-acting control**:



- push and hold the roller (**1**) **FORWARD** to provide a constant flow of hydraulic oil to the **male quick-coupling** (**2**); the female quick-coupling (**3**) is placed into discharge;
- release the roller to stop the flow;
- while the roller is pushed, the mechanical latch can be activated by pushing it even more. You can release the roller that holds the position and the control stays active;
- to deactivate the latch, return the roller to the central (neutral) position;
- push and hold the roller (**1**) **BACK** to provide a constant flow of hydraulic oil to the **female quick-coupling** (**3**); the male quick-coupling (**2**) is in discharge. In this case, the mechanical latch cannot be activated.

When the hydraulic system is active, the light (**4** - if present) lights up on the display.

NOTICE

For details of the controls, see the label located on the driver's seat and the instructions in this user manual.

If it is necessary to keep the auxiliary hydraulic system active without the operator being in the driver's seat, it is necessary to follow the instructions given in section "6.20.2.4 - Auxiliary hydraulic system AUX1 latch with operator not in the driver's seat" to page 6-46.

6.20.2.4 - Auxiliary hydraulic system AUX1 latch with operator not in the driver's seat

⚠ WARNING

Some optional equipment requires a constant supply via the auxiliary hydraulic system even when the operator is not in the driver's seat (e.g. backhoe). The auxiliary hydraulic system AUX1 latch with operator not in the driver's seat must be used only for the equipment that requires it.

When the latch is active without the operator on board, all controls are enabled with the exception of the travel controls.

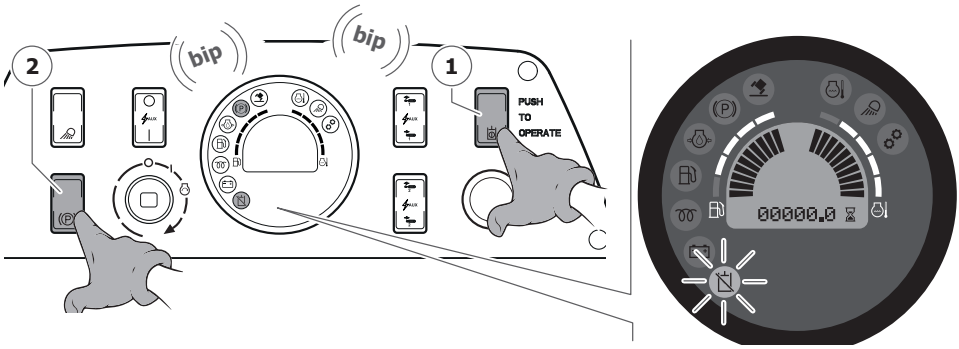
The auxiliary hydraulic system AUX1 latch with operator not in the driver's seat can be activated both in single-acting mode and in double-acting mode.

To select the mode, refer to section *"6.20.2.1 - Hydraulic system three-way switch AUX1" to page 6-43.*

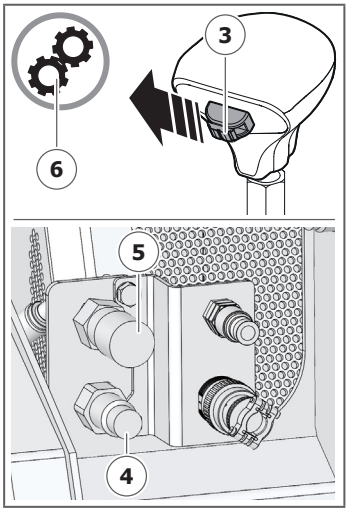
For both modes, the latch can be activated only for the male quick-coupling, while the female quick-coupling remains in discharge; for activation, the operator must not be in the driver's seat.

To **activate** the auxiliary hydraulic system AUX1 latch with operator not in the driver's seat:

- leave the driver's seat;
- press and hold the control cut-out button (**1**) for 5 seconds:
  - the controls cut-out light **flashes**;
  - the parking brake light **flashes**
  - an acoustic signal is **activated**;
- press the parking brake button (**2**) within 3 seconds;
  - the parking brake light comes on **steady**;



- push the roller (**3**) **FORWARD** until the mechanical latch is activated to provide a constant flow of hydraulic oil to the **male quick-coupling** (**4**); the female quick-coupling (**5**) is put in discharge;
    - the auxiliary hydraulic system AUX1 light (**6** - if present) comes on **steady**.



To **deactivate** the auxiliary hydraulic system when the operator is **not** in the driver's seat:

- get on the foot board;
- bring the roller back to the central (neutral) position.

NOTICE

For details on the controls, refer to the label located on the driver's seat and to the instructions in this user manual.

DO NOT keep the roller pushed back for long periods of time. The hydraulic circuit does not activate any function but is still under pressure and so there is the risk of the hydraulic oil overheating.

Use the auxiliary hydraulic system AUX1 latch with operator not in the driver's seat in single-acting mode ONLY for short periods of time to prevent the hydraulic oil from overheating.

6.20.3 - Drain line (direct to tank - optional)

For equipment (e.g. shredder head) requiring drainage without back pressure a drainage line may be added to the second boom. This discharges directly into the tank and is suitable for low oil flow rates.

DESCRIPTION AND COMMAND

As it is a drainage line it requires no controls.

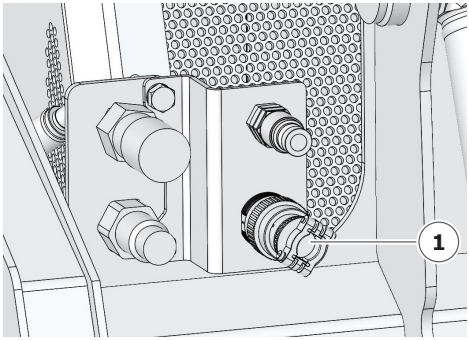
6.21 - Electrical auxiliary systems (optional)

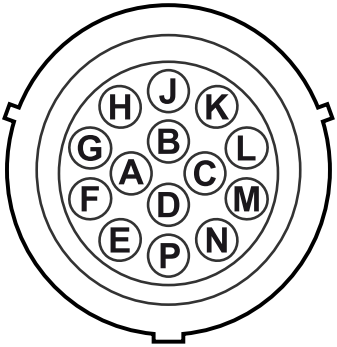
On the front of the boom there is an electrical connection (**1**) to which optional equipment requiring electrical controls can be connected.

When the relative control is activated, an electric signal is sent to the relative pin of the electrical connection.

Push-button controls or switches are controls of the type **ON**-**OFF**.

The connector is of the **Deutsch HD 30 - 14-way type, female, (male terminal port)**.

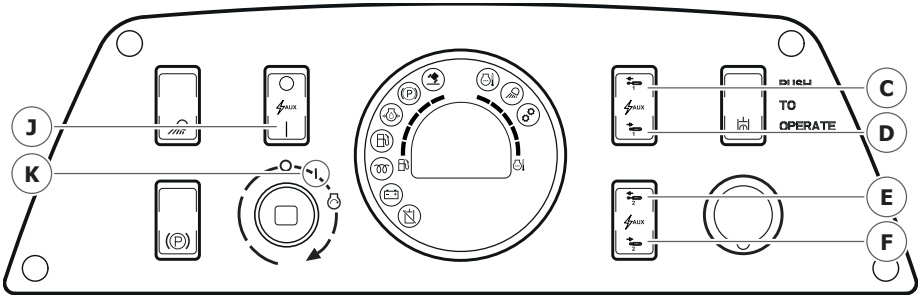




FRONT VIEW
(opposite wires)

POSITION	COLOUR	WIRE FUNCTION	MAX ABSORPTION	FUSE-PROTECTED
A	BLACK	Ground	N.A.	N.A.
B	BLACK	Ground	N.A.	N.A.
C	GREEN	Button electrical system 1 - UP (extend cylinder)	3A	F17 (15A)
D	GREEN	Button electrical system 1 - DOWN (retract cylinder)	3A	F17 (15A)
E	GREEN	Button electrical system 2 - UP (extend cylinder)	3A	F17 (15A)
F	GREEN	Button electrical system 2 - DOWN (retract cylinder)	3A	F17 (15A)
G	N.A.	Non-wired	N.A.	N.A.
H	N.A.	Non-wired	N.A.	N.A.
J	GREEN	Switch electrical system 0-1 (1 - ON)	3A	F17 (15A)
K	ORANGE	Under-panel power supply (+15 utilities)	10A	F23 (10A)
L	BLACK	Ground	N.A.	N.A.
M	BLACK	Ground	N.A.	N.A.
N	BLACK	Ground	N.A.	N.A.
P	BLACK	Ground	N.A.	N.A.

The position of the buttons and the function that can be activated is shown below.



6.21.1 - Connecting equipment to electrical systems

⚠ WARNING

Read the contents of the equipment instruction manual carefully before connecting to the machine.

Never connect any equipment to the electrical lines before it is properly installed from a mechanical point of view and locked on the machine boom.

All operations must be performed with the machine parked on flat and compact ground.

The equipment must be connected to an electrical outlet with a flexible wiring harness equipped with a compatible connector.

To **connect** the equipment to the electrical system:

- mechanically install the equipment;
- place the machine on flat,, compact ground and lower the equipment to the ground;
- stop the machine;
- connect the equipment wiring to the electrical socket on the boom, checking that the specifications and dimensions correspond to those indicated.

☞ *NOTICE*

For the characteristics of the equipment connection and relative functions, see the manufacturer's manual.

In the event of any uncertainty when connecting the equipment, consult the Service Centre.

6.21.2 - Operation of electrical auxiliary systems

The buttons only send current to the corresponding PIN when they are kept pushed down.

Switches, once activated, send current continuously.

The under-panel power supply (+15 utilities) supplies power when the starting equipment switch is in the ON (**I**) position.

NOTICE

Only connect equipment with a compatible electrical connections and suitable electrical characteristics for the machine. There is a risk of short circuit or overload of the electrical system resulting in damage to the machine.

6.22 - Emergency boom lowering procedure

WARNING

Ensure no one is standing under or near the equipment before starting the procedure to lower the boom.

This procedure is to be carried out if the engine stops and cannot be restarted or, if any other failure occurs that stops the machine with the equipment not resting on the ground.

Lower the boom to place the bucket or equipment on the ground, as follows:

- go to the driver's seat;
- turn the starting equipment switch (ignition key) to ON;
- press the control cut-out button;
- move the right joystick forward, the boom begins to descend;
- keep the joystick pushed forwards until the equipment reaches the ground.

WARNING

If in carrying out the above procedure the boom does not lower to a position where the equipment is resting on the ground, contact the *Service Centre****.***

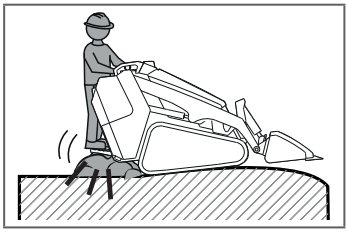
IN THE MEANTIME DO NOT ALLOW ANYONE TO COME NEAR THE BOOM.

6.23 - Procedure for the temporary activation of the controls with the operator not detected in the driver's seat

⚠ WARNING

The use of this procedure must be limited to the time strictly necessary to remove the machine from the condition that is causing it to be blocked.

Make sure that nobody is near the machine.



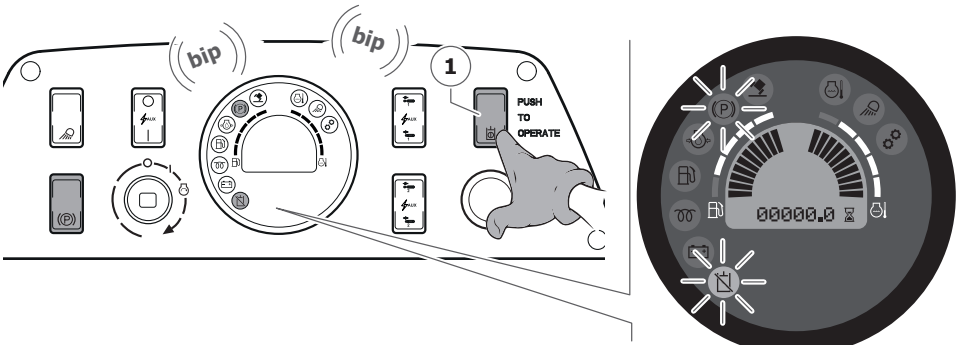
The foot board is equipped with a sensor that detects the presence of the operator in the driver's seat and allows for the controls to be enabled.

In certain conditions, the sensor may not detect the presence of the operator correctly (for example due to uneven ground), making it impossible to operate the machine.

The procedure that allows for the controls to be enabled when the previously described conditions occur is indicated below.

Temporary **enabling** of the controls with the operator not detected in the driver's seat:

- press and hold the control cut-out button (**1**) for 5 seconds;
- the controls cut-out light and the parking brake light flash and an acoustic signal is activated;
- all controls are enabled except for the auxiliary hydraulic system;
- perform the operations to remove the machine from the blocked condition;
- when the foot board sensor goes back to correctly detecting the presence of the operator, normal machine operation is restored; the controls are enabled, the lights stop flashing and the acoustic signal stops;
- it is possible to resume work.



6.24 - Supplementary counterweight installation and removal procedure

⚠ WARNING

When the supplementary counterweights are installed, the overall machine weight changes. Take this into consideration when transporting the machine.

Always check that the right number of counterweights is installed on the machine based on the indications in the following table.

The supplementary counterweights are the modular type, they can be installed in a variable number to increase the operating load and capacity, see sections *"3.10 - Operating load" to page 3-6* and *"7.3 - Operating capacity" to page 7-5*.

The counterweights are ALWAYS installed in equal numbers and must be equally distributed between the two sides of the machine.

The number of counterweights that can be installed is linked to the track type, follow the instructions in the table.

TRACK WIDTH	WEIGHT (each)	No. COUNTERWEIGHTS
250 mm	22 kg	3 + 3
150 mm		1 + 1

For **installation**, proceed as described below:

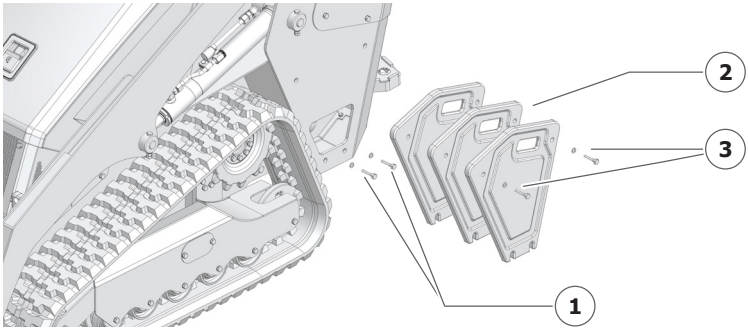
- obtain the required material according to the number of counterweights to be installed;
- tighten the 2 lower bolts (**1**) on the machine frame by approx. 10 mm;
- Position the counterweights (**2**), inserting them from above and resting them on the bolts (**1**), taking care not to drop the counterweights that are not yet secured by the bolts;
- insert and tighten the 2 upper screws (**3**);
- tighten the 2 lower screws (**1**).

Repeat the entire procedure on the other side of the machine.

For **removal**, proceed as described below:

- loosen without removing the 2 lower bolts (**1**) from the machine frame, they must stay in place to approx. 10 mm;
- remove the 2 upper bolts (**3**), taking care not to drop the counterweights, which are no longer secured by the bolts;
- remove the counterweights (**2**) by extracting them from above;
- remove the 2 lower bolts (**1**).

Repeat the entire procedure on the other side of the machine.



⚠ WARNING

Use bolts having suitable size, length and resistance class to ensure a proper fixing of the counterweights and prevent them from falling while working.

6.25 - Daily storage

Proceed as indicated in section *"6.13 - Stopping and parking the machine" to page 6-22*.

7 - RECOMMENDED OPTIONAL EQUIPMENT

⚠ WARNING

If optional equipment is installed and used, carefully read the relevant user manual and strictly follow the instructions contained in it.

Only use optional equipment recommended by the *MANUFACTURER* ***and compliant with the requirements reported in the table in section*** *"7.2 - Specifications on authorised equipment" to page 7-4****.***

THE MANUFACTURER ***shall not be held responsible for any damage to property or people and for the reduction of the efficiency of the machine, due to the application or use of incompatible equipment.***

While replacing equipment it is important to wear appropriate PPE, according to the indications given in section *"2.4.1 - Personal Protective Equipment (PPE)" to page 2-15*, to avoid contact with grease, splashes of pressurised oil or metal splinters.

7.1 - Safety precautions

Any type of interchangeable equipment or accessory can be installed on the machine for construction works, roadworks and earth-moving operations, in compliance with the operating limits indicated in this manual. Installation must be performed in compliance with the safety standards, according to the instructions in this manual and in compliance with those of the manufacturer of the equipment or accessory. Interchangeable equipment and accessories must be compliant to the applicable accident prevention standards.

The employer must in any case verify the suitability of the combination in relation to the activities to be carried out.

The installation of optional equipment or accessories other than those authorised by the *MANUFACTURER* not only compromises the machine life, but can also cause safety issues.

When installing accessories or optional equipment not indicated in this use and maintenance manual, contact the *Service Centre*. Otherwise the *MANUFACTURER* denies all liability for accidents or damage.

The use of equipment on the machine can change its stability. The stability depends on the dimensions and weight of the machine with the accessory fitted to it, as well as on the weight and position of any resulting loads applied to the machine (load capacity).

The *MANUFACTURER* does not issue any declarations or warranties, express or implied, regarding the design, manufacture or suitability for use on the machine of accessories provided by third parties. This machine does not envisage the use of, and must not be used with, any accessories that exceed the maximum permitted lifting capacity.

The installer of the equipment must check that:

- The **hydraulic** characteristics of the equipment are compatible with those of the machine, see section *"6.20 - Auxiliary hydraulic systems" to page 6-40;*
- the electrical characteristics of the equipment are compatible with those of the machine, see **electrics** *"6.21 - Electrical auxiliary systems (optional)" to page 6-48;*
- The characteristics of the equipment's quick-coupling plate are compatible with those of the machine, see section *"7.4 - Quick-coupling" to page 7-10;*
- after pairing the machine-equipment, the operator's visibility is guaranteed and complies with standards in force;
- the equipment does not interfere with any part of the machine and does not encroach on the driver's seat.

⚠ WARNING

When removing or installing equipment, take the following precautions and pay attention to the safety conditions during operations.

Perform installation and dismantling operations on a solid, level surface.

When the operations are performed by two or more operators, agree on the signals for communication and follow them during the operations.

Use a crane for the installation or the removal, on the machine, of equipment with a weight greater than 25 kg.

The use of a crane requires specialized personnel. Never allow non specialised persons to use a crane.

It is dangerous to perform operations with suspended equipment; never stand under a load lifted by a crane. Always choose a safe position in order not to run any risks if the load should drop.

Identify the centre of gravity of the equipment so as to hook it in such a way that during the movements it will remain stable and well hooked.

After removing the equipment from the machine, place it on the ground and check that it is stable; if the equipment is not stable, place it on a suitable support.

After installing the equipment, check that it is connected in a stable manner.

Keep unauthorised people out of the equipment storage area.

For further information on installation and dismantling operations, contact the *Service Centre*.

7.2 - Specifications on authorised equipment

⚠ WARNING

The tables below provide details of the equipment recommended by the** MANUFACTURER**.

Pay particular attention to safety criteria and, before starting any operations, perform a test (in a safe place) to check the operating area of the equipment and its centre of gravity.

Some equipment, in a fully retracted position, may interfere with certain parts of the machine or encroach on the driver's seat. Therefore, appropriate care should be taken to avoid this.

The recommended equipment is listed below:

TYPE	**INTENDED USE (of machine paired with equipment)**
*MULCHER	Floor level plant mulching.
*TRENCHER	Removal of material to develop trenches.
*DEMOLITION HAMMER	Demolition of material such as asphalt, concrete, rock, etc.
SWEEPER	Cleaning of surfaces such as roads, paved areas, factory floors etc. of debris, gravel, etc.
SNOW PLOUGH	Removal of snow and ice by pushing.
SNOW BLOWER	Removal of snow and ice by throwing it to the side.
DOZER BLADE	Removal and levelling of soil, crushed rock or gravel, etc., by pushing.
MULTIFUNCTIONAL BUCKET CLAMSHELL BUCKET 4 IN 1 BUCKET	Excavation, loading, filling, transport of material (such as soil, crushed rock or gravel).
AUGER	Soil drilling.
**BACKHOE	Excavation, loading, lifting of material (such as soil, crushed rock or gravel) with the bucket.

*** This equipment may create airborne debris that is hazardous to the operator's health. During operation, the operator is required to wear suitable PPE (safety helmet, safety goggles, safety gloves). See the use and maintenance manual of the equipment for further safety instructions.**

**** This equipment requires additional verification to assess stability during work, which must be carried out by the equipment installer. The flow rates indicated in this manual refer to the equipment in the transport condition.**

Other tools can also be installed in addition to the equipment listed here, see section *"3.10 - Operating load" to page 3-6.*

Following are instructions regarding the operating capacity of the machine and method of selecting the equipment.

7.3 - Operating capacity

The **operating capacity** is the maximum weight of the equipment that can be installed on the machine in relation to the position of the barycentre, with respect to the quick-coupling plate. For example, the further the barycentre of the equipment from the machine, the less its capacity.

The operating capacity is calculated according to standard **ISO 14397-1**, and refers to:

- equipment that is NOT used to load and transport material or equipment whose weight is considered at full load (e.g. mixing bucket, multifunctional bucket and sweeper bucket);
- machine positioned on sound, firm and level ground;
- machine equipped in all available configurations (e.g. canopy or cab version, etc.).

The **tip-over load** is the limit weight above which the machine loses stability (tips over), it is provided ONLY as a reference and **NEED NOT** be considered when selecting the equipment.

⚠ WARNING

When the machine is used in conditions other than those indicated in the manual (for instance, on a surface which is not compact, but rough or slippery, or on a slope, etc.), the operator must take into account the new conditions that reduce the machine's stability and capacity. The operator must therefore work at reduced speed so as to ensure stability of the machine.

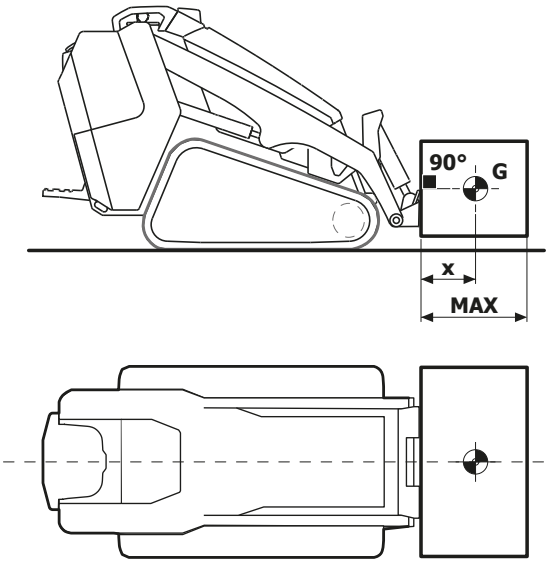
WARNING

For equipment used to load material, for example: multifunctional bucket and sweeper bucket, use the weights and barycentre measured in the maximum load conditions technically possible (equipment weight plus loaded material).

To evaluate the machine-equipment coupling, both the position of the barycentre and the weight of the equipment must be known.

EQUIPMENT BARYCENTRE

Method for measuring the barycentre of the equipment.



Key:

X	Distance from equipment barycentre to quick-coupling plate (mm), calculated perpendicularly.
MAX	Distance from front overhang of equipment to quick-coupling plate (mm), calculated perpendicularly.
G	Equipment barycentre.

If the position of the barycentre is not known, the maximum overall dimensions of the equipment can be used (**MAX**).

EQUIPMENT WEIGHT

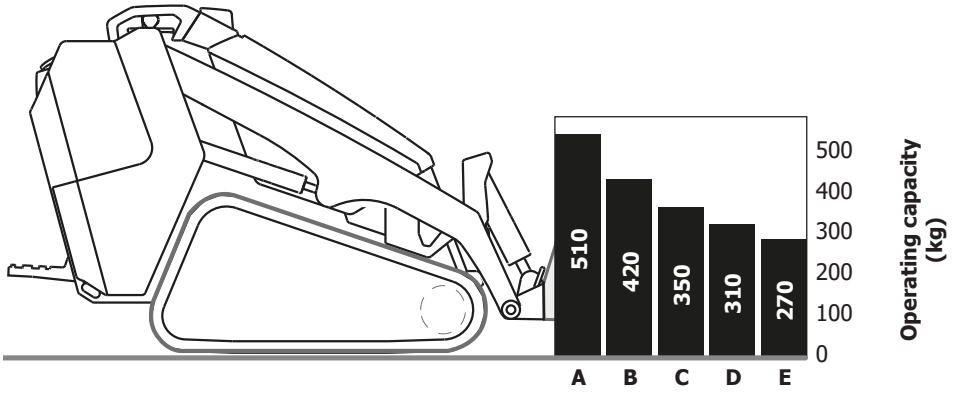
Consult the rating plate affixed by the manufacturer on the equipment.

EVALUATION OF MACHINE - EQUIPMENT PAIRING

When both values are known (barycentre and weight of equipment), consult the following tables to evaluate whether the pairing is allowed. These are the instructions for table consultation:

- find the interval (in boxes **A-B-C-D-E**) that includes the value of the equipment barycentre (**X**). If the value of the barycentre is NOT within any of the indicated intervals, the equipment CANNOT be installed;
- the column corresponding to the interval (**X**) shows the **OPERATING CAPACITY**, which MUST be GREATER THAN or EQUAL TO the weight of the equipment being assessed. If the weight of the equipment is greater than the maximum indicated operating capacity, the equipment CANNOT be installed;
- in the row indicating the operating capacity, check the **NUMBER OF COUNTERWEIGHTS** that need to be installed on the machine. **The machine - equipment coupling is ONLY possible once the correct number of counterweights have been installed.**

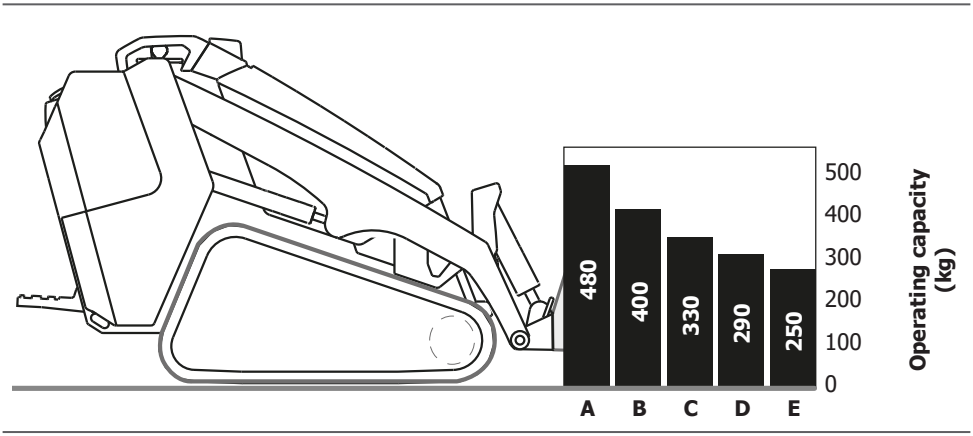
TABLE VALID FOR TRACKS WITH WIDTH 250 mm



		X distance between equipment barycentre and quick-coupling **(mm)**				
COUNTER-WEIGHTS (no.)	**LOAD (kg)**	**A** (0 ÷ 200)	**B** (201 ÷ 400)	**C** (401 ÷ 600)	**D** (601 ÷ 800)	**E** (801 ÷1,000)
3 + 3	**OPERATING CAPACITY**	**510**	**420**	**350**	**310**	**270**
	TIP-OVER LOAD	1,450	1,200	1,000	880	770

For more information regarding installation of the counterweights, see section *"6.24 - Supplementary counterweight installation and removal procedure" to page 6-53*.

TABLE VALID FOR TRACKS WITH WIDTH 180 mm



		X distance between equipment barycentre and quick-coupling **(mm)**				
COUNTER-WEIGHTS (no.)	**LOAD (kg)**	**A** (0 ÷ 200)	**B** (201 ÷ 400)	**C** (401 ÷ 600)	**D** (601 ÷ 800)	**E** (801 ÷1,000)
1 + 1	**OPERATING CAPACITY**	**480**	**400**	**330**	**290**	**250**
	TIP-OVER LOAD	1,370	1,140	940	820	710

For more information regarding installation of the counterweights, see section *"6.24 - Supplementary counterweight installation and removal procedure" to page 6-53*.

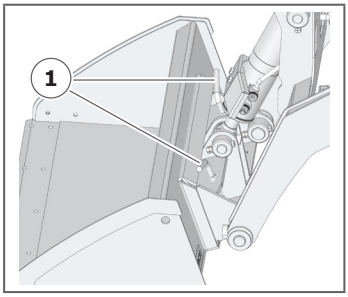
7.4 - Quick-coupling

The machine is equipped with a quick-coupling system which allows for the rapid replacement of the bucket or other equipment.

The coupling is the **CII type** (Common Industrial Interface).

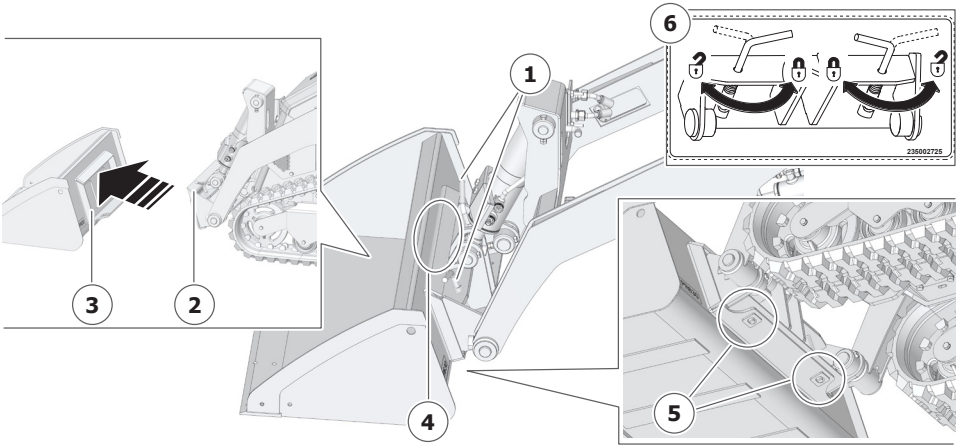
The equipment used must feature a connection plate compatible with the quick coupling of the machine.

The **quick-coupling** is manually activated using levers (**1**), which act directly on the quick-coupling.



Coupling the bucket or equipment:

- the equipment must be placed on flat, compact ground; if this is not the case, move it with the aid of a load-lifting vehicle of suitable capacity;
- lower the boom completely;
- press the control cut-out button;
- turn the two levers (**1**) outwards;
- move the machine closer to the equipment, with the quick coupling (**2**) aligned with the connection area of the equipment (**3**).
- slowly move forwards with the boom lowered and the quick-coupling tilted forward slightly;
- place the top edge (**4**) of the quick coupling under the connection plate of the equipment;
- lift the boom 100/150 mm inserting the edge of the quick coupling inside the plate of the equipment;



- recall the quick coupling towards the machine so that it is in contact with the equipment; the equipment should be lifted about 50 mm off the ground;
- press the control cut-out button;
- turn both levers inwards to engage the locking wedges (**5**);
- make any hydraulic and/or electrical connections on the equipment, see sections *"6.20.1 - Connection of equipment to the hydraulic systems" to page 6-41* and *"6.21 - Electrical auxiliary systems (optional)" to page 6-48;*
- climb up to the driver's seat and lift the boom until you can see the wedges, to check that they are correctly inserted;
- the operating instructions are summarised on the operational label (**6**).

To release the bucket/equipment, perform the operations in reverse order.

⚠ CAUTION

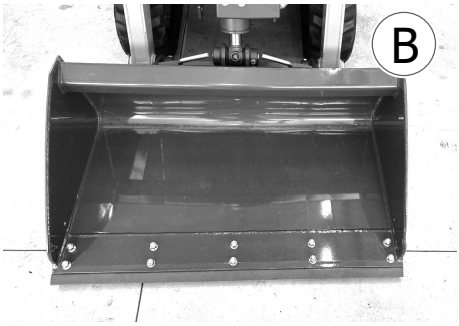
When changing equipment, do not place any body parts outside the driver's seat.

Both locking wedges must be inserted in the equipment. If one of the two pins is damaged or not working properly, do not use the machine until both pins are operational.

Always check that the machine's quick-coupling and the equipment plate are free from debris before coupling and uncoupling.

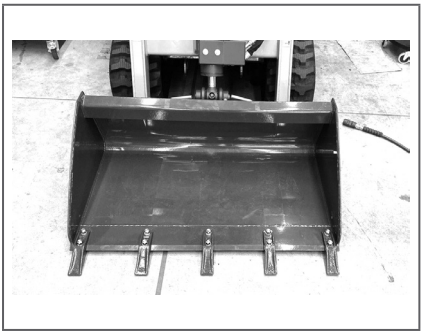
7.5 - Bucket teeth and blade

The bucket can be equipped with bucket teeth **(A)** or with and additional blade **(B)**.



To replace a bucket tooth proceed as follows:

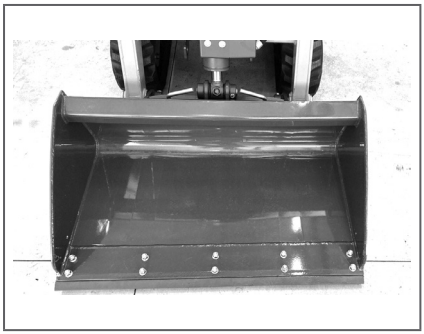
1. Position the machine on a hard and level ground. Place the bottom side of the bucket on a block so that the bucket teeth are ahead of the block.
2. Remove the two nuts, the two washers and the two bolts that hold the tooth to the bucket.
3. Extract the tooth and replace it.



***NOTE**: the wear of the bucket teeth depends upon several application factors. Examples of these factors are the materials mainly handled on the jobsite and the operator's digging style.*

To replace additional blade proceed as follows:

1. Position the machine on a hard and level ground. Place the bottom side of the bucket on a block so that the additional blade is ahead of the block.
2. Remove the ten nuts, the ten washers and the ten bolts that hold the additional blade to the bucket.
3. Extract the addtional blade and replace it.



***NOTE**: the wear of the additional blade depends upon several application factors. Examples of these factors are the materials mainly handled on the jobsite and the operator's digging style.*

7.6 - Precautions

While replacing equipment it is important to wear appropriate PPE, according to the indications given in section *"2.4.1 - Personal Protective Equipment (PPE)" to page 2-15*, to avoid contact with grease, splashes of pressurised oil or metal splinters.

Before uncoupling the equipment from the machine, place it on firm, level ground to prevent it from moving after uncoupling and thereby causing injury to persons and/or damage to property.

8 - MAINTENANCE

This section contains a complete list of requirements and procedures regarding the maintenance of this machine.

Maintenance provides for two types of operations:

- **daily**: through checks and operations performed **every day** directly by the operator;
- **periodical**: through checks and operations performed at specific **time intervals** by the *Service Centre*.

See the *Periodical Maintenance* table for the list of operations and relative time intervals.

Periodical maintenance operations must be performed at authorised *CASE workshops, where the interventions must also be recorded in the special register.*

If the information or procedures contained in this chapter are not fully understood, contact your local *Service Centre* for clarifications before proceeding.

Before starting work, make sure that the maintenance work has been carried out on the equipment in use, as described in the Use and Maintenance Manual of the equipment itself.

8.1 - Safety

⚠ WARNING

Carry out maintenance operations on a sturdy, flat surface.

Maintenance operations must not be carried out with the equipment raised; always place it on the ground.

If it is necessary to keep the boom raised while performing maintenance operations, remove the equipment and insert the boom lock for maintenance as indicated in the dedicated section.

Do not carry out maintenance when the machine is running. Before any intervention set the machine in safety according to *"8.1.1 - Putting the machine out of service for maintenance" to page 8-4****.***

Before doing any work on the machine, read the instructions in the manual carefully.

During maintenance operations, observe the precautions printed on the safety signs on the machine.

Do not try to carry out any maintenance unless you have the necessary skills, the right information, the safety tools and the instruments and equipment necessary to do the job properly.

Ensure the equipment used to lift and support the machine is in good working order and withstands the weight of the machine.

NEVER carry out any maintenance or servicing work on this machine while the engine is running. Contact with moving or hot parts, or with any high-pressure fluid leaks, may cause serious injury or death.

Wear appropriate PPE as indicated in section *"2.4.1 - Personal Protective Equipment (PPE)" to page 2-15****.***

Failure to comply with the safety regulations and proper maintenance procedures could cause damage or faults on the machine and result in injury or even death of the operator or other persons in the vicinity.

Do not start the engine of the machine in inadequately ventilated, enclosed areas, so as to avoid accumulating of exhaust gases.

Before starting the machine, clear the area from the machine action range.

Never leave the machine unattended with the engine running.

Wash the machine regularly and remove all traces of grease, oil and debris, so as to prevent any form of personal injury and machine damage.

Do not spray water or steam onto the driver's seat.

Clean the machine, taking care not to direct the high-pressure water spray at the radiator or any electrical parts.

When washing, protect the connectors of the electrical system and do not wet the starting equipment switch.

If you are working in dusty environments, reduce maintenance interval times by half.

When working in dusty areas:

- check frequently for air filter blockage;
- clean the radiator frequently to prevent the fins from becoming blocked;
- change the fuel filter more often;
- clean the electrical components; in particular, remove any dust from the alternator and starter engine.

Do not use flammable liquids to clean machine components, avoid open flames, and do not smoke.

Keep all grease nipples, breather pipes and areas around the dipsticks particularly clean to prevent any dirt getting in.

Thorough cleaning of the machine will help to identify damaged components more easily.

NOTICE

IT IS RECOMMENDED TO USE ORIGINAL SPARE PARTS ONLY.

Do not carry out any procedure, modification or repairs of any kind, except for those indicated in this handbook. Only the Service Centre has the necessary knowledge of the machine and the experience to carry out any intervention with the appropriate technique.

This machine has been assembled using instruments based on the metric decimal system. Use metric tools of the appropriate type and size to carry out maintenance procedures.

CASE ***recommends waste storage and disposal procedures in respect of the environment. Do not discharge liquids into the ground or drains, or into waste catchment areas. Use suitable containers for the collection of these liquids, then store and/or dispose of them in the safe and approved manner. Check and observe all government and/or municipal regulations regarding the storage, disposal and recycling of waste.***

8.1.1 - Putting the machine out of service for maintenance

The **placement out of service for maintenance** procedure must be carried out to deactivate and place the machine in safe conditions during maintenance operations.

WARNING

Before carrying out any maintenance intervention or service on components of the hydraulic system, release any residual pressure.

Before performing any inspections or maintenance operations disable the machine as follows:

- position the machine on a flat, level surface;
- rest the equipment on the ground;
- stop the machine;
- Release the pressure of the hydraulic system as described in section *"6.19 - Discharge residual pressure in the hydraulic system" to page 6-39*;
- remove the starting equipment key, which must remain in possession and accessible only to the person performing the maintenance;
- apply a caution sign (**1**), **NOT supplied**, near the starting equipment board.

At the end of the interventions, the person in charge of the maintenance operations can restore the machine by following the procedure in reversed order; the machine will therefore be ready for normal operation.

8.2 - Tools and equipment for maintenance

Any additional instruments or tools required for maintenance and adjustment purposes, and not included in the tool kit, are included in the following table.

Key to the following table:

(1) "Manually" means that the maintenance or adjustment operation can be performed by hand, without using any tools

(2) Spanners of various types can be used to tighten bolts and nuts on machines

PART INVOLVED IN MAINTENANCE		Manually (1)	Hex Keys (2)	Socket wrenches (2)	Tool for oil filter	Torque wrench	Brush for battery terminals
ENGINE	Belt		X	X			
	Air filter	X					
	Fuel filter		X				
	Oil filter	X	X		X		
	Oil	X		X			
	Radiator	X	X	X			
UNDERCARRIAGE	Tracks			X			
	Rollers			X		X	
	Idle wheel			X		X	
	Drive sprocket			X		X	
HYDRAULIC SYSTEM	Components	X	X	X		X	
	Distributor		X	X		X	
	Gear motors		X	X		X	
	Radiator	X	X	X			
ELECTRICAL SYSTEM	Alternator		X	X			
	Battery		X				X
	Lighting	X	X				
	Starting system		X	X			

8.3 - Safety devices

The guards, also called hoods or covers, provide protection against the risks such as high noise level, burns or moving parts.

The inner parts of the machine can be accessed for maintenance through the hoods and covers.

During the operation the guards must be kept closed. The guards present on the machine are listed below.

Their integrity and anchorage must be checked periodically.

WARNING

Do not hold the hood and access covers open when the machine is on a slope or in windy conditions. The hoods and access covers can close accidentally causing personal injury.

8.3.1 - Engine hood

The engine hood (**1**) is positioned centrally on the body of the machine.

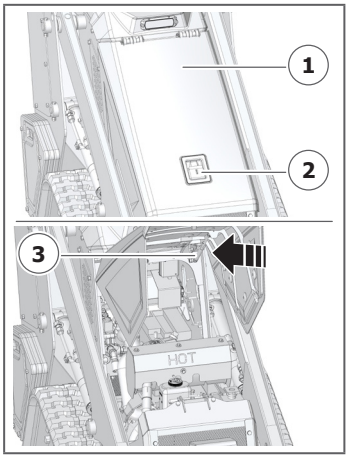
From here you can access: the engine, the fuel system, the cooling system, the air filter, etc...

To **open** the hood:

- using the handle (**2**), pull the hood upwards and push it as far as it will go;
- the hood is held open by a gas spring (**3**) with a mechanical lock.

To **close** the hood:

- while holding the hood with one hand, use the gas spring body (**3**) to release it;
- Pull the hood downwards until the lock can be felt to engage.



The hood can be locked using a padlock (not supplied).

⚠ WARNING

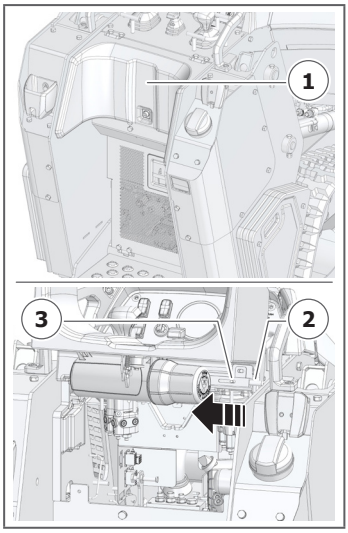
Over time, the gas spring may wear out and no longer be able to push the hood to the end of its stroke, in which case the mechanical lock will not engage automatically; replace the gas spring.

Be very careful if the hood is open and the mechanical lock is NOT engaged as it may suddenly close and cause severe injuries to the operator's hands or head.

8.3.2 - Upper compartment cover (cushion)

The upper compartment cover (**1**) is the operator's support cushion.

From here it is possible to access the following: document holder, single/double-acting switch.



To **open** the cover:

- insert the key into the lock and turn it counter-clockwise;
- release the lock by pushing the key;
- Pull the cover upwards to open it until the locking pin (**2**) clicks.

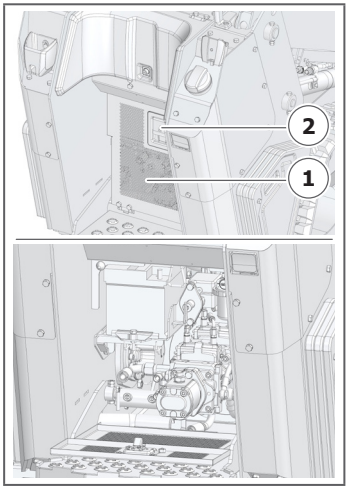
To **close** the cover:

- pull the locking pin by using the socket (**3**) to the left;
- slowly close the cover downwards until it stops;
- lock the cover by turning the key clockwise and then remove it.

8.3.3 - Lower compartment cover

The lower compartment cover (**1**) is located in front of the driver's seat.

From here it is possible to access the following: battery, battery cut-off, fuel filters.



To **open** the cover:

- using the handle (**2**), pull the cover and guide it downwards to open it.

To **close** the cover:

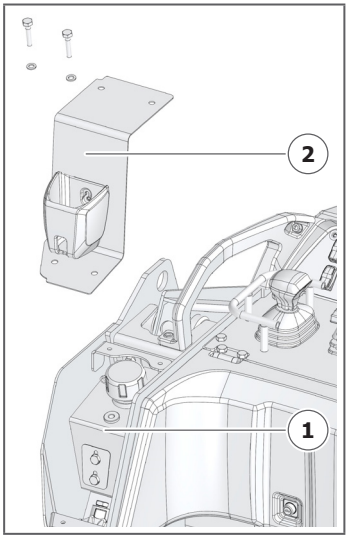
- guide the cover upwards until the lock can be felt to engage.

The cover can be locked using a padlock (not supplied).

8.3.4 - Oil tank compartment guard

The oil tank compartment guard (**1**) is located on the left side of the machine, to the left of the operator's seat.

From here it is possible to access the following: oil tank.



To **remove** the guard:

- unscrew the bolts securing the guard;
- remove the guard (**2**) by pulling it upwards.

To **refit** the guard:

- place the guard in its housing;
- Reposition the bolts.

8.4 - Locking the boom for maintenance

⚠ WARNING

It is dangerous to work under the raised boom without it being locked and with the equipment still installed. The boom may drop down causing serious injuries.

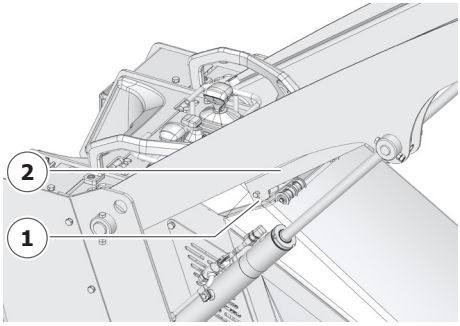
Should it be necessary to perform a maintenance operation with the boom raised, remove the equipment and lock the boom.

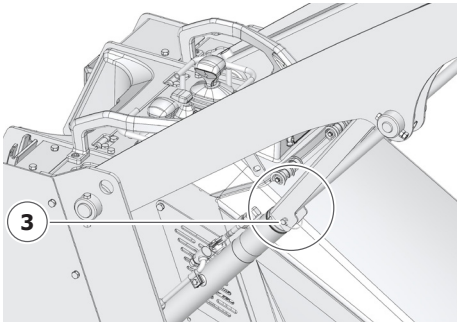
Following these instructions correctly eliminates the risk of accidental lowering of the boom, resulting in damage to the operator and/or to people who may be near the machine.

The boom lock device in the raised position is installed on the right boom cylinder.

To **lock** the boom:

- uncouple the equipment, refer to section *"7.4 - Quick-coupling" to page 7-10;*
- lift the boom completely and stop the machine;
- remove the pin (**1**) from the locking device;
- lower the locking device (**2**) and bring it into contact with the cylinder rod;
- start the machine and lower the boom slowly until the locking device comes into contact with the cylinder body;
- stop the machine;
- insert the pin in position (**3**) to prevent the locking device from moving.





To **unlock** the boom:

- remove the locking pin (**3**);
- start the engine and raise the boom to maximum height;
- stop the machine;
- lift the locking device (**2**) and lock it with the special pin (**1**) by inserting it from the inside towards the outside of the machine;
- make sure that the safety spring is engaged in the pin;
- start the machine and completely lower the boom.

8.5 - Electrical system

DANGER

Before carrying out any work on the electrical system, carefully read the instructions on battery maintenance and observe the applicable instructions.

WARNING

Operations not indicated ARE PROHIBITED.

The maintenance interventions to be carried out on the electrical system are the following:

- check the tension of the alternator belt;
- check that the alternator belt is not damaged or broken;
- check and replace fuses and relays, see section *"9.1 - Fuses and relays" to page 9-1*;
- replace the work lights and LED strips, see sections *"9.2 - Work lights replacement" to page 9-6 and "9.3 - LED strip replacement" to page 9-7*.

If the cables are damp or their insulation is damaged, the electrical system will leak current and may cause machine malfunction or harm to the operator.

Avoid getting the electrical system wet when washing the machine or if it rains.

If damaged cables are noticed, stop the machine and contact the *Service Centre* for repairs.

When working for extended periods near rivers, lakes or the sea, protect connectors with suitable anti-corrosives.

8.6 - Tracks

Inspect the condition of the tracks periodically and check their tension.

If the track is too tight, there will be more friction on the rolling components and, as a consequence, more power will be needed for travel.

If the track is too loose, there will be more friction while reversing and, as a consequence, more power will be needed for travel. The track may also come out of the guide edges of the rolling components, causing the travel to stop.

Make sure that the tracks have equal tension: a different tension can cause a deviation of the machine from the travel trajectory.

8.7 - Refilling

8.7.1 - Refilling quantity table

NOTICE

Before each change or refill of the liquids/oils used by the machine, check to see if the system is filled with mineral or organic products.

Never mix different types of products so as not to alter their characteristics.

For further information on the lubricants and fuels required, see section *"8.7.2 - Products for lubrication" to page 8-15*.

The refilling quantities indicated in the table are indicative values; in any case refer to the dipstick and the level markers.

After each change or refill, check the level of the corresponding group.

Oils, filters, cooling liquids and battery fluids are pollutants that should not be released into the environment but disposed of in accordance with the environmental protection regulations in force.

NOTICE

For further details on the maintenance of the heat engine, carefully follow the instructions in the USER MANUAL of the engine provided with each machine.

EQUIPPING THE MACHINE FOR THE FIRST TIME

Refilling	Type	Brand	Quantity
Diesel Engine (with filter change)	SAE 10W40 ACEA E9	NO.1 ENGINE OIL™ SAE 10W- 40 CK-4 SEMI-SYNTHETIC	4.5 l
Diesel engine cooling system	ASTM D6210 TYPE I-FF	EXTENDED LIFE OAT COOLANT/ANTIFREEZE CONCENTRATE (*)	3.5 l
	ASTM D6210 TYPE I-FF	EXTENDED LIFE OAT COOLANT/ANTIFREEZE 50/50 PREMIXED	
Hydraulic system	ISO 11158 L-HV46	PREMIUM HYDRAULIC OIL HV46 MULTI-GRADE ANTIWEAR	20 l
Hydraulic oil tank			17 l
Travel gear motors	SAE 80W-90 API GL-5	HYPOID GEAR OIL EP SAE 80W-90	0.15 l x 2
Track tensioner grease nipples	NLGI 2 (**)	MULTI-PURPOSE MOLY GREASE EP / AW / NLGI 2	-
Joints greasing points			
Fuel tank	EN 590	-	30 l

(*) Concentrate antifreeze to be mixed 50/50 with distilled (deionized) water.

(**) Lithium + Molybdenum bisophlurum.

EQUIPPING THE MACHINE FOR THE FIRST TIME WITH ECO-FRIENDLY LUBRICANTS

Below is the list of eco-friendly lubricants used; for other fluids, refer to the previous table.

Refilling	Type	Brand	Quantity
Diesel Engine (with filter change)	SAE 10W40 ACEA E9	PANOLIN BIOMOT LX 10W-40	4.5 l
Hydraulic system	ISO 15380 HEES 46	PANOLIN HLP SYNTH E46	20 l
Hydraulic oil tank			17 l
Travel gear motors	SAE 80W-90 API GL-5	PANOLIN BIOGEAR RS 80W-90	0.15 l x 2
Track tensioner grease nipples	NLGI 2	PANOLIN BIOGREASE EP 2	-
Joints greasing points			

8.7.2 - Products for lubrication

The scrupulous observation of the rules for the use of lubricants and products for the operation of the machine, increases the reliability and life of the machine itself.

It is particularly important to comply with the lubricant qualities indicated.

The replacement and lubrication intervals are indicated in section *"8.11 - Regular maintenance" to page 8-34.*

Do not mix different types of oil, if there is no certainty about the type of oil used, avoid topping up and proceed with changing.

Filling quantity specifications:

For further information on the filling quantities and specifications on the lubrication and products required for the operation of the machine, see section *"8.7.1 - Refilling quantity table" to page 8-13*.

Measures for environmental protection

Always adopt and respect the measures for environmental protection.

Comply with the specific national laws.

Before draining fluids from the machine, take precautions to ensure their proper disposal.

Disposal of used products

Used products and special waste are, for example:

- oils, lubricants, etc.;
- cooling liquids;
- fuels;
- filters, oil filter cartridges, etc.

8.7.3 - Fuel

DANGER

Do not expose the fuel to flames or sparks, as diesel fuel is an inflammable substance; this may cause a fire, with the risk of personal injuries and damage to the machine.

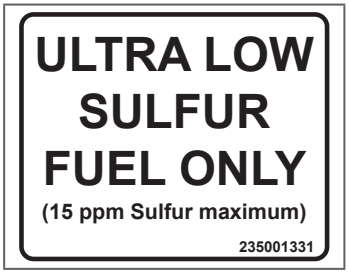
Always refill at the end of the day.

When refilling using the dedicated electric pump (if present), make sure there is no water on the top of the fuel drum and that the fuel pump does not draw up any condensation from the bottom of the drum.

The fuel used must correspond with the minimum requirements of the specifications indicated below.

Specifications allowed:

- DIN EN 590;
- ASTM D 975-89a – 1D, 2D;
- NATO F-54;
- JIS K2204 Grade 1, 2.



NOTICE

The sulphur content must not exceed 15 ppm. A greater sulphur content will cause serious damage to the engine.

Use fuel that is suitable for the temperature of the work environment; the pour point used must be five degrees lower than the lowest external temperature.

8.7.4 - Engine oil

Choose the engine oil carefully and follow the applicable maintenance schedule:

- daily check of the oil level;
- periodic replacement of the oil filter;
- periodic oil change.

Use clean oils, make sure that the containers are clean and that no foreign bodies get into the oil.

Do not mix different brands of oil.

If you have any oils that are different from those currently being used, do not top the oil up but rather drain all the oil and replace it with whatever oil you have available.

Inspect and change the oil in a clean area to prevent dirt from entering the tank.

When seals and O-Rings are removed, replace them with new ones and clean the sealing surfaces well. After the maintenance operations, check the seals and make sure there are no leaks.

The lubricant oils to be used are for Diesel engines and meet the specific requirements indicated below:

Classification	Specification
API (American Petroleum Institute)	CK-4
ACEA - (Association des Constructeurs Européens de l'Automobile)	E9

Lubricant oil viscosity

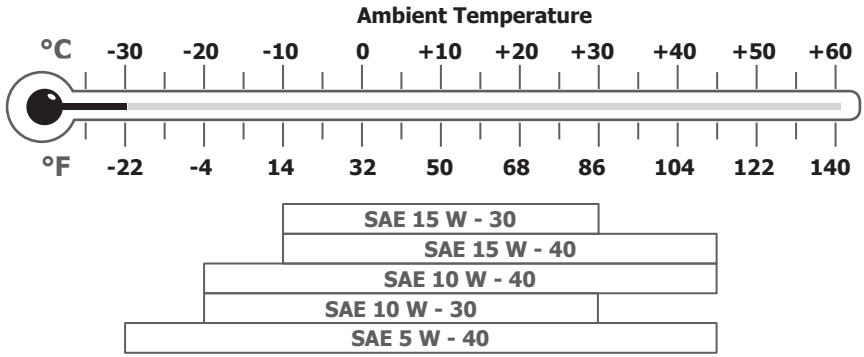
The lubricant oil viscosity is chosen according to the SAE (Society of Automotive Engineers) classification.

In order to choose the correct SAE class, the ambient temperature is essential.

The choice of SAE classification does not determine the quality of a lubricant oil.

If the viscosity is too high, there may be difficulties in starting the machine; if the viscosity is too low, the effectiveness of the lubrication may be compromised.

The temperature intervals indicated in the graph below are indicative only; they may be lower or higher for short periods of time (2/3 days).



Choice of SAE class according to the temperature

NOTICE

*The engine oil and filter must be replaced **at least once a year** even if the deadline for the replacement interval has not been reached.*

8.7.5 - Cooling liquid

Before leaving the factory, the machine is filled with cooling liquid for a temperature of **-30°C.**

Make sure the cooling capacity of the liquid is suitable for the working temperature.

NOTICE

The cooling liquid must be also suitable to minimum temperatures reached during shut down periods, to avoid serious damage to the engine and cooling system.

Adapt the mixture, antifreeze liquid/distilled water as required, as indicated in the following table:

ANTIFREEZE % VOLUME	DISTILLED WATER % VOLUME	FREEZING POINT °C	BOILING POINT °C
25	75	-12	105
33	67	-18	106
50	50	-38	109
60	40	-50	113

To dilute the additives, use distilled water or drinkable tap water.

The tap water must be: colourless, clear and free of mechanical impurities.

Seawater, brackish water, salt solutions and industrial waste water are not suitable.

The cooling system works in a reliable manner only if operating under pressure. Therefore it is essential that the system is kept clean and airtight, that the radiator and overflow tank caps work correctly and that the required level of cooling liquid is maintained.

The recommended anti-corrosion/antifreeze additives guarantee sufficient protection against cold temperatures, corrosion and cavitation, they do not corrode the seals and flexible hoses and they are non-foaming.

Cooling liquids containing an anti-corrosion/antifreeze additive that is inadequate, insufficient or has been prepared incorrectly, may cause damage to the construction elements of the cooling circuit. Moreover, deposits may form on the construction elements of the radiator that reduce the heat exchange, thus causing overheating and resulting in engine failure.

Operation in warm weather conditions (temperature that never drops below +5°C)

Always use a glycol-based cooling liquid (antifreeze) even when the engine is operated in places where antifreeze protection is not required.

8.7.6 - Hydraulic system oils

The following maintenance is required on the hydraulic system:

- periodic check of the oil level in the tank;
- periodic replacement of the oil filters;
- periodic oil change.

When seals and O-Rings are removed, replace them with new ones and clean the sealing surfaces well. After the maintenance operations, check the seals and make sure there are no leaks.

When a cylinder or hydraulic system component is removed, bleed out the air as follows after refitting:

- start the engine and let it idle for a while;
- allow all cylinders to perform their full stroke 4/5 times, slowly and without insisting on the limit switch.

The machine is first equipped with mineral or synthetic eco-friendly hydraulic oil with a high viscosity index. The choice between the two products is made at the request of the customer depending on the intended use of the machine.

Eco-friendly hydraulic oil is suitable for use in environmentally sensitive areas, it reduces the risk of contamination in the event of accidental spillage, while minimising direct and indirect legal consequences, additionally, it has longer drain intervals than mineral oil if the requirements indicated are met.

The use of regenerated or re-refined base oil is not recommended.

Hydraulic oils with characteristics equal to or greater than the following are recommended:

Hydraulic oil type	Performance specifications	Environmental specifications
Mineral	ISO-L-HV DIN 51524 3rd part (HVLP) or ISO 11158:2009 (HV) Viscosity index ≥150 and <170 VICKERS M-2950	No requirement
Eco-friendly (Synthetic ester)	ISO 15380 HEES Viscosity index ≥145 and <155 Zinc-free ASTM D943 dry TOST > 3000 h ASTM D 2070 (mod. 1680 h) Test FZG A/8.3/90 12° fill level VICKERS V104 C	Biodegradable as per OCSE 301 B >70% Water hazard class according to VwVwS: WGK1

NOTICE

Always check the correct type of oil for the machine in use by consulting the liquids table.

VISCOSITY OF THE LUBRICATING OIL

The lubricant oil viscosity is chosen according to the ISO classification.

In order to choose the correct ISO class, knowing the **operating temperature** of the oil is essential.

The ISO classification does not determine the quality of a lubricating oil.

If the viscosity is too high, the hydraulic system may not work correctly or get damaged; if the viscosity is too low, the performance of the machine may be reduced.

The viscosity of the hydraulic oil changes as its temperature changes. The oil can work at a viscosity ranging from 13 to 860 mm2/s, the optimum conditions for which maximum performance is achieved occur at a viscosity ranging from 15 to 35 mm2/s.

It is difficult to correlate the ambient temperature with the operating temperature of the hydraulic oil, because the operating temperature is linked, in addition to the ambient temperature, to the way the machine is used and to the type of work being carried out. The table below gives the indicative values that can help in the selection of the oil, if in doubt contact the *Service Centre*.

Viscosity class	Reference viscosity at +40°C	Ambient temperature	
	mm²/s	min. °C	max °C
ISO VG 32	32	-20	+30
ISO VG 46	46	-5	+40
ISO VG 68	68	+5	+50

8.7.6.1 - Requirements for using eco-friendly hydraulic oil

The use of eco-friendly lubricants involves the knowledge and the respect of certain specific procedures that have the purpose of allowing oil change intervals that are much longer than the corresponding mineral oil, while ensuring correct operation of the machine and the protection of its components.

The procedures to be followed are as follows:

- Mixing with other biodegradable oils is NOT permitted.
- Top-ups with mineral oil are NOT permitted.
- The maximum percentage of mineral oil permitted is 5% of the total quantity of filling (resulting from accidental mixing, for example, the use of equipment previously installed on a machine equipped with mineral oil).
- Throughout the working life, pollution with solid materials (debris, dust and the like) should be limited as much as possible, it must not exceed the purity class 21/17/13 (according to ISO 4406). Pay particular attention when changing equipment.
- The water content must not exceed the maximum permissible value of 0.1%.
- The costs of the oil analysis, carried out at the intervals indicated below, are borne by the manufacturer of the oil. The costs of taking and sending samples are excluded.
- The measures indicated by the manufacturer following the oil analysis, such as drainage, filtration and the like, must be complied with. After the measurements have been carried out, an additional control sample must be taken and sent back to the manufacturer.

- In the event of an accidental loss of oil into the environment, immediately take a sample of the oil from the machine and send it to the manufacturer in the same way as for regular testing. This operation will be useful in case of any dispute of contamination by the supervisory bodies.

NOTICE

On machines equipped at the factory with ECO-FRIENDLY HYDRAULIC OIL, near the hydraulic oil tank cap there is a warning sign.

It is possible to convert the hydraulic system of a machine from mineral hydraulic oil to eco-friendly hydraulic oil.

NOTICE

During the conversion operation, there is the risk of damaging the hydraulic system of the machine.

Mixing non-polluting hydraulic liquids and mineral oils will cause an aggressive action which will damage the hydraulic system. ***Do not use mixtures*** *of ECO-FRIENDLY HYDRAULIC OIL and MINERAL OIL.*

Always ask the Service Centre for instructions for conversion, and follow them!

8.7.6.2 - Scheduled plan for analysis and control of ecological hydraulic oil

The planned analysis and control plan consists of taking a hydraulic oil sample at pre-defined intervals and sending it to the oil manufacturer's laboratory.

The laboratory will check the functional parameters of the sample, issuing a report with the results and indicating whether the oil needs to be replaced.

The oil check intervals are as follows:

Check interval after commissioning/oil change	**Normal use**	**Heavy duty use (example demolition hammer or shredder head)**
1st check after	500 hours	200 hours
2nd check after	1000 hours	500 hours
Following checks after	1000 hours or at least once a year	500 hours or at least once a year

The actual need to change the oil will be indicated by the laboratory.

NOTICE

In the absence of regular periodical checks, the replacement interval is the one indicated in the periodical maintenance table.

8.7.6.3 - Requirements for the sampling of eco-friendly hydraulic oil

For the procedure for taking the oil sample from the machine, refer to section *"8.11.11 - Hydraulic system oil sampling/replacement" to page 8-52.*

The following are additional requirements on which the reliability of the oil analysis depends.

CONTAINERS

Use sterile, new, clean and originally sealed sample containers (500 ml capacity).

Containers must have a label with the following data:

- company name;
- machine model;
- machine serial number;
- identification of the content (type of oil);
- sampling date.

To the side is an example of a label and recommended container.

ACCOMPANYING DOCUMENT

The document accompanying the oil sample must be sent with the sample. In the absence of a correct accompanying document it is not possible to perform an exact evaluation of the sample. An accompanying document must be filled in completely for each sample submitted.

The form for the sample accompanying document is shown below.

Electronic format for printing can be downloaded from the PANOLIN website:

www.panolin.com

Accompanying document for samples of eco-friendly hydraulic oil:

Oil sample consignment form

PANOLIN® Swiss Oil Technology +

Use separate form for each sample **Please write in block letters!**

Company _____

Street _____

ZIP/City _____

*Serial/chassis number _____

Inventory number/code _____

of lubricant used _____

*mandatory

Please send to:

PANOLIN Production AG
Tec Center/Laboratory
Blaesimuehle 2 – 6
CH-8322 Madetswil

Machine/vehicle/device

Machine, vehicle, type (e.g. power shovel) _____

Brand _____

Type _____

Year _____

Oil sampling point

☐ Engine ☐ Compressor ☐ Gearbox ☐ Centralised lubricating system ☐ Axle ☐ Recirculation

☐ Hydraulic Minimess/warm oil ☐ Bottom hydraulic-tank/cold oil ☐ Top hydraulic-tank/warm oil

☐ Other _____

Working time/oil volume

Mileometer reading _____ ☐ Working time ☐ Kilometer

Working time since last oil drain _____ ☐ Working time ☐ Kilometer

Total oil volume _____

Top up quantity since last oil drain _____

Grounds for oil analysis

☐ Oil condition monitoring ☐ Sample after conversion ☐ Sample after filtration/dewatering ☐ Comparison

☐ Other _____

Remarks

_____

Please send the analysis report ☐ by mail ☐ by e-mail

Name: _____ Date: _____

First name: _____ Signature: _____

No signature required if sent by email.

E-Mail:

To be completed by PANOLIN

UB-Nr. _____ Distributor: _____

PACKING

Containers should be placed inside plastic bags to contain any spills. Store the containers inside a cardboard box with filling material to protect the contents.

Samples must be shipped within 48 hours to the following address:

PANOLIN International Inc.

Bläsimühle 2 - 6

CH-8322 Madetswil

Switzerland

Tel. 044 956 65 65

info@panolin.com

8.8 - Battery

If the machine does not start due to low battery power, please follow the instructions below.

DANGER

The battery produces hydrogen which could explode. Do not smoke and avoid sparks near the battery.

Electrolyte is made up of dilute sulphuric acid which could corrode clothes and skin; in the event of contact, rinse the area affected immediately with plenty of running water. If the acid penetrates in the eyes, wash with plenty of water and contact a doctor.

Always wear safety goggles and rubber gloves when working on the battery.

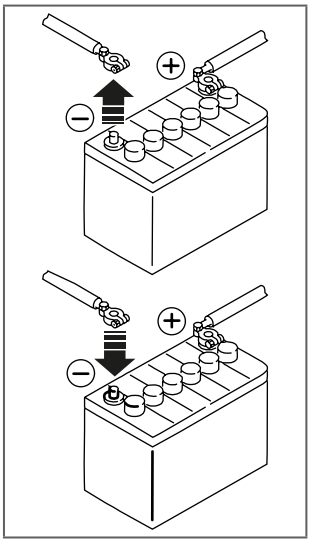
WARNING

It is dangerous to charge the battery while it is attached to the machine. Always remove it first before charging.

Prior to working on the battery, stop the engine and turn the starting equipment key to OFF position.

If a tool touches the positive terminal and at the same time the machine structure, sparks may be generated, with the risk of an explosion.

Tighten the connection terminals carefully, as loose contacts may cause sparks and consequently explosions.



NOTICE

The oxide accumulation around the terminals drains the battery out. Clean thoroughly the terminals and coat them with a thin film of grease before installation.

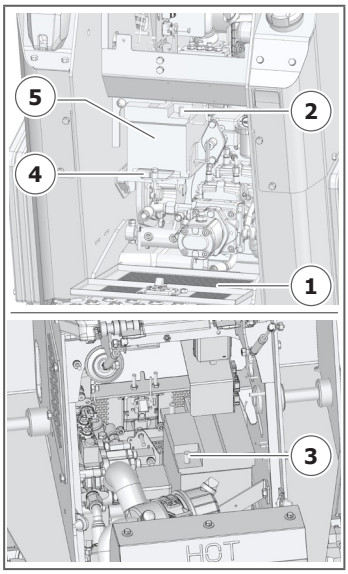
8.8.1 - Fitting and removing the battery

WARNING

Secure the machine as indicated in section *"8.1.1 - Putting the machine out of service for maintenance" to page 8-4****.***

REMOVAL:

- open the lower compartment cover (**1**) and the engine compartment hood;
- disable the battery disconnection switch;
- disconnect the earth cable (**2**) from the negative terminal (**-**);
- disconnect the cable (**3**) from the positive terminal (**+**);
- loosen the bolts and remove the bracket (**4**) that holds the battery;
- remove the battery (**5**).

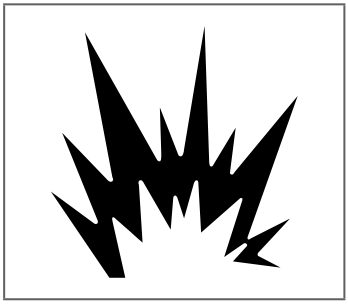


INSTALLATION:

- position the battery (**5**) in the specified position;
- tightly secure the battery using the fixing brackets (**4**) and **make sure it is stable and does not move**;
- connect the cable (**3**) to the positive (**+**) terminal of the battery;
- connect the earth cable (**2**) to the negative terminal (**-**) of the battery;
- restore the battery isolator switch so that normal operation can be resumed;
- close the guards.

8.8.2 - Recharging the battery

When charging the battery, always follow the instructions given in section *"8.8 - Battery" to page 8-28* and the indications in the instruction manual of the battery charger.



⚠ WARNING

While recharging the battery, hydrogen is generated, which is a flammable gas and which may explode, therefore the battery must be removed from the machine and taken to a well ventilated area before charging it.

Replace the battery immediately if the casing is damaged.

Adjust the battery charger voltage so it is the same as the voltage of the battery to be charged. If the voltage is not correctly set, the battery charger may overheat and cause an explosion.

Connect the positive (+) terminal of the charger to the positive terminal (+) of the battery and the negative (-) terminal of the charger to the negative terminal (-) of the battery. Make sure the terminals are securely fastened.

Adjust the charging current to 1/10 of the battery nominal capacity; When applying a quick charge, regulate it to a lower level than the battery nominal capacity. If the charging current is too high, the electrolyte can escape or dry out and the battery may catch fire and explode.

If the battery electrolyte is frozen, do not charge the battery or run the engine with a different power adapter. A different power adapter will ignite the electrolyte and cause the battery to explode.

8.9 - Tightening torque tables

Refer to these tables when no specific tightening torques are given. The following specifications apply to clamping devices with metric threads supplied, either dry or lubricated with motor oil.

Values are given in Nm, tolerance is ± 10%.

METRIC COARSE THREADS			
THREAD	**8.8**	**10.9**	**12.9**
M6	10	14.5	17.5
M8	25	35	42
M10	48	68	82
M12	86	120	145
M14	135	190	230
M16	215	300	360
M18	295	410	490
M20	410	580	690
M22	550	780	930
M24	720	1,000	1,200
M27	1,040	1,450	1,750
M30	1,400	2,000	2,400

METRIC FINE THREADS			
THREAD	**8.8**	**10.9**	**12.9**
M8x1	27	38	44
M10x1.25	52	72	88
M12x1.25	95	135	165
M12x1.5	90	125	150
M14x1.5	150	205	250
M16x1.5	220	310	380
M18x1.5	320	460	550
M20x1.5	460	670	770
M22x1.5	620	880	1,050
M24x2	800	1,100	1,300
M27x2	1,100	1,600	1,300
M30x2	1,500	2,100	2,500

8.10 - Weights of the material in a pile

MATERIAL	kg/m^3	lbs/ft^3
Aluminium	881	55
Slate	2243	140
Clay	368 - 513	23 - 32
Oat	416	26
Bauxite	1202 - 1922	75 - 120
Concrete	1378 - 1778	86 - 111
Coal	1282	80
Soft coal	368	23
Ash	561 - 833	35 - 52
Coke (in piles - loose)	849 - 1009	53 - 63
Green beans	769	48
Granular phosphate	1442	90
Wheat	769	48
Crushed ice	593	37
Dry gravel	1522	95
Granite	1490 - 1778	93 - 111
Shelled corn	673	42
Animal feed	577	36
Iron ore	2323	145
Copper ore	1666	104
Snow	240 - 801	15 - 50
Shelled peanuts	280	17
Potatoes	769	48
Peas	769	48

MATERIAL	kg/m^3	lbs/ft^3
Sugar beet pulp - wet	561	35
Crushed	769	48
Potash	1089	68
Granular quartz	1762	110
Rice	769	48
Limestone rick (loose - crushed)	1538 - 1602	96 - 100
Foundry sand (dry - wet)	1522 - 1906	95 -119
Sand and gravel (dry - wet)	1730 - 2003	108 -125
Compact mineral salt	2163	135
Schist	1410	88
Crushed slags	1121	70
Rye	705	44
Cotton seeds	401	25
Soy	743	46
Taconite	1741	109
Soil (sand and gravel)	1570	98
Soil - topsoil (dry)	929 - 1089	58 -68
Soil - topsoil (wet)	1602 - 1666	100 -104
Compact peat	753	47
Chippings	288	18
Piles of sulphur	1330	83
Raw sugar	961	60

8.11 - Regular maintenance

The hour meter records the total engine operating hours, and should be used to schedule all the maintenance procedures listed below. Read the hour meter daily.

Refer to the value indicated on the electronic hour meter on the display (if present).

Carry out the assistance interventions respecting the working hours interval or upon expiry of the indicated time limit.

Intervene more frequently if the machine is used in harsh conditions.

Reference	OPERATION DESCRIPTION	Page	DAILY	AFTER 50 HOURS	EVERY 50 HOURS	EVERY 250 HOURS	EVERY 500 HOURS	EVERY 1,000 HOURS	EVERY 2,000 HOURS
1	Check of safety devices	2-42	●						
2	Check of safety signs	2-5	●						
3	Check of guards	8-6	●						
4	Check of engine oil level	8-36	●						
5	Check of cooling liquid level	8-42	●						
6	Check of hydraulic oil level	8-48	●						
7	Check for air filter clogging	8-66	●						
8	Clean radiator	8-47	●						
9	Lubricate pins	8-75	●						
10	Performance check (speed of machine movements)	8-36		**Δ**					
11	Hydraulic system operating pressures check	8-36		**Δ**					
12	Track tension check	8-60		**Δ**	●				
13	Check that the screws of the drive wheel/rollers are tight	8-57		**Δ**		●			
14	Check the tension of the alternator belt and fan belt	8-65		**Δ**		●			
15	Check of cooling liquid sleeves	8-46		**Δ**		●			
16	Replacement of engine oil	8-38		**Δ**		**●1**			

Reference	OPERATION DESCRIPTION	Page	DAILY	AFTER 50 HOURS	EVERY 50 HOURS	EVERY 250 HOURS	EVERY 500 HOURS	EVERY 1,000 HOURS	EVERY 2,000 HOURS
17	Replacement of engine oil filter	8-40		**Δ**		**•1**			
18	Replacement of fuel filter	8-68		**Δ**		**•1**			
19	Replacement of air filter	8-66		**Δ**		**•1**			
20	Replacement of discharge circuit hydraulic oil filter	8-50		**Δ**			**•2**		
21	Replacement of cooling liquid	8-44					**•2**		
22	Drain fuel tank	8-69					**•2**		
23	Replacement of water separator filter	8-70					**•2**		
24	Replacement of translation motor oil	8-73					**•2**		
25	Hydraulic system oil sampling / replacement	8-52						**•2***	
26	Replacement of intake circuit hydraulic oil filter	8-54						**•2**	
27	Replacement of alternator belt and fan belt	8-65						**•3**	
28	Clean filter on fuel suction	8-71							**•2**

To be carried out at the indicated work time interval or at the latest within:

1 = 1 year

2 = 2 years

3 = 3 years

Δ = only the first time

***** = different replacement interval if eco-friendly lubricant is used, see dedicated section

8.11.1 - Performance check

To check the performance (speed of machine movements) and operating pressures of the hydraulic system, contact the *Service Centre*.

8.11.2 - Check of engine oil level

WARNING

Secure the machine as indicated in section *"8.1.1 - Putting the machine out of service for maintenance" to page 8-4****.***

WARNING

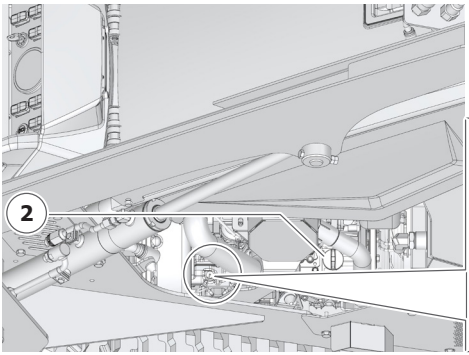
Immediately after using the machine, the temperature of the components and of the hydraulic oil may be high and may cause burns, after stopping, wait until the temperature drops below 40°C before proceeding with maintenance operations.

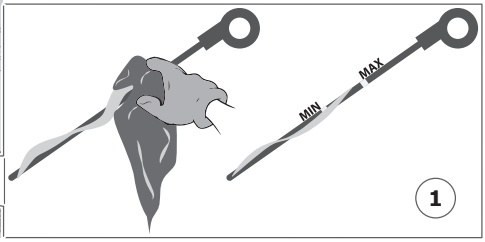
The oil level is checked by means of the marked dipstick (**1**) situated in the engine compartment.

To **check** the oil level:

- open the engine compartment hood;
- pull out the marked dipstick (**1**);
- clean it, by wiping off the oil with a cloth;
- insert it again;

- pull the dipstick out again and check the oil level on the stick; it must be between the minimum (MIN) and maximum (MAX) marks;
- close the engine compartment hood.





If the level is below the MIN mark, add more oil through the top filler (**2**), following the indications in section *"8.7.4 - Engine oil" to page 8-17.*

When adding oil, NEVER exceed the MAX mark.

NOTICE

If the level is above the MAX mark, there may be serious faults. Contact the Service Centre.

8.11.3 - Replacement of engine oil

⚠ WARNING

Secure the machine as indicated in section *"8.1.1 - Putting the machine out of service for maintenance" to page 8-4****.***

⚠ WARNING

Immediately after using the machine, the temperature of the components and of the hydraulic oil may be high and may cause burns, after stopping, wait until the temperature drops below 40°C before proceeding with maintenance operations.

☞ *NOTICE*

The oil change operation should be performed when the oil is luke warm (+25 to +40°), as this improves the drainage of the old oil.

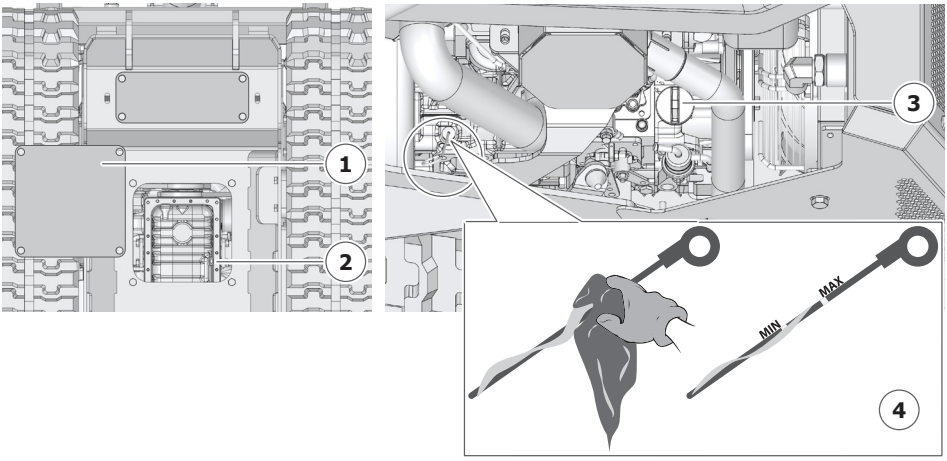
When it is cold, the oil drainage may be compromised or prove to be difficult.

This would cause the mixing of old oil and new oil, resulting in a reduction of the life of the engine.

To **replace** the engine oil:

- unscrew the screws and remove the protective cover (**1**);
- unscrew the engine oil drain plug (**2**) located under the engine and let the oil flow out into a suitable container and dispose of it in compliance with the standards in force;
- open the engine compartment hood;
- unscrew the filler cap (**3**) to help the oil to drain out;
- wait for the oil to flow out completely;
- clean the caps (**2-3**) and the oil dipstick (**4**);
- tighten the drain plug (**2**) and refit the protective cover (**1**);
- add more oil through the inlet (**3**) according to the type and amount indicated in the liquids table;

- check that the level is correct on the dipstick (**4**);
- replace the oil filler cap (**3**);
- start the engine and let it run for a few minutes, then shut it down and check the level again;
- close the engine compartment hood.



NOTICE

Change the oil filter every time you change the engine oil.

The engine oil and the related filter are highly pollutant products; do not discard them into the environment.

8.11.4 - Replacement of engine oil filter

⚠ WARNING

Secure the machine as indicated in section *"8.1.1 - Putting the machine out of service for maintenance" to page 8-4****.***

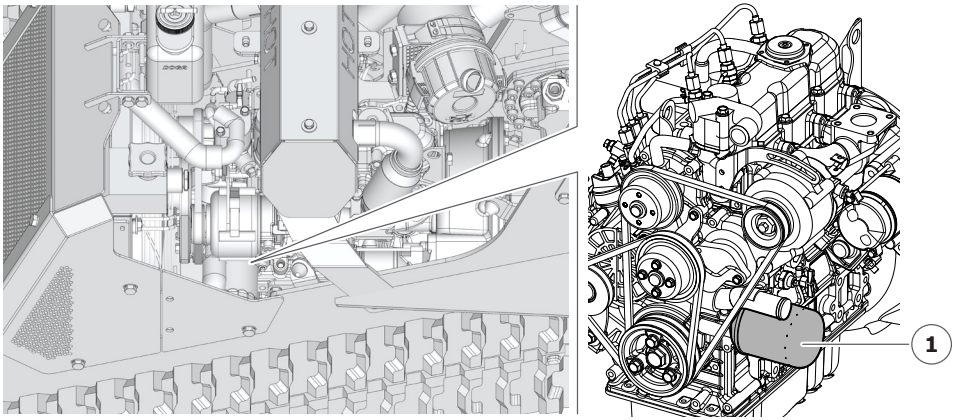
⚠ WARNING

Immediately after using the machine, the temperature of the components and of the hydraulic oil may be high and may cause burns, after stopping, wait until the temperature drops below 40°C before proceeding with maintenance operations.

The engine oil filter (**1**) is located inside the engine compartment.

To **replace** the filter:

- open the engine compartment hood;
- using the appropriate spanner (not supplied), unscrew the used filter and discard it;
- clean the surrounding area and fit a new filter, screwing it on by hand;
- make sure that the engine oil level is correct by means of the dipstick;
- start the engine and let it run for a few minutes, then shut it down and check the level again;
- check for leaks and make sure that the low oil pressure indicator light switches off;
- close the engine compartment hood.



NOTICE

Change the oil filter every time you change the engine oil.

The engine oil and the related filter are highly pollutant products; do not discard them into the environment.

8.11.5 - Check of cooling liquid level

⚠ WARNING

Secure the machine as indicated in section *"8.1.1 - Putting the machine out of service for maintenance" to page 8-4****.***

⚠ WARNING

Do not remove the radiator cap while the liquid is hot as it could spray out and scald the operator. Wait 1 hour after the engine has been stopped to allow the temperature of the liquid to decrease.

Unscrew the cap slowly to discharge the pressure before removing the cap.

The cooling liquid contains antifreeze and is inflammable; do not use naked flames near the liquid and do not smoke when filling.

☞ *NOTICE*

Always comply with the correct antifreeze liquid/distilled water ratio, for further information see section "8.7.5 - Cooling liquid" to page 8-18.

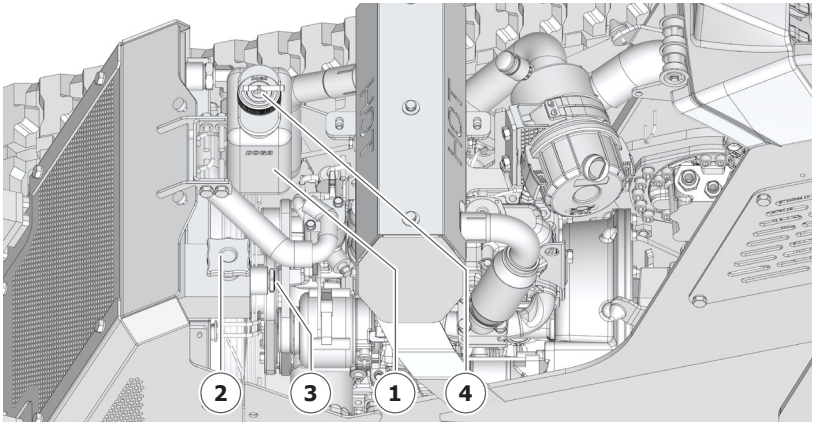
If the cooling liquid level drops constantly and significantly, check the seal of the couplings between the engine and radiator, or the radiator itself, for leaks.

To **check the level** of cooling liquid:

- open the engine compartment hood;
- make sure that the liquid fills the indicator (**1**) completely;
- if the liquid fills the hole (**3**) completely and the liquid level in the tank (**1**) is **above** the MIN mark, the level is correct and the check is complete; otherwise, add more cooling liquid as described below.

To **add cooling liquid**:

- unscrew the radiator cap (**2**);
- add more liquid through the opening according to the type indicated in the liquids table until the radiator is full; check the level through the hole (**3**);
- Unscrew the cap (**4**) of the tank (**1**) and top up to a level above the MIN mark;
- refit the caps (**2-4**);
- close the engine compartment hood.



NOTICE

If the level of the liquid inside the radiator is low and the overflow tank is refilled with cooling liquid, check the seals and for any air leaks in the coupling that connects the radiator and the overflow tank.

If the problem persists, contact your Service Centre.

8.11.6 - Replacement of cooling liquid

⚠ WARNING

Secure the machine as indicated in section *"8.1.1 - Putting the machine out of service for maintenance" to page 8-4****.***

⚠ WARNING

Do not remove the radiator cap while the liquid is hot as it could spray out and scald the operator. Wait 1 hour after the engine has been stopped to allow the temperature of the liquid to decrease.

Unscrew the cap slowly to discharge the pressure before removing the cap.

The cooling liquid contains antifreeze and is inflammable; do not use naked flames near the liquid and do not smoke when filling.

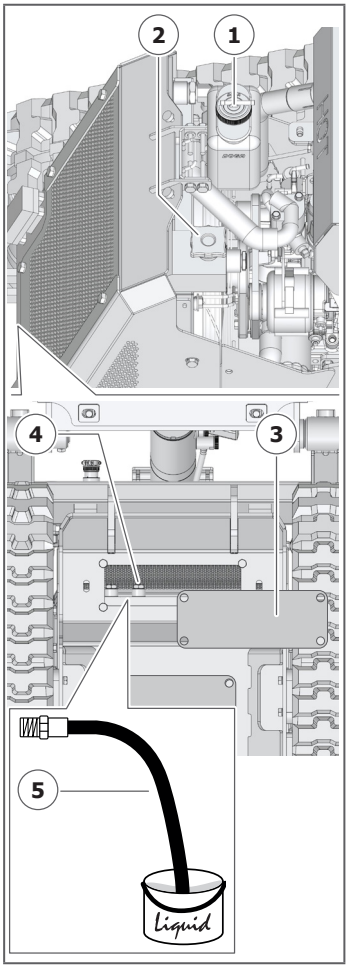
☞ *NOTICE*

Always comply with the correct antifreeze liquid/distilled water ratio, for further information see section "8.7.5 - Cooling liquid" to page 8-18.

To **change** the cooling liquid:

- open the engine compartment hood;
- unscrew the overflow tank plug (**1**), remove it and let the liquid flow into a suitable container, then dispose of it in compliance with the Standards currently in force;
- put the overflow tank back in place;
- remove the radiator cap (**2**);
- remove the guard (**3**) beneath the machine;
- unscrew the protection cap of the quick discharge valve***** (**4**);

- screw the special discharge hose (**5**) supplied with the machine on the valve, making sure that the non-threaded is inside a suitable container; while screwing it on, the valve opens and allows the liquid to flow out;
- wait for all of the liquid to flow out, then dispose of it in compliance with current Standards;
- unscrew the discharge hose and screw on the protection cap of the quick discharge valve* (**4**);
- refit the guard (**3**);
- add more liquid through the opening (**2**) according to the type and amount indicated in the liquids table and screw the plug back in;
- add fresh liquid in the overflow tank (**1**), bringing the level between the MIN and MAX marks and screw the plug back in;
- close the engine compartment hood.
- Run the engine on minimum for **5 minutes** in order to expel any air left inside the circuit then stop the engine;
- open the engine hood and check the level of the liquid and restore it as described in section *"8.11.5 - Check of cooling liquid level" to page 8-42;*
- close the engine hood and run the engine at the maximum speed;
- after **10 minutes**, stop the engine and check the cooling liquid level again.



***** if the **quick discharge valve** (optional) is not present, proceed in the same way by unscrewing the drain plug without using the discharge hose (**5**).

8.11.7 - Check and replacement of cooling liquid sleeves

WARNING

Secure the machine as indicated in section *"8.1.1 - Putting the machine out of service for maintenance" to page 8-4****.***

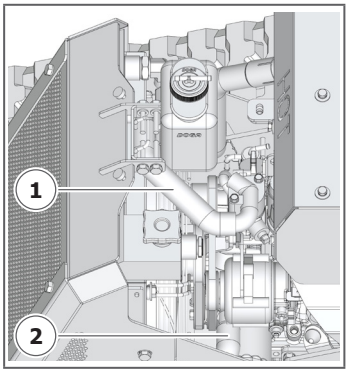
WARNING

Immediately after using the machine, the temperature of the components and of the hydraulic oil may be high and may cause burns, after stopping, wait until the temperature drops below 40°C before proceeding with maintenance operations.

To prevent the cooling liquid from leaking and damaging the engine, it is necessary to periodically check and, if necessary, replace the sleeves that connect the engine to the radiator.

To **check** the sleeves:

- open the engine compartment hood;
- check the upper sleeve (**1**);
- check the lower sleeve (**2**);
- if they are both intact and are not cracked or leak, the check is over;
- close the engine compartment hood.



If **the sleeves are damaged**:

- drain the cooling system as indicated in section *"8.11.6 - Replacement of cooling liquid" to page 8-44;*
- loosen the clamps on the ends of the sleeve;
- remove the damaged sleeve;
- insert a new sleeve;
- reposition the clamps;
- fill the cooling system and check that the cooling liquid level is correct, by completing the procedure described in section *"8.11.6 - Replacement of cooling liquid" to page 8-44*.

8.11.8 - Cleaning the radiator

WARNING

Secure the machine as indicated in section *"8.1.1 - Putting the machine out of service for maintenance" to page 8-4****.***

WARNING

Immediately after using the machine, the temperature of the components and of the hydraulic oil may be high and may cause burns, after stopping, wait until the temperature drops below 40°C before proceeding with maintenance operations.

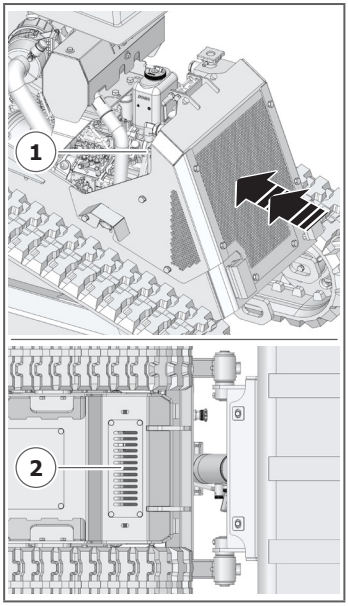
NOTICE

When the machine works in very dusty environments, check radiator clogging more frequently.

In these conditions the cleaning interval should be halved with respect to the indications given in the periodic maintenance table.

To **check** the cleanliness of the radiator:

- open the engine compartment hood;
- check the radiator fins (**1**) on the inner side;
- if clogged, clean them using a brush soaked in a specific detergent;
- then dry using a jet of compressed air (max 10 bar) blowing from the outside towards the inside;
- if the radiator is just dusty it only needs cleaning out with compressed air, blowing a jet of compressed air (max 10 bar) from the outside towards the inside;
- to facilitate the removal of dust, remove the carter (**2**);
- use compressed air (max. 10 bar) to clean the radiator compartment;
- replace the carter and close the engine compartment hood.



NOTICE

Perform this operation every time the radiator, for accidental causes, is dirtied with oil, fuel or other oily or greasy substances, otherwise the radiator may get clogged and its cooling capacity may be reduced, resulting in the overheating of the engine.

8.11.9 - Check of hydraulic oil level

WARNING

Secure the machine as indicated in section *"8.1.1 - Putting the machine out of service for maintenance" to page 8-4****.***

WARNING

Immediately after using the machine, the temperature of the components and of the hydraulic oil may be high and may cause burns, after stopping, wait until the temperature drops below 40°C before proceeding with maintenance operations.

To **check** the oil level:

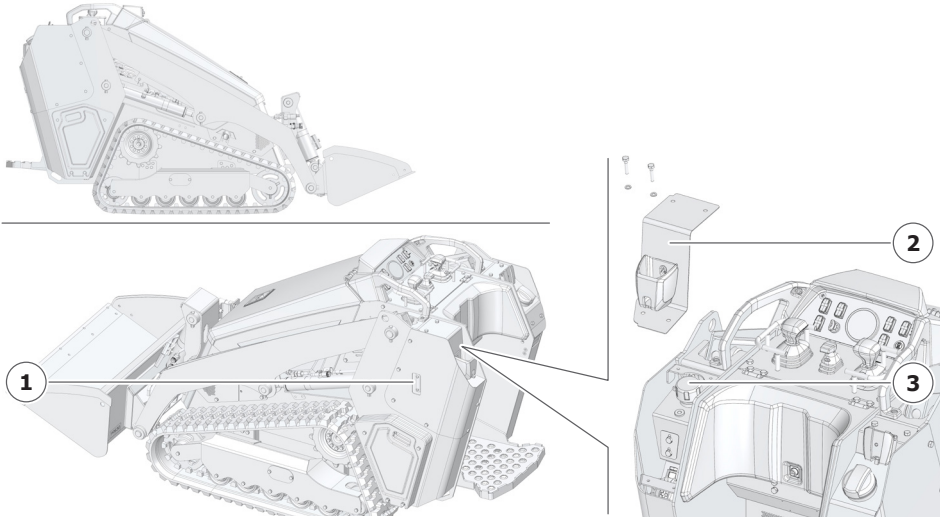
- position the machine as indicated in the following figure;
- wait for the oil to cool (temperature below 30°C);
- check on the indicator (**1**) that the oil level is in the middle;
- if the level is correct, the check is over.

WARNING

Before carrying out any maintenance work on the hydraulic system, the residual pressure must be released as indicated in the specific section.

If the **level is less than half**:

- Remove the guard (**2**) by unscrewing the screws;
- unscrew the hydraulic oil tank cap (**3**);
- add more oil according to the type indicated in the liquids table until the level has been reached;
- Once oil has been added, screw the cap (**3**) back on following the procedure in reverse order;
- refit the guard.



8.11.10 - Change discharge circuit hydraulic oil filter

⚠ WARNING

Secure the machine as indicated in section *"8.1.1 - Putting the machine out of service for maintenance" to page 8-4****.***

⚠ WARNING

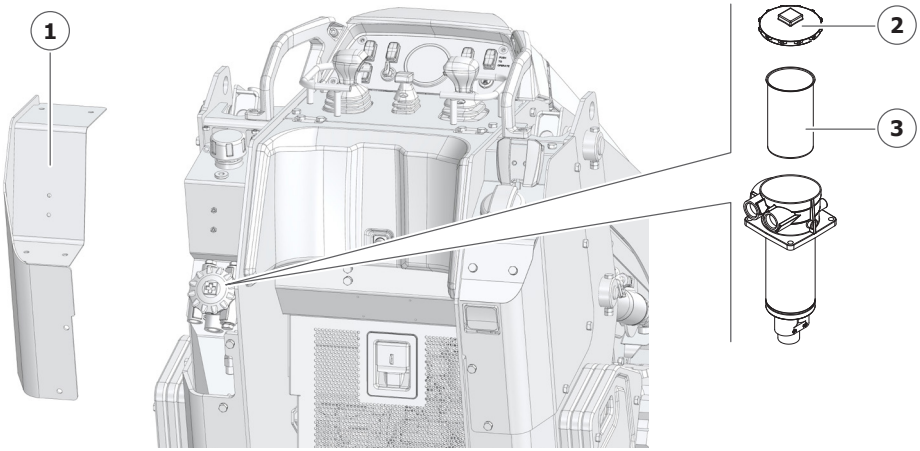
Immediately after using the machine, the temperature of the components and of the hydraulic oil may be high and may cause burns, after stopping, wait until the temperature drops below 40°C before proceeding with maintenance operations.

Before carrying out any maintenance work on the hydraulic system, the residual pressure must be released as indicated in the specific section.

The discharge circuit hydraulic oil filter (**1**) is housed inside the hydraulic oil tank.

To **replace** the filter:

- Remove the guard (**1**) by unscrewing the screws;
- unscrew the filter cover (**2**);
- remove the old cartridge (**3**) and dispose of it in accordance with regulations in force;
- clean the surrounding area and insert the new cartridge;
- screw the filter cover;
- make sure that the hydraulic oil level is correct;
- start the engine and let it run for a few minutes, then stop it and check the level again.
- Check that there are no leaks and that the low oil pressure light turns off on the control panel;
- close the guard (**1**).



Old filters and hydraulic fluid are highly pollutant items; do not discard them into the environment, but put them in sealed containers and deliver them to the specialised waste disposal centres.

8.11.11 - Hydraulic system oil sampling/replacement

WARNING

Secure the machine as indicated in section *"8.1.1 - Putting the machine out of service for maintenance" to page 8-4****.***

WARNING

Immediately after using the machine, the temperature of the components and of the hydraulic oil may be high and may cause burns, after stopping, wait until the temperature drops below 40°C before proceeding with maintenance operations.

Before carrying out any maintenance work on the hydraulic system, the residual pressure must be released as indicated in the specific section.

NOTICE

The hydraulic oil change operation should be performed when the oil is lukewarm (+25 to +40°), as this improves the drainage of the old oil. In lower temperatures, evacuation may be compromised or difficult.

This would cause the mixing of old oil and new oil, resulting in a reduction of the life of the components.

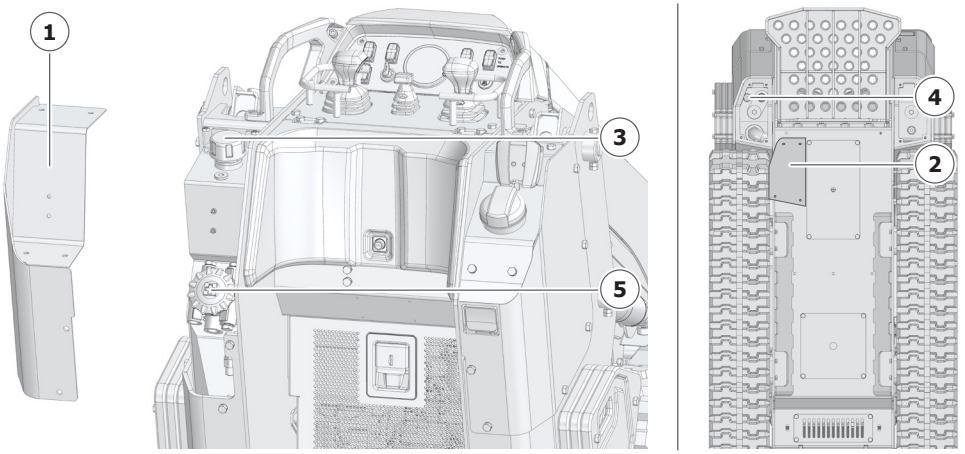
Only use the allowed lubricating oils indicated by CASE in the dedicated table in section "8.7 - Refilling" to page 8-13.

Never start the engine with the tank empty as this will definitely damage the pump.

To take **samples** of the eco-friendly oil:

- start the machine and make movements until the hydraulic oil has reached a temperature of approximately +40°C, then stop the machine;
- Remove the left guard (**1**);
- remove the guard beneath the machine (**2**) on the hydraulic tank side;
- unscrew the hydraulic oil tank filler cap (**3**);
- using a clean syringe, withdraw 500 ml of oil through the cap (**4**), ensuring that aspiration takes place at the middle of the level;
- oil samples taken from different sampling points are NOT allowed;

- if you suspect that the hydraulic oil contains water, take the oil sample with the hydraulic system cold (i.e. after downtime of at least 2 days), proceeding as described above;
- after receiving the results of the analyses (see section *"8.7.6.1 - Requirements for using eco-friendly hydraulic oil" to page 8-22*) replace the oil if necessary.



To **replace** the oil:

- The oil must be at a temperature of 40°C, if it is hotter leave it to cool down or alternatively move the machine until this temperature is reached. Working with the oil at this temperature there will be no risk of being burnt and all the used oil will be drained from the system;
- open the radiator compartment cover;
- Remove the left guard (**1**);
- unscrew the hydraulic oil tank filler cap (**3**);
- remove the drain plug (**4**) and let the oil flow into a suitable container;
- wait for all of the oil to flow out, then dispose of it in compliance with the standards in force;
- replace the discharge circuit hydraulic oil filter (**5**), refer to section *"8.11.10 - Change discharge circuit hydraulic oil filter" to page 8-50*;
- replace the intake circuit hydraulic oil filter, see section *"8.11.12 - Replacement of intake circuit hydraulic oil filter" to page 8-54*.

- clean the drain plug (**4**) as there may be metallic deposits on it and then put it back in place;
- fill up with oil, of the type and quantity indicated in the liquids table, until the level is reached as described in section *"8.11.9 - Check of hydraulic oil level" to page 8-48,* and then screw on the cap (**3**);
- close the left guard (**1**);
- Start the engine and let it idle, then extend the cylinders completely; move each cylinder several times to bleed all the air out of the system.
- Check the level again and top up if necessary.

Old filters and hydraulic fluid are highly pollutant items; do not discard them into the environment, but put them in sealed containers and deliver them to the specialised waste disposal centres.

8.11.12 - Replacement of intake circuit hydraulic oil filter

WARNING

Secure the machine as indicated in section *"8.1.1 - Putting the machine out of service for maintenance" to page 8-4****.***

WARNING

Immediately after using the machine, the temperature of the components and of the hydraulic oil may be high and may cause burns, after stopping, wait until the temperature drops below 40°C before proceeding with maintenance operations.

Before carrying out any maintenance work on the hydraulic system, the residual pressure must be released as indicated in the specific section.

NOTICE

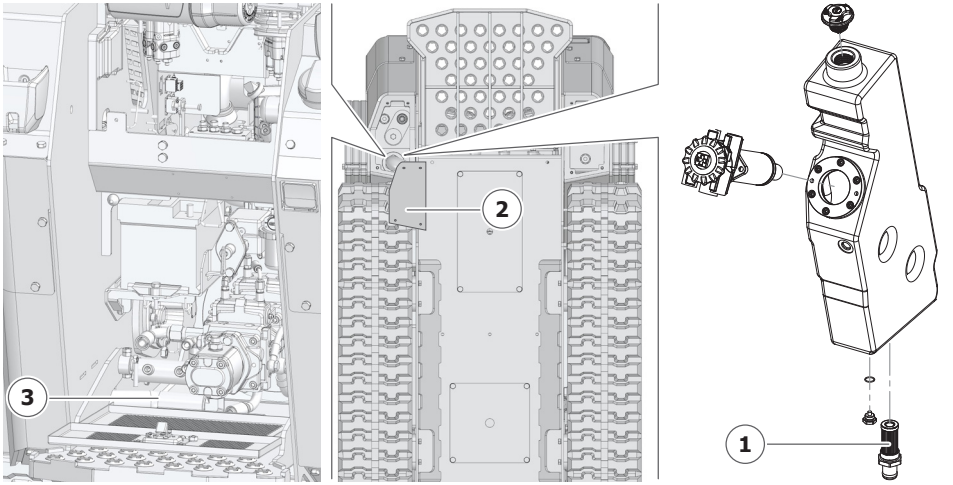
Never start the engine with the tank empty as this will definitely damage the pump.

Only use the allowed lubricating oils indicated by CASE in the dedicated table in section "8.7 - Refilling" to page 8-13.

The intake circuit hydraulic oil filter (**1**) is housed inside the hydraulic oil tank at the bottom.

To **replace** the filter:

- remove the guard beneath the machine (**2**) on the hydraulic tank side;
- drain the hydraulic oil as indicated in section *"8.11.11 - Hydraulic system oil sampling/ replacement" to page 8-52;*
- wait for the liquid to flow out completely;
- disconnect the intake sleeve (**3**);
- unscrew the old filter (**1**) and dispose of it in compliance with the applicable standards;
- clean the surrounding area and fit a new filter;
- connect the intake sleeve (**3**);
- restore the hydraulic oil level;
- Close the protective structure once more;
- start the engine and let it run for a few minutes, then shut it down and check the level again;
- check for leaks.



Old filters and hydraulic fluid are highly pollutant items; do not discard them into the environment, but put them in sealed containers and deliver them to the specialised waste disposal centres.

8.11.13 - Check of hydraulic line condition

WARNING

Secure the machine as indicated in section *"8.1.1 - Putting the machine out of service for maintenance" to page 8-4****.***

WARNING

Before carrying out any maintenance work on the hydraulic system, the residual pressure must be released as indicated in the specific section.

CAUTION

DO NOT run or otherwise operate the machine if any hydraulic hose or fitting is found to be leaking or visibly damaged. Serious injury could result from contact with hydraulic oil expelled under extreme pressure from hoses or fittings.

Before using the machine, inspect the machine from the outside, and inspect all hydraulic system pipes, hoses and fittings for damage or leaks.

In the doubt of a hidden leak, avoid approaching with your hands but use a piece of cardboard to check for the actual presence of the leak.

If a leak or other damage is found DO NOT use the machine, repair the fault before using the machine.

NOTICE

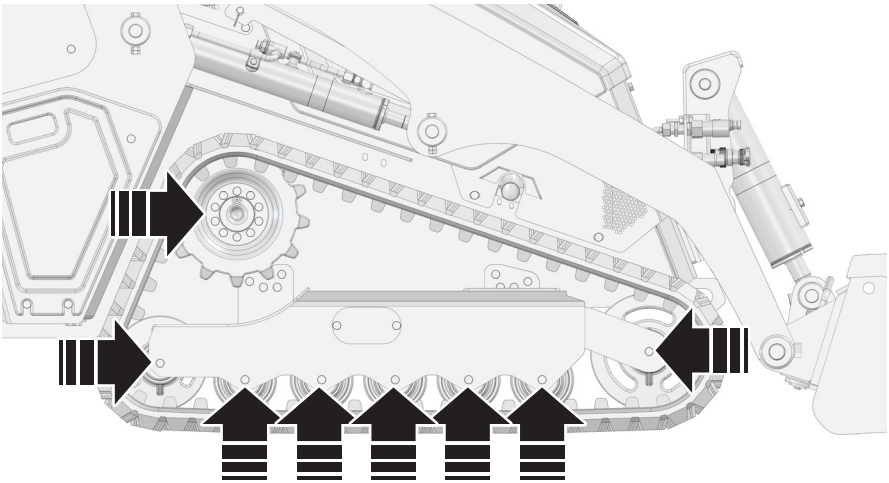
When you disconnect a hydraulic component, label the parts so you do not make mistakes when reconnecting the fittings.

8.11.14 - Check of drive wheel/roller screw tightness

WARNING

Secure the machine as indicated in section *"8.1.1 - Putting the machine out of service for maintenance" to page 8-4****.***

Periodically check for loose bolts on the drive gears, track tensioner and track rollers.



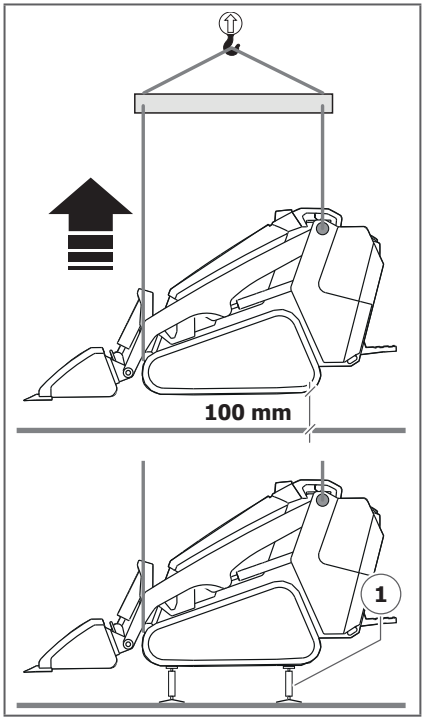
8.11.15 - Track service position

WARNING

Secure the machine as indicated in section *"8.1.1 - Putting the machine out of service for maintenance" to page 8-4****.***

To carry out a number of maintenance procedures on the undercarriage, the tracks must first be raised off the ground, allowing access and creating some space between the ground and the undercarriage. To raise the machine into the track servicing position, proceed as follows:

- lift the machine as described in section *"4.4 - Lifting the machine" to page 4-6;*
- when the tracks are about **100 mm** from the ground, stop the lifting operations.
- block the machine in a safe condition using the dedicated jacks (**1**) located under the frame.
- once all track maintenance operations are complete, repeat in reverse order the steps of the procedure described to lower the machine from the track maintenance position.



WARNING

DO NOT lift the machine over the indicated limit since it could tilt and damage the hydraulic lines and cause serious injuries.

Before starting any maintenance interventions with the machine in the track service position, it must be locked in a safe condition.

The machine must be locked in a safe condition by placing suitable jacks under the frame able to bear the overall weight of the machine. While setting the machine in safety, use caution to avoid crushing hazards.

8.11.16 - Check of track tension

⚠ WARNING

Secure the machine as indicated in section *"8.1.1 - Putting the machine out of service for maintenance" to page 8-4****.***

The machine is equipped with a system that allows the tension of the tracks to be adjusted.

If one or both of the tracks is not properly tensioned the following problems may occur:

- uneven tension between the two tracks will make it difficult for the machine to travel in a straight direction, either forwards or in reverse;
- high tension will result in increased pressure on the idler and drive sprocket bearings, causing vibration and leading to premature failure of the tracks;
- low tension may cause the track to slip off the front idler.

Probable causes of a change in track tension are:

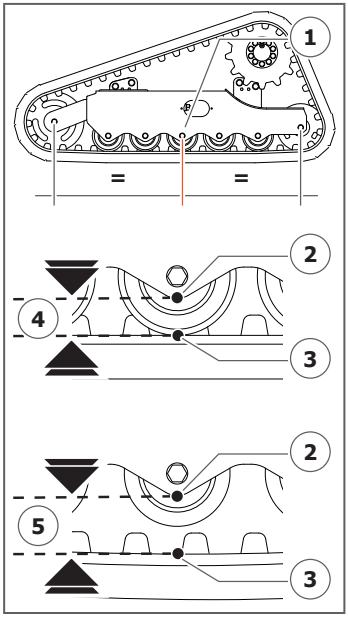
- wear of undercarriage components (tracks, drive wheels, idlers, rollers) caused by normal working operations;
- the type of soil on which the machine is positioned, e.g. muddy or compacted soil;
- accumulation of mud, sand or other material on the surface (inside and outside) of the tracks.

Take the following precautions before checking and adjusting track tension:

- place the machine on flat, firm ground, preferably tarmac or concrete;
- ensure that the tracks and undercarriage components are free from foreign bodies.

Measurement of track tension:

- at the centre of each track frame (**1**), determine a reference point (**2**) then measure the distance between each reference point (**2**) and the top of the corresponding track shoe (**3**);
- bring the machine to the track service position as indicated in the dedicated section;
- Re-measure the distance from the same track frame reference points (**2**) to the corresponding track treads (**3**);
- Subtract the smaller measurement from the larger (**4-5**) for each side;
- the result is the track tension value;
- If the result for each side is within the range of values indicated in the table, then the tensions are correct.



TYPE		min	max
Rubber tracks	mm	10	12

- should the tension of the tracks be wrong, see section *"8.11.17 - Adjusting the track tension" to page 8-62;*
- at this point, it is possible to remove the machine from the track service position.

8.11.17 - Adjusting the track tension

WARNING

Secure the machine as indicated in section *"8.1.1 - Putting the machine out of service for maintenance" to page 8-4****.***

WARNING

DO NOT attempt to make any track tension adjustments until the following procedures have been read and clearly understood.

If any uncertainty remains after having read the material, contact the *Service Centre* ***immediately for additional information.***

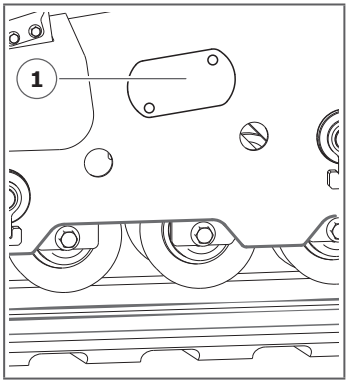
Track tension is adjusted by increasing or reducing the grease loading of a hydraulic cylinder (also known as a track tensioner) that applies a thrust to the idler wheel.

Adding grease increases the thrust and tensions the track, removing it has the opposite effect.

Each track has a dedicated adjustment, adjust one at a time.

The tension is adjusted by means of the tension valve, which is accessed by removing a cover (**1**) located on the outside of the frame of each track.

The valve is equipped with a grease nipple that meets the specifications *given in the table*; a suitable grease pump must be used to increase the tension.



Valve specifications		
Tightening torque	Nm	65
Max. pump pressure	bar	300
Pump coupling type		UNI 7663

WARNING

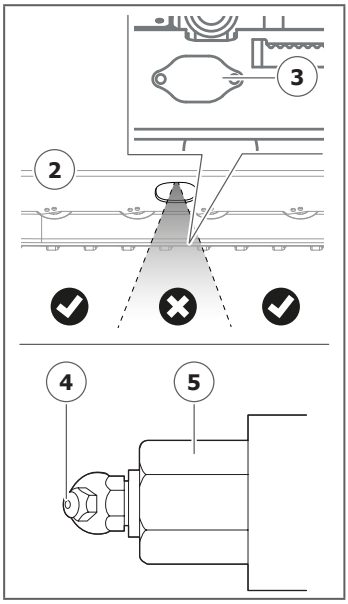
DO NOT remove the grease nipple on the end of the valve, or attempt to turn the valve body by hand.

The grease may be ejected at a very high pressure and penetrate the skin causing serious injuries to the person or the valve body may be projected and hit the operator causing serious injuries or death.

Always operate WHILST STANDING TO THE SIDE of the valve access hole. DO NOT stand with head, hands or body in front of the valve access hole.

To increase track tension

- STAND TO THE SIDE of the valve access cover as shown in figure (**2**);
- remove the cover (**3**) located on the track frame;
- using the grease pump, add a small amount of grease to the grease nipple (**4**) at the end of the valve (**5**);
- proceed until the tension reaches the indicated value then replace the cover;
- carry out the procedure on the other track, if necessary.
- Start the machine and drive straight ahead for at least 20 m;
- stop the machine and check the tension of the tracks.



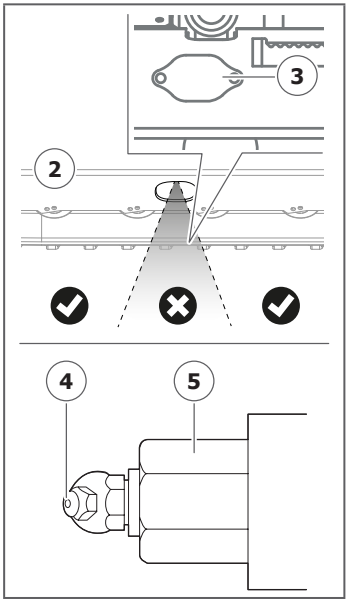
If the tension corresponds to the values indicated, the adjustment is complete.

If the tension is still insufficient, repeat the procedure.

If the tension is too high, follow the procedure described below.

To decrease track tension

- STAND TO THE SIDE of the valve access cover as shown in figure (**2**);
- remove the cover (**3**) located on the track frame;
- using a spanner that allows adequate clearance from the opening, slowly unscrew the valve body (**5**) counter-clockwise by 0.5/1.0 turn to allow the grease to escape;
- When the tension reaches the indicated value, screw the valve in a clockwise direction with the indicated tightening torque, then replace the cover;
- carry out the procedure on the other track, if necessary.
- Start the machine and drive straight ahead for at least 20 m;
- stop the machine and check the tension of the tracks.



If the tension corresponds to the values indicated, the adjustment is complete.

If the tension is still too high, repeat the procedure.

If the tension is insufficient, follow the procedure described above.

8.11.18 - Check of tension and replacement of alternator and fan belts

⚠ WARNING

Secure the machine as indicated in section *"8.1.1 - Putting the machine out of service for maintenance" to page 8-4****.***

To **check** the tension of the belt, press the longer section of the belt with your thumb (between the engine pulley and the alternator pulley).

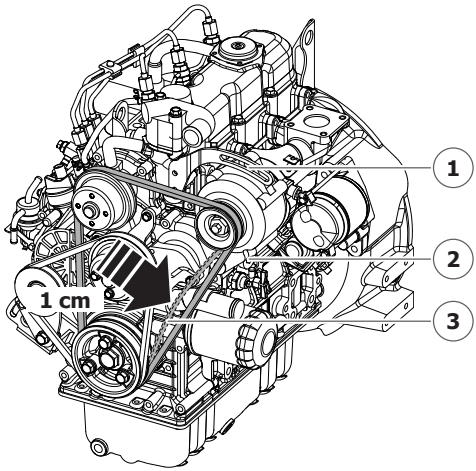
If the belt flexes more than 1 cm, tension it:

- loosen the upper (**1**) and lower (**2**) alternator holding bolts;
- push the alternator outwards until the belt is correctly tensioned, then tighten the fixing bolts;
- check again the belt (**3**) tension.

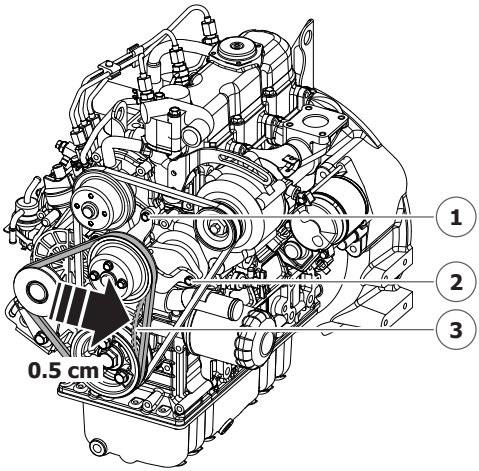
To **replace** the belt:

- loosen the upper (**1**) and lower (**2**) alternator holding bolts;
- push the alternator outwards loosening the belt;
- remove the oil belt and dispose it of according to current Standards;
- position the new belt and proceed to tighten it as indicated previously.

Alternator belt



Fan belt



8.11.19 - Check and replacement of air filter

WARNING

Secure the machine as indicated in section *"8.1.1 - Putting the machine out of service for maintenance" to page 8-4****.***

WARNING

Immediately after using the machine, the temperature of the components and of the hydraulic oil may be high and may cause burns, after stopping, wait until the temperature drops below 40°C before proceeding with maintenance operations.

NOTICE

Only open the air filter housing for scheduled maintenance or when required because the air filter indicator light is lit.

Excessive opening to check or clean an element increases the possibility of premature element failure, allowing dirt to enter and damage the engine.

Do not run the engine with the intake filter opened or not properly assembled.

All air cleaner manufacturers agree that attempting to clean or wash an element increases the chances of damaging that element. It is highly recommended that you consider the value of cleaning an element against the risks of the operation, which could result in engine damage. Adopt the policy that all elements should be replaced with new ones rather than cleaning them.

Careful cleaning or washing, if carried out correctly, can extend the life of an element. However, you must realize that each time an element is cleaned the dirt holding capacity is reduced and the risk of dirt reaching the clean side of the filter is increased. Filters should never be washed more than six times, or kept in service for more than one year, whichever comes first.

NOTICE

When the machine works in very dusty environments, check filter clogging more frequently.

In these conditions the replacement interval should be halved with respect to the indications given in the periodic maintenance table.

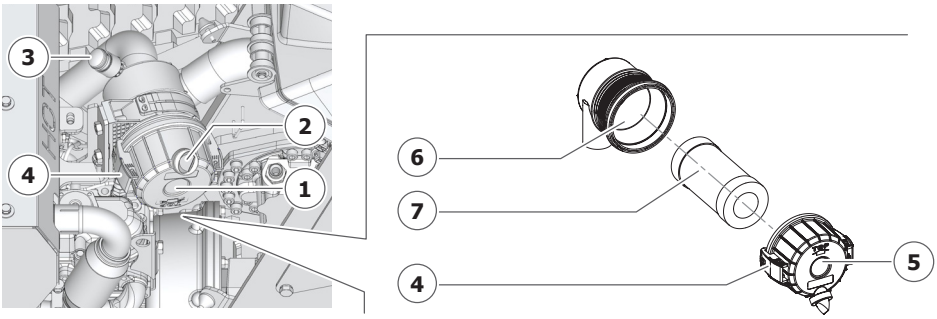
The air filter (**1**) is housed inside the engine compartment.

To **check** the status of the air filter:

- remove dust from the breather valve (**2**) by squeezing both sides, opening the valve and allowing loose particles to fall out;
- a blockage indicator is mounted on the air filter (**3**). When the indicator is red, it means that the filter cartridge is blocked and needs to be either cleaned or replaced. To return the indicator to its normal operating position press down the button located on the indicator itself.

To **clean** the inner air filter cartridge:

- open the engine compartment hood;
- Open the lid (**5**) retaining clips (**4**) and remove it from the fixed side (**6**);
- remove the filter cartridge (**7**), by pulling it horizontally;
- check the cartridge for any breakage or cuts. Do not clean or reuse damaged elements but replace them with new parts;
- Clean the cartridges with a jet of clean, dry compressed air, blowing from the inside out;
- Always clean the inner surface of the fixed part (**6**). Any dust deposits could prevent airtight sealing and cause leakage. Make sure all impurities are removed before fitting the new or cleaned element;
- Fit the new elements with the open side facing inwards. To achieve an airtight seal, apply pressure to the outside edge rather than to the centre;
- put the filter lid (**5**) in place and fix with the clips (**4**);
- close the engine compartment hood.



8.11.20 - Replacement of fuel filter

WARNING

Change the fuel filter with the engine cold.

If you spill fuel during this operation, clean up the spill to avoid any risk of fire.

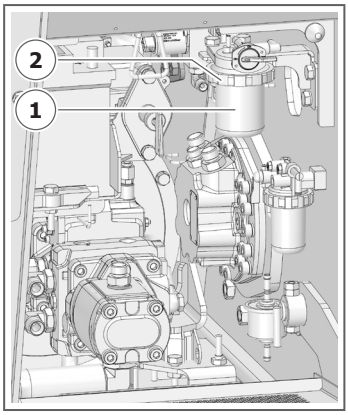
WARNING

Secure the machine as indicated in section *"8.1.1 - Putting the machine out of service for maintenance" to page 8-4****.***

The fuel filter (**1**) is housed in the lower compartment in front of the driver's seat.

To **replace** the filter:

- open the lower compartment cover;
- close the tap located on the filter itself;
- unscrew the ferrule (**2**) to remove the cup where the old filter is housed, then dispose of it according to current Standards;
- clean the surrounding area and insert the new filter;
- Reposition the cup and tighten the ferrule (**2**);
- bleed out the air as indicated in section *"8.11.24 - Bleeding air from the fuel circuit" to page 8-72*;



- close the lower compartment cover;
- start the engine and let it run for a few minutes and make sure there are no leaks.

8.11.21 - Draining the fuel tank

WARNING

Secure the machine as indicated in section *"8.1.1 - Putting the machine out of service for maintenance" to page 8-4****.***

WARNING

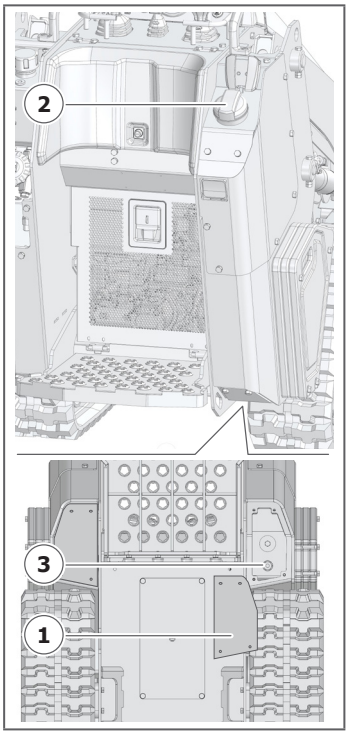
Immediately after using the machine, the temperature of the components and of the hydraulic oil may be high and may cause burns, after stopping, wait until the temperature drops below 40°C before proceeding with maintenance operations.

If you spill fuel during this operation, clean up the spill to avoid the risk of fire.

To remove the impurities and the condensate which may deposit on the bottom of the fuel tank, it must be drained periodically.

To **drain it**:

- remove the guard beneath the machine (**1**) on the fuel tank side;
- unscrew the fuel filler cap (**2**);
- unscrew the drain plug (**3**) and allow the oil to drain out into a suitable container; dispose of in accordance with current standards;
- wait for the fuel to flow out completely;
- clean the cap (**3**) and screw it back on;
- fill up with fuel;
- replace the cap on the fuel filler spout (**2**);
- vent the air as indicated in section *"8.11.24 - Bleeding air from the fuel circuit" to page 8-72*;
- check for leaks;
- close the guard beneath the machine (**1**).



8.11.22 - Draining water from the fuel circuit

WARNING

Secure the machine as indicated in section *"8.1.1 - Putting the machine out of service for maintenance" to page 8-4****.***

WARNING

Immediately after using the machine, the temperature of the components and of the hydraulic oil may be high and may cause burns, after stopping, wait until the temperature drops below 40°C before proceeding with maintenance operations.

If you spill fuel during this operation, clean up the spill to avoid the risk of fire.

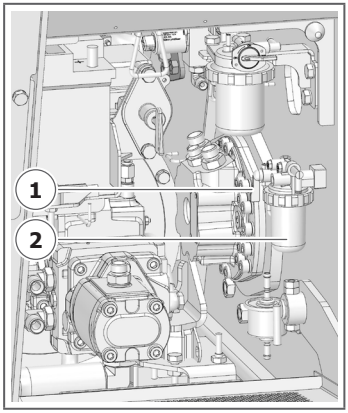
The water separator filter is housed in the lower compartment in front of the driver's seat.

A separator filter collects any condensation formed in the diesel tank so as to prevent it from being pumped to the engine together with the fuel.

Inside the separator filter there is a **red float** that rises and becomes clearly visible in the presence of water, in this case proceed with discharge.

In this case, **drain the water**:

- open the lower compartment cover;
- close the tap (**1**) located on the separator;
- unscrew the cup (**2**), pour out the liquid it contains and clean thoroughly;
- if necessary, remove the old filter element and dispose of it according to the Standards in force and replace it with a new one;
- screw the cup back in and tighten it firmly;
- open the tap (**1**);



- bleed out the air as indicated in the dedicated section;
- close the lower compartment cover;
- start the engine and let it run for a few minutes and make sure there are no leaks.

8.11.23 - Cleaning the filter on the fuel intake

WARNING

Secure the machine as indicated in section *"8.1.1 - Putting the machine out of service for maintenance" to page 8-4****.***

WARNING

Immediately after using the machine, the temperature of the components and of the hydraulic oil may be high and may cause burns, after stopping, wait until the temperature drops below 40°C before proceeding with maintenance operations.

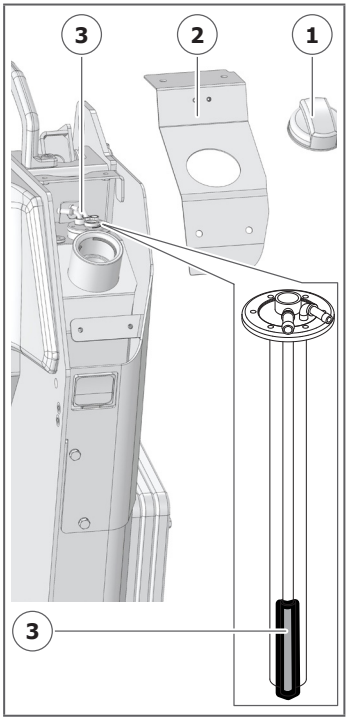
If you spill fuel during this operation, clean up the spill to avoid the risk of fire.

Fuel intake is carried out via the level indicator mark (**1**) which is housed on the inside of the fuel compartment.

On the intake there is a wire mesh filter on which impurities may accumulate. These must be removed periodically.

To **clean** the fuel intake filter:

- Remove the fuel tank cap (**1**);
- remove the right guard (**2**);
- disconnect the pipes and the electrical connection on the fuel level indicator (**3**);
- unscrew the screws and remove the fuel level indicator (**3**);
- remove all impurities from the filter using a brush soaked in fuel;
- refit the fuel level indicator;
- reconnect the pipes taking care to place them as they were originally and restore the electrical connection;
- bleed out the air as indicated in the dedicated section;
- close the right guard and screw the fuel tank cap back on;
- start the engine and let it run for a few minutes and make sure there are no leaks.



8.11.24 - Bleeding air from the fuel circuit

⚠ WARNING

Secure the machine as indicated in section *"8.1.1 - Putting the machine out of service for maintenance" to page 8-4****.***

⚠ WARNING

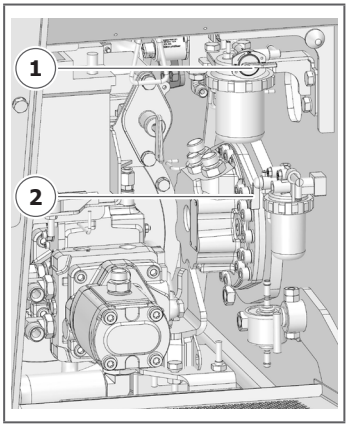
Immediately after using the machine, the temperature of the components and of the hydraulic oil may be high and may cause burns, after stopping, wait until the temperature drops below 40°C before proceeding with maintenance operations.

If you spill fuel during this operation, clean up the spill to avoid the risk of fire.

While performing maintenance on the fuel system, some air may enter the circuit causing machine malfunctions. After performing this type of maintenance, always bleed the air.

To **bleed** the air:

- fill the fuel tank completely;
- open the lower compartment cover;
- open the fuel filter tap (**1**);
- open the water separator tap (**2**);
- close the lower compartment cover;
- turn the starting equipment switch onto IGNITION: in this way the electric pump of the fuel system is activated and automatically bleeds the air;
- wait **1 minute** and try to start the engine;
- if the engine does not start, wait another minute with the key on IGNITION and try again.



If the engine does not start, repeat the procedure from the beginning; if necessary contact the *Service Centre*.

8.11.25 - Level control and replacement of geared motors translation oil

WARNING

Secure the machine as indicated in section *"8.1.1 - Putting the machine out of service for maintenance" to page 8-4****.***

WARNING

Remember that the side travel gear motors and their oil can become extremely hot while working and so it is essential when carrying out this operation with the machine still hot to protect all parts of the body with adequate clothing, goggles and safety equipment, because there is the risk of burns and personal injury.

Undo the screw caps slowly to inspect the level of oil in the gear motors.

This is so that the pressure built up inside the gear motors can be let out gradually.

When the oil is replaced, never stand in front of the caps so as not to be hit by jets of pressurised oil.

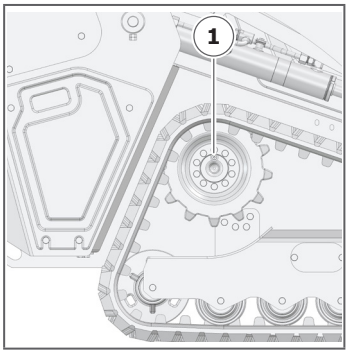
Aligning the plugs for filler and level plugs on the side gear motors, described below, should be carried out with an assistant on the ground. The assistant must however remain strictly outside the working range of the machine.

Never inspect or carry out maintenance on the travel engine circuits while on a slope.

They are highly pressurised due to the machine weight.

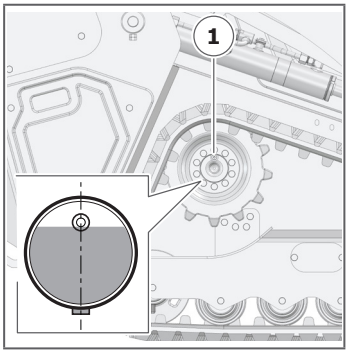
Park the machine on a firm, level surface. The side gear motor must be orientated so that the plug (**1**) is positioned at the highest point, as indicated in then figure.

This position is essential for correct maintenance to be carried out.



To **check** the level:

- position the gear motor as indicated above;
- lower the equipment to the ground;
- stop the engine and remove the ignition key;
- slowly undo the screwplug (**1**), to allow the pressure in the gear motor to be gradually released. Once the pressure has been released, remove the plug completely (**1**) from its seat;

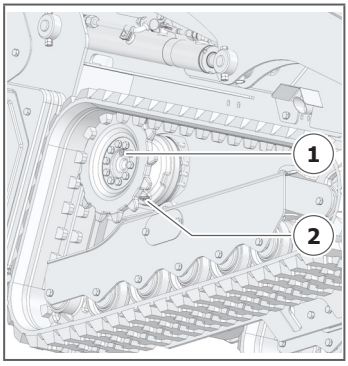


- if the oil level is not up to the hole, top up with the type of oil indicated until it flows out of the hole. Oil spilling out the hole means the correct level has been reached;
- fit back the plug (**1**).

The operations described above must be carried out on both side travel gear motors.

To **replace** the oil:

- Position the gear motor as shown in the figure;
- lower the equipment to the ground;
- stop the engine and remove the ignition key;
- slowly undo the screwplug (**1**), to allow the pressure in the gear motor to be gradually released. Once the pressure has been released, remove the plug completely (**1**) from its seat;



- unscrew the drain plug (**2**) and let the oil flow out into a suitable container and dispose of it in compliance with the standards in force;
- wait for the oil to flow out completely;
- screw in the plug (**2**);
- follow the instructions of the oil level check procedures, to restore the level.

The operations described above must be carried out on both side travel gear motors.

8.12 - Lubrication of pins

WARNING

Secure the machine as indicated in section *"8.1.1 - Putting the machine out of service for maintenance" to page 8-4****.***

NOTICE

Only use the allowed lubricating greases indicated by CASE in the dedicated table in section "8.7 - Refilling" to page 8-13.

Couplings between certain parts of the machine must be lubricated using grease, inserted via special accessories called grease nipples (in accordance with UNI 7663).

Clean the grease nipples before attaching the grease gun.

Clean off any excess worn grease after lubrication.

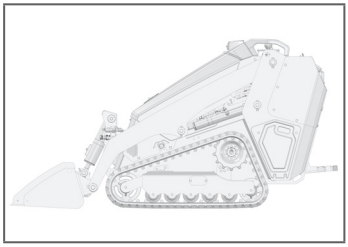
If you use the machine under critical operating conditions, carry out this maintenance task more frequently.

As a general rule it is well to remember that each cylinder has two grease nipples located on the connecting hitch and that each pin that acts as a pivot for movement has at least one grease nipple.

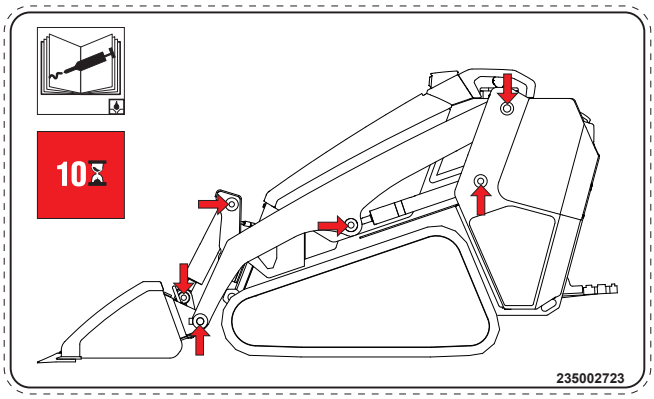
After carrying out operations with the boom immersed in water or after cleaning the machine with water, always lubricate pins that have been in contact with water.

To **lubricate** the machine:

- position the machine as shown in the figure;
- lower the equipment to the ground and turn off the engine;
- Grease nipples are located at the points indicated by the grease nipple label on the machine and shown below.



POSITION OF LUBRICATION POINTS



8.13 - Long inactivity periods

If **long periods of inactivity** (over **6 months**) are expected, the machine should be parked indoors in order to keep it in good condition, taking the following precautions:

- park the machine on a flat, solid surface (e.g. concrete floor);
- inspect the machine. Repair any damaged or worn parts. Replace with new parts where necessary;
- carry out a complete and thorough cleaning;
- place the machine in a dry, covered location. If it cannot be placed in a covered area, select flat, compact ground and protect it with a waterproof sheet arranged to allow ventilation. Otherwise condensation could form, which is harmful to the machine;
- the ambient temperature of the machine's place of storage must comply with the instructions given in this manual;
- fill the fuel tank completely so as to prevent the formation of condensation;
- remove the battery and make sure that it is charged, then place it in a sheltered, dry place; recharge it periodically;
- drain the cooling liquid from the radiator. Drainage is not essential if the system is filled with an anti-freeze mixture;
- place a warning on the controls indicating that there is no cooling liquid (only if it has been drained);

- loosen the fan belt from the alternator and the fan;
- preferably retract all cylinders. Otherwise, cover any exposed parts of the cylinder rods in grease;
- grease the hydraulic cylinder rods and all the equipment joints;
- lubricate all greasing points;
- dismantle the injectors and inject engine oil through the injector openings (the operation must be carried out using a syringe after having moved the piston to bottom dead centre). After having injected the engine oil and using the starter motor, force the thermal motor to run for a bit in order to distribute a protective layer of oil on the linings, then refit the injectors. It is advisable to allow an authorised workshop to carry out this operation;
- cover the open end of the exhaust pipe;
- paint all vulnerable parts to prevent any rust formation.

To restore the machine operation follow the procedure below:

- remove any grease from the hydraulic cylinder rod;
- adjust the tension of the fan and alternator belts;
- fill the radiator with cooling liquid;
- Fill the tank with fuel;
- check all fluid levels (lubricants and hydraulic systems);
- make sure that the battery is charged, then install it;
- replace the fuel filter and bleed the air from the fuel system;
- carry out all the periodic maintenance indicated in the special table, see section *"8.11 - Regular maintenance" to page 8-34*;
- when a vehicle stands idle for an extended period, the humidity in the air could get into the oil. Ensure that there is no water in the oil before and after starting the engine. If any water is found in the oil, replace the oil;
- take the cover off the end of the exhaust pipe, start the engine and let it idle for about 20 minutes without applying any loads;
- before moving the machine, check that the instruments, indicator lights and work lights are working properly;
- check the condition of all hoses and connections;
- carry out complete cycles of all the hydraulic functions several times.

8.14 - Long-term storage

If you decide to permanently decommission the machine, dispose of it in accordance with the laws in force in the country of use.

⚠ WARNING

The disposal of the machine must be undertaken exclusively by suitably trained and qualified personnel authorised to carry out this operation.

Commence with the dismantling of hydraulic components only once these, as well as the hydraulic oils and lubricants, are completely cool and after any residual pressure has been vented.

Prior to commencing any dismantling operations, drain all the components supplied with the machine, tanks and systems, of all fluids in accordance with the GENERAL SAFETY STANDARDS.

Below is a non-exhaustive list of the pollutants and components in the machine:

- fluids (hydraulic system, cooling system, etc.);
- gases (air-conditioning system and battery, where fitted);
- acid (batteries);
- plastic material (tracks, coverings, etc.).

Break down the machine into homogeneous parts, do not disperse the polluting products in the environment, but deliver them to the appropriate collection centres where they will be disposed of according to the laws in force.

9 - ELECTRICAL COMPONENTS

⚠ WARNING

Before working on the electrical system, make sure that the machine is stopped and wear suitable PPE.

Before carrying out any work on the electrical system, carefully read all the instructions given in section *"8.5 - Electrical system" to page 8-12**.***

9.1 - Fuses and relays

⚠ WARNING

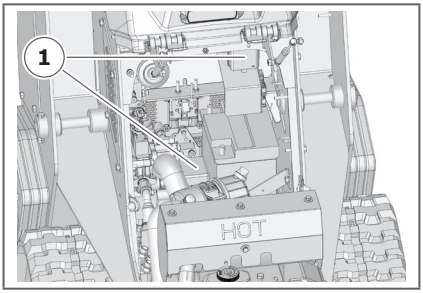
Secure the machine as indicated in section *"8.1.1 - Putting the machine out of service for maintenance" to page 8-4**.***

The fuses protect the electrical components and wiring against damage. The relays are used to activate the high power circuits.

If a fuse or a relay appear to be rusty, or are loose in their holders, fit new ones immediately.

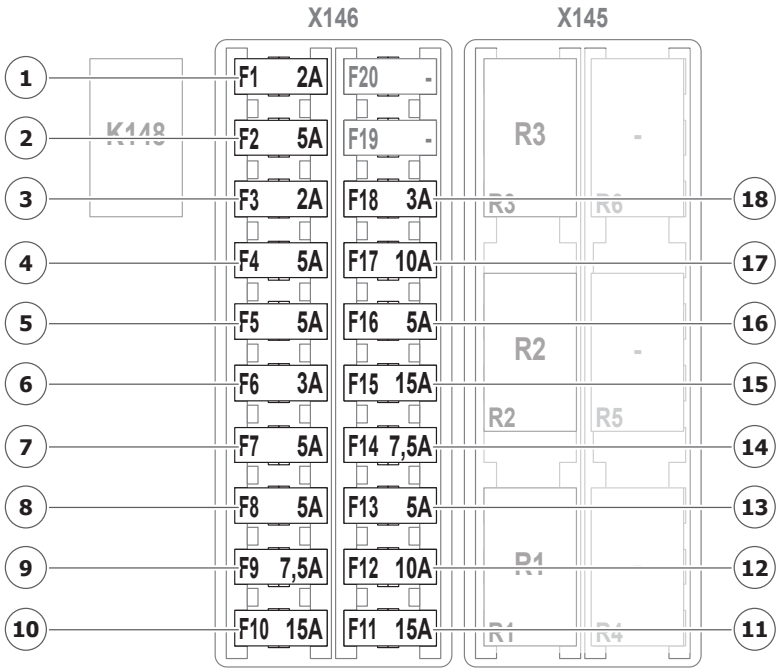
Always replace a fuse with another of the same capacity.

Fuses and relays are located inside the engine compartment (**1**).



9.1.1 - Control box fuses

To access the fuses, open the engine hood, remove the fuse box and relay guard.

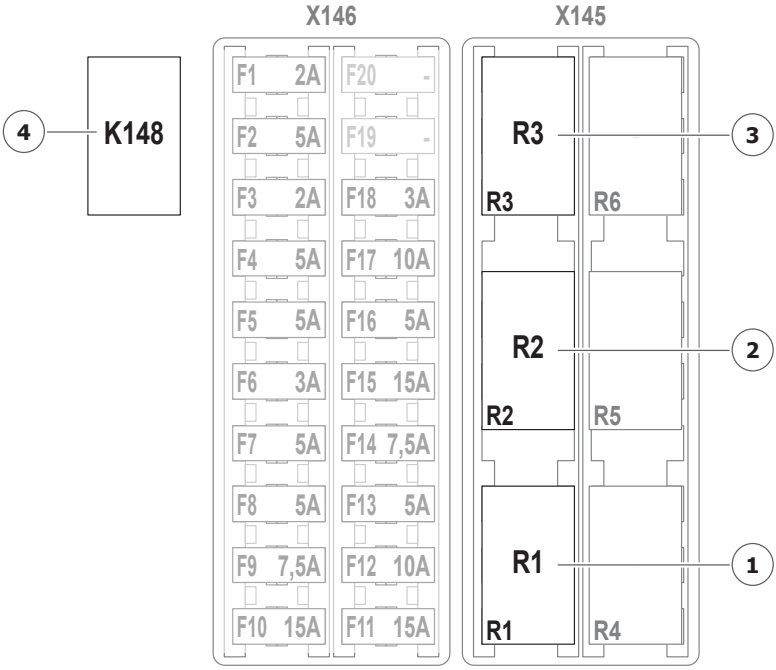


List of fuses

1	**F1**	2A	S.50 panel start.
2	**F2**	5A	Bougie timer
3	**F3**	2A	Alternator
4	**F4**	5A	Electrostop / fuel pump
5	**F5**	5A	Immobilizer / general sv.
6	**F6**	3A	Immobilizer
7	**F7**	5A	Display
8	**F8**	5A	Satellite
9	**F9**	7.5A	Horn
10	**F10**	15A	+30 starter panel
11	**F11**	15A	Sv. AUX boom
12	**F12**	10A	12V socket
13	**F13**	5A	VE cobo
14	**F14**	7.5A	Lights / backlight
15	**F15**	15A	VP IO-EXT
16	**F16**	5A	Horn button
17	**F17**	10A	Boom socket
18	**F18**	3A	Backlight

9.1.2 - Control unit relays

To access the fuses, open the engine hood, remove the fuse box and relay guard.

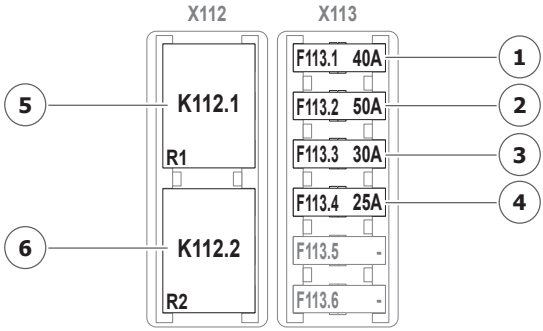


List of relays

1	**R1**	Clacson
2	**R2**	Satellite
3	**R3**	Overturned machine shut-down
4	**K148**	Services

9.1.3 - Engine fuses and relays

To access the fuses, open the engine hood, remove the fuse box and relay guard.



List of engine fuses

1	**F113.1**	40A	Starting equipment
2	**F113.2**	50A	Service relay
3	**F113.3**	30A	Bougies
4	**F113.4**	25A	General

List of engine relays

5	**K112.1**	Starting equipment
6	**K112.2**	Bougie pre-heating

9.2 - Work lights replacement

WARNING

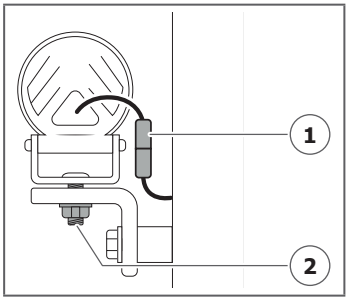
Secure the machine as indicated in section *"8.1.1 - Putting the machine out of service for maintenance" to page 8-4****.***

The work lights are of the LED type; in the event of a fault, the entire light must be replaced.

Before replacing the working light, check that all the fuses and relays are in good working order.

To **replace** the working light:

- position the machine on a flat, level surface;
- place the equipment and dozer blade on the ground;
- stop the machine;
- if the work light is not accessible from the ground, use a suitable ladder according to the standard;
- disconnect the electrical connector (**1**);
- unscrew the mounting screw/s (**2**);
- remove the damaged light;
- to fit the new working light, follow the procedure described in reverse order.



9.3 - LED strip replacement

WARNING

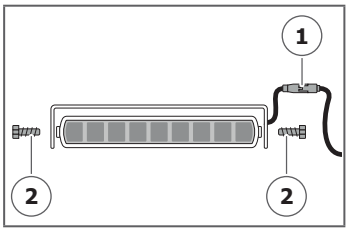
Secure the machine as indicated in section *"8.1.1 - Putting the machine out of service for maintenance" to page 8-4****.***

The light strips are of the LED type; in the event of a fault, the entire strip must be replaced.

Before replacing the strip, check that all the fuses and relays are in good working order.

To **replace** the strip:

- position the machine on a flat, level surface;
- place the equipment and dozer blade on the ground;
- stop the machine;
- if the strip is not accessible from the ground, use a suitable ladder according to the standard;
- remove any covers to access the LED strip;
- disconnect the electrical connector (**1**);
- unscrew the mounting screw/s (**2**);
- remove the damaged strip;
- to fit the new strip, follow the procedure described in reverse order.



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Dealer's stamp

The manufacturer and its authorized representative reserves the right to make improvements in design and changes in specifications at any time without notice and without incurring any obligation to install them on units previously sold. Specifications, descriptions, and illustrative material herein are as accurate as known at the time of publication, but are subject to change without notice.

Availability of some models and equipment builds varies according to the country in which the equipment is being used. For exact information about any particular product, please consult your Case dealer.

CASE CONSTRUCTION