

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

# **CX25D**

## Mini Excavator

# OPERATOR'S MANUAL

**Part Number 91899226**  
1st edition English  
January 2023



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**COMMISSIONING**

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Fill-in before commissioning of the equipment:

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**Machine model:** .....

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

**Engine Serial No.:** .....

**Year of construction:** .....

**Commissioned on:** .....

**Dealer:**



|                                                               |            |
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# 1 - INTRODUCTION

## 1.1 - Regarding this manual

This booklet is a manual containing the use and maintenance instructions for the operator, relating to a **tracked hydraulic**:

- model **CX25D**.

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.

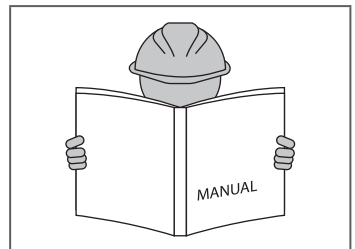
Failure to read and comply with the instructions preceded by a safety-related warning symbol can cause death or serious injury.



***This is the warning symbol. It is used in this manual to warn the user of a potential risk of personal injuries. Comply with all the safety warnings 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.**

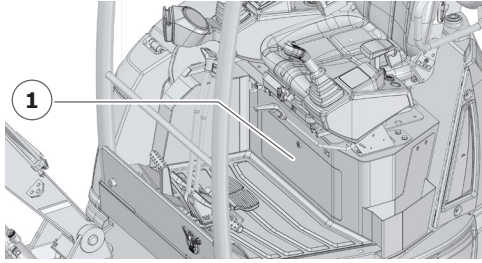


It must be kept safely in the appropriate lockable housing (1) and referred to carefully as it contains important directions for operator safety, proper working operation and correct maintenance.

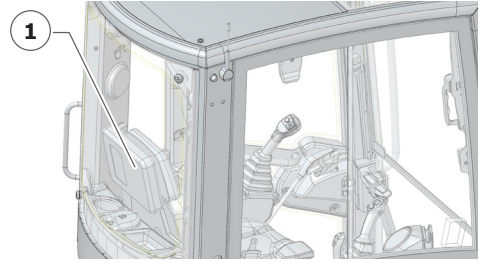
The machine must be used only as expressly indicated. Any other use is to be considered inappropriate and therefore hazardous.

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### CANOPY VERSION



### CAB VERSION



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 10000 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.*

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

### Copyright

*The indications and the illustrations in this manual must not be reproduced, published or used for competitive purposes. With explicit reservation of all rights envisioned by the copyright law.*

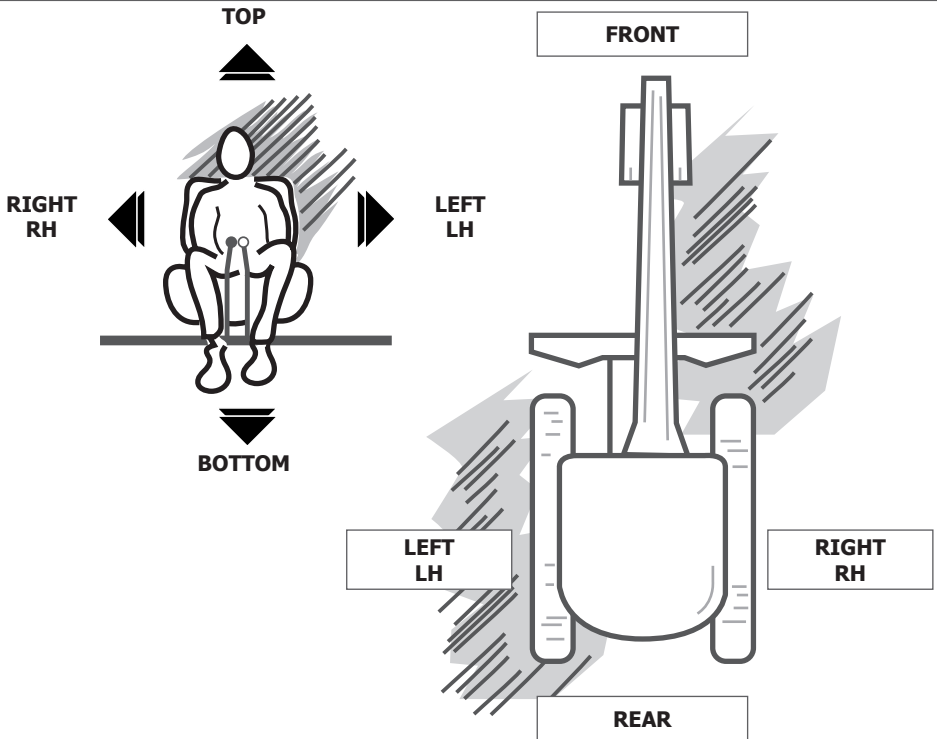
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### 1.1.1 - Manual consultation and terminology

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

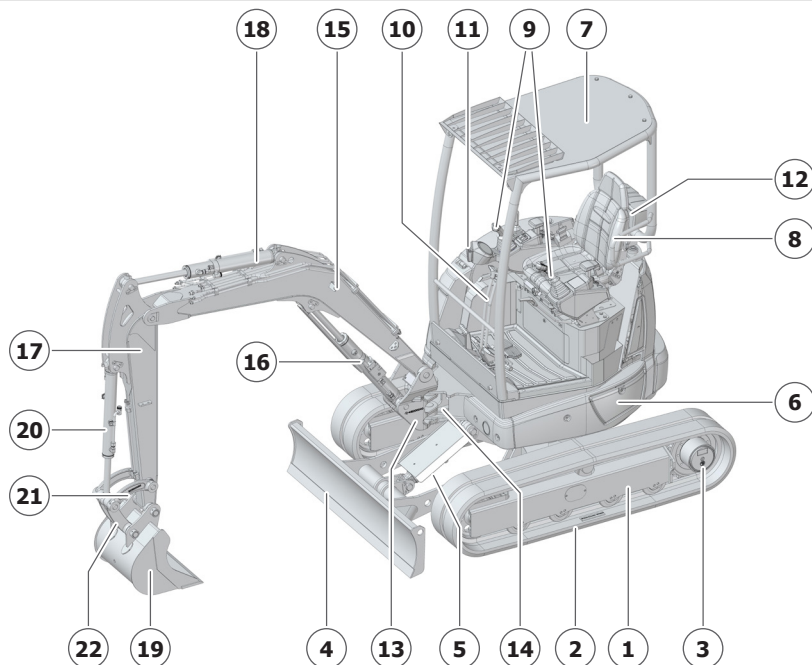
- **"left"** abbreviated as **"lh"** refers to the left side of the operator when sitting in the driver's position;
- **"right"** abbreviated as **"rh"** refers to the right side of the operator when sitting in the driver's position;
- **"top"** or **"above"** always refers to the part of the machine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



## INTRODUCTION

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.

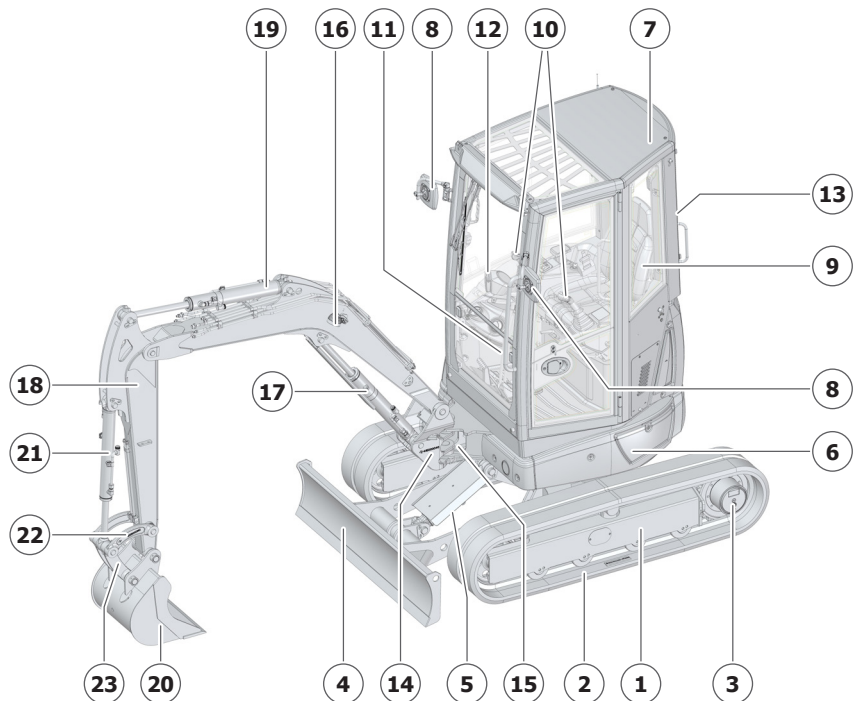
### CANOPY VERSION



#### Key:

|    |                      |    |                      |
|----|----------------------|----|----------------------|
| 1  | Undercarriage        | 12 | Storage compartments |
| 2  | Tracks               | 13 | Boom Swing Tower     |
| 3  | Translation Motor    | 14 | Boom Swing Cylinder  |
| 4  | Dozer Blade          | 15 | First Boom           |
| 5  | Dozer Blade Cylinder | 16 | Lifting Cylinder     |
| 6  | Turning Frame        | 17 | Second Boom          |
| 7  | Canopy               | 18 | Digging Arm Cylinder |
| 8  | Operator Seat        | 19 | Bucket               |
| 9  | Joysticks            | 20 | Bucket Cylinder      |
| 10 | Travel levers        | 21 | Bucket Articulations |
| 11 | Mobile phone holder  | 22 | Connecting Rod       |

## CAB VERSION



### Key:

|           |                      |           |                      |
|-----------|----------------------|-----------|----------------------|
| <b>1</b>  | Undercarriage        | <b>13</b> | Bottle holder        |
| <b>2</b>  | Tracks               | <b>14</b> | Boom Swing Tower     |
| <b>3</b>  | Translation Motor    | <b>15</b> | Boom Swing Cylinder  |
| <b>4</b>  | Dozer Blade          | <b>16</b> | First Boom           |
| <b>5</b>  | Dozer Blade Cylinder | <b>17</b> | Lifting Cylinder     |
| <b>6</b>  | Turning Frame        | <b>18</b> | Second Boom          |
| <b>7</b>  | Cab                  | <b>19</b> | Digging Arm Cylinder |
| <b>8</b>  | Rear-view mirrors    | <b>20</b> | Bucket               |
| <b>9</b>  | Operator Seat        | <b>21</b> | Bucket Cylinder      |
| <b>10</b> | Joysticks            | <b>22</b> | Bucket Articulations |
| <b>11</b> | Travel levers        | <b>23</b> | Connecting Rod       |
| <b>12</b> | Mobile phone holder  |           |                      |



### **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.*

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## 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 CE-UKCA PLATE

|                                                                                                                                                                        |                      |                                                                                                                       |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|-----------------------------------------------------------------------------------------------------------------------|
| <b>CASE</b><br>CONSTRUCTION                                                                                                                                            |                      | <div style="font-size: 2em;">CE</div> <div style="font-size: 1.5em;">UK</div> <div style="font-size: 1.5em;">CA</div> |
| Designation/Model<br><b>Hydraulic Excavator</b>                                                                                                                        |                      |                                                                                                                       |
| Product Identification Number (PIN)<br>★                                                                                                                               |                      |                                                                                                                       |
| Year of Construction                                                                                                                                                   | Model Year           |                                                                                                                       |
| Nominal engine power<br>kW                                                                                                                                             | Operating mass<br>kg |                                                                                                                       |
| <b>MADE IN ITALY</b><br>by Sampierana s.p.a.<br>Via Leonardo da Vinci, 40, San Piero In Bagno (FC), 47021 - ITALY<br><div style="text-align: right;">Part Number</div> |                      |                                                                                                                       |

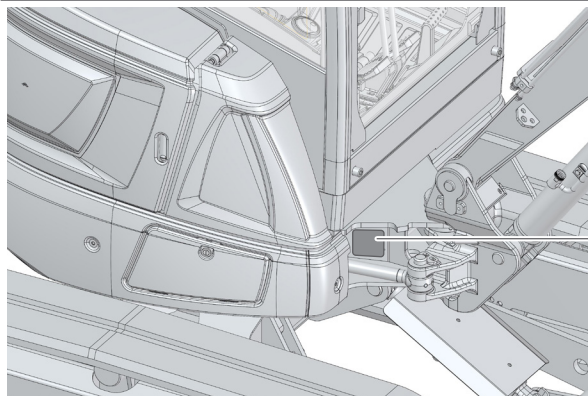
Numbered callouts: 1 points to the bottom of the plate; 2 points to the UKCA marking; 3 points to the CE marking; 4 points to the PIN; 5 points to the operating mass; 6 points to the year of construction; 7 points to the nominal engine power; 8 points to the designation/model.

### Key:

- |   |                                                                                      |
|---|--------------------------------------------------------------------------------------|
| 1 | Business name or manufacturer's full address                                         |
| 2 | CE / UKCA Marking                                                                    |
| 3 | Model year                                                                           |
| 4 | Serial number/machine identification number<br>(product identification number - PIN) |
| 5 | Weight of the most usual configuration (expressed in kg)                             |
| 6 | Year of manufacture                                                                  |
| 7 | Engine nominal power (expressed in kW)                                               |
| 8 | Machine designation                                                                  |

## POSITION OF THE MACHINE CE PLATE

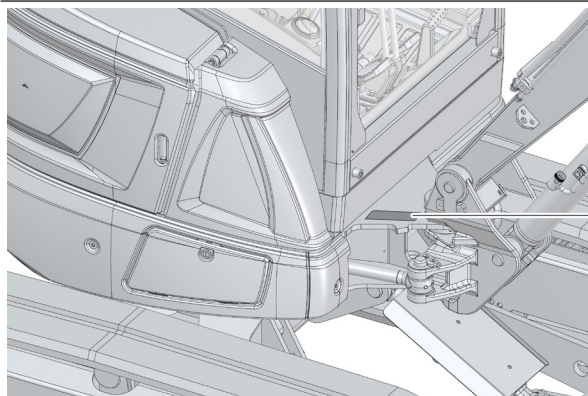
---



**Machine ID plate**

## POSITION OF MACHINE PUNCHING PINS

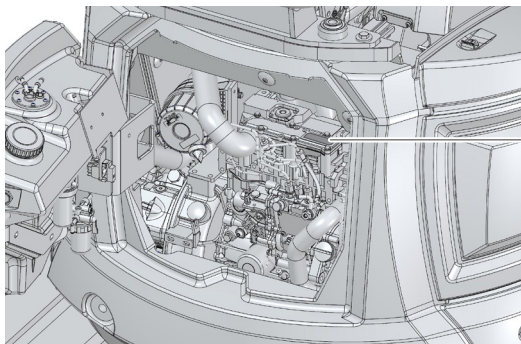
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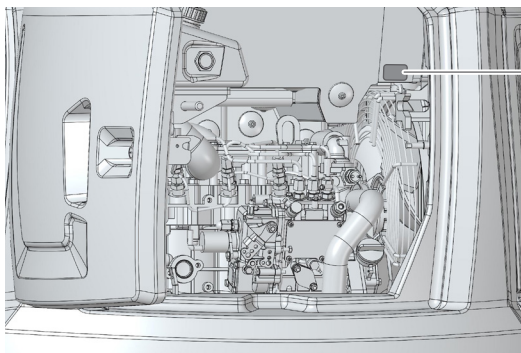
**Machine PIN**

## POSITION OF THE ENGINE PLATE

---



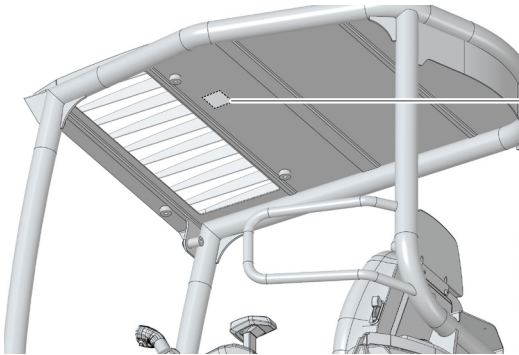
**Engine ID  
plate**



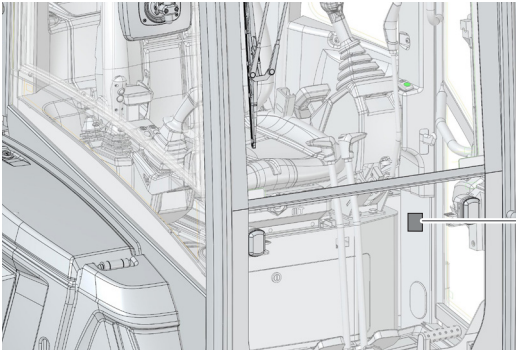
**Supplementary engine  
identification plate**

## POSITION OF THE PROTECTIVE STRUCTURE PLATE

---



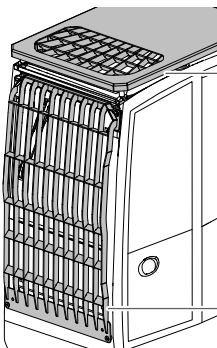
**Protective structure  
ID plate  
(canopy)**



**Protective structure  
ID plate  
(cab)**

## POSITION OF THE OPTIONAL PROTECTIVE GRIDS

---



**TOP-GUARD protective grid  
identification plate**

**FRONT-GUARD  
protective grid  
identification plate**



### 1.3 - Manufacturer

The **tracked hydraulic excavator** is produced exclusively by:

---

#### **SAMPIERANA s.p.a.**

Via Leonardo da Vinci, 40

47021 S. Piero in Bagno (FC)

<http://www.sampierana.com>

---

**EUROCOMACH is a brand owned by SAMPIERANA S.p.A.**

#### **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:

- movement, collection, transport and unloading of earth, rocks or other materials;
- loading of said materials onto lorries, conveyor belts or other means of transport.

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 1-14 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 transport flammable or otherwise hazardous materials.

DO NOT use the machine to lift or transport people.

NEVER use the machine for load handling operations if it is not equipped with the specific load handling equipment (available as an optional accessory).

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 - CE Declaration of Conformity

The CE declaration of conformity is a document signed by the manufacturer that ensures and declares that the machine complies with all standards in terms of safety.

This document must always be kept on board the machine and must accompany the machine until its complete decommissioning.

The declaration states all the data of identification of the machine, or the manufacturer and all the relevant standards.

Below is a FACSIMILE of a CE declaration:

|                                                                                                                                                                                                                        |                                                                     |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------|
| <br>SAMPIERANA S.p.A.                                                                                                                 |                                                                     |
| <b><u>"EC" DECLARATION OF CONFORMITY</u></b>                                                                                                                                                                           |                                                                     |
| The undersigned declare that the machine described below has been designed and manufactured in compliance with the following European Directives, as amended, and the regulations transposing them into national laws: |                                                                     |
| 1. 2006/42/EC "Safety of machinery"                                                                                                                                                                                    |                                                                     |
| 1.1 European Harmonised standards under which conformity is declared:                                                                                                                                                  | EN 474-1:2006+A6:2019;<br>EN 474-5:2006+A3:2013                     |
| 1.2 Main safety components installed and supplied with the machine                                                                                                                                                     |                                                                     |
| 1.2.1 Falling Object Protective Structure (F.O.P.S.)                                                                                                                                                                   | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No |
| 1.2.2 Object handling application kit (EN 474-5 §5.6.4; EN 474-1 Annex E)                                                                                                                                              | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No |
| 1.2.3 Roll Over Protective Structure (R.O.P.S.)                                                                                                                                                                        | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No |
| 1.2.4 Cab front guard                                                                                                                                                                                                  | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No |
| 1.2.7 ###                                                                                                                                                                                                              |                                                                     |
| 1.4 Name and address of the person authorised to compile the technical file:<br>Sampierana S.p.A. - Via Leonardo da Vinci 40 - 47021 S. Piero in Bagno (FC), Italy                                                     |                                                                     |
| 2. 2000/14/EC "Noise emission"                                                                                                                                                                                         |                                                                     |
| 2.1 Conformity assessment procedure followed:                                                                                                                                                                          | Annex VI (art. 6/2)                                                 |
| 2.2 Name and address of the Notified Body involved:                                                                                                                                                                    | ECO Certificazioni S.p.A. (0714)                                    |
| 2.3 Measured sound power level LWA (ref. 1 pW):                                                                                                                                                                        | dB(A)                                                               |
| 2.4 Guaranteed sound power level LWA (ref. 1 pW):                                                                                                                                                                      | dB(A)                                                               |
| 2.5 Engine power (as defined by ISO 14396):                                                                                                                                                                            | kW                                                                  |
| 2.6 Holder of the technical documentation: Sampierana S.p.A. - Engineering Department<br>Via Leonardo da Vinci 40 - 47021 S. Piero in Bagno (FC), Italy                                                                |                                                                     |
| 3. 2014/30/EU "Electromagnetic compatibility"                                                                                                                                                                          |                                                                     |
| 3.1 European Harmonised standards under which conformity is declared:                                                                                                                                                  | EN ISO 13766-1:2018                                                 |
| 4. Other applicable Directive/s: ###                                                                                                                                                                                   |                                                                     |
| 5. Manufacturer: Sampierana S.p.A.<br>Via Leonardo da Vinci 40<br>47021 S. Piero in Bagno (FC), Italy                                                                                                                  | 6. Category: Hydraulic excavator                                    |
| 7. Type: -                                                                                                                                                                                                             | 8. Serial n°: -                                                     |
| <div style="border: 1px solid black; width: 100px; height: 20px; margin: 0 auto;"></div>                                                                                                                               |                                                                     |
| San Piero in Bagno, Italia 01/06/2022                                                                                                                                                                                  | Signature<br>(Name and Function)                                    |

## Specifically for UKCA



SAMPIERANA S.p.A.  
Via Leonardo da Vinci, 40 - 47021 San Piero in Bagno (FC) - Italia

**"UKCA" DECLARATION OF CONFORMITY**

The undersigned declares that the machine described below has been designed and manufactured in compliance with the following Regulations, as amended:

**1. 2008 n.1597 "Supply of Machinery"**

1.1 UK designated standards under which conformity is declared: **BS EN 474-1:2006+A6:2019**  
**BS EN 474-5:2006+A3:2013**

**1.2 Main safety components installed and supplied with the machine:**

1.2.1 Falling Object Protective Structure (FOPS)

1.2.2 Object handling application kit

1.2.3 Roll Over Protective Structure (ROPS)

1.2.4 Cab front guard

1.2.7 # # #

Yes No

☐ ☒

☐ ☒

☒ ☐

☐ ☒

☐ ☒

**1.3 Name and address of the person authorized to compile the technical file:**

Sampierana S.p.A. - Via Leonardo da Vinci, 40 - 47021 San Piero in Bagno (FC), Italy

**2. 2001 n.1701 "Noise Emission in the Environment for Use Outdoor"**

2.1 Conformity assessment procedure followed: **SCHEDULE 9, procedure 1 (SI)**

**2.2 Name and address of the Approved Body involved:**

NB 8500 - AnP Certification Ltd - 2 Parkfield Street, Rusholme, Manchester, M14 4PN

2.3 Measured sound power level LWA (ref. 1 pW):

dB(A)

2.4 Guaranteed sound power level LWA (ref. 1 pW):

dB(A)

2.5 Engine power (as defined by BS ISO 14396):

kW

2.6 Holder of the technical documentation: Sampierana S.p.A. - Via Leonardo da Vinci, 40  
47021 San Piero in Bagno (FC), Italy

**3. 2016 n.1091 "Electromagnetic Compatibility Regulation"**

3.1 UK designated standards under which conformity is declared: **BS EN ISO 13766-1:2018**

**4. Manufacturer: SAMPIERANA S.p.A.**

**5. Category: Hydraulic excavator**

**6. Type: -**

**7. Serial n°: -**

San Piero in Bagno, Italia, 00/00/0000

Signature  
(Name and Function)



## 2 - SAFETY

### 2.1 - Safety symbol

---



***This is the warning symbol. It is used in this manual to warn the user of a potential risk of personal injuries. Comply with all the safety warnings 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 **tracked hydraulic excavator**.

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.
- Always fasten the seat belt before starting the machine.
- Learn the position and use of the pedals, command levers, instruments and LED 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.
- Always face the machine when climbing onto or off of it and use the steps and handles or cab uprights. 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.
- Always check the slipperiness of the foot boards, steps and handles when climbing onto or off 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 - Consulting the safety signs in the manual

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.***

---

## SAFETY

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.



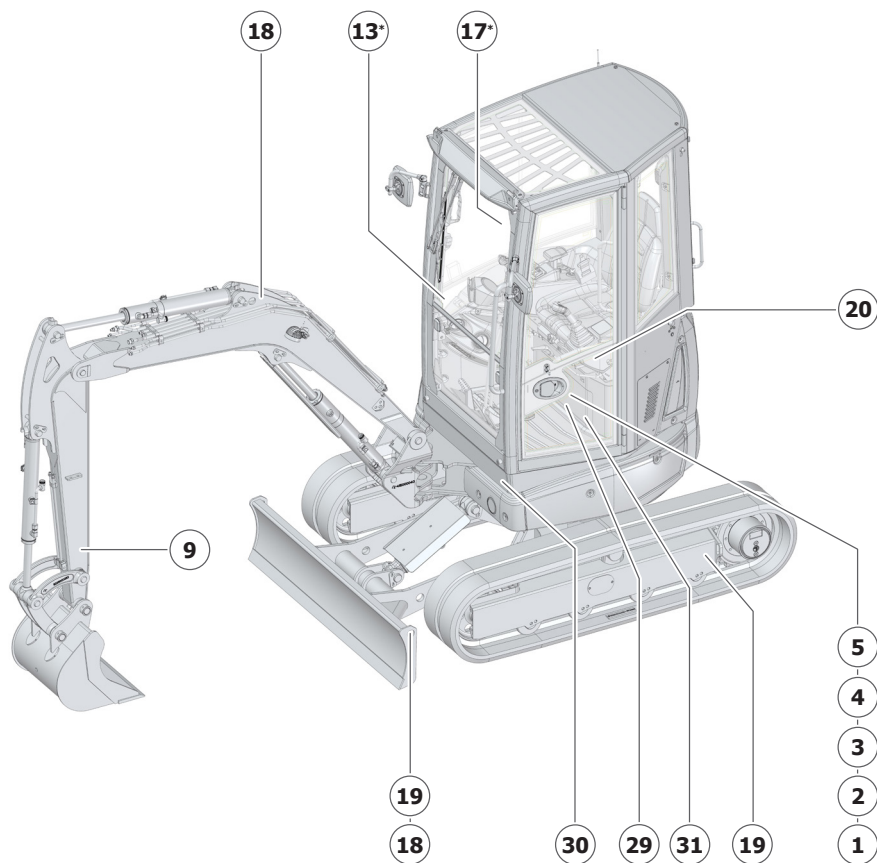
## DANGER

***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.
- 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.

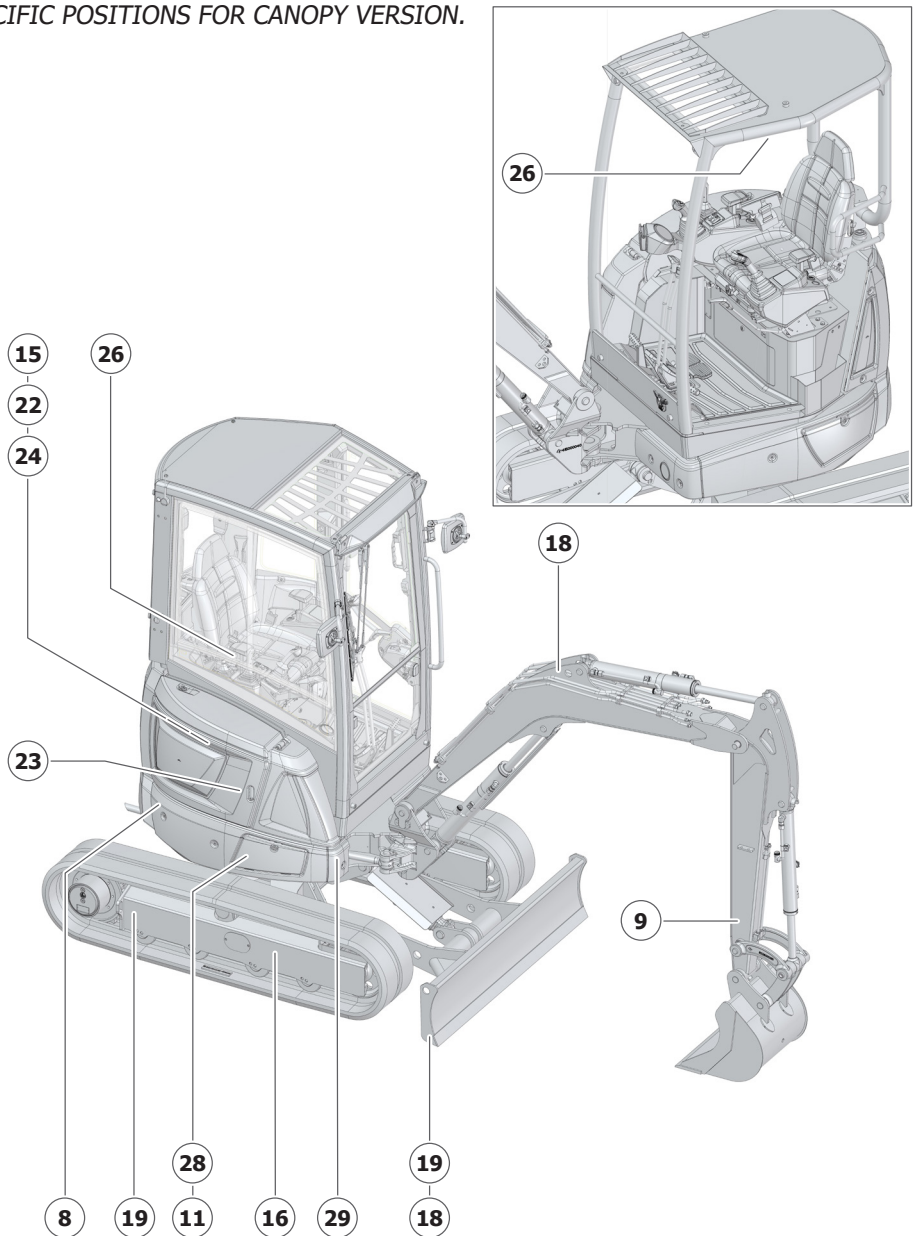
Below is a series of images indicating the positioning of the safety signs and operation related labels.



**\*SIGNS ONLY AVAILABLE  
FOR CAB VERSION.**

**SAFETY SIGNS AND OPERATION RELATED LABELS**

*SPECIFIC POSITIONS FOR CANOPY VERSION.*







**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 tip-over or roll-over**

Always fasten the seat belt when on-board the machine.

In the event of tip-over or roll-over, do not leave the driver's position but grip the seat tightly.

**3 Risk of fatal injury caused by contact or being too close to electric cables**

Keep the safety distances indicated by the power cables.

**4 Risk of damage caused by involuntary movement of the machine**

Prior to leaving the driver's seat:

- lower the machine boom;
- lock the controls using the controls cut-out lever;
- shut down the machine and remove the key.

**5 Risk of damage caused by the impact of the equipment against the cab**

Use caution when using the boom swing: read and understand the use and maintenance manual.

**6 Risk of burns caused by hot surfaces**

Do not touch hot surfaces.

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

**7 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.



**8 Risk of fatal injury caused by the slewing or by the reversed motion**

Stay at a safe distance from the machine to prevent all risk of injury.

**9 Risk of damage caused by the machine booms or by the equipment installed**

Stay at a safe distance from the boom and the equipment installed to prevent all risk of injury.

**10 Crushing risk during maintenance**

Always engage the safety catch before starting any maintenance operations, with the canopy or cab in the raised position, in order to prevent all risk of crushing.

**11 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.

**12 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.



**13 Risk of damage caused by the fall of the openable windshield**

Always lock the windshield, both in open and closed position.

**14 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.

**15 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.

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

Read and understand the use and maintenance manual.

**17 Safety exit (cab version only)**

Indicates the emergency exit in case of machine tip-over, roll-over or other obstructions of the main exit (see "EMERGENCY EXIT" to page 2-36).



**Operational labels key:****18 Lifting point**

Indicates the points to be used to lift the machine.

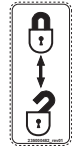
**19 Anchorage point**

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

**20 Lock - Unlock**

The closed padlock indicates the locked position.

The open padlock indicates the unlocked position.

**21 Fuel tank cap**

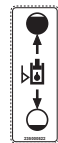
Indicates the position of the cap for topping-up the fuel.

**22 Hydraulic oil tank cap**

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

**23 Hydraulic oil MIN-MAX level**

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

**24 Cooling liquid**

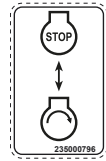
Indicates the overflow tank with the cooling liquid inside.

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

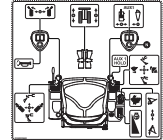


**25 Engine Stopping**

Indicates the function of the engine shut down switch to be used during maintenance operations.

**26 Controls**

Indicates the position and functioning of the machine controls.

**27 AUX 1 plant single/double acting switch**

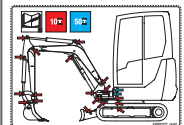
Indicates how to modify the functioning of the AUX 1 hydraulic plant.

**28 Battery cut-off**

Indicates the position of the battery cut-off.

**29 Lubrication points**

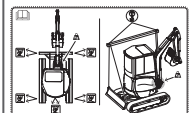
Indicates the points where lubrication must be performed.  
Indicates lubrication intervals.

**30 Sound emission**

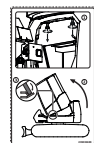
Indicates the value in decibels Lwa of the sound emitted by the machine (read the value on the label located on the machine or in the section "3.16 - Sound emission" to page 3-21).

**31 Lifting and anchorage for transport**

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

**32 Protective structure tip-over procedure**

Indicates the procedure to overturn the protective structure.



## 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 enabled, 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 **tracked hydraulic excavator** supplied with the machine, before using it for the first time.



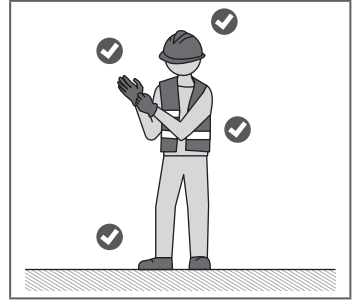
### 2.4.1 - Personal Protective Equipment (PPE)



## 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:

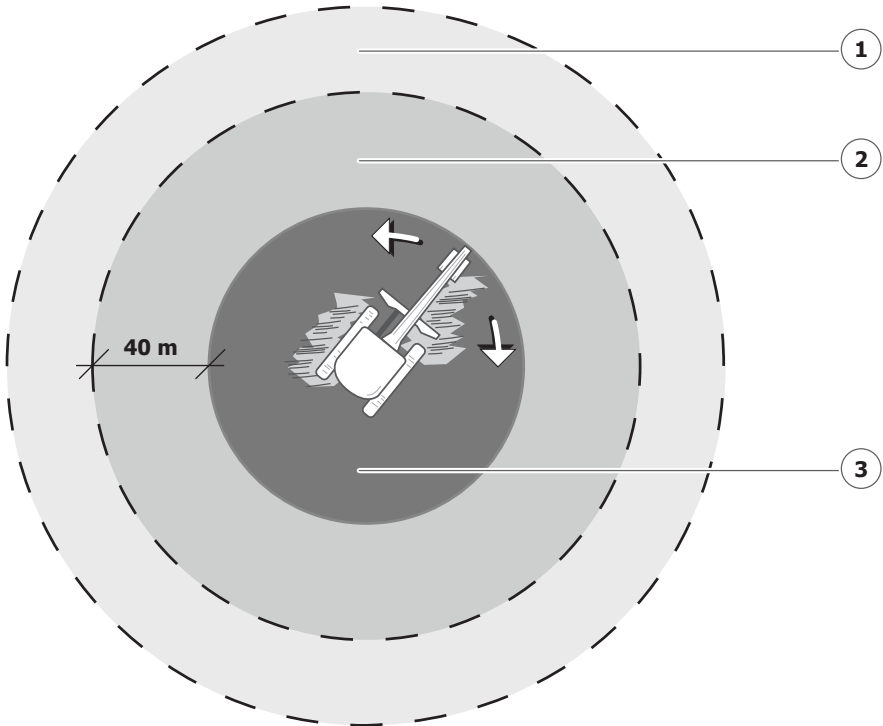
- a safety helmet;
- safety footwear;
- safety goggles;
- protective gloves;
- ear defenders;
- high visibility clothing.

## 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 risks

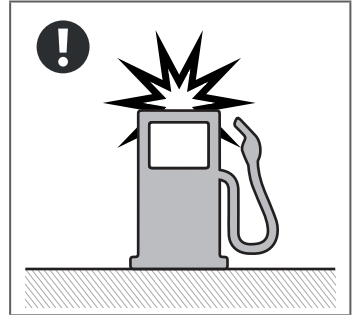
***Below is a description of the operations or situations that may expose people to danger or risks.***



### **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.

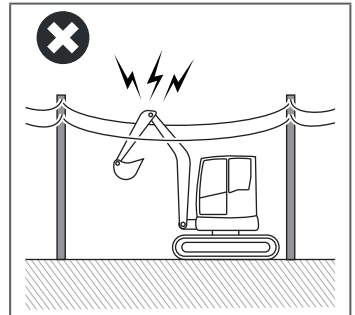


### **DANGER**

#### **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, equipment, or protective structure is always at a suitable distance.



If the machine enters into contact with the electrical lines:

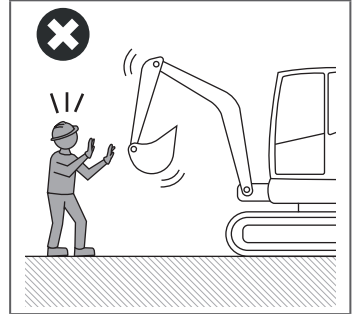
- DO NOT leave the driver's seat and DO NOT touch the metal parts;
- if possible, move the vehicle away from the hazard zone;
- avoid other people approaching;
- ask other people to cut the power supply to the electrical supply lines.



## DANGER

### RISK OF INJURIES TO PERSONS NEAR THE MACHINE

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

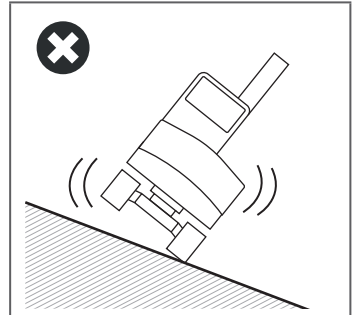


## WARNING

### RISK OF TIP-OVER AND 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.

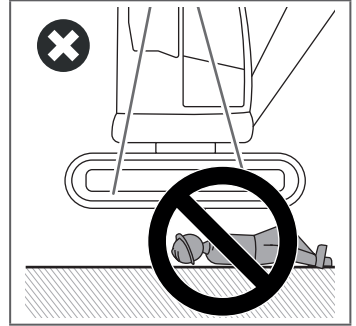
Never exceed the nominal lifting capacity of the machine.



## 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.

- Nobody must stand under the boom or work equipment if raised.
- When the machine is lifted by means of the work equipment, under no circumstances stand under the raised parts.

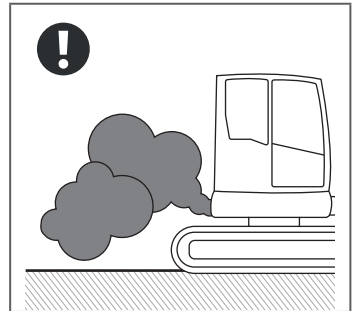
Lowering the raised parts may cause serious accidents with possible injuries or even death.



## 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.



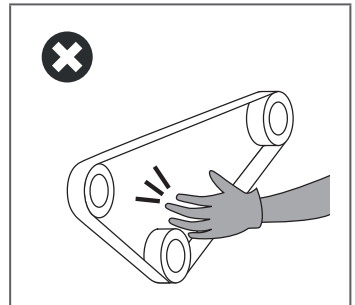
## WARNING

### 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.

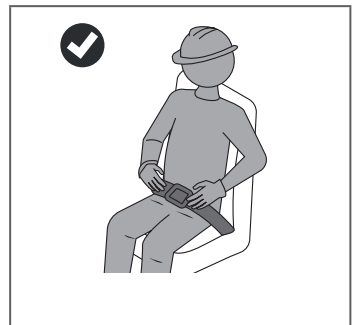


## WARNING

### RISK OF CRUSHING

During a possible tip-over or roll-over of the machine, the operator could be thrown off the seat and then get crushed by the machine.

Choose a comfortable driving position. Adjust the position of the seat and the control levers. Adjust the tension of the belt so that it can hold the operator leaving the abdomen completely free. Do not start working before having followed these safety conditions.



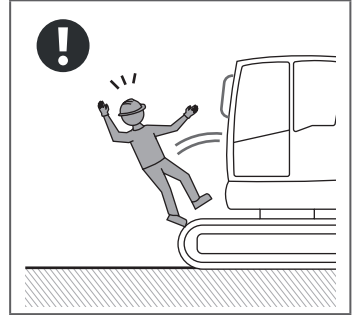


## WARNING

### RISK OF FALLING

Be sure to check the steps and handrails. If damages, loosening or other faults are found, carry out the necessary repairs.

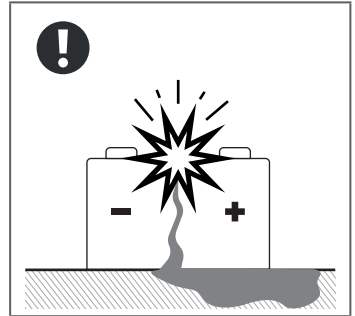
If there are any slippery substances on steps or handles, such as mud, oil or lubricant, remove them completely.



## 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.



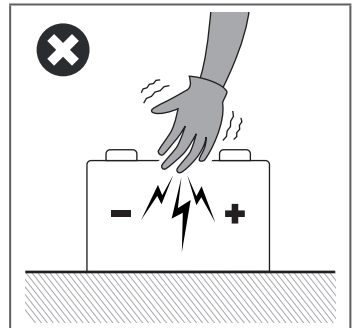
## WARNING

### RISK OF ELECTRIC SHOCK

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

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

Ensure the electrical connection wires and terminals do not show any signs of corrosion, cracking or scorching, otherwise immediately contact your *local Authorised Dealer*.





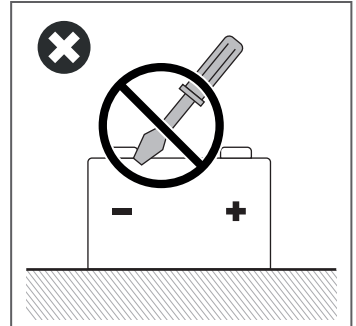


## WARNING

### 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.

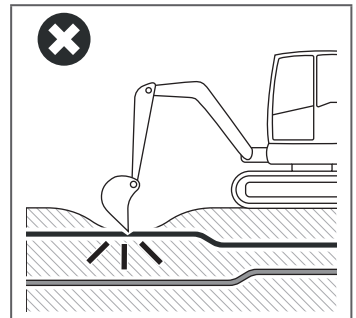


## WARNING

### 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.



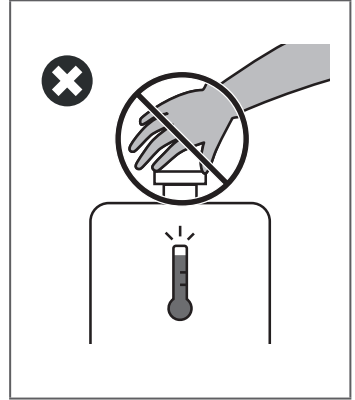
## WARNING

### 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.



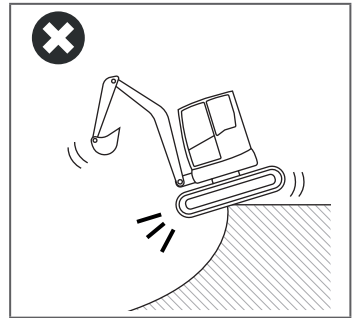
## WARNING

### 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.



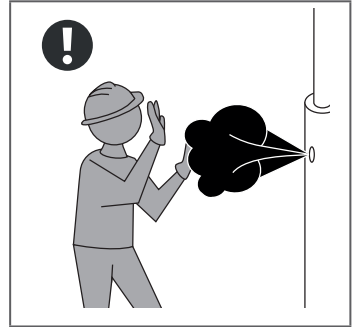
## WARNING

### 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 and dozer blade to the ground, stop the machine and release any residual pressure as described in section "6.25 - Discharge residual pressure in the hydraulic system" to page 6-62.

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.

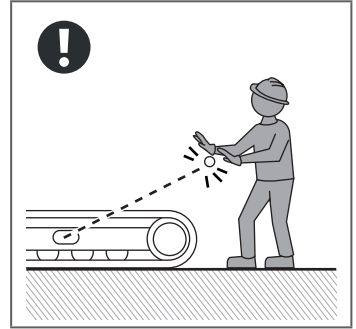


## WARNING

### 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

### SEAT BELT

Adjust the seat and always fasten the seat belt before starting the machine. Carefully follow the indications given in the dedicated sections: "6.3 - *Driver's seat*" to page 6-5 and "6.5 - *Seat belt*" to page 6-8.



# WARNING

### CHECK FOR ADEQUATE VISIBILITY BEFORE STARTING TO OPERATE

**Make sure there is proper visibility for work purposes.**

Clean the windows (if present), rear-view mirrors (if present) and lights, in order to guarantee good visibility. Make sure the rear-view mirrors are intact and correctly positioned so as to ensure the complete visibility around the machine.

If the cab windows (if present) are cracked or broken, do not start work without repairing them.



## **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 travel, use the horn to signal.



# WARNING

## MACHINE ASCENT/DESCENT

Get on and off the machine only near the dedicated handles or steps (if present) and tracks.

Before getting on the machine, clean the steps (if present), the part of the track that will be stepped on and the handles if stained with oil, grease and mud, check their condition; have them repaired if necessary.

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.

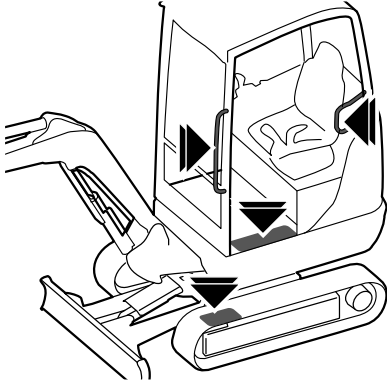
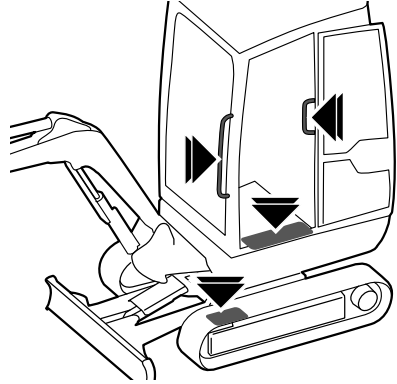
Get on and off the machine slowly and carefully, DO NOT carry tools or other items, always keep your hands free and able to grip the handles.

Do not jump on or off the machine.

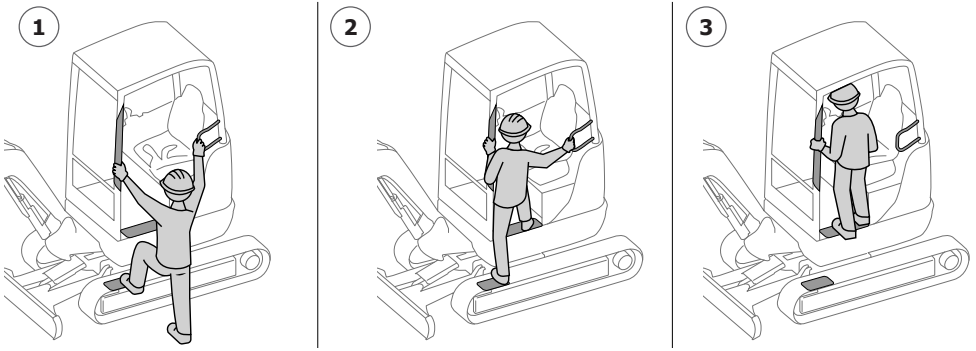
Do not try to climb on or off the machine when it is moving.

Do not get on or off the machine by grasping the control levers or the controls cut-out lever.

In the cab version machine, lock the door in the open position before getting in or out of the machine.

**Machine hooking points:****CANOPY VERSION****CAB VERSION**

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



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

- align the turning frame to the undercarriage so that the dozer blade stays near the boom;
- lower the dozer blade and the equipment to the ground;
- stop the engine and remove the ignition key;
- lift the controls cut-out lever and unbuckle the seat belt.

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





# 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 "6.11 - *Engine jump-starting procedure*" to page 6-34 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 start work after the temperature of each device in the machine has lowered.



## 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 AND ROLL-OVER

***Performing movements of slewing or travel with the boom extended is hazardous and may cause the machine to tip over or roll over. When moving, keep the boom as close to the machine as possible and maintain a maximum distance of 30 cm between the lower part of the equipment and the ground.***

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.

**The guard structure makes the driver's seat the only safe place to be in the event of the machine tipping over or rolling over.**

### **During tip-over or roll-over:**

- KEEP THE SEAT BELT FASTENED.
- DO NOT LEAVE THE DRIVER'S SEAT.
- STAY SEATED AND HOLD THE SEAT FIRMLY WITH YOUR HANDS BETWEEN YOUR LEGS.
- LEAN AWAY FROM THE POINT OF IMPACT.

### **Once the tip-over or roll-over has finished:**

- make sure the machine is stable and there cannot be further tilting;
- unbuckle the seat belt;
- quickly leave the driver's seat by leaving from the machine side facing upwards.

Do not attempt to leave the machine by sliding beneath the structure.

**In case the main door is blocked, use the emergency exit.**



## WARNING

### EMERGENCY EXIT

After an emergency situation during which it is not possible to use the main access route to abandon the machine, the emergency exit must be used. This is at the front of the driver's seat.

If the emergency exit is blocked too, identify a possible exit on the right side of the cab or at the back.

**If the machine is equipped with a closed cab**, the emergency exit is the front windshield and is indicated by means of the label in the figure.

To exit, open the windshield.



If the front windshield mechanism is blocked, use the special hammer to break the glass and exit.

If the emergency exit is blocked, identify a possible exit through the right-hand side or rear windows. Once identified, break the glass with the dedicated hammer.

**If the FRONT-GUARD front protective grid is installed on the machine**, the emergency exit is to be identified as the right-hand side or rear window. To exit, break the glass (if present) using the special hammer.



## WARNING

### MACHINE STABILITY

When the turning frame and the boom assembly form a 90° angle with the undercarriage, the stability of the machine is at its minimum; in this position, pay more attention to the risk of tipping over or rolling over.

To provide maximum machine stability while working:

- where possible, position the machine so that the tracks are parallel with the turning frame and first boom assembly;
- keep the dozer blade lowered and in contact with the ground;
- avoid lifting the tracks off the ground using the dozer blade.



## WARNING

### INCREASING STABILITY USING THE DOZER BLADE

***If the cylinder of the dozer blade is not equipped with a security valve (optional), the dozer blade must not be used to stabilise the machine.***

***If the dozer blade is used improperly, the hydraulic hoses can get damaged and cause a sudden loss of stability of the machine with the consequent damage to the operator and/or to the machine.***

The cylinder of the dozer blade can be provided with a lock valve (optional); if so, the blade can be used to increase the stability of the machine.

**ALWAYS** lower the dozer blade before starting work; the safety of the operator, maximum nominal loads and the stability of the machine are increased thanks to the lowering of the dozer blade in any working condition.



## WARNING

### TRAVELLING AND WORKING 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.***

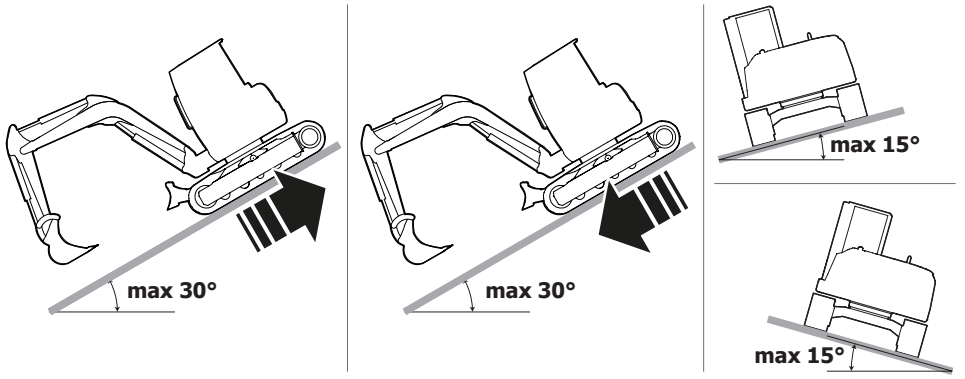
All indications supplied in the manual refer to the use of the machine on a flat and stable surface.

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.

Travelling or working on a slope can be hazardous. 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

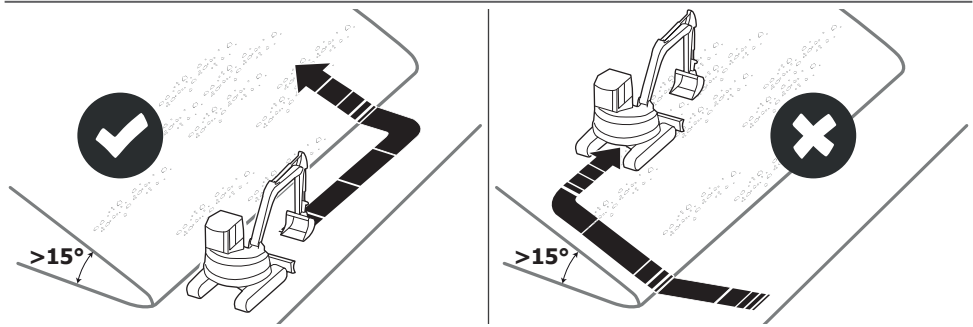


**When travelling on a slope with an angle lower than 15°,** always reduce the machine speed and maintain a slow, steady motion. Apply braking by smoothly returning both travel control levers to the NEUTRAL position (N).

**If travel on a slope with an angle greater than 15° is required,** take the following additional precautions:

- descend or ascend only and NEVER drive the machine across steep slopes;
- the boom assembly must be facing the direction of travel;
- position the dozer blade in front of the operator, under the boom assembly;
- to climb up and go down, proceed with forward travel;
- position the lower part of the equipment about 30 cm off the ground.

**Changing direction on slopes is allowed only if the slope is less than 15°.**





## 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. Pay particular attention to the overall rotation of the machine.



## WARNING

### LIFTING THE MACHINE

Follow all the instructions given in section "4.4 - Lifting the machine" to page 4-7.



## 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 overhead and side clearances carefully before driving around or under any fixed structures, such as buildings, bridges, towers, etc.



## 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 (upper part of the track).

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?
- Do you hear rumbling?

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



## WARNING

### KEEP THE AREA AROUND THE OPERATOR SEAT CLEAN

Always keep the operator's seat and its accesses clean.

Do not climb with dirty, muddy or greasy shoes.

Do not place any object at the bottom of the operator seat or around pedals, and do not hang anything 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.

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 8-5.

Use the correct tools, make sure that spanners and tools are in the correct position. Treat machined and polished surfaces with care.

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 and the dozer blade 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 "6.25 - Discharge residual pressure in the hydraulic system" to page 6-62.

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 lift, move or rotate the bucket over people or on the truck 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 - Operator protective structure



## WARNING

***It is prohibited to remove or change the protective structure.***

***It is prohibited to operate the machine with no protective structure in place.***

The **protective structure (1)** protects the operator from being crushed in the event that the machine tips over or rolls over.

The machine is always supplied with a protective structure to protect the operator. It can be **closed** (cab) or **open** (canopy).

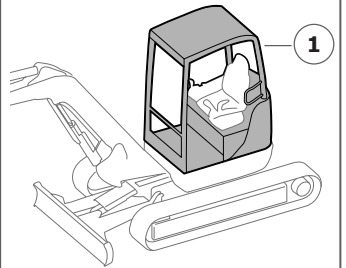
The protective structure has been tested and has passed the tests according to the following standards:

- ROPS ISO 12117-2  
(Roll Over Protective Structure)
- TOPS EN 13531  
(Tip Over Protective Structure)
- FOPS ISO 10262 Level I  
(Falling Object Protective Structure)

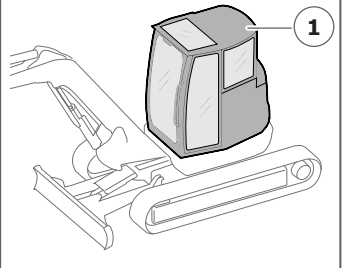
Check that the protective structure is in good condition:

- it must not be damaged;
- it must not have any rusted parts;
- the fastening screws must be correctly tightened.

**CANOPY**



**CAB**



In case of running into one of the indicated problems, contact the *Service Centre* to have checks carried out and to restore the structure.

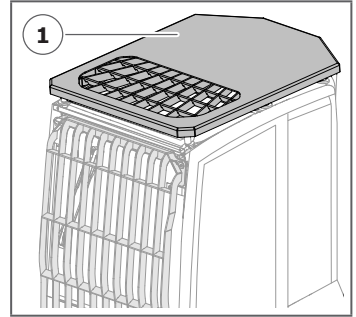
**DO NOT** change, repair, carry out welding or drilling on the operator protective structure. The protection will be compromised by this, creating a hazard that could cause death or serious injury to persons.

The protective structure, the operator seat and the seat belt must be carefully checked after any accidents. Contact the *Service Centre* to replace any parts that show signs of damage.

### 2.8.1.1 - TOP-GUARD Level II protective grid (optional)

The TOP-GUARD level II (1) protective grid is a metal grid that is installed in the upper part of the protection structure which prevents falling objects from reaching the operator.

The use of this protection is mandatory when working under conditions where there is the risk of heavy objects falling from above, for example: large rocks, large pieces of debris.



The use of this protection is mandatory when working in certain types of environments, for example: tunnels, slopes with falling objects.

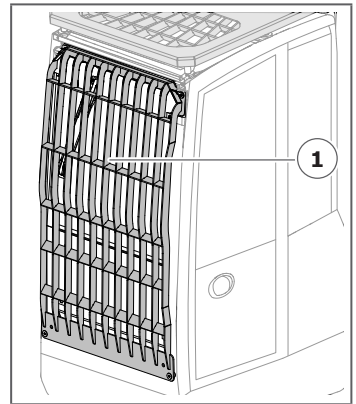
It is the operator's duty to assess these risks and so his responsibility to fit the protection.

### 2.8.1.2 - Protection grid FRONT-GUARD Level II (option)

The FRONT-GUARD Level II (1) protective grid is a metal grid that is installed at the front of the protection structure which prevents objects from the front of the machine from reaching the operator.

The use of this protection is mandatory when working in environments where there is the risk that large objects may hit the front of the machine, for example: large rocks, large pieces of debris.

The use of this protection is mandatory when working with certain types of equipment, for example: trunk grapple, selection grapple.



For instructions on the installation of this equipment refer to chapter "7 - Recommended optional equipment" to page 7-1.

It is the responsibility of the equipment installer to ensure that this protection is present on the machine.

### 2.8.2 - Seat belt

The seat belt is essential because it retains the operator anchored to the seat in case of tip-over or roll-over. The condition, cleanliness and mechanical mountings of the seat belt must be checked regularly.

**Operations to be carried out before starting:** before starting the engine, the operator has to fasten the seat belt, after having checked it is in perfect order.

**Operations to be carried out before leaving the machine:** the operator can remove the seat belt only when the engine has come to a stop.



## WARNING

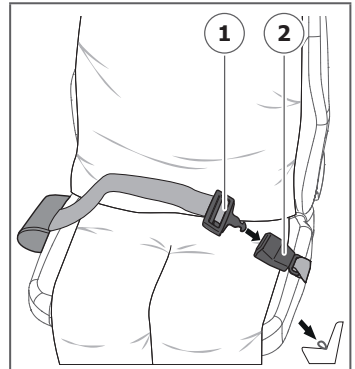
***Serious injury or death may result from any failure to use the seat belt fitted to this machine. The seat belt is an essential component that complements the operator's protective structure and is provided to protect the operator in the event of the machine tipping over or rolling over. The seat belt MUST be used whenever the machine is being operated.***

***Inspect the seat belt on each occasion prior to use, in order to identify any cuts or worn webbing, or any defect in the latch assembly. If any wear or damage is noted, DO NOT operate the machine until the seat belt has been replaced.***

Before starting the engine, first adjust the seat as required for optimum reach and comfort, if possible. Then adjust the seat belt as follows.

**Locking** the seat belt:

- take the end of the seat belt (**1** - from the side of the seat) and pull it across to the other side;
- while holding your back upright on the seat, pull the belt buckle over your body at the level of your pelvis;
- check that the belt is not twisted and that it does not rest on sharp pieces of clothing;
- insert the end of the belt (**1**) into the latch (**2**);
- check that it has been inserted correctly by pulling the latch plate (**1**).





**Releasing** the seat belt:

- press the red button (2) on the buckle;
- remove the latch plate from the buckle (1), and slowly accompany it on the winder to free yourself, then get off the machine.



## WARNING

***Following an accident, the safety belt must be replaced, the operator seat and the seat fastening elements must be checked by a Service Centre.***

### 2.8.3 - Control cut-out lever

The control cut-out lever (safety lever) is located on the left joystick holder assembly.

Pulling the lever (1) upwards raises the whole assembly; in position (2) all controls are disabled.

When the lever (1) is pushed down again, the joystick unit returns to operating mode and the control circuit is restored.

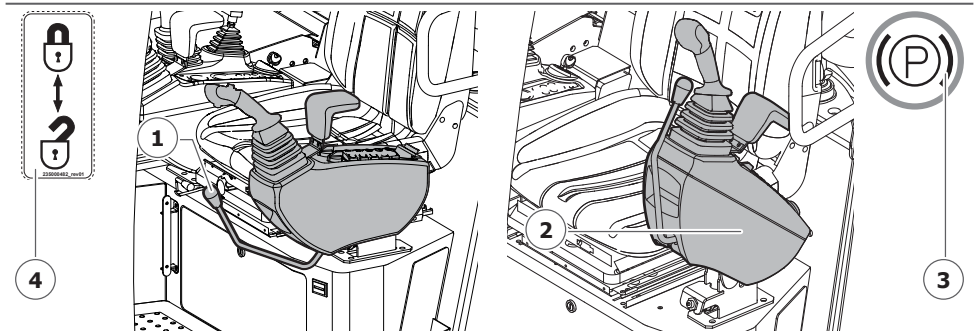


## WARNING

***This operation must be performed every time one leaves the driver's seat, so as to prevent the accidental activation of the controls while getting on/off the machine.***

Once the control console has been raised, the "control locked" warning light on the control panel turns on (3).

In order to work, the machine must have the lever (1) lowered; the label (4) applied to the side of the joystick holder shows how the lever works.



### 2.8.4 - Location of fire extinguisher

Local rules or regulations may require a **fire extinguisher to be fitted** to the machine at the operator station.



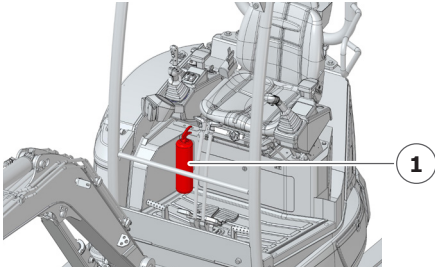
## CAUTION

***The machine is supplied without a fire extinguisher. Installation must be carried out in compliance with the current standards in force and is the responsibility of the owner of the machine.***

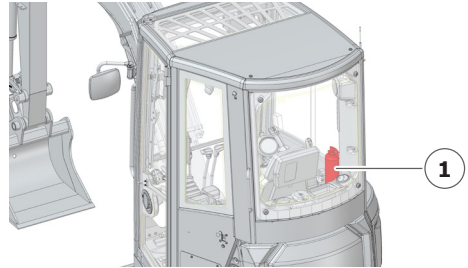
The space for the installation of the fire extinguisher is located behind the operator seat on the left (1).

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**CANOPY VERSION**



**CAB VERSION**



The installed extinguisher must include the following specifications:

- it must be firmly anchored to prevent it from falling or moving during operation and injuring the operator;
- it must be positioned so as not to restrict the minimum space requirements available to the operator;
- during installation of the extinguisher **AVOID WELDING** the protective structure of the machine;
- it must be of a type approved by the current standards in the country where the machine is used;
- it must be suitable for extinguishing fires caused by electrical short circuits, fuel, oils, or plastic materials;
- it must be inspected regularly to ensure that it always operates as required by the current standards in the country where the machine is used.

### 3 - TECHNICAL DATA

#### 3.1 - General data

| MODEL                                                                      |                                                | CX25D                                              |
|----------------------------------------------------------------------------|------------------------------------------------|----------------------------------------------------|
| Operating weight ISO 6016 with <b>canopy</b><br>(with bucket and operator) | kg                                             | 2.580                                              |
| Operating weight ISO 6016 with <b>cab</b><br>(with bucket and operator)    | kg                                             | 2.710                                              |
| Specific ground pressure                                                   | kg/cm <sup>2</sup>                             | 0.28                                               |
| Travel speed                                                               | 1 <sup>a</sup> - km/h<br>2 <sup>a</sup> - km/h | from 0 to 2.6<br>from 0 to 4.3<br>(AUTO TWO SPEED) |
| Slewing rotation speed                                                     | rpm                                            | 10                                                 |

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

- bucket 55 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 (e.g. long boom, etc.).

### 3.2 - Engine

| MODEL                        |     | CX25D      |
|------------------------------|-----|------------|
| Brand                        |     | YANMAR     |
| Model                        |     | 3TNV76     |
| Level of pollutant emissions |     | EU Stage 5 |
| Power                        | kW  | 13.7       |
|                              | CV  | 18.6       |
|                              | HP  | 18.4       |
|                              | rpm | 2,200      |
| Displacement                 | cc  | 1.116 cc   |
| Number of cylinders          | no. | 3          |
| Cooling                      |     | Liquid     |
| Fuel supply                  |     | Diesel     |
| UNLADEN minimum speed        | rpm | 1.250      |
| UNLADEN maximum speed        | rpm | 2.350      |
| LOADED maximum speed         | rpm | 2.200      |



### **NOTICE**

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

### 3.3 - Hydraulic system

| MODEL                                  |       | CX25D                                                                                                                             |
|----------------------------------------|-------|-----------------------------------------------------------------------------------------------------------------------------------|
| Plant type                             |       | Load Sensing centre closed with Flow Sharing distributor                                                                          |
| Pump type                              |       | 1 Load Sensing pump with variable displacement                                                                                    |
| Pump displacement                      | cc    | 25                                                                                                                                |
| Total flow rate                        | l/min | 50                                                                                                                                |
| Operating pressures:                   |       |                                                                                                                                   |
| - first boom;                          |       |                                                                                                                                   |
| - second boom;                         |       |                                                                                                                                   |
| - bucket;                              | bar   | 250                                                                                                                               |
| - boom swing;                          |       |                                                                                                                                   |
| - dozer blade;                         |       |                                                                                                                                   |
| - translation motors;                  |       |                                                                                                                                   |
| - Slewing gear motor                   | bar   | 195                                                                                                                               |
| - servo-controls                       | bar   | 34                                                                                                                                |
| Hydraulic servo-controls for operation |       | 3 joysticks + 1 hydraulic pedal                                                                                                   |
| Travel                                 |       | Hydraulic drive units with axial pistons with automatic device for speed transmission "AUTO TWO SPEED" and negative parking brake |
| Slewing                                |       | Hydraulic drive units with axial pistons and negative parking brake                                                               |

**For the data of the auxiliary hydraulic systems, refer to section "6.27 - Auxiliary hydraulic systems" to page 6-64.**

### 3.4 - Performances

| MODEL                                                    |     | CX25D         |
|----------------------------------------------------------|-----|---------------|
| Bucket breakout force ISO 6015                           | daN | 2.570         |
| Standard boom breakout force<br>(optional boom) ISO 6015 | daN | 1.380 (1.250) |
| Tractive force                                           | daN | 2.400         |
| Maximum slope                                            |     | 60% - 30°     |

### 3.5 - Digging arm

| MODEL                                                                                  |    | CX25D |
|----------------------------------------------------------------------------------------|----|-------|
| First boom length                                                                      | mm | 2.128 |
| Length of second standard boom                                                         | mm | 1.350 |
| Length of second optional boom                                                         | mm | 1.550 |
| Increased weight of the second optional boom<br>(compared to the second standard boom) | kg | 12    |

### 3.6 - Counterweight

| TYPE                                     | CX25D    |
|------------------------------------------|----------|
| <b>Light</b> supplementary counterweight | optional |

| MODEL                                        |    | CX25D |
|----------------------------------------------|----|-------|
| Supplementary counterweight weight           | kg | 120   |
| Supplementary counterweight<br>rear overhang | mm | 70    |

### 3.7 - Dozer blade

| MODEL                                        |    | CX25D |
|----------------------------------------------|----|-------|
| Standard blade width                         | mm | 1.500 |
| Height                                       | mm | 350   |
| Stroke height                                | mm | 350   |
| Stroke depth                                 | mm | 240   |
| Distance from the centre of the slewing ring | mm | 1.300 |

### 3.8 - Undercarriage

| MODEL                |  | CX25D                            |
|----------------------|--|----------------------------------|
| FRAMED UNDERCARRIAGE |  | FIXED - 'X' box-frame            |
| Lower rollers        |  | 4 rh + 4 lh (in oil bath)        |
| Upper rollers        |  | 1 rh + 1 lh (in oil bath)        |
| Track tensioner      |  | hydraulic adjustment with grease |
| Rubber tracks        |  | 280 x 52.5 x 82                  |

### 3.9 - Brakes

| MODEL                                              | CX25D                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|----------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Service brake on travel and rotation               | <p><b>Type:</b> hydrostatic.</p> <p><b>Brake activation:</b> it is activated automatically when the movement control lever is released (the distributor spool, together with the balancing valves (counter balance valve) of the drive units, closes the oil passage completely or partially).</p> <p><b>Brake deactivation:</b> it is deactivated automatically when the movement control lever is moved (the distributor spool moves from the centre towards the use, opening the oil passage).</p>                                                                                                                                                                                                  |
| Secondary and parking brake on travel and rotation | <p><b>Type:</b> negative mechanical with spring on discs in oil back inside the gear motors.</p> <p><b>Brake activation:</b> it is activated automatically when the movement control lever is released (the movement control pressure is interrupted and this also releases the brake discs). The activation is not instantaneous but it takes place after a delay necessary to avoid excessive wear to the discs in case it is activated when the machine is not completely stopped.</p> <p><b>Brake deactivation:</b> it is deactivated automatically when the movement control lever is moved (the movement control pressure also releases the brake discs). The deactivation is instantaneous.</p> |



### 3.10 - Nominal lifting capacity



## WARNING

***To perform load handling operations, the machine must be equipped with the special load handling equipment (optional).***

***For further Information, see section "7.8 - Load handling" to page 7-29.***

The machine can be prearranged for lifting loads if equipped with the optional kit for the handling of objects on condition that it is provided with the devices prescribed by **EN474-5** and when all national regulations are complied with. The optional object handling kit should be obtained from the *Service Centre*.

The **nominal lifting capacity** is the maximum weight that can be applied to the bucket pin (weight of equipment with any loaded material).

The nominal lifting capacity refers to:

- machine positioned on sound, firm and level ground;
- the indicated capacities remain valid for the full slewing range of the turning frame;
- boom in NON-slewed position (if present);
- the indicated capacities refer to the bucket hinge pin;
- outreach referred to the centre of rotation (slewing ring);
- undercarriage extended to maximum track widening (if present);
- machine without quick-coupling attachment and equipment;
- all the protective structures available;
- all types of tracks available;
- the lifting capacities do not exceed 75% of the tip-over or roll-over limit or 87% of the hydraulic limit, in accordance with Standard **ISO 10567**;
- for some optional equipment, the Standards indicate that the nominal lifting capacities must be reduced in certain operating conditions. For information on the equipment in use, see the relevant section in the chapter "7 - Recommended optional equipment" to page 7-1.



## 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.**

**The capacities shown must be adapted depending on the type of equipment fitted.**



## WARNING

**If the cylinder of the dozer blade is not equipped with a security valve (optional), the dozer blade must not be used to stabilise the machine. Refer to the lifting capacity tables with the RAISED BLADE values.**

**If the dozer blade is used improperly, the hydraulic hoses can get damaged and cause a sudden loss of stability of the machine with the consequent damage to the operator and/or to the machine.**

If the cylinder of the dozer blade is equipped with a security valve (optional), the dozer blade **CAN be used** to stabilize the machine.

The load capacities indicated refer to machines equipped with cab, rubber tracks, without bucket and without quick-coupling.

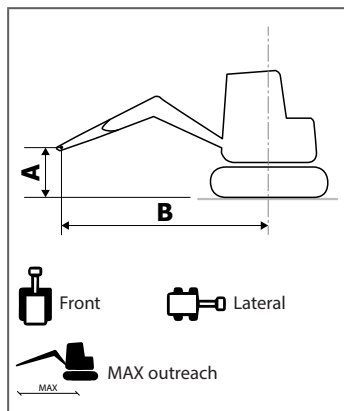
The symbol \* indicates the hydraulic load limit.

**0 m** refers to the ground level.

The values between round brackets ( ) refer to machines equipped with a supplementary counterweight: **0.12 tonnes**

**It is forbidden to remove the supplementary counterweight; it is possible to replace it with a heavier one.**

The load capacity is measured in **tonnes**.



**Raised boom, Standard Boom (1.350 mm)**

| A (m)       | B (m)                                                                               |                                                                                     |                                                                                    |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
|-------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|
|             | 1.0                                                                                 |                                                                                     | 2.0                                                                                |                                                                                   | 3.0                                                                               |                                                                                   | 4.0                                                                               |                                                                                   | MAX                                                                               |                                                                                   |
|             |  |  |  |  |  |  |  |  |  |  |
| <b>3.0</b>  | ---                                                                                 | ---                                                                                 | ---                                                                                | *0.36<br>(*0.36)                                                                  | *0.36<br>(*0.36)                                                                  | ---                                                                               | ---                                                                               | *0.38<br>(*0.38)                                                                  | *0.38<br>(*0.38)                                                                  | 3.40 m                                                                            |
| <b>2.0</b>  | ---                                                                                 | ---                                                                                 | ---                                                                                | *0.40<br>(*0.40)                                                                  | *0.40<br>(*0.40)                                                                  | ---                                                                               | ---                                                                               | *0.38<br>(*0.38)                                                                  | 0.31<br>(0.34)                                                                    | 3.95 m                                                                            |
| <b>1.0</b>  | ---                                                                                 | ---                                                                                 | *0.97<br>(*0.97)                                                                   | 0.80<br>(0.89)                                                                    | *0.53<br>(*0.53)                                                                  | 0.45<br>(0.50)                                                                    | *0.40<br>(*0.40)                                                                  | 0.37<br>(*0.37)                                                                   | 0.27<br>(0.30)                                                                    | 4.30 m                                                                            |
| <b>0</b>    | ---                                                                                 | ---                                                                                 | 1.11<br>(*1.15)                                                                    | 0.76<br>(0.85)                                                                    | 0.59<br>(*0.61)                                                                   | 0.43<br>(0.48)                                                                    | 0.40<br>(*0.40)                                                                   | 0.40<br>(*0.40)                                                                   | 0.29<br>(0.32)                                                                    | 4.00 m                                                                            |
| <b>-1.0</b> | *3.45<br>(*3.45)                                                                    | 2.93<br>(3.24)                                                                      | *0.99<br>(*0.99)                                                                   | 0.76<br>(0.85)                                                                    | *0.56<br>(*0.56)                                                                  | 0.43<br>(0.48)                                                                    | ---                                                                               | *0.42<br>(*0.42)                                                                  | 0.35<br>(0.39)                                                                    | 3.51 m                                                                            |
| <b>-2.0</b> | ---                                                                                 | ---                                                                                 | *0.51<br>(*0.51)                                                                   | *0.51<br>(*0.51)                                                                  | ---                                                                               | ---                                                                               | ---                                                                               | *0.37<br>(*0.37)                                                                  | *0.37<br>(*0.37)                                                                  | 2.40 m                                                                            |

Lowered boom, Standard Boom (1.350 mm)

| A (m) | B (m)                                                                               |                                                                                     |                                                                                     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
|-------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|
|       | 1.0                                                                                 |                                                                                     | 2.0                                                                                 |                                                                                   | 3.0                                                                               |                                                                                   | 4.0                                                                               |                                                                                   | MAX                                                                               |                                                                                   |
|       |  |  |  |  |  |  |  |  |  |  |
| 3.0   | ---                                                                                 | ---                                                                                 | ---                                                                                 | ---                                                                               | *0.36<br>(*0.36)                                                                  | *0.36<br>(*0.36)                                                                  | ---                                                                               | ---                                                                               | *0.38<br>(*0.38)                                                                  | *0.38<br>(*0.38)                                                                  |
| 2.0   | ---                                                                                 | ---                                                                                 | ---                                                                                 | ---                                                                               | *0.40<br>(*0.40)                                                                  | *0.40<br>(*0.40)                                                                  | ---                                                                               | ---                                                                               | *0.38<br>(*0.38)                                                                  | 0.31<br>(0.34)                                                                    |
| 1.0   | ---                                                                                 | ---                                                                                 | *0.97<br>(*0.97)                                                                    | 0.80<br>(0.89)                                                                    | *0.53<br>(*0.53)                                                                  | 0.45<br>(0.50)                                                                    | *0.40<br>(*0.40)                                                                  | 0.29<br>(0.33)                                                                    | *0.37<br>(*0.37)                                                                  | 0.27<br>(0.30)                                                                    |
| 0     | ---                                                                                 | ---                                                                                 | *1.15<br>(*1.15)                                                                    | 0.76<br>(0.85)                                                                    | *0.61<br>(*0.61)                                                                  | 0.43<br>(0.48)                                                                    | *0.40<br>(*0.40)                                                                  | 0.29<br>(0.32)                                                                    | *0.40<br>(*0.40)                                                                  | 0.29<br>(0.32)                                                                    |
| -1.0  | ---                                                                                 | 2.93<br>(3.24)                                                                      | *0.99<br>(*0.99)                                                                    | 0.76<br>(0.85)                                                                    | *0.56<br>(*0.56)                                                                  | 0.43<br>(0.48)                                                                    | ---                                                                               | ---                                                                               | *0.42<br>(*0.42)                                                                  | 0.35<br>(0.39)                                                                    |
| -2.0  | ---                                                                                 | ---                                                                                 | *0.51<br>(*0.51)                                                                    | *0.51<br>(*0.51)                                                                  | ---                                                                               | ---                                                                               | ---                                                                               | ---                                                                               | *0.37<br>(*0.37)                                                                  | *0.37<br>(*0.37)                                                                  |
|       |                                                                                     |                                                                                     |                                                                                     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |  |

**Raised boom, Optional Boom (1.550 mm)**

| A (m)       | B (m)                                                                               |                                                                                     |                                                                                    |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
|-------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|
|             | 1.0                                                                                 |                                                                                     | 2.0                                                                                |                                                                                   | 3.0                                                                               |                                                                                   | 4.0                                                                               |                                                                                   | MAX                                                                               |                                                                                   |
|             |  |  |  |  |  |  |  |  |  |  |
| <b>3.0</b>  | ---                                                                                 | ---                                                                                 | ---                                                                                | ---                                                                               | ---                                                                               | ---                                                                               | ---                                                                               | ---                                                                               | *0.35<br>(*0.35)                                                                  | 3.64 m                                                                            |
| <b>2.0</b>  | ---                                                                                 | ---                                                                                 | ---                                                                                | *0.35<br>(*0.35)                                                                  | *0.35<br>(*0.35)                                                                  | *0.35<br>(*0.35)                                                                  | 0.30<br>(0.34)                                                                    | *0.35<br>(*0.35)                                                                  | 0.28<br>(0.32)                                                                    | 4.15 m                                                                            |
| <b>1.0</b>  | ---                                                                                 | *0.86<br>(*0.86)                                                                    | 0.82<br>(*0.86)                                                                    | *0.49<br>(*0.49)                                                                  | 0.45<br>(*0.49)                                                                   | *0.38<br>(*0.38)                                                                  | 0.29<br>(0.33)                                                                    | 0.36<br>(*0.36)                                                                   | 0.26<br>(0.29)                                                                    | 4.30 m                                                                            |
| <b>0</b>    | ---                                                                                 | 1.10<br>(*1.13)                                                                     | 0.76<br>(0.84)                                                                     | 0.59<br>(*0.59)                                                                   | 0.42<br>(0.47)                                                                    | 0.39<br>(*0.40)                                                                   | 0.28<br>(0.32)                                                                    | 0.36<br>(*0.37)                                                                   | 0.26<br>(0.30)                                                                    | 4.20 m                                                                            |
| <b>-1.0</b> | *4.16<br>(*4.16)                                                                    | 2.87<br>(3.18)                                                                      | *1.03<br>(*1.03)                                                                   | *0.58<br>(*0.58)                                                                  | 0.42<br>(0.47)                                                                    | ---                                                                               | ---                                                                               | *0.39<br>(*0.39)                                                                  | 0.31<br>(0.35)                                                                    | 3.74 m                                                                            |
| <b>-2.0</b> | ---                                                                                 | ---                                                                                 | *0.65<br>(*0.65)                                                                   | ---                                                                               | ---                                                                               | ---                                                                               | ---                                                                               | *0.38<br>(*0.38)                                                                  | *0.38<br>(*0.38)                                                                  | 2.77 m                                                                            |

Lowered boom, Optional Boom (1.550 mm)

| A (m) | B (m)                                                                               |                                                                                     |                                                                                     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
|-------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|
|       | 1.0                                                                                 |                                                                                     | 2.0                                                                                 |                                                                                   | 3.0                                                                               |                                                                                   | 4.0                                                                               |                                                                                   | MAX                                                                               |                                                                                   |
|       |  |  |  |  |  |  |  |  |  |  |
| 3.0   | ---                                                                                 | ---                                                                                 | ---                                                                                 | ---                                                                               | ---                                                                               | ---                                                                               | ---                                                                               | *0.35<br>(*0.35)                                                                  | *0.35<br>(*0.35)                                                                  | 3.64 m                                                                            |
| 2.0   | ---                                                                                 | ---                                                                                 | ---                                                                                 | *0.35<br>(*0.35)                                                                  | *0.35<br>(*0.35)                                                                  | *0.35<br>(*0.35)                                                                  | 0.30<br>(0.34)                                                                    | *0.35<br>(*0.35)                                                                  | 0.28<br>(0.32)                                                                    | 4.15 m                                                                            |
| 1.0   | ---                                                                                 | *0.86<br>(*0.86)                                                                    | 0.82<br>(*0.86)                                                                     | *0.49<br>(*0.49)                                                                  | 0.45<br>(*0.49)                                                                   | *0.38<br>(*0.38)                                                                  | 0.29<br>(0.33)                                                                    | *0.36<br>(*0.36)                                                                  | 0.26<br>(0.29)                                                                    | 4.30 m                                                                            |
| 0     | ---                                                                                 | *1.13<br>(*1.13)                                                                    | 0.76<br>(0.84)                                                                      | *0.59<br>(*0.59)                                                                  | 0.42<br>(0.47)                                                                    | *0.40<br>(*0.40)                                                                  | 0.28<br>(0.32)                                                                    | *0.37<br>(*0.37)                                                                  | 0.26<br>(0.30)                                                                    | 4.20 m                                                                            |
| -1.0  | ---                                                                                 | 2.87<br>(3.18)                                                                      | *1.03<br>(*1.03)                                                                    | *0.58<br>(*0.58)                                                                  | 0.42<br>(0.47)                                                                    | ---                                                                               | ---                                                                               | *0.39<br>(*0.39)                                                                  | 0.31<br>(0.35)                                                                    | 3.74 m                                                                            |
| -2.0  | ---                                                                                 | ---                                                                                 | *0.65<br>(*0.65)                                                                    | ---                                                                               | ---                                                                               | ---                                                                               | ---                                                                               | *0.38<br>(*0.38)                                                                  | *0.38<br>(*0.38)                                                                  | 2.77 m                                                                            |

### 3.11 - Standard / optional equipment

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

#### Equipment key:

| <p>● STANDARD                      ○ OPTIONAL                      / NOT AVAILABLE</p>                                   |       |
|--------------------------------------------------------------------------------------------------------------------------|-------|
| EQUIPMENT                                                                                                                | CX25D |
| Canopy (ROPS - FOPS Level 1)                                                                                             | ●     |
| Cab (ROPS/TOPS - FOPS Level 1):<br>- heating and ventilation;<br>- automatic courtesy light;<br>- Front wiper and washer | ○     |
| Closing protective structure platform for maintenance                                                                    | ●     |
| FRONT-GUARD Level I front protective grid                                                                                | ○     |
| TOP-GUARD Level II upper protective grid                                                                                 | ○     |
| Double travel speed with AUTOMATIC SHIFT DOWN                                                                            | ●     |
| Horn for travel movement                                                                                                 | ○     |
| Dozer blade                                                                                                              | ●     |
| Floating control for dozer blade                                                                                         | ○     |
| Rubber tracks                                                                                                            | ●     |
| Monoboam                                                                                                                 | ●     |
| Second standard boom                                                                                                     | ●     |
| Long second boom                                                                                                         | ○     |
| Boom swing                                                                                                               | ●     |
| Load handling configuration                                                                                              | ○     |
| Guard on lifting cylinder and on dozer blade cylinder                                                                    | ●     |
| Supplementary counterweights (refer to section "3.6 - Counterweight" to page 3-4)                                        | ○     |
| Auxiliary hydraulic system on AUX1 boom                                                                                  | ●     |
| Auxiliary hydraulic system on AUX2 boom                                                                                  | ○     |
| Auxiliary hydraulic system on mechanical AUX3 boom                                                                       | ○     |
| Drainage line on boom towards hydraulic oil tank                                                                         | ○     |

## TECHNICAL DATA

| EQUIPMENT                                                                                                                                 | CX25D |
|-------------------------------------------------------------------------------------------------------------------------------------------|-------|
| Single-acting/double-acting mechanical switch on AUX1 auxiliary hydraulic system                                                          | ●     |
| Mechanical adjustment of maximum AUX1 auxiliary hydraulic system flow rate                                                                | ●     |
| Piloted block valves on cylinders on first boom and second boom                                                                           | ○     |
| Block valve on the dozer blade cylinder                                                                                                   | ○     |
| Set-up for hydraulic quick-coupling equipment                                                                                             | ○     |
| Hydraulic set-up for cutting head with additional pump                                                                                    | ○     |
| LED work light on first boom                                                                                                              | ●     |
| LED strips on roof on front side                                                                                                          | ○     |
| LED strips on roof on rear side                                                                                                           | ○     |
| Rotating head lamp                                                                                                                        | ○     |
| Auxiliary power socket at the driver's seat                                                                                               | ●     |
| Electrical outlet on roof for rotating head lamp with switch (cab version)                                                                | ●     |
| Electric immobiliser                                                                                                                      | ○     |
| Geo-localisation system GEO-SERVICE                                                                                                       | ○     |
| Rear-view mirrors on canopy (left and right)                                                                                              | ○     |
| Rear-view mirrors on cab (left and right)                                                                                                 | ●     |
| Seat with adjustable spring suspension and seat belt                                                                                      | ●     |
| Use and maintenance manual                                                                                                                | ●     |
| Compartment for maintenance tools                                                                                                         | ●     |
| Document glove box                                                                                                                        | ●     |
| Interchangeable equipment to be fitted to the second boom (refer to section "7.1.1 - Specifications on authorised equipment" to page 7-4) | ○     |



### 3.12 - Rotary structure

The upper structure of the machine (turning frame, booms) rotates independently from the bottom section (undercarriage). This movement is permitted by the slewing ring, which ensures movement of parts with minimum friction. The slewing ring consists of two rings free to rotate with each other; one is securely joined to the undercarriage, the other to the turning frame.

### 3.13 - Fluid capacities

Refer to section "8.7.1 - Refilling quantity table" to page 8-16.

| MODEL                              |   | CX25D     |
|------------------------------------|---|-----------|
| Fuel tank                          | l | 26        |
| Hydraulic oil tank                 | l | 29        |
| Hydraulic system                   | l | 40        |
| Cooling system                     | l | 5         |
| Engine oil with replaceable filter | l | 2,8       |
| Travel gear motors                 |   | 0.6 l x 2 |

### 3.14 - Electrical system

| MODEL                                |        | CX25D                        |
|--------------------------------------|--------|------------------------------|
| 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                     |

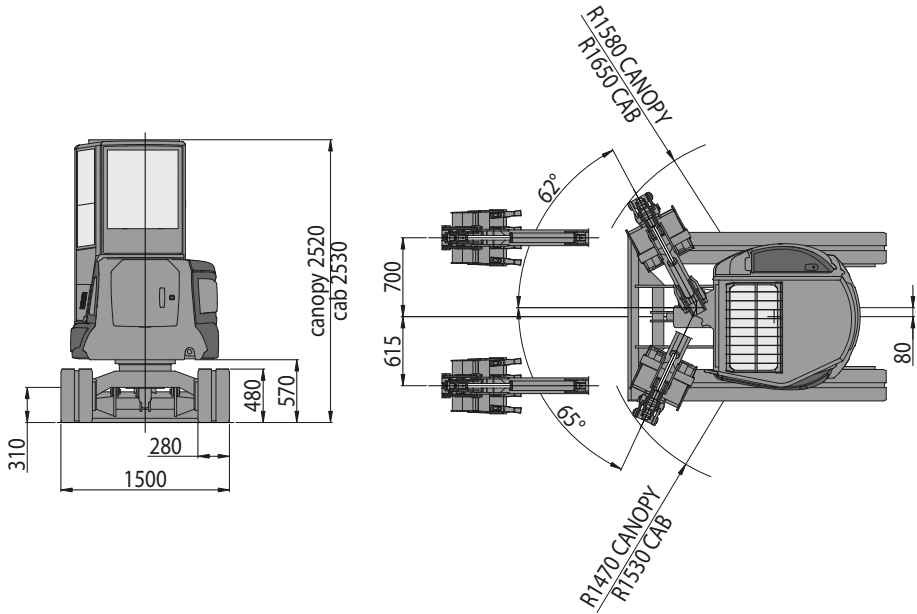
### 3.15 - Overall dimensions

Overall dimensions are given in **mm** for machine equipped with standard 2nd arm and excavation bucket with standard attachment.

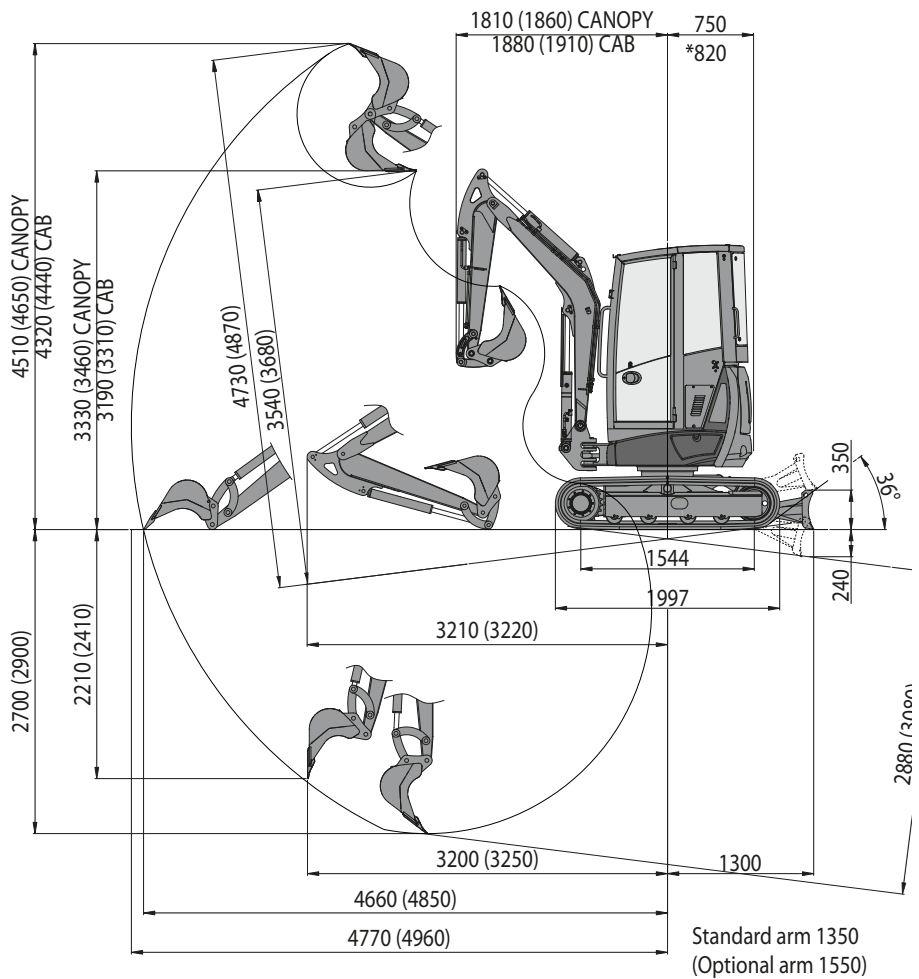
If in round brackets **(xxx)**, they refer to machines with optional 2nd arm.

The symbol \* refers to a machine equipped with **supplementary counterweight**.

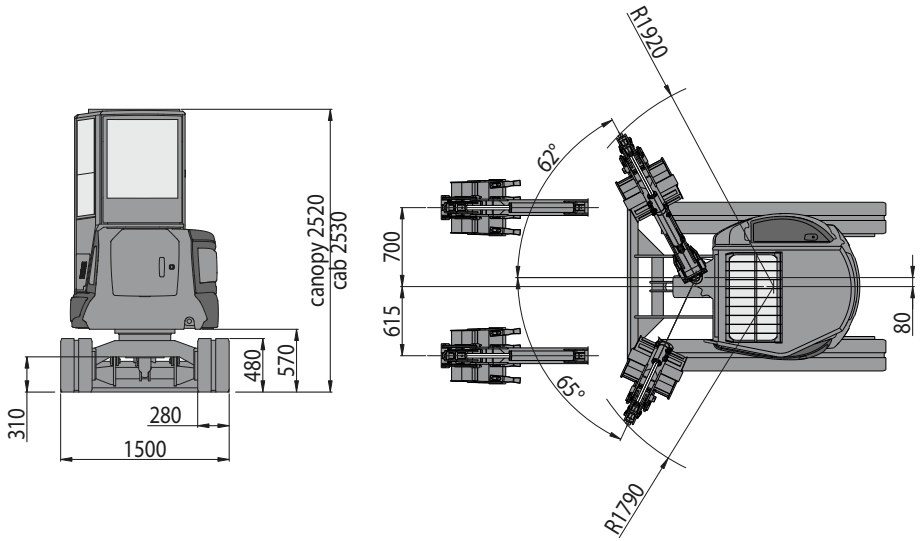
STANDARD VERSION



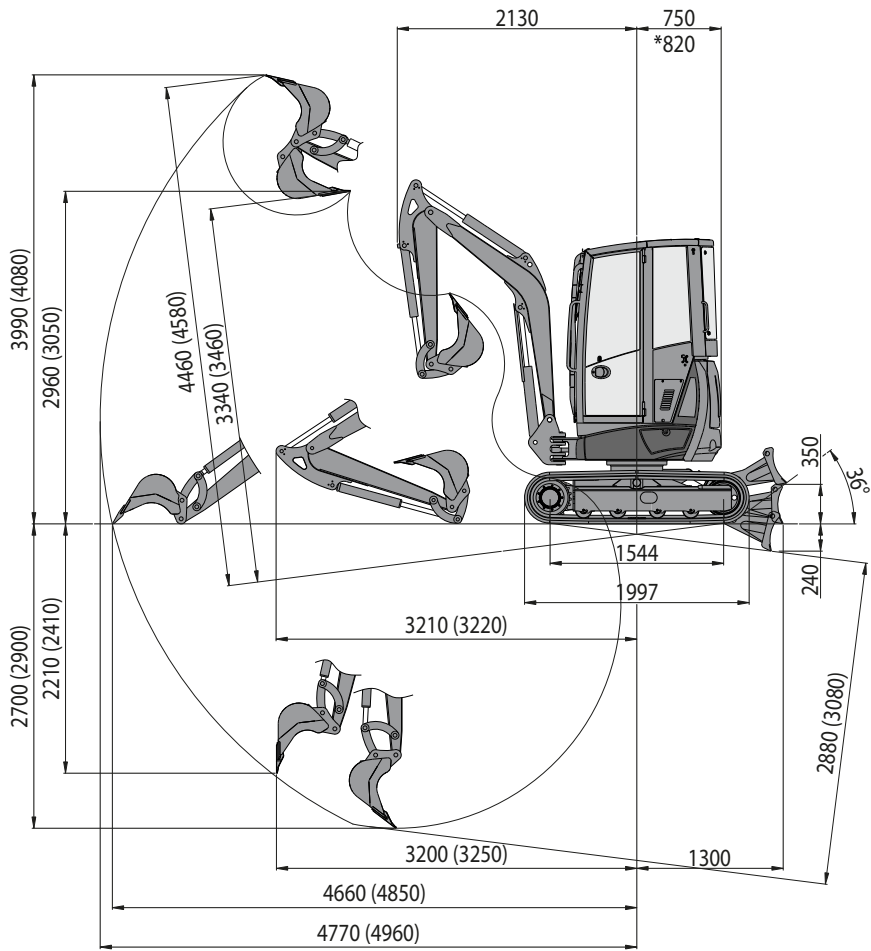
STANDARD VERSION



VERSION WITH FRONT GUARD GRID



VERSION WITH FRONT GUARD GRID



### 3.16 - Sound emission

#### SOUND PRESSURE

| NAME                                                                            | CX25D |
|---------------------------------------------------------------------------------|-------|
| ISO 6396 - LpA<br>(adjusted from driver's seat<br>with <b>canopy</b> )<br>dB(A) | 79    |

#### SOUND POWER

| NAME                                                                                     | CX25D |
|------------------------------------------------------------------------------------------|-------|
| 2000/14/CE and with UK<br>directive 2001 n.1701 - LwA<br>and subsequent changes<br>dB(A) | 93    |

The guaranteed sound power level is indicated on a sticker attached to the machine (see section "2.3 - Safety signs and operation related labels" to page 2-5).



### 3.17 - Vibrations

The vibrations level transmitted to the operator depends mainly on the conditions of the ground on which the machine is operating, on the work methods being applied and the equipment fitted to the machine.

Exposure to vibration can be reduced substantially by complying with the following suggestions:

- use equipment suitable for the type of machine and the type of task to be performed;
- adjust and lock the seat in the appropriate position; inspect on regular basis the seat suspension, making any necessary adjustments and performing any necessary maintenance;
- regularly perform any maintenance operation of the driving position;
- operate the accessories smoothly, as far as possible, avoiding any sudden movements or excessive jolts;
- adjust your speed and path and, as far as possible, avoid particularly rough paths and hitting possible obstacles, so as to minimise the vibration level.

The machine has been tested in accordance with the following regulations:

- ISO 2631
- EN ISO 5349
- EN 1032
- EN 12096

| <b>HAND-ARM VIBRATIONS</b> |                  |      |
|----------------------------|------------------|------|
| Vibration level            | m/s <sup>2</sup> | 0.56 |
| Measurement uncertainty    | m/s <sup>2</sup> | 0.28 |

| <b>VIBRATIONS OF WHOLE BODY</b> |                  |      |
|---------------------------------|------------------|------|
| Vibration level                 | m/s <sup>2</sup> | 0.22 |
| Measurement uncertainty         | m/s <sup>2</sup> | 0.11 |

Tests performed without load on a flat, compact surface.

The values indicated refer to continuous exposure during an 8-hour working day.



## 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.***

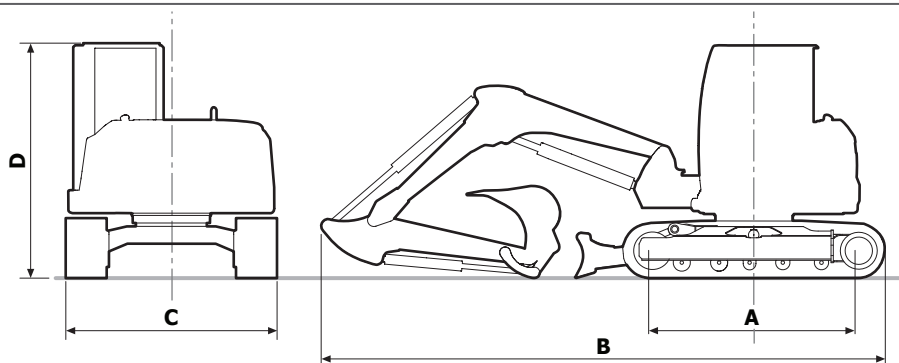
***A non-slip mat with a friction coefficient of at least 0.6 is required, to be placed between the tracks and the loading platform.***

***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.***

***Follow current standards regarding width, height, weight and transport speed allowed.***

## 4.1 - Shipping dimensions



|   | MODEL               |    | CX25D |
|---|---------------------|----|-------|
| A | Pitch               | mm | 1.544 |
| B | Machine-side length | mm | 4.210 |
| C | Undercarriage width | mm | 1.500 |
| D | Height              | mm | 2.527 |

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

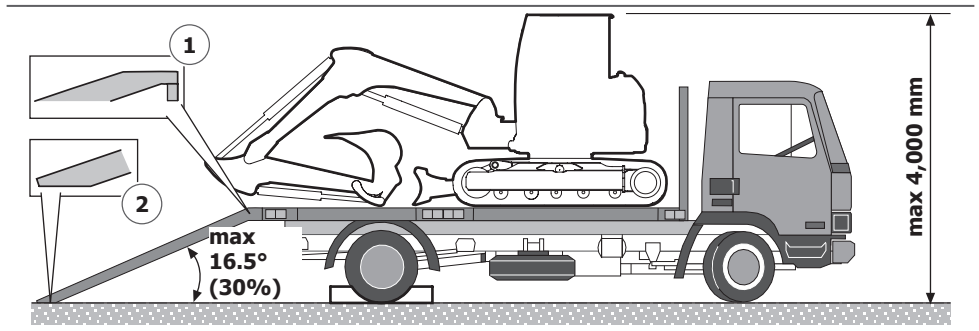
## 4.2 - Loading/unloading operations

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;
- the ramps **MUST NOT** form an angle greater than  $16.5^\circ$  (30% 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 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 in motion on a loading ramp or on the deck of the means of transport.***

Load the machine according to the indications:

- 1** - align the turning frame to the undercarriage so that the dozer blade stays near the boom;
- 2** - point the rear of the machine to the means of transport;
- 3** - Align the machine to the means of transport.
- 4** - Start loading the machine in reverse. Have another operator watch the loading/unloading operations from a safe distance so as to warn the driver on possible hazardous situations which 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 "6.18.1 - Forward and reverse travel" to page 6-47 and "6.18.3 - Turning while moving forward" to page 6-49.***

- 5** - If, when climbing the ramp, the machine is not aligned, go back to the starting position and repeat the aligning phase, then resume the loading procedure.



### **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.***

- 6** - Position the machine on the means of transport and lower the dozer blade onto the deck;
- 7** - close the bucket or the equipment, retract the second boom and lower the digging arm onto the deck to reduce the overall footprint to the minimum;
- 8** - park the machine according to the indications given in section "6.22 - *Parking the machine*" to page 6-56;
- 9** - make sure that the machine tracks are on the non-slip mat, for the entire surface; if not, reposition the machine correctly;
- 10** - 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 means of transport

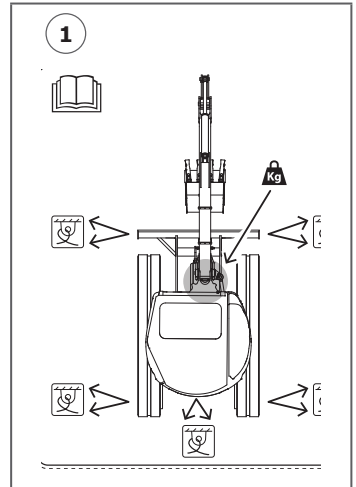
Before loading the machine, see the identification plate attached to it to know the weight and make sure that the truck used to transport it has an adequate load capacity.

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

Collect the boom and rest it on the loading platform, in order to reduce the overall dimensions as much as possible; pay particular attention to the maximum height and to anything that may protrude from the back of the truck.

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.

#### 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, 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.***

***Do not use the fillets of the counterweight and/or of the protective structure, to lift the machine; it may break and cause the machine to fall, resulting in serious damage to people or objects.***

***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.*

---

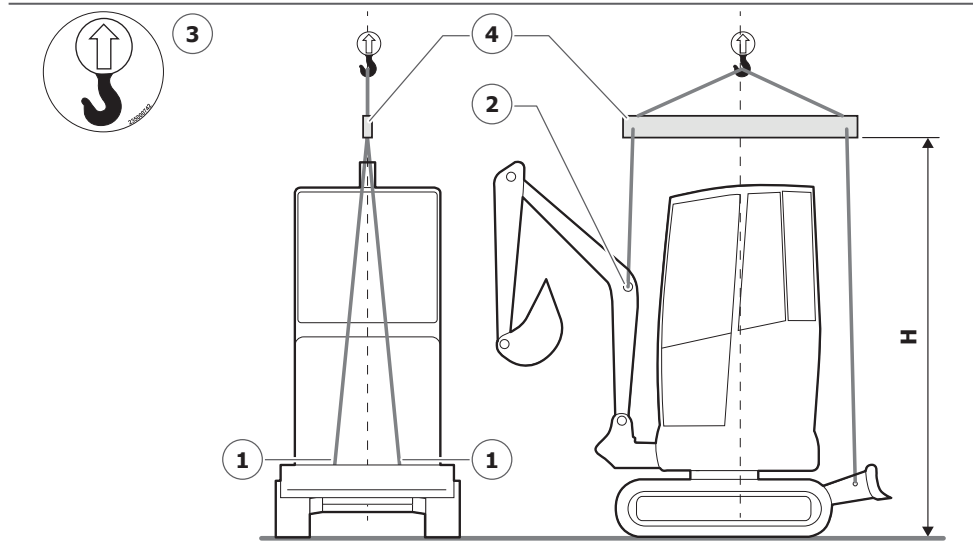
#### **4.4.1 - Lifting procedure**

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

- 1** - start the engine, rotate the turning frame so that the boom is on the opposite side to the blade, with the turning frame parallel to the tracks;
- 2** - move the boom to a swing angle equal to **0°** (if present);
- 3** - lift the first boom completely;
- 4** - close the bucket completely;
- 5** - close the 2nd arm until there is a distance of about **10 cm** between the digging boom or the bucket, and the machine;
- 6** - raise the dozer blade completely;
- 7** - raise the controls cut-out lever;
- 8** - enable the slewing lock (if provided);
- 9** - stop the engine, close the windows (if present), remove the ignition key, then get off the machine. Close the cab door (if present);
- 10** - attach lifting cables to the points on 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 for each side to the left and right of the dozer blade (**1**);
  - one for each side to the left and right of the top part of the first boom (**2**);
- 11** - connect the cables to the lifting accessory (bar) (**4**), respecting the dimensions indicated in the figure;
- 12** - respect the minimum height indicated in the figure to avoid contact between the lifting accessories and the machine, a greater height is allowed;



## TRANSPORTING THE MACHINE

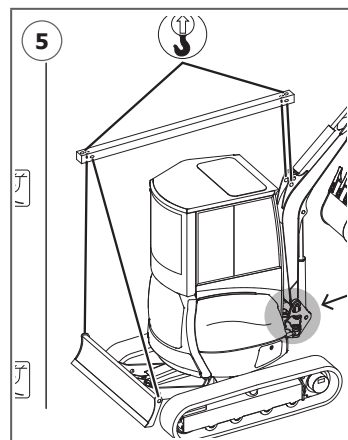


|          |                                                     |                  |
|----------|-----------------------------------------------------|------------------|
| <b>H</b> | Minimum height from ground of the lifting accessory | 3,000 mm         |
| <b>L</b> | Length of lifting accessory                         | 1,700 - 2,200 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;

**13** - move the machine to the desired place and lower it slowly; the supporting surface must be flat and compact;



**14** - 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.***

***Nobody must stand near the machine while towing; only the operators on the two machines can 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.

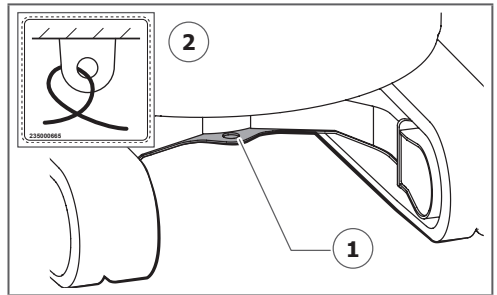
These instructions refer to moving the machine when it has broken down or is stuck in the ground.

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;
- 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 undercarriage (**1**), the hooks are indicated by the dedicated labels (**2**).
- **DO NOT** use other anchorage points (e.g. boom, bucket or any accessory installed);
- the tow bar must be in a horizontal position and parallel to the tracks;
- **NEVER** continue towing unless both tracks are fully in contact with the ground.

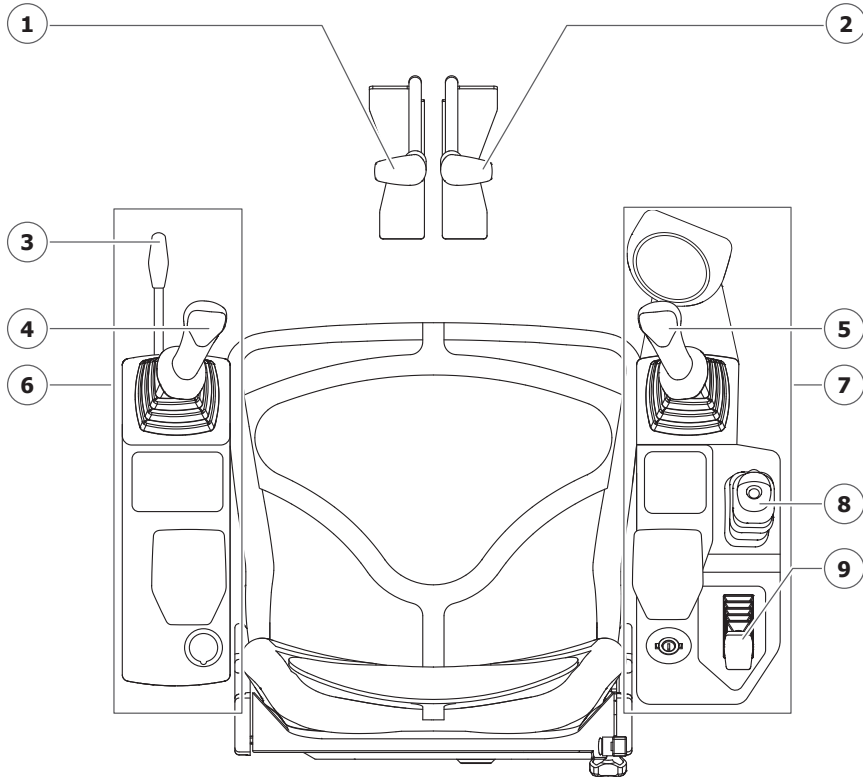


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## 5 - CONTROLS AND TOOLS

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

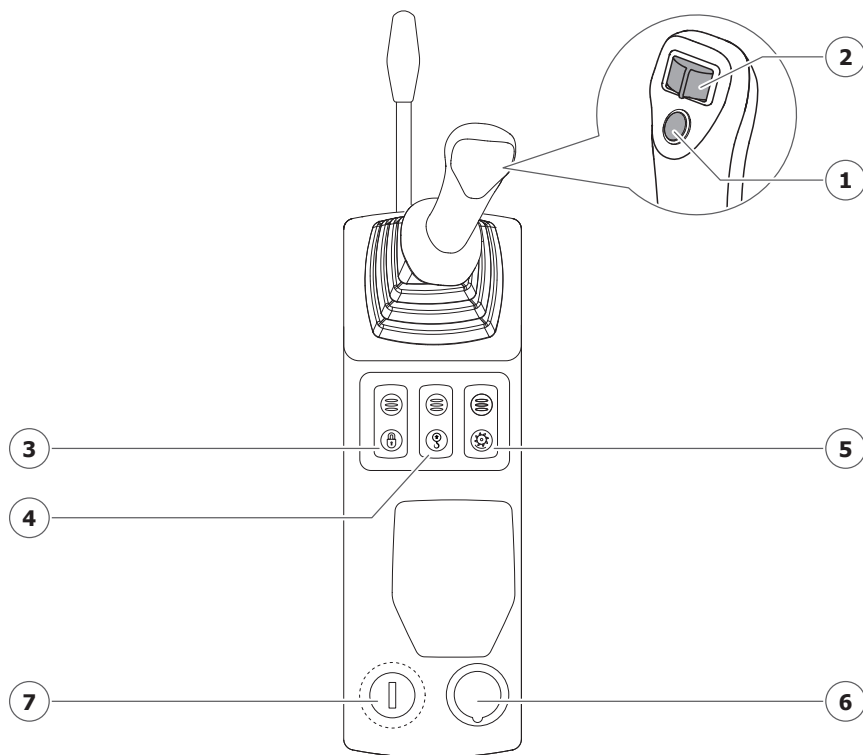
### 5.1 - Description of control levers



#### Key:

|   |                        |   |                       |
|---|------------------------|---|-----------------------|
| 1 | Left travel lever      | 6 | Left control console  |
| 2 | Right travel lever     | 7 | Right control console |
| 3 | Controls cut-out lever | 8 | Dozer blade Joystick  |
| 4 | Left Joystick          | 9 | Throttle lever        |
| 5 | Right joystick         |   |                       |

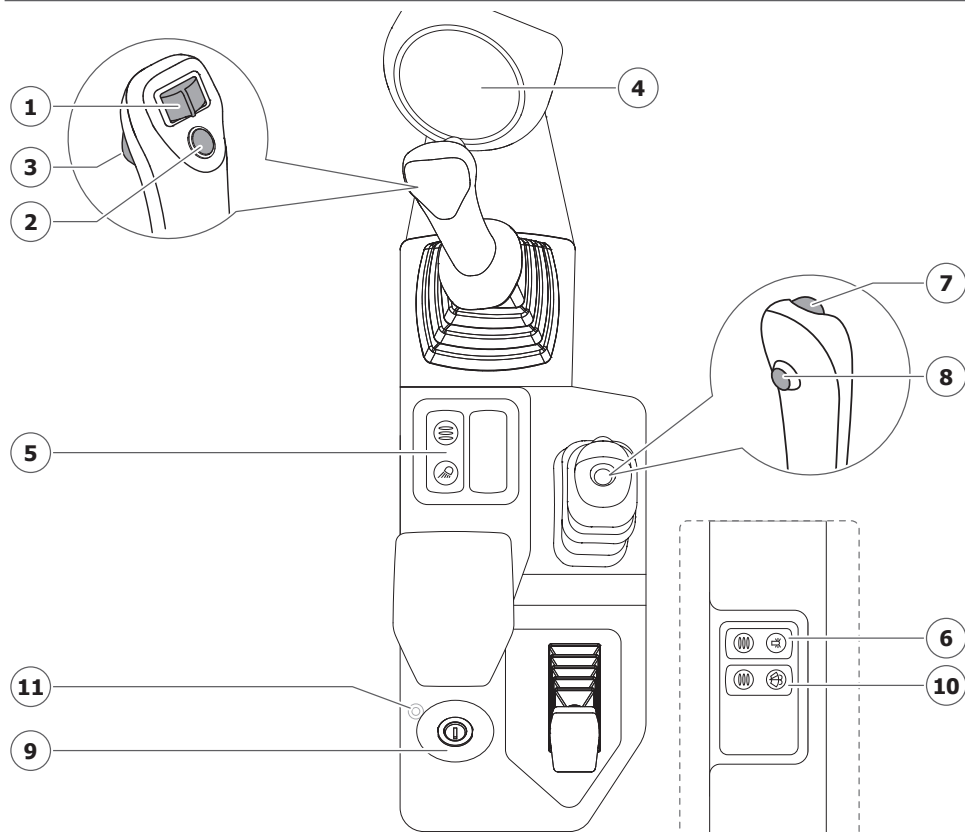
## 5.2 - Description of left control console



### Key:

|          |                                                                                        |          |                                                                     |
|----------|----------------------------------------------------------------------------------------|----------|---------------------------------------------------------------------|
| <b>1</b> | Horn button                                                                            | <b>5</b> | Hydraulic system control button for shredder head <b>(optional)</b> |
| <b>2</b> | Roller:<br>- boom swing <b>(standard)</b><br>- AUX2 hydraulic system <b>(optional)</b> | <b>6</b> | 12V current tap                                                     |
| <b>3</b> | Double-acting hydraulic quick coupling approval button <b>(optional)</b>               | <b>7</b> | Key switch for hydraulic quick coupling <b>(optional)</b>           |
| <b>4</b> | Load handling button <b>(optional)</b>                                                 |          |                                                                     |

## 5.3 - Description of right control console



### Key:

|          |                                                                                                                                       |           |                                                                |
|----------|---------------------------------------------------------------------------------------------------------------------------------------|-----------|----------------------------------------------------------------|
| <b>1</b> | Roller AUX1 hydraulic system                                                                                                          | <b>7</b>  | Fast drive button                                              |
| <b>2</b> | Boom swing/AUX2 hydraulic system mode selector button on right joystick roller (active only if the <b>optional</b> system is present) | <b>8</b>  | Dozer blade floating button ( <b>optional</b> )                |
| <b>3</b> | Lock button AUX1 hydraulic system                                                                                                     | <b>9</b>  | Starter switch                                                 |
| <b>4</b> | Control panel                                                                                                                         | <b>10</b> | Windshield wiper and washer switch ( <b>cab version only</b> ) |
| <b>5</b> | Work lights switch                                                                                                                    | <b>11</b> | Immobiliser indicator light ( <b>optional</b> )                |
| <b>6</b> | Rotating head lamp switch ( <b>cabin version only</b> )                                                                               |           |                                                                |

## 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

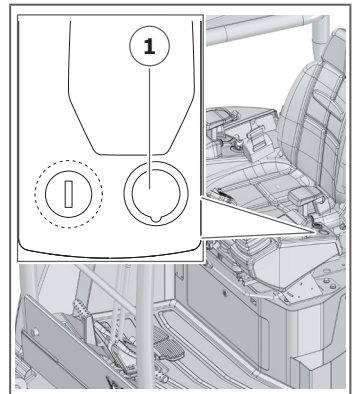
*The rollers are very sensitive, so take care when working not to touch them by accident, an unwanted hydraulic function could occur compromising the safety of the operator and anyone nearby.*

---

## 5.5 - Auxiliary power socket on console

An auxiliary socket (1), used to connect the rotating head lamp, is located on the left control console. 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 STARTING EQUIPMENT position.





## 5.6 - Flashing light (optional)

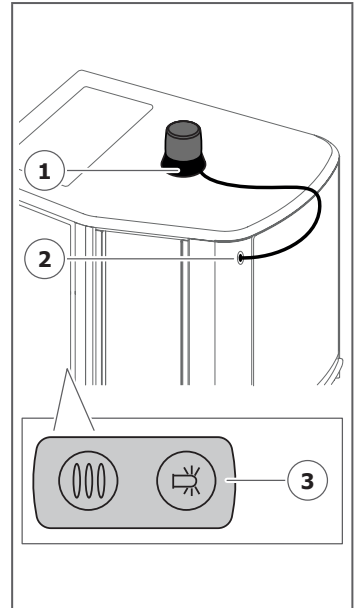
The machine can be equipped with an approved flashing light (called rotating head lamp).

The rotating head lamp (1) is used to indicate the presence of a moving operating machine and it must be used when required by local Standards.

The rotating head lamp is equipped with a magnetic base, it must be installed on the roof of the protective structure and it must be on when the machine is running.

To **position/remove** the rotating head lamp:

- park the machine according to the indications given in section "6.22 - *Parking the machine*" to page 6-56;
- Get off the machine;
- place a ladder (not supplied), of a size suitable for current Standards, at the back of the machine, climb up and place the rotating head lamp at the centre of the roof;
- climb down and remove the ladder;
- insert the electrical connection (2) of the rotating head lamp into one of the sockets available.

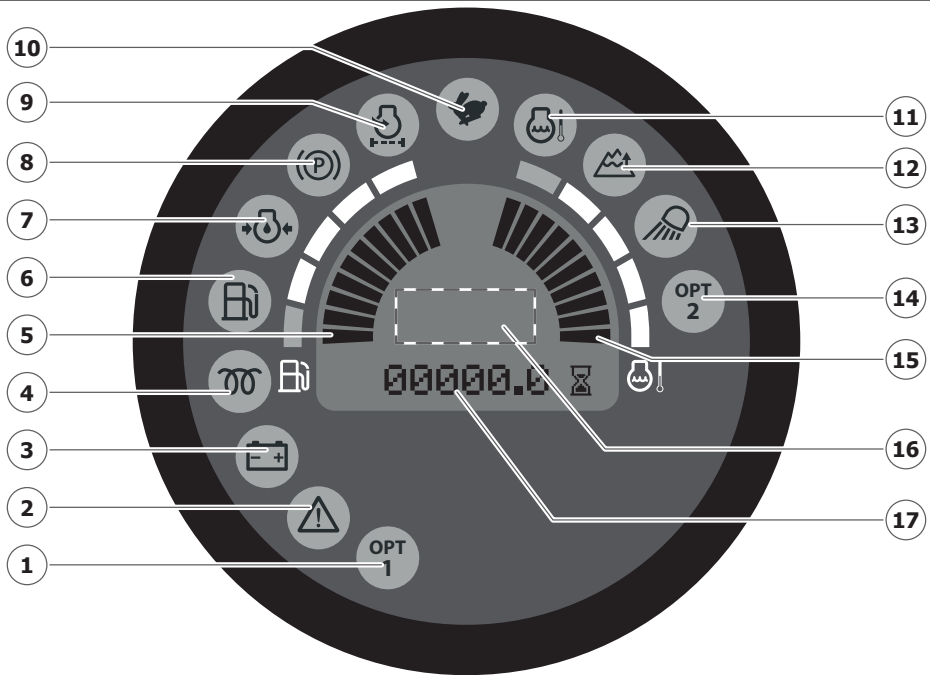


To remove the rotating head lamp, perform the operations in reverse order.

When the machine is started, the rotating head lamp is activated:

- **automatically** if it has been connected to the auxiliary socket on the control panel, see section "5.5 - *Auxiliary power socket on console*" to page 5-4.
- **by pressing the dedicated switch (3)** if it has been connected to the auxiliary socket on the protective structure, see sections "6.7.3 - *Auxiliary socket inside the cab*" to page 6-12 and "6.7.4 - *Auxiliary socket outside the cab*" to page 6-13.

## 5.7 - Control panel



### Key:

|   |                                                                  |    |                                                                   |
|---|------------------------------------------------------------------|----|-------------------------------------------------------------------|
| 1 | <b>OPT1</b> indicator light - AUX2 hydraulic system (if present) | 10 | Fast drive indicator light                                        |
| 2 | Alarm indicator light                                            | 11 | Coolant temperature light                                         |
| 3 | Alternator light                                                 | 12 | Altitude light NOT ACTIVE                                         |
| 4 | Pre-heat light                                                   | 13 | Work lights light                                                 |
| 5 | Fuel level indicator                                             | 14 | <b>OPT2</b> light - hydraulic system for cutter head (if present) |
| 6 | Fuel level indicator light                                       | 15 | Coolant temperature indicator                                     |
| 7 | Engine oil pressure warning light                                | 16 | Message area                                                      |
| 8 | Controls cut-out light                                           | 17 | Hour meter                                                        |
| 9 | Air filter clogging light                                        |    |                                                                   |

### FUEL LEVEL INDICATOR

Indicates the level of the fuel in the tank.

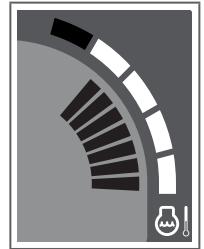
During work, the last section of the indicator must be in the white zone.



### 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.



### HOURLY METER

This area displays the total hours of the machine.



### OPT1 INDICATOR LIGHT

It turns on when the AUX2 auxiliary hydraulic system is activated (if present).



### ALARM LIGHT

Turns on whenever an alarm message appears, remains lit as long as the alarm is present.



### 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 starter 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 ignition 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 start 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

It lights up when the cut-out lever is raised.

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



### AIR FILTER CLOGGED WARNING LIGHT

Lights up when the air filter element is clogged; remove and clean the intake filter, replace it if necessary.

The procedure for this operation is described in section "8.10.19 - Check and replacement of air filter" to page 8-66.



### FAST DRIVE INDICATOR LIGHT

Lights up when fast drive is engaged.



### COOLANT TEMPERATURE WARNING LIGHT

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



### ALTITUDE INDICATOR LIGHT

NOT ACTIVE.



### WORK LIGHTS INDICATOR LIGHT

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



### OPT2 INDICATOR LIGHT

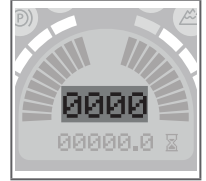
It turns on when the flail head hydraulic system is activated (if present).



### 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.**



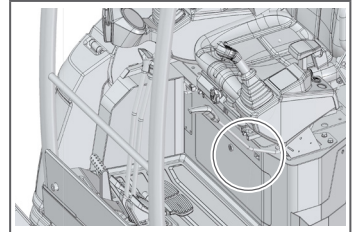
**Indicators and warning lights are only operational once the ignition switch is in the ON position.**

### 5.8 - Secondary hour meter

It records the working hours carried out by the machine; it is located at the bottom right of the operator station.

It is useful to quickly view the total hours of the machine when it is off and without having to get on.

The digits to the left of the decimal point indicate the hours, while the digits to the right of the decimal point indicate the tenths of an hour (6 minutes, 360 seconds).



### NOTICE

*This meter only works when the engine is running.*

*For maintenance operations, refer to the electronic hour meter on the control panel, refer to section "5.7 - Control panel" to page 5-6.*

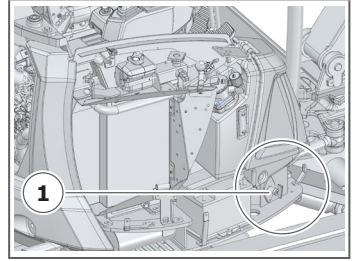
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### 5.9 - Battery disconnect switch

The isolator switch (1) is located inside the battery compartment cover; for access refer to section "8.3.4 - Battery compartment guard" to page 8-10.

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

For the operation see section "6.2 - Battery disconnect switch" to page 6-4.

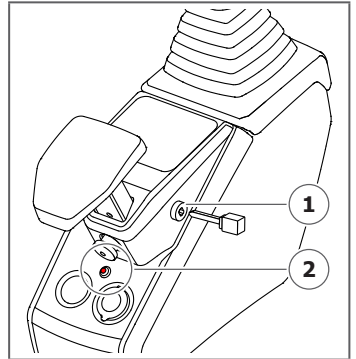


### 5.10 - Electric immobiliser (optional)

This system prevents the machine from being started up by unauthorised persons.

The electric immobiliser (1) and the status LED (2) are located on the left console.

For the operation see section "6.11 - Engine jump-starting procedure" to page 6-34.



## 5.11 - Geo-localisation system (optional)



### NOTICE

*the CASE CONSTRUCTION **SiteWatch™** website ([www.casesitewatch.com](http://www.casesitewatch.com)) will not be accessible until the CASE CONSTRUCTION **SiteWatch™** subscription for this machine is registered 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](http://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 "8.11 - Long inactivity periods" to page 8-79.*

---

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 any dirt from the windshield in order to ensure good visibility.***

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

***Remove all dirt from the surface of the rear-view mirrors and check that they are correctly positioned (if present).***

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

***Adjust the operator seat to a comfortable position that facilitates machine operation, and check for any signs of damage or wear on the seat belt and its locking mechanism.***

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

***Before starting up the engine, fasten the seat belt and lift the control cut-out lever.***

***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.***



## **WARNING**

***If the cylinder of the dozer blade is not equipped with a security valve (optional), the dozer blade must not be used to stabilise the machine. If the dozer blade is used improperly, the hydraulic hoses can get damaged and cause a sudden loss of stability of the machine with the consequent damage to the operator and/or to the machine.***

***When reversing, turn the turning frame so as to 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 the bucket or equipment and the dozer blade are fully lowered and the machine turned 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.***

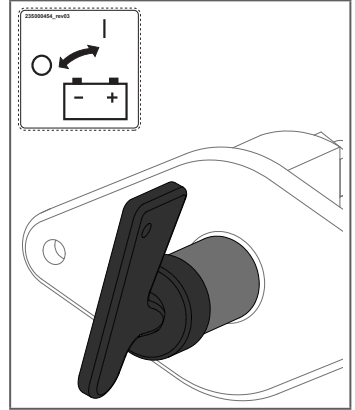
## 6.2 - Battery disconnect switch

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.*

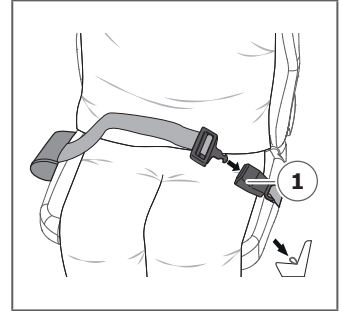
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### 6.3 - Driver's seat

The operator seat is equipped with an approved seat belt (1) with two connection points and adjustable in length.

Before starting work, the operator can choose the most comfortable driving position depending on his/her physique by making the adjustments described below.

After adjusting the position of the seat, fasten the seat belt so that it can hold the operator at the waist, leaving the abdomen completely free.



## WARNING

***Do not operate the seat adjustment levers while the machine is operating. During this operation the control levers could be accidentally moved and generate uncontrolled movements of the machine and therefore cause serious or fatal injuries.***

***To prevent accidents, before starting the machine check that all adjustments have clicked into place properly.***



## CAUTION

***Do not leave any objects near the seat because during the movements there may be collisions and this may damage the seat or injure the operator.***

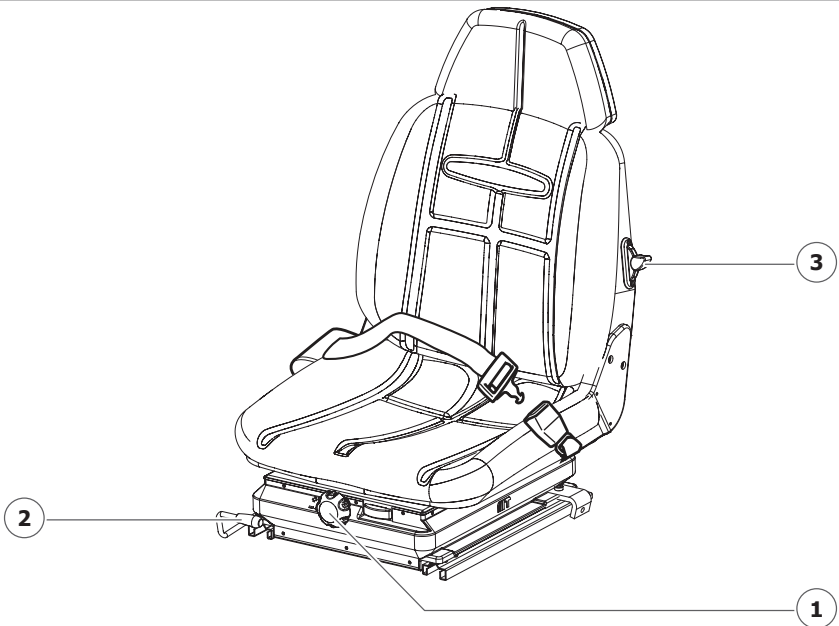


## NOTICE

*The seat is not waterproof; make sure it does not come into contact with any liquid. Always close the windows and doors of the cab (if present) after work or during maintenance.*

---

The driver's seat is of the approved type and complies with workplace safety legal requirements. It is fitted with a damping system and permits adjustment to the optimum setting for the operator's weight.



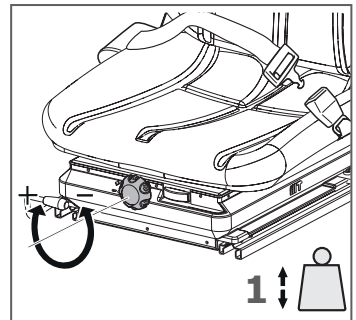
### Key:

- |          |                                                                   |          |                            |
|----------|-------------------------------------------------------------------|----------|----------------------------|
| <b>1</b> | Weight adjustment                                                 | <b>3</b> | Adjustment of the backrest |
| <b>2</b> | Longitudinal adjustment of the seat with respect to the joysticks |          |                            |

### 1 - WEIGHT ADJUSTMENT

The weight of the operator must be adjusted by turning the weight control knob.

Turning the knob changes the hardness of the suspension to obtain the one most suitable for the weight of the operator.





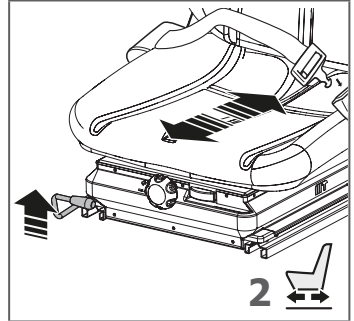
## CAUTION

***Seats that have not been properly adjusted have a lower range of oscillation. To prevent injury to persons, whenever the machine is started or the driver is changed, the seat must be adjusted according to the weight of the driver.***

### 2 - LONGITUDINAL ADJUSTMENT OF THE SEAT WITH RESPECT TO THE JOYSTICKS

Move the adjustment lever upwards to release the guides, adjust the seat lengthwise with respect to the joysticks.

After making the adjustment make sure that the lever "clicks" to secure the runners. Check that the seat does not move any further backwards or forwards.



### 3 - ADJUSTING THE BACKREST

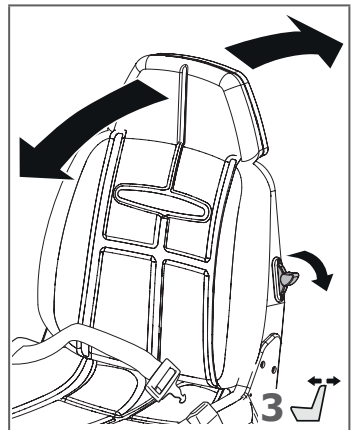
To release the backrest pull the locking lever downwards.

Do not press on the backrest while releasing it.

The most comfortable position is found by increasing or decreasing the pressure on the backrest.

To secure the backrest in place release the lever.

The backrest can be collapsed completely forwards until it is horizontal.



## NOTICE

*If the operator is not sitting down, activate the locking lever keeping one hand on the top of the backrest to stop it from jumping forwards.*

The seat position should always be adjusted to suit the operator's physique.

A seat adjustment that is unsuited to the operator or to the type of work to be performed may lead to premature operator tiredness and result in the improper operation of the machine.

The seat position should be individually adjusted for each machine operator.

The operator must be in a position to press the pedals down fully and to operate the control levers properly, with his back resting comfortably against the backrest.

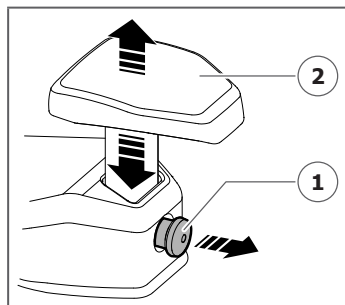
If not, move the seat forwards or backwards and then try again.

### 6.4 - Arm rests

The arm rests can be adjusted in height.

Height adjustment is carried out for each arm rest as follows:

- slightly unscrew knob (1) counter-clockwise;
- pull it outwards and simultaneously raise or lower the arm rest (2);
- Once the desired height has been reached, release the knob and tighten the knob clockwise.



### 6.5 - Seat belt

The seat belt is essential because it retains the operator anchored to the seat in case of tip-over or roll-over. The condition, cleanliness and mechanical mountings of the seat belt must be checked regularly.

For more details, see section "2.8.2 - Seat belt" to page 2-48.

**ALWAYS FASTEN the seat belt when seated in the driver's seat.**

### 6.6 - Controls cut-out lever

The controls cut-out lever prevents the accidental activation of all machine functions.

For more details, see section "2.8.3 - Control cut-out lever" to page 2-49.

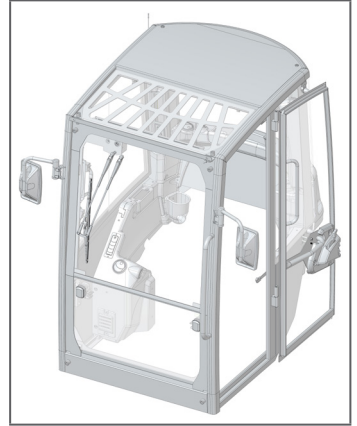
**Before leaving the driver's seat, ALWAYS lock the controls by means of the controls cut-out lever.**



### 6.7 - Driver's cab (optional)

The machine is equipped with an enclosed air-conditioned cab (heated or cooled as required).

The cab consists of a single unit, secured to the structure by flexible supports to dampen vibrations for increased operator comfort.



## WARNING

***If the cab is bumped or the machine tips or rolls over for any reason, contact the Service Centre immediately to check the cab's rigidity and the active protection that it must provide to the operator.***

### 6.7.1 - Entering and leaving the driving cab



## WARNING

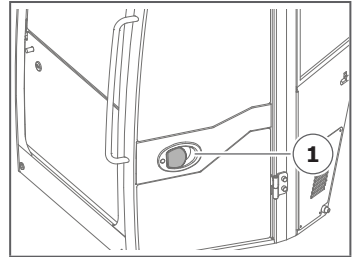
***For the procedures, refer to section "MACHINE ASCENT/DESCENT" to page 2-31.***

***The controls cut-out lever must be raised every time the operator leaves his/her seat. In this way, the controls will not be accidentally activated while the machine is ascending/descending.***

### ENTRY TO THE DRIVING CAB

Access to the enclosed cab is by means of the left hand side door.

To enter the enclosed cab, unlock the door with the key provided, pull the handle (1) to release the latch, and pull to open. Once inside, grasp the special handhold and pull to close and latch the door.



The door can be locked from the outside using the key provided.

It is recommended to note the number of the key so that a spare one can be ordered if necessary.



## WARNING

***The driving cab door should be kept locked when operating the machine, in order to prevent it from opening accidentally.***

## EXIT FROM THE DRIVING CAB



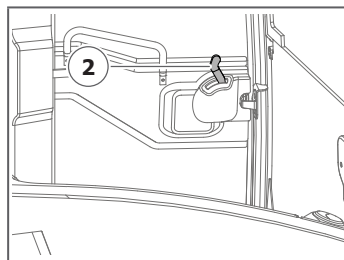
# WARNING

***Before getting out of the cab:***

- ***lower the equipment to the ground;***
- ***lift the controls cut-out lever;***
- ***switch off the engine.***

***In this way, uncontrolled actions will be prevented while the operator is getting off the machine.***

To exit the enclosed cab, grasp the latch release lever (2) and pull inwards, then push the door to open. After having got out, close and lock the door.



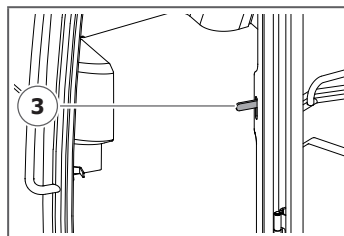
# WARNING

***If an emergency occurs preventing the door from being used, the front windshield of the cab can be used as an emergency exit, for further details refer to section "6.7.10 - Hammer for emergency exit" to page 6-18.***

## OPEN DOOR RESTRAINT RELEASE

The left cab door will be secured in the open position when it is opened and swung to 180°.

To release the door and allow it to close, push down the lever that controls the lock, (3) located on the left upright.



# NOTICE

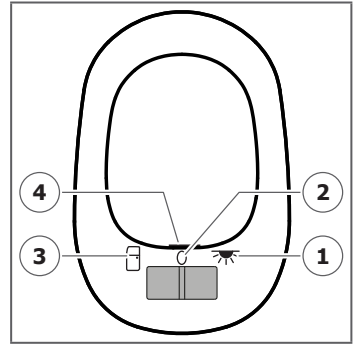
***For easier connection/release, grease the connecting parts of the lock periodically.***

### 6.7.2 - Courtesy light

The courtesy light is positioned on the left upright and it is used to light up the inside of the cab in conditions of poor visibility.

The courtesy light has two operating modes that can be selected by means of the switch:

- **light always on**, put the switch in position (1);
- **automatic light**, put the switch in position (2), in this mode the courtesy light turns on when the door is open;
- **light always off**, put the switch in position (3).



To replace the courtesy light bulb, insert a screwdriver between the protective glass and the light bulb housing (4) to release the locks on the glass, then remove.

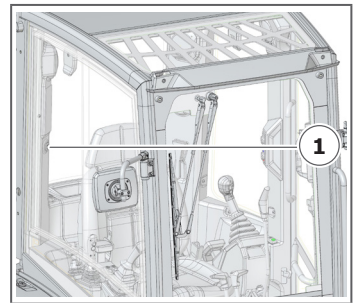
The new light bulb must have the same characteristics as the one replaced.

To refit the courtesy light, carry out the operations in reverse order.

### 6.7.3 - Auxiliary socket inside the cab

An auxiliary socket (1), used to power the rotating head lamp is located on the right upright (inside the cab). The socket is of the ISO 4165 standard two-pin type, powered by 12V.

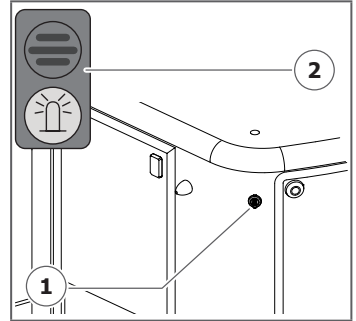
The socket is *locked*; it is powered only when the key in the starting equipment switch is in the STARTING EQUIPMENT position.



#### 6.7.4 - Auxiliary socket outside the cab

An auxiliary socket (1), used to power the rotating head lamp is located on the rear left upright (outside the cab). 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 of the ignition switch is on the IGNITION position. To activate the socket, press the rotating head lamp button on the rear control console (2).



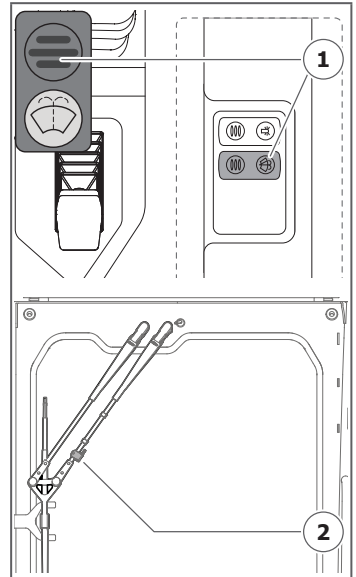
#### 6.7.5 - Windshield wiper

To **activate** the **windshield wiper** use the switch (1) located on the right side of the cab; the first position turns the wiper on, the second position turns on the screen washer; when sufficient cleaning fluid has been dispensed, release the switch.

The ignition key switch must be in **IGNITION** position for the windshield wiper to operate.

Clean the wiper blades periodically with suitable detergents or alcohol. Make sure that they are not damaged or the cleaning will be streaky. Replace the wiper blades if the rubber is permanently deformed or shows any signs of wear.

In case of especially cold conditions (below 0°C) check that the wiper blades have not frozen to the windshield; if necessary, use a special de-icing product.



If the screen washer (2) fails to operate, ensure the supply circuits are not blocked; if necessary clear the spray nozzles using a pin.



### NOTICE

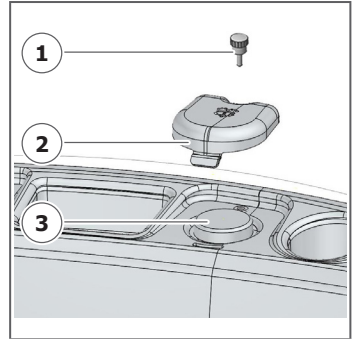
*Failure to follow the above procedures will cause premature wear of the wiper blade rubber.*

### 6.7.6 - Water container for windshield wiper

The screen washer fluid tank cap (3) is located behind the operator station, allowing the screen washer fluid to be topped up.

To **top up** the container:

- unscrew the screw (1);
- remove the cover (2);
- remove the cap (3);
- top up as required.
- Refit the cap, the cover and tighten the screw.



If ambient air temperature is expected to drop below 0°C, use a special washer fluid formulated for low temperatures.

### 6.7.7 - Opening the windshield

The windshield (1) can be opened for ventilation purposes.



## WARNING

***When opening the glass, always make sure that the machine is off to avoid operating the controls accidentally.***

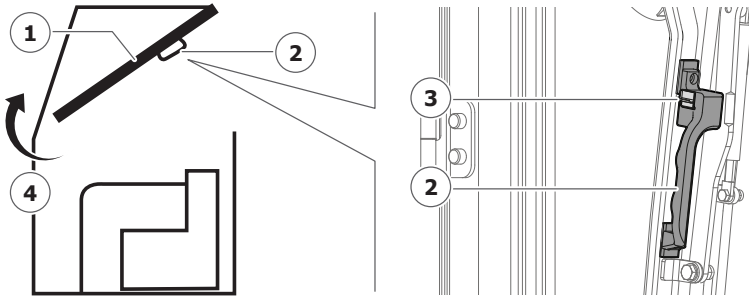
***When opening/closing the windshield, take care not to injure your fingers or your head.***

***Never use the machine without the windshield properly locked in place at the front (windshield closed) or at the top (windshield open).***

***During operations with the equipment, that imply the risk of projected objects which could enter the cab, make sure the cab door and windows are closed and locked.***

To **open** the windshield:

- turn off the machine;
- grab both handles (2) and push the buttons (3) with both thumbs;
- pull simultaneously both handles backwards tilting the windshield inwards (4);
- while still holding the handles, push the windshield upwards until it is parallel with the cab roof and you hear both locks “**click**” into place;
- reposition the display so that the image is clearly visible.



To **close** the windshield:

- turn off the machine;
- grab both handles (2) and push the buttons (3) with both thumbs;
- pull simultaneously both handles downwards tilting the windshield outwards (4);
- while still holding the handles, push the windshield outwards until you hear both locks “**click**” into place.

It is possible to reposition the glass by following the above procedure in reverse order; make sure that **both** levers (2) have locked into place.



## WARNING

***During operations with the equipment, that imply the risk of projected objects which could enter the cab, make sure the cab door and windows are closed and locked.***

### 6.7.8 - Opening the lower front glass

The lower front glass (1) can be opened for ventilation purposes.



## WARNING

**When opening the glass, always make sure that the machine is off to avoid operating the controls accidentally.**

**During operations with the equipment, that imply the risk of projected objects which could enter the cab, make sure the cab door and windows are closed and locked.**

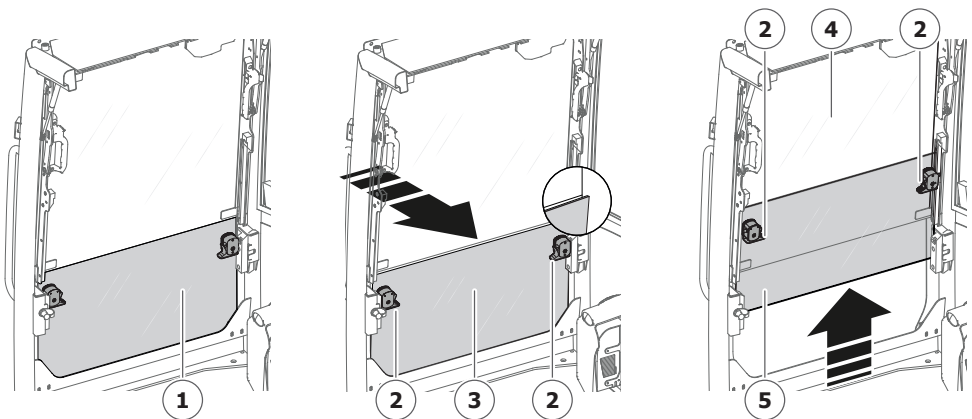
The glass can be tilted inwards or it can be opened completely.

To **tilt** the glass:

- push both levers (2) down;
- pull the glass towards the inside of the cab;
- release the levers and make sure that the glass is locked in the tilted position (3).

To **open** the glass:

- make sure that the windshield (4) is closed;
- push both levers (2) down;
- lift the glass, about 10 cm, upwards (5);
- release the levers and continue to lift the glass making it sliding in the special guides until both levers click;
- open and lift the windshield completely, as described in section "6.7.7 - Opening the windshield" to page 6-14.



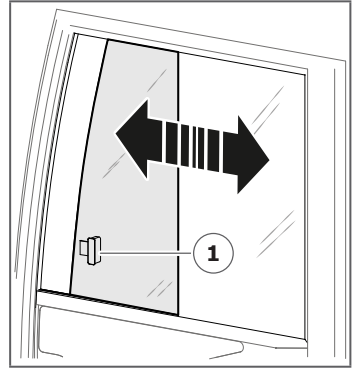


### 6.7.9 - Opening the right side window

The right side of the cab has a window that slides open.

Follow the procedure below to open and close it:

- take hold of the closing handle (1);
- move the window slowly (backwards to open the window, forwards to close it) to the required position;
- let go of the handle (1).



To lock the window closed, push the rear of the closing system forwards until a “click” is heard.



## WARNING

***During operations with the equipment, that imply the risk of projected objects which could enter the cab, make sure the cab door and windows are closed and locked.***

### 6.7.10 - Hammer for emergency exit



## WARNING

***If the glass has to be broken using the hammer, avoid possible injuries caused by shards of glass.***

***Before leaving the cab, remove the fragments of glass left around the windshield edge to avoid injury.***

***Pay attention not to slip on the glass spread out all over the ground.***

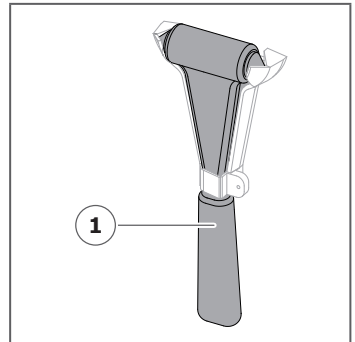
The emergency exit has been identified and indicated in section "2.7 - Safety procedures" to page 2-29.

In the event of an emergency, if the windshield does not open by the normal means, break the it with the hammer (1).



## NOTICE

Make sure that the glass breaker hammer is ***always present*** in the cab and fixed on the upright.

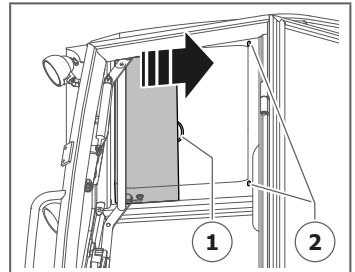


### 6.7.11 - Sun shade

The large top window can be covered with a sun shade to protect from being dazzled by the sun.

Pull the end (1) to lengthen the curtain and to hook it into the appropriate clips (2).

To open the shade again, unhook it and accompany it as it rewinds.



## NOTICE

***Do not let go of the shade suddenly, rewinding too abruptly could damage it .***

### 6.7.12 - Cab ventilation system

The **ventilation and heating** unit allows to keep a comfortable climate in the cab while operating the machine, both in hot weather and in cold weather.

Ventilation and exchange of air are achieved by means of a variable speed fan.

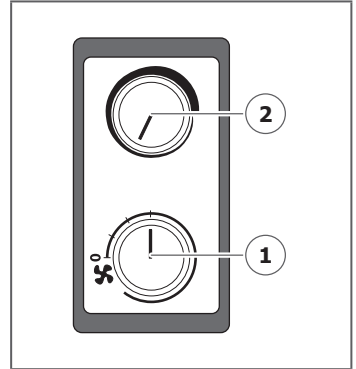
The ventilation power and temperature of the ventilated air are controlled by two hand grips on the rear right upright.

To adjust the fan **speed**:

- turn the hand grip (1) and bring it to the desired speed.

To adjust the **temperature** of the ventilated air:

- turn the hand grip (2) counter-clockwise for cold air or clockwise for warm air.



### AIR VENTS

The air vents can be adjusted and are arranged in such a way that to make the cab comfortable and well ventilated.

The air vents (3-4) are positioned so as to direct the airflow towards the front windshield, in order to keep the glass clear.

A slot (5) is positioned to direct the air flow towards the operator.

A slot (6) is positioned behind the seat in order to direct the air flow towards the rear windshield in order to demist the glass.



### 6.8 - 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 machine can be equipped with devices to improve visibility, such as rear-view mirrors; refer to the procedures below for instructions on how to use them.

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.**

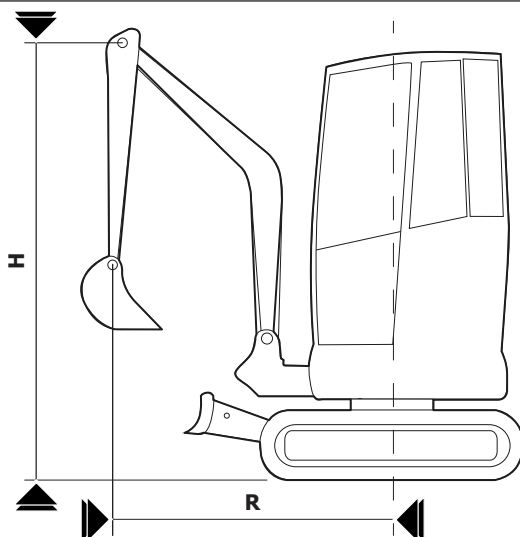
## 6.8.1 - Travel position

To move, keep the machine configured as indicated below.

- move the boom to a swing angle equal to **0°** (if present);
- lift the first boom completely;
- position the digging boom vertically;
- position the bucket as indicated in the figure;
- raise the dozer blade 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 booms as closely as possible to the indications listed above, ensuring a distance of **approximately 400 mm** between the ground and the equipment itself;
- ensure that the site is properly organised to minimise the risks of limited visibility.



|          |                                                                              |            |
|----------|------------------------------------------------------------------------------|------------|
| <b>H</b> | Height from ground at centre of pin of first/second boom                     | ~ 2,900 mm |
| <b>R</b> | Distance from the centre of the slewing ring to the centre of the bucket pin | ~ 1,750 mm |

### 6.8.2 - Adjusting the rear view mirrors

The rear-view mirrors are installed as standard on the cab version, while they are an optional accessory on the canopy version.



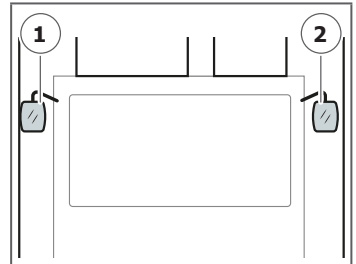
## WARNING

***Adjust all rear-view mirrors as indicated in this manual.***

The machine can be equipped with rear-view mirrors installed on the machine:

- 1** - left side (**1**);
- 2** - right side (**2**).

The rear-view mirrors improve visibility in the area surrounding the machine.

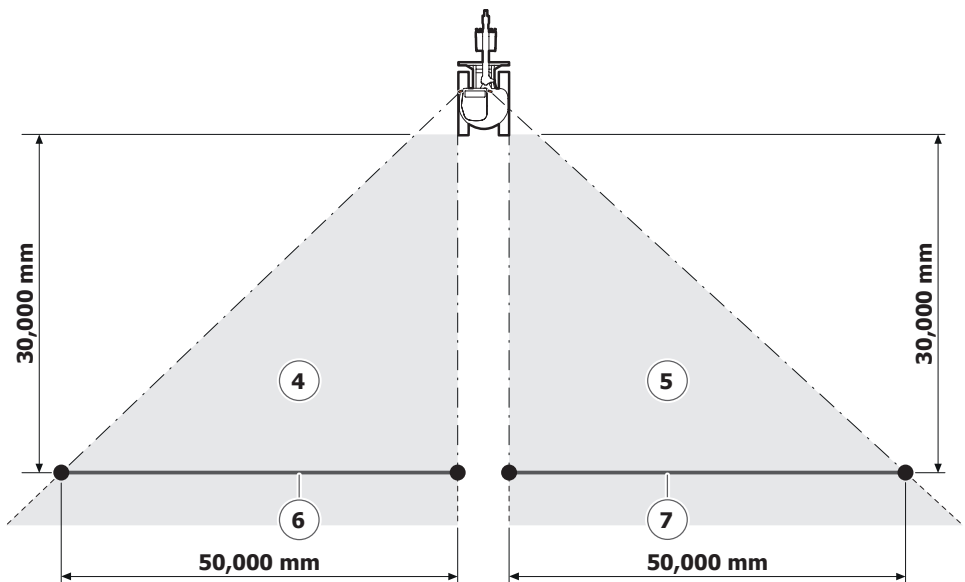


Before starting the machine or each time the operator changes, it is necessary to make sure that the rear-view mirrors are not damaged, that they are clean and that they are adjusted according to the following procedures.

It is advisable to use the help of an operator outside the machine who must move the mirrors while the operator in charge of driving the machine is sat in the driver's seat with the seat belt fastened, providing instructions for correct adjustment.

### Adjusting the side mirrors:

- park the machine on a level surface, with plenty of space and without any obstacles;
- lower the equipment and the dozer blade to the ground;
- raise the control cut-out lever and stop the engine;
- adjust the rear-view mirrors so as to ensure the visibility of the area indicated in the figure; adjust them from the ground without climbing onto the tracks or any other parts of the machine; if they cannot be reached from the ground, use an approved ladder;
  - use the left side mirror to view the area (4);
  - use the right side mirror to view the area (5);
- the area indicated (4-5) is measured at ground level;
- be sure to see the ground indicated by the line (6-7);
- be sure to also see part of the machine.



**NOTE:** picture not to scale.

## 6.9 - 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.

#### 6.9.1 - Checks prior to the start up

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

Perform the reading of the hour meter to check whether periodic maintenance is required, see section "8.10 - Regular maintenance" to page 8-35.

---



### **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 second 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.

---

### **7 POSITIONING OF REAR-VIEW MIRRORS (IF PRESENT)**

Make sure the rear-view mirrors are intact and correctly positioned so as to ensure the complete visibility around the machine.

---

### 6.9.2 - 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 the operator is sitting in the driver's seat and with the seat belt fastened.***

***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.***

---

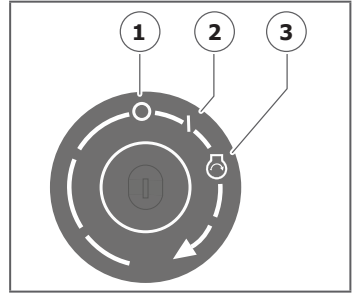
***If the machine is fitted with an electric immobiliser (optional), before proceeding, carry out the operations described in section "6.10 - Start-up procedure with electric immobiliser (optional)" to page 6-33.***

## IGNITION SWITCH

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

The starter switch has four positions:

- 1 - "OFF";
- 2 - "IGNITION";
- 3 - "START-UP".



### 1 - "OFF" POSITION:

In this position, power is supplied only to the stereo system, the courtesy lights in the cab and to the fuel pump. The key can be inserted or removed in this position.

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;
- joystick servo relays;
- bougies;
- horn;
- working lights;
- enclosed cab and cab equipment (if provided).

### 3 - "START-UP" 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.*

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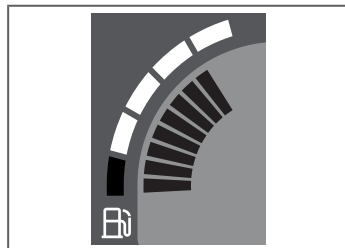
### FUEL INDICATOR

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

Prior to engine start-up, briefly turn the ignition 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 8-16.*

*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.

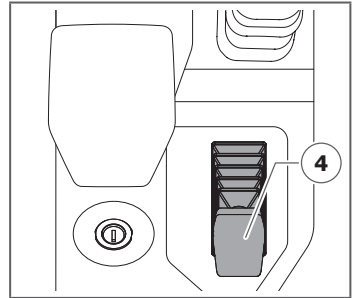
If this warning light turns ON during operation, refill the fuel tank immediately. After topping up, with the engine running, the indicator light goes off.



## THROTTLE LEVER

This command (4) controls the engine speed.

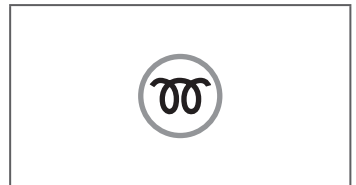
A complete description of the operating principle is provided in section "6.17 - Throttle lever" to page 6-44.



## PRE-HEATER

The bougies are electronically controlled, and are supplied with power whenever the ignition 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.*

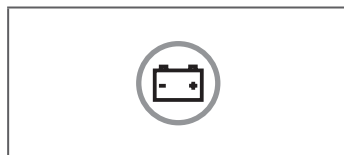
*In all the cases listed above, contact the Service Centre, who will check the machine to eliminate any faults.*

---

## 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.*

---

### AIR FILTER CLOGGED WARNING LIGHT

This warning light comes on to indicate that the air filter is clogged and requires maintenance.

Refer to the "8 - Maintenance" to page 8-1 chapter of this manual for the proper service procedure.



### NOTICE

*If the warning light comes on during normal machine operation, stop the work and switch off the engine, proceed with maintenance of the air filter.*

---

### COOLANT TEMPERATURE INDICATOR

This indicator indicates the temperature of the cooling liquid.

The normal operating temperature is between 80°C and 95°C.



### 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.*

---

### START-UP

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.*

---



## 6.10 - Start-up procedure with electric immobiliser (optional)

An immobiliser is an electrical device which only allows the machine to be started if it is switched off using a special electronic key.

This system prevents the machine from being started up by unauthorised persons.

The immobiliser consists of:

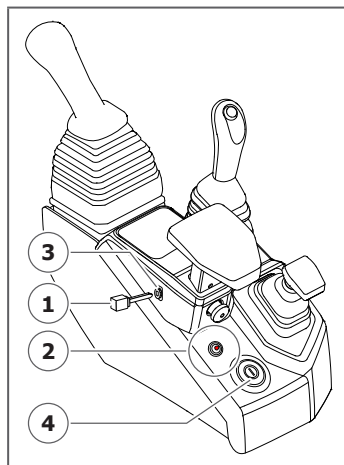
- electronic key (1);
- Status LED (2);
- key reader (3);
- key card.

When the LED (2) flashes slowly, the immobiliser is active (the engine CANNOT be started).

To **disable** the immobiliser:

- insert the electronic key (1) into the reader (3), the LED lights up with a steady light indicating that the key has been recognised;
- remove the electronic key and turn the ignition key (4) within 30 seconds, the LED goes out and the engine starts;
- when the engine is stopped, the immobiliser is automatically activated after 30 seconds.

To start the engine once more, repeat the above procedure.



## NOTICE

*The engine cannot be started with an inserted electronic key.*

*It is advisable to use a single key fob for the electronic key and the machine ignition key.*

For the complete machine start-up procedure, see section "6.9.2 - Procedure for starting the machine" to page 6-26.

A duplicate key card is supplied for use in the event of loss and a key card to be used when requesting additional replacement keys. If both key and the key card are lost, contact the Service Centre.

## 6.11 - Engine jump-starting procedure

If the engine does not start by following the procedures given in section "6.9.2 - Procedure for starting the machine" to page 6-26, check if the battery is charged. Replace the battery if necessary (refer to section "8.8 - Battery" to page 8-31).

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



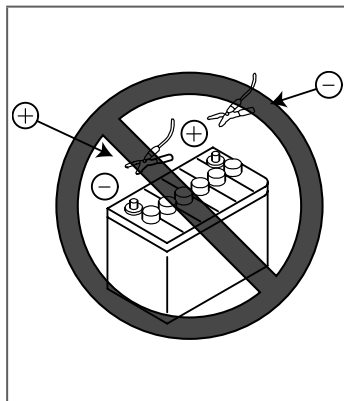
## WARNING

***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.*

---

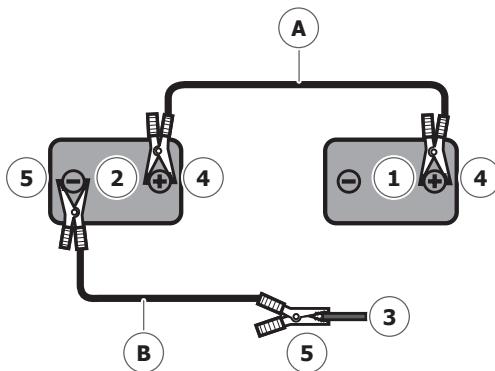
The machine used for the jump-start must be equipped with a 12 V negative earth system and a battery of at least 500 CCA (cold start amperes).

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 8-8.

## 6.11.1 - 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:

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

## 6.11.2 - Starting the engine



## WARNING

**Before starting the engine, make sure the servo-control cut-out lever is RAISED. If one of the equipment control levers is touched by accident during starting, the working equipment could move suddenly and cause serious damage or injury.**

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.

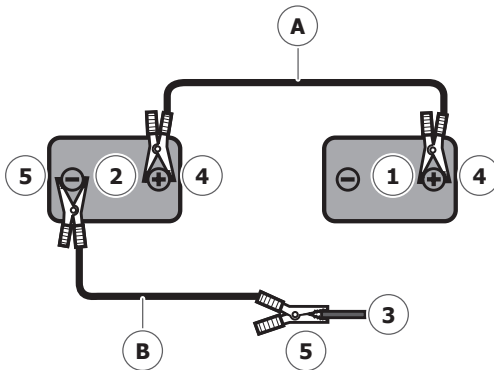
Turn the starter switch of the machine to be started to the START position and start the engine.

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

### 6.11.3 - 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**).



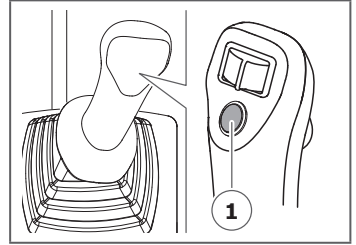
#### Key:

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

#### 6.11.4 - Horn

The horn button (1) is located at the bottom of the **left joystick** and is activated when the ignition key switch is set to the "IGNITION" 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.



#### 6.12 - Work lights

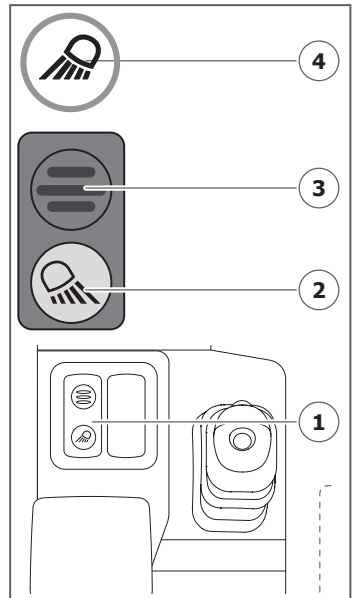
On the machine there are **work lights** that are to be used when visibility is low.

One light is positioned as standard, on the first boom; other lights (optional) can be placed on the protective structure.

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

- press the symbol (2):
  - **first click:** to turn on the front lights;
  - **second click:** to turn on **also** the optional lights (if present);
- press the opposite side (3): to turn off the lights.

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



## 6.13 - Using the machine in lower temperature conditions 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 8-19.

#### COOLING LIQUID

Use a cooling liquid that is suitable for low temperatures, see section "8.7.5 - Cooling liquid" to page 8-22.

#### ENGINE OIL

Use oil that is suitable for low temperatures, see section "8.7.4 - Engine oil" to page 8-20.

#### HYDRAULIC OIL

Use oil that is suitable for low temperatures, see section "8.7.6 - Hydraulic system oil" to page 8-23.

## **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 8-31.

### **6.14 - 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.***





## **WARNING**

***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.***

***Do not rest the feet on the control pedals when not in use; rest your feet on the floor, or, alternatively, on the supports provided at the side of the travel levers (if present).***

***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 try to crush concrete or boulders using the sideways motion of the bucket.***

***Do not free-fall the bucket during excavation.***

***Do not travel nor dig with the bucket stuck into the ground.***

***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.***



## WARNING

### **While reversing:**

- **before commencing any movement, check that there are no persons or obstacles in the surrounding area;**
- **if there are areas of which the operator has poor visibility, position a person who will be able to carry out signalling operations;**
- **take particular care not to bump into other machines or persons when turning or rotating the machine;**
- **always be sure to take the above precautions, even when the machine is fitted with rear-view mirrors.**

**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

When driving or transporting the machine with the booms collected, do not allow the bucket to strike against the blade.

After having operated in water or mud, always clean and inspect the machine and grease the pins on the bucket, the swing post, and any other parts that have been submerged.

Digging with the booms on the opposite side of the blade prevents the cylinder of the first boom from striking against the blade.

Do not operate the digging boom with brusque movements, especially if moving downwards: the track frame could get damaged.

Ensure that the rear of the machine does not hit anything while turning.

Before starting to work, always make sure the equipment installed does not collide against the booms.

During excavations in depth, make sure the cylinder of the digging boom and the second boom are not accidentally hitting the ground.

Do not try to move rocks or similar objects using the blade: it can damage both the blade and its cylinder.

## 6.15 - Stopping the machine

To stop the machine, proceed as follows:

- park the machine as described in section "6.22 - Parking the machine" to page 6-56;
- reduce the engine speed to minimum;
- turn the starting equipment key switch to **OFF** and remove the key;
- open the controls cut-out lever;
- Enable the slewing lock (if provided);
- Close all the windows (if fitted);
- unbuckle the seat belt and get out of the machine;
- close and lock the cab door (if present) and the all covers, refer to section "8.3 - Guards" to page 8-8.



### **NOTICE**

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

*Always protect the electrical components of the cab (if present) from harsh weather conditions and make sure all windows, the sliding glass and the access door are closed.*

---



### **WARNING**

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

***Do not leave the machine turned on.***

## 6.16 - 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

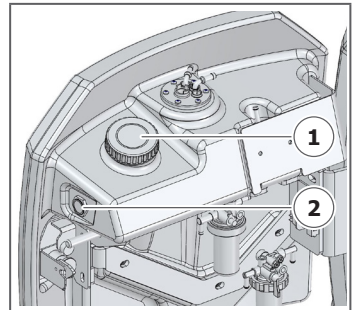
***When topping up with fuel, take care not to spill any, clean up any spillage carefully.***

***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;
- when the fuel level has reached the visual indicator (2), the tank is full;
- replace the cap (1).

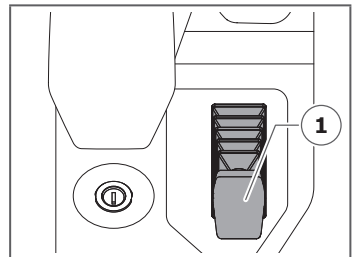


## 6.17 - Throttle lever

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

**Minimum position:** the control is pushed completely forward.

**Maximum position:** the control is pushed completely backwards.



## 6.18 - Machine movement

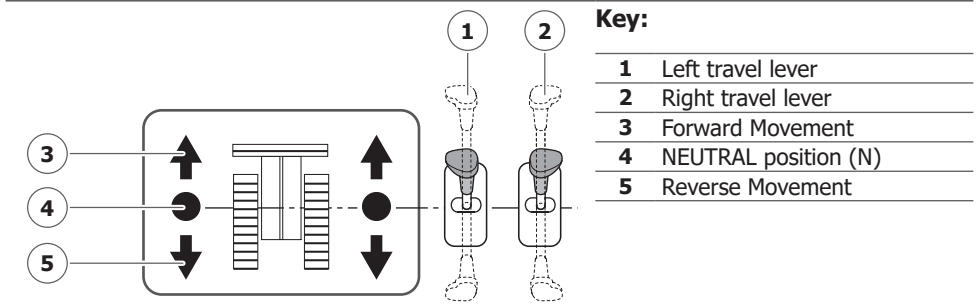
**For safe machine movement, always move the travel control levers slowly and smoothly. Operators which are not familiarised with tracked machines should initially operate the machine at 50% of its maximum travel speed until they master the control function and feel confident on the machine.**

The travel levers control the machine FORWARD and REVERSE motion, as well as LEFT and RIGHT steering and braking. The left lever controls the left track, while the right lever controls the right track.

The functions of both controls are locked out when the control cut-out lever is raised to allow entry or exit from the machine. To enable the controls, the control cut-out lever must be fully lowered, see the procedure given in section "6.6 - Controls cut-out lever" to page 6-8.

With both levers in the **NEUTRAL** position (**N**), both tracks are motionless and hydraulic braking is engaged on the travel engines.

- Whenever either lever is moved from its **NEUTRAL** (**N**) position, the brake for the related track drive is released and movement starts.
- Whenever either lever is returned to its **NEUTRAL** position (**N**), the movement of the respective track drive ceases and braking is engaged back.





## **NOTICE**

*Unless specifically noted, all references to direction in this manual, including travel and turn instructions, are deemed to be from the operator's point of view and with the dozer blade at the front.*

*The travel control levers operate the track drive engines mounted on the undercarriage.*

*The machine movements depend on the driver's orientation; if the operator is turned 180° in relation to the dozer blade, the machine movements are the opposite of those indicated in the operating instructions.*

---



## **NOTICE**

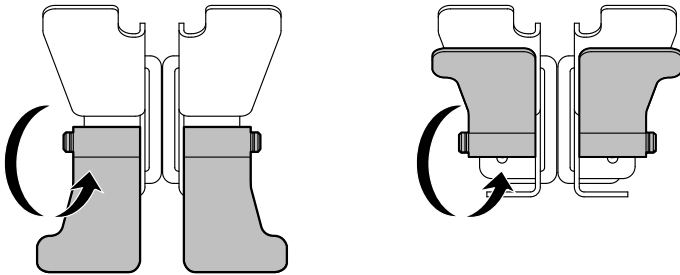
*Both the hand travel control levers have projecting pedals near the bottom of each lever.*

*These pedals allow the operator to operate the tracks without removing his/her hands from the joysticks.*

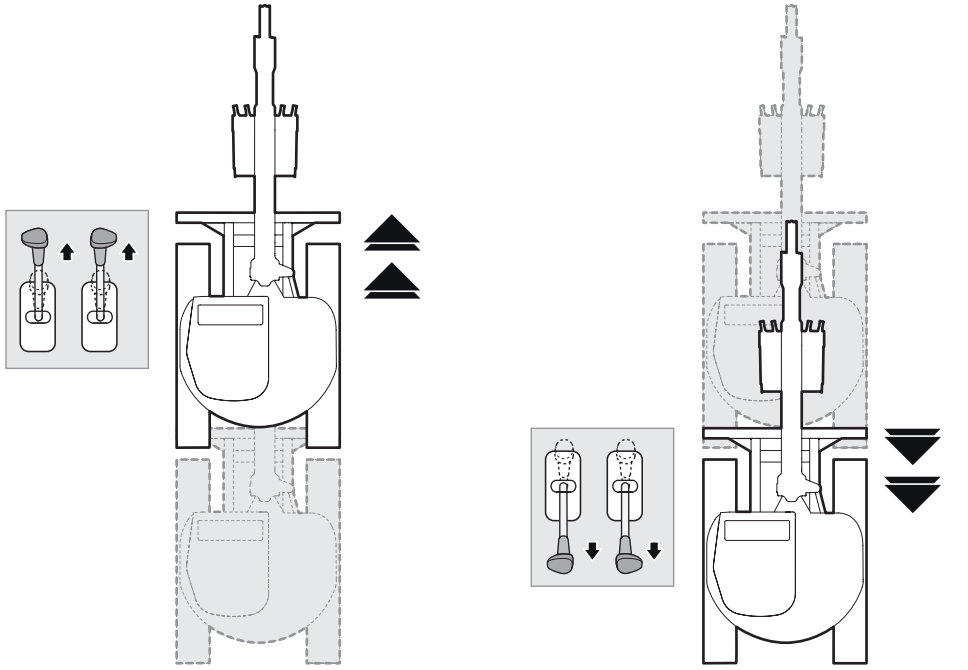
---

The pedals have rear parts that can be folded forwards to reduce their size. This gives more room for climbing into and out of the cab and for placing the feet while working.

---



### 6.18.1 - Forward and reverse travel



To begin **FORWARD** travel, move both control levers forward equally. As additional pressure is applied on the control levers, the machine speed will increase. To STOP the forward travel, return slowly both controls to their NEUTRAL (N) position.

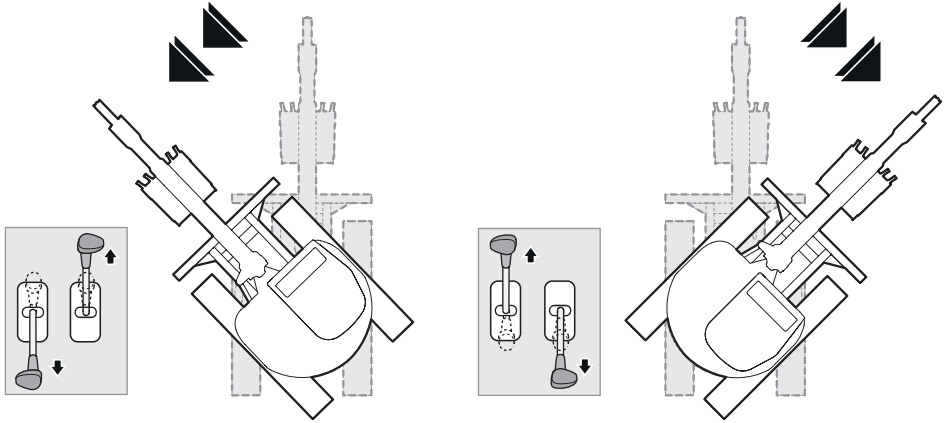


### **NOTICE**

*Any forced, quick return of either travel control levers to the NEUTRAL position will cause an immediate braking response from the respective track drive.*

To travel in **REVERSE**, pull back slowly on both control levers. The further the controls are moved, the more the speed of movement will increase. To STOP REVERSE travel, slowly return both controls to their NEUTRAL (N) position.

### 6.18.2 - Pivoting the machine around its axis

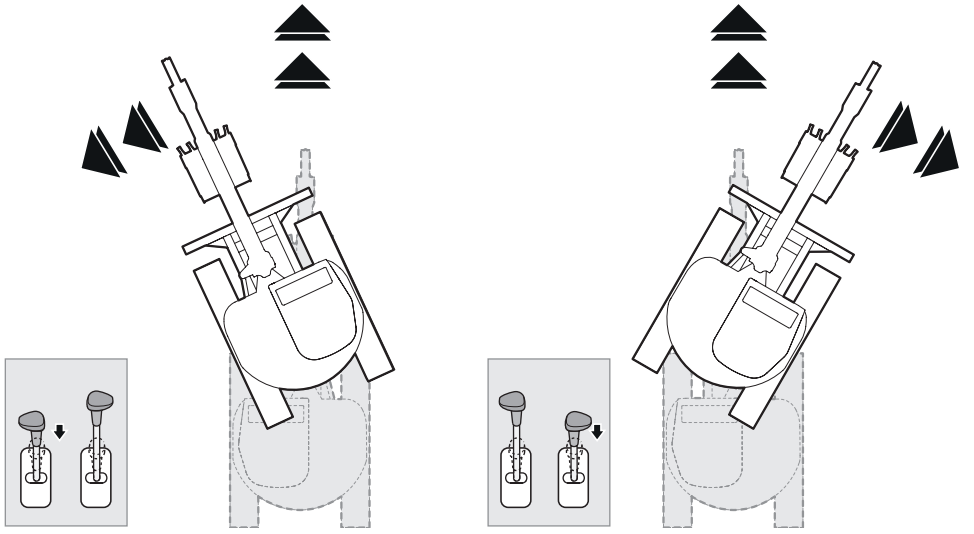


To pivot the machine to the **LEFT** on its axis, push the right control lever forward while pulling the left lever to the rear.

To pivot the machine to the **RIGHT** on its axis, push the left control lever forward while pulling the right lever to the rear.



### 6.18.3 - Turning while moving forward

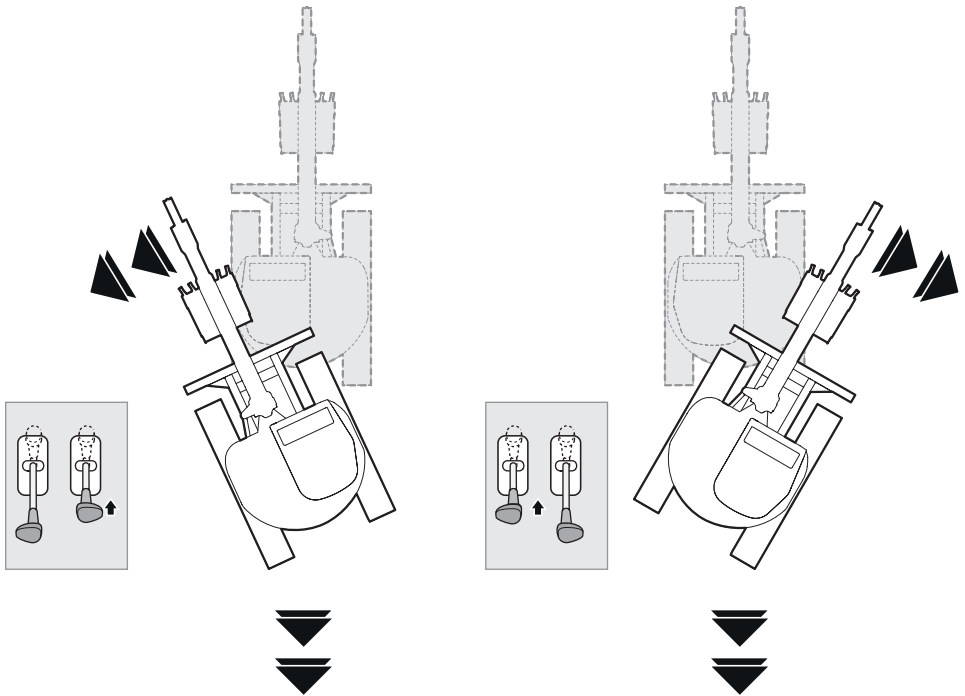


With the machine travelling straight **FORWARD**, both control levers must be pushed forward by equal amounts.

To turn **LEFT** while travelling **FORWARD**, reduce forward pressure slightly on the left hand lever, thus slowing down the left track. The machine will turn toward the **LEFT**.

To turn **RIGHT** while travelling **FORWARD**, reduce forward pressure slightly on the right hand lever so that the machine will turn toward the **RIGHT**.

#### 6.18.4 - Turning while reversing



With the machine moving straight in **REVERSE**, both control levers must be pulled back by equal amounts.

To turn **LEFT** while **REVERSING**, reduce rearward pressure slightly on the right hand lever, thus reducing the speed of the right track. The machine will turn toward the LEFT.

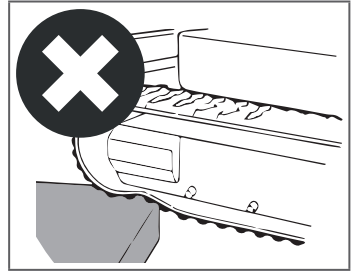
To turn **RIGHT** while **REVERSING**, reduce rearward pressure slightly on the left hand lever so that the machine will turn toward the RIGHT.

### 6.18.5 - Precautions during the operation of the tracks

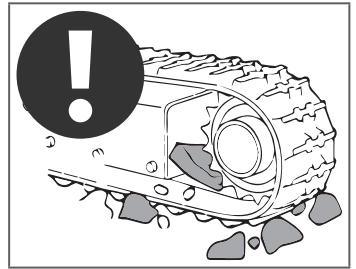
All of the above precautions are applicable to both rubber tracks and steel tracks (optional).

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

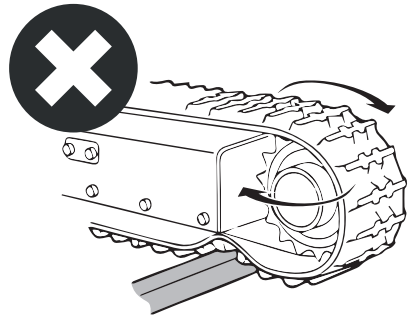
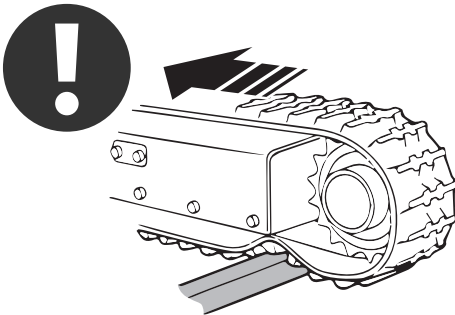
The machine will subject the track to an excessive load, resulting in the breakage or cutting of the tread (in the case of rubber tracks, the internal steel cord may be damaged).



Prevent foreign bodies from getting stuck between the track and the frame or the components of the undercarriage; if this happens, the entire undercarriage may be damaged and the track may be deformed and/or cut.



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 rubber 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.***

***Rubber tracks are less stable than those made of steel due to their flexibility. Be very careful when operating a machine with rubber tracks.***



## NOTICE

*Any movements or steering over protruding bodies or uneven ground may cause the local loosening of the track resulting in the possible release of the same (in the case of rubber tracks, the internal steel cord may be damaged).*

*Avoid rotating around the machine axis at high speed.*

*Rotating around the machine axis on a surface made of high friction material, such as sharp stones, could damage the track and the components of the undercarriage.*

---

### 6.19 - Travel speed

The machine features double travel speed which can be used in both directions.

The two gears are called:

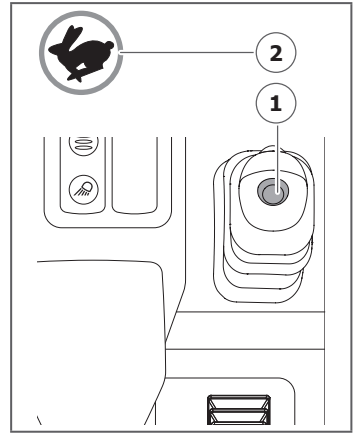
- **1<sup>st</sup>** gear or slow gear;
- **2<sup>nd</sup>** gear or fast gear.

The gear is activated by means of a button **(1)** located on the top part of the dozer blade lever.

The gear is changed by pressing the button (it is not necessary to keep it pressed).

When the fast gear is active, the relative light **(2)** turns on.

It is possible to change gear before or during travel.



The machine features the **AUTO SHIFT DOWN** function (automatic, cannot be disabled). While travelling in fast gear, after a certain stress value has been exceeded, the machine will be placed in slow gear. When the stress decreases, the machine will return to fast gear.

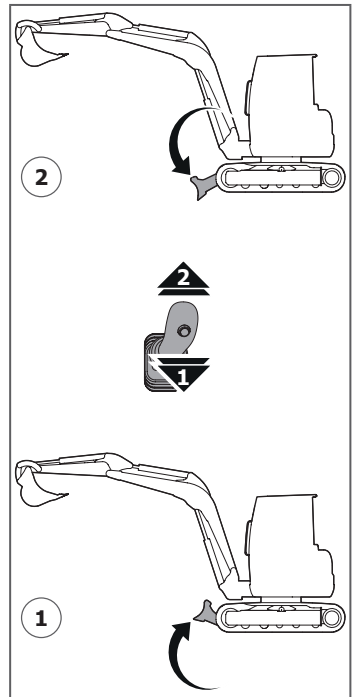
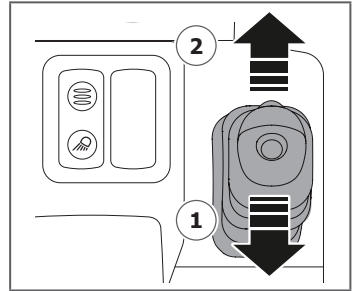
## 6.20 - Dozer blade control lever

This lever controls the raising/lowering of the dozer blade:

**1 - TO RAISE:** pull the lever backwards.

**2 - TO LOWER:** push the lever forwards.

The operation may be performed both while the vehicle is stopped and when it is moving (while travelling).



### Key:

- |   |                                     |
|---|-------------------------------------|
| 1 | Raised position of the dozer blade  |
| 2 | Lowered position of the dozer blade |



## WARNING

***If the cylinder of the dozer blade is not equipped with a security valve (optional), the dozer blade must not be used to stabilise the machine.***

***If the dozer blade is used improperly, the hydraulic hoses can get damaged and cause a sudden loss of stability of the machine with the consequent damage to the operator and/or to the machine.***



## NOTICE

*Before starting any digging operation, LOWER the dozer blade until it is completely touching the ground.*

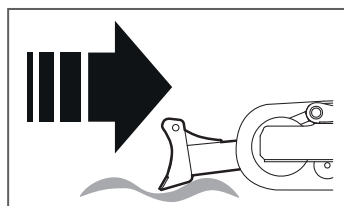
*When parking the machine, the dozer blade must be LOWERED to the ground.*

### 6.21 - Dozer blade floating command (optional)

The machine can be equipped with the dozer blade floating command.

This allows to neutralise the function of the dozer blade cylinder, shorting the bottom sides and stem. In this condition, the blade is free to move up and down following the unevenness of the ground and simply resting on the ground by gravity.

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

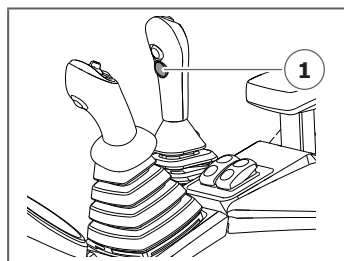


## WARNING

***Do not activate the floating command if the tracks are lifted from the ground by means of the blade; the machine will undergo a sudden drop which may cause it to tip or roll over.***

The floating mode is activated by means of a button located on the front of the dozer blade lever:

- button (1) on standard dozer blade lever.



## NOTICE

*Activate the dozer blade floating command only when the blade is resting on the ground, because as it drops suddenly, it may get damaged and/or it may damage the objects under it.*

## 6.22 - Parking the machine



# WARNING

***Avoid as much as possible parking the machine on slopes.***

Parking procedure:

- 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;
- align the turning frame to the undercarriage so that the dozer blade stays near the boom;
- lower the dozer blade and the equipment to the ground;
- shut down the engine according to the procedures specified in section "6.15 - Stopping the machine" to page 6-43;
- then turn the starter switch to the "OFF" position and remove the key;
- Pull upwards the control cut-out lever ensuring that it comes up all the way.
- Enable the slewing lock (if provided);
- Close all the windows (if fitted);
- Get off the machine;
- Close and lock the cab door (if present) and the covers indicated in section "8.3 - Guards" to page 8-8.



# NOTICE

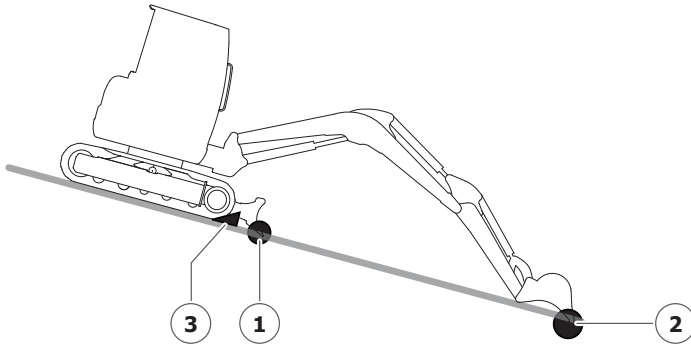
*It is not necessary to enable the parking brakes, they get enabled automatically.*

---



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

- point the dozer blade down the slope and dig it in the ground (**1**);
  - position the bucket down the slope and make sure the teeth of the bucket are dug in the soil (**2**), if no equipment that can be dug into the ground is present, just rest the bucket to the ground;
  - block suitably (using wedges **3**) both tracks.
- 



### **NOTICE**

*Always protect the electrical components of the cab from harsh weather conditions and make sure all windows, the sliding glass and the access door are closed.*

---

## 6.23 - Operating the boom



### **NOTICE**

*The joystick controls allow to operate the first boom, the second boom, bucket and slewing.*

---

The functions of all controls are locked out when the controls cut-out lever is open to allow entry or exit from the machine. To enable both joysticks, the controls cut-out lever must be fully closed, see the procedure given in section "6.6 - Controls cut-out lever" to page 6-8.



### **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.*

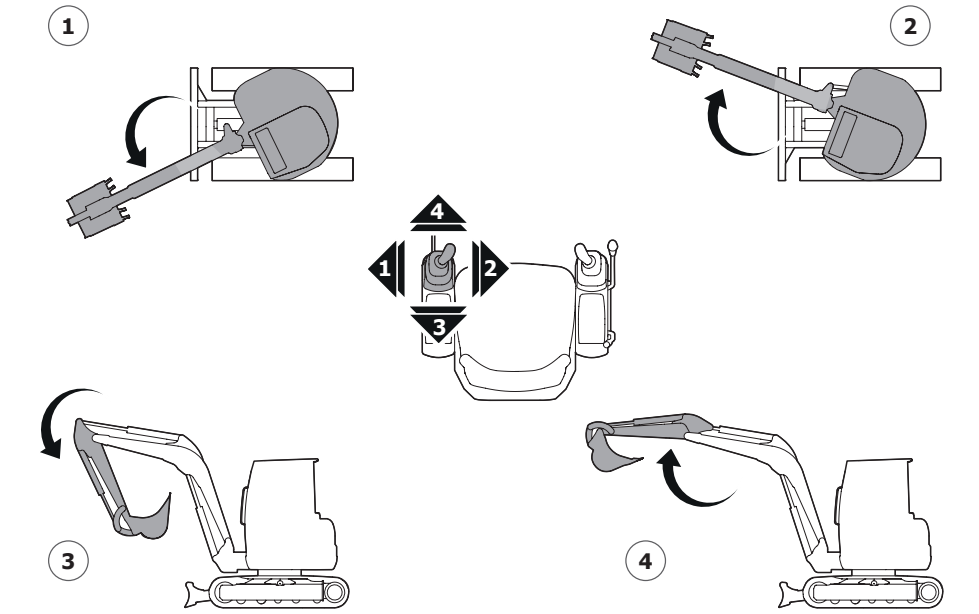
*Some movements of the boom have a function that slows down the speed of the hydraulic cylinder near the limit stop. This feature reduces brusque movements during work, ensuring longer life of the machine components.*

---

### **6.23.1 - Left Joystick**

The left joystick controls the extension and retraction of the second boom, as well as the RH and LH rotation of the first boom and turning frame:

- Moving the left joystick to the LEFT will swing the turning frame to the left (**1** - counter-clockwise direction);
- moving the left joystick to the RIGHT will swing the turning frame to the right (**2** - clockwise direction);
- pushing the left joystick BACKWARDS will lower the second boom (**3**);
- pulling the left joystick FORWARDS will raise the second boom (**4**).



## Key:

- |   |                                                          |
|---|----------------------------------------------------------|
| 1 | Slewing of the turning frame and first boom to the left  |
| 2 | Slewing of the turning frame and first boom to the right |
| 3 | Closing the second boom                                  |
| 4 | Opening the second boom                                  |



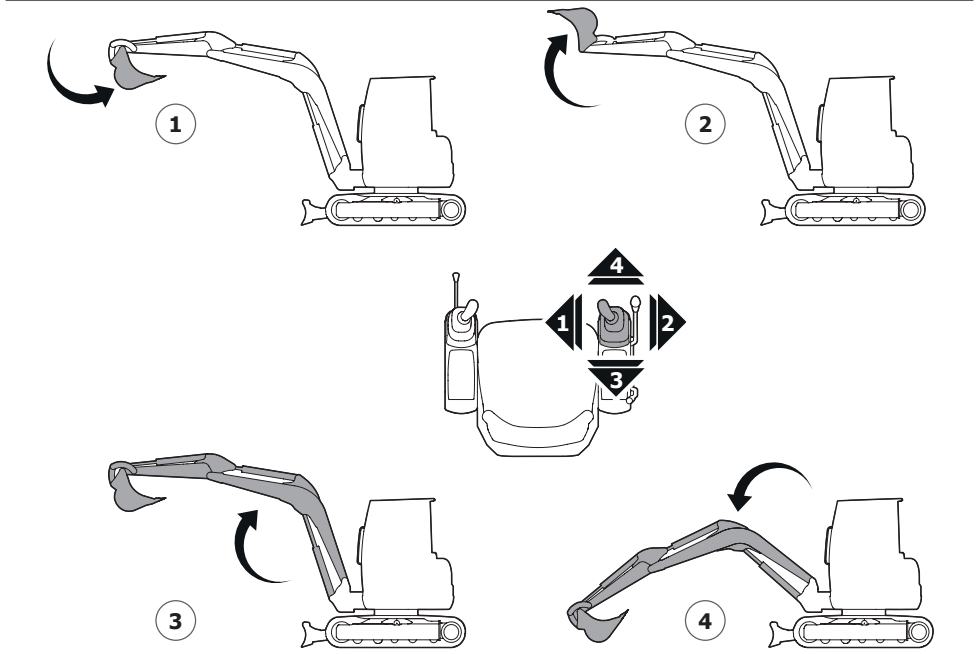
## NOTICE

*When the joystick is in neutral position (in the centre), the slewing service brake is automatically engages; this braking is of a mechanical type (negative) and, therefore, is always on during normal machine use, acting also as parking brake. The brake is automatically enabled when the machine is stopped.*

## 6.23.2 - Right joystick

The right joystick controls the raising and lowering of the digging arm and controls the movement of the bucket. The bucket works according to the switches on the second boom which must be in DIG mode:

- 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);
- pushing the right joystick FORWARD will extend the first boom (3);
- pulling the right joystick BACKWARD will retract the first boom (4).



### Key:

|   |                         |
|---|-------------------------|
| 1 | Closing the bucket      |
| 2 | Opening the bucket      |
| 3 | Lifting the first boom  |
| 4 | Lowering the first boom |

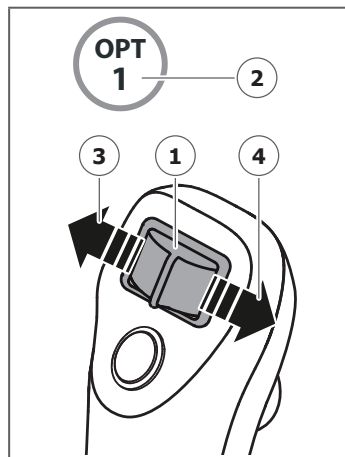
## 6.24 - Boom swing control

The boom swing is the movement made by the first boom when it is rotated to the left or right with respect to the turning frame.

The control can be activated by means of the boom swing roller (1), on the upper side of the **left joystick**.

To **operate** the boom swing control:

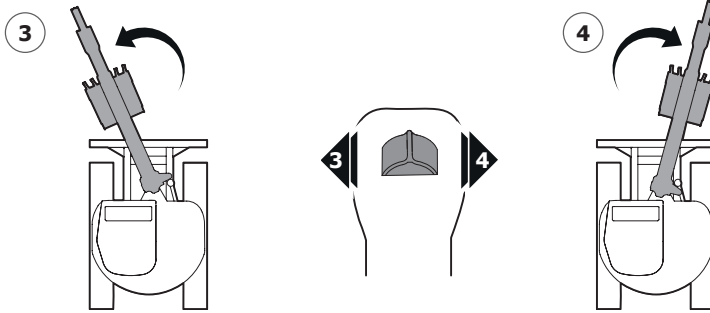
- check that the indicator light OPT1 (2) on the control panel is **off**;
- push the roller to the **LEFT** to turn the first boom to the left;
- release the roller when the boom reaches the required position;
- push the roller to the **RIGHT** to turn the first boom to the right;
- release the roller when the boom reaches the required position.



## **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.*

---



**Key:**

- |          |                                                                            |
|----------|----------------------------------------------------------------------------|
| <b>3</b> | By pushing the roller to the left, the first boom will swing to the left   |
| <b>4</b> | By pushing the roller to the right, the first boom will swing to the right |



## WARNING

***If a very wide equipment is fitted (ditch cleaning bucket) and the machine is operated with the boom slewed, pay attention when the equipment moves closer to the machine body and/or to the operator protective structure. This position may cause impacts resulting in severe or fatal injury.***

### 6.25 - 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 discharge the residual pressure:

- position the machine on flat, compact ground;
- lower the equipment and the dozer blade to the ground;
- switch off the engine;
- turn the ignition key to the IGNITION position (without starting the engine);
- keep the controls cut-out lever lowered;
- operate all controls (joysticks, levers and roller) to release the pressure;
- stop the machine;
- slowly unscrew the cap of the hydraulic oil tank;
- proceed with the maintenance of the hydraulic system.

## 6.26 - Boom swing/AUX2 hydraulics system selector button (optional)



# WARNING

**Before each use, check the status of the indicator light on the boom swing/AUX2 hydraulic system (OPT1 - 1) selector button on the control panel to be sure which control is to be activated.**

**The activation of an undesired control may cause serious injuries.**

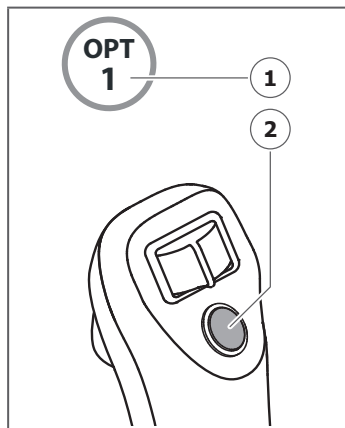
If the machine is equipped with an AUX2 hydraulic system (optional), the control associated with the boom swing function can be switched to the AUX2 hydraulic system function (for further information on the individual functions refer to sections "6.24 - Boom swing control" to page 6-61 and "6.27.4 - AUX2 Auxiliary hydraulic system (optional)" to page 6-76).

Either one of the two functions can be selected by means of the boom swing/AUX2 hydraulic system selector button located:

- on the right joystick (**2**).

The active mode is indicated by the activation of the OPT1 indicator light (**1**) located on the control panel:

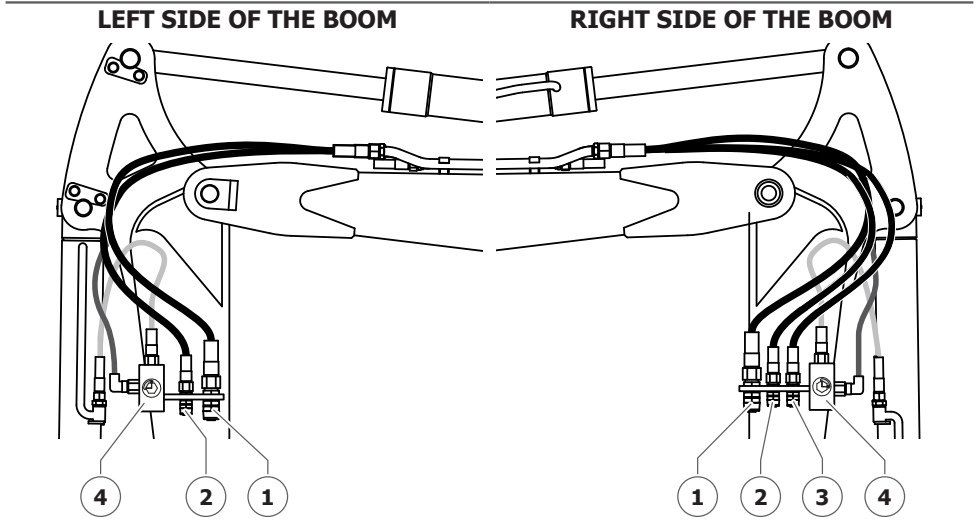
- indicator light **off**: **boom swing** mode selected;
- indicator light **on**: **AUX2** auxiliary hydraulic system function selected.



## 6.27 - Auxiliary hydraulic systems

The second boom features the end of some pipes that can be connected to optional equipment that require additional hydraulic functions.

The pipes are on both sides of the boom; below is an indication of which system each pipe refers to.



### Key:

|   |                            |
|---|----------------------------|
| 1 | AUX1                       |
| 2 | AUX2 (optional)            |
| 3 | Drain line (optional)      |
| 4 | Mechanical AUX3 (optional) |



| Auxiliary hydraulic system     | Max capacity (l/min)                  |                                       | Pressure max (bar) |       | Connection thread          |
|--------------------------------|---------------------------------------|---------------------------------------|--------------------|-------|----------------------------|
|                                | left                                  | right                                 | left               | right |                            |
| <b>AUX1</b> Standard Mode      | <b>36</b> std setting - max <b>50</b> | <b>36</b> std setting - max <b>50</b> | 200                | 250   | 1/2" GAS lh<br>3/4" GAS rh |
| <b>AUX1</b> Shredder head mode | 19                                    | /                                     | 180                | /     | 1/2" GAS lh<br>3/4" GAS rh |
| <b>AUX2</b>                    | 12                                    | 8                                     | 250                |       | 1/4" GAS lh<br>1/4" GAS rh |
| <b>Mechanical AUX3</b>         | 29                                    | 22                                    | 250                |       | 3/8" GAS lh<br>3/8" GAS rh |
| <b>DRAINAGE LINE</b>           | //                                    | //                                    | //                 |       | 1/4" GAS                   |

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

### 6.27.1 - Connection of equipment to the hydraulic systems



## WARNING

***Read carefully the contents of the equipment instruction manual before using the machine or carrying out any maintenance operations.***



## WARNING

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

---

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 "6.25 - Discharge residual pressure in the hydraulic system" to page 6-62;
- remove the caps from the ends of the taps indicated, take care not to damage or lose the parts removed;
- connect the pipes from the equipment to the taps, making sure that the characteristics and sizes of the fittings are the same as those prescribed.



## **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**

*For any doubts that may arise concerning the connection of the equipment to the hydraulic system, contact 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.*

---

### **6.27.2 - Connections on second boom**

The pipes of the auxiliary systems end with threaded fitting on which taps are installed which allow to isolate the hydraulic system from dirt entering and prevent oil leaks if no equipment is connected.

The hydraulic equipment must be connected to the taps by means of flexible rubber hoses.

After disconnecting the equipment, always put the caps back on.

### 6.27.3 - 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; the operation is described in the next section.

For the operating details, refer to sections:

- "6.27.3.2 - Single-acting mode AUX1" to page 6-70;
- "6.27.3.3 - Double-acting mode AUX1" to page 6-71.

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.

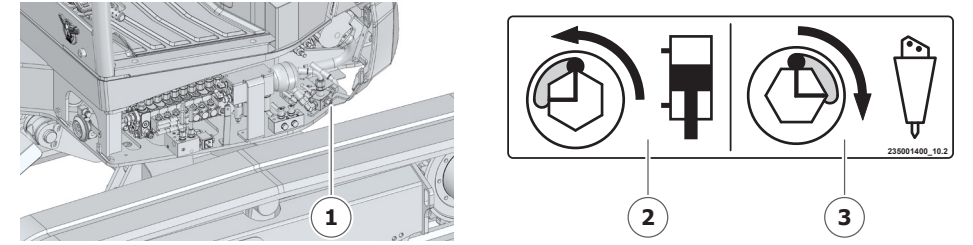
The oil flow can be regulated by acting on the accelerator hand grip; always observe the flow rate indicated by the manufacturer of the equipment.

### 6.27.3.1 - AUX1 hydraulic system three-way switch

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

To select the desired mode:

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



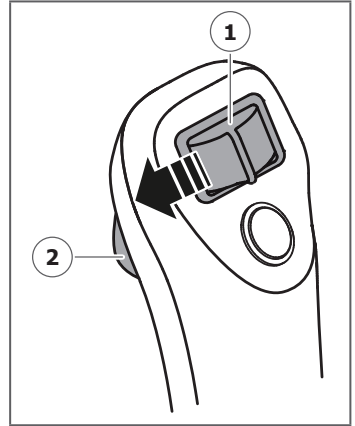
### 6.27.3.2 - Single-acting mode AUX1

This mode provides for the pressurised flow only on the left connection, while the right connection will remain discharged.

To enable this mode, refer to section "6.27.3.1 - AUX1 hydraulic system three-way switch" to page 6-69.

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

- push and keep pushed to the **LEFT** the roller (1) to provide a constant flow of hydraulic oil to the **left piping**; the right piping is always empty (direct to the tank) even if no control is engaged;
- release the roller to stop the flow;
- while pushing the roller, the electric hold can be activated by pressing the button (2), so that the control remains on and the roller can be released; the electric hold for the oil flow to the equipment can be activated at any stage of roller travel, making it possible to provide a partial flow and keep it constant at the required level;



- to deactivate the hold, press again the button (2) or move the roller (1) to its neutral position;
- no function is activated by pushing the auxiliary hydraulic control roller to the right if it is in single-acting mode.



## 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 pressed down for long periods. The hydraulic circuit does not activate any function but is still under pressure and so there is the risk of the hydraulic oil overheating.*

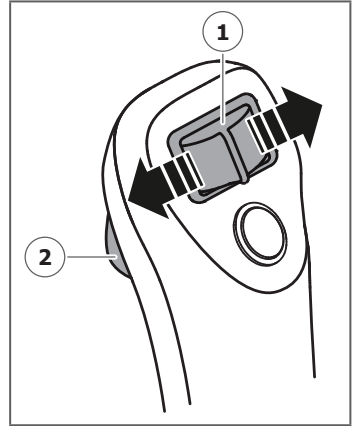
### 6.27.3.3 - Double-acting mode AUX1

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 "6.27.3.1 - AUX1 hydraulic system three-way switch" to page 6-69.

To operate **AUX1 double-acting control**:

- push and keep pushed to the **LEFT** the roller (1) to provide a constant flow of hydraulic oil to the **left piping**; at the same time, the right piping is discharged;
- release the roller to stop the flow;
- while pushing the roller, the electric hold can be activated by pressing the button (2), so that the control remains on and the roller can be released; the electric hold for the oil flow to the equipment can be activated at any stage of roller travel, making it possible to provide a partial flow and keep it constant at the required level;



- to deactivate the hold, press again the button (2) or move the roller (1) to its neutral position;
- push and keep pushed to the **RIGHT** the roller (1) to provide a constant flow of hydraulic oil to the **right piping**; at the same time, the left piping is discharged. In this case, it is not possible to activate the electric hold.



## **NOTICE**

*For details of the controls, see the label located on the driver's seat and the instructions in this user manual.*

---

#### 6.27.3.4 - Mechanical adjustment of maximum AUX1 system flow rate



## WARNING

**Secure the machine as indicated in section "8.1.1 - Putting the machine out of service for maintenance" to page 8-5.**

The **maximum flow rate** of the auxiliary hydraulic system **AUX1** can be **adjusted mechanically** by acting on the distributor.

The proportionality of the control (roller), from zero to the maximum set flow rate, is maintained.

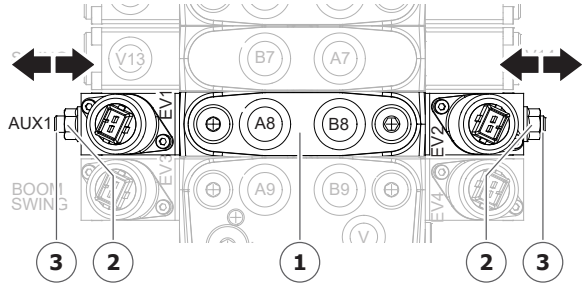
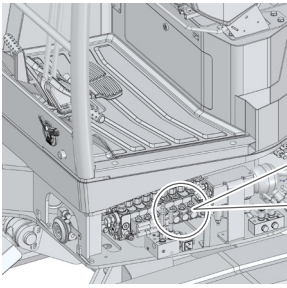
The table in section "6.27 - Auxiliary hydraulic systems" to page 6-64 indicates the values of the maximum flow rate.

To change the flow rate:

- lift the protective structure as indicated in section "8.4 - Protective structure tip-over" to page 8-12;
- identify the dedicated section of the hydraulic distributor **(1)**;
- unscrew the lock nut **(2)**;
- act on the grub screws **(3)** at the end of the spool stroke:
  - **unscrew** the grub screw to **increase** the maximum flow rate;
  - **screw** the grub screw to **decrease** the maximum flow rate.
- restore the machine following the procedures described in reverse order;
- start the machine and use the AUX1 hydraulic system to check that the adjustment made is suitable; if not, repeat the whole procedure.

To use the AUX1 auxiliary hydraulic system, follow the procedure described in section "6.27.3 - AUX1 Auxiliary hydraulic system" to page 6-68.





## NOTICE

*It is possible to set the maximum flow rate independently for each line of the system (piping on the left side and piping on the right side of the boom), according to the operating needs (e.g. with an adjustable ditch cleaning bucket the maximum flow rate is adjusted in such a way that the oscillation has the same speed in both directions).*

### 6.27.3.5 - Cutter head mode with additional AUX1 system pump (optional)

The cutter head mode of the AUX1 auxiliary hydraulic system is used for the operation of specific equipment that require a continuous and uniform flow of oil, for example the **cutter head**.

This mode provides for an **additional gear pump** (with a fixed and constant flow rate according to the engine speed).

The table in section "6.27 - Auxiliary hydraulic systems" to page 6-64 indicates the values of the maximum flow rate.

It is however possible to use the AUX1 hydraulic system by means of the dedicated electro-proportional roller when the cutter head mode is NOT active.



## WARNING

**Make sure that nobody is in the work area.**

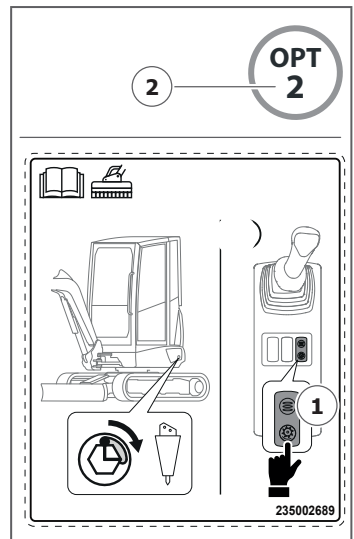
**Operating the control immediately activates the hydraulic system, so the equipment is started.**

To **activate** the mode:

- select single-acting operation, see section "6.27.3.1 - AUX1 hydraulic system three-way switch" to page 6-69;
- press the switch **(1)** on the left console:
  - LED **on**: equipment **operating**, at the same time the OPT2 indicator light on the control panel turns on **(2)**;
  - LED **off**: equipment **paused**, at the same time the OPT2 indicator light on the control panel turns off.

If during operation the controls are blocked (by means of the controls cut-out lever), the hydraulic system stops.

Reactivating the controls pauses the system; to activate it again, press switch **(1)** twice.





## **NOTICE**

*Use the shredder head system only after selecting the single-acting mode, otherwise the machine performance will be lower.*

---



## **NOTICE**

*When this mode is activated, the main pump of the machine is automatically derated (to ensure the operation of the additional pump), so the other functions (e.g. travel and boom movements) are slowed down but still possible while using the equipment.*

*While the cutter head mode is active, it is advisable NOT to use the roller to avoid overheating the power line.*

*For the operating modes with the equipment, always refer to the user manual of the equipment itself.*

---

#### 6.27.4 - AUX2 Auxiliary hydraulic system (optional)



## WARNING

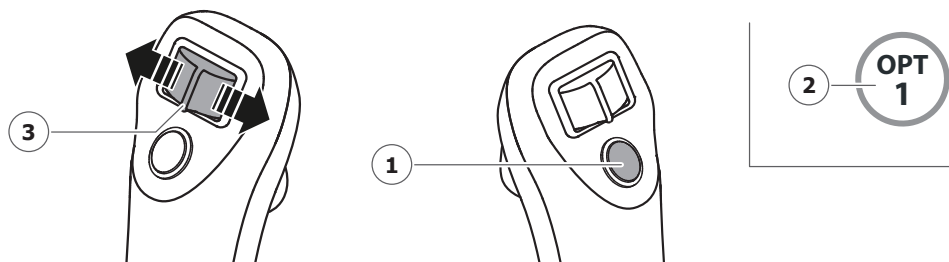
**Before each use, always check the status of the OPT1 light, to be sure which control will be activated.**

**The activation of an undesired control may cause serious injuries.**

The **AUX2** hydraulic system works in double-acting mode and is suitable for equipment that requires a reduced oil flow such as for tilting buckets or gripper rotors.

To **activate the control**:

- press the button (1) on the right joystick, the OPT1 indicator light on the control panel turns on (2);
- Push and hold the roller (3) on the left joystick to the **LEFT** to provide a constant flow of hydraulic oil to the **left piping**, at the same time the right piping is discharged;
- release the roller to stop the flow;
- Push and hold roller (3) to the **RIGHT** to provide a constant flow of hydraulic oil to the **right piping**, at the same time the left piping is discharged;
- release the roller to stop the flow;
- press the button (1), the OPT1 indicator light on the control panel turns off (2).



## NOTICE

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

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

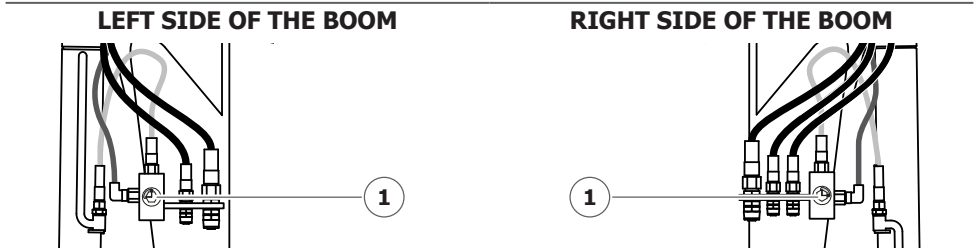
### 6.27.5 - Mechanical AUX3 auxiliary hydraulic system (optional)

By means of two mechanical switches, the double-acting **mechanical AUX3** hydraulic system, shuts off the pipes of the bucket cylinder and makes them available for connection to equipment requiring a reduced oil flow, such as gripper rotors. This system is used for equipment with which there is no need to move the bucket cylinder.

The switches are located on the second boom.

To **activate the control**:

- turn both switches **(1)** as indicated below in the table to activate/deactivate the AUX3 system;
- both switches must be turned in such a way as to enable the same function.



|        | LEFT SIDE OF THE BOOM | RIGHT SIDE OF THE BOOM |
|--------|-----------------------|------------------------|
| AUX3   |                       |                        |
| BUCKET |                       |                        |



### **NOTICE**

*Never leave the switches halfway, always bring them to a stop. Before diverting the circuit, fully retract the bucket cylinder. If left extended, it may hit the equipment and get damaged.*



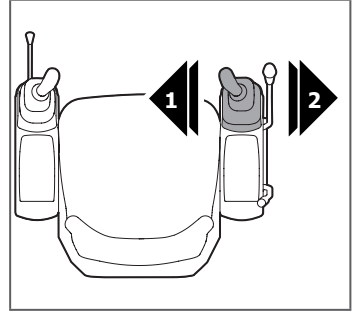
## NOTICE

*Never leave the switches halfway, always bring them to a stop. Before diverting the circuit, fully retract the bucket cylinder. If left extended, it may hit the equipment and get damaged.*

The mechanical AUX3 auxiliary hydraulic system is controlled using the right joystick.

To **activate the control**:

- move the joystick **(1)** to the left to send the oil flow to the left connection;
- release the joystick in the central position to stop the flow;
- move the joystick **(2)** to the right to send the oil flow to the right connection.



### 6.27.6 - 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.

## 6.28 - Emergency lifting-boom lowering procedure



### WARNING

***Ensure no one is standing under or near the equipment before starting the procedure to lower the booms.***

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 booms and equipment not resting on the ground.

Lower the lifting boom as follows until the bucket or equipment rest on the ground:

- turn the starter switch (ignition key) to ON;
- lower the controls cut-out lever;
- move the right joystick control lever forwards - the first boom will start 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.***

## 6.29 - Procedure for installing and removing the supplementary counterweight



### WARNING

***To lift the supplementary counterweight use adequately sized cables and eye bolts; never use cables that show signs of wear or have broken strands.***

***Do not lift the supplementary counterweight differently than as illustrated below; there is the risk of losing balance.***

***When lifting the supplementary counterweight , make sure it is well balanced, evenly lifted and that no one approaches the load.***

***Before lifting the supplementary counterweight, make sure the eye bolts are properly secured to the top bores.***

***When a supplementary counterweight is installed, the overall machine weight changes. Take this into consideration when transporting the machine.***

### 6.29.1 - Supplementary counterweight

The technical data for the supplementary counterweights are given in section "3.6 - Counterweight" to page 3-4.

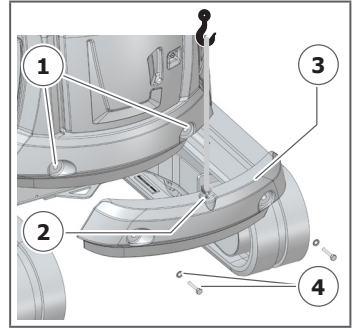


## WARNING

**Respect the combinations indicated in section "3.6 - Counterweight" to page 3-4.**

To install and remove them, proceed as described below:

- remove the caps (1);
- screw the eyebolt (2) in the respective housing of the counterweight to be installed on the machine;
- using a suitable lifting device, hook the eyebolt, lift the counterweight (3) and bring it near the back of the machine;
- position the screws (4) to secure the counterweight.



To remove the counterweight repeat the procedure in reverse order.



## 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.**

### 6.30 - Daily storage

Proceed as indicated in section "6.22 - Parking the machine" to page 6-56.



## 7 - RECOMMENDED OPTIONAL EQUIPMENT



### DANGER

***To perform load handling operations, the machine must be equipped with the special load handling equipment (optional).***

***For further Information, see section "7.8 - Load handling" to page 7-29.***



### 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 "7.1.1 - 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.***

All the tools required for the normal replacement of equipment are included in the wrench kit supplied with the machine.

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 2-17, 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 (lifting capacity).

The lifting capacities for this machine are listed in the relative tables in chapter "3 - *Technical data*" to page 3-1; always refer to these tables.

The machine lifting capacity is reduced by the weight of the equipment installed.

Third party accessory suppliers may or may not supply accessory lifting capacity tables. The nominal lifting capacity values for this type of accessory must be requested from the third party suppliers.

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 "6.27 - *Auxiliary hydraulic systems*" to page 6-64;
- The **electrical** characteristics of the equipment are compatible with those of the machine;

- the characteristics of the equipment coupling are compatible with those of the second boom of the machine;
- after pairing the machine-equipment, the operator's visibility is guaranteed and complies with standards in force;
- the equipment does not interfere with any parts of the machine, in particular with the protective structure and 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.

**7.1.1 - 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 fully retracted position, may interfere with some parts of the machine (in particular with the operator cab). Therefore, pay attention to avoid interference.***

The recommended equipment is listed below:

| <b>BUCKETS</b>                 | <b>WIDTH<br/>(mm)</b> | <b>WEIGHT<br/>WHEN<br/>EMPTY<br/>(kg)</b> | <b>CAPACITY<br/>(l)</b> |
|--------------------------------|-----------------------|-------------------------------------------|-------------------------|
| Ditching bucket                | 300                   | 48                                        | 33                      |
| Ditching bucket                | 400                   | 63                                        | 48                      |
| Ditching bucket                | 500                   | 81                                        | 65                      |
| Ditching bucket                | 600                   | 98                                        | 82                      |
| Ditching bucket                | 700                   | 118                                       | 100                     |
| Ditch cleaning bucket          | 1.000                 | 83                                        | 125                     |
| Ditch cleaning bucket          | 1.200                 | 97                                        | 154                     |
| Pivoting ditch cleaning bucket | 1.000                 | 86                                        | 96                      |
| Pivoting ditch cleaning bucket | 1.200                 | 96                                        | 117                     |
| Trapezoidal bucket             | 60°                   | 50                                        | 63                      |

The weight of the bucket, the volumetric capacity of the bucket and the density of the material to be handled must be considered when choosing the bucket to be used.

| QUICK COUPLING ATTACHMENTS                        | WEIGHT (kg) |
|---------------------------------------------------|-------------|
| Mechanical or hydraulic quick-coupling attachment | 39          |

| EQUIPMENT         | WEIGHT<br>MAX<br>(kg) |
|-------------------|-----------------------|
| Demolition hammer | 115                   |
| Shredder head     | 115                   |
| Bough shears      | 115                   |
| Selection grapple | 115                   |
| Auger             | 115                   |

**The hydraulic characteristics of the equipment must be compatible with those of the auxiliary hydraulic systems of the machine, refer to section "6.27 - Auxiliary hydraulic systems" to page 6-64.**



## NOTICE

The total weight of the equipment must **NOT** exceed the nominal lifting capacity indicated in the table in section "3.10 - Nominal lifting capacity" to page 3-7.

To calculate the total weight of the equipment, use the following formula:

**Total weight = Weight of equipment + Weight of quick coupling (if present) + Weight of hydraulic thumb (if present) + Weight of loaded material (if present).**

## 7.2 - Equipment with standard coupling (pins)

The equipment is installed on the second boom by means of a mechanical pin connection.



## NOTICE

The pictures of the equipment are purely indicative. The procedure is valid for all equipment with a standard coupling (pins).

### 7.2.1 - Installation and removal

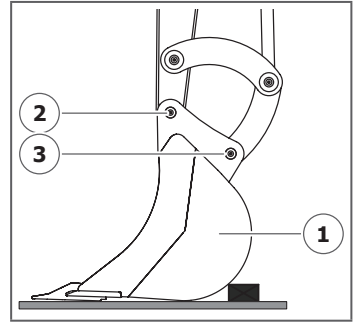


## WARNING

***To avoid personal injury from loose material or flying debris, always wear safety glasses and proper protective clothing when removing or refitting pivot pins.***

To **remove** the equipment:

- position the machine on flat, compact ground;
- lower the first boom, positioning the second boom and equipment in such a way that the latter is resting on the ground;
- block the equipment **(1)** using a suitable support (if necessary) so that it maintains its position during and after the removal operations;



- disconnect any hydraulic or electrical systems as indicated in section "6.27.1 - Connection of equipment to the hydraulic systems" to page 6-66;
- remove both pins **(2-3)** and raise the second boom to release the equipment and complete the operation.

To **install** the equipment:

- the equipment must be firmly secured using a suitable support (if necessary) so that it maintains its position during the installation operations;
- Clean both pivot pins and their fixing holes **(2-3)**;
- align the second boom with the first pivot pin mounting holes of the equipment **(2)**. Fit the pin and secure it in place;
- align the equipment coupling with the second pivot pin mounting holes of the equipment **(3)**. Fit the pin and secure it in place;
- lubricate both pivot pins;
- connect any hydraulic or electrical systems as indicated in the dedicated sections;
- start the engine and make the cylinder perform two complete movements to check that it runs smoothly.

If there is no abnormal friction or jamming when rotating the equipment, it means the operation has been carried out correctly; otherwise, contact the *Service Centre*.

### 7.3 - Quick-coupling



## WARNING

***Use only quick-couplings in accordance with current Standards and which allow for the correct coupling of the equipment to be checked from the operator seat, without having to get off the machine.***

***Before performing any operation, carefully read this manual and the instructions provided by the manufacturer of the quick coupling device.***

***Perform all coupling and release operations with the bucket or the equipment placed on the ground and make sure that there are no people in the work area before and during the procedure.***



## NOTICE

*The quick-coupling system increases the overall dimensions of the equipment. Check the operating range of the coupled equipment to avoid the hazard of contact with the protective structure of the machine.*

---

The quick-coupling attachment is an interchangeable device that can be installed on the machine 2nd arm which is used to rapidly replace the end tool/equipment.

The following positions are therefore possible:

- quick dismantling of the tool/equipment being used;
- quick installation of another tool/different equipment.

With the quick-coupling attachment, changing between various tools/equipment, even of different types, is simple and fast.

The quick-coupling can have the following operation:

- mechanical;
- hydraulic.

The control of the **mechanical quick coupling** is of the manual type and it is activated by means of a lever that acts directly on the quick coupling.

The control of the **hydraulic quick coupling** is achieved by means of a flow of hydraulic oil activated directly from the driver's seat.

**For the warnings concerning safety and instructions for operation, always refer to the use and maintenance manual of the manufacturer of the quick-coupling attachment itself.**

**For the control instructions of the HYDRAULIC quick coupling, refer to the following sections.**

The machine can be supplied with or without the quick-coupling attachment installed.

The machines supplied without the quick-coupling attachment may be equipped with a fitting for the installation of the hydraulic quick-coupling attachment.

To install and remove the quick-coupling attachment, proceed as indicated for the installation of the equipment with standard coupling (pins). If the attachment is of the hydraulic type, see the following sections for instructions on the hydraulic connection.

### **7.3.1 - Hydraulic quick-coupling attachment**

The set-up for the hydraulic quick-coupling consists of the control part and operating instructions on the operator seat and the hydraulic pipes. that end on the final section of the second boom.

There are the following types of set-up for the hydraulic quick-coupling attachment:

- **single-acting;**
- **single adjustment double-acting.**

All types of quick-couplings have two operating modes:

- **open** (release), which allows the bucket/equipment to be changed;
- **closed** (coupled), which connects the bucket/equipment to the quick-coupling attachment and allows for normal machine operations.



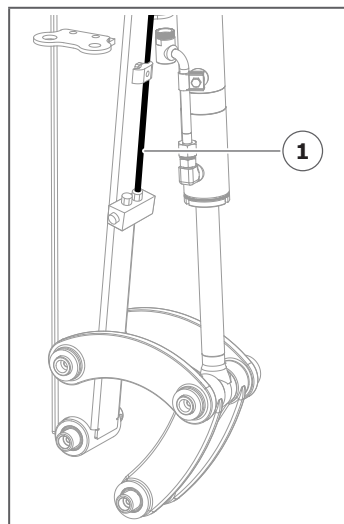
### 7.3.1.1 - Single-acting hydraulic quick coupling attachment set-up

The single-acting hydraulic quick-coupling attachment set-up is designed to control a single-acting hydraulic quick-coupling attachment which is released by hydraulic pressure and coupled mechanically with spring return.

The single-acting hydraulic quick-coupling attachment set-up provides a hydraulic flow line (1) on the second boom.

The hydraulic flow line is pressurised when the quick-coupling release command (opening) is given, otherwise it is discharged.

When opening, the pressure in the line is the maximum pressure indicated in the table.



## WARNING

***Make sure that the control modes and the technical specifications of the hydraulic quick-coupling attachment set-up are compatible with what is indicated in the user manual of the quick-coupling attachment itself.***

***After installing the quick-coupling attachment, make sure that it works properly before starting work.***

### Technical data - Single-acting

|                   |       |                                   |
|-------------------|-------|-----------------------------------|
| MAX pressure      | bar   | 70 ÷ 250<br>(factory setting 200) |
| Flow rate         | l/min | 11                                |
| Connection thread |       | 1/4" GAS                          |

The maximum pressure value can be adjusted mechanically by means of the quick-coupling hydraulic valve; see section "7.3.1.3 - Single-acting valve maximum pressure adjustment" to page 7-12.

The hydraulic connection must be made using a flexible hose (not supplied) with characteristics compatible with those indicated in the table.

For the operating instructions, see section "7.3.2.1 - Single-acting hydraulic quick-coupling attachment" to page 7-15.

### 7.3.1.2 - Double-acting hydraulic quick coupling set-up

The double-acting hydraulic quick-coupling attachment set-up is designed to control a double-acting hydraulic quick-coupling attachment which is released and coupled by hydraulic pressure. This type of quick-coupling has the special feature of keeping the circuit constantly pressurised during working operations.

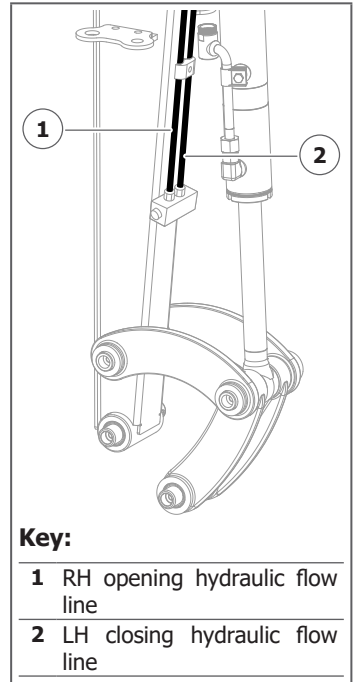
The double-acting hydraulic quick-coupling attachment set-up provides two hydraulic flow lines **(1-2)** on the second boom.

The opening hydraulic flow line **(1)** is pressurised when the quick-coupling release command (opening) is given; at the same time, the closing line **(2)** is discharged.

When the quick-coupling closing command is given, pressure and discharge are inverted on the two lines.

When opening, the pressure in the opening line is the maximum pressure set on the quick-coupling valve.

When closing, the pressure in the closing line is the pressure of the main hydraulic system of the machine. To prevent the quick-coupling closing pressure from changing according to the operating mode of the machine (stand-by or working with load), there is a check valve on the closing hydraulic flow line. The check valve keeps the line pressurised even if the pressure in the machine's main system drops.



## WARNING

***Make sure that the control modes and the technical specifications of the hydraulic quick-coupling attachment set-up are compatible with what is indicated in the user manual of the quick-coupling attachment itself.***

***After installing the quick-coupling attachment, make sure that it works properly before starting work.***

| Technical data - Single adjustment double-acting |       |                                   |
|--------------------------------------------------|-------|-----------------------------------|
| MAX pressure                                     | bar   | 70 ÷ 250<br>(factory setting 200) |
| Flow rate                                        | l/min | 40                                |
| Connection thread                                |       | 1/4" GAS                          |

The maximum pressure value can be adjusted mechanically by means of the quick-coupling hydraulic valve; see section "7.3.1.4 - *Single adjustment double-acting valve maximum pressure adjustment*" to page 7-13.

The hydraulic connection must be made using flexible hoses (not supplied) with characteristics compatible with those indicated in the table.

For the operating instructions, see section "7.3.2.2 - *Double-acting hydraulic quick-coupling attachment*" to page 7-19.

### 7.3.1.3 - Single-acting valve maximum pressure adjustment



## WARNING

**The following procedure must be performed by specially trained personnel; the operators must wear the PPE indicated in section "2.4.1 - Personal Protective Equipment (PPE)" to page 2-17.**

The single-acting hydraulic quick-coupling attachment valve and the single adjustment double-acting hydraulic quick-coupling attachment valve have a maximum pressure adjustment.

There is only one maximum pressure value for all hydraulic lines.

To **adjust** the maximum pressure:

- make sure that no equipment is installed on the quick-coupling;
- carry out the bucket opening movement to its end of travel (cylinder fully closed);
- rest the boom on the ground and stop the machine;
- connect a special device (not supplied) to measure the pressure of the opening line on the second boom;

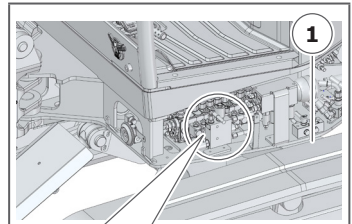
- remove the left side panel (1) and identify the maximum pressure adjustment valve (2);

- Unscrew the safety nut (3), adjust the pressure by turning the screw (4). By turning clockwise, the pressure increases; by turning counter-clockwise, the pressure decreases;

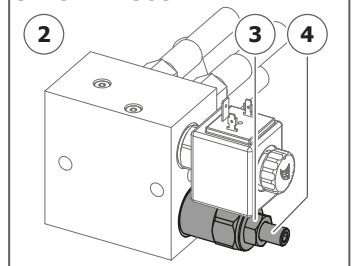
- tighten the safety nut, start the machine, accelerate the engine to maximum speed;

- command the release of the equipment and, at the same time, read the pressure value detected by the special device;

- repeat the adjustment (with the engine stopped) if the pressure is not as desired;



**SINGLE-ACTING VALVE - SINGLE ADJUSTMENT**



- if the pressure is correctly adjusted, stop the machine and put the side panel back in place and continue with the installation of the hydraulic quick-coupling attachment.

**7.3.1.4 - Single adjustment double-acting valve maximum pressure adjustment****WARNING**

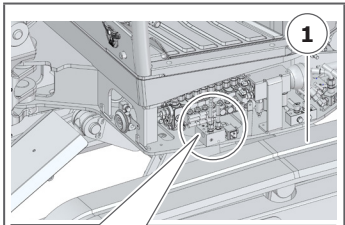
**The following procedure must be performed by specially trained personnel; the operators must wear the PPE indicated in section "2.4.1 - Personal Protective Equipment (PPE)" to page 2-17.**

The single-acting hydraulic quick-coupling attachment valve and the single adjustment double-acting hydraulic quick-coupling attachment valve have a maximum pressure adjustment.

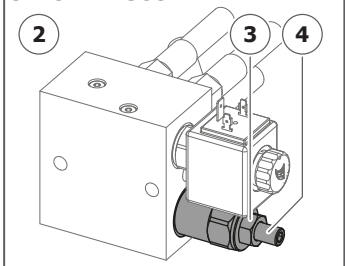
There is only one maximum pressure value for all hydraulic lines.

To **adjust** the maximum pressure:

- make sure that no equipment is installed on the quick-coupling;
- carry out the bucket opening movement to its end of travel (cylinder fully closed);
- rest the boom on the ground and stop the machine;
- connect a special device (not supplied) to measure the pressure of the closing line on the second boom;
- remove the left side panel (1) and identify the maximum pressure adjustment valve (2);
- unscrew the safety nut (3), adjust the pressure by turning the screw (4). By turning clockwise, the pressure increases; by turning counter-clockwise, the pressure decreases;
- tighten the safety nut, start the machine, accelerate the engine to maximum speed;
- carry out the bucket opening movement insisting on its end of travel and, at the same time, detect the pressure value measured by the special device;
- repeat the adjustment (with the engine stopped) if the pressure is not as desired;



**DOUBLE-ACTING VALVE - SINGLE ADJUSTMENT**



- if the pressure is correctly adjusted, stop the machine and put the side panel back in place and continue with the installation of the hydraulic quick-coupling attachment.

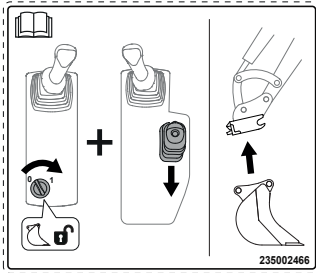
### 7.3.2 - Hydraulic quick-coupling attachment

There are two types of hydraulic quick-coupling attachment:

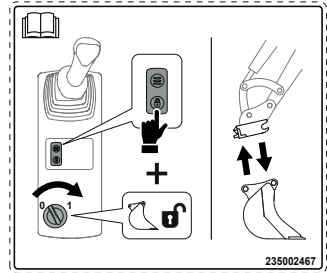
- **single-acting;**
- **double-acting.**

To identify the type of attachment installed, see the illustrative label on the operator seat.

#### SINGLE-ACTING



#### DOUBLE-ACTING



Any hydraulic and electrical systems on the equipment must be:

- **connected** after attaching the equipment to the quick-coupling;
- **disconnected** before releasing the equipment from the quick-coupling.

For further information, see section "6.27.1 - Connection of equipment to the hydraulic systems" to page 6-66.

### **7.3.2.1 - Single-acting hydraulic quick-coupling attachment**

On the single-acting hydraulic quick-coupling attachment the release is hydraulically operated while coupling is mechanical with a return spring.



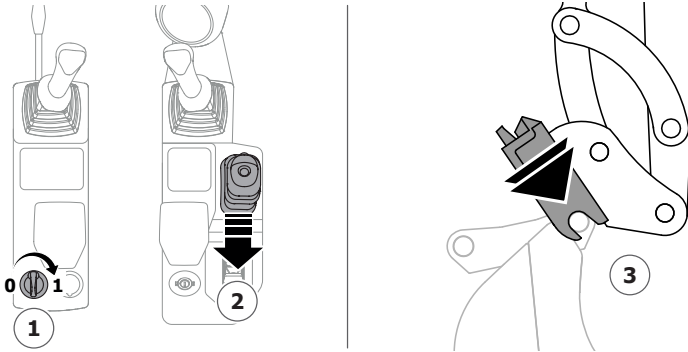
## **WARNING**

***Always make sure that the bucket or the equipment is securely coupled before starting work and sits in a stable manner on the ground when it is uncoupled, otherwise it could tip over and/or move causing personal injury or damage.***

## SINGLE-ACTING

**Locking** the equipment:

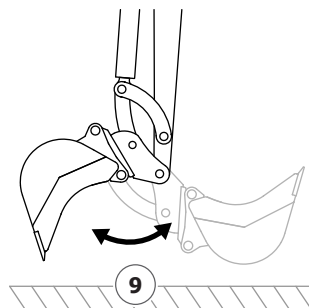
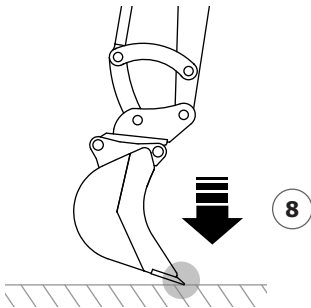
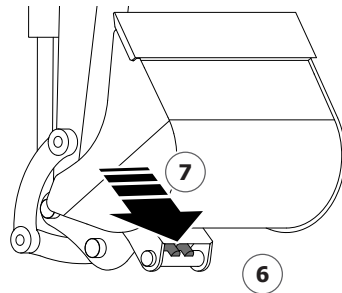
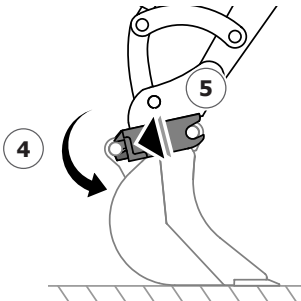
- check there is nobody in the vicinity, and if there is move them away;
- raise the dozer blade completely and lower it slightly to release the pressure;
- insert the special key in the block (1) on the left console;
- turn the key clockwise, a buzzer will begin to signal a dangerous situation;
- keeping the key turned, pull back the lever (2) that controls the dozer blade to pressurise the circuit and open the quick-coupling so it is ready to hitch up;
- release the dozer blade lever and then the key, the buzzer will stop;
- with the quick coupling, move slowly towards the equipment to be connected and hook it onto the inner part of the coupling (3);





## RECOMMENDED OPTIONAL EQUIPMENT

- keeping the equipment on the ground, perform the bucket closing movement (4) to bring the coupling to the end of its stroke; in this way, the coupling closes (5) automatically, securing the coupled equipment.
- Keeping the equipment close to the ground, check that it is correctly attached to the quick-coupling:
  - if the quick-coupling is equipped with a correct coupling indicator, check that it is in the correct position (as indicated in the user manual of the quick-coupling itself), **otherwise** check on the front side of the equipment (6) that the locking devices (pins - 7) of the quick-coupling have come out completely and that they are correctly inserted in the hole;
  - place the equipment on the ground and push (8), this operation is called *BUMP TEST*;
  - make the bucket cylinder perform two complete movements (9).

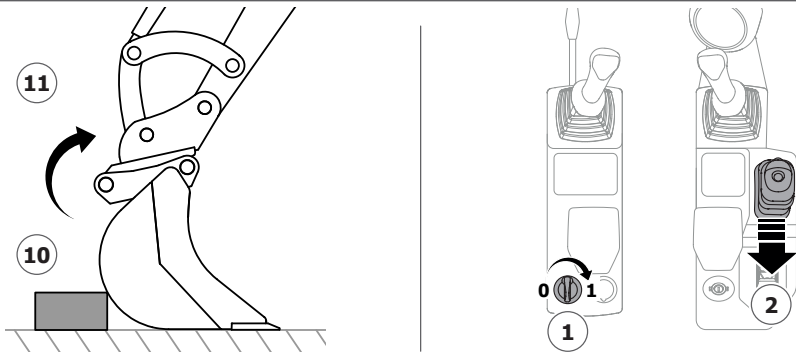


- If all the checks have a positive outcome, the equipment is correctly attached; otherwise, repeat the procedure from the start;
- remove the key (1) from the block and put it in a safe place to prevent the coupling system from being activated by accident;
- The working operations may now be commenced.

## SINGLE-ACTING

### Releasing the equipment:

- check there is nobody in the vicinity, and if there is move them away;
- place the equipment stably on the ground, using some supports (**10**) if necessary, to prevent it from moving after it has been released, with the risk of causing damage to people and/or property;
- raise the dozer blade completely and lower it slightly to release the pressure;
- insert the special key in the block (**1**) on the left console;
- turn the key clockwise, a buzzer will begin to signal a dangerous situation;
- keeping the key turned, pull back the lever (**2**) that controls the dozer blade, so that the circuit is pressurised and the quick-coupling attachment opens to release the equipment;
- release the dozer blade lever and then the key, the buzzer will stop;
- carry out the bucket opening movement to its end of travel (**11**);



- move the boom away slowly, releasing the inner part of the quick-coupling from the equipment;
- the machine is now ready to be fitted with other equipment;
- if you do not wish to carry on working, rest the quick-coupling attachment on the ground and lower the dozer blade;
- remove the key from the block (**1**) and put it in a safe place to prevent the quick-coupling from being activated by accident;
- raise the control cut-out lever, switch off the engine. and get off the machine.

### **7.3.2.2 - Double-acting hydraulic quick-coupling attachment**

In the double-acting hydraulic quick-coupling attachment both coupling and uncoupling functions are hydraulically operated. This type of quick-coupling has the special feature of keeping the circuit constantly pressurised during working operations.



## **WARNING**

***Always make sure that the bucket or the equipment is securely coupled before starting work and sits in a stable manner on the ground when it is uncoupled, otherwise it could tip over and/or move causing personal injury or damage.***

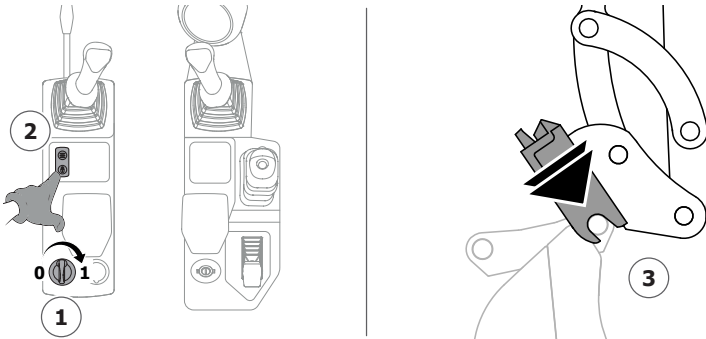
***Each time the machine is started, make sure that the buzzer sounds; if this does not happen, stop the machine and contact the Service Centre to repair the fault.***

***When starting the machine, while the buzzer is buzzing, DO NOT move the boom.***

## DOUBLE-ACTING

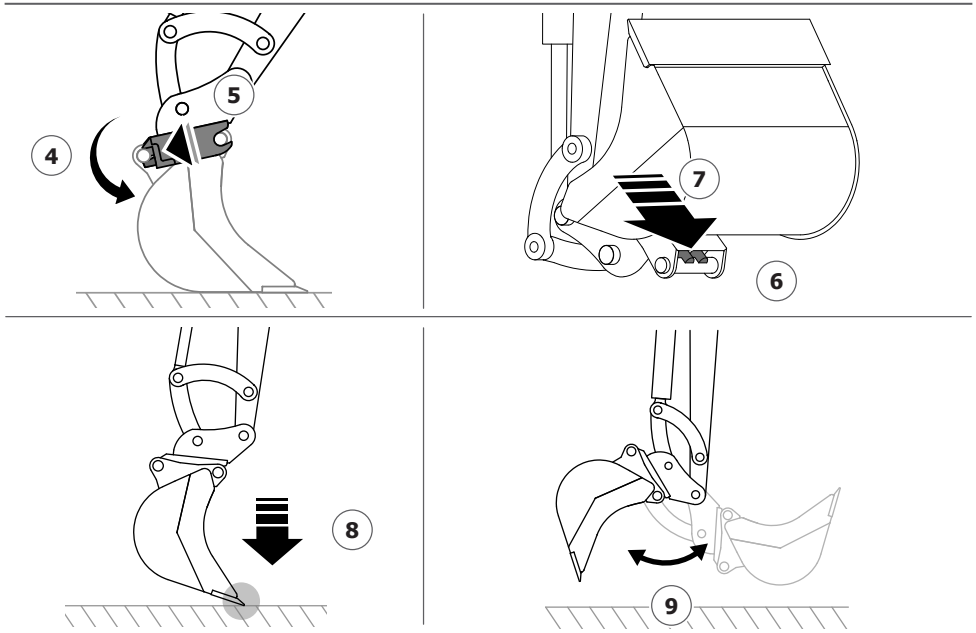
**Locking** the equipment:

- check there is nobody in the vicinity, and if there is move them away;
- insert the special key in the block **(1)** on the left console and turn it clockwise;
- while keeping the key turned, press the button **(2)** on the right console; a buzzer will begin to sound, signalling a dangerous situation. In this way, the opening circuit is pressurised and the quick-coupling opens and is ready for coupling;
- release the button and the key;
- during this phase, the buzzer will continue to sound;
- with the quick coupling, move slowly towards the equipment to be connected and hook it onto the inner part of the coupling **(3)**;
- keeping the equipment on the ground, perform the bucket closing movement **(4)** to bring the coupling to the end of its stroke;
- turn the key **(1)** clockwise and at the same time press the button **(2)**;
- the quick-coupling starts to close **(5)** and the buzzer stops.



## RECOMMENDED OPTIONAL EQUIPMENT

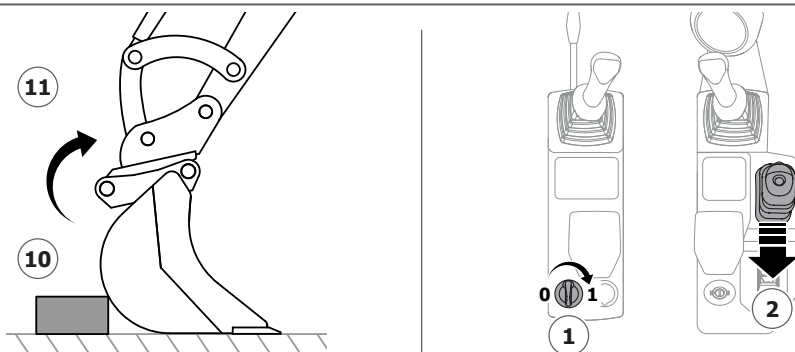
- Keeping the equipment close to the ground, check that it is correctly attached to the quick-coupling:
  - if the quick-coupling is equipped with a correct coupling indicator, check that it is in the correct position (as indicated in the user manual of the quick-coupling itself), **otherwise** check on the front side of the equipment (**6**) that the locking devices (pins - **7**) of the quick-coupling have come out completely and that they are correctly inserted in the hole;
  - place the equipment on the ground and push (**8**), this operation is called *BUMP TEST*;
  - make the bucket cylinder perform two complete movements (**9**).



- If all the checks have a positive outcome, the equipment is correctly attached; otherwise, repeat the procedure from the start;
- remove the key (**1**) from the block and put it in a safe place to prevent the coupling system from being activated by accident;
- The working operations may now be commenced.

**DOUBLE-ACTING****Releasing** the equipment:

- check there is nobody in the vicinity, and if there is move them away;
- place the equipment stably on the ground, using some supports **(10)** if necessary, to prevent it from moving after it has been released, with the risk of causing damage to people and/or property;
- insert the special key in the block **(1)** on the left console and turn it clockwise;
- while keeping the key turned, press the button **(2)** on the left console; a buzzer will begin to sound, signalling a dangerous situation. In this way, the opening circuit is pressurised and the quick-coupling opens, releasing the equipment;
- release the button and the key;
- during this phase the buzzer will continue to sound until an equipment coupling operation has been performed;
- carry out the bucket opening movement to its end of travel **(11)**;



- move the boom away slowly, releasing the inner part of the quick-coupling from the equipment;
- the machine is now ready to be fitted with other equipment;
- if you do not wish to carry on working, rest the quick-coupling attachment on the ground and lower the dozer blade;
- remove the key from the block **(1)** and put it in a safe place to prevent the quick-coupling from being activated by accident;
- raise the control cut-out lever, switch off the engine. and get off the machine.

## 7.4 - Demolition hammer



# WARNING

***During operation with the demolition hammer, there is a risk of flying splinters and/or debris which may cause serious injuries to the operator.***

***On the machine with cab, make sure that the door and windows are closed and locked.***

***Do not use the demolition hammer on the canopy version machine without having installed the operator protection front panel (optional).***

The machine is prearranged for the installation of a hydraulic demolition hammer.

A suitable breaker must be chosen, bearing in mind its intended use.

The working conditions with a demolition hammer are more demanding than with other equipment.

### 7.4.1 - Installation and removal

Proceed as indicated in the previous sections according to the type of coupling available on the equipment.

### 7.4.2 - Precautions for use



# WARNING

***During the work, flying splinters or debris may hit the operator position or other parts of the machine; take the following precautions and be very careful so as to prevent accidents that may damage the machine and cause injuries to the operator.***

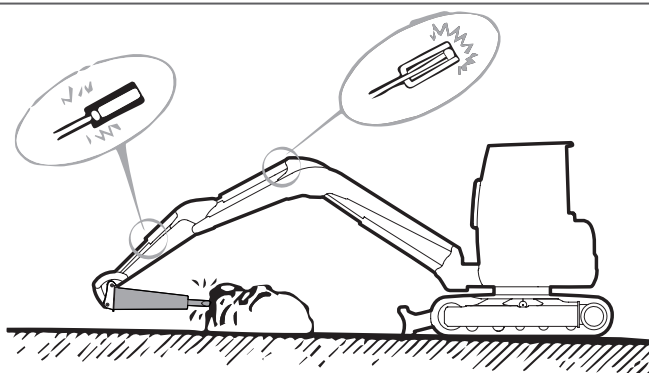
***During work operations, keep the boom in the position without swing, the demolition hammer must always be in front of the operator, never to the side.***

## RECOMMENDED OPTIONAL EQUIPMENT

Avoid operating with the machine cylinders near their limit stop (maximum extension or retraction), so as not to damage the accessory or the cylinders.



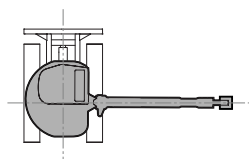
**WRONG**



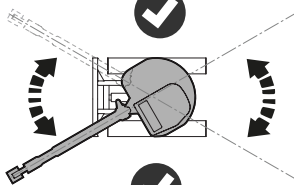
Do not operate with the demolition hammer in a sideways position; the machine will become unstable and the undercarriage components will be subjected to increased wear.



**WRONG**



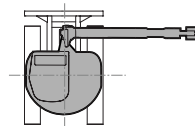
**RIGHT**



**RIGHT**



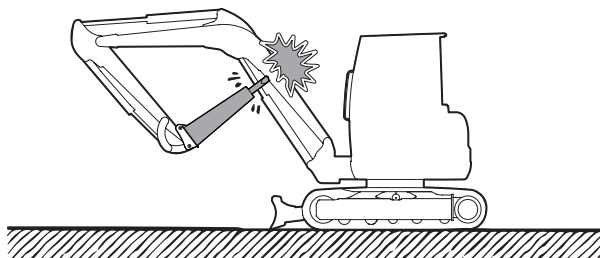
**WRONG**



When operating the machine, take care not to hit the boom or other parts of the machine with the demolition hammer.



**WRONG**

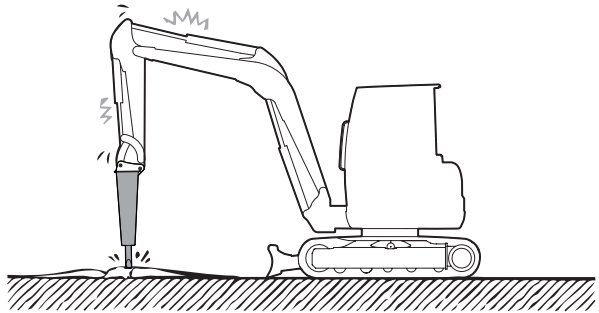




Do not use the demolition hammer with the second boom in a vertical position; excessive vibration on the second boom may cause oil leaks.



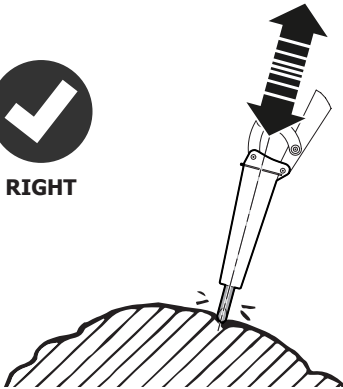
**WRONG**



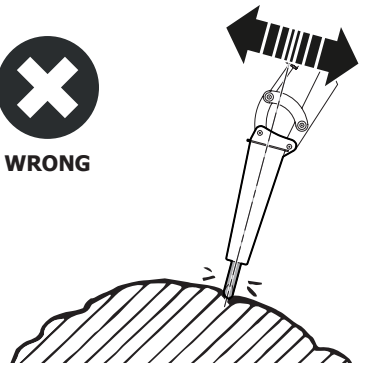
With the boom, apply a force in the same direction of the tip while: approaching the object to be demolished, during the demolition and while moving away from the object.



**RIGHT**



**WRONG**



Do not operate with the demolition hammer for more than one minute in the same spot, since the tip and/or hydraulic mechanism may get excessively worn; if the object does not break within a minute, place the tip on another spot.

### 7.4.3 - Operation

For operating the demolition hammer, refer to section "6.27.3 - AUX1 Auxiliary hydraulic system" to page 6-68. Always consult the manual supplied by the manufacturer of the equipment.

## 7.5 - Shredder head



# DANGER

***Stop the equipment and wait for the rotor to stop completely before getting off the machine. Always bear in mind that the rotor, due to its high inertia, takes about 20 seconds before it stops.***

***It is dangerous to approach the equipment with the rotor moving.***



# WARNING

***During operation with the shredder head, there is a risk of flying splinters and/or debris which may cause serious injuries to the operator.***

***On the machine with cab, make sure that the door and windows are closed and locked.***

***Do not use the shredder head on the canopy version machine without having installed the operator protection front panel (optional).***

***Observe the safety distances to avoid the risk of flying splinters and/or debris towards people and/or things.***

The shredder head is a piece of equipment for clearing grass, reeds, bramble bushes and bushes with woody vegetation.

For the optimum operation of the shredder head, it is necessary to have the hydraulic set-up for shredder head with additional pump, which allows for a constant supply during all machine movements. For more details, see section "6.27.3.5 - Cutter head mode with additional AUX1 system pump (optional)" to page 6-74.

If the machine is not equipped with the dedicated shredder head system, it can be controlled with the standard AUX1 auxiliary hydraulic system in **single-acting** mode.



# NOTICE

***Make sure that the hydraulic features (e.g. drainage line) of the machine are compatible with those indicated in the user manual of the equipment.***

---

It is necessary to bear in mind that the machine speed must be adapted to the type and quantity of material to be chopped, as excessive speed will overload the machine and the equipment itself, resulting in premature wear and reduced performance.

### 7.5.1 - Installation and removal

Proceed as indicated in the previous sections according to the type of coupling available on the equipment.

### 7.6 - Material handling grapple



## WARNING

***When working with a rotating grapple (with rotor), there is a risk that the material will hit the machine's protective structure, causing serious injuries to the operator.***

***The rotating grapple can be used ONLY if the machine has a FRONT-GUARD, see section "2.8.1.2 - Protection grid FRONT-GUARD Level II (option)" to page 2-47.***

***Be very careful when handling bulky objects that may hit the cab or parts of the machine during rotation, causing a hazard to the operator.***

The grapple is a piece of equipment designed and built to handle materials; the operations involve grabbing the material, lifting it and placing it elsewhere. The material is grabbed and released with a movement of the grapple itself, without the need for the manual intervention of a person.

The machine is configured to be able to work with different types of grapples.

The most appropriate grapple must be chosen taking into account the intended use.

The grapple can have a static or rotating movement.



## WARNING

***When working with the grapple for trunks, it is possible to travel (machine movement with tracks) only on flat surfaces and with the boom parallel to the tracks. In these conditions, the nominal lifting capacities indicated in section "3.10 - Nominal lifting capacity" to page 3-7 must be reduced by 15%.***

***In stationary mode (movement of the boom only), the nominal lifting capacities do not change.***

### **7.6.1 - Installation and removal**

Proceed as indicated in the previous sections according to the type of coupling available on the equipment.

### **7.6.2 - Operation**

The equipment is hydraulically connected to the auxiliary hydraulic systems; for operation, refer to section "6.27 - *Auxiliary hydraulic systems*" to page 6-64. Always consult the manual supplied by the manufacturer of the equipment.

## **7.7 - Auger**

The auger is a piece of equipment used to drill into the ground.

If envisaged in the user manual of the equipment, it is possible to use the hydraulic system in double-acting mode, which allows for operation in both directions of rotation.

### **7.7.1 - Installation and removal**

Proceed as indicated in the previous sections according to the type of coupling available on the equipment.

### **7.7.2 - Operation**

The equipment is hydraulically connected to the auxiliary hydraulic systems; for operation, refer to section "6.27 - *Auxiliary hydraulic systems*" to page 6-64. Always consult the manual supplied by the manufacturer of the equipment.

## 7.8 - Load handling



# DANGER

***To perform load handling operations, the machine must be equipped with the special load handling equipment (optional).***

***During load handling operations, it is extremely important to follow the instructions contained in this manual and to comply with local Standards.***

***Failure to do so may result in serious or fatal injuries.***

Load handling includes lifting, lowering and carrying a **load** using **lifting accessories**, for which the assistance of a person or machine operator is required to hook, unhook or stabilise (during transport) the load.

The **load** in the load handling application can be, for example: pipes, containers.

The **lifting accessories** are, for example: wire ropes, chains or textile straps.

Lifting accessories do NOT include any equipment used to hook the load without the intervention of a person, for example: grapples, clamshell buckets, grapples for trunks, vacuum lifting devices, magnetic plates and pallet forks.

Optionally, the machine can be configured for load handling.

The load handling configuration provides for the following components:

- safety valve on first boom cylinder, second boom cylinder and positioner boom cylinder (if present);
- overload signalling device;
- load attachment point (load handling hook);
- load handling table.



## WARNING

***The capacities indicated in the load handling table must be reduced according to the weight of the lifting accessories used and of the equipment installed.***

***The load attachment point is the hook positioned on the bucket articulation connecting rod; DO NOT use other points or methods. It is forbidden to use lifting hooks installed on the equipment, for example: quick-coupling, bucket, etc. Before starting lifting operations, check the lifting hook for cracks or deformation and any abnormalities in the device protecting against the automatic release of the load (spring tab).***

***Use clean, undamaged lifting accessories (cables, ropes, chains, shackles, etc.) of adequate capacity, in accordance with current lifting regulations. Be sure to use self-locking hooks to prevent unintentional opening during handling operations.***

***During load handling operations, the lifting accessories must NOT come into contact with parts of the boom or equipment to avoid damage and to avoid overloading the structure; remove the equipment if necessary.***

***The lifting devices can be used only to lift parts that are not anchored to the ground. Never use them for pulling, uprooting or demolition operations.***

***Use the tracks to transport the load only if it is really necessary and if the ground is flat and solid. Before starting to travel, rotate the turning frame and position the boom parallel to the undercarriage. Do not travel with the boom positioned transversely to the undercarriage. The travel speed must be less than 3 km/h. Move carefully and avoid abrupt starts and stops.***

***A suspended load may swing freely, hitting people or machine parts such as the protective structure. Make sure that all people are away from the range of action of the moving machine. Move the load slowly. If the load starts to swing while moving it, lower it slowly to the ground and sling it in such a way that unintentional swinging is avoided as much as possible.***



## WARNING

***If the shape or size of the load make it impossible or difficult for the operator to see clearly, the assistance of a ground operator is required. The people helping to guide the load and securing it must always be within the field of vision of the machine operator. During load handling, the operators in charge of securing the load can only approach the load with the approval of the machine operator and only to the side of the boom. The machine operator may only give approval when the machine is stationary and the load is not suspended.***

To **handle** loads, proceed as follows:

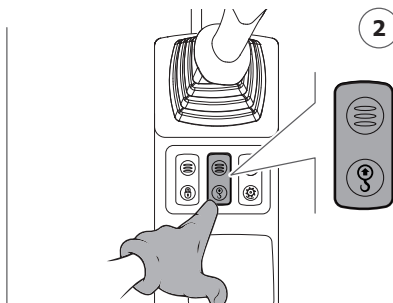
- evaluate the weight of the object to be handled and compare it with the data indicated in the load handling table (1) in the operator seat. Do not lift loads exceeding the maximum values indicated in the table;
- press the overload switch (2) to enable the overload signalling device; the corresponding indicator light (3) will light up on the display.

**1**

$L_{H_{max}} = 1.80\text{ m}$   
 $L_{H_{min}} = 1.80\text{ m}$   
 $L_B = 1.80\text{ m}$   
 $AP = 1\text{ m}$   
 $W = 1000\text{ kg}$   
 $B = 60\text{ kg}$   
 $C = 100\text{ kg}$

| W (t) | 0 | 0.5 | 1 | 1.5 | 2 | 2.5 | 3 | 3.5 | MAX |
|-------|---|-----|---|-----|---|-----|---|-----|-----|
| 3     |   |     |   |     |   |     |   |     |     |
| 2.5   |   |     |   |     |   |     |   |     |     |
| 2     |   |     |   |     |   |     |   |     |     |
| 1.5   |   |     |   |     |   |     |   |     |     |
| 1     |   |     |   |     |   |     |   |     |     |
| 0.5   |   |     |   |     |   |     |   |     |     |
| 0     |   |     |   |     |   |     |   |     |     |
| -0.5  |   |     |   |     |   |     |   |     |     |
| -1    |   |     |   |     |   |     |   |     |     |
| -1.5  |   |     |   |     |   |     |   |     |     |

W (t)

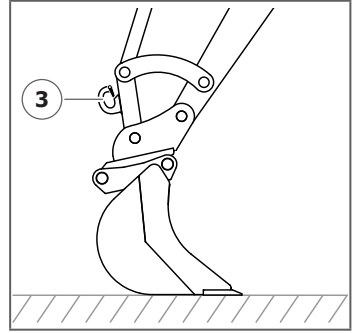


## NOTICE

*The overload signalling device warns the operator with an acoustic signal that the lifted load exceeds the allowed limit.*

*If an overload condition is detected, lower the load to the ground and check the load conditions, referring to the load handling table.*

- Extend the bucket cylinder to the end of its stroke;
- secure the load to the lifting hook (3) positioned on the bucket articulation connecting rod using lifting accessories of adequate capacity for the load to be lifted. To limit load swinging, use shorter lifting accessories;
- check that there are no obstacles in the work area that the machine will travel through;



- lift the load slowly, avoiding abrupt movement that may make it swing.



## WARNING

***Keep the load close to the machine to increase stability and work preferably in the direction of the longitudinal axis, rather than transversely.***

***Lift the load to the minimum height necessary for handling.***

- Place the load where required, making sure that it is stable and rests on a solid base appropriate for its weight;
- remove the lifting accessories from the hook.



## WARNING

***When the machine is configured for load handling, it must be commissioned in accordance with the Standards in force in the country where the machine is used. For Italy, see the indications in section "7.8.3 - Commissioning and registration of lifting equipment (Italy only)" to page 7-36.***



### 7.8.1 - Load handling table



## WARNING

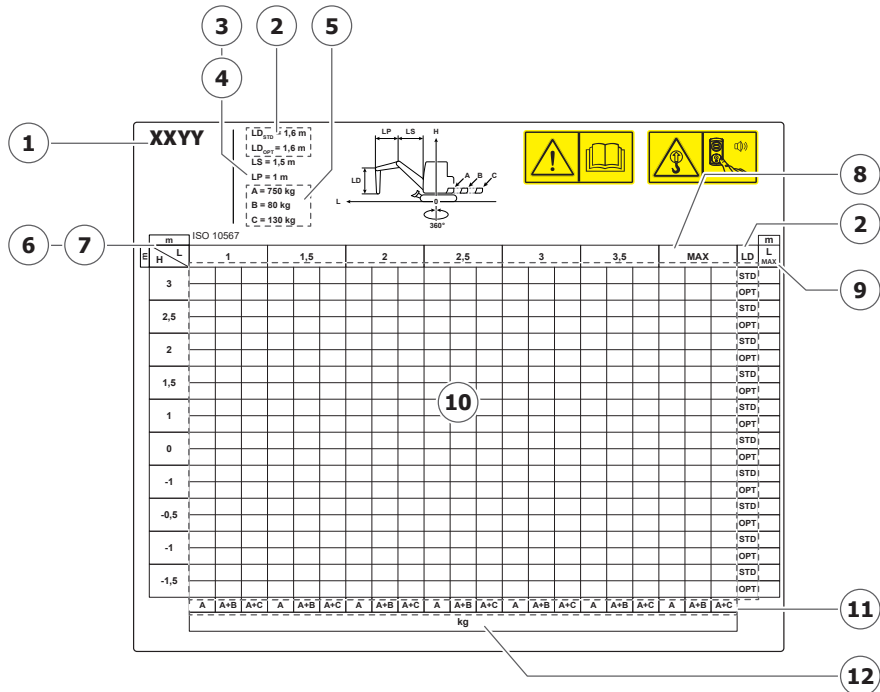
***When the machine is used in conditions other than those indicated in the manual (for instance, on a surface which is not compact, but rough or slippery, or on a slope, etc.), the operator must take into account the new conditions that reduce the machine's stability and capacity. The operator must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

The load handling table indicates the nominal lifting capacity of the machine at different distances from the rotation axis, at different heights from the ground and for different machine configurations.

The nominal lifting capacity refers to:

- machine positioned on sound, firm and level ground;
- the indicated capacities remain valid for the full slewing range of the turning frame;
- boom in NON-slewed position (if present);
- outreach referred to the centre of rotation (slewing ring);
- undercarriage extended to maximum track widening (if present);
- machine without quick-coupling attachment and equipment;
- all the protective structures available;
- all types of tracks available;
- dozer blade raised;
- the lifting capacities do not exceed 75% of the tip-over or roll-over limit or 87% of the hydraulic limit, in accordance with standard **ISO 10567**.

## RECOMMENDED OPTIONAL EQUIPMENT



### Key:

|                                                                          |                                                       |
|--------------------------------------------------------------------------|-------------------------------------------------------|
| <b>1</b> Machine model                                                   | <b>7</b> <b>H</b> : lifting height from the ground    |
| <b>2</b> <b>LD<sub>STD</sub></b> : Length of second standard boom        | <b>8</b> <b>MAX</b> : maximum lifting distance        |
| <b>LD<sub>OPT</sub></b> : Length of second optional boom                 |                                                       |
| <b>3</b> <b>LS</b> : Length of first boom                                | <b>9</b> <b>L MAX</b> : maximum outreach              |
| <b>4</b> <b>LP</b> : Length of positioner boom (if present)              | <b>10</b> Lifting capacity                            |
| <b>5</b> Weight of counterweights:                                       | <b>11</b> Counterweight configuration                 |
| <b>A</b> : main counterweight                                            |                                                       |
| <b>B-C-D</b> : supplementary counterweights (if present)                 |                                                       |
| <b>6</b> <b>L</b> : lifting distance from the centre of the slewing ring | <b>12</b> Unit of measurement of the lifting capacity |

### 7.8.2 - Safety valves

The safety valves prevent the boom from falling in an uncontrolled manner in the event of a pipe rupture or explosion, allowing the operator to slowly lower the equipment to the ground using the normal controls.

In addition to this, the safety valves keep the boom in a stable position during work operations, reducing normal hydraulic distributor leakage.

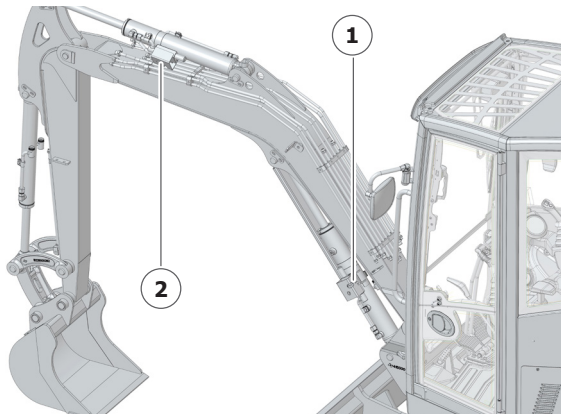


## NOTICE

*Before starting load handling operations, check that the valves are not damaged or noisy.*

*If any abnormal conditions are found, contact the Service Centre.*

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#### Key:

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**1** Safety valve on first boom cylinder

**2** Safety valve on second boom cylinder

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### 7.8.3 - Commissioning and registration of lifting equipment (Italy only)

The machine configured for load handling is classified by Italian Standards as lifting equipment.

When a brand new piece of lifting equipment is purchased, it is necessary to promptly report its commissioning/registration to the local INAIL (National Institute for Insurance against Industrial Industries) office, using, from 27 May 2019, the CIVA application on the INAIL website.

The certification and verification services of lifting equipment and systems, which must be requested exclusively online using the CIVA application, are the following for an excavator set up for lifting loads:

#### COMMISSIONING AND REGISTRATION

For the **commissioning and registration** of lifting equipment, it is necessary to go to the INAIL website [www.inail.it](http://www.inail.it) and access the online services using SPID-CNS-CIE.

**Enter the section:** *Certification and Verification – CIVA – Lifting – Registration* Select a new service for Mobile Crane.

**Fill in the required fields**, attach the required documents and submit the application.

At this point, it is possible to use the machine. INAIL will not carry out any checks on the occasion of commissioning and registration.

INAIL will then assign a serial number to the machine and send it to the applicant.



### **NOTICE**

*The excavator set up for lifting loads is a machine that performs several functions (digging and lifting loads). It is therefore necessary to file a declaration of commissioning and registration even if the load handling function will not be used.*

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## FIRST PERIODIC INSPECTION

The first periodic inspection must be requested from the competent INAIL department. With reference to the date of commissioning, at least 45 days before the expiry of the deadline for the First Periodic Inspection, set out by Anx. VII of the Italian Legislative Decree no.81/2008 according to the type of equipment, the request for the first periodic inspection must be made to INAIL.

To make the **request for the first periodic inspection**, it is necessary to go to the INAIL website [www.inail.it](http://www.inail.it) and access the online services using SPID-CNS-CIE.

**Enter the section:** *Certification and Verification – CIVA – Lifting – First Periodic Inspection* Select a new service for Mobile Crane.

Enter the serial number of the equipment, previously assigned by INAIL, and continue with the application.

INAIL will submit the application to an INAIL technician or delegate it to the Qualified Person indicated by the user. In both cases, the owner will be notified of the assignment of the technician via email.

Once the verification has been carried out, a report with the outcome (positive/negative) will be issued and the owner will be notified via email.

The requests must be made by:

- the Employer of the Company using the lifting equipment or its delegate with the requirements set out by the Italian Legislative Decree 81-2008;
- the Self-Employed owner and/or user of the equipment;
- The Owner (e.g. Hirer, Dealer, etc...).

Alternatively, it is possible to delegate a consultant for systems and equipment who will use CIVA on behalf of the Employer, Self-Employed Worker or Owner.

### **7.8.3.1 - Periodic inspections after the first one**

The purpose of periodic inspections is to ensure compliance with the manufacturer's installation instructions, the state of maintenance and preservation, the maintenance of the safety conditions originally envisaged by the manufacturer and specific to the work equipment, the efficiency of the safety and control devices.

The periodic inspections after the first one must be requested to the Local Health Unit or to authorised subjects according to the Italian Ministerial Decree of 11 April 2011.

At least 30 days before each periodic inspection, the Employer must send a request to the authorised body, either private or public. The deadline for carrying out the inspection is, in this case, **30 days** from the request.

The types of equipment subject to verification and the frequency are listed in Annex VII of the same Decree. In the case of an excavator configured for lifting loads, it falls under the SC Group: Material lifting equipment not operated by hand, art. 1.1.1. of the Italian Ministerial Decree 11-04-2011. a) Mobile material lifting equipment with a capacity of more than 200 kg.

The reports drawn up following the inspections must be kept and made available to the supervisory body.

The inspections are subject to payment and the costs thereof are charged to the owner.

### **7.8.3.2 - Transferring the equipment to another owner**

If the equipment is transferred to another owner, the person eligible must submit a request to INAIL using the CIVA application to transfer the registration of the system/equipment.

### **7.8.3.3 - Purchasing the equipment from another owner**

If the equipment is purchased from another owner, the person eligible must submit a request to INAIL using the CIVA application to transfer the registration of the system/equipment. The periodic inspections after the first one continue with the same frequency indicated in Annex VII of the Italian Legislative Decree no.81/2008.

## 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 *by 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 be carried out with the dozer blade and the equipment resting on the ground.***

***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 8-5.***

***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 "2.4.1 - Personal Protective Equipment (PPE)" to page 2-17.***



If you are working in dusty environments, reduce maintenance interval times by half.

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 inside the cab or anywhere near the driving position.

Clean the machine avoiding to point high-pressure water jets directly at the radiator.

When washing, protect the connectors of the electrical system and do not wet the starting equipment switch.

When working in dusty areas:

- check frequently for air filter blockage;
- clean the radiator and air conditioner condenser (if present) frequently, to prevent the fins from clogging;
- 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;
- place the equipment and dozer blade on the ground;
- stop the machine;
- Release the pressure of the hydraulic system as described in section "6.25 - Discharge residual pressure in the hydraulic system" to page 6-62;
- remove the starting equipment key, which must remain in possession and accessible only to the person performing the maintenance;
- enable the engine shut down safety switch as indicated in section "8.1.2 - Engine shut down safety switch" to page 8-6;
- apply a caution sign (1), **NOT supplied**, near the starting equipment board.



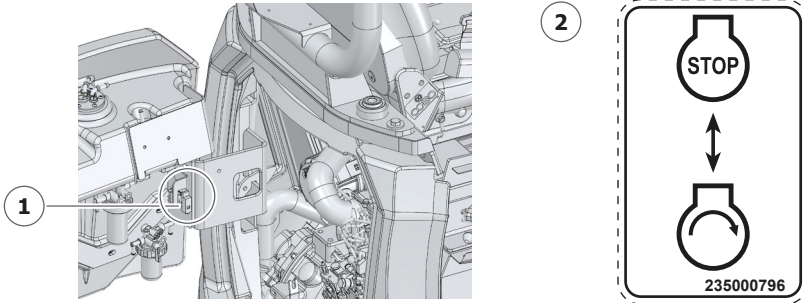
At the end of the interventions, the person in charge of the maintenance operations can restore the machine by following the procedure in reversed order; the machine will therefore be ready for normal operation.

### 8.1.2 - Engine shut down safety switch

The machine is equipped with a safety switch (1) to stop the engine, located inside the engine hood, to the right of the air filter.

It has to be used as a safety device during maintenance so as to prevent the accidental starting up of the engine.

Once the maintenance is finished, restore the switch condition so that the normal operation of the machine is also restored.



To access the switch lever open the red cover.

- If the lever is **raised**: the engine is **shut down**.
- If the lever is **lowered**: the engine is **running**.

Details of its use are provided on the dedicated label (3).

The red cover can only be lowered with the lever in the down position.



## **NOTICE**

*If the machine does not start, make sure that the engine stop safety switch is in the correct position.*

---

**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

8-7

### 8.3 - Guards

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 located on the rear side of the machine.

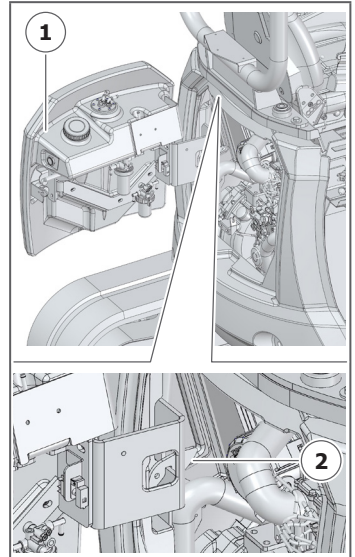
From this hood you can access: the engine, the air filter, the fuel tank, etc...

To **open** the hood:

- insert the key into the lock and turn it counter-clockwise;
- release the lock by pushing the key;
- pull the cover to the left using the special handhold to open it;
- when the cover is raised the latch clicks into place (2). The cover can now be left as it is since is being held in the open position by the stop.

To **close** the hood:

- push it to the left, lift up the stop (2) and close it slowly back to the right until you hear the latching of the lock;
- lock the hood by turning the key clockwise and then remove it.





## CAUTION

***Be very careful when the hood is open as it could close suddenly and cause serious injury to the operator's hands or head.***

### 8.3.2 - Upper radiator compartment cover

The upper radiator compartment cover (1) is located on the upper right side of the machine.

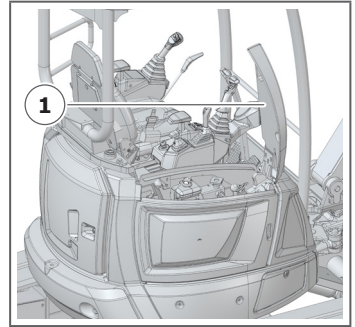
From this cover you can access: the water/oil radiator, the tank.

To **open** the cover:

- insert the key into the lock and turn it counter-clockwise;
- accompany the cover up to open it.

To **close** the cover:

- accompany the cover downwards until you hear the lock click;
- lock the cover by turning the key clockwise and then remove it.



## NOTICE

*Close the upper radiator compartment cover only if the lateral radiator cover is closed; they may collide and get damaged.*

---

### 8.3.3 - Lateral radiator compartment cover

The lateral radiator cover (1) is located on the right side of the machine.

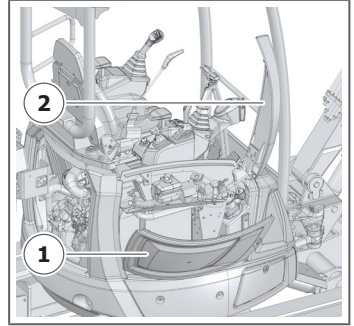
From this cover you can access: the water/oil radiator.

To **open** the cover:

- open the tank compartment cover (2) (refer to section "8.3.2 - Upper radiator compartment cover" to page 8-9);
- insert the key into the lock and turn it counter-clockwise;
- accompany the cover towards you to open it.

To **close** the cover:

- push the cover until you hear the lock click;
- close the tank compartment cover (2);
- lock the cover by turning the key clockwise and then remove it.



## NOTICE

*Close the upper radiator compartment cover only if the lateral radiator cover is closed; they may collide and get damaged.*

### 8.3.4 - Battery compartment guard

The battery compartment guard (1) is located on the right side of the machine.

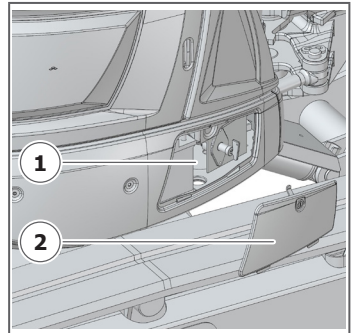
From this cover you can access: the battery, the isolator switch.

To **open** the guard:

- insert the key into the lock and turn it counter-clockwise;
- remove the guard (2) by pulling it out from the top.

To **refit** the guard:

- Fit the base onto the machine and rest the top part on it;
- lock the cover by turning the key clockwise and then remove it.





### 8.3.5 - Distributor compartment guard

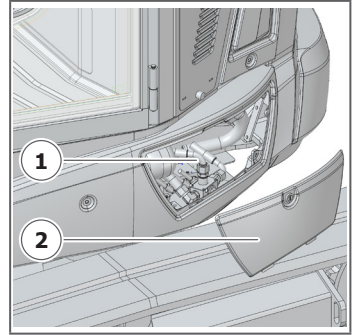
The distributor compartment guard (1) is located on the left side of the machine. From this cover you can access: the distributor.

To **open** the guard:

- insert the key into the lock and turn it counter-clockwise;
- remove the guard (2) by pulling it out from the top.

To **refit** the guard:

- Fit the base onto the machine and rest the top part on it;
- lock the cover by turning the key clockwise and then remove it.



### 8.3.6 - Document holder (canopy version), fuse and relay compartment guard

The document holder (canopy version), fuse and relay compartment guard (1) is located on the front of the operator seat, under the seat itself.

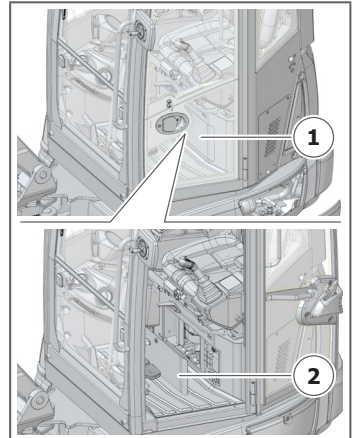
It allows access to: machine documents, relays and fuses of the electrical system.

To **remove** the guard:

- insert the key into the lock and turn it counter-clockwise;
- remove the guard (1) by pulling it out from the top.

To **refit** the guard:

- fit the base (2) onto the machine and rest the top part on it;
- lock the cover by turning the key clockwise and then remove it.



### 8.3.7 - Tool holder cover (canopy version)

The tool holder compartment cover (1) is located on the rear side of the machine, above the engine compartment hood.

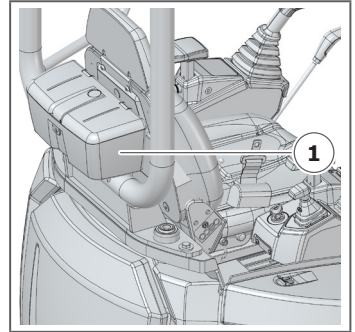
It allows access to: an empty compartment where all the tools provided can be placed.

To **open** the cover:

- insert the key into the lock and turn it counter-clockwise;
- accompany the cover up to open it.

To **close** the cover:

- push it down until you hear the lock click;
- lock the cover by turning the key clockwise and then remove it.



### 8.4 - Protective structure tip-over

To perform maintenance operations on internal parts positioned under the driver's seat, the protective structure can be lifted (tipped).



## WARNING

***When the protective structure is being tipped over, follow the procedure indicated very carefully, in order to avoid crushing the operator.***

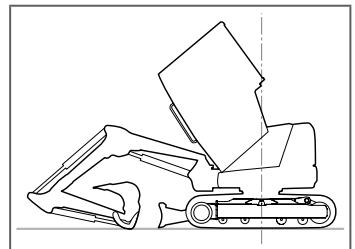


## WARNING

***Secure the machine as indicated in section "8.1.1 - Putting the machine out of service for maintenance" to page 8-5.***

To **tip over** the protective structure:

- position the machine on a flat, level surface;
- Rest the dozer blade on the ground and position the boom as shown in the figure;
- stop the engines, lift the controls cut-out lever;
- for the cab version, lift the lower front glass;



- leave the driving position;
- close the cover;
- open the engine hood (1);

- loosen the screws (2);
- ensure no-one remains near the machine, especially in the rear area;
- raise the protective structure by pushing it forward, until it has been tipped over completely.

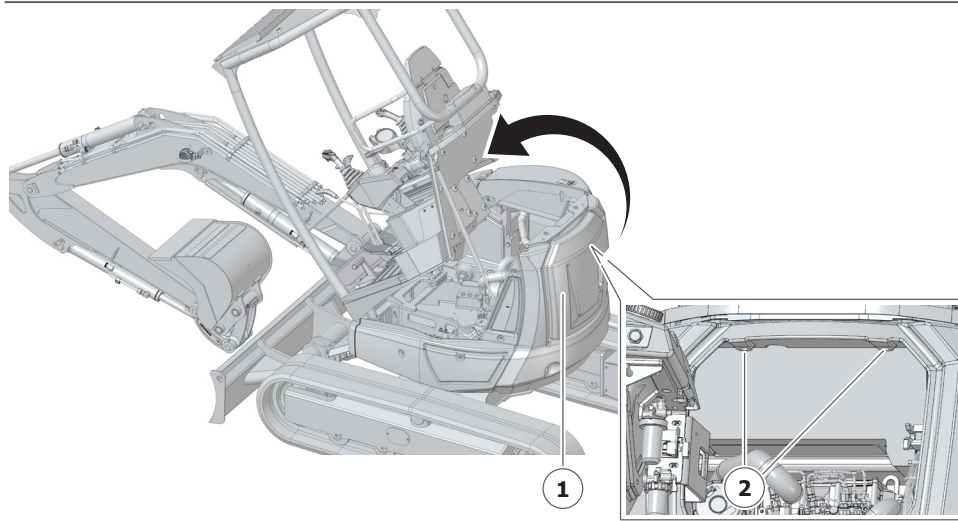


## WARNING

***Crushing/shearing hazard.***

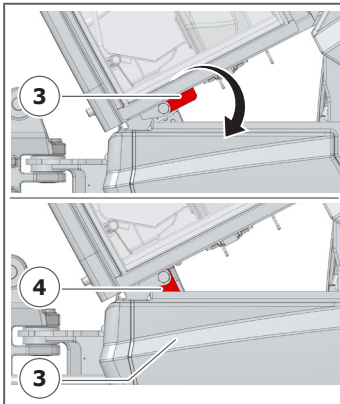
***Handle the protective structure away from the tip-over hinge.***

---



- remove the safety pin (5) from its housing and release the safety lock (6);
- turn the safety lock (6) downwards in the locked position, thus preventing the involuntary and unexpected tipping over of the structure;
- secure the safety lock with the pin (5).

To put the protective structure back in place, repeat the procedure in reverse order.



## Screw characteristics (2)

|                     |                 |
|---------------------|-----------------|
| Screw size          | M16 x 2.00 x 60 |
| Bolt strength class | 10.9            |
| Tightening torque   | Nm 300          |



## WARNING

***When the structure is raised, do not attempt to start the machine.***

***Before carrying out any work, replace the protective structure in its original position.***

## 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.**

If the cables are damp or their insulation is damaged, current will be dispersed within the electrical system, which may cause the machine to malfunction.

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 working lights, see section "9.2 - Work lights replacement" to page 9-7 "9.3 - LED strip replacement" to page 9-8.

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 many hours on the banks of rivers, lakes or the sea, protect the connectors with suitable anti-corrosive agents.

## 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 8-18.

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<br>(with filter change) | SAE 10W40<br>ACEA E9      | AKCELA UNITEK 10W-40                  | 2,8 l     |
| Diesel engine<br>cooling system       | ASTM D6210<br>TYPE I-FF   | TUTELA ACTIFULL OT<br>CONCENTRATE (*) | 5 l       |
|                                       | ASTM D6210<br>TYPE III-FF | TUTELA ACTIFULL OT 50/50<br>PREMIXED  |           |
| Hydraulic system                      | ISO 11158                 | TUTELA HYDROSYSTEM 46<br>HV NT        | 40 l      |
| Hydraulic oil tank                    | L-HV46                    |                                       | 29 l      |
| Travel gear motors                    | SAE 80W90<br>API GL-5     | TUTELA HYPOIDE EP 80W-90<br>NT        | 0.6 l x 2 |
| Track tensioner<br>grease nipples     | NLGI 2 (**)               | TUTELA MOLY GREASE                    | -         |
| Joints greasing<br>points             |                           |                                       |           |
| Fuel tank                             | EN 590                    | -                                     | 26 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<br>(with filter change) | SAE 10W-40 | PANOLIN<br>BIOMOT LX 10W-40  | 2,8 l     |
| Hydraulic system                      | ISO 46     | PANOLIN<br>HLP SYNTH E46     | 40 l      |
| Hydraulic oil tank                    |            |                              | 29 l      |
| Travel gear motors                    | SAE 80W-90 | PANOLIN<br>BIOGEAR RS 80W-90 | 0.6 l x 2 |
| Track tensioner<br>grease nipples     | EP 2       | PANOLIN<br>BIOGREASE EP 2    | -         |
| Joints greasing<br>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 "8.10 - *Regular maintenance*" to page 8-35.

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 8-16.



#### **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.***

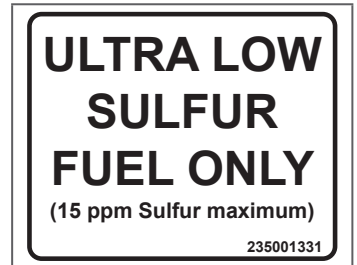
Always refill at the end of the day.

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)                               | CI-4, CH-4     |
| ACEA - (Association des Constructeurs Européens de l'Automobile) | E3, E5, E7, B3 |

### Lubricant oil viscosity

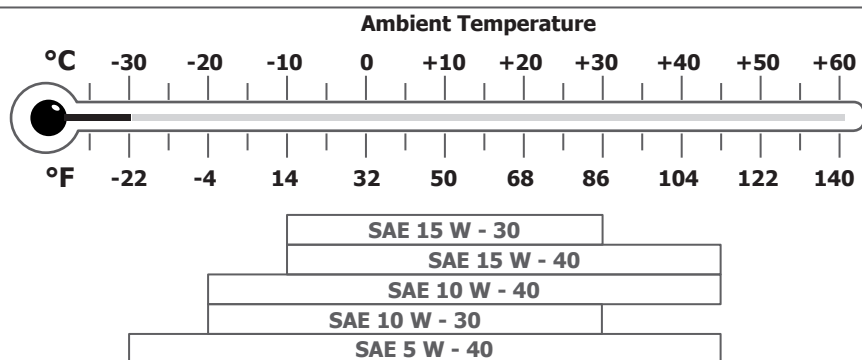
The lubricant oil viscosity is chosen according to the SAE (Society of Automotive Engineers) classification.

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:

Adapt the mixture, antifreeze liquid/distilled water as required, as indicated in the following table:

| ANTIFREEZE<br>% VOLUME | DISTILLED<br>WATER<br>% VOLUME | FREEZING POINT<br>°C | BOILING POINT<br>°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 oil**

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                                                                  |
|------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------|
| <b>Mineral</b>                           | ISO-L-HV<br>DIN 51524 3rd part (HVLV) or<br>ISO 11158:2009 (HV)<br>Viscosity index $\geq 150$ and $< 170$<br>VICKERS M-2950                                                               | No requirement                                                                                |
| <b>Eco-friendly</b><br>(Synthetic ester) | ISO 15380 HEES<br>Viscosity index $\geq 145$ and $< 155$<br>Zinc-free<br>ASTM D943 dry TOST $> 3000$ h<br>ASTM D 2070 (mod. 1680 h)<br>Test FZG A/8.3/90 12° fill level<br>VICKERS V104 C | Biodegradable as per OCSE 301<br>B $> 70\%$<br>Water hazard class according to<br>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 mm<sup>2</sup>/s, the optimum conditions for which maximum performance is achieved occur at a viscosity ranging from 15 to 35 mm<sup>2</sup>/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 |        |
|-----------------|------------------------------|---------------------|--------|
|                 | mm <sup>2</sup> /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<br>(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 "8.10.11 - Hydraulic system oil sampling/replacement" to page 8-53.

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](http://www.panolin.com)

**PANOLIN®**  
Swiss Oil Technology 

\*mandatory

**Please send to:**

CH-8322 Madetswil

Year \_\_\_\_\_

☐ Other \_\_\_\_\_

Top up quantity since last oil drain \_\_\_\_\_

☐ Other \_\_\_\_\_

## E-Mail:

[illegible]

## 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](mailto: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.***



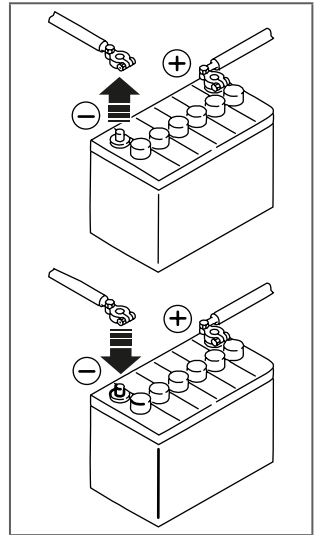
## WARNING

***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 ignition 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

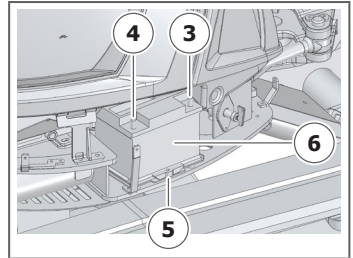
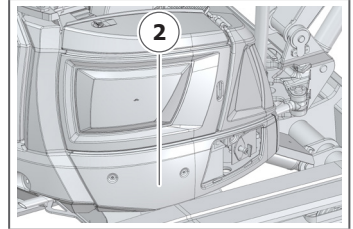


## WARNING

**Secure the machine as indicated in section "8.1.1 - Putting the machine out of service for maintenance" to page 8-5.**

#### REMOVAL:

- close the battery compartment cover (1);
- disconnect the battery, as indicated in sections "5.9 - Battery disconnect switch" to page 5-11 and "6.2 - Battery disconnect switch" to page 6-4;
- loosen the screws and remove the right side panel (2);
- disconnect the earth cable (3) from the negative terminal (-);
- disconnect the cable (4) from the positive terminal (+);
- loosen the screws and remove the bracket (5) holding the battery;
- remove the battery (6).

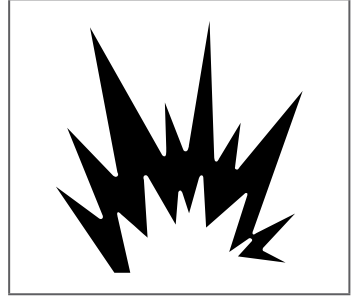


#### INSTALLATION:

- Install the battery (6) in the specified position;
- tightly secure the battery using the fixing bracket (5) and **make sure it is stable and does not move;**
- connect the cable (4) to the positive (+) terminal of the battery;
- connect the earth cable (3) to the negative (-) terminal of the battery;
- reposition the side panel (2) and secure it with the screws;
- restore the battery isolator switch so that normal operation can be resumed;
- refit the battery compartment cover (1).

### 8.8.2 - Recharging the battery

When charging the battery, always follow the instructions given in section "8.8 - Battery" to page 8-31 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 the tightening devices supplied with metric threads, either dry or oil-lubricated (daNm) [kgm].

| METRIC COARSE THREADS |     |      |      |      |
|-----------------------|-----|------|------|------|
| SIZE                  | 5.8 | 8.8  | 10.9 | 12.9 |
| M6                    | 0.7 | 1    | 1.45 | 1.75 |
| M8                    | 1.6 | 2.5  | 3.5  | 4.2  |
| M10                   | 3.5 | 4.8  | 6.8  | 8.2  |
| M12                   | 6   | 8.6  | 12   | 14.5 |
| M14                   | 8.5 | 13.5 | 19   | 23   |
| M16                   | 14  | 21.5 | 30   | 36   |
| M18                   | 20  | 29.5 | 41   | 49   |
| M20                   | 30  | 41   | 58   | 69   |
| M22                   | 37  | 55   | 78   | 93   |
| M24                   | 50  | 72   | 100  | 120  |
| M27                   | 65  | 104  | 145  | 175  |
| M30                   | 90  | 140  | 200  | 240  |

| METRIC FINE THREADS |     |     |      |      |
|---------------------|-----|-----|------|------|
| SIZE                | 5.8 | 8.8 | 10.9 | 12.9 |
| M8x1                | 1.8 | 2.7 | 3.8  | 4.4  |
| M10x1.25            | 3.5 | 5.2 | 7.2  | 8.8  |
| M12x1.25            | 6.5 | 9.5 | 13.5 | 16.5 |
| M12x1.5             | 6.3 | 9   | 12.5 | 15   |
| M14x1.5             | 10  | 15  | 20.5 | 25   |
| M16x1.5             | 15  | 22  | 31   | 38   |
| M18x1.5             | 21  | 32  | 46   | 55   |
| M20x1.5             | 30  | 46  | 67   | 77   |
| M22x1.5             | 40  | 62  | 88   | 105  |
| M24x2               | 50  | 80  | 110  | 130  |
| M27x2               | 70  | 110 | 160  | 190  |
| M30x2               | 100 | 150 | 210  | 250  |



## 8.10 - 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 100 HOURS | EVERY 250 HOURS | EVERY 500 HOURS | EVERY 1,000 HOURS | EVERY 2,000 HOURS |
|-----------|------------------------------------------------------------|------|-------|-----------------|-----------------|-----------------|-------------------|-------------------|
| 1         | Check of safety devices                                    | 2-46 | •     |                 |                 |                 |                   |                   |
| 2         | Check of safety signs                                      | 2-5  | •     |                 |                 |                 |                   |                   |
| 3         | Check of guards                                            | 8-8  | •     |                 |                 |                 |                   |                   |
| 4         | Check of engine oil level                                  | 8-37 | •     |                 |                 |                 |                   |                   |
| 5         | Check of cooling liquid level                              | 8-43 | •     |                 |                 |                 |                   |                   |
| 6         | Check of hydraulic oil level                               | 8-50 | •     |                 |                 |                 |                   |                   |
| 7         | Check for air filter clogging                              | 8-66 | •     |                 |                 |                 |                   |                   |
| 8         | Clean radiator                                             | 8-48 | •     |                 |                 |                 |                   |                   |
| 9         | Check for ventilation system air filter clogging           | 8-68 | •     |                 |                 |                 |                   |                   |
| 10        | Lubricate pins                                             | 8-77 | •     |                 |                 |                 |                   |                   |
| 11        | Performance check (speed of machine movements)             | 8-37 |       | Δ               |                 |                 |                   |                   |
| 12        | Hydraulic system operating pressures check                 | 8-37 |       | Δ               |                 |                 |                   |                   |
| 13        | Track tension check                                        | 8-61 |       | Δ               | •               |                 |                   |                   |
| 14        | Check that the screws of the drive wheel/rollers are tight | 8-58 |       | Δ               | •               |                 |                   |                   |
| 15        | Check the alternator/fan belt tension                      | 8-65 |       | Δ               | •               |                 |                   |                   |
| 16        | Check of cooling liquid sleeves                            | 8-47 |       | Δ               | •               |                 |                   |                   |

| Reference | OPERATION DESCRIPTION                              | Page | DAILY | AFTER 100 HOURS | EVERY 250 HOURS | EVERY 500 HOURS | EVERY 1,000 HOURS | EVERY 2,000 HOURS |
|-----------|----------------------------------------------------|------|-------|-----------------|-----------------|-----------------|-------------------|-------------------|
| <b>17</b> | Replacement of engine oil                          | 8-39 |       | <b>Δ</b>        | <b>●1</b>       |                 |                   |                   |
| <b>18</b> | Replacement of engine oil filter                   | 8-41 |       | <b>Δ</b>        | <b>●1</b>       |                 |                   |                   |
| <b>19</b> | Replacement of fuel filter                         | 8-70 |       | <b>Δ</b>        | <b>●1</b>       |                 |                   |                   |
| <b>20</b> | Replacement of air filter                          | 8-66 |       | <b>Δ</b>        | <b>●1</b>       |                 |                   |                   |
| <b>21</b> | Replacement of drain circuit hydraulic oil filter  | 8-51 |       | <b>Δ</b>        |                 | <b>●2</b>       |                   |                   |
| <b>22</b> | Replacement of ventilation system air filter       | 8-68 |       |                 | <b>●1</b>       |                 |                   |                   |
| <b>23</b> | Replacement of cooling liquid                      | 8-45 |       |                 |                 | <b>●2</b>       |                   |                   |
| <b>24</b> | Drain fuel tank                                    | 8-71 |       |                 |                 | <b>●2</b>       |                   |                   |
|           | Replacement of water separator filter              | 8-72 |       |                 |                 |                 |                   |                   |
|           | Clean filter on fuel suction                       | 8-73 |       |                 |                 |                 |                   |                   |
| <b>25</b> | Check oil level of translation motors              | 8-75 |       |                 | <b>●</b>        |                 |                   |                   |
| <b>26</b> | Replacement of translation motor oil               | 8-75 |       |                 |                 | <b>●2</b>       |                   |                   |
| <b>27</b> | Hydraulic system oil sampling / replacement        | 8-53 |       |                 |                 |                 | <b>●2*</b>        |                   |
| <b>28</b> | Replacement of intake circuit hydraulic oil filter | 8-55 |       |                 |                 |                 | <b>●2</b>         |                   |
| <b>29</b> | Replace alternator/fan belt                        | 8-65 |       |                 |                 |                 | <b>●3</b>         |                   |
| <b>30</b> | Replacement of cooling liquid filter sleeves       | 8-47 |       |                 |                 |                 |                   | <b>●3</b>         |

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** = First time only

**\*** = different replacement interval if eco-friendly lubricant is used, see the dedicated section

### 8.10.1 - Performance check

To check the performance (speed of machine movements) and operating pressures of the hydraulic system, contact the *Service Centre*.

### 8.10.2 - Check the oil level in the engine



## WARNING

***Secure the machine as indicated in section "8.1.1 - Putting the machine out of service for maintenance" to page 8-5.***



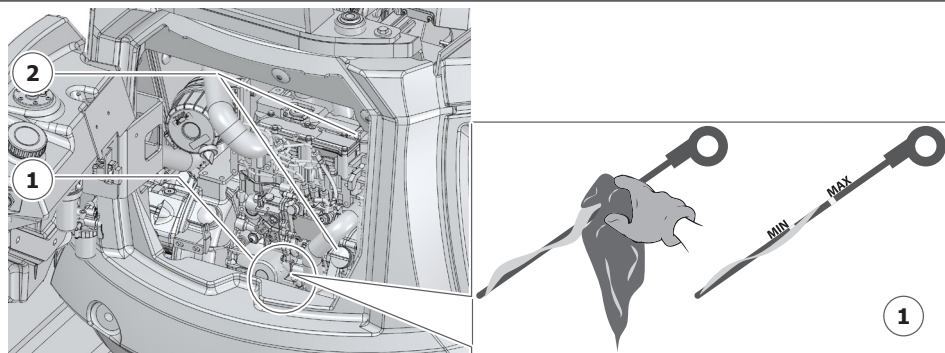
## WARNING

***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 one of the two top fillers (2), following the indications in section "8.7.4 - Engine oil" to page 8-20.

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.*

---

### 8.10.3 - Changing the engine oil



## WARNING

**Secure the machine as indicated in section "8.1.1 - Putting the machine out of service for maintenance" to page 8-5.**



## 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.*

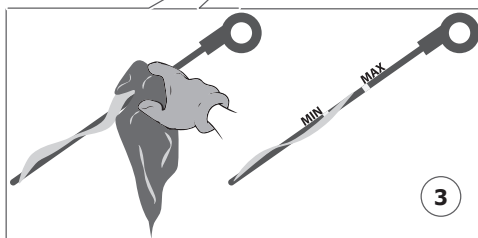
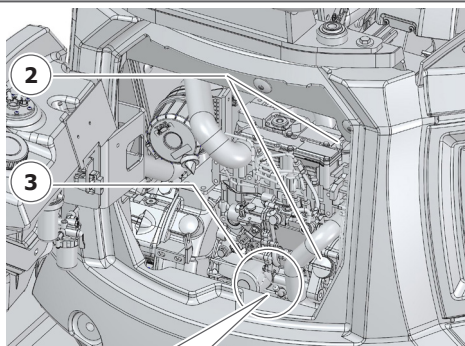
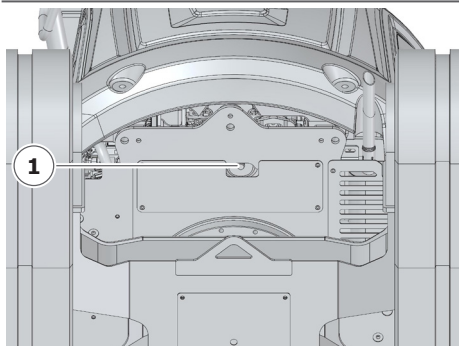
*This would cause the mixing of old oil and new oil, resulting in a reduction of the life of the engine.*

---

To **replace** the engine oil:

- unscrew the engine oil drain plug **(1)** placed under the engine and let the oil flow out into a suitable container, then dispose of it in compliance with current standards;
- open the engine compartment hood;
- unscrew one of the filler caps **(2)** to help the oil to drain out;
- wait for the oil to flow out completely;
- clean the caps **(1-2)** and the oil dipstick **(3)**;
- screw the drain plug back in place **(1)**;
- add more oil through the inlet **(2)** according to the type and amount indicated in the liquids table;

- check that the level is correct on the dipstick (3);
- replace the oil filler cap (2);
- 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.***

#### 8.10.4 - Changing the engine oil filter



## WARNING

**Secure the machine as indicated in section "8.1.1 - Putting the machine out of service for maintenance" to page 8-5.**



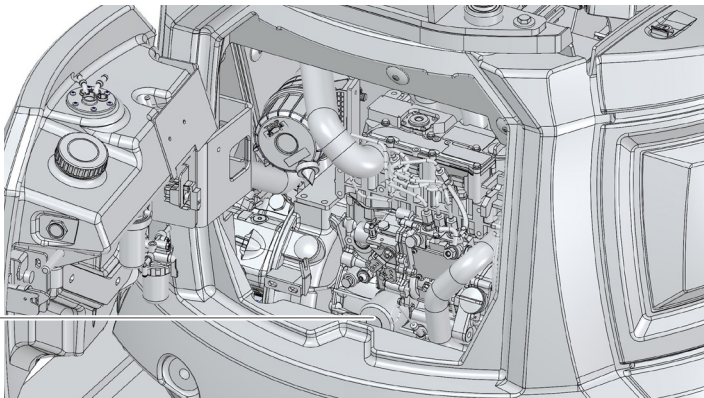
## WARNING

**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 on the control panel switches off;
- close the engine compartment hood.



1



### **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.***

---



### 8.10.5 - Check the cooling liquid level



## WARNING

**Secure the machine as indicated in section "8.1.1 - Putting the machine out of service for maintenance" to page 8-5.**



## 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 refer to section "8.7.5 - Cooling liquid" to page 8-22.*

*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.*

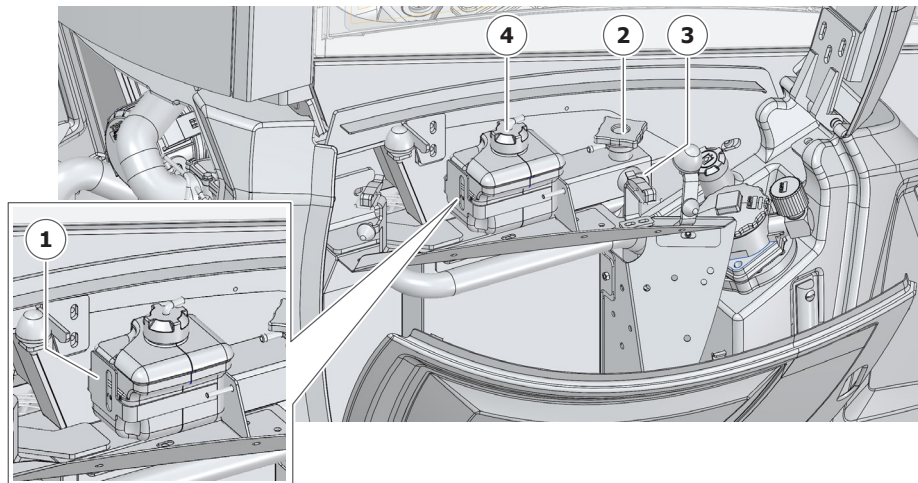
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To **check the level** of cooling liquid:

- open the engine hood and the radiator cover;
- 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.*

### 8.10.6 - Changing the cooling liquid



## WARNING

**Secure the machine as indicated in section "8.1.1 - Putting the machine out of service for maintenance" to page 8-5.**



## 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

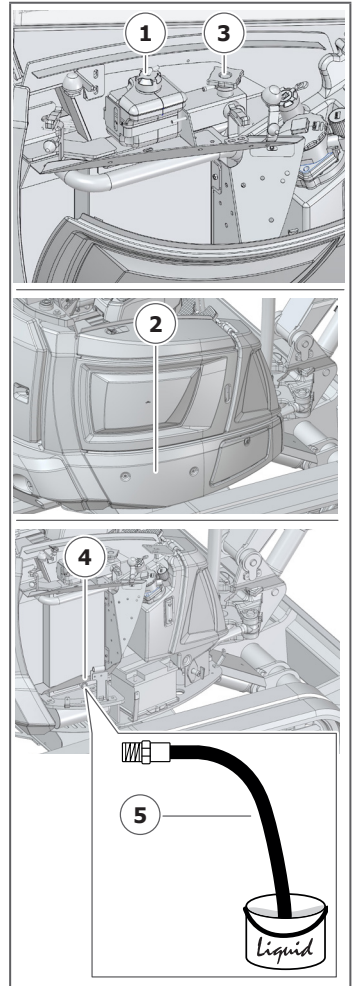
*Always comply with the correct antifreeze liquid/distilled water ratio, for further information see section "8.7.5 - Cooling liquid" to page 8-22.*

---

To **replace** the cooling liquid:

- open the radiator compartment covers;
- 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 right side panel **(2)**;
- remove the radiator cap **(3)**;

- 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 side panel (2);
- add more liquid through the opening (3) 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;
- 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 "8.10.5 - Check the cooling liquid level" to page 8-43;



- 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).

### 8.10.7 - 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 8-5.**



## 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.**

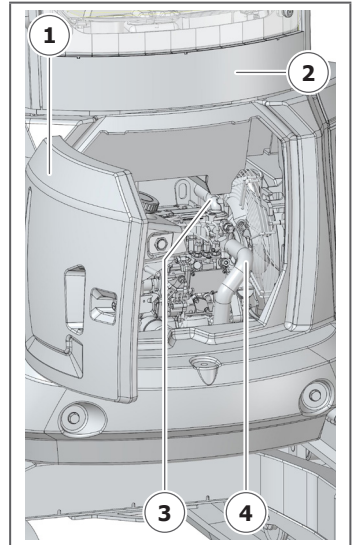
To prevent the cooling liquid from leaking and damaging the engine, it is necessary to periodically check and replace the sleeves that connect the engine to the radiator.

To **check** the sleeves:

- open the engine hood (1);
- tilt the upper structure (2);
- check the upper sleeve (3);
- check the lower sleeve (4);
- if they are both intact and are not cracked or leak, the check is over;
- close the upper structure and refit the right cover.

If **the sleeves are damaged**:

- loosen the clamps on the ends;
- remove the damaged sleeve;
- insert a new sleeve;
- refit the clamps.



### 8.10.8 - Cleaning the radiator



## WARNING

**Secure the machine as indicated in section "8.1.1 - Putting the machine out of service for maintenance" to page 8-5.**



## 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

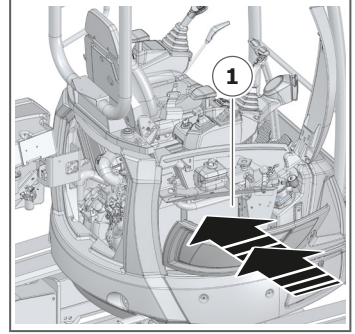
When the machine works in very dusty environments, check radiator clogging more frequently.

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 hood and the radiator compartment covers;
- check the radiator fins (1);
- 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;
- use compressed air (max. 10 bar) to clean the radiator compartment;
- close the radiator compartment cover.



### **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 machine.*

---

### 8.10.9 - Check the hydraulic oil level



## WARNING

***Secure the machine as indicated in section "8.1.1 - Putting the machine out of service for maintenance" to page 8-5.***



## 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.



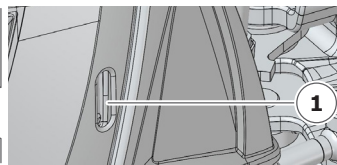
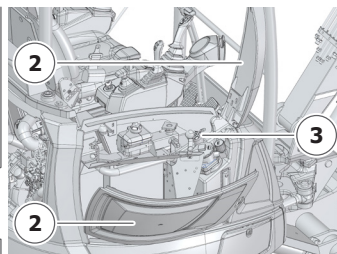
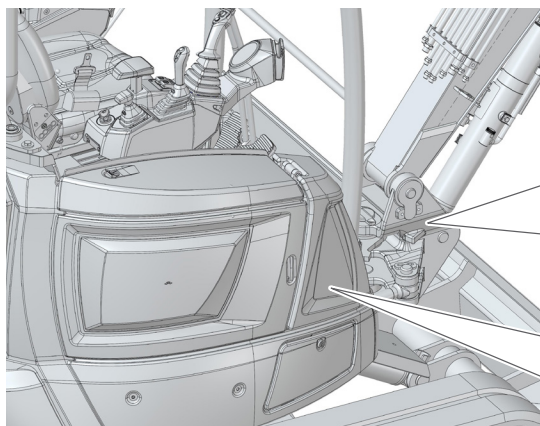
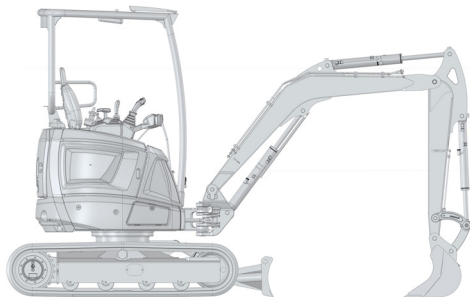
## WARNING

***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**:

- open the radiator compartment covers **(2)**;
- unscrew the hydraulic oil tank cap **(3)** by turning it counter-clockwise;
- 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 back on following the reverse procedure;
- close the engine compartment hood.





### 8.10.10 - Replacement of drain 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 8-5.**



## WARNING

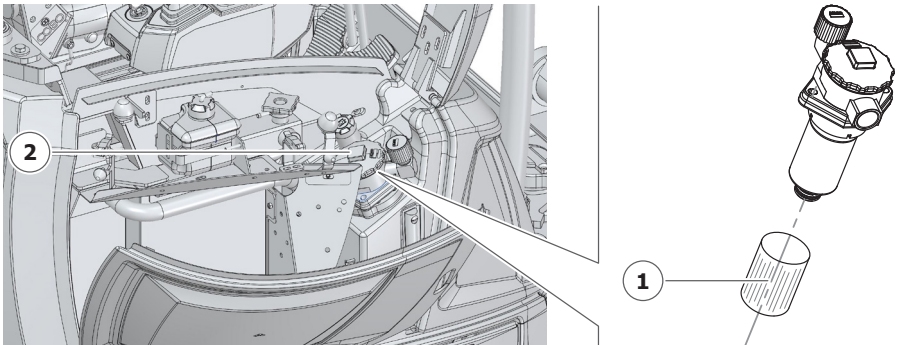
**Immediately after using the machine, the temperature of the components and of the hydraulic oil may be high and may cause burns, after stopping, wait until the temperature drops below 40°C before proceeding with maintenance operations.**

**Before carrying out any maintenance work on the hydraulic system, the residual pressure must be released as indicated in the specific section.**

The drain circuit hydraulic oil filter (1) is housed inside the hydraulic oil tank at the top.

To **replace** the filter:

- open the radiator compartment covers;
- unscrew the filter cover (2);
- unscrew the old filter (1) and dispose of it in compliance with the applicable standards;
- clean the surrounding area and insert the new filter;
- screw the filter cover and the screws;
- 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 upper structure again.



***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.***

### 8.10.11 - 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 8-5.**



## 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 8-16.

Never start the engine with the tank empty as this will definitely damage the pump.

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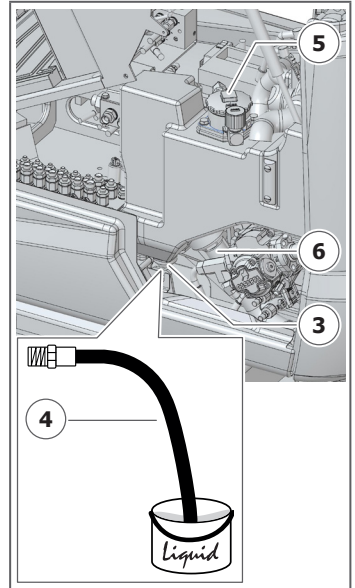
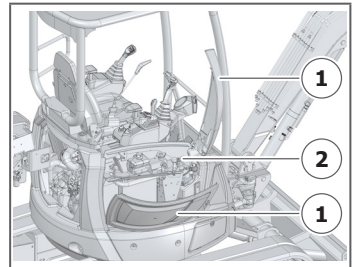
To take **samples** of the eco-friendly oil:

- start the machine and make movements until the hydraulic oil has reached a temperature of approximately +40°C, then stop the machine;
- open the engine hood (1);
- unscrew the hydraulic oil tank filler cap (2);
- remove the left cover;
- tip the protective structure;
- using a clean syringe, withdraw 500 ml of oil through the cap (3), 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 "8.7.6.3 - Requirements for the sampling of eco-friendly hydraulic oil" to page 8-28) 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 covers (1);
- remove the right cover;
- tip the protective structure;
- unscrew the hydraulic oil tank filler cap (2);
- unscrew the protection cap of the quick discharge valve (3);
- screw the special discharge hose (4) supplied with the machine on the valve, making sure that the non-threaded end is inside a suitable container; while screwing it on, the valve opens and allows the oil to flow out;
- wait for all of the oil to flow out, then dispose of it in compliance with the standards in force;
- unscrew the discharge hose and screw on the protection cap of the quick discharge valve (3);
- replace the discharge circuit hydraulic oil filter (5), refer to section "8.10.10 - Replacement of drain circuit hydraulic oil filter" to page 8-51;
- replace the intake circuit hydraulic oil filter (6), refer to section "8.10.12 - Replacement of intake circuit hydraulic oil filter" to page 8-55;



- fill up with oil, of the type and quantity indicated in the liquids table, until the level is reached as described in section "8.10.9 - Check the hydraulic oil level" to page 8-50, and then screw on the cap (2);
- close the rear cover;
- 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.***

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### 8.10.12 - 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 8-5.***



## 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.*

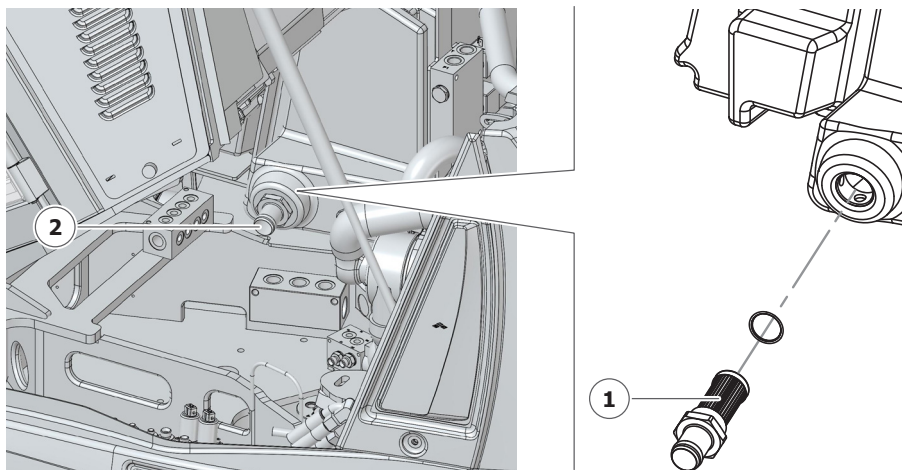
*Only use the allowed lubricating oils indicated by CASE in the dedicated table in section "8.7 - Refilling" to page 8-16.*

---

The intake circuit hydraulic oil filter (1) is housed inside the hydraulic oil tank which can be accessed from the lower cover on the rear side of the machine.

To **replace** the filter:

- tip the protective structure;
- drain the hydraulic oil as indicated in section "8.10.11 - Hydraulic system oil sampling/ replacement" to page 8-53;
- wait for the liquid to flow out completely;
- disconnect the intake sleeve (2);
- 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 (2);
- refit the protective cover;
- close the upper structure again;
- restore the hydraulic oil level;
- 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.**

### 8.10.13 - Check the condition of hydraulic lines



## WARNING

**Secure the machine as indicated in section "8.1.1 - Putting the machine out of service for maintenance" to page 8-5.**



## 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.*

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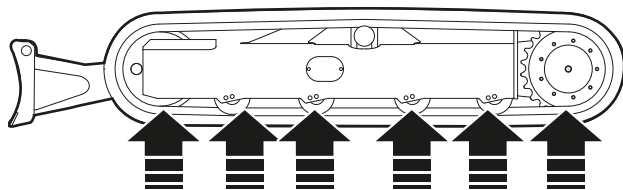
#### 8.10.14 - Check that the screws of the drive wheel/rollers are tight



## WARNING

**Secure the machine as indicated in section "8.1.1 - Putting the machine out of service for maintenance" to page 8-5.**

Periodically check for loose bolts on the drive gears, track tensioner and track rollers.





### 8.10.15 - Track service position



## WARNING

**Secure the machine as indicated in section "8.1.1 - Putting the machine out of service for maintenance" to page 8-5.**

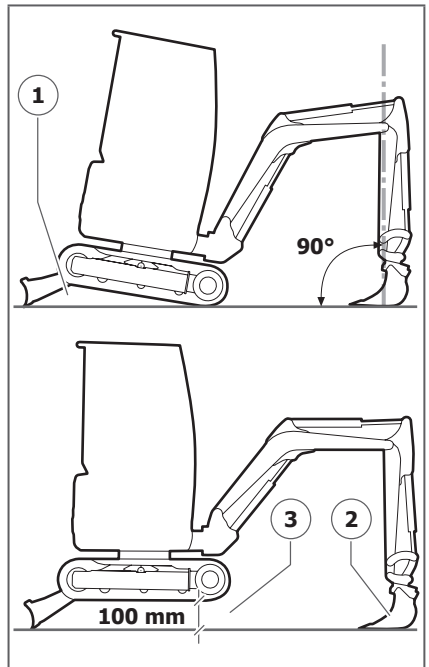


## WARNING

**There must be present a second person in charge with maintenance so as to supports the operator moves from the ground level while the machine is in track service position.**

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:

- turn the upper part of the structure 180° so that the dozer blade stays behind the operator;
- move the first boom to the central position in front of the operator (if the boom swing or deporté is present);
- lower the dozer blade to the ground and keep pressing the control until the end of the machine is lifted off the ground (1) of about **100 mm**;
- Position the second boom so that the boom cylinder is at right angles (90°) to the ground;
- Lower the boom to bring the bucket to the ground (2);
- apply downward pressure on the first boom, and simultaneously extend the second boom as required, so that the front of the machine rises off the ground (3) of about **100 mm**. The machine body must be positioned horizontally.





## WARNING

***DO NOT lift the machine over the indicated limit since it could tilt and damage the hydraulic lines and cause serious injuries.***

- Switch off the engine, open the controls cut-out lever outwards and wait for the person on the ground to block the machine safely.



## WARNING

***Prior to getting off the machine or starting any maintenance interventions, block it in track service position and set it in safety.***

***The person on the ground must block the machine in a safe condition by placing suitable jacks under the frame of the undercarriage that withstand the entire weight of the machine. While setting the machine in safety, use caution to avoid crushing hazards.***

- Get off the machine very carefully since it is in a lifted position;
- 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.

### 8.10.16 - 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 8-5.**

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:

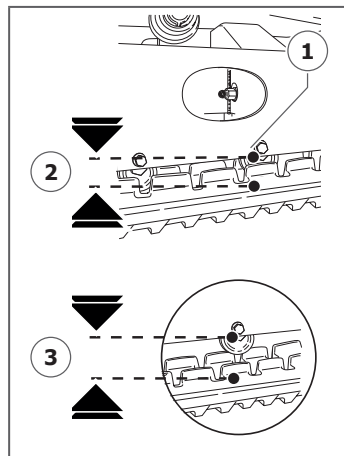
- wear of undercarriage components (tracks, drive wheels, idlers, rollers) caused by normal working operations;
- the type of soil on which the machine is positioned, e.g. muddy or compacted soil;
- accumulation of mud, sand or other material on the surface (inside and outside) of the tracks.

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:

- Determine a reference point near the centre of each track frame (1), then measure the distance between each reference point and the top of the corresponding track tread (2);
- 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 to the corresponding track treads (3);
- Subtract the smaller measurement from the larger (2-3) 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 | 20  | 25  |

- the machine can now be removed from the track service position and placed onto the ground;
- should the tension of the tracks be wrong, see section "8.10.17 - Adjusting the track tension" to page 8-63.

## 8.10.17 - 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 8-5.**



# 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.**

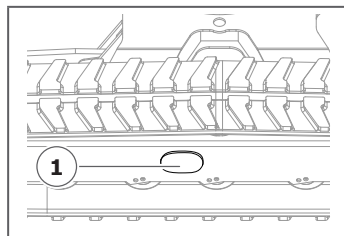
Track tension is adjusted by increasing or reducing the grease loading of a hydraulic cylinder (also known as a track tensioner) that applies a thrust to the idler wheel.

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  | 90       |
| Max. pump pressure   | bar | 300      |
| Pump coupling type   |     | UNI 7663 |



# WARNING

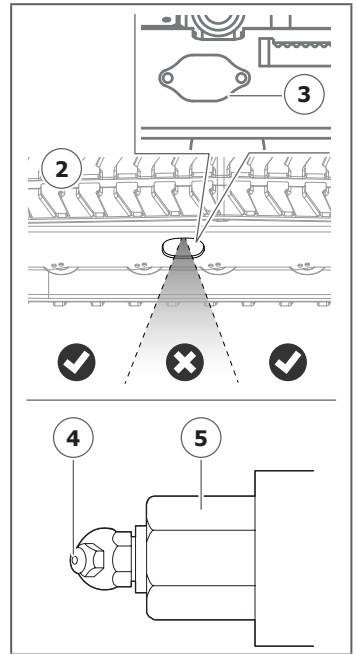
**DO NOT remove the grease nipple on the end of the valve, or attempt to turn the valve body by hand.**

**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.

### 8.10.18 - Checking and replacing the alternator/fan belt tension



## WARNING

**Secure the machine as indicated in section "8.1.1 - Putting the machine out of service for maintenance" to page 8-5.**

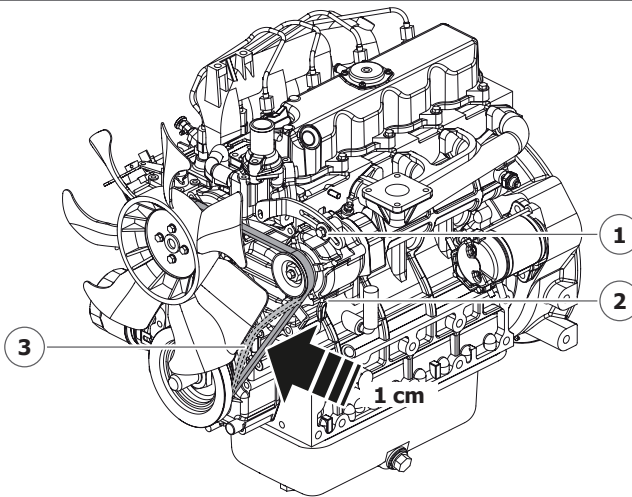
To **check** the tension of the belt, press the longer section of the belt with your thumb (between the engine pulley and the alternator pulley).

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.



### 8.10.19 - 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 8-5.**



## 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.

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## 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.

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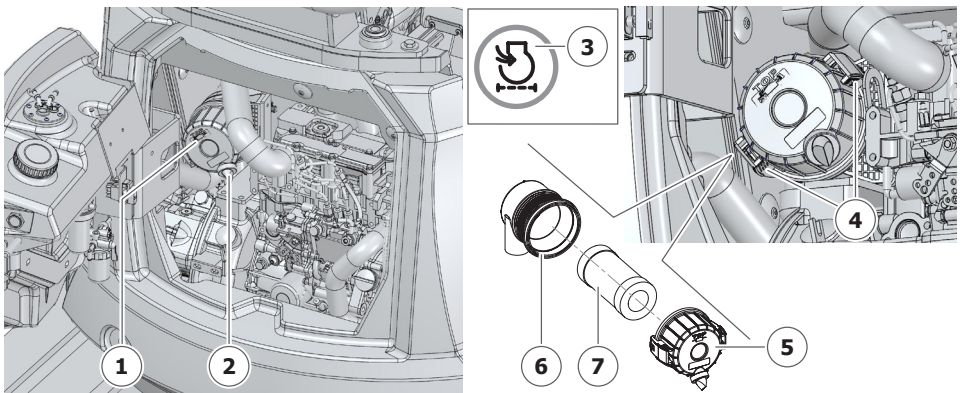
The air filter (1) is housed inside the engine compartment.

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;
- turn the ignition key switch to the "IGNITION" position and observe the air filter clogging indicator light (3) on the control panel;
- If the light is ON, the filter must be replaced or cleaned.

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.



### 8.10.20 - Checking for clogging and replacing the cab ventilation system air filter



## WARNING

**Secure the machine as indicated in section "8.1.1 - Putting the machine out of service for maintenance" to page 8-5.**

The cab ventilation system is equipped with two air filters:

- external cab air filter (1);
- internal cab air filter (2).



## NOTICE

*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. 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.*

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## NOTICE

*When the machine works in very dusty environments, check filter clogging more frequently.*

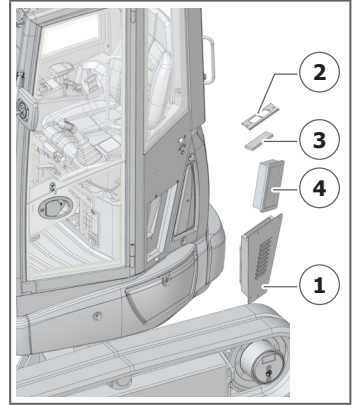
*In these conditions the replacement interval should be halved with respect to the indications given in the periodic maintenance table.*

*Perform the check even when there is a reduction in the efficiency of the ventilation system.*

---

To **check** the status of the filters:

- unscrew the screws securing the protective guard (1) and remove it;
- remove the screws that hold the lid (2), then remove it;
- remove the **internal cab air filter (3)** and check for breakage or cuts. Do not clean or reuse damaged elements but replace them with new parts;
- remove the **external cab air filter (4)** and check for breakage or cuts. Do not clean or reuse damaged items but replace with new ones;



- clean the filter carefully using compressed air, blowing from the clean side towards the dirty side;
- if the maintenance interval has been reached, replace the filter with a new one and dispose of the old one in accordance with current Standards;
- always clean the inside surface of the filter housing, ensuring that all impurities are removed before fitting the new or cleaned element;
- reposition all components in reverse order.

### 8.10.21 - 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.*



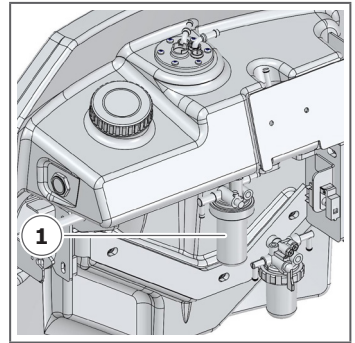
## WARNING

**Secure the machine as indicated in section "8.1.1 - Putting the machine out of service for maintenance" to page 8-5.**

The fuel filter (1) is housed in the engine hood.

To **access** the filter:

- open the engine compartment hood;
- close the tap located on the filter itself (if present).



To **replace** the filter:

- unscrew the filter and dispose of it in compliance with current Standards;
- clean the surrounding area to prevent any debris from getting into the circuit;
- moisten the seal of the new filter with engine oil;
- insert the filter to the base and screw it on manually until tight;
- vent the air as indicated in section "8.10.25 - Bleeding air from the fuel circuit" to page 8-74;
- close the engine compartment hood;
- start the engine and let it run for a few minutes and make sure there are no leaks.

### 8.10.22 - 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 8-5.**



## WARNING

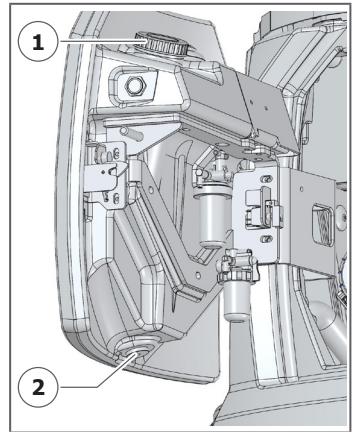
**Immediately after using the machine, the temperature of the components and of the hydraulic oil may be high and may cause burns, after stopping, wait until the temperature drops below 40°C before proceeding with maintenance operations.**

**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:**

- open the engine compartment hood;
- unscrew the fuel filler cap (1);
- unscrew the drain plug (2) 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 (2) and screw it back on;
- fill up with fuel;
- replace the cap on the fuel filler spout (1);



- vent the air as indicated in section "8.10.25 - Bleeding air from the fuel circuit" to page 8-74;
- check for leaks;
- close the engine compartment hood.

### 8.10.23 - 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 8-5.**



## 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.**

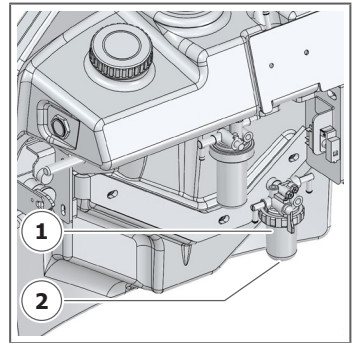
The water separator filter (1) is housed in the engine hood.

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 water/fuel separator filter there is an **electric indicator** which makes a message appear on the display when some water is present.

In this case, **drain the water:**

- open the engine compartment hood;
- disconnect the cable of the sensor positioned under the water separator filter;
- place a container under the drain plug (2);
- unscrew the drain plug, wait for all the contents to flow out and dispose of in compliance with current Standards;
- refit the drain plug and reconnect the sensor cable;



- bleed out the air as indicated in the dedicated section;
- close the engine compartment hood;
- start the engine and let it run for a few minutes and make sure there are no leaks.

### 8.10.24 - 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 8-5.**



## 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.**

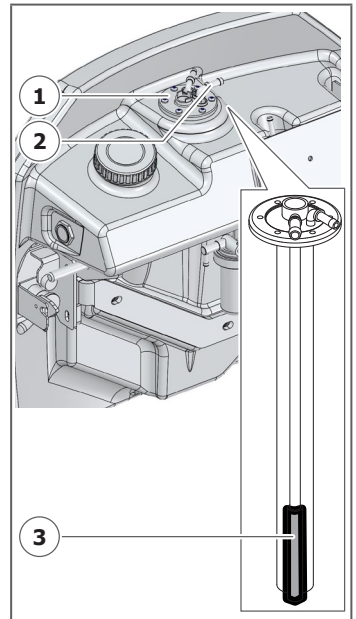
**If you spill fuel during this operation, clean up the spill to avoid the risk of fire.**

The fuel intake is carried out by means of the fuel level indicator (1) which is housed inside the engine hood.

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:

- open the engine compartment hood;
- disconnect the pipes and the electrical connection on the fuel level indicator (2);
- 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 engine compartment hood;
- start the engine and let it run for a few minutes and make sure there are no leaks.



### 8.10.25 - 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 8-5.**



## WARNING

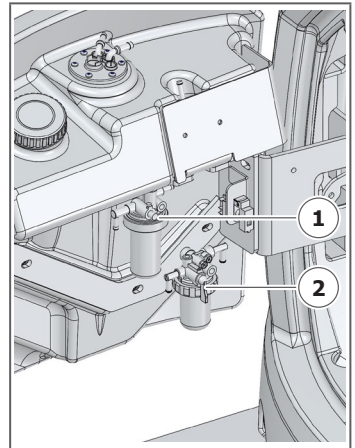
**Immediately after using the machine, the temperature of the components and of the hydraulic oil may be high and may cause burns, after stopping, wait until the temperature drops below 40°C before proceeding with maintenance operations.**

**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 engine compartment hood;
- open the fuel filter tap (1);
- open the water separator tap (2);
- close the engine compartment hood;
- turn the ignition 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.



### 8.10.26 - Level check and replacement of oil in the translation motors



## WARNING

**Secure the machine as indicated in section "8.1.1 - Putting the machine out of service for maintenance" to page 8-5.**



## 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.**

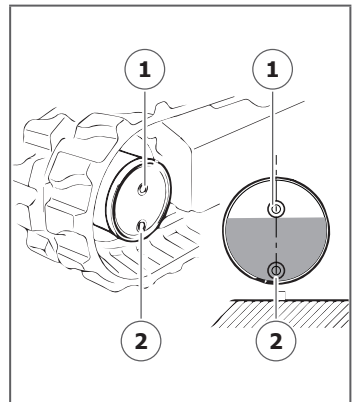
**They are highly pressurised due to the machine weight.**

Park the machine on a firm, level surface. The side gear motor must be orientated so that the plugs (1) and (2) are aligned vertically as indicated in then figure.

This position is essential for correct maintenance to be carried out.

After positioning the gear motor for draining or refilling with oil, set out the machine controls in the following way:

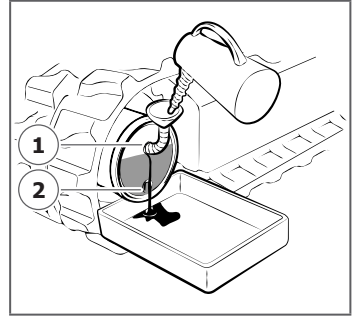
- place the machine on the ground;
- move the throttle lever to the idle position, turn off the engine, take out the ignition key and raise the safety lever to the STOP position.



To **check** the level:

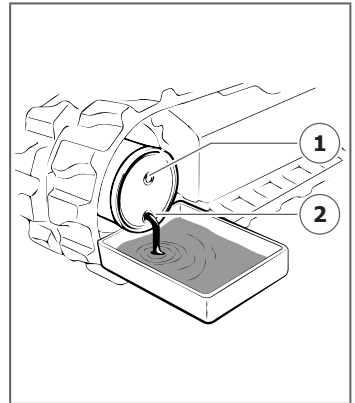
- position the gear motor as indicated above;
- unscrew the cap (1), if the oil level is not up to the hole, top up with the type of oil indicated in "section" until it flows out of the hole. Oil spilling out the hole means the correct level has been reached;
- fit back the plug (1).

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;
- 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 plug (2) and remove it from its seat;
- drain out the oil into a suitable container;
- screw in the plug (2);
- follow the instructions of the oil level check procedures, to restore the level.



### 8.10.27 - Swivel geared motor



## WARNING

**Secure the machine as indicated in section "8.1.1 - Putting the machine out of service for maintenance" to page 8-5.**

The swivel gear engine is lubricated internally by the same hydraulic oil as the machine system. This engine therefore requires no maintenance.

### 8.10.28 - Lubrication of pins



## WARNING

**Secure the machine as indicated in section "8.1.1 - Putting the machine out of service for maintenance" to page 8-5.**



## NOTICE

*Only use the allowed lubricating greases indicated by CASE in the dedicated table in section "8.7 - Refilling" to page 8-16.*

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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.

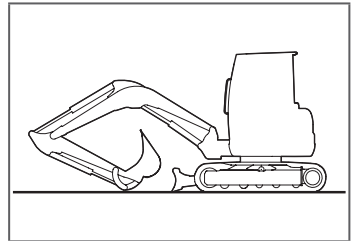
If you use the machine under critical operating conditions, carry out this maintenance task more frequently.

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.

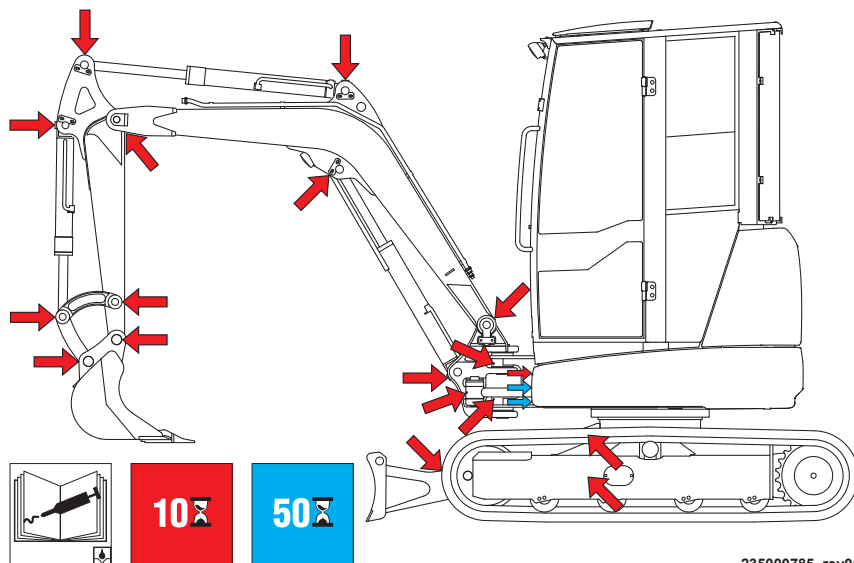
After working with machine parts immersed in water, lubricate pins that have been in contact with water.

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



235000785 rev01

### 8.11 - 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 belt from the alternator and the conditioner (if present)an;
- 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 "8.10 - Regular maintenance" to page 8-35;
- 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.

## 8.12 - 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.***

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## 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 8-15.***

### 9.1 - Fuses and relays



### WARNING

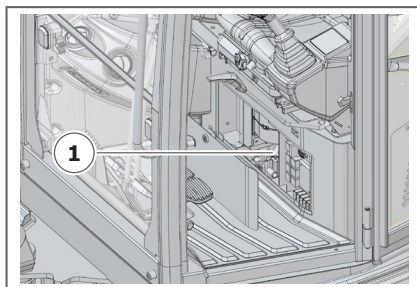
***Secure the machine as indicated in section "8.1.1 - Putting the machine out of service for maintenance" to page 8-5.***

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.

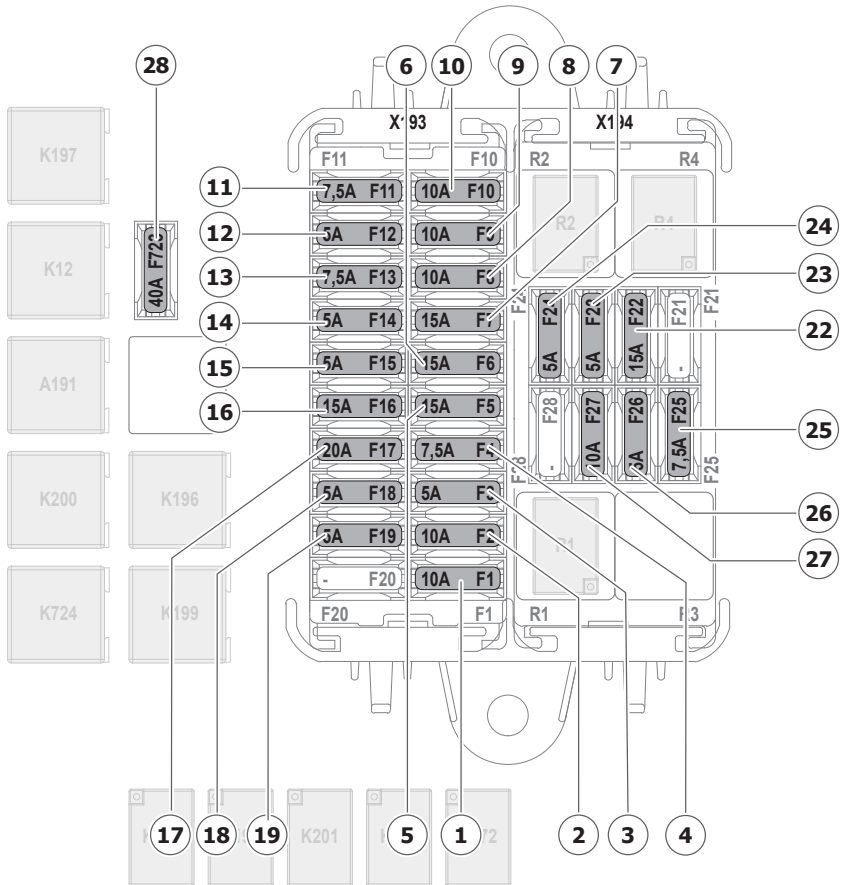
Always replace a fuse with another of the same capacity.

The fuses and relays are located inside the dedicated compartment (1).



### 9.1.1 - Control box fuses

To access the fuses, remove the fuse and relay compartment cover, located under the operator's seat.

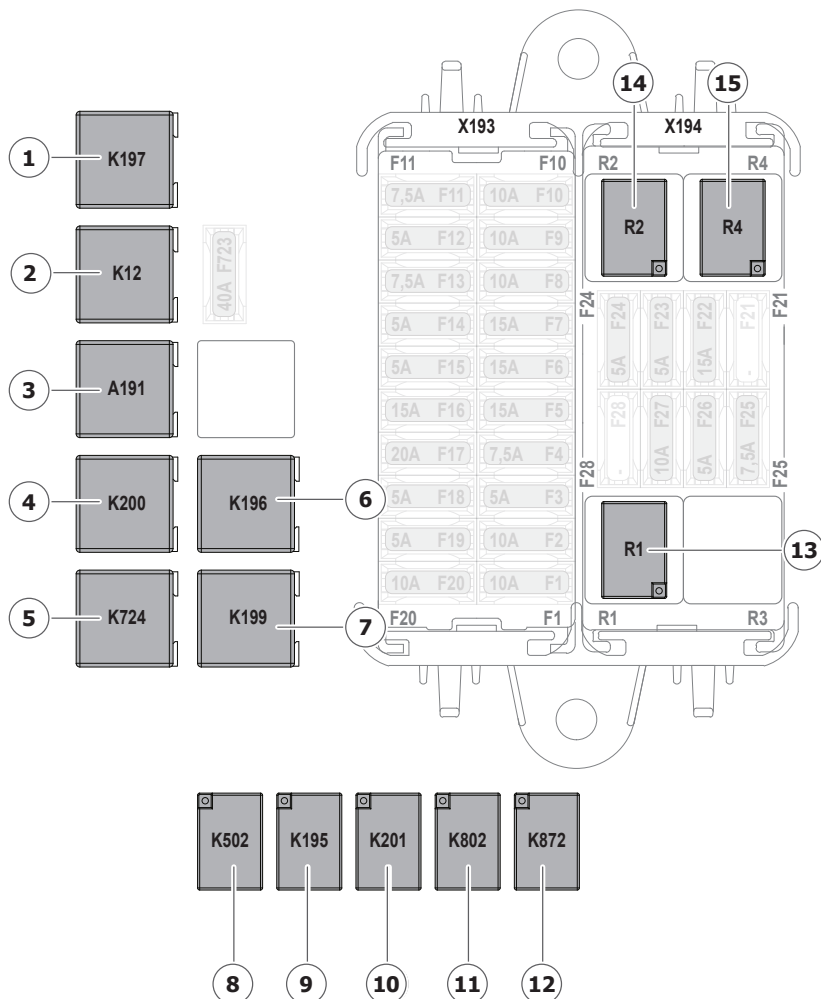


**List of fuses**

|           |             |                                                      |
|-----------|-------------|------------------------------------------------------|
| <b>1</b>  | <b>F1</b>   | 10A Alternator/hold engine fuse                      |
| <b>2</b>  | <b>F2</b>   | 10A Head unit fuse                                   |
| <b>3</b>  | <b>F3</b>   | 5A Controls cut-out lever micro fuse                 |
| <b>4</b>  | <b>F4</b>   | 7.5A Control panel/switches/head unit backlight fuse |
| <b>5</b>  | <b>F5</b>   | 15A AUX1/AUX3 switch solenoid valve fuse             |
| <b>6</b>  | <b>F6</b>   | 15A Front working lights fuse                        |
| <b>7</b>  | <b>F7</b>   | 15A Rear working light fuse                          |
| <b>8</b>  | <b>F8</b>   | 10A I/O EXT2 control box fuse                        |
| <b>9</b>  | <b>F9</b>   | 10A I/O EXT2 control box fuse (optional)             |
| <b>10</b> | <b>F10</b>  | 10A Windscreen wiper fuse                            |
| <b>11</b> | <b>F11</b>  | 7.5A Rotating head lamp fuse                         |
| <b>12</b> | <b>F12</b>  | 5A Diagnostics socket/hour meter fuse                |
| <b>13</b> | <b>F13</b>  | 7.5A Horn fuse                                       |
| <b>14</b> | <b>F14</b>  | 5A Starter panel fuse                                |
| <b>15</b> | <b>F15</b>  | 5A Telematics fuse                                   |
| <b>16</b> | <b>F16</b>  | 15A 12V socket/head unit/glass bowl fuse             |
| <b>17</b> | <b>F17</b>  | 20A Heating unit fuse                                |
| <b>18</b> | <b>F18</b>  | 5A Control panel fuse                                |
| <b>19</b> | <b>F19</b>  | 5A Joysticks fuse                                    |
| <b>22</b> | <b>F22</b>  | 15A Safety fuse                                      |
| <b>23</b> | <b>F23</b>  | 5A Travel horn sensors fuse                          |
| <b>24</b> | <b>F24</b>  | 5A Starter panel fuse                                |
| <b>25</b> | <b>F25</b>  | 7.5A Fuse - relay box                                |
| <b>26</b> | <b>F26</b>  | 5A Optional fuse                                     |
| <b>27</b> | <b>F27</b>  | 10A Heating control unit fuse                        |
| <b>28</b> | <b>F723</b> | 40A Starter relay fuse                               |

### 9.1.2 - Control box relays

To access the fuses, remove the fuse and relay compartment cover, located under the operator's seat.

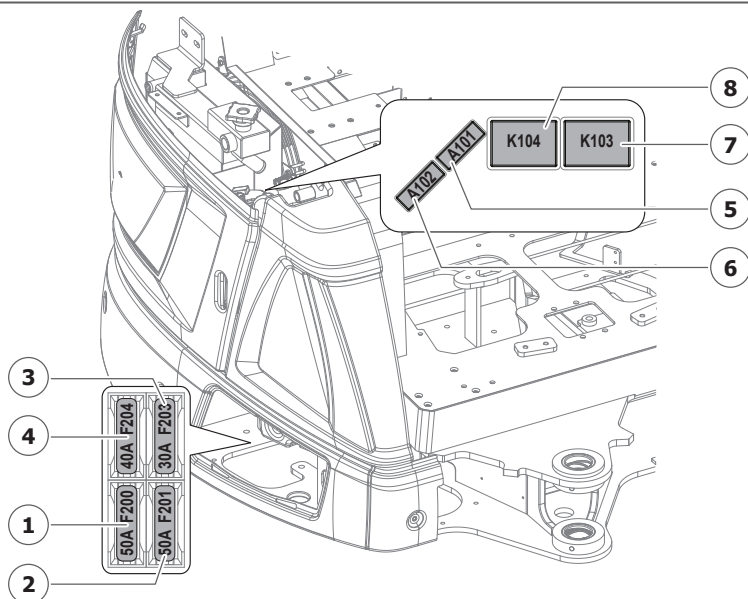


**List of relays**

|           |             |                                              |
|-----------|-------------|----------------------------------------------|
| <b>1</b>  | <b>K197</b> | Service relay                                |
| <b>2</b>  | <b>K12</b>  | Starter relay                                |
| <b>3</b>  | <b>K191</b> | Starting equipment anti-repeater control box |
| <b>4</b>  | <b>K200</b> | Seconds speed relay                          |
| <b>5</b>  | <b>K724</b> | Floating relay (optional)                    |
| <b>6</b>  | <b>K199</b> | Cutter safety relay (Optional)               |
| <b>7</b>  | <b>K196</b> | Heating relay                                |
| <b>8</b>  | <b>K502</b> | Shredder relay                               |
| <b>9</b>  | <b>K195</b> | Horn relay                                   |
| <b>10</b> | <b>K201</b> | Relay +15 satellite (opt)                    |
| <b>11</b> | <b>K802</b> | AUX2/boom swing switch solenoid valve relay  |
| <b>12</b> | <b>K872</b> | Front working lights relay (optional)        |
| <b>13</b> | <b>R1</b>   | Servo-controls relay                         |
| <b>14</b> | <b>R2</b>   | Start approval relay                         |
| <b>15</b> | <b>R4</b>   | Relay work lights rear                       |

### 9.1.3 - Engine fuses and relays

There are other fuses and relays for the management of the engine, inside the turning frame next to the battery; to access them, remove the right side panel.



#### List of fuses

|   |             |                                |
|---|-------------|--------------------------------|
| 1 | <b>F200</b> | 50A Fuse +30                   |
| 2 | <b>F201</b> | 50A Pre-heat and start-up fuse |
| 3 | <b>F203</b> | 30A A/C capacitor fan fuse     |
| 4 | <b>F204</b> | 40A A/C capacitor fan fuse     |

#### List of relays

|   |             |                      |
|---|-------------|----------------------|
| 5 | <b>K101</b> | Bougie timer         |
| 6 | <b>K102</b> | Engine cut-off timer |
| 7 | <b>K103</b> | Engine cut-off relay |
| 8 | <b>K104</b> | Pre-heat relay       |

## 9.2 - Work lights replacement



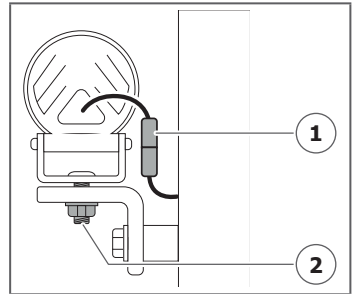
# WARNING

**Secure the machine as indicated in section "8.1.1 - Putting the machine out of service for maintenance" to page 8-5.**

The work lights are LED type, in the event of a fault, the entire lamp must be replaced. Before replacing the work light, check that all the fuses and relays are in good working order.

To **replace** the work 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 work light;
- to fit the new work light, follow the procedure described in reverse order.



### 9.3 - LED strip replacement



## WARNING

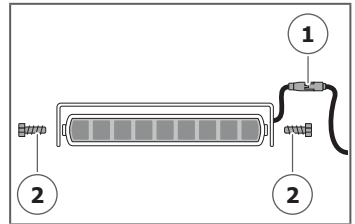
**Secure the machine as indicated in section "8.1.1 - Putting the machine out of service for maintenance" to page 8-5.**

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.





## 10 - TROUBLESHOOTING

This section was drawn up in order to assist maintenance staff and help them to identify the most common faults. The list is limited to only those problems that can be solved with ordinary equipment.



### **CAUTION**

***For remedies marked \*, kindly contact the Service Centre.***



### **NOTICE**

*For other causes not specified in this manual contact the Service Centre.*

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**10.1 - Distributor**

| <b>DISTRIBUTOR</b>                                                        |                                                                                            |                                                                              |
|---------------------------------------------------------------------------|--------------------------------------------------------------------------------------------|------------------------------------------------------------------------------|
| <b>Problems</b>                                                           | <b>Possible causes</b>                                                                     | <b>Solutions</b>                                                             |
| <b>Inability to hold the load</b>                                         | Oil leaks from inside the PISTON.                                                          | Replace valve-housing assembly.                                              |
|                                                                           | Oil leaks from the relief valve.                                                           | Disassemble and clean or replace relief valve.                               |
| <b>Load falls when piston is shifted from neutral to "raise" position</b> | Debris has entered the load safety valve.                                                  | Disassemble and clean the load check valve.                                  |
|                                                                           | The poppet or seat of load check valve is damaged.                                         | Replace the poppet or lap valve seat.                                        |
| <b>Spool jams</b>                                                         | Abnormal increase in oil temperature.                                                      | Remove obstacles to allow oil to flow freely through the pipes.              |
|                                                                           | Hydraulic oil is dirty.                                                                    | Change the fluid and clean the hydraulic circuit.                            |
|                                                                           | The pipe port joints are too tight, so the valve housing is sitting in the wrong position. | Check the tightening torque.<br>Loosen the mounting bolts, check and adjust. |
| <b>Spool jams</b>                                                         | Foreign bodies have penetrated the spool grooves.                                          | Remove the foreign bodies or replace valve housing assembly.                 |
|                                                                           | Pressure is too high.                                                                      | Check using the pressure gauge and adjust.                                   |
|                                                                           | The lever or joint is bent.                                                                | Remove the joint and check.                                                  |
|                                                                           | Spool is bent.                                                                             | Replace valve-housing assembly.                                              |
|                                                                           | Return spring is damaged.                                                                  | Replace the spring.                                                          |
|                                                                           | The return spring or end cap is not properly seated.                                       | Loosen end cap, align it and retighten it.                                   |
|                                                                           | Internal valve temperature distribution is not uniform.                                    | Warm up entire circuit.                                                      |

| DISTRIBUTOR               |                                                    |                                                |
|---------------------------|----------------------------------------------------|------------------------------------------------|
| Problems                  | Possible causes                                    | Solutions                                      |
| Oil leakage from oil seal | Back pressure on valve return circuit is too high. | Use a larger return circuit.                   |
|                           | Debris on the seal.                                | Remove the seal and clean it.                  |
|                           | Seal plate is loose.                               | Clean seal plate and re-tighten it with bolts. |
|                           | Spool is damaged.                                  | Replace valve-housing assembly.                |
|                           | Seal is pinched or damaged.                        | Replace the oil seal.                          |
| Spool does not move       | Valve is clogged up with debris.                   | Remove debris and clean circuit.               |
|                           | Spool end cap is full of oil.                      | Replace end cap seal.                          |
|                           | Drive link is seized and does not move.            | Make link move freely.                         |

**10.2 - Hydraulic engine**

| <b>HYDRAULIC ENGINE</b>                            |                                                      |                                                                                                     |
|----------------------------------------------------|------------------------------------------------------|-----------------------------------------------------------------------------------------------------|
| <b>Problems</b>                                    | <b>Possible causes</b>                               | <b>Solutions</b>                                                                                    |
| <b>Hydraulic engine does not run at all</b>        | The hydraulic oil level is low.                      | Add oil.                                                                                            |
|                                                    | Hydraulic pump is faulty.                            | Replace the hydraulic pump.                                                                         |
|                                                    | Oil leak inside the hydraulic engine.                | Replace the hydraulic engine.                                                                       |
|                                                    | The internal parts of the hydraulic engine are worn. | Replace the entire hydraulic engine or its worn parts.                                              |
|                                                    | Drive shaft is overloaded.                           | Check the load adjustment device and remove cause of overload.                                      |
|                                                    | Oil viscosity is too low.                            | Replace with hydraulic oil of the correct viscosity.                                                |
| <b>Hydraulic engine runs in one direction only</b> | Relief valve for operating valve is faulty.          | Disassemble and clean relief valve for operating valve or replace it.                               |
|                                                    | The counterweight spool jams.                        | Replace the counterbalance valves.<br>Replace the hydraulic pump.<br>Replace the main relief valve. |

| HYDRAULIC ENGINE                                 |                                                      |                                                    |
|--------------------------------------------------|------------------------------------------------------|----------------------------------------------------|
| Problems                                         | Possible causes                                      | Solutions                                          |
| <b>Hydraulic engine does not run fast enough</b> | Insufficient incoming oil flow.                      | Lower oil temperature.                             |
|                                                  | The oil flow is too high: oil leaks.                 | Add oil and re-tighten the intake joint.           |
|                                                  | Air is sucked into the engine.                       | Re-tighten the joints.                             |
|                                                  | Oil leak inside the hydraulic engine.                | Replace the hydraulic engine.                      |
| <b>Hydraulic engine makes abnormal noise</b>     | The hydraulic oil level is low.                      | Add oil.                                           |
|                                                  | Air is sucked into the engine.                       | Re-tighten the joint on the intake side.           |
|                                                  | Oil temperature is too high.                         | Lower oil temperature.                             |
|                                                  | Hydraulic engine is internally worn or damaged.      | Replace the hydraulic engine.                      |
|                                                  | Shaft is incorrectly mounted.                        | Re-align shaft.<br>Remove the cause of cavitation. |
| <b>Oil leaks from shaft seal</b>                 | Oil seal is damaged.                                 | Replace the oil seal.                              |
|                                                  | Shaft is damaged or worn.                            | Replace shaft.                                     |
|                                                  | Hydraulic engine case internal pressure is too high. | Replace the oil seal and clean the drain pipe.     |

**10.3 - Hydraulic cylinder**

| <b>HYDRAULIC CYLINDER</b>                      |                                                  |                                               |
|------------------------------------------------|--------------------------------------------------|-----------------------------------------------|
| <b>Problems</b>                                | <b>Possible causes</b>                           | <b>Solutions</b>                              |
| <b>Hydraulic cylinder has inadequate power</b> | Relief valve pressure setting is too low.        | Adjust the pressure.                          |
|                                                | Oil leaks inside the hydraulic cylinder.         | Replace the cylinder gaskets.                 |
|                                                | The hydraulic cylinder piston or rod is damaged. | Replace the hydraulic cylinder piston or rod. |
|                                                | Oil leaks from the operating valve.              | Replace valve-housing assembly.               |
| <b>Hydraulic cylinder external oil leak</b>    | Hydraulic cylinder gaskets are defective.        | Replace the hydraulic cylinder gaskets.       |
|                                                | Hydraulic cylinder rod is damaged.               | Replace hydraulic cylinder rod.               |
| <b>Piston does not move smoothly</b>           | Oil temperature is too high.                     | Lower oil temperature.                        |
|                                                | Air is sucked into the engine.                   | Add oil and tighten the intake joint.         |

**10.4 - Limit valves**

| <b>MAXIMUM PRESSURE VALVES</b>            |                                                   |                                                                             |
|-------------------------------------------|---------------------------------------------------|-----------------------------------------------------------------------------|
| <b>Problems</b>                           | <b>Possible causes</b>                            | <b>Solutions</b>                                                            |
| <b>Pressure does not rise at all</b>      | Poppet is stuck and remains open.                 | Disassemble, check for debris and make sure the poppet moves freely.        |
|                                           | Foreign bodies have got into the valve seat.      | Clean all parts.                                                            |
| <b>Limit valve is not stable</b>          | Pilot poppet seat is damaged.                     | Replace the worn parts.                                                     |
|                                           | Pilot piston is jammed against the main poppet.   | Disassemble, clean and eliminate surface flaws.                             |
| <b>Limit valve does not work properly</b> | Valve is worn because of foreign bodies.          | Replace the worn parts.                                                     |
|                                           | The lock nut and adjusting screw are loose.       | Adjust the pressure.                                                        |
| <b>Oil leaks</b>                          | Valve seats are damaged and O-rings are worn.     | Replace the worn and damaged parts.                                         |
|                                           | Some parts are clogged because of foreign bodies. | Disassemble, ensure the parts are free of flaws, clean and reassemble them. |

## 10.5 - Accessories

| ACCESSORIES                              |                                                                        |                                                                              |
|------------------------------------------|------------------------------------------------------------------------|------------------------------------------------------------------------------|
| Problems                                 | Possible causes                                                        | Solutions                                                                    |
| <b>Overall operating power decreases</b> | Engine power is low.                                                   | Refer to engine manual.                                                      |
|                                          | Hydraulic pump is worn.                                                | Replace the hydraulic pump.                                                  |
|                                          | Main relief valve is defective.                                        | Adjust pressure or replace valve.                                            |
|                                          | The hydraulic oil level is low.                                        | Add oil.                                                                     |
|                                          | Hydraulic oil viscosity is wrong.                                      | Replace with hydraulic oil of the correct viscosity.                         |
|                                          | Intake filter is clogged.                                              | Replace intake filter.                                                       |
| <b>All functions are faulty</b>          | Hydraulic pump is faulty.                                              | Replace the hydraulic pump.                                                  |
|                                          | The hydraulic oil level is low.                                        | Add oil.                                                                     |
| <b>Accessory's power is down</b>         | Main or secondary relief valve pressure is set too low or incorrectly. | Adjust pressure setting or replace relief valve.                             |
|                                          | Hydraulic cylinder gaskets are damaged.                                | Replace the hydraulic cylinder gaskets.                                      |
|                                          | The hydraulic cylinder piston and cylinder are damaged.                | Replace the hydraulic cylinder piston and cylinder or modify the assembling. |



| ACCESSORIES                                  |                                                         |                                                                              |
|----------------------------------------------|---------------------------------------------------------|------------------------------------------------------------------------------|
| Problems                                     | Possible causes                                         | Solutions                                                                    |
| <b>Attachment falls under its own weight</b> | Hydraulic cylinder gaskets are damaged.                 | Replace the hydraulic cylinder gaskets.                                      |
|                                              | The hydraulic cylinder piston and cylinder are damaged. | Replace the hydraulic cylinder piston and cylinder or modify the assembling. |
|                                              | Oil leaks from the operating valve.                     | Replace valve-housing assembly.                                              |
| <b>Accessory connections are noisy</b>       | Oil or grease level is low.                             | Add oil or grease.                                                           |
|                                              | The connecting pin vibrates.                            | Replace the bush or the pin.                                                 |

## 10.6 - Travelling

| TRAVELLING                     |                                                      |                                    |
|--------------------------------|------------------------------------------------------|------------------------------------|
| Problems                       | Possible causes                                      | Solutions                          |
| <b>Travelling power is low</b> | Main relief valve pressure setting is too low.       | Adjust the pressure.               |
|                                | Counterbalance valve is defective.                   | Replace the counterbalance valves. |
|                                | The performance of the hydraulic engine has dropped. | Replace the hydraulic engine.      |
|                                | The swivel joint gaskets are damaged.                | Replace the swivel joint gaskets.  |
|                                | The hydraulic pump performance has dropped.          | Replace the hydraulic pump.        |
|                                | Oil leaks from the operating valve.                  | Replace valve-housing assembly.    |

| TRAVELLING                                     |                                                      |                                             |
|------------------------------------------------|------------------------------------------------------|---------------------------------------------|
| Problems                                       | Possible causes                                      | Solutions                                   |
| <b>Machine moves erratically</b>               | Track tension is too high.                           | Adjust the track tension.                   |
|                                                | Stones or foreign bodies are present.                | Remove any stones or foreign bodies.        |
|                                                | Counterbalance valve is defective.                   | Replace the counterbalance valves.          |
|                                                | The performance of the hydraulic engine has dropped. | Replace the hydraulic engine.               |
|                                                | The hydraulic engine sucks air.                      | Add oil.                                    |
| <b>Machine does not run in a straight line</b> | Right and left track tension is different.           | Adjust them to an equal and proper tension. |
|                                                | The hydraulic pump performance has dropped.          | Replace the hydraulic pump.                 |
|                                                | The performance of the hydraulic engine has dropped. | Replace the hydraulic engine.               |
|                                                | Oil leaks from the operating valve.                  | Replace valve-housing assembly.             |
|                                                | The swivel joint gaskets are damaged.                | Replace the swivel joint gasket.            |
|                                                | Lever links are loose.                               | Adjust the pressure.                        |

**10.7 - Operation levers**

| <b>OPERATION LEVERS</b>       |                                      |                                 |
|-------------------------------|--------------------------------------|---------------------------------|
| <b>Problems</b>               | <b>Possible causes</b>               | <b>Solutions</b>                |
| <b>Levers hard to operate</b> | Debris in the operating valve spool. | Clean the operating valve.      |
|                               | The valve piston jams.               | Replace valve-housing assembly. |
|                               | Poor lubrication of the lever links. | Apply oil or grease.            |
|                               | The lever links too tightened.       | Apply oil or grease.            |

**10.8 - Hydraulic pump**

| <b>HYDRAULIC PUMP</b>                        |                                                |                                                             |
|----------------------------------------------|------------------------------------------------|-------------------------------------------------------------|
| <b>Problems</b>                              | <b>Possible causes</b>                         | <b>Solutions</b>                                            |
| <b>No oil flows from hydraulic pump</b>      | The hydraulic oil level is low.                | Add oil.                                                    |
|                                              | Intake filter is clogged.                      | Replace filter. If oil is dirty, replace it with fresh oil. |
| <b>Hydraulic pump pressure does not rise</b> | Hydraulic pump internal oil leak.              | Replace the hydraulic pump.                                 |
|                                              | The hydraulic pump sucks air.                  | Add oil and check the intake hose.                          |
|                                              | Main relief valve pressure setting is too low. | Adjust the pressure.                                        |

| HYDRAULIC PUMP                            |                                                                          |                                                              |
|-------------------------------------------|--------------------------------------------------------------------------|--------------------------------------------------------------|
| Problems                                  | Possible causes                                                          | Solutions                                                    |
| <b>Abnormal noise from hydraulic pump</b> | Cavitation due to bent intake pipe or clogged intake filter.             | Replace filter. If oil is dirty, replace it with fresh oil.  |
|                                           | Air is sucked in due to loose intake joint or shortage of hydraulic oil. | Re-tighten the intake joint or add oil.                      |
|                                           | Cavitation due to hydraulic fluid viscosity.                             | Replace with hydraulic fluid having the proper viscosity.    |
|                                           | The pump and the engine are not aligned.                                 | Align them.                                                  |
|                                           | The hydraulic fluid contains bubbles.                                    | Find the cause and remove it.<br>Replace oil with fresh oil. |
| <b>Oil leaks out from hydraulic pump</b>  | Hydraulic pump seal is defective.                                        | Replace seal or replace hydraulic pump.                      |

### 10.9 - Swivel joint

| SWIVEL JOINT                           |                                           |                                  |
|----------------------------------------|-------------------------------------------|----------------------------------|
| Problems                               | Possible causes                           | Solutions                        |
| <b>Operating power is low</b>          | The swivel joint gaskets is damaged.      | Replace the swivel joint gasket. |
|                                        | The rotor of the swivel joint is damaged. | Replace the swivel joint.        |
| <b>Oil leaking out of Swivel joint</b> | The swivel joint gaskets is damaged.      | Replace the swivel joint gasket. |

**10.10 - Rotation**

| <b>ROTATION</b>                                     |                                                              |                                                     |
|-----------------------------------------------------|--------------------------------------------------------------|-----------------------------------------------------|
| <b>Problems</b>                                     | <b>Possible causes</b>                                       | <b>Solutions</b>                                    |
| <b>Swivel power is low</b>                          | The performance of the hydraulic engine has dropped.         | Replace the hydraulic engine.                       |
|                                                     | Swivel ring is jammed.                                       | Oil/grease or replace the swivel ring.              |
| <b>Swivel retarder keeps turning</b>                | Retarder valve pressure is set too low.                      | Adjust the pressure.                                |
|                                                     | The secondary relief valve or retarder valve is clogged.     | Clean the secondary relief valve or retarder valve. |
|                                                     | The performance of the hydraulic engine has dropped.         | Replace the hydraulic engine.                       |
|                                                     | Oil leaks from the operating valve.                          | Replace valve-housing assembly.                     |
| <b>Swivelling continues with retarder activated</b> | Port relief valve or retarder valve pressure is set too low. | Adjust the pressure.                                |
|                                                     | The secondary relief valve or retarder valve is clogged.     | Clean the secondary relief valve or retarder valve. |
|                                                     | The performance of the hydraulic engine has dropped.         | Replace the hydraulic engine.                       |
|                                                     | Oil leaks from the operating valve.                          | Replace valve-housing assembly.                     |
| <b>Abnormal noise when swivelling</b>               | The hydraulic engine sucks air.                              | Add oil.                                            |
|                                                     | Swivel bearing is not well lubricated.                       | Add oil/grease.                                     |

**10.11 - Engine and related parts**

| <b>ENGINE AND RELATED PARTS</b> |                                                         |                                                                                                         |
|---------------------------------|---------------------------------------------------------|---------------------------------------------------------------------------------------------------------|
| <b>Problems</b>                 | <b>Possible causes</b>                                  | <b>Solutions</b>                                                                                        |
| <b>Engine does not start</b>    | Faulty starter switch.                                  | Repair the defective connection and contact positions.                                                  |
|                                 | Defective starter motor revolution.                     | Remedy possible flat battery, starter engine failure or bad or loose connections on power distribution. |
|                                 | Incorrect viscosity of engine oil.                      | Check and remedy.<br>Pre-heat using an air heater.                                                      |
|                                 | The engine is extremely cold.                           | Warm up the cooling liquid (add hot water).                                                             |
|                                 | The crankshaft, camshaft, piston or bearing are seized. | Repair.                                                                                                 |
|                                 | Air in the fuel supply system.                          | Drain the fuel system completely.                                                                       |
|                                 | No fuel in tank.                                        | Add fuel.                                                                                               |
|                                 | Poor fuel quality.                                      | Check and replace.                                                                                      |
|                                 | Fuel filter clogged.                                    | Clean or replace.                                                                                       |
|                                 | Compression inadequate.                                 | Repair.                                                                                                 |
|                                 | Defective fuel injector pump.                           | Repair.                                                                                                 |

| ENGINE AND RELATED PARTS                  |                                            |                                                                      |
|-------------------------------------------|--------------------------------------------|----------------------------------------------------------------------|
| Problems                                  | Possible causes                            | Solutions                                                            |
| <b>Engine stops suddenly when running</b> | No fuel in tank.                           | Add fuel.                                                            |
|                                           | Fuel filter clogged.                       | Clean or replace.                                                    |
|                                           | Air in the fuel supply system.             | Tighten the joints on fuel system pipes.                             |
| <b>Oil pressure is defective</b>          | Oil shortage.                              | Add oil.                                                             |
|                                           | Oil leaks from the joint.                  | Repair.                                                              |
|                                           | Faulty oil pressure switch.                | Replace it.                                                          |
|                                           | Oil filter clogged.                        | Replace the filtering element.                                       |
|                                           | Oil viscosity is too low.                  | Replace with oil suitable for the operating temperature.             |
|                                           | The oil pump is not working properly.      | If the problem persists after re-adjusting and cleaning, replace it. |
| <b>Engine overheating</b>                 | Low cooling liquid level.                  | Top up.                                                              |
|                                           | Water leakage.                             | Check the hoses and radiator.                                        |
|                                           | Wrong fan belt tension.                    | Adjust or replace it.                                                |
|                                           | Radiator failure.                          | Repair or replace.                                                   |
|                                           | The fan is broken.                         | Replace it.                                                          |
|                                           | The anti-freeze concentration is too high. | Dilute the mixture.                                                  |
|                                           | Thermostat faulty.                         | Replace it.                                                          |
|                                           | Water pump faulty.                         | Replace it.                                                          |

| ENGINE AND RELATED PARTS                                |                                          |                                               |
|---------------------------------------------------------|------------------------------------------|-----------------------------------------------|
| Problems                                                | Possible causes                          | Solutions                                     |
| <b>Defective charging of battery</b>                    | Wrong fan belt tension.                  | Adjust tension.                               |
|                                                         | Faulty cables.                           | Repair.                                       |
|                                                         | Faulty indicator light.                  | Replace it.                                   |
|                                                         | Battery failure.                         | Check the connections, recharge, replace.     |
|                                                         | Regulator failure.                       | Replace it.                                   |
|                                                         | Alternator failure.                      | Repair or replace.                            |
| <b>White or blue smoke coming from the exhaust</b>      | Too much oil.                            | Lower the quantity to the specified level.    |
|                                                         | Lower viscosity of the oil.              | Replace with oil having the proper viscosity. |
|                                                         | Over-cooling of the radiator.            | Cover the radiator or replace it.             |
|                                                         | Incorrect injection timing.              | *Adjust again.                                |
|                                                         | Low compression value.                   | * Disassemble, inspect, or replace the part.  |
| <b>Black or dark grey smoke coming from the exhaust</b> | Poor fuel quality.                       | Replace with better quality fuel.             |
|                                                         | Incorrect valve clearance.               | Adjust it.                                    |
|                                                         | Faulty operation of the injector pump.   | * Adjust and replace if necessary.            |
|                                                         | Low compression value.                   | * Disassemble, inspect, or replace the part.  |
|                                                         | Air intake blocked (clogged air filter). | Clean or replace the filtering element.       |



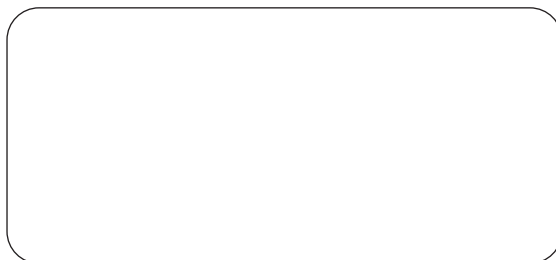
| ENGINE AND RELATED PARTS           |                                      |                                                                           |
|------------------------------------|--------------------------------------|---------------------------------------------------------------------------|
| Problems                           | Possible causes                      | Solutions                                                                 |
| <b>Excessive fuel consumption</b>  | Injector pump operating incorrectly. | * Adjust and replace if necessary.                                        |
|                                    | Faulty injection nozzle.             | * Adjust and replace if necessary.                                        |
|                                    | Incorrect injection timing.          | * Adjust and repair it or replace it with a better one.                   |
|                                    | Poor fuel quality.                   | Replace with better quality fuel.                                         |
|                                    | Compression inadequate.              | * Disassemble, inspect, or replace the part.                              |
|                                    | Air intake blocked.                  | Clean or replace the filtering element.                                   |
| <b>Oil consumption is too high</b> | Too much oil.                        | Lower the quantity to the specified level.                                |
|                                    | Oil viscosity is too low.            | Replace with oil having viscosity suitable for the operating temperature. |
|                                    | Oil leaks.                           | Locate leak and tighten it or replace part if necessary.                  |
|                                    | The cylinder piston ring is worn.    | * Disassemble, inspect, or replace the part.                              |

## 10.12 - Control electronics

| CONTROL ELECTRONICS                                                                                                        |                                                          |                                                                         |
|----------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------|-------------------------------------------------------------------------|
| Problems                                                                                                                   | Possible causes                                          | Solutions                                                               |
| <b>With the engine running the display shows nothing (if present)</b>                                                      | Display not connected correctly to the line.             | Check display electrical connection and plug it into the line properly. |
|                                                                                                                            | Display not working because ambient temperature too low. | Wait a few minutes with the cab heating set to maximum temperature.     |
|                                                                                                                            | Faulty display.                                          | Replace the display.                                                    |
|                                                                                                                            | Faulty control box.                                      | Replace the control box.                                                |
| <b>With the engine running and the controls cut-out lever closed, no functions work when the command rollers are moved</b> | Electronic control box power error.                      | Switch the machine off and then on again.                               |
|                                                                                                                            | Roller disconnected on joystick.                         | Open the joystick and check the roller electrical connection.           |
|                                                                                                                            | Faulty roller.                                           | Replace the roller.                                                     |
|                                                                                                                            | Faulty control box.                                      | Replace the control box.                                                |
| <b>The buttons on the display do not perform the functions stated in this manual (if present)</b>                          | Faulty or broken buttons.                                | Replace the pushbutton panel on the display dashboard.                  |
|                                                                                                                            | Faulty display.                                          | Replace the display.                                                    |
|                                                                                                                            | Faulty control box.                                      | Replace the control box.                                                |



Dealer's stamp



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