CX17D
CX18D
CX19D
CX20D
Mini Excavator

OPERATOR'S MANUAL



COMMISSIONING

Fill-in before commissioning	Fill-in before commissioning of the equipment:				
Machine model:					
Machine serial no./PIN:					
Engine Serial No.:					
Year of construction:					
Commissioned on:					
Dealer:					

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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 CX17D ;	- model CX19D ;
- model CX18D ;	- model CX20D .

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.

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

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

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

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

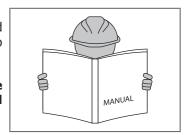
Failure to read and comply with the instructions preceded by a safety-related warning symbol can cause death or serious injury.



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

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

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



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

The housing can be closed by means of a padlock (not supplied). The housing must be closed at the end of the working day for the machine in the canopy version; for the machine in the cab version, simply lock the door.

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

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 10,000 working hours. Said duration is subject to the regular carrying out of all the control and maintenance operations as indicated in the relevant manual. Upon expiry of one of the above periods, the machine must be subjected to extraordinary servicing by the manufacturer or by workshops authorised by the same in order to assess the conditions of use and to determine the residual life. Otherwise it must be taken out of service.



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

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

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

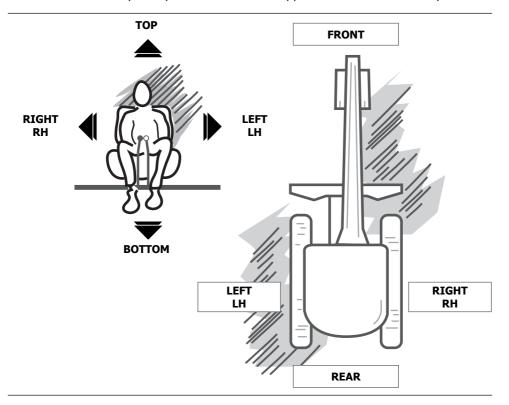
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1.1.1 - Manual consultation and terminology

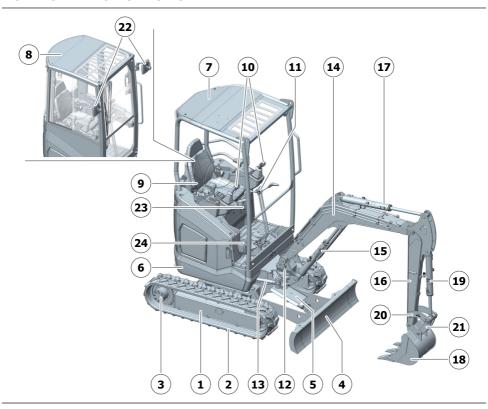
The manual has been made up using terminology that is indicated below:

- "**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.



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.

MODEL CX17D - CX18D - CX19D

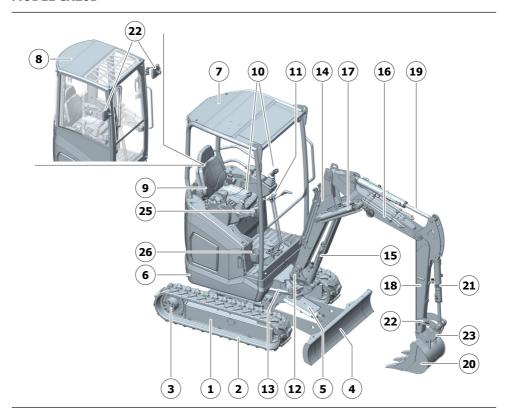


-	
1	Undercarriage
2	Tracks
3	Translation Motor

Kev:

1	Undercarriage	13	Boom Swing Cylinder
2	Tracks	14	First Boom
3	Translation Motor	15	First Boom Cylinder
4	Dozer Blade	16	Second Boom
5	Dozer Blade Cylinder	17	Second Boom Cylinder
6	Turning Frame	18	Bucket (Equipment)
7	Canopy	19	Bucket Cylinder
8	Cab (optional)	20	Bucket Articulations
9	Operator Seat	21	Connecting Rod
10	Joysticks	22	Rear-view mirrors
11	Travel levers	23	Mobile phone holder
12	Boom Swing Tower	24	Bottle holder

MODEL CX20D



Key:

1	Undercarriage	14	First Boom
2	Tracks	15	First Boom Cylinder
3	Translation Motor	16	Triple Positioner Boom
4	Dozer Blade	17	Triple Positioner Cylinders
5	Dozer Blade Cylinder	18	Second Boom
6	Turning Frame	19	Second Boom Cylinder
7	Canopy	20	Bucket (Equipment)
8	Cab (optional)	21	Bucket Cylinder
9	Operator Seat	22	Bucket Articulations
10	Joysticks	23	Connecting Rod
11	Travel levers	24	Rear-view mirrors
12	Boom Swing Tower	25	Mobile phone holder
13	Boom Swing Cylinder	26	Bottle 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.

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*.



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

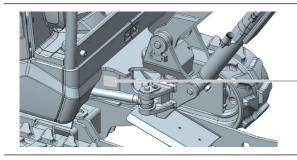
FACSIMILE OF THE MACHINE PLATE



Key:

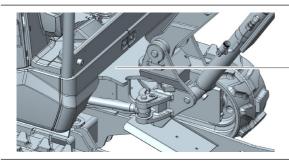
- 1 Business name or manufacturer's full address
- 2 Type / Model & designation
 - 3 Serial number/machine identification number (product identification number - PIN)

POSITION OF THE MACHINE CE PLATE



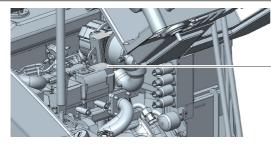
Machine ID plate

POSITION OF MACHINE PUNCHING PINS

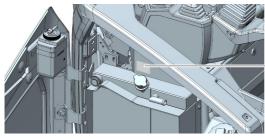


Machine PIN

POSITION OF THE ENGINE PLATE

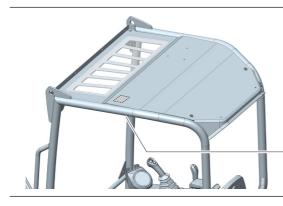


Engine ID plate

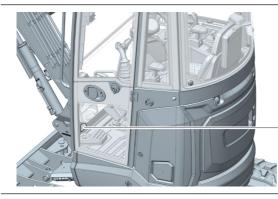


Supplementary engine identification plate

POSITION OF THE PROTECTIVE STRUCTURE PLATE

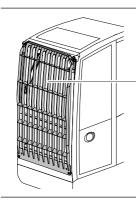


Protective structure
ID plate
(canopy)



Protective structure ID plate (cab)

POSITION OF THE OPTIONAL PROTECTIVE GRIDS



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)

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 operate the ground controls. The control devices must only be operated from the driving position.

DO NOT transport flammable or otherwise hazardous materials.

DO NOT use the machine to lift or transport people.

NEVER use the machine 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 $^{\circ}$ C if adequate modifications are not made as indicated in the section relating to low temperatures.

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

DO NOT use the machine in:

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

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

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



WARNING

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



WARNING

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



WARNING

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

1.7 - Emissions overview

YANMAR CO., LTD. EMISSION CONTROL SYSTEM WARRANTY - USA ONLY Your Warranty Rights and Obligations:

The California Air Resources Board (CARB), the United State Environmental Protection Agency (EPA) and YANMAR CO., LTD. hereafter referred to as YANMAR, are pleased to explain the emission control system warranty on your 2016, 2017, or 2018 model year industrial compression-ignition engine. California-certified, new off-road compression-ignition engines must be designed, built and equipped to meet the State's stringent anti-smog standards. In the remaining forty nine (49) states, new non-road compression-ignition engines must be designed, built and equipped to meet the United States EPA emissions standards. YANMAR must warrant the emission control system on your engine for the periods of time listed below provided there has been no abuse, neglect or improper maintenance of your engine.

Your emission control system may include parts such as the fuel injection system, the air induction system, the electronic control system, EGR (Exhaust Gas Recirculation) system and the diesel particulate filter system. Also included may be hoses, belts, connectors and other emission-related assemblies. Your emission control system may include parts such as the fuel injection system and the air induction system. Also included may be hoses, belts, connectors and other emission-related assemblies.

Where a warrantable condition exists, YANMAR will repair your off-road compression-ignition engine at no charge to you including diagnosis, parts and labor.

Manufacturer's Warranty Period:

2016, 2017, or 2018 model year off-road compression-ignition engines are warranted for the periods listed below. If any emission-related part on your engine is found to be defective during the applicable warranty period, the part will be repaired or replaced by YANMAR.

If your engine is certified as	And its maximum power is	And its rated speed is	Then its warranty period is
Variable speed or constant speed	Less than 19.0 kW (25.8 Hp)	Any speed	1,500 hours or two (2) years whichever comes first. In the absence of a device to measure the hours of use, the engine has a warranty period of two (2) years.
Constant speed	19.0 – 37.0 kW (25.8 – 50.3 Hp)	3000 RPM or higher	1,500 hours or two (2) years whichever comes first. In the absence of a device to measure the hours of use, the engine has a warranty period of two (2) years.
Constant speed	19.0 – 37.0 kW (25.8 – 50.3 Hp)	Less than 3000 RPM	3,000 hours or five (5) years whichever comes first. In the absence of a device to measure the hours of use, the engine has a warranty period of five (5) years.
Variable speed	19.0 – 37.0 kW (25.8 – 50.3 Hp)	Any speed	3,000 hours or five (5) years whichever comes first. In the absence of a device to measure the hours of use, the engine has a warranty period of five (5) years.
Variable speed or constant speed	Greater than 37.0 kW (50.3 Hp)	Any speed	3,000 hours or five (5) years whichever comes first. In the absence of a device to measure the hours of use, the engine has a warranty period of five (5) years.

Warranty Coverage:

This warranty is transferable to each subsequent purchaser for the duration of the warranty period. YANMAR recommends that repair or replacement of any warranted part will be

performed at an authorized YANMAR dealer Warranted parts not scheduled for replacement as required maintenance in the owner's manual shall be warranted for the warranty period. Warranted parts scheduled for replacement as required maintenance in the owner's manual are warranted for the period of time prior to the first scheduled replacement. Any warranted parts scheduled for replacement as required maintenance that are repaired or replaced under warranty shall be warranted for the remaining period of time prior to the first scheduled replacement. Any part not scheduled for replacement that is repaired or replaced under warranty shall be warranted for the remaining warranty period.

During the warranty period, YANMAR is liable for damages to other engine components caused by the failure of any warranted part during the warranty period.

Any replacement part which is functionally identical to the original equipment part in all respects may be used in the maintenance or repair of your engine, and shall not reduce YANMAR's warranty obligations. Add-on or modified parts that are not exempted may not be used. The use of any non-exempted add-on or modified parts shall be grounds for disallowing a warranty

Warranted Parts:

This warranty covers engine components that are a part of the emission control system of the engine as delivered by YANMAR to the original retail purchaser. Such components may include the following:

- A. Fuel injection system (including Altitude compensation system)
- B. Cold start enrichment system
- C. Intake manifold and Air intake throttle valve
- D. Turbocharger systems
- E. Exhaust manifold and exhaust throttle valve
- F. Positive crankcase ventilation system
- G. Charge Air Cooling systems (only 3TNV86CHT, 4TNV86CHT, 4TNV94CHT)
- H. Exhaust Gas Recirculation (EGR) systems
- I. Exhaust gas after treatment (diesel particulate filter system)
- J. Electronic Control units, sensors, solenoids and wiring harnesses used in above systems
- K. Hoses, belts, connectors and assemblies used in above systems
- Emission Control Information Labels

Since emissions related parts may vary slightly between models, certain models may not contain all of these parts and other models may contain the functional equivalents.

Exclusions:

Failures other than those arising from defects in material or workmanship are not covered by this warranty. The warranty does not extend to the following: malfunctions caused by abuse, misuse, improper adjustment, modification, alteration, tampering, disconnection, improper or inadequate maintenance, or use of non-recommended fuels and lubricating oils; accident-caused damage and replacement of expendable items made in connection with scheduled maintenance. YANMAR disclaims any responsibility for incidental or consequential such as loss of time, inconvenience, loss of use of equipment/engine or commercial loss.

Owner's Warranty Responsibilities:

As the off-road compression-ignition engine owner, you are responsible for the performance of the required maintenance listed in your owner's manual. YANMAR recommends that you retain all documentation, including receipts, covering maintenance on your off-road compression-ignition engine, but YANMAR cannot deny warranty solely for the lack of receipts, or for your failure to ensure the performance of all scheduled maintenance.

YANMAR may deny your warranty coverage if your off-road compression-ignition engine or a part has failed due to abuse, neglect, improper maintenance or unapproved modifications.

Your engine is designed to operate on diesel fuel only. Use of any other fuel may result in

your engine no longer operating in compliance with CARB and EPA emissions requirements.

You are responsible for initiating the warranty process. You are responsible for presenting your engine to an authorized YANMAR dealer or distributor as soon as a problem exists. The warranty repairs should be completed by the dealer as expeditiously as possible. If you have any questions regarding your warranty rights and responsibilities, or would like information on the nearest YANMAR dealer or authorized service center, you should contact YANMAR America Corporation.

Website: https://www.yanmar.com E-mail: CS_support@yanmar.com

Toll free telephone number: 1-800-872-2867, 1-855-416-7091

What the Emergency Stationary Type Engine Owner must Do:

The engines for emergency stationary type generators certified by Federal Law (40 CFR Part60) are limited to emergency use only, and the operation for maintenance checks and verification test for functions is required. The total operating hours for maintenance and verification test for functions should not exceed 100 hours per year. However, there is no limitation on the operating hours for emergency use. Keep a log of the number of hours the engine is operated for both emergency use and non-emergency use. Also, note the reason for the operation.



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2 - SAFETY

2.1 - Safety symbol



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

2.2 - General safety

There are many risks linked to work with a **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.

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.
0	Be Careful!
	Direction of operation or Direction of movement.
•	Closed, Locked.
1	Open, Released.
53	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.

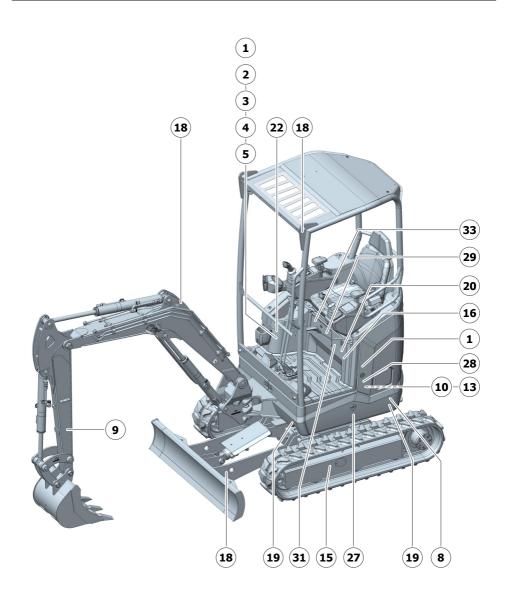
SAFETY

- Wash the labels with soap and water and dry them with a soft cloth.
- When washing the machine using water sprays, keep a distance of at least one metre from the surface to avoid damaging the labels.
- Replace any damaged or missing labels with original stickers obtained from your *Service Centre*.
- Should it be necessary to replace a component displaying stickers, make sure that the new component has the same labels.
- When replacing labels, make sure that the base is clean, dry and free from oil or grease. Press any air bubbles towards the outer edges.

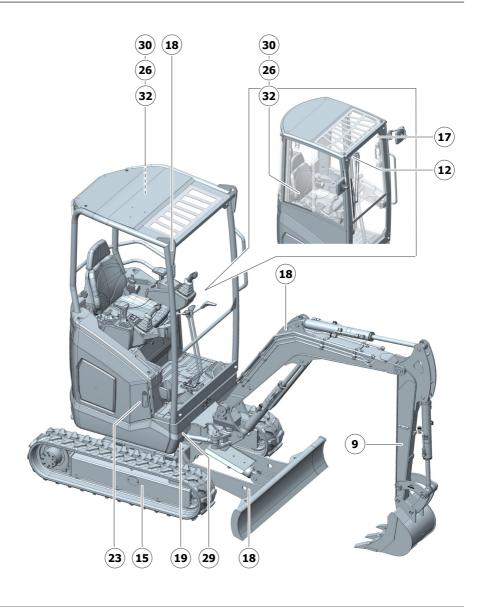
Below is a series of images indicating the positioning of the safety signs and operation related labels.

SAFETY SIGNS AND OPERATION RELATED LABELS FOR:

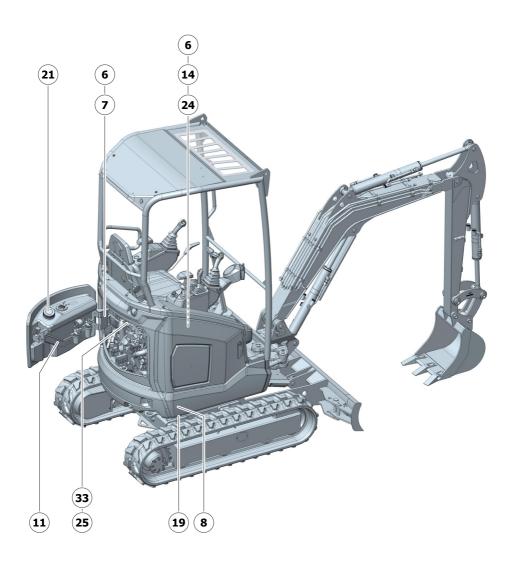
MODELS CX17D - CX18D - CX19D



MODELS CX17D - CX18D - CX19D

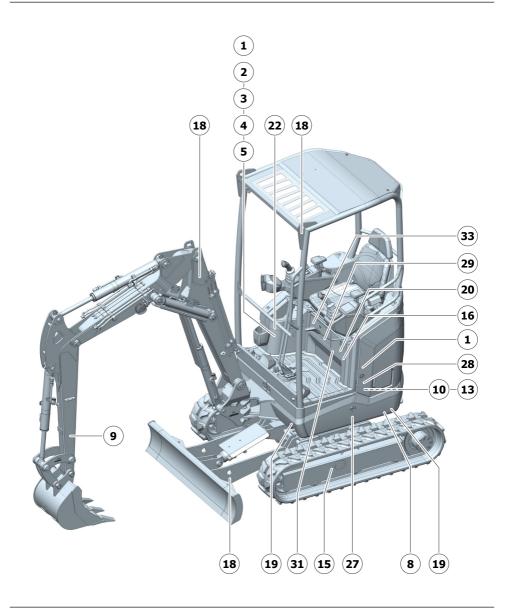


MODELS CX17D - CX18D - CX19D

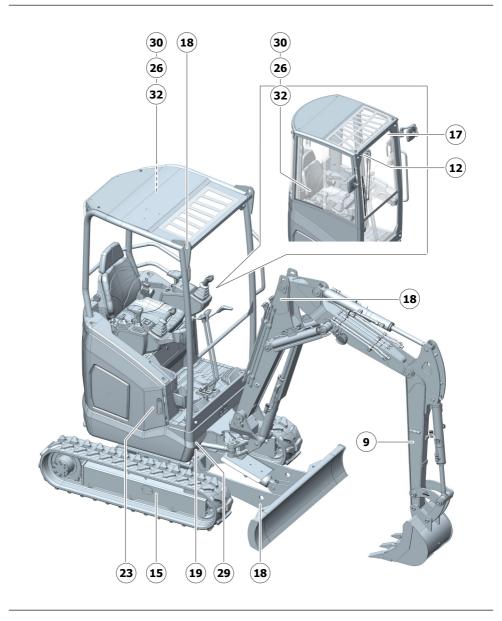


SAFETY SIGNS AND OPERATION RELATED LABELS FOR:

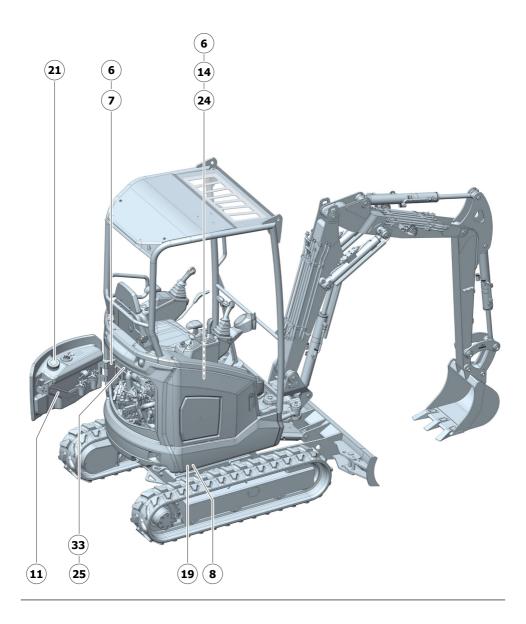
MODEL CX20D



MODEL CX20D



MODEL CX20D



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.



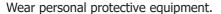
9 Risk of damage caused by the machine booms or by the equipment installed

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



10 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.



Follow the operating instructions.



11 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.

12 Hazard of damage caused by the fall of the openable windshield (Cab version only)

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



13 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.



14 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.



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

Read and understand the use and maintenance manual.



16 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.



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 2-40).



Legend of Operation Related Labels for operation and maintenance:

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 MIN level of the cooling liquid in the overflow tank. Read and understand the use and maintenance manual to learn about the specifications of the cooling liquid.



25 Engine start inhibition

Indicates the function of the engine start inhibition switch for use during maintenance operations.



26 Controls

Indicates the position and functioning of the machine controls.



27 AUX1 system single/double-acting switch

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



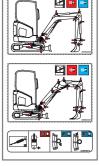
28 Battery cut-off

Indicates the position of the battery cut-off.



29 Lubrication points

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



30 Lifting and anchorage for transport

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

31 Protective structure tip-over procedure

Indicates the procedure to overturn the protective structure.



32 ISO/SAE control levers

Illustrates the control lever functions under the ISO and SAE control configurations. For further details refer to paragraph "6.26.3 - TPSS Valve ISO-SAE (optional) control layout" to page 6-64



33 ISO/SAE valve function

Illustrates the valve function for selecting ISO or SAE control layout $% \left(1\right) =\left(1\right) \left(1\right) \left($



2.4 - Machine driver

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

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

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

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

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

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

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

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

The operator is also responsible for:

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

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



DANGER

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

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

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

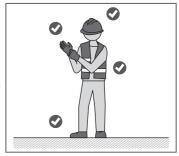
2.4.1 - Personal Protective Equipment (PPE)



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:

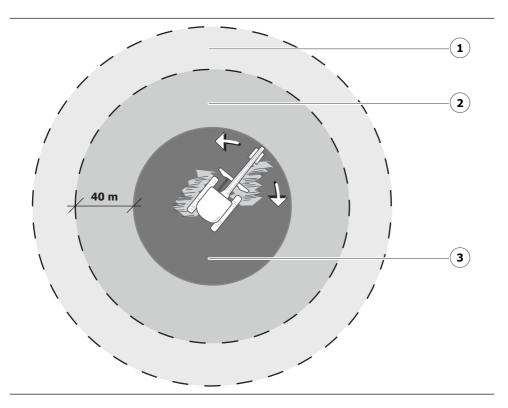
- a safety helmet;
- safety footwear;
- safety goggles;
- protective gloves;
- ear defenders;
- high visibility clothing.

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 Residual Risks

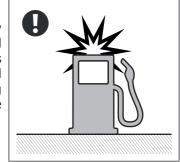
Below is a description of the operations or situations that may expose people to danger or risks.



DANGER

RISK OF FUEL EXPLOSION

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

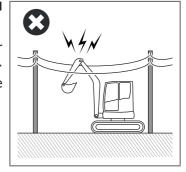




DANGER

RISK OF ELECTROCUTION CAUSED BY HIGH ELECTRIC VOLTAGE

Pay attention to overhead power lines, contact or approach may expose the operator to electrical shocks. Ensure that the boom, 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;
- se possibile allontanare il veicolo dalla zona di pericolo;
- 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.



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.





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.





RISK OF FALLING

Be sure to check the steps and handrails. If damage 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.

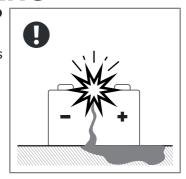




WARNING

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 skilled, authorised person.

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

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

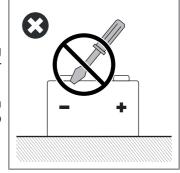




RISK OF CRUSHING AND ELECTROCUTION

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.



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.



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 "6.29 - Discharge residual pressure in the hydraulic system" to page 6-72.

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.



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 6-4, e "2.8.2 - Seat belt" to page 2-52.



WARNING

CHECK FOR ADEQUATE VISIBILITY BEFORE STARTING TO OPERATE

Make sure there is proper visibility for work purposes.

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

Clean the 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.



CHECKING THE SAFETY DEVICES

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



WARNING

EXAMINATIONS PRIOR TO THE START UP

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



WARNING

CHECK THE SURROUNDING AREA BEFORE COMMISSIONING

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



WARNING

ALERTS PRIOR TO THE START UP

Before starting the machine, use the horn to signal.



WARNING

SAFETY ASPECTS DURING OPERATION

Before starting to travel, use the horn to signal.



GETTING ON AND OFF THE MACHINE

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 or 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.

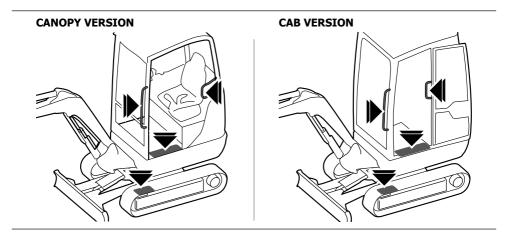
Do not jump on or off the machine.

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

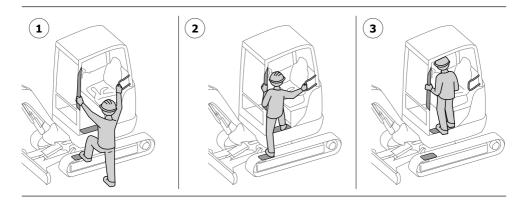
Do not get on or off the machine by grasping the control levers or the controls cut-out lever.

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

Machine hooking points:



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



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 "6.13 - Engine jump-starting procedure" to page 6-35 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!



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.



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.



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.



INCREASING STABILITY USING THE DOZER BLADE

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.

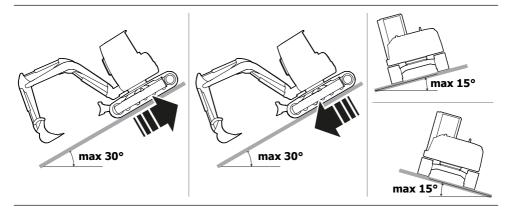
All indications supplied in the manual refer to the use of the machine on a flat and stable surface.

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.

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

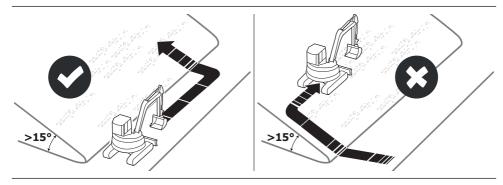


When travelling on a slope with an angle lower than 15°, always reduce the machine speed and maintain a slow, steady motion. Apply braking by smoothly returning both travel control levers to the NEUTRAL position (N).

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°.





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 of the machine" to page 4-10.



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.



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 tipover 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.



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.



NOTICE

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



WARNING

PRECAUTIONS DURING MAINTENANCE

Before starting maintenance, always deactivate the machine as indicated in section "8.1.1 - Putting the machine out of service for maintenance" to page 8-5.

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 "6.29 - Discharge residual pressure in the hydraulic system" to page 6-72.

Please contact the Service Centre for more details.



WARNING

PRECAUTIONS TO BE TAKEN WHILE OPERATING

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

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

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

2.8 - Safety devices

2.8.1 - Operator guard 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.

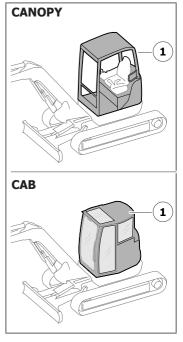
The machine is always supplied with a protective structure to protect the operator. It can be **closed** (cab) or **open** (canopy).

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.



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.

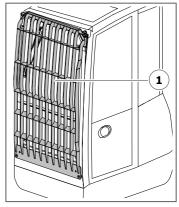
The protective structure, the operator seat and the seat belt must be carefully checked after any accidents. Contact the *Service Centre* to replace any parts that show signs of damage.

2.8.1.1 - Protection grid FRONT-GUARD Level I (optional)

The FRONT-GUARD Level I (1) protection 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 small objects may hit the front of the machine, for example: small rocks, small 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.

2.8.1.2 - Operator protection front panel (optional)

The front protection panel (1) is a transparent, polycarbonate panel that is installed at the front of the canopy, it impedes splinters or debris from the equipment in use from reaching the operator.

Use of this protection is mandatory when working with equipment that generates a splinter or debris ejection hazard for the operator.

Examples of equipment that pose this type of hazard:

- demolition hammer;
- shredder head.



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

Use this protection only when using the indicated equipment.

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



CAUTION

Always keep the protection panel free from dust, water droplets and dirt of all types to ensure good visibility.

Care must be taken when cleaning to prevent scratching of the panel which would lead to a reduction in visibility.

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 - Controls 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.

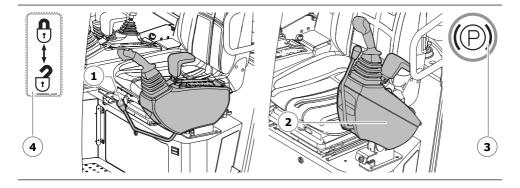


WARNING

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 - Slewing locking lever

The slewing of the turning frame can be locked mechanically by means of a specific lever (1) located on the support base at the operator's feet on the left-hand side of the travel levers.

The slewing can be **engaged** only when the turning frame is aligned with the undercarriage, in the following positions:

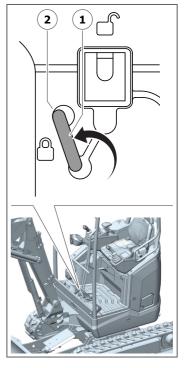
- with the booms above the dozer blade
- with the booms on the opposite side to the dozer blade.

To **lock** the slewing:

- make sure that the turning frame is aligned with the undercarriage;
- lift the lever and move it back, sliding it in the special slot to lock the rotation;
- when in position (2) lower it so as to lock its position.

To **release** the slewing, carry out the same operations in reverse order.

Always lock the slewing when transporting the machine and at the end of each day of work.





Do not insert the lock when the turning frame is not aligned with the undercarriage because, during the slewing phase, the locking mechanism and the rotation motor may be seriously damaged.

2.8.5 - Location of fire extinguisher

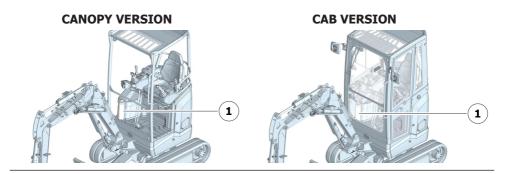
Local rules or regulations may require a **fire extinguisher to be fitted** to the machine at the operator station.



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 to the right of the operator seat (1).



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.

To **install** the fire extinguisher:

- unscrew the screws that secure the bottle holder and remove it;
- position the fire extinguisher and secure it to the bottle holder fastening elements.

3.1 - General data

MODEL		CX17D	CX18D	CX19D	CX20D
Operating weight ISO 6016 with canopy (with bucket and operator) kg		1,770	1,830	1,880	2,010
Operating weight ISO 6016 with cab (with bucket and operator) kg		1,880	1,940	1,990	2,120
Specific ground pressure	kg/cm²	0.33	0.31	0.32	0.34
Travel speed	1 st - km/h 2 nd - km/h	from 0 to 2.2 from 0 to 4.1 (AUTO TWO SPEED)			to 2.3 to 4.4 /O SPEED)
Slewing rotation speed	rpm	10.5			

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

- bucket 35 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		CX17D	CX18D	CX19D	CX20D	
Brand		YANMAR				
Model		3TN	V70	3TN	IV76	
Level of pollutant emissions			EU St	age 5		
	kW	11	3	13	3.7	
	CV	15	5.4	18	3.6	
Rated power	HP	15	5.2	18	3.4	
	rpm	2,2	200	2,200		
	kW	12	2.0	13.7		
	CV	16.3		18.6		
Power	HP	16	5.1	18.4		
	rpm	2,500		2,200		
Displacement	СС	8!	54	11	16	
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				



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.

Engine, Only for North American market

MODEL		CX17D	CX18D	CX19D	CX20D	
Brand		YANMAR				
Model		3TN'	/74F	3TN'	V80F	
Level of pollutant emissions			El	PA		
	kW	11	.1	13	3.4	
	CV	15	5.1	18	3.1	
Rated power	HP	14	.9	18	3.0	
	rpm	2,2	200	2,200		
	kW	11	.2	13.4		
	CV	15.2		18.2		
Power	HP	15	5.0	18.0		
	rpm	2,5	500	2,200		
Displacement	СС	8!	54	11	16	
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				



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		CX17D	CX18D	CX19D	CX20D	
Plant type		Open centre				
Pump type		Double		variable flo ar pump	ow rate	
Pump displacement	СС	8 + 8	+ 6.6	9 + 9	+ 6.6	
Total flow rate	l/min	16 + 16	5 + 13.1	18 + 18	3 + 13.1	
Operating pressures: - first boom;						
second boom;bucket;translation motors.	bar	220		240		
boom swing;dozer blade;undercarriage extension;		205				
- triple positioner boom;			N.A.		205	
- slewing gear motor	bar		17	70		
- servo-controls	bar	34				
Hydraulic servo-controls for operation	n	2 joysticks + 1 hydraulic pedal				
Travel		Double displacement orbital gear mot with automatic speed change device "A TWO SPEED"				
Slewing		Hydraulic orbital gear motor				

For the data of the auxiliary hydraulic systems, refer to section "6.31 - Auxiliary hydraulic systems" to page 6-74.

3.4 - Performance

MODEL		CX17D	CX18D	CX19D	CX20D
Bucket breakout force ISO 6015	daN	1,500			
Standard boom breakout force (optional boom) ISO 6015	daN	990 (N.A.)	990 (880)		
Tractive force	daN	1,700		1,860	
Maximum slope		60% - 30°			

3.5 - Digging arms

MODEL		CX17D	CX18D	CX19D	CX20D
First boom length	mm	1,614 1,720		1,250	
Positioner boom length	mm	N.A.			1,150
Length of second standard boom	mm	1,150			
Length of second optional boom	mm	N.A. 1,350			
Increased weight of the second option boom (compared to the second standboom)	N.A.		12		

3.6 - Counterweight



CAUTION

The supplementary counterweights can be installed one as an alternative to the other.

The standard supplementary counterweight can be removed ONLY if it is replaced with a heavier counterweight.

MODEL	CX17D	CX18D	CX19D	CX20D
Light supplementary counterweight	standard	optional	optional	standard
Heavy supplementary counterweight	N.A.	optional	optional	optional

MODEL	CX17D - CX18D - CX19D - CX20D
Weight of light supplementary counterweight kg	80
Weight of heavy supplementary counterweight kg	130
Rear protrusion of light supplementary counterweight mm	65
Rear protrusion of heavy supplementary counterweight mm	105

3.7 - Dozer blade

MODEL		CX17D	CX18D	CX19D	CX20D	
Standard blade width	mm	990/1,250 990/1,300				
Height	mm	243				
Stroke height	mm	280	290			
Stroke depth	mm	238	264			
Distance from the centre of the slewing ring	mm	1,092		1,137		

3.8 - Undercarriage

MODEL	CX17D	CX18D	CX19D	CX20D		
FRAMED UNDERCARRIAGE	VARIABLE with hydraulic extension					
Lower rollers	3 rh + 3 lh - oil bath					
Upper rollers	not present					
Track tensioner	Hydraulic adjustment with grease					
Rubber tracks mm	230 x 48 x 66	2	230 x 48 x 70)		

3.9 - Fluid capacities

Refer to section "8.7.1 - Refilling quantity table" to page 8-15.

MODEL		CX17D	CX18D	CX19D	CX20D	
Fuel tank	ı	25				
Hydraulic oil tank	ı	20				
Hydraulic system	ı	29 30				
Cooling system	ı	4,5				
Engine oil with replaceable filter	ı	2.4 2.8			.8	

3.10 - Electrical system

MODEL	CX17D	CX18D	CX19D	CX20D		
Electrical system	12 V d.c. ground on negative					
Lead-acid battery with liquid electrolyte	12 V 65 Ah					
Alternator	12 V 40 A					
Starter motor	12 V 1.0	12 V 1	.2 kW			

3.11 - Brakes

MODEL	CX17D	CX18D	CX19D	CX20D
Service brake on travel	movement cor in combination completely or Brake deacti movement cor	tion: activated atrol lever is released with the gear repartially shut off vation: deactivatrol lever is more centre toward	eased (the distri motors balancin f the oil). ated automatica ved (the distribi	butor spool g valves ally when the utor spool
Secondary and parking brake on travel	inside engines Brake activa movement cor movement cor function guara Brake deacti the movement	tion: activated a atrol lever is rele atrol pressure, that intees braking to vation: deactive control lever is a re overcomes that	automatically weased (in the above the Load Holding orque by friction ated automatical moved (the moved)	hen the sence of Mechanism n). ally when ovement
Service brake on rotation	movement cor moves toward: partially). Brake deacti movement cor	tion: activated antrol lever is released the centre, show the centre, show the centre is more centre toward.	eased (the distri utting off oil cor ated automatica ved (the distribi	butor spool mpletely or ally when the utor spool
Secondary and parking brake on rotation	lowering the d	tion: must be p edicated pin. vation: must b		

3.12 - Nominal lifting capacities



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 are 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 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.

MODEL CX17D

The load capacities indicated are for a machine equipped with all types of protective structure, all types of tracks, with no bucket and no quick-coupling.

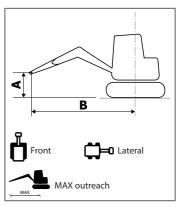
The symbol * indicates the hydraulic load limit.

0 m refers to the ground level.

The values refer to the machine equipped with supplementary counterweight: **0.080 tonnes**

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

The unit of measurement of load capacity is **tonnes**.



Blade raised, Standard Boom (1,150 mm) - Model CX17D

								B (m)							
4	0	0.5	1	1.0	1.5	2	2.	2.0	2.5	D.	3.0	0		MAX	
(E)		B	-	B	-	8	40	8	₽	8	-	å	-	B	
2.5		l	ŀ	ŀ	1	1	1		0.27	0.30	1	1	0.22	0.25	2.76 m
2.0		1	1	1	l	l	1	1	0.27	0.30	0.19	0.22	0.18	0.20	3.09 m
1.5		1	l	1	l	l	1	1	0.26	0.29	0.19	0.21	0.16	0.18	3.28 m
1.0		ļ	l	l	l	l	0.36	0.40	0.25	0.28	0.19	0.21	0.16	0.18	3.37 m
0.5		1	1	1	l	l	0.33	0.37	0.24	0.26	0.18	0.20	0.15	0.17	3.36 m
0		l	1	1	0.49	0.55	0.31	0.35	0.23	0.26	0.17	0.20	0.15	0.18	3.25 m
-0.5	N.A.	N.A.	1.08	1.21	0.49	0.55	0.31	0.35	0.22	0.25	0.17	0.20	0.16	0.18	3.25 m
-1.0		l	1.09	1.23	0.49	0.56	0.31	0.35	0.23	0.25	1	1	0.20	0.23	2.69 m
-1.5	1	l	l	l	0.51	0.57	0.32	0.36	1	i	l	l	0.31	0.34	2.08 m

Blade lowered, Standard Boom (1,150 mm) - Model CX17D

								B (m)							
4	0	0.5	1	1.0	1.	1.5	2.0	0	2.5	2	3.0	0		MAX	
(m)	-	å	₽	B	-	å	-	8	-	å	-	B	-	B	
2.5	1		1	l		l	-	1	*0.36	0.30	-		*0.40	0.25	2.76 m
2.0	1	!	1	1	l	1		1	*0.36	0:30	*0.39	0.22	*0.40	0.20	3.09 m
1.5		1		1	l	1	1	l	*0.41	0.29	*0.40	0.21	*0.40	0.18	3.28 m
1.0			1	1	l		*0.63	0.40	*0.51	0.28	*0.45	0.21	*0.42	0.18	3.37 m
0.5	1	l	1	l	l	l	*0.79	0.37	*0.58	0.26	*0.47	0.20	*0.42	0.17	3.36 m
0		1		1	*1.47	0.55	*0.88	0.35	*0.63	0.26	*0.49	0.20	*0.44	0.18	3.25 m
-0.5	N.A.	N.A.	N.A.	1.21	*1.39	0.55	*0.88	0.35	*0.63	0.25	*0.46	0.20	*0.41	0.18	3.25 m
-1.0	-	1	N.A.	1.23	*1.18	0.56	*0.78	0.35	*0.54	0.25	1	-	*0.46	0.23	2.69 m
-1.5	1		1	l	*0.76	0.57	*0.48	0.36	ŀ	i	l	l	*0.43	0.34	2.08 m

MODEL CX18D

The load capacities indicated are for a machine equipped with all types of protective structure, all types of tracks, with no bucket and no quick-coupling.

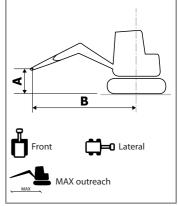
The symbol * indicates the hydraulic load limit.

0 m refers to the ground level.

The values between square brackets () refer to machines equipped with an supplementary counterweight: **0.080** tonnes

The values between square brackets [] refer to machines equipped with a supplementary counterweight: **0.130** tonnes

The unit of measurement of load capacity is **tonnes**.



Blade raised, Standard Boom (1,150 mm) - Model CX18D

							B (m)						
4	1.	1.0	1.5	2	2	2.0		2.5	3.	3.0		MAX	
(E)	-	8	-	8	- -	8	-	8	-	8	-	8	XVV
3.0	-	-	l	l	1	1	l	l	1	1	0.34 (0.38) [*0.39]	0.34 (0.38) [*0.39]	2.38 m
2.5	-	ļ	l	1	-	I	l	l	1	l	0.25 (0.28) [0.30]	0.25 (0.28) [0.3]	2.88 m
2.0	-	ļ	ļ	l	-	l	0.32 (*0.35) [*0.35]	0.32 (*0.35) [*0.35]	0.23 (0.26) [0.28]	0.23 (0.26) [0.28]	0.21 (0.24) [0.25]	0.21 (0.23) [0.25]	3.20 m
1.5		ļ	l		-	l	0.31 (0.35) [0.37]	0.31 (0.34) [0.37]	0.23 (0.26) [0.28]	0.23 (0.26) [0.28]	0.19 (0.21) [0.23]	0.19 (0.21) [0.23]	3.38 m
1.0	-	ļ	l	l	0.42 (0.47) [0.51]	0.42 (0.46) [0.50]	0.30 (0.34) [0.36]	0.30 (0.34) [0.36]	0.23 (0.26) [0.28]	0.23 (0.26) [0.28]	0.18 (0.21) [0.22]	0.18 (0.21) [0.22]	3.46 m
0.5	-	-	l	l	0.39 (0.45) [0.48]	0.39 (0.44)	0.28 (0.32) [0.35]	0.28 (0.32) [0.34]	0.22 (0.25) [0.27]	0.22 (0.24) [0.26]	0.17 (0.20) [0.22]	0.17 (0.20) [0.21]	3.46 m
0	-	ļ	0.60 (0.68) [0.74]	0.58 (0.66) [0.71]	0.38 (0.43) [0.47]	0.38 (0.42) [0.46]	0.28 (0.31) [0.34]	0.27 (0.31) [0.33]	0.21 (0.24) [0.26]	0.21 (0.24) [0.26]	0.18 (0.21) [0.22]	0.18 (0.21) [0.22]	3.36 ш
-0.5	1.41 (1.59) [1.71]	1.29 (1.44) [1.55]	0.60 (0.68) [0.74]	0.58 (0.66) [0.71]	0.38 (0.43) [0.46]	0.37 (0.42) [0.45]	0.27 (0.31) [0.33]	0.27 (0.31) [0.33]	0.21 (0.24) [0.26]	0.21 (0.24) [0.26]	0.20 (0.23) [0.24]	0.20 (0.22) [0.24]	3.15 m
-1.0	1.42 (1.61) [1.72]	1.30 (1.46) [1.56]	0.61 (0.69) [0.74]	0.59 (0.67) [0.71]	0.38 (0.43) [0.47]	0.37 (0.42) [0.46]	0.27 (0.31) [0.34]	0.27 (0.31) [0.33]	1	l	0.23 (0.26) [0.29]	0.23 (0.26) [0.28]	2.82 m
-1.5	-	1	0.63 (0.71) [*0.72]	0.61 (0.68) [*0.72]	0.39 (0.44) [0.48]	0.39 (0.43) [0.47]	l	i	i	l	0.33 (0.37) [*0.38]	0.32 (0.36) [*0.38]	2.27 m

Blade lowered, Standard Boom (1,150 mm) - Model CX18D

							B (m)						
4	1	1.0	1.	1.5	2	2.0	2.5	2	3.0	0		MAX	
E (E)	-	å	-	8	-	8	-	8	-	B	-	8	NAX Y
3.0	1		1				1	1	1		*0.39 (*0.39)	0.34 (0.38)	2.38 m
											[*0.39]	[*0.39]	
7.5		!	ŀ	1	ŀ	1	1		ŀ	1	*0.37	0.25	2.88 m
ì											[*0.37]	[0.30]	
							*0.35	0.32	*0.34	0.23	*0.35	0.21	
2.0	1	!	!		!	1	(*0.35)	(*0.35)	(*0.34)	(0.26)	(*0.35)	(0.23)	3.20 m
							1.0.35	T0.35	1.0.34	0.28	1.0.35	0.25	
							*0.38	0.31	*0.37	0.23	*0.36	0.19	
1.5	1	!	1		1	1	(*0.38)	(0.34)	(*0.37)	(0.26)	(*0.36)	(0.21)	3.38 m
					*0 64	77	× 0.00	70.0	× × ×	0.20	00.0	0.40	
,					*0.61	0.42	÷0.49	0.30	*0.42	0.23	*0.39	0.18	,
1.0	1	!	1		(*0.61)	(0.46)	(*0.49)	(0.34)	(*0.42)	(0.26)	(*0.39)	(0.21)	3.46 m
					[*0.61]	0.50	*0.49	0.36	*0.42	0.28	*0.39	0.22	
					*0.77	0.39	*0.55	0.28	*0.45	0.22	*0.38	0.17	
0.5	ł	!	1		(*0.77)	(0.44)	(*0.55)	(0.32)	(*0.45)	(0.24)	(*0.38)	(0.20)	3.46 m
					[*0.77]	[0.47]	[*0.55]	[0.34]	[*0.45]	[0.26]	[*0.38]	[0.21]	
			*1.37	0.58	*0.84	0.38	%0.60	0.27	*0.46	0.21	*0.39	0.18	
0	1	!	(*1.37)	(0.66)	(*0.84)	(0.42)	(*0.60)	(0.31)	(*0.46)	(0.24)	(*0.39)	(0.21)	3.36 m
			[*1.37]	[0.71]	[*0.84]	[0.46]	[*0.60]	[0.33]	[*0.46]	[0.26]	[*0.39]	[0.22]	
	N.A.	N.A.	*1.27	0.58	*0.82	0.37	*0.59	0.27	*0.44	0.21	*0.40	0.20	
-0.5	$\overline{}$	(N.A.)	(*1.27)	(0.66)	(*0.82)	(0.42)	(*0.59)	(0.31)	(*0.44)	(0.24)	(*0.40)	(0.22)	3.15 m
	[N.A.]	[N.A.]	[*1.27]	[0.71]	[*0.82]	[0.45]	[*0.59]	[0.33]	[*0.44]	[0.26]	[*0.40]	[0.24]	
	N.A.	N.A.	*1.08	0.59	*0.72	0.37	*0.52	0.27			*0.40	0.23	
-1.0	$\overline{}$	(N.A.)	(*1.08)	(0.67)	(*0.72)	(0.42)	(*0.52)	(0.31)	ŀ	l	(*0.40)	(0.26)	2.82 m
	[N.A.]	[N.A.]	[*1.08]	[0.71]	[*0.72]	[0.46]	[*0.52]	[0.33]			[*0.40]	[0.28]	
			*0.72	0.61	*0.49	0.39					*0.38	0.32	
-1.5	1	i	(*0.72)	(0.68)	(*0.49)	(0.43)	1	1		1	(*0.38)	(0.36)	2.27 m
			[*0./2]	1.0./2	1.0.49	[0.47]					^U.38	^U.38	

Blade raised, Optional Boom (1,350 mm) - Model CX18D

								B (m)							
4	1	1.0	1,	1.5	2	2.0	2	2.5	3.0	0	3.	3.5		MAX	
(m)	-	å	-	B	-	l l	-	8	-	4	-	4	-	Ç₽-	TI TOWN
3.0	-	1	-	-	-		-	l	l		i	-	0.28 (0.31) [0.34]	0.28 (0.31) [0.33]	2.68 m
2.5	-		-	-	-	-	-	l	0.23 (0.26) [0.28]	0.23 (0.26) [0.28]		-	0.21 (0.24) [0.26]	0.21 (0.24) [0.26]	3.12 m
2.0					-			l	0.23 (0.26) [0.28]	0.23 (0.26) [0.28]			0.18 (0.21) [0.23]	0.18 (0.21) [0.22]	3.40 m
1.5	ļ						0.31 (0.35) [*0.35]	0.31 (0.34) [*0.35]	0.23 (0.26) [0.28]	0.23 (0.25) [0.27]	0.17 (0.20) [0.21]	0.17 (0.20) [0.21]	0.17 (0.19) [0.21]	0.17 (0.19) [0.20]	3.57 m
1.0	-	1			0.43 (0.48) [0.51]	0.42 (0.47) [0.50]	0.30 (0.34) [0.36]	0.30 (0.33) [0.36]	0.22 (0.25) [0.27]	0.22 (0.25) [0.27]	0.17 (0.20) [0.22]	0.17 (0.20) [0.21]	0.16 (0.18) [0.20]	0.16 (0.18) [0.20]	3.66 m
0.5	-	1			0.39 (0.44)	0.39 (0.44)	0.28 (0.32) [0.34]	0.28 (0.31) [0.34]	0.21 (0.24) [0.26]	0.21 (0.24) [0.26]	0.16 (0.19) [0.21]	0.17 (0.19) [0.21]	0.15 (0.18) [0.19]	0.15 (0.18) [0.19]	3.65 m
0	-	1	0.59 (0.67) [0.72]	0.57 (0.65) [0.70]	0.37 (0.43) [0.46]	0.37 (0.42) [0.45]	0.27 (0.31) [0.33]	0.27 (0.30) [0.33]	0.20 (0.23) [0.25]	0.20 (0.23) [0.25]	0.16 (0.19) [0.20]	0.16 (0.19) [0.20]	0.16 (0.18) [0.20]	0.16 (0.18) [0.20]	3.55 m
-0.5		1.25 (1.40) [1.51]	0.59 (0.67) [0.72]	0.57 (0.64) [0.69]	0.37 (0.42) [0.45]	0.36 (0.41) [0.44]	0.26 (0.30) [0.33]	0.26 (0.30) [0.32]	0.20 (0.23) [0.25]	0.20 (0.23) [0.25]	-	-	0.17 (0.20) [0.21]	0.17 (0.20) [0.21]	3.36 m
-1.0	1.38 (1.56) [1.68]	1.26 (1.42) [1.52]	0.59 (0.67) [0.72]	0.57 (0.65) [0.70]	0.37 (0.42) [0.45]	0.36 (0.41) [0.44]	0.26 (0.30) [0.33]	0.26 (0.30) [0.32]	0.20 (0.23) [0.25]	0.20 (0.23) [0.25]	l	1	0.20 (0.23) [0.25]	0.20 (0.23) [0.24]	3.06 m
-1.5		1.29 (1.45) [1.55]	0.60 (0.68) [0.74]	0.58 (0.66) [0.71]	0.37 (0.43) [0.46]	0.37 (0.42) [0.45]	0.27 (0.31) [0.33]	0.27 (0.30) [0.33]	i	ı	i	I	0.26 (0.29) [0.32]	0.26 (0.29) [0.31]	2.58 m

Blade lowered, Optional Boom (1,350 mm) - Model CX18D

								B (m)							
4	1	1.0	1.	1.5	2	2.0	2.	2.5	3.0	0	3.5	5		MAX	
E (E)	-	8	-	8	-	8	-	8	-	å	-	å	-	8	TI WAY
3.0	!								ł	ŀ			*0.34 (*0.34) [*0.34]	0.28 (0.31) [0.33]	2.68 m
2.5	-	-		1			1	-	*0.32 (*0.32) [*0.32]	0.23 (0.26) [0.28]	ļ	1	*0.33 (*0.33) [*0.33]	0.21 (0.24) [0.26]	3.12 m
2.0			l	l			l	l	*0.31 (*0.31) [*0.31]	0.23 (0.26) [0.28]	l	1	*0.33 (*0.33) [*0.33]	0.18 (0.21)	3.40 m
1.5	1	-	l	ł			*0.35 (*0.35) [*0.35]	0.31 (0.34) [*0.35]		0.23 (0.25) [0.27]	*0.33 (*0.33) [*0.33]	0.17 (0.20) [0.21]	*0.33 (*0.33) [*0.33]	0.17 (0.19) [0.20]	3.57 m
1.0		-		ł	*0.55 (*0.55) [*0.55]	0.42 (0.47)	*0.44 (*0.44) [*0.44]		*0.39 (*0.39) [*0.39]	0.22 (0.25) [0.27]	*0.36 (*0.36) [*0.36]		*0.35 (*0.35) [*0.35]	0.16 (0.18) [0.20]	3.66 m
0.5			l		*0.71 (*0.71) [*0.71]		*0.51 (*0.51) [*0.51]		*0.42 (*0.42) [*0.42]	0.21 (0.24) [0.26]	*0.36 (*0.36) [*0.36]	l	*0.35 (*0.35) [*0.35]	l	3.65 m
0	-	-	*1.37 (*1.37) [*1.37]	0.57 (0.65) [0.70]	*0.81 (*0.81) [*0.81]	0.37 (0.42) [0.45]	*0.57 (*0.57) [*0.57]		*0.45 (*0.45) [*0.45]		*0.36 (*0.36) [*0.36]	0.16 (0.19) [0.20]			3.55 m
-0.5	N.A. (N.A.) [*3.05]		*1.32 (*1.32) [*1.32]	0.57 (0.64) [0.69]	*0.82 (*0.82) [*0.82]	0.36 (0.41) [0.44]	*0.59 (*0.59) [*0.59]		*0.45 (*0.45) [*0.45]	0.20 (0.23) [0.25]			*0.37 (*0.37) [*0.37]	0.17 (0.2) [0.21]	3.36 m
-1.0	N.A. (N.A.) [*2.56]	-	*1.17 (*1.17) [*1.17]		*0.76 (*0.76) [*0.76]	I			*0.39 (*0.39) [*0.39]	0.20 (0.23) [0.25]		l	*0.37 (*0.37) [*0.37]	0.20 (0.23) [0.24]	3.06 m
-1.5	N.A. (N.A.) [*1.78]	1.29 (1.45) [1.55]	*0.89 (*0.89) [*0.89]	0.58 (0.66) [0.71]	*0.59 (*0.59) [*0.59]	0.37 (0.42) [0.45]	*0.40 (*0.40) [*0.40]	0.27 (0.30) [0.33]	l	ŀ	ŀ	l	*0.36 (*0.36) [*0.36]	0.26 (0.29) [0.31]	2.58 m

MODEL CX19D

The load capacities indicated are for a machine equipped with all types of protective structure, all types of tracks, with no bucket and no quick-coupling.

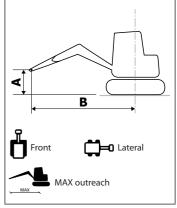
The symbol * indicates the hydraulic load limit.

0 m refers to the ground level.

The values between square brackets () refer to machines equipped with an supplementary counterweight: **0.080** tonnes

The values between square brackets [] refer to machines equipped with a supplementary counterweight: **0.130** tonnes

The unit of measurement of load capacity is **tonnes**.



Blade raised, Standard Boom (1,150 mm) - Model CX19D

							B (m)						
4	1	1.0	1.	1.5	2	2.0		2.5	3.	3.0		MAX	
Œ	-	8	-	ß	-	8	-	8	-	8	-	8	T XOW
3.0		l	l	ı			l	1	1	1	0.35 (0.39)	0.35 (0.39)	2.38 m
2.5		l				-	1		1	-	(0.29)	(0.29)	2.88 m
2.0		1	i			!	0.32 (*0.35) [*0.35]	0.32 (*0.35) [*0.35]	0.24 (0.27)	0.24 (0.27)	0.21 (0.24) [0.26]	0.21 (0.24) [0.26]	3.20 m
1.5		l	1	1		1	0.31 (0.35) [0.38]	0.32 (0.35)	0.23 (0.26) [0.28]	0.24 (0.26)	0.19 (0.22)	0.19 (0.22) [0.23]	3.38 ш
1.0	-	-	!	!	0.43 (0.48) [0.51]	0.43 (0.48) [0.51]	0.31 (0.34) [0.37]	0.31 (0.34) [0.37]	0.23 (0.26) [0.28]	0.23 (0.26) [0.28]	0.18 (0.21) [0.23]	0.19 (0.21) [0.23]	3.46 m
0.5	!	!	!	!	0.40 (0.45)	0.40 (0.45)	0.29 (0.33)	0.29 (0.33)	0.22 (0.25) [0.27]	0.22 (0.25) [0.27]	0.18 (0.20) [0.22]	0.18 (0.20) [0.22]	3.46 m
0		1	0.61 (0.69) [0.75]	0.60 (0.68)	0.39 (0.44)	0.39 (0.44)	0.28 (0.32) [0.34]	0.28 (0.32)	0.21 (0.25) [0.27]	0.22 (0.25) [0.27]	0.18 (0.21) [0.23]	0.19 (0.21) [0.23]	3.36 m
-0.5	1.43 (1.61) [1.73]	1.33 (1.48) [1.58]	0.61 (0.69) [0.75]	0.60 (0.68)	0.38 (0.44)	0.38 (0.43)	0.28 (0.31) [0.34]	0.28 (0.32) [0.34]	0.21 (0.24) [0.26]	0.22 (0.25) [0.26]	0.20 (0.23) [0.25]	0.20 (0.23)	3.15 m
-1.0	1.45 (1.63) [1.74]	1.34 (1.50) [1.60]	0.62 (0.70) [0.75]	0.61 (0.68) [0.73]	0.39 (0.44) [0.47]	0.39 (0.44) [0.47]	0.28 (0.32) [0.34]	0.28 (0.32) [0.34]	1	-	0.24 (0.27) [0.29]	0.24 (0.27) [0.29]	2.82 m
-1.5			0.64 (0.72) [*0.72]	0.62 (0.70) [*0.72]	0.40 (0.45) [0.48]	0.40 (0.45) [0.48]		1		l	0.33 (0.37) [*0.38]	0.33 (0.37) [*0.38]	2.27 m

Blade lowered, Standard Boom (1,150 mm) - Model CX19D

							B (m)						
4	1.	1.0	1.5	5	2	2.0	2.5	5	3.0	0		MAX	
(m)	-	8	-	å	-	B	-	å	-	å	-	8	NOX NOX
3.0	-	-	1				1		1		*0.39	0.35	2.38 m
											*0.39	*0.39	
C T				ļ							*0.37	0.26	200
											[*0.37]	[0.31]	2.00
							*0.35	0.32	*0.34	0.24	*0.35	0.21	
2.0	1	1	1	1	1	1	(*0.35)	(*0.35)	(*0.34)	(0.27)	(*0.35)	(0.24)	3.20 m
							[*0.35]	[*0.35]	[*0.34]	[0.29]	[*0.35]	[0.26]	
							*0.38	0.32	*0.37	0.24	*0.36	0.19	
1.5		1	1	1		1	(*0.38)	(0.35)	(*0.37)	(0.26)	(*0.36)	(0.22)	3.38 m
							[*0.38]	[0.38]	[*0.37]	[0.28]	[*0.36]	[0.23]	
					*0.61	0.43	*0.49	0.31	*0.42	0.23	*0.39	0.19	
1.0		1	1	1	(*0.61)	(0.48)	(*0.49)	(0.34)	(*0.42)	(0.26)	(*0.39)	(0.21)	3.46 m
					[*0.61]	[0.51]	[*0.49]	[0.37]	[*0.42]	[0.28]	[*0.39]	[0.23]	
					*0.77	0.40	*0.55	0.29	*0.45	0.22	*0.38	0.18	
0.5	1	1	1	1	(*0.77)	(0.45)	(*0.55)	(0.33)	(*0.45)	(0.25)	(*0.38)	(0.20)	3.46 m
					[*0.77]	[0.48]	[*0.55]	[0.35]	[*0.45]	[0.27]	[*0.38]	[0.22]	
			*1.37	09.0	*0.84	0.39	09'0 *	0.28	*0.46	0.22	*0.39	0.19	
0	1	1	(*1.37)	(0.68)	(*0.84)	(0.44)	(*0.60)	(0.32)	(*0.46)	(0.25)	(*0.39)	(0.21)	3.36 m
			[*1.37]	[0.73]	[*0.84]	[0.47]	[*0.60]	[0.34]	[*0.46]	[0.27]	[*0.39]	[0.23]	
	N.A.	1.33	*1.27	09.0	*0.82	0.38	*0.59	0.28	*0.44	0.22	*0.40	0.20	
-0.5	(N.A.)	(1.48)	(*1.27)	(0.68)	(*0.82)	(0.43)	(*0.59)	(0.32)	(*0.44)	(0.25)	(*0.40)	(0.23)	3.15 m
	[N.A.]	[1.58]	[*1.27]	[0.73]	[*0.82]	[0.46]	[*0.59]	[0.34]	[*0.44]	[0.26]	[*0.40]	[0.25]	
	N.A.	1.34	*1.08	0.61	*0.72	0.39	*0.52	0.28			*0.40	0.24	
-1.0	(N.A.)	(1.50)	(*1.08)	(0.68)	(*0.72)	(0.44)	(*0.52)	(0.32)	1	1	(*0.40)	(0.27)	2.82 m
	[N.A.]	[1.60]	[*1.08]	[0.73]	[*0.72]	[0.47]	[*0.52]	[0.34]			[*0.40]	[0.29]	
			*0.72	0.62	*0.49	0.40					*0.38	0.33	
-1.5			(*0.72)	(0.70)	(*0.49)	(0.45)	-		1	1	(*0.38)	(0.37)	2.27 m
				[*0./2]	 1.49]	0.48					*0.38	*0.38	

Blade raised, Optional Boom (1,350 mm) - Model CX19D

								B (m)							
4	1,	1.0	1	1.5	7	2.0	2.	2.5	.Ω	3.0	m	3.5		MAX	
(m)	-	å	-	å	-	å	-	å	-	å	-	å	-	å	Now.
3.0													0.28 (0.32) [*0.34]	0.29 (0.32) [*0.34]	2.68 m
2.5		1	-	1	ł	1	1	l	0.24 (0.27) [0.29]	0.24 (0.27) [0.29]	-	-	0.22 (0.25)	0.22 (0.25) [0.27]	3.12 m
2.0	l	1	1		1	-	-	1	0.23 (0.27) [0.29]	0.24 (0.27) [0.29]	1	1	0.19 (0.21) [0.23]	0.19 (0.21) [0.23]	3.40 m
1.5	l	-	-		-	-	0.31 (0.35) [*0.35]	0.31 (0.35) [*0.35]	0.23 (0.26) [0.28]	0.23 (0.26) [0.28]	0.18 (0.20) [0.22]	0.18 (0.20) [0.22]	0.17 (0.19) [0.21]	0.17 (0.20) [0.21]	3.57 m
1.0		!			0.43 (0.48)	0.43 (0.48) [0.51]	0.30 (0.34)	0.31 (0.34) [0.37]	0.23 (0.26)	0.23 (0.26)	0.18 (0.20) [0.22]	0.18 (0.20) [0.22]	0.16 (0.19) [0.20]	0.17 (0.19) [0.20]	3.66 m
0.5	-	!	!		0.40 (0.45)	0.40 (0.45)	0.28 (0.32)	0.29 (0.32) [0.35]	0.21 (0.24) [0.26]	0.22 (0.25)	0.17 (0.19) [0.21]	0.17 (0.20) [0.21]	0.16 (0.18) [0.20]	0.16 (0.18) [0.20]	3.65 m
0	1	!	0.60 (0.68) [0.73]	0.59 (0.66)	0.38 (0.43)	0.38 (0.43)	0.27 (0.31) [0.34]	0.28 (0.31) [0.34]	0.21 (0.24) [0.26]	0.21 (0.24) [0.26]	0.16 (0.19) [0.21]	0.17 (0.19) [0.21]	0.16 (0.19) [0.20]	0.16 (0.19) [0.20]	3.55 m
-0.5	1.39 (1.57) [1.68]	1.29 (1.44) [1.54]	0.60 (0.68) [0.73]	0.59 (0.66) [0.71]	0.37 (0.42) [0.46]	0.37 (0.42) [0.45]	0.27 (0.31) [0.33]	0.27 (0.31) [0.33]	0.20 (0.23) [0.25]	0.21 (0.24) [0.26]		-	0.17 (0.20) [0.22]	0.18 (0.20) [0.22]	3.36 m
-1.0		1.30 (1.46) [1.56]	0.60 (0.68) [0.73]	0.59 (0.66) [0.71]	0.37 (0.42) [0.46]	0.37 (0.42) [0.45]	0.27 (0.30) [0.33]	0.27 (0.31) [0.33]	0.21 (0.24) [0.26]	0.21 (0.24) [0.26]	ŀ	ŀ	0.20 (0.23) [0.25]	0.20 (0.23) [0.25]	3.06 m
-1.5	1.43 (1.61) [1.73]	1.33 (1.49) [1.59]	0.61 (0.69) [0.75]	0.60 (0.68) [0.73]	0.38 (0.43) [0.47]	0.38 (0.43) [0.46]	0.27 (0.31) [0.34]	0.28 (0.31) [0.34]	l	I	l	I	0.26 (0.30) [0.32]	0.27 (0.30) [0.32]	2.58 m

Blade lowered, Optional Boom (1,350 mm) - Model CX19D

								B (m)							
4	1	1.0	1.	1.5	2.	2.0	2.5	.5	3.0	0	3.5	5		MAX	
Œ	-	å	-	å	- -	1	-	8	-	å	-	8	-	å	MAX
3.0	-				!	!	l	-	ł		ļ	!	*0.34 (*0.34) [*0.34]	0.29 (0.32) [*0.34]	2.68 m
2.5			-	ŀ	1	l	!	l	*0.32 (*0.32) [*0.32]	0.24 (0.27) [0.29]		l	*0.33 (*0.33) [*0.33]	0.22 (0.25) [0.27]	3.12 m
2.0	1		l			1	l		*0.31 (*0.31) [*0.31]	0.24 (0.27) [0.29]	l	l	*0.33 (*0.33) [*0.33]	0.19 (0.21) [0.23]	3.40 m
1.5	1		l			-	*0.35 (*0.35) [*0.35]	0.31 (0.35) [*0.35]	*0.34 (*0.34) [*0.34]	0.23 (0.26) [0.28]	*0.33 (*0.33) [*0.33]	0.18 (0.20) [0.22]	*0.33 (*0.33) [*0.33]	0.17 (0.20) [0.21]	3.57 m
1.0			l		*0.55 (*0.55) [*0.55]	0.43 (0.48) [0.51]	*0.44 (*0.44) [*0.44]		*0.39 (*0.39) [*0.39]	0.23 (0.26) [0.28]	*0.36 (*0.36) [*0.36]	0.18 (0.20) [0.22]	*0.35 (*0.35) [*0.35]		3.66 m
0.5			l		*0.71 (*0.71) [*0.71]	1 —	*0.51 (*0.51) [*0.51]		*0.42 (*0.42) [*0.42]	0.22 (0.25) [0.27]					3.65 m
0	!		*1.37 (*1.37) [*1.37]	0.59 (0.66) [0.71]				1	*0.45 (*0.45) [*0.45]	0.21 (0.24) [0.26]	*0.36 (*0.36) [*0.36]	l .			3.55 m
-0.5	N.A. (N.A.) [*3.05]	1.29 (1.44) [1.54]	*1.32 (*1.32) [*1.32]	0.59 (0.66) [0.71]	*0.82 (*0.82) [*0.82]		*0.59 (*0.59) [*0.59]	0.27 (0.31) [0.33]	*0.45 (*0.45) [*0.45]	0.21 (0.24) [0.26]		-	*0.37 (*0.37) [*0.37]	0.18 (0.20) [0.22]	3.36 m
-1.0	- O ^ I	-							*0.39 (*0.39) [*0.39]	0.21 (0.24) [0.26]	l	1	*0.37 (*0.37) [*0.37]		3.06 m
-1.5	N.A. (N.A.) [*1.78]	1.33 (1.49) [1.59]	*0.89 0.60 (*0.89) (0.68) [*0.89] [0.73]	0.60 (0.68) [0.73]	*0.59 (*0.59) [*0.59]	0.38 (0.43) [0.46]	*0.40 (*0.40) [*0.40]	0.28 (0.31) [0.34]	ł	l		ı	*0.36 (*0.36) [*0.36]	0.27 (0.3) [0.32]	2.58 m

MODEL CX20D

The load capacities indicated are for a machine equipped with all types of protective structure, all types of tracks, with no bucket and no quick-coupling.

The symbol * indicates the hydraulic load limit.

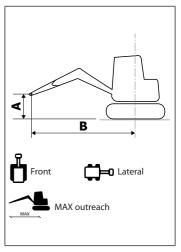
0 m refers to the ground level.

The values refer to the machine equipped with supplementary counterweight: **0.080 tonnes.**

The values between square brackets () refer to machines equipped with an supplementary counterweight: **0.130** tonnes

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

The unit of measurement of load capacity is **tonnes**.



Blade raised, Standard Boom (1,150 mm) - Model CX20D

								B (m)							
1.0	0		1,	1.5	2.	2.0	2.	2.5	Э.	3.0	3.	3.5		MAX	
<u> </u>				8	40	8	-	8	4	8	4		d-		Not.
1				1					1				0.35 (0.38)	0.34 (0.37)	2.46 m
-		-	-	-	-	-	0.36 (0.38)	0.35 (0.38)	0.25 (0.27)	0.25 (0.27)	-		0.24 (0.26)	0.24 (0.26)	3.06 m
-		-	-	1	-	-	0.36 (0.38)	0.35 (0.38)	0.26 (0.28)	0.26 (0.28)	1	-	0.20 (0.21)	0.20 (0.21)	3.44 m
-		-	-	1	0.50 (0.54)	0.49 (0.52)	0.35 (0.37)	0.34 (0.36)	0.25 (0.27)	0.25 (0.27)	0.19 (0.21)	0.19 (0.21)	0.17 (0.19)	0.17 (0.19)	3.70 m
		-	-	1	0.49 (0.52)	0.47 (0.51)	0.34 (0.36)	0.33 (0.36)	0.25 (0.27)	0.25 (0.27)	0.19 (0.21)	0.19 (0.20)	0.16 (0.17)	0.16 (0.17)	3.85 m
1		-	0.77 (0.88)	0.74 (0.78)	0.49 (0.52)	0.47 (0.51)	0.34 (0.37)	0.33 (0.36)	0.25 (0.27)	0.25 (0.27)	0.19 (0.21)	0.19 (0.21)	0.16 (0.17)	0.16 (0.17)	3.92 m
		-	0.71 (0.76)	0.68 (0.73)	0.44 (0.48)	0.43 (0.47)	0.32 (0.35)	0.32 (0.34)	0.24 (0.26)	0.24 (0.26)	0.18 (0.20)	0.18 (0.20)	0.15 (0.16)	0.15 (0.16)	3.92 m
1.51 (1.63)		1.37 (1.47)	0.65 (0.7)	0.63 (0.67)	0.40 (0.44)	0.39 (0.43)	0.29 (0.32)	0.29 (0.31)	0.22 (0.24)	0.22 (0.24)	0.18 (0.19)	0.17 (0.19)	0.15 (0.17)	0.15 (0.17)	3.83 m
1.52 (1.64)		1.38 (1.48)	0.65 (0.7)	0.63 (0.67)	0.40 (0.43)	0.39 (0.42)	0.29 (0.31)	0.28 (0.31)	0.22 (0.24)	0.22 (0.24)	0.17 (0.19)	0.17 (0.19)	0.17 (0.18)	0.17 (0.18)	3.66 m
1.53 (1.65)		1.39 (1.49)	0.66 (0.71)	0.63	0.40 (0.44)	0.39 (0.43)	0.29 (0.31)	0.28 (0.31)	0.22 (0.24)	0.22 (0.24)	1	1	0.19 (0.20)	0.19 (0.20)	3.40 m
1.57		1.57 1.42 (1.69) (1.52)	0.66 (0.72)	0.64 (0.69)	0.64 0.41 (0.69) (0.44)	0.40 (0.43)	0.29 (0.32)	0.29 (0.31)	1				*0.22	*0.22 *0.22 (*0.22) 2.81 m	2.81 m

Blade lowered, Standard Boom (1,150 mm) - Model CX20D

								B (m)							
4	1	1.0	1.5	5	2.0	0	2.5	5	3.0	0	3.5	5		MAX	
(m)	-	B	-		-			B	-	B	40	B		B	No.
3.5		-	l		-	-		-	-	-	-	-	*0.63 0.34 (*0.63) (0.37)	0.34 (0.37)	2.46 m
3.0					-	-	*0.51 (*0.51)	0.35 (0.38)	*0.51 0.35 *0.52 0.25 (*0.51) (0.38) (*0.52) (0.27)	0.25 (0.27)	-	-	*0.52 0.24 (*0.52) (0.26)	0.24 (0.26)	3.06 m
2.5	-	-	-		-	-	*0.51 (*0.51)	0.35 (0.38)	*0.51 0.35 *0.44 0.26 (*0.51) (0.38) (*0.44) (0.28)	0.26 (0.28)	-	-	*0.47 0.20 (*0.47) (0.21)	0.20 (0.21)	3.44 m
2.0		-			*0.56 (*0.56)	0.49 (0.52)	*0.42 0.34 *0.41 0.25 *0.37 0.19 *0.37 0.19 (*0.37) (*0.42) (*0.41) (*0.27) (*0.37	0.34 (0.36)	*0.41 (*0.41)	0.25 (0.27)	*0.37	0.19 (0.21)	*0.37	0.17 (0.19)	3.70 m
1.5				-	*0.64 (*0.64)	0.47 (0.51)	*0.64 0.47 *0.50 0.33 *0.44 0.25 *0.36 (*0.64) (0.51) (*0.50) (0.36) (*0.44) (0.27) (*0.36)	0.33 (0.36)	*0.44	0.25 (0.27)	*0.36 (*0.36)	0.19 (0.2)	*0.35 (*0.35)	0.16 (0.17)	3.85 m
1.0	1		*0.83	0.74 (0.78)	*0.64 (*0.64)	0.47 (0.51)	*0.64 0.47 *0.54 0.34 *0.40 0.25 *0.39 0.19 *0.36) (*0.64) (0.51) (*0.54) (0.36) (*0.40) (0.27) (*0.39) (0.21) (*0.36)	0.34 (0.36)	*0.40	0.25 (0.27)	*0.39	0.19 (0.21)	*0.36	0.16 (0.17)	3.92 m
0.5			*1.46 0.68 (*1.46) (0.73)	0.68 (0.73)		0.43 (0.47)	*0.89 0.43 *0.63 0.32 *0.54 0.24 *0.47 (*0.89) (0.47) (*0.63) (0.34) (*0.54) (0.26) (*0.47)	0.32 (0.34)	*0.54 (*0.54)	0.24 (0.26)	*0.47 (*0.47)	0.18 (0.2)	*0.37 0.15 (*0.37)	0.15 (0.16)	3.92 m
0	N.A. (N.A.)	1.37 (1.47)	*1.73 0.63 *1.05 0.39 (*1.73) (0.67) (*1.05) (0.43)	0.63 (0.67)	*1.05 (*1.05)	0.39 (0.43)	*0.75	0.29 (0.31)	*0.58 (*0.58)	0.22 (0.24)	*0.45		*0.34 (*0.34)	0.15 (0.17)	3.83 m
-0.5	N.A. (N.A.)	1.38 (1.48)	1.38 *1.69 0.63 *1.00 0.39 (1.48) (*1.69) (0.67) (*1.00) (0.42)	0.63 (0.67)	*1.00	0.39 (0.42)	*0.72 (*0.72)	0.28 (0.31)	0.28 *0.54 0.22 (0.31) (*0.54) (0.24)	0.22 (0.24)	*0.37	0.17 (0.19)	*0.30	0.17 (0.18)	3.66 m
-1.0	N.A. (N.A.)	I	1.39 *1.52 0.63 *0.91 0.39 *0.67 0.28 *0.47 0.24 (1.49) (*1.52) (0.68) (*0.91) (0.43) (*0.67) (0.31) (*0.47) (0.24)	0.63 (0.68)	*0.91 (*0.91)	0.39 (0.43)	*0.67	0.28 (0.31)	*0.47	0.22 (0.24)			*0.24 (*0.24)	0.19 (0.20)	3.40 m
-1.5	N.A.)	1.42 (1.52)	N.A. 1.42 *0.73 0.64 *0.45 0.40 *0.34 0.29 (N.A.) (1.52) (*0.73) (0.69) (*0.45) (0.43) (*0.34) (0.31)	0.64 (0.69)	*0.45 (*0.45)	0.40 (0.43)	*0.34 (*0.34)	0.29 (0.31)	ł		ł		*0.22 *0.22 (*0.22) (*0.22)	*0.22 (*0.22)	2.81 m

Blade raised, Optional Boom (1,350 mm) - Model CX20D

									B (m)								
4		1.0	1.5	2	2.	2.0	2.	2.5	3.0	0	3.5	2	4.0	0		MAX	
(m)	40	B	40	å	40	B	₽	B	40	B	40	B	40	13	40	8	T XWX
4.0	ł	ł	1	1	1	-	1	1	-	1	-	-	1	1	0.53 (0.57)	0.52 (0.55)	1.91 m
3.5	ł	ł	ł	l	l		0.35 (0.38)	0.35 (0.37)		1			ŀ	ł	0.28 (0.30)	0.28 (0.30)	2.80 m
3.0	ŀ	ł	ł	l	ŀ		0.36	0.35 (0.38)	0.26 (0.28)	0.25 (0.27)			ŀ	ł	0.21 (0.22)	0.21 (0.22)	3.32 m
2.5	1			1	1		0.36 (0.38)	0.35 (0.38)	0.26 (0.28)	0.26 (0.27)	0.19 (0.21)	0.19 (0.21)			0.17	0.17	3.67 m
2.0	1	ł	-	-	1	-	0.35 (0.38)	0.34 (0.37)	0.26 (0.28)	0.25 (0.27)	0.19 (0.21)	0.19 (0.21)	1	1	0.15 (0.17)	0.15 (0.16)	3.91 m
1.5	1	-	-	-	0.48 (0.52)	0.47	0.34 (0.36)	0.33 (0.36)	0.25 (0.27)	0.25 (0.27)	0.19 (0.21)	0.19 (0.21)	0.14 (0.16)	0.14 (0.16)	0.14 (0.15)	0.14 (0.15)	4.06 m
1.0	ł	1	0.76 (0.81)	0.73 (0.78)	0.48 (0.51)		0.47 0.34 (0.50) (0.36)	0.33 (0.36)	0.25 (0.27)	0.25 (0.27)	0.19 (0.21)	0.19 (0.20)	0.15 (0.16)	0.15 (0.16)	0.14 (0.15)	0.14 (0.15)	4.12 m
0.5	1.53 (1.65)	$\begin{pmatrix} 1.38 \\ (1.48) \end{pmatrix}$	0.72 (0.78)	0.69 (0.74)	0.45 (0.48)	0.44 (0.47)	0.31 (0.34)	0.31 (0.33)	0.23 (0.25)	0.23 (0.25)	0.18 (0.19)	0.18 (0.19)	0.14 0.14 0.13 (0.15) (0.15)	0.14 (0.15)	0.13 (0.15)	0.13 (0.14)	4.12 m
0	1.49 (1.61)	$\binom{1.35}{(1.45)}$	0.67 (0.72)	0.64 (0.69)	0.42 (0.45)	0.41 (0.44)	0.30 (0.33)	0.30 (0.32)	0.22 (0.24)	0.22 (0.24)	0.17 (0.19)	0.17 (0.19)	0.14 (0.15)	0.14 (0.15)	0.14 (0.15)	0.14 (0.15)	4.03 m
-0.5	1.49	$\binom{1.35}{(1.45)}$	0.65 (0.7)	0.62 (0.67)	0.41 (0.45)	0.40 (0.43)	0.29 (0.32)	0.29 (0.31)	0.22 (0.24)	0.21 (0.23)	0.17 (0.19)	0.17 (0.18)	1	1	0.14 (0.16)	0.14 (0.16)	3.88 m
-1.0	1.50 (1.62)	$\frac{1.36}{(1.46)}$	0.63	0.61 (0.66)	0.39 (0.42)	0.38 (0.41)	0.27 (0.30)	0.27 (0.29)	0.21 (0.23)	0.21 (0.23)	0.17 (0.18)	0.17 (0.18)	1	1	0.16 (0.18)	0.16 (0.18)	3.62 m
-1.5	1.53 (1.64)	$\begin{pmatrix} 1.38 \\ (1.48) \end{pmatrix}$	0.65 (0.71)	0.63 (0.67)	0.40 (0.44)	0.40 (0.43)	0.28 (0.31)	0.28 (0.30)	0.21 (0.23)	0.21 (0.23)	-	-	1		*0.17 (*0.17)	*0.17 *0.17 (*0.17)(*0.17)	3.23 m
-2.0	ł	1	0.68 (0.73)	0.65	0.65 *0.41 0.41 (0.70) (*0.41)(*0.41)	0.41 (*0.41)	-	-	-	-	-	-	ŀ		*0.34	*0.34 *0.34 (*0.34)(*0.34)	2.17 m

Blade lowered, Optional Boom (1,350 mm) - Model CX20D

									B (m)								
V	-	1.0	1	1.5	2.0	0	2.5	2	3.0	0	3.5	2	4.0	0		MAX	
(m)	-	B	4	å	40	₽ B	40	B	- D	B	-	B	-	₽ B	40	8	J
4.0	1	1	l	1	l	1	l		1		l		1		*0.79	0.52 (0.55)	1.91 m
3.5	!	ļ	l		ł	l	*0.52 (*0.52)	0.35 (0.37)	1		ł		l		*0.54 (*0.54)	0.28 (0.3)	2.80 m
3.0	!	l	l		ŀ		*0.48	0.35 (0.38)	*0.48 0.35 *0.46 0.25 (*0.48) (0.38) (*0.46) (0.27)	0.25 (0.27)	ŀ				*0.46 0.21 (*0.46) (0.22)	0.21 (0.22)	3.32 m
2.5		l			l		*0.48 0.35 (*0.48) (0.38)	0.35	*0.48 0.35 *0.46 0.26 *0.43 0.19 (*0.48) (0.27) (*0.49) (0.21)	0.26 (0.27)	*0.43	0.19 (0.21)	1		*0.42 0.17 (*0.42) (0.19)	0.17	3.67 m
2.0	-		1		1	-	*0.50 (*0.50)	0.34 (0.37)	*0.44	0.25 (0.27)	*0.41 (*0.41)	0.19 (0.21)	-	-	*0.40 0.15 (*0.40) (0.16)	0.15 (0.16)	3.91 m
1.5	-	l	1		*0.68 (*0.68)	0.47	*0.52 (*0.52)	0.33	*0.52 0.33 *0.42 0.25 (*0.52) (0.36) (*0.42) (0.27)	0.25 (0.27)	*0.41 (*0.41)	0.19 (0.21)	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	0.14 (0.16)	*0.38 (*0.38)	0.14 (0.15)	4.06 m
1.0	1		*1.07 (*1.07)	*1.07 0.73 (*1.07) (0.78)		0.47	*0.51 (*0.51)	0.33	*0.47	0.25 (0.27)	*0.44	0.19 (0.20)	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	0.15 (0.16)	*0.37	0.14 (0.15)	4.12 m
0.5	N.A.)	1.38 (1.48)	*1.24 (*1.24)	*1.24 0.69 (*1.24) (0.74)	*0.8 (*0.8)	0.44 (0.47)	*0.62	0.31 (0.33)	*0.53 (*0.53)	0.23 (0.25)	*0.45 (*0.45)	0.18 (0.19)	*0.8 0.44 *0.62 0.31 *0.53 0.23 *0.45 0.18 *0.37 0.14 *0.34 0.14 (*0.47) (*0.62) (*0.33) (*0.53) (*0.25) (*0.45) (*0.19) (*0.37) (*0.37) (*0.34) (*0.14) (*0.37)	0.14 (0.15)	*0.34 (*0.34)	0.13 (0.14)	4.12 m
0	N.A.)	1.35 (1.45)	*1.62 0.64 (*1.62) (0.69)	0.64 (0.69)		0.41 (0.44)	*0.68 (*0.68)	0.30 (0.32)	*0.56 (*0.56)	0.22 (0.24)	*0.46 (*0.46)	0.17	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$		$*0.31 \mid 0.14 $ (*0.31)	0.14 (0.15)	4.03 m
-0.5	N.A.)	1.35 (1.45)	*1.73 (*1.73)	0.62 (0.67)	*1.03 (*1.03)	0.40 (0.43)	*0.74 (*0.74)	0.29 (0.31)	*0.57	0.21 (0.23)	*0.44	0.17 (0.18)	1		*0.28 0.14 (*0.28) (0.16)	0.14 (0.16)	3.88 m
-1.0	N.A. (N.A.)	1.36 (1.46)	*1.52 0.61 (*1.52) (0.66)	0.61 (0.66)		0.38 (0.41)	*0.65 (*0.65)	0.27 (0.29)	*0.91 0.38 *0.65 0.27 *0.48 0.21 (*0.91) (0.41) (*0.65) (0.29) (*0.48) (0.23)	0.21 (0.23)	*0.30 (*0.30)	0.17 (0.18)	1		*0.23 0.16 (*0.23) (0.18)	0.16 (0.18)	3.62 m
-1.5	N.A. (N.A.)	1.38 (1.48)	*1.37 (*1.37)	0.63 (0.67)	*0.88 (*0.88)		*0.56 (*0.56)	0.28 (0.30)	*0.56 0.28 *0.29 0.21 (*0.56) (0.30) (*0.29) (0.23)	0.21 (0.23)	1	-	1	-	*0.17 *0.17 (*0.17)(*0.17)	*0.17 (*0.17)	3.23 m
-2.0	-		*0.73 0.65 (*0.73) (0.70)	0.65	*0.41 (*0.41)	0.41 (*0.41)	ŀ	ł	ŀ	1	1	1	1		*0.34 *0.34 (*0.34)(*0.34)	*0.34 (*0.34)	2.17 m

3.13 - Standard / custom equipment

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

Equipment key:

• STANDARD OPTIONAL / NOT AVAILABLE

EQUIPMENT	CX17D	CX18D	CX19D	CX20D
Canopy (ROPS - FOPS Level 1)	•	•	•	•
Cab (ROPS/TOPS - FOPS Level 1):				
- heating and ventilation;				
- automatic courtesy light;	0	0	0	0
- Front wiper and washer				
Closing protective structure platform for maintenance	•	•	•	•
FRONT-GUARD Level I front protective grid	0	0	0	0
Front panel for operator protection (canopy version)	0	0	0	0
Hydraulic track widening	•	•	•	•
Double travel speed with AUTOMATIC SHIFT DOWN	•	•	•	•
Horn for travel movement	0	0	0	0
Extendible dozer blade with extensions	•	•	•	•
Rubber tracks	•	•	•	•
Monoboom	•	•	•	•
Second standard boom	•	•	•	•
Long second boom	1	0	0	0
Boom swing	•	•	•	•
Load handling configuration	0	0	0	0
Guard on lifting cylinder and on dozer blade cylinder	•	•	•	•
Guard on dozer blade cylinder	•	•	•	•

EQUIPMENT	CX17D	CX18D	CX19D	CX20D
Supplementary counterweights (refer to section "3.6 - Counterweight" to page 3-6)	•	0	0	•
Auxiliary hydraulic system on AUX1 boom	•	•	•	•
Auxiliary hydraulic system on AUX2 boom	0	0	0	0
Auxiliary hydraulic system on mechanical AUX3 boom	0	0	0	0
Drainage line on boom towards hydraulic oil tank	0	0	0	0
Single-acting/double-acting mechanical switch on AUX1 auxiliary hydraulic system	•	•	•	•
Piloted block valves on cylinders on first boom and second boom	0	0	0	•
Block valve on the dozer blade cylinder	0	0	0	0
Security valves on triple positioner cylinders	1	1	1	•
ISO-SAE Pattern change valve	0	0	0	1
Set-up for hydraulic quick-coupling equipment	0	0	0	0
Hydraulic set-up for cutting head with additional pump	1	1	0	0
LED work light(s) on first boom	•	•	•	•
LED strips on roof on front and rear sides	0	0	0	0
Rotating head lamp	0	0	0	0
Electrical outlet on roof for rotating head lamp with switch (canopy version)	0	0	0	0
Electrical outlet on roof for rotating head lamp with switch (cab version)	•	•	•	•
Auxiliary power socket at the driver's seat	•	•	•	•
Electric immobiliser	0	0	0	0
Geo-localisation system	0	0	0	0
Rear-view mirrors on canopy (left and right)	0	0	0	0
Rear-view mirrors on cab (left and right)	•	•	•	•

EQUIPMENT	CX17D	CX18D	CX19D	CX20D
Seat with adjustable spring suspension and seat belt	•	•	•	•
Use and maintenance manual and tool kit for maintenance	•	•	•	•
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)	0	0	0	0

3.14 - Rotating 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.

3.15 - Overall dimensions

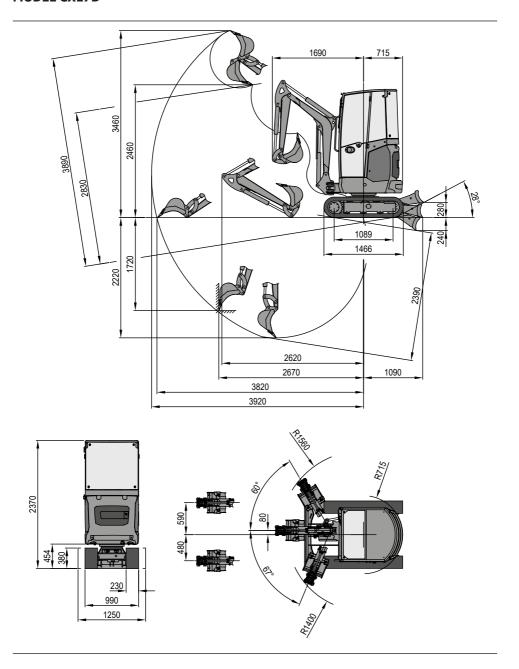
The overall dimensions are indicated in **mm** for machines with standard 2nd arm and excavation bucket.

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

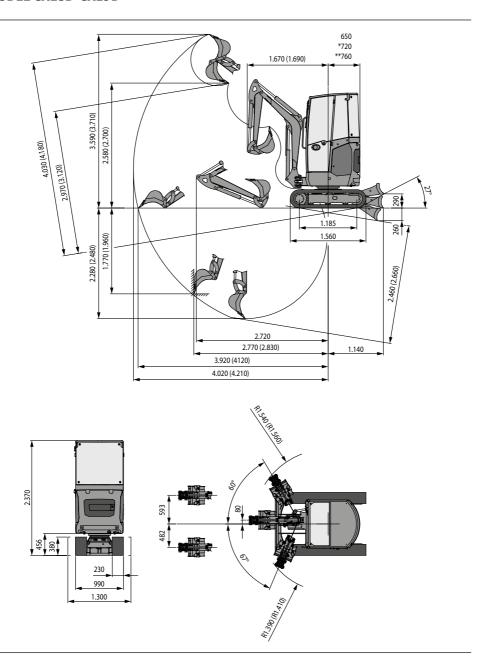
The symbol * means that the machine is fitted with a **light supplementary** counterweight.

The symbol ** means that the machine is fitted with a **heavy supplementary** counterweight.

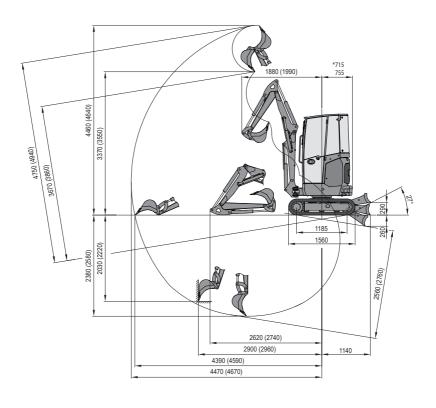
MODEL CX17D

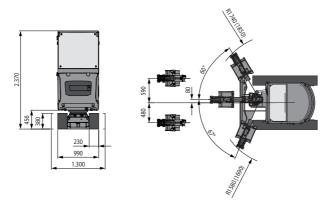


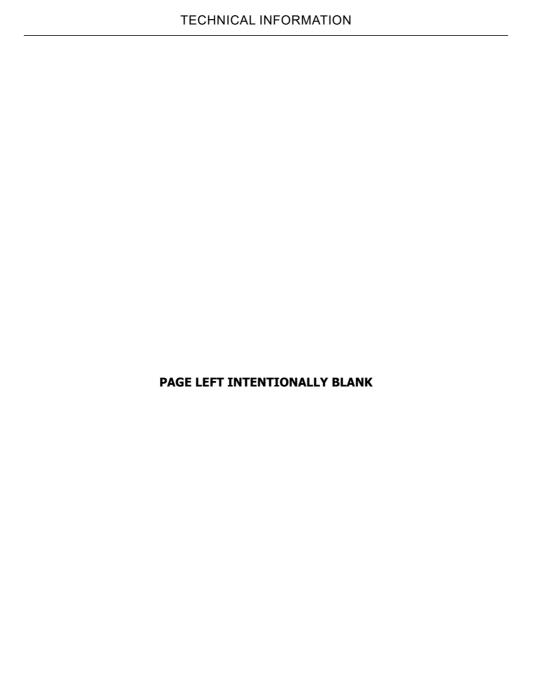
MODEL CX18D-CX19D



MODEL CX20D







4 - TRANSPORTING THE MACHINE



WARNING

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

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

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

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

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

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

4.1 - Transportation dimensions

The dimensions of the machine are indicated in section "3.15 - Overall dimensions" to page 3-30.

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

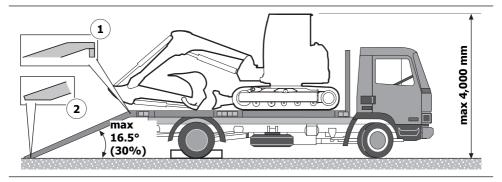
4.2 - Loading/unloading Operations

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° (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 $+5^{\circ}$ C), follow the instructions given in the relevant section before starting the loading/unloading manoeuvres.



WARNING

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

Load the machine according to the indications:

- **1 -** align the turning frame to the undercarriage so that the dozer blade stays near the boom;
- **2 -** if the machine is equipped with an extendible undercarriage and dozer blade, it is preferable to keep them in an extended position to increase their stability;
- **3** point the rear of the machine to the means of transport;
- **4 -** Align the machine to the means of transport.
- **5 -** 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 "6.21.1 - Forward and reverse travel" to page 6-51 and "6.21.4 - Turning while reversing" to page 6-54.

6 - 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.

TRANSPORTING THE MACHINE

- **7 -** Position the machine on the means of transport and lower the dozer blade onto the deck;
- **8** 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;
- **9** park the machine according to the indications given in section "6.18 Stopping and parking the machine" to page 6-45;
- 10 make sure that the machine tracks are on the non-slip mat, for the entire surface; if not, reposition the machine correctly;
- **11** secure the machine to the deck of the means of transport as indicated in the following section.

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



WARNING

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

4.3 - Securing the machine on the mean of transport

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

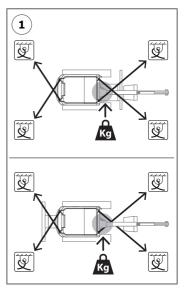
After having loaded the machine onto the truck, position it and secure it as indicated below and on the special operation label (1).

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.

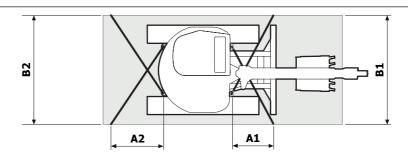
Check and follow the Standards in force in the country the transport is carried out.

TRANSPORTING THE MACHINE

It is possible to anchor the machine in different configurations:

CONFIGURATION 1

Boom in blade position with 4 anchor points: 2 front and 2 rear on turning frame.



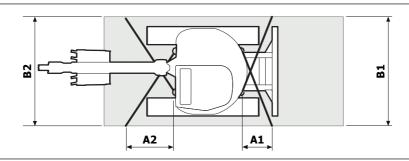
		Anchor points	on DOZER BLA	DE SIDE	
	d range of alues	CX17D	CX18D	CX19D	CX20D
A1	mm	700 ÷ 900		700 ÷ 900	
B1	mm	1,800 ÷ 2,450		1,800 ÷ 2,450	

	Ancho	or points on SID	DE OPPOSITE TO	O DOZER BLADE	
	d range of alues	CX17D	CX18D	CX19D	CX20D
A2	mm	400 ÷ 1,000		400 ÷ 1,000	
B2	mm	1,800 ÷ 2,450		1,800 ÷ 2,450	

A	nchoring capac	ity of the faster	ning system	
Minimum value	CX17D	CX18D	CX19D	CX20D
LC (Lashing Capacity)		100	daN	

CONFIGURATION 2

Boom in opposite position to blade with 4 anchor points: 2 front and 2 rear on turning frame.



		Anchor points	on DOZER BLA	DE SIDE	
	l range of lues	CX17D	CX18D	CX19D	CX20D
A1	mm	400 ÷ 800		400 ÷ 800	
B1	mm	1,800 ÷ 2,450		1,800 ÷ 2,450	

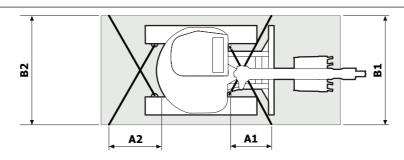
	Ancho	or points on SID	E OPPOSITE TO	O DOZER BLADE	
Allowed val	range of ues	CX17D	CX18D	CX19D	CX20D
A2	mm	600 ÷ 1,200		600 ÷ 1,200	
B2	mm	1,800 ÷ 2,450		1,800 ÷ 2,450	

Anchoring capacity of the fastening system						
Minimum value	Minimum value CX17D CX18D CX19D CX20D					
LC (Lashing Capacity)	100 daN					

CONFIGURATION 3

Model: CX18D-CX19D-CX20D

Boom in blade position with 4 anchor points: 2 front ones on the turning frame and 2 rear ones in the undercarriage.



	Anchor points on DOZER BLADE SIDE					
	range of lues	CX17D	CX18D	CX19D	CX20D	
A1	mm	N.A.	700 ÷ 900			
B1	mm	N.A.		1,800 ÷ 2,450		

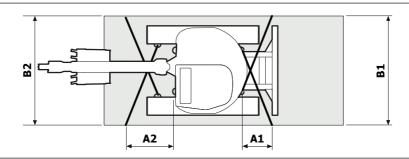
	Anchor points on SIDE OPPOSITE TO DOZER BLADE					
	range of ues	CX17D	CX18D	CX19D	CX20D	
A2	mm	N.A.		500 ÷ 1,000		
B2	mm	N.A.		1,800 ÷ 2,450		

Anchoring capacity of the fastening system						
Minimum value	CX17D	CX18D	CX19D	CX20D		
LC N.A.		100 daN				
(Lashing Capacity)	N.A.		100 dan			

CONFIGURATION 4

Model: CX18D-CX19D-CX20D

Boom in opposite position to blade with 4 anchor points: 2 front ones on the turning frame and 2 rear ones in the undercarriage.



	Anchor points on DOZER BLADE SIDE					
	l range of lues	CX17D	CX18D CX19D		CX20D	
A1	mm	N.A.	400 ÷ 800			
B1	mm	N.A.	1,800 ÷ 2,450			

Anchor points on SIDE OPPOSITE TO DOZER BLADE					
	range of ues	CX17D	CX18D	CX19D	CX20D
A2	mm	N.A.	500 ÷ 1,000		
B2	mm	N.A.		1,800 ÷ 2,450	

Anchoring capacity of the fastening system					
Minimum value	CX17D	CX18D	CX19D	CX20D	
LC	N.A.		100 daN		
(Lashing Capacity)	14.74.		100 dain		

4.4 - Lifting of 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.



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.

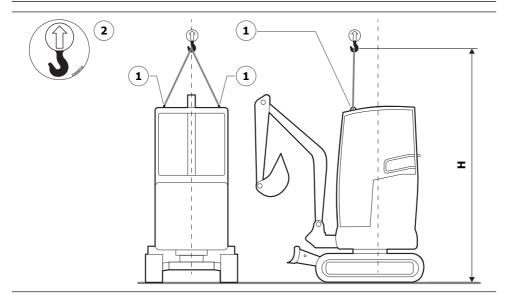
If in doubt, contact the Service Centre.

4.4.1 - Lifting procedure for canopy version

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 near the blade, with the turning frame parallel to the tracks;
- **2** move the boom to a swing angle equal to **0**° (if present);
- 3 close the articulated boom completely (model CX20Donly);
- 4 lift the first boom completely;
- **5** close the bucket completely;
- **6 -** close the 2nd arm until there is a distance of about **10 cm** between the digging boom or the bucket, and the machine;
- **7** raise the dozer blade completely;
- 8 raise the controls cut-out lever;
- 9 Enable the slewing lock (if provided);
- **10** stop the engine, remove the ignition key, then get off the machine;
- **11** 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 **2**):
 - one for each side on the left and on the right of the canopy (1);
- **12** respect the minimum height indicated in the figure to avoid contact between the lifting accessories and the machine, a greater height is allowed;
- 13 lift the machine slowly.

TRANSPORTING THE MACHINE

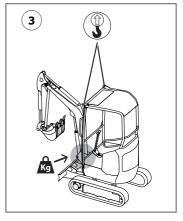


H Minimum height from ground of the lifting accessory

3,500 mm

The lifting instructions are given in a simplified manner on a special label (3) applied to the machine.

- 14 Move the machine to the desired place and lower it slowly; the supporting surface must be flat and compact;
- **15** when the machine is completely resting on the ground, disconnect the accessories.

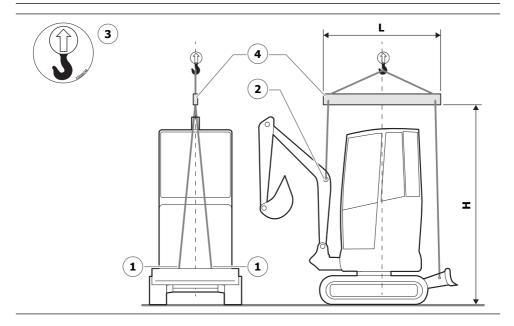


TRANSPORTING THE MACHINE

4.4.2 - Lifting procedure for canopy / cab version

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 close the articulated boom completely (model CX20Donly);
- **4** lift the first boom completely;
- **5** close the bucket completely;
- **6 -** close the 2nd arm until there is a distance of about **10 cm** between the digging boom or the bucket, and the machine;
- **7** raise the dozer blade completely;
- 8 raise the controls cut-out lever;
- 9 Enable the slewing lock (if provided);
- 10 stop the engine, close the windows (if present), remove the ignition key, then get off the machine. Close the cab door (if present);
- **11** 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);
- **12** connect the cables to the lifting accessory (bar) **(4)**, respecting the dimensions indicated in the figure;
- **13** respect the minimum height indicated in the figure to avoid contact between the lifting accessories and the machine, a greater height is allowed;
- **14** lift the machine slowly.

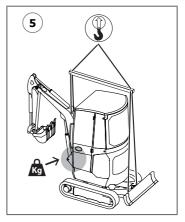


Н	Minimum height from ground of the lifting accessory	3,000 mm
L	Length of lifting accessory	1600 ÷ 2000 mm

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;

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



16 - 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.

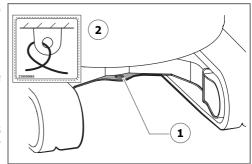
If the machine is stuck in the ground (e.g. muddy ground), proceed with recovery by towing it only as much as necessary to pull it out.

When towing, meet the following conditions:

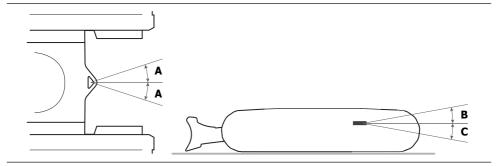
- while towing, the operator **MUST NOT** be on the towed machine;
- tow the machine on flat surfaces only;
- the distance towed should be as short as possible; for long distances, load the machine on a truck;

TRANSPORTING THE MACHINE

- tow at a maximum speed of 1 km/h;
- maintain a sufficient distance to avoid contact between the machine and the towing vehicle; this distance must be under **3 m**;
- while towing, do not allow anyone to access the space between the towing vehicle and the machine;
- connect a tow bar to the dedicated tow hook of the 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 positioned as indicated below;



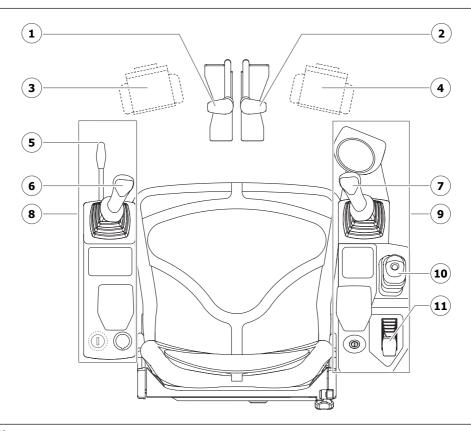
	Α	Maximum horizontal pull angle	± 30°
ſ	В	Maximum upper vertical pull angle	20°
ſ	С	Maximum lower vertical pull angle	5°

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

5 - CONTROLS AND TOOLS

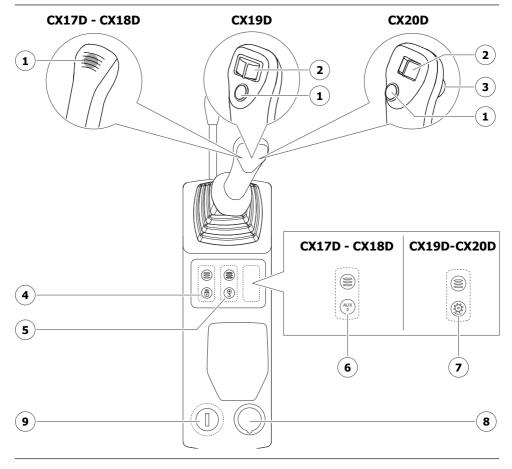
The function of each control and tool is described in detail in chapter "6 - Using the machine" to page 6-1.

5.1 - Description of main controls and levers



Key:			
1	Left travel lever	7	Right joystick
2	Right travel lever	8	Left control console
3	AUX1 hydraulic system pedal (only models CX17D - CX18D)	9	Right control console
4	Pedal: - boom swing - AUX2 hydraulic system (optional) (only models CX17D - CX18D)	10	Undercarriage width adjustment / dozer blade joystick
5	Controls cut-out lever	11	Throttle lever
6	Left Joystick		

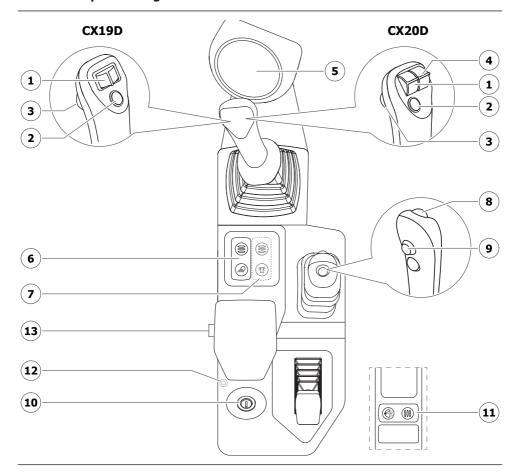
5.2 - Description of left control console



Key:

-			
1	Horn button	6	Boom swing/AUX2 hydraulics system mode selector button on left pedal (optional)
2	Roller: - boom swing; - AUX2 hydraulic system (optional)	7	Hydraulic system control button for shredder head (optional)
3	Optional electrical button 1	8	12V current tap
4	Double-acting hydraulic quick coupling attachment approval button (optional)	9	Key switch for hydraulic quick coupling (optional)
5	Load handling button (optional)		

5.3 - Description of right control console



Key:

1	Roller AUX1 hydraulic system	7	Rotating head lamp switch
2	Boom swing/AUX2 hydraulic system	8	Fast drive button
	mode selector button on left joystick roller (active only if the optional system is present)	9	Undercarriage width adjustment / dozer blade mode selection button
3	Lock button AUX1 hydraulic system	10	Starter switch
4	Triple positioner boom roller	11	Windshield wiper and washer switch (cab version only)
5	Control panel	12	Immobiliser indicator light (optional)
6	Work lights switch	13	Immobiliser electronic key indicator light/reader (optional)

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.



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.

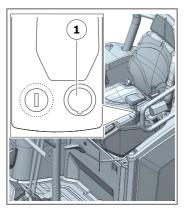
5.5 - Optional electrical buttons on the joystick

The electrical buttons, on the joysticks, can be used to activate some optional functions. For details, see the control sticker near the driver's seat.

5.6 - 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.





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

5.7 - 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 "6.18 - Stopping and parking the machine" to page 6-45;
- 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;
- 2

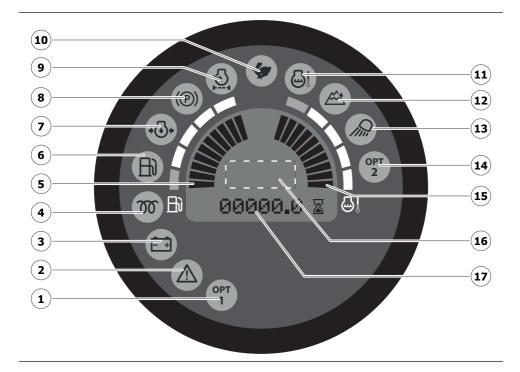
- climb down and remove the ladder;
- insert the electrical connection (2) of the rotating head lamp into one of the sockets available.

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 "5.6 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 "6.8 Auxiliary power socket on the canopy (optional)" to page 6-8 and "6.9.3 Auxiliary socket outside the cab" to page 6-11.

5.8 - Control panel



Key:

1	OPT1 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 indicator light
4	Pre-heat light	13	Work lights light
5	Fuel level indicator	14	OPT2 indicator light - flail head hydraulic system (CX19D- CX20D - if present)
6	Fuel level indicator light	15	Coolant temperature indicator
7	Engine oil pressure warning light	16	Message area (CX19D- CX20D)
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

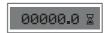
This indicates the temperature of the engine cooling liquid.

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



HOUR 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

It lights up when the function automatically controlling the altitude at which the machine is working is activated.

For more details, see section "6.17.1 - Altitude indicator light" to page 6-44.



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 $(\mathbf{CX19D}\text{-}\mathbf{CX20D}\text{-}\text{if present}).$



MESSAGE AREA (CX19D-CX20D)

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.

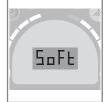


Indicators and warning lights are only operational once the ignition switch is in the ON position.

INITIAL DISPLAY CHECK

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

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

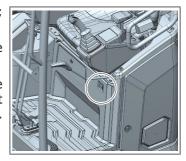


5.9 - Secondary hour meter

It records the working hours carried out by the machine; it is located at the bottom left of the operator's seat.

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.

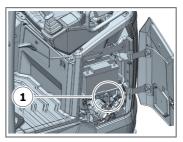
For maintenance operations, refer to the electronic hour meter on the display.

5.10 - Battery disconnect switch

The battery disconnect switch (1) is located inside the battery compartment; for access see section "8.3.3 - Battery compartment cover" 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 6-3.

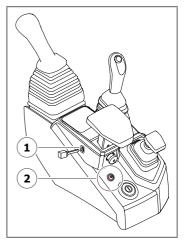


5.11 - Electric immobiliser (optional)

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 right console.

For the operation see section "6.12 - Start-up procedure with electric immobiliser (optional)" to page 6-34.



5.12 - Geo-localisation system (optional)



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

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



WARNING

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

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



NOTICE

The system absorbs a small amount of energy even when the machine is turned off. In the event of prolonged machine inactivity, carefully follow the instructions given in section "8.11 - Long inactivity periods" to page 8-78.

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.

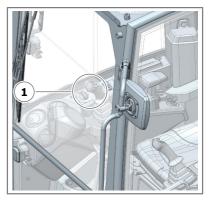


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5.13 - Ventilation and heating

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

The ventilation and heating unit (1) is positioned on the inner right side of the cab.



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.



WARNING

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.

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.

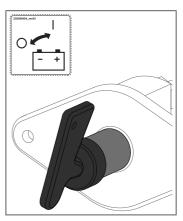
6.2 - Battery disconnect switch

Before commissioning the machine, check its condition.

If the lever is in the $\mathbf{0}^{"}$ position the machine cannot be started, move the lever to position $\mathbf{1}^{"}$ 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 $\mathbf{0}''$ 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.



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

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

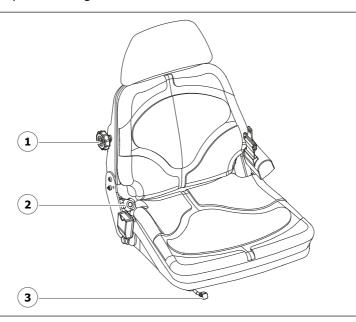
Do not leave any objects near the seat because during the movements there may be collisions and this may damage the seat or injure the operator.



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:

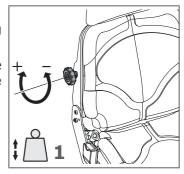
1	Weight adjustment	3	Longitudinal	adjustment	of	the	seat
			with respect to the joysticks				

2 Adjustment of the backrest

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.





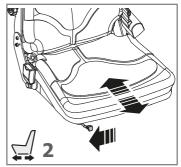
CAUTION

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

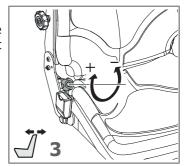
Move the adjustment lever to the right to release the guides, adjust the seat lengthwise with respect to the joysticks.

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 adjust the backrest, turn the hand grip clockwise to tilt the backrest back and counter-clockwise to tilt it 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.

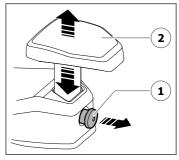
If not, move the seat forwards or backwards and then try again.

6.4 - Armrests

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 2-52.

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 - Controls cut-out lever" to page 2-54.

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

6.7 - Rotation locking lever

The slewing locking lever mechanically locks the slewing of the turning frame (rotary structure).

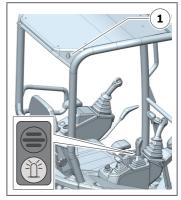
For more details, see section "2.8.4 - Slewing locking lever" to page 2-55.

Always lock the slewing when transporting the machine and at the end of each day of work.

6.8 - Auxiliary power socket on the canopy (optional)

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

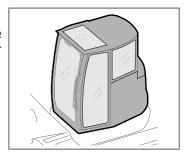
The socket is *locked*; it is powered only when the key of the ignition switch is on the IGNITION position. To activate the socket, press the rotating head lamp button on the right control console (2).



6.9 - Driver's cab (optional)

The machine can be equipped with a closed cab.

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.

6.9.1 - Entering and leaving the driving cab



WARNING

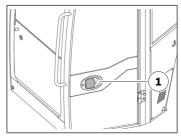
For the procedures, refer to section "GETTING ON AND OFF THE MACHINE" to page 2-35.

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.



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



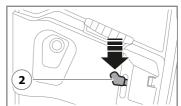
WARNING

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 leave the closed cab, grab the locking lever (2) and push it down, then push the door to open it. After having got out, close and lock the door.





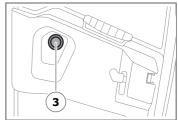
WARNING

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 "6.9.9 - Hammer for emergency exit" to page 6-17.

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 the knob (3) that controls the lock located on the left upright.





NOTICE

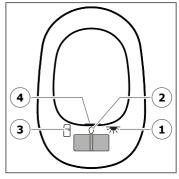
For easier connection/release, grease the connecting parts of the lock periodically.

6.9.2 - 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.

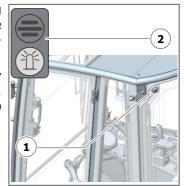
The new light bulb must have the same characteristics as the one replaced.

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

6.9.3 - 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 right control console (2).



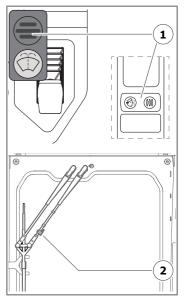
6.9.4 - Windshield wiper

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.



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

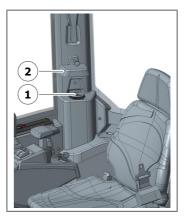
6.9.5 - Water bottle for windshield wiper

The cap of the screen washer tank (1) is located to the driver's right, allowing quick and easy access for topping up the liquid.

To **top up** the container:

- unscrew the knob and remove the protection (2);
- unscrew the cap (1);
- top up as required.
- Refit the cap and the protection.

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



6.9.6 - Opening the windshield

The windshield can be opened for ventilation purposes.

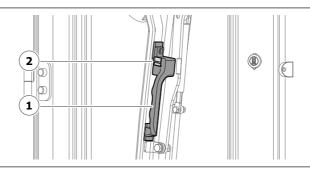


WARNING

When opening the glass, always make sure that the machine is off to avoid involuntary machine movements.

Follow the procedure described for opening the glass (1):

- Take hold of both handles (1) one on each side and push downwards with the thumbs on the buttons (2);
- pull simultaneously both handles backwards tilting the windshield inwards;
- using the gas strut, push the windshield upwards parallel with the cab roof in the fully open position until you hear both locks "click" into place.



The windshield can be lowered by following the same procedure in reverse order until the locking "click" is heard. At this point the windshield will be completely closed.



WARNING

When 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).

Always lock in open or closed position the cab door and windows.

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.

6.9.7 - 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 involuntary machine movements.

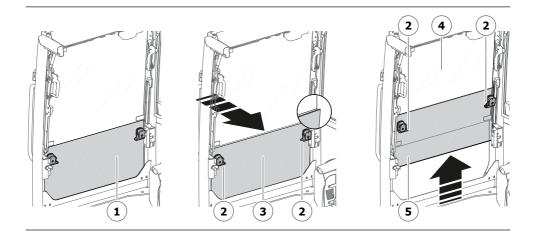
The glass can be tilted inwards or it can be opened completely.

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 "6.9.6 Opening the windshield" to page 6-13.



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.



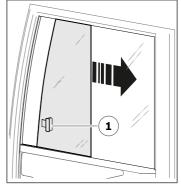
WARNING

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.

6.9.8 - 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.

6.9.9 - Hammer for emergency exit



WARNING

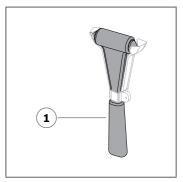
If the glass has to be broken using the hammer, avoid possible injuries caused by shards of glass.

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 2-33.

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





NOTICE

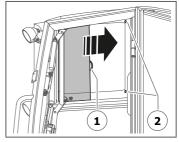
Make sure that the hammer is **always** inside the cab and secured to the left upright.

6.9.10 - 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.





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

6.9.11 - Cab ventilation system

The **ventilation and heating unit** is positioned on the inner right side of the cab.

It 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.

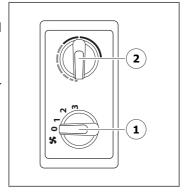
The ventilation power and temperature of the ventilated air are controlled by two hand grips on the rear right upright.

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.

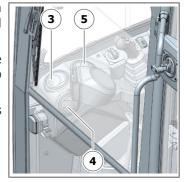


AIR VENTS

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.



6.10 - 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 machines and 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.

6.10.1 - Travel position

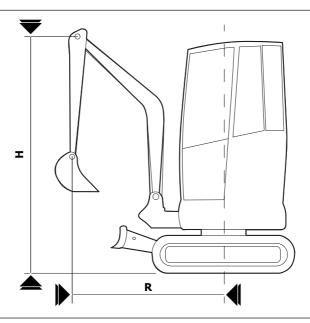
To move, keep the machine configured as indicated below.

MODEL CX17D

- move the boom to a swing angle equal to **0°** (if present);
- lift the first boom completely;
- Position the 2nd arm so that the pin at the end is in the position shown in the figure;
- 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.



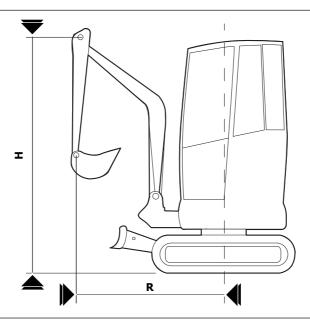
Н	Height from ground at centre of pin of first/second boom	~ 2,260 mm	
R	Distance from the centre of the slewing ring to the centre of the bucket pin	~ 1,320 mm	

MODEL CX18D-CX19D

- move the boom to a swing angle equal to **0°** (if present);
- lift the first boom completely;
- Position the 2nd arm so that the pin at the end is in the position shown in the figure;
- 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.



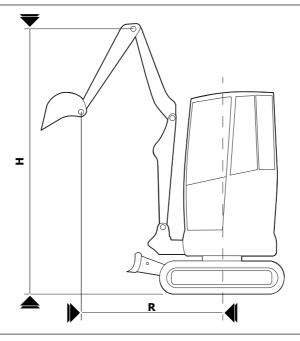
Н	Height from ground at centre of pin of first/second boom	~ 2,340 mm	
R	Distance from the centre of the slewing ring to the centre of the bucket pin	~ 1,570 mm	

MODEL CX20D

- move the boom to a swing angle equal to 0° (if present);
- lift the first boom completely;
- open the triple positioner boom completely;
- open the bucket completely;
- close the 2nd arm completely;
- 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.



-		Height from ground at centre of pin of first/second boom	~ 2,900 mm	
		Distance from the centre of the slewing ring to the centre of the bucket pin	~ 1,700 mm	

6.10.2 - Adjusting the rear view mirrors



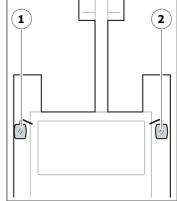
WARNING

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

The machine can be equipped with the following rearview 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.

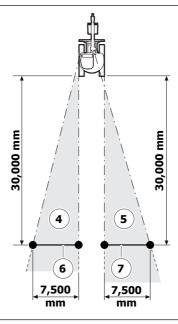


Before starting the machine or each time the operator changes, it is necessary to make sure that the rear-view mirrors are not damaged, that they are clean and that they are adjusted according to the following procedures.

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;
- retract the undercarriage to the minimum track width;
- raise the control cut-out lever and stop the engine;
- adjust the rear-view mirrors from the ground without climbing onto the tracks or other parts of the machine, so that the area shown in the figure is visible;
 - 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.

6.11 - 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.

6.11.1 - Inspections prior to starting

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

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



CAUTION

Carry out checks and maintenance operations before starting the machine.

Keep unauthorised persons away from the machine while checking it.

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

1 PERIODIC MAINTENANCE

Perform the reading of the hour meter to check whether periodic maintenance is required, see section "8.10 - Regular maintenance" to page 8-34.

2 CHECKING THE MACHINE FOR LEAKS

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

Leaks can lead to malfunctions and machine breakdown.

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

3 CLEANING THE MACHINE

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

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

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

4 CHECKING THE MACHINE FOR WEAR

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

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

5 CHECKING THE TRACKS FOR WEAR

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

6 STATUS OF EQUIPMENT

Check the equipment installed on the 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.

6.11.2 - 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.

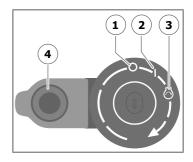
If the machine is fitted with an electric immobiliser (optional), before proceeding, carry out the operations described in section "6.12 - Start-up procedure with electric immobiliser (optional)" to page 6-34.

IGNITION SWITCH

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

The starter switch has 3 positions:

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



1 - "OFF" POSITION:

In this position, power is supplied only to the stereo system, the courtesy glass bowls 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;
- Engine pre-heating (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.



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

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

FUEL INDICATOR

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

Prior to engine start-up, briefly turn the 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.



The machine engine must be operated using only suitable fuel, for the characteristics refer to section "8.7 - Refilling" to page 8-15.

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.

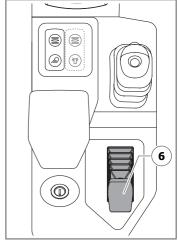
If this warning light turns ON during operation, refill the fuel tank immediately. After topping up, with the engine running, the indicator light goes off.



THROTTLE LEVER

This command (6) is used to control the engine speed.

A complete description of the operating principle is provided in section "6.20 - Throttle lever" to page 6-48.



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 startup.





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 "TGNTTION".

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.



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.

6.12 - 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:

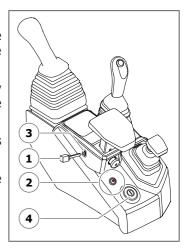
- electronic key (1);
- Status LED (2);
- key reader (3);
- key card.

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 am 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 "6.11.2 - Procedure for starting the machine" to page 6-27.

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 key card are lost, contact the *Service Centre*.

6.13 - Engine jump-starting procedure

If the engine does not start by following the procedures given in section "6.11.2 - Procedure for starting the machine" to page 6-27, check if the battery is charged. Replace the battery if necessary (see section "8.8 - Battery" to page 8-30).

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



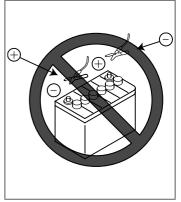
WARNING

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.

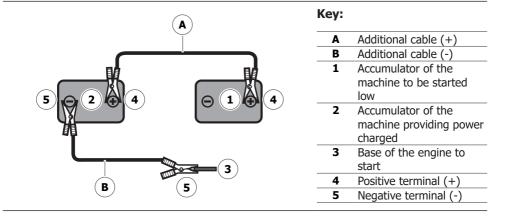
The machine used for the jump-start must be equipped with a 12 V negative earth system and a battery of at least 500 CCA (cold start amperes).

To access the battery and perform the jump-start procedure, the battery cover must be opened, see section "8.3.3 - Battery compartment cover" to page 8-10.

6.13.1 - 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**).



6.13.2 - Starting the engine

Ensure the clamps are properly connected to the battery terminals.

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

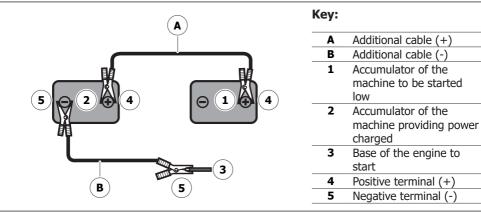
Turn the starter switch of the machine to be started to the START position and start the engine.

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

6.13.3 - Removing the additional cables

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

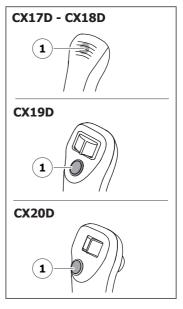
- disconnect one clamp of the additional cable (**B**) from the engine base (**3**) of the started machine (**1**);
- disconnect the remaining clamp of additional cable (**B**) from the negative (-) terminal of the machine that has provided power (2);
- disconnect one clamp of the additional cable (**A**)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



6.14 - 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.



6.15 - Work lights

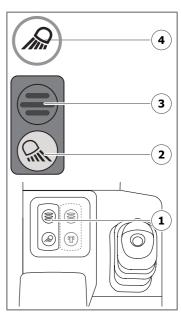
On the machine there are **work lights** that are to be used when visibility is low.

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.



6.16 - Operating at low temperatures



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 oils" 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 8-30.

6.17 - 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 $+5^{\circ}$ C), follow the instructions given in the relevant section before starting the normal work operations.

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

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

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

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



WARNING

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.

if the machine is equipped with an extendible undercarriage and/or dozer blade, during work, it is preferable to keep them in an extended position to increase the stability of the machine;

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 lower the bucket at the maximum speed when digging.

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 where the operator has poor visibility, place a person in charge of reporting, this person must ALWAYS be in a safe area at an adequate distance from the machine;
- take care not to hit other machines or people when moving the machine.

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



NOTICE

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

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

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

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.

6.17.1 - Altitude indicator light



NOTICE

Altitude control is only active on machines intended for countries where pollutant emission Standards require it. Specifically, it is NOT required in countries of the European Union, so the altitude indicator light will be present but not active.

To comply with pollutant emission standards, the engine features a control unit that detects the altitude at which the machine is working.

If the altitude exceeds the value allowed, the engine power is reduced.



This situation is indicated by the altitude indicator light turning on (1).

The performance of the machine will therefore be reduced.

As soon as the machine is moved to a lower altitude, the light will turn off automatically and it will be possible to use the machine at its maximum performance.

6.18 - Stopping and parking the machine



WARNING

Avoid as much as possible parking the machine on slopes.

Procedure for stopping and parking the machine:

- drive the machine on a flat, levelled surface;
- choose an area where no falling of rocks nor landslides are possible;
- choose an area where the machine does not block pedestrians or other means and however, in an area permitted according to the standards in force;
- align the turning frame to the undercarriage so that the dozer blade stays near the boom;
- Enable the slewing lock (if provided);
- lower the dozer blade and the equipment to the ground;
- reduce the engine speed to minimum;
- turn the starting equipment key switch to **OFF** and remove the key;
- Pull upwards the control cut-out lever ensuring that it comes up all the way.
- Close all the windows (if fitted);
- unbuckle the seat belt and get out of the machine;
- deactivate the battery isolator switch as indicated in section "6.2 Battery disconnect switch" to page 6-3;
- Close and lock the cab door (if present) and the covers indicated in section "8.3 Safety devices" 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.



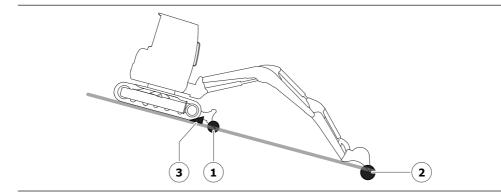
WARNING

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

Do not leave the machine turned on.

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

- it is necessary to check that the slope is less than 10°;
- 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;
- appropriately block (by means of wedges 3, not supplied) both tracks.



6.19 - Refuelling



DANGER

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



CAUTION

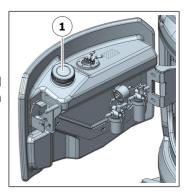
When topping up with fuel, take care not to spill any, clean up any spillage carefully.

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

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

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

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

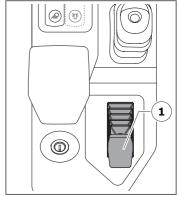


6.20 - Throttle lever

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.



6.21 - Machine movement

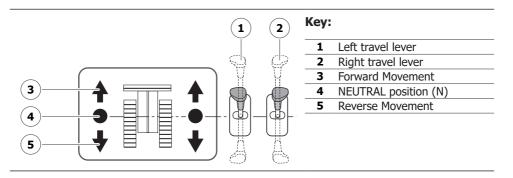
For safe machine movement, always move the travel control levers slowly and smoothly. Operators which are not familiarised with tracked machines should initially operate the machine at 50% of its maximum travel speed until they master the control function and feel confident on the machine.

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 6-7.

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.

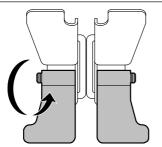


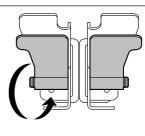
NOTICE

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

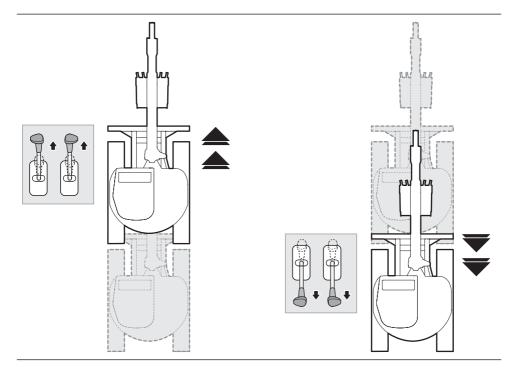
These pedals allow the operator to operate the tracks without removing his/her hands from the joysticks.

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.





6.21.1 - Forward and reverse travel



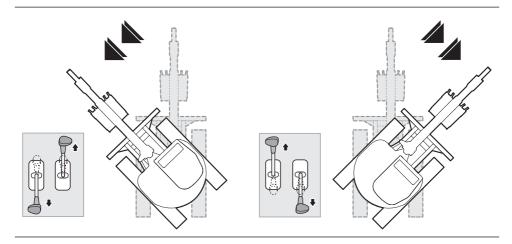
To begin **FORWARD** travel, move both control levers forward equally. As additional pressure is applied on the control levers, the machine speed will increase. To STOP the forward travel, return slowly both controls to their NEUTRAL (N) position.



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.

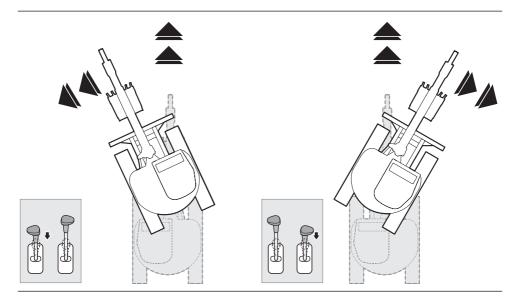
6.21.2 - Pivoting the machine around its axis



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.

6.21.3 - Turning while moving forward

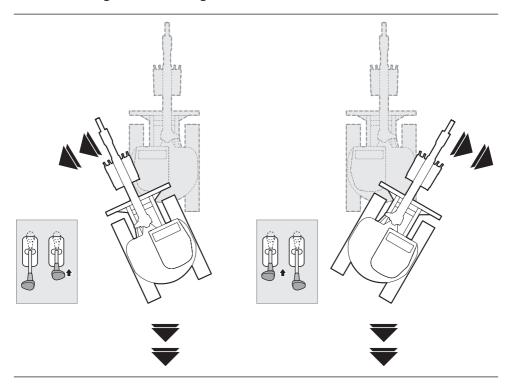


With the machine travelling straight **FORWARD,** both control levers must be pushed forward by equal amounts.

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.

6.21.4 - 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.

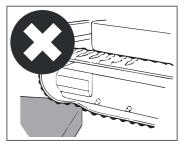
To turn **RIGHT** while **REVERSING**, reduce rearward pressure slightly on the left hand lever so that the machine will turn toward the RIGHT.

6.21.5 - Precautions during the operation of the tracks

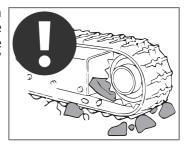
All of the above precautions are applicable to both rubber tracks and steel tracks (optional).

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

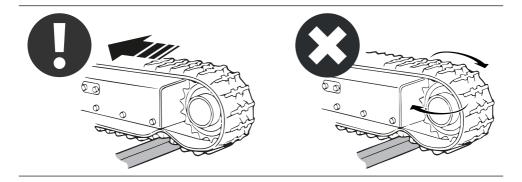
The machine will subject the track to an excessive load, resulting in the breakage or cutting of the tread (in the case of rubber tracks, the internal steel cord may be damaged).



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.



USING THE MACHINE

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.



P 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.

6.22 - Travel speed

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

The two gears are called:

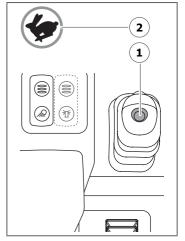
- 1st gear or slow gear;
- 2nd gear or fast gear.

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.



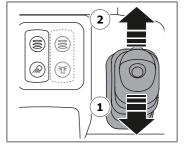
The machine features the **AUTO SHIFT DOWN** function (automatic, cannot be disabled). While travelling in fast gear, after a certain stress value has been exceeded, the machine will be placed in slow gear. When the stress decreases, the machine will return to fast gear.

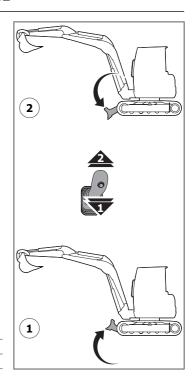
6.23 - Dozer blade control lever

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



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.

The machine can be equipped with an optional dozer blade; for information referred to this accessory see section "6.25 - Extendible dozer blade with extensions" to page 6-60.

6.24 - Undercarriage width adjustment

The expandable undercarriage has the ability to hydraulically change the width of the tracks to adapt to the specific work or movement needs.

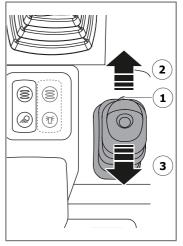
In the narrower configuration, the width is reduced to allow access to smaller and more confined work areas or for the transport operations of the machine. In the wider configuration, the maximum stability of the machine is achieved.

To change the width of the undercarriage (extension/closing):

- press and hold the button (1);
- to extend the undercarriage, push the lever (2) forwards. When the extension is complete, put the lever back in the neutral position and release the button;
- to **retract** the undercarriage, pull the lever (3) **backwards**. When the extension is complete, put the lever back in the neutral position and release the button.

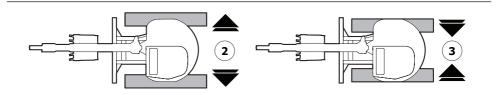
Adjust the tracks only on flat, even ground.

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



If the switch (1) is deactivated before the control lever returns to the neutral position (at the centre), the undercarriage width adjustment function will be immediately replaced by the dozer blade height adjustment function.

If this happens while the vehicle is moving, the blade may touch the ground and cause the vehicle to stop suddenly.



Key:

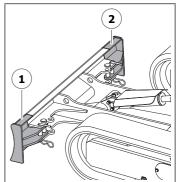
- 2 Wide position of the tracks
- 3 Narrow position of the tracks

6.25 - Extendible dozer blade with extensions

The dozer blade is equipped with two extensions (1 - 2) which are used to increase the width of the blade so that it adapts to the width of the undercarriage.

In this way the material moved by the dozer blade will be pushed away and not under the tracks, to allow the machine to travel over a level surface.

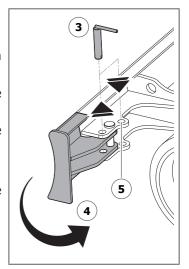
If the extensions are not used, they can be closed back into the blade, limiting its size and making it easier for the machine to travel.



To **close** the extensions:

- remove the outermost fixing pin (3);
- remove the split located on the underside of the pin and poll it out;
- turn the extension towards the inside of the machine
 (4);
- secure the extension by placing the pin (3) in the hole provided (5);
- refit the safety split pin.

To **open** the extensions repeat the procedure in reverse order.





Before using the machine after opening or closing the blade extensions, make sure they are secured correctly with the safety pin and relative split pin.

6.26 - Boom movement

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

There are 2 control configurations, also called "control layouts":

- ISO European (standard);
- SAE American (optional).

Choose the one that best suits the operator's driving experience.

When setting up the desired layout, refer to paragraph "6.26.3 - TPSS Valve ISO-SAE (optional) control layout" to page 6-64.



WARNING

Before starting work, always check which control layout has been set.

Before turning the turning frame, use the rear-view mirrors (if fitted) or look around to ensure the movement area is clear.

Take care that no-one is present in the vicinity: if anyone should approach the area, stop the machine immediately.

All controls will cease to function when the control cut-out lever is on, for the purpose of entering/leaving the machine. To activate the two control levers, the control cut-out lever must be fully off: refer to the procedure in paragraph "6.6 - Controls cut-out lever" to page 6-7.



NOTICE

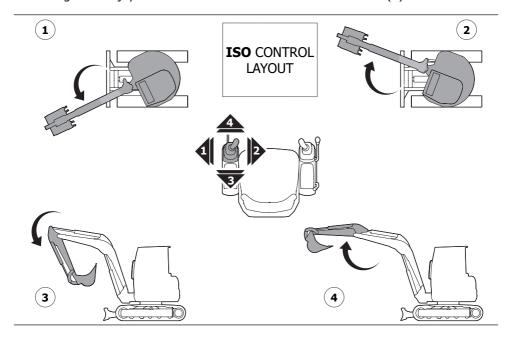
DO NOT leave any of the hydraulic controls engaged after the cylinder reaches its limit stop in any direction. This practice forces the hydraulic oil to pass through the main relief valve, causing a rapid build-up of heat in the system resulting in overheating and loss of power, in addition to reducing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

6.26.1 - 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);
- moving the left joystick BACKWARDS will lower the second boom (3);
- moving 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

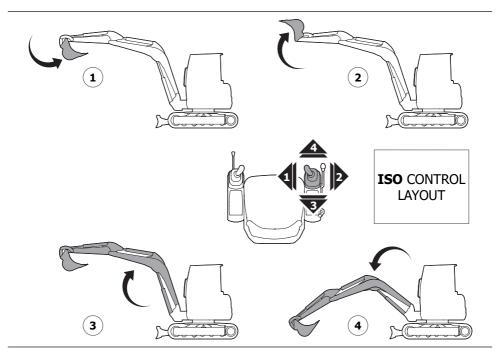


When the joystick is in neutral position (in the centre), the slewing service brake is automatically engages; this braking is of a mechanical type (negative) and, therefore, is always on during normal machine use, acting also as parking brake. The brake is automatically enabled when the machine is stopped.

6.26.2 - Right joystick

The right joystick controls the raising and lowering of the first boom and performs the bucket movements. The bucket operation depends on the switches on the second boom, which must be set to DIG:

- 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);
- moving the right joystick FORWARDS will extend the first boom (3);
- moving the right joystick BACKWARDS 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

6.26.3 - TPSS Valve ISO-SAE (optional) control layout

The valve nominated TPSS enables a choice of control layout:

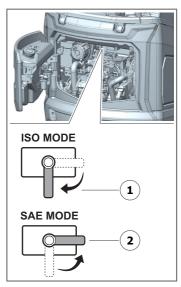
- **ISO European** (1);
- SAE American (2).

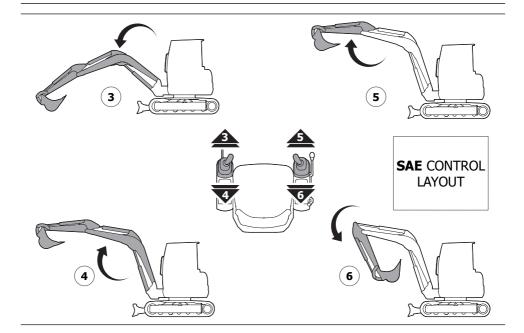
The ISO control layout differs from the SAE control layout in the position of the controls for the first and second booms.

Turning the valve to position (1) sets **ISO** controls.

Turning the valve in the opposite direction, to position (2), set **SAE** controls.

In the SAE setup, functions **3-4** of the left hand control lever are performed by the right hand control lever **5-6** and vice versa (refer to the following figure). All other machine functions remain unaltered.





Key:

- **3** Lowering the first boom
 - 4 Lifting the first boom
 - 5 Opening the second boom
- 6 Closing the second boom

6.27 - 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.

Depending on the model, this control can be activated by:

- pedal (for models CX17D CX18D);
- roller on joystick (for models CX19D- CX20D).

6.27.1 - Boom swing pedal (CX17D - CX18D)



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.

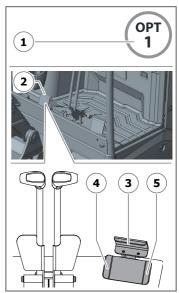
For operation, refer to the corresponding section "6.30 - Boom swing/AUX2 hydraulics system selector button (optional)" to page 6-73.

The activation of an undesired control may cause serious injuries.

The boom swing pedal (2) is located on the operator seat foot board to the right of the travel levers.

To operate the pedal boom swing control:

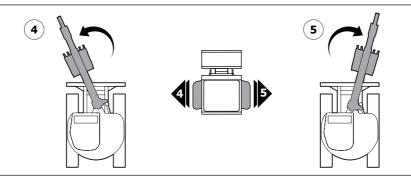
- check that the indicator light OPT1 (1) on the control panel is off;
- lift the pedal protection (3);
- push on the left end of the pedal (4) to rotate the first boom to the left;
- release the pedal when the boom reaches the required position;
- push on the right end of the pedal (5) to rotate the first boom to the right;
- release the pedal 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:

- 4 By pushing on the left end of the pedal, the boom will swing to the left
- **5** By pushing on the right end of the pedal, the 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 swing slewed, pay attention when the equipment moves closer to the machine body and/or to the operator protective structure. This position could cause impacts resulting in serious or fatal injury.

6.27.2 - Boom swing roller (CX19D- CX20D)



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.

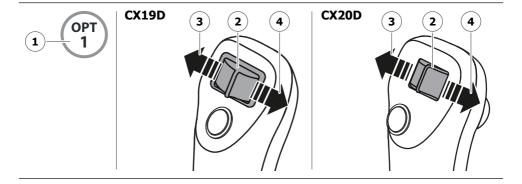
For operation, refer to the corresponding section "6.30 - Boom swing/AUX2 hydraulics system selector button (optional)" to page 6-73.

The activation of an undesired control may cause serious injuries.

The boom swing roller (2) is on the rear side of the **left joystick**.

To operate the boom swing control:

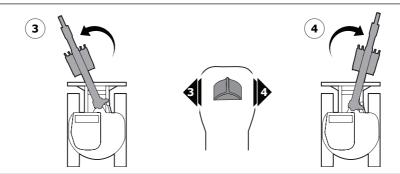
- check that the indicator light OPT1 (1) on the control panel is off;
- push the roller to the LEFT to turn the first boom to the left (3);
- release the roller when the boom reaches the required position;
- push the roller to the RIGHT to turn the first boom to the right (4);
- release the roller when 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:

- **3** By pushing the roller to the left, the boom will swing to the left
- **4** By pushing the roller to the right, the boom will swing to the right

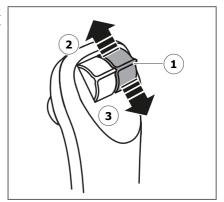


WARNING

If a very wide piece of 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 could cause impacts resulting in serious or fatal injury.

6.28 - Triple positioner roller (CX20D)

The vertical roller located on the right joystick (1), is only used to move the triple positioner boom.

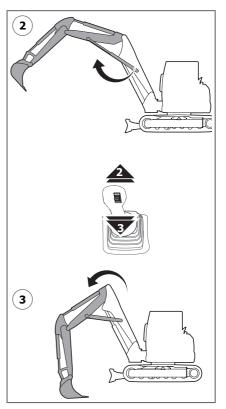


To enable the triple positioner, proceed as follows:

- push the roller **up** (2) to open the triple boom;
- release the roller when the boom reaches the required position;
- push the roller **down** (3) to close the triple boom;
- release the roller when the boom reaches the required position;

Key:

- **2** Push the roller up to open the triple boom
 - **3** Push the roller down to close the triple boom





WARNING

When the triple boom is closed any equipment fitted will gradually move towards the cab. Be very careful not to collide with the cab or the undercarriage while working.

This could cause damage to the machine and serious injury to the operator.



NOTICE

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

6.29 - 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.

6.30 - 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 "6.27 - Boom swing control" to page 6-66 and "6.31.4 - AUX2 Auxiliary hydraulic system (optional)" to page 6-87).

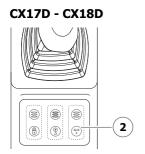
Either one of the two functions can be selected by means of the boom swing/AUX2 hydraulic system selector button located:

- on the left control console (CX17D CX18D 2);
- on the right joystick (CX19D 3);
- on the right joystick (CX20D 4).

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.





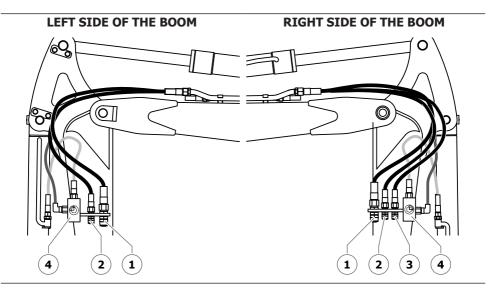




6.31 - Auxiliary hydraulic systems

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	ΔΙ	IX1

- 2 AUX2 (optional)
- **3** Drain line (optional)
- 4 Mechanical AUX3 (optional)

USING THE MACHINE

Auxiliary hydraulic	Mode		apacity nin)		sure (bar)	Connection
system		left	right	left	right	ciii caa
	Standard CX17D - CX18D	29).1	20)5	
AUX1	Standard CX19D- CX20D	31	.1	20	05	3/8" GAS lh 1/2" GAS rh
	Shredder head mode (optional CX19D- CX20D)	19	/	180	/	1/2 0/3111
AUX2	Standard	13	3.1	20)5	1/4" GAS lh 1/4" GAS rh
Mechanical	Standard CX17D - CX18D	16		22	20	3/8" GAS lh
AUX3	Standard CX19D- CX20D	18 240 3/8"		3/8" GAS rh		
DRAINAGE LINE	//	/	/	/	/	1/4" GAS

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

6.31.1 - 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 "6.29 Discharge residual pressure in the hydraulic system" to page 6-72;
- 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.

6.31.2 - 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.

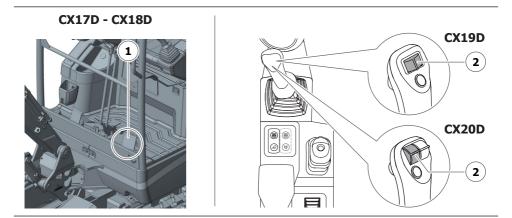
6.31.3 - AUX1 Auxiliary hydraulic system



For the technical characteristics, see section "3.3 - Hydraulic system" to page 3-4.

The **AUX1** auxiliary hydraulic system is controlled by:

- the left pedal (1) for models CX17D CX18D;
- the roller (2) on the right joystick for models CX19D-CX20D.



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, see sections:

- "6.31.3.2 Single-acting mode AUX1" to page 6-80;
- "6.31.3.3 Double-acting mode AUX1" to page 6-83.

USING THE MACHINE

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.

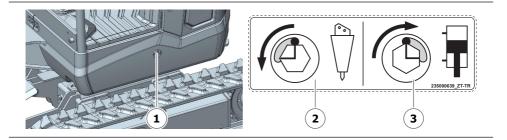
The oil flow can be adjusted by adjusting the engine speed; always observe the flow rates specified by the equipment manufacturer.

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



6.31.3.2 - Single-acting mode AUX1

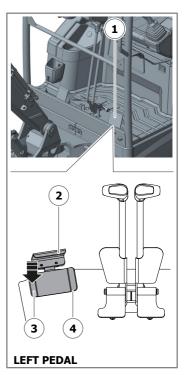
This mode provides for the pressurised flow only on the left connection, while the right connection will remain discharged.

To enable this mode, refer to section "6.31.3.1 - AUX1 hydraulic system three-way switch" to page 6-79.

MODELS CX17D - CX18D

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

- lift the guard (2) of the pedal (1);
- Push and keep pushed the LEFT end (3) of the pedal to provide a constant flow of hydraulic oil to the left piping; the right piping is always discharged (direct to the tank) even if no control is activated;
- release the pedal to stop the flow;
- no function is activated by pressing the RIGHT end
 (4) of the auxiliary hydraulic control pedal if the single-acting mode is activated.





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 right end (4) of the pedal pressed for a long time. The hydraulic circuit does not activate any function but is still under pressure and so there is the risk of the hydraulic oil overheating.

MODEL CX19D

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

- push and keep pushed to the LEFT the roller (5) 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 (6), 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 (**6**) or move the roller (**5**) 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.



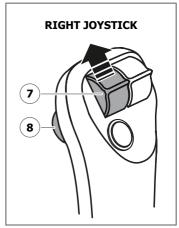
For details on the controls, refer to the label located on the driver's seat and to the instructions in this user manual.

DO NOT keep the roller pressed to the right for a long time. The hydraulic circuit does not activate any function but is still under pressure and so there is the risk of the hydraulic oil overheating.

MODEL CX20D

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

- push and keep pushed UP the roller (7) 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 (8), 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 (**6**) or move the roller (**5**) to its neutral position;
- no function is activated by pushing the auxiliary hydraulic control roller down if it is in single-acting mode.



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.

6.31.3.3 - Double-acting mode AUX1

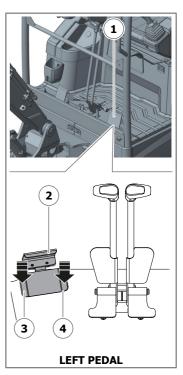
This mode provides for the reversible control of the flow; while one of the two pipes is pressurised, the other is discharged.

To enable this mode, refer to section "6.31.3.1 - AUX1 hydraulic system three-way switch" to page 6-79.

MODELS CX17D - CX18D

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

- lift the guard (2) of the pedal (1);
- Push and keep pushed the LEFT end (3) of the pedal to provide a constant flow of hydraulic oil to the left piping; at the same time, the right piping is discharged;
- release the pedal to stop the flow;
- push and keep pushed the RIGHT end (4) to provide a constant flow of hydraulic oil to the right piping; at the same time, the left piping is discharged.



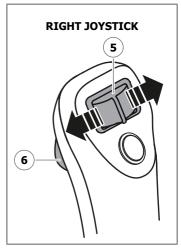


NOTICE

MODEL CX19D

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

- push and keep pushed to the LEFT the roller (5) 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 (6), 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;



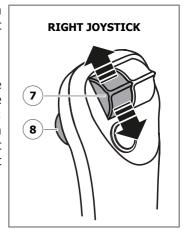
- to deactivate the hold, press again the button (**6**) or move the roller (**5**) to its neutral position;
- push and keep pushed to the **RIGHT** the roller (**5**) to provide a constant flow of hydraulic oil to the **right piping**; at the same time, the left piping is discharged. In this case, it is not possible to activate the electric hold.



MODEL CX20D

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

- push and keep pushed UP roller (7) 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 (8), 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 (8) or move the roller (7) to its neutral position;
- Push and keep pushed **DOWN** the roller (**7**) to provide a constant flow of hydraulic oil to the **right piping** while the left piping is discharged. In this case, it is not possible to activate the electric hold.



6.31.3.4 - 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 "6.31 - Auxiliary hydraulic systems" to page 6-74 indicates the values of the maximum flow rate.

It is however possible to use the AUX1 hydraulic system by means of the previously described controls when shredder head mode is NOT active.



WARNING

Make sure that nobody is in the work area.

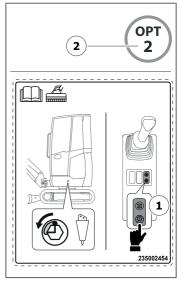
Operating the control immediately activates the hydraulic system, so the equipment is started.

To activate the mode:

- select single-acting operation, see section "6.31.3.1
 AUX1 hydraulic system three-way switch" to page 6-79;
- 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 $(\mathbf{1})$ twice.





NOTICE

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



NOTICE

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.

6.31.4 - AUX2 Auxiliary hydraulic system (optional)

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

The system is controlled by:

- right pedal for models CX17D CX18D;
- roller on left joystick for models CX19D- CX20D.



WARNING

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

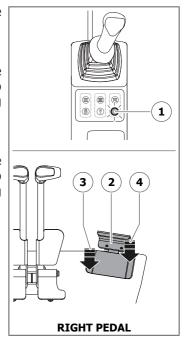
For operation, refer to the corresponding section "6.30 - Boom swing/AUX2 hydraulics system selector button (optional)" to page 6-73.

The activation of an undesired control may cause serious injuries.

MODELS CX17D - CX18D

To activate the control:

- check that the indicator light (1) on the key on the left control console is **on**;
- lift the guard (2) of the pedal;
- Push and keep pushed the LEFT end (3) of the pedal to provide a constant flow of hydraulic oil to the left piping; at the same time, the right piping is discharged;
- release the pedal to stop the flow;
- Push and keep pushed the RIGHT end (4) of the pedal to provide a constant flow of hydraulic oil to the right piping; at the same time, the left piping is discharged;
- release the pedal to stop the flow.



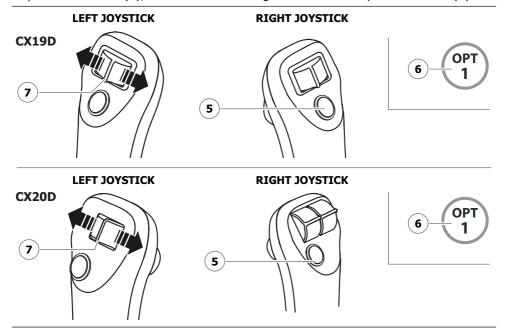


For the technical characteristics, see section "3.3 - Hydraulic system" to page 3-4.

MODEL CX19D-CX20D

To activate the control:

- press the button (**5**) on the joystick, the OPT1 indicator light on the control panel turns on (**6**);
- push and hold the roller (7) on the 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 (7) 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 (5), the OPT1 indicator light on the control panel turns off (6).





For the technical characteristics, see section "3.3 - Hydraulic system" to page 3-4.

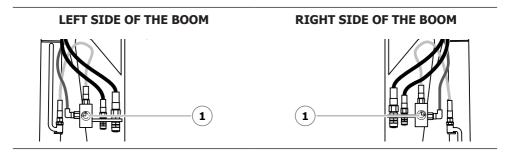
6.31.5 - Mechanical AUX3 auxiliary hydraulic system (optional)

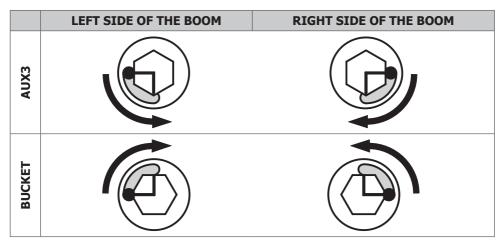
By means of two mechanical switches, the double-acting **mechanical AUX3** hydraulic system, shuts off the pipes of the bucket cylinder and makes them available for connection to equipment requiring a reduced oil flow, such as gripper rotors. This system is used for equipment with which there is no need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







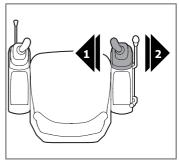
NOTICE

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.



6.31.6 - 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.

6.32 - 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.

6.33 - 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.



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6.33.1 - Supplementary counterweight

The technical data for the supplementary counterweights are given in section "3.6 - Counterweight" to page 3-6.



WARNING

Respect the combinations indicated in section "3.6 - Counterweight" to page 3-6.

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.

6.34 - Daily storage

Proceed as indicated in section "6.18 - Stopping and parking the machine" to page 6-45.

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 2-21, 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 information" 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 "6.31 - Auxiliary hydraulic systems" to page 6-74;

RECOMMENDED OPTIONAL EQUIPMENT

- 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:

BUCKET	WIDTH (mm)	WEIGHT WHEN EMPTY (kg)	CAPACITY (I)
Ditching bucket	200	23	15
Ditching bucket	250	25	20
Ditching bucket (standard)	300	29	25
Ditching bucket	400	34	37
Ditching bucket	500	40	49
Ditching bucket	600	45	61
Ditch cleaning bucket	800	49	75
Ditch cleaning bucket	1000	59	96
Pivoting ditch cleaning bucket	800	76	75
Pivoting ditch cleaning bucket	1000	86	96
Trapezoidal bucket	60°	29	37

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.

RECOMMENDED OPTIONAL EQUIPMENT

QUICK COUPLING	WEIGHT (kg)
Mechanical or hydraulic quick-coupling attachment	22

EQUIPMENT	MAX WEIGHT (kg)
Demolition hammer	100
Shredder head	100
Bough shears	100
Selection grapple	100
Auger	100

The hydraulic characteristics of the equipment must be compatible with those of the auxiliary hydraulic systems of the machine, refer to section "6.31 - Auxiliary hydraulic systems" to page 6-74.



The total weight of the equipment must **NOT** exceed the nominal lifting capacity indicated in the table in section "3.12 - Nominal lifting capacities" to page 3-9.

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 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.



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

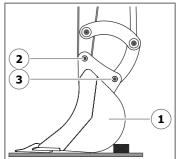


WARNING

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 "6.31.1 Connection of equipment to the hydraulic systems" to page 6-76;
- 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.

RECOMMENDED OPTIONAL EQUIPMENT

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 - Set-up for hydraulic quick-coupling

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 two types of set-up for the hydraulic quick-coupling attachment:

- single-acting;
- double-acting.

All types of guick-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.

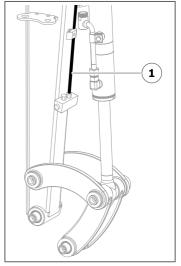
7.3.1.1 - Single effect hydraulic quick coupler set-up

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	205	
Flow rate	l/min	13	
Connection thread		1/4" GAS	

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 effect hydraulic quick coupler 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.

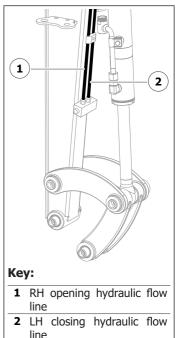
The double-acting hydraulic quick-coupling attachment set-up provides two hydraulic flow lines (1-2) on the second boom.

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 dat	a - Double-a	cting
MAX pressure CX17D - CX18D	bar	70 ÷ 200 (factory setting 200)
MAX pressure CX19D- CX20D	bar	70 ÷ 200 (factory setting 200)
Flow rate	l/min	16
Connection thread		1/4" GAS

The maximum pressure value can be adjusted mechanically by means of the quick-coupling hydraulic valve; see the following section.

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 - Maximum pressure adjustment



WARNING

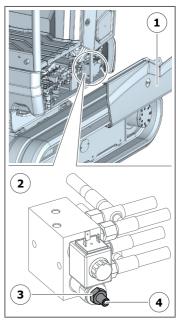
The following procedure must be performed by specially trained personnel; the operators must wear the PPE indicated in section "2.4.1 - Personal Protective Equipment (PPE)" to page 2-21.

The double-acting quick-coupling valve has a maximum pressure setting.

There is only one maximum pressure value for both 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);
- tighten the safety nut, start the machine, accelerate the engine to maximum speed;



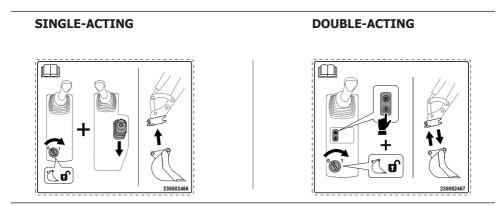
- carry out the bucket opening movement insisting on its end of travel and, at the same time, detect the pressure value measured by the special device;
- repeat the procedure (with the engine stopped) if the pressure is not as desired;
- if the pressure is correctly adjusted, stop the machine and put 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.



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 "6.31.1 - Connection of equipment to the hydraulic systems" to page 6-76.

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.



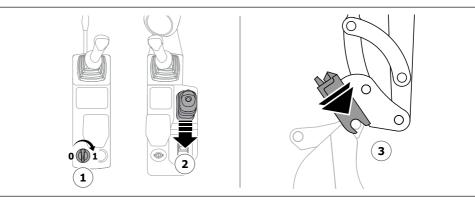
WARNING

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.

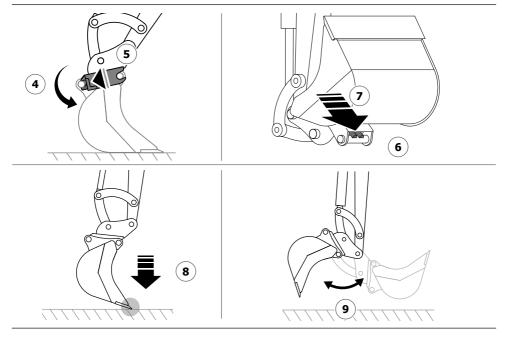
SINGLE-ACTING

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);



- 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).

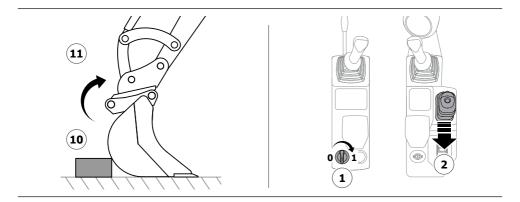


- If all the checks have a positive outcome, the equipment is correctly attached; otherwise, repeat the procedure from the start;
- remove the key (1) from the block and put it in a safe place to prevent the coupling system from being activated by accident;
- The working operations may now be commenced.

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.

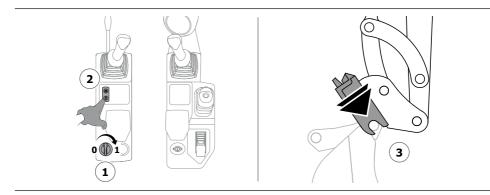
Each time the machine is started, make sure that the buzzer sounds; if this does not happen, stop the machine and contact the Service Centre to repair the fault.

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

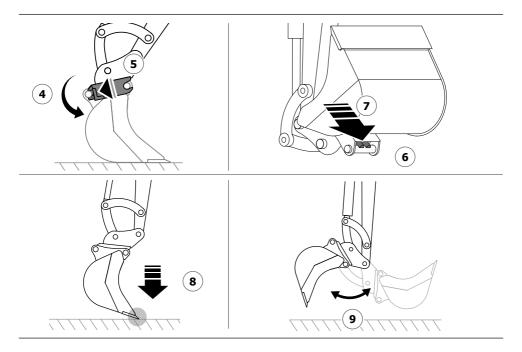
DOUBLE-ACTING

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 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 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.



- 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).

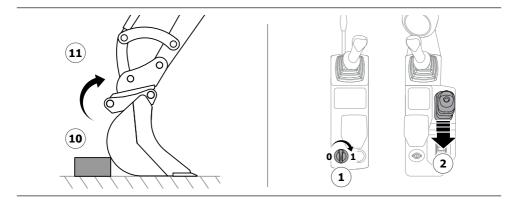


- If all the checks have a positive outcome, the equipment is correctly attached; otherwise, repeat the procedure from the start;
- remove the key (1) from the block and put it in a safe place to prevent the coupling system from being activated by accident;
- The working operations may now be commenced.

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 that 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

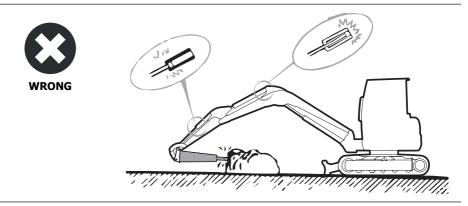


WARNING

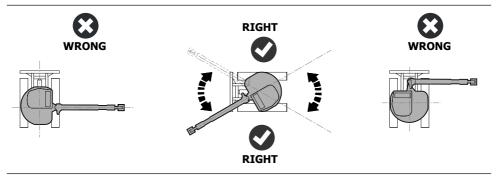
During the work, flying splinters or debris may hit the operator position or other parts of the machine; take the following precautions and be very careful so as to prevent accidents that may damage the machine and cause injuries to the operator.

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.

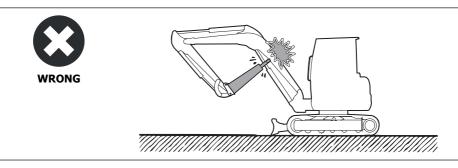
Avoid operating with the machine cylinders near their limit stop (maximum extension or retraction), so as not to damage the accessory or the cylinders.



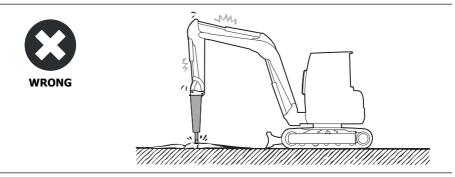
Do not operate with the demolition hammer in a sideways position; the machine will become unstable and the undercarriage components will be subjected to increased wear.



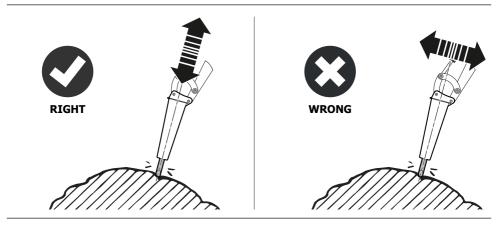
When operating the machine, take care not to hit the boom or other parts of the machine with the demolition hammer.



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



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.



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 - Drive

For operating the demolition hammer, refer to section "6.31.3 - AUX1 Auxiliary hydraulic system" to page 6-78. 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 demolition hammer 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 "6.31.3.4 - Cutter head mode with additional AUX1 system pump (optional)" to page 6-86.

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 "2.8.1.1 - Protection grid FRONT-GUARD Level I (optional)" to page 2-51.

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 "3.12 - Nominal lifting capacities" to page 3-9 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 "6.31 - Auxiliary hydraulic systems" to page 6-74. 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 "6.31 - Auxiliary hydraulic systems" to page 6-74. 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 belts.

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.

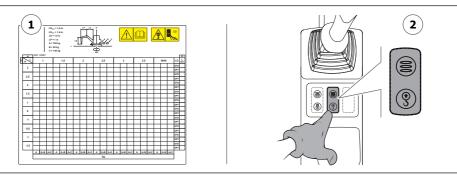


WARNING

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.



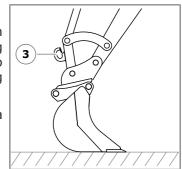


NOTICE

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



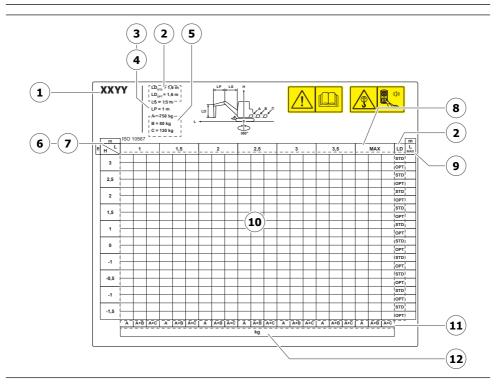
WARNING

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 are 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**.



Key:

1	Machine model	7	H: lifting height from the ground
2	\mathbf{LD}_{STD} : Length of second standard boom	8	MAX: maximum lifting distance
	LD _{OPT} : Length of second optional boom		
3	LS: Length of first boom	9	L MAX: maximum outreach
4	LP : Length of positioner boom	10	Lifting capacity
	(if present)		
5	Weight of counterweights:	11	Counterweight configuration
	A: main counterweight		
	B-C-D : supplementary counterweights (if present)		
6	L : lifting distance from the centre of the slewing ring	12	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.



Before starting load handling operations, check that the valves are not damaged or noisy.

If any abnormal conditions are found, contact the Service Centre.

CX17D - CX18D - CX19D CX20D

Key:

Safety valve on first boom cylinder (one per side)
 Safety valve on positioner boom cylinder (one per side)

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 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.



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.

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 <u>www.inail.it</u> 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 CASE, where the interventions must also be recorded in the special register in chapter.

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

Perform maintenance works only with the machine positioned on flat and compact ground.

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 as indicated in section "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.

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.

Release the residual pressure of the hydraulic system as described in section "6.29 - Discharge residual pressure in the hydraulic system" to page 6-72.

In the hydraulic oil tank there may be some residual pressure; with great care, slowly unscrew the cap to allow the air to exit before starting any maintenance operations on the hydraulic system.

Wear appropriate PPE as indicated in section "2.4.1 - Personal Protective Equipment (PPE)" to page 2-21.

MAINTENANCE

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, taking care not to direct the high-pressure water spray at the radiator or any electrical parts.

When washing, protect the connectors of the electrical system and do not wet the starting equipment switch.

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 "6.29 Discharge residual pressure in the hydraulic system" to page 6-72;
- remove the starting equipment key, which must remain in possession and accessible only to the person performing the maintenance;
- activate the engine start inhibition switch as indicated in section "8.1.2 Engine start inhibition switch" to page 8-6;
- apply a caution sign (1), **NOT supplied**, near the starting equipment board.



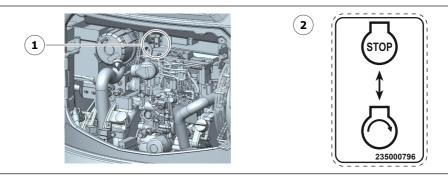
At the end of the interventions, the person in charge of the maintenance operations can restore the machine by following the procedure in reversed order; the machine will therefore be ready for normal operation.

8.1.2 - Engine start inhibition switch

The machine is equipped with an engine start inhibition switch (1), located inside the engine hood, to the right of the air filter.

This switch must be used during maintenance to prevent the engine from being started.

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 **lifted**: the engine **cannot** be **started**.
- If the lever is **lowered**: the engine is **can** be **started**.

Details of its use are provided on the dedicated label (2).

The red cover can only be lowered with the lever in the down position.



If the machine does not start, make sure that the engine start inhibition switch is in the correct position.

8.2 - Tools and equipment for maintenance

Any additional instruments or tools required for maintenance and adjustment purposes, and not included in the tool kit, are included in the following table.

Key to the following table:

- (1) "Manually" means that the maintenance or adjustment operation can be performed by hand, without using any tools
- (2) Spanners of various types can be used to tighten bolts and nuts on machines

	PART INVOLVED IN MAINTENANCE	Manually (1)	Hex Keys (2)	Socket wrenches (2)	Tool for oil filter	Torque wrench	Brush for battery terminals
ENGINE	Belt		×	×			
	Air filter	×					
	Fuel filter		×				
	Oil filter	×	×		×		
	Oil	X		×			
	Radiator	X	×	X			
UNDERCARRIAGE	Tracks			×			
	Rollers			×		×	
	Idle wheel			×		×	
	Drive sprocket			×		×	
HYDRAULIC	Components	×	×	×		×	
SYSTEM	Distributor		×	×		×	
	Gear motors		×	×		×	
	Radiator	×	×	×			
ELECTRICAL	Alternator		×	×			
SYSTEM	Battery		×				×
	Lighting	×	×				
	Starting system		×	×			

8.3 - Safety devices

The guards, also called hoods or covers, provide protection against the risks such as high noise level, burns or moving parts.

The inner parts of the machine can be accessed for maintenance through the hoods and covers.

During the operation the guards must be kept closed. The guards present on the machine are listed below.

Their integrity and anchorage must be checked periodically.



WARNING

Do not hold the hood and access covers open when the machine is on a slope or in windy conditions. The hoods and access covers can close accidentally causing personal injury.

8.3.1 - Engine hood

The engine hood (1) is located on the rear side of the machine.

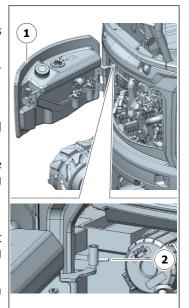
From this hood you can access: the engine, the air filter, the fuel tank, etc...

To **open** the hood:

- make sure that the battery compartment cover is closed;
- 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.



NOTICE

Open the engine hood only if the battery compartment cover is closed; they may collide and get damaged.

8.3.2 - Radiator compartment cover

The radiator cover (1) is located on the right side of the machine.

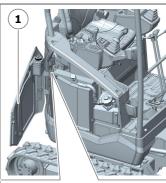
From this cover, you can access: the radiator, the hydraulic oil tank, etc...

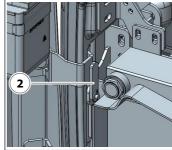
To **open** the cover:

- insert the key into the lock and turn it counterclockwise;
- pull the cover to the left to open it;
- when the cover is completely open, turn the stop (2) upwards all the way to keep the cover open.

To **close** the cover:

- push the cover to the left and turn the stop (2) downwards;
- slowly close the cover to the right until it stops;
- lock the cover by turning the key clockwise and then remove it.





8.3.3 - Battery compartment cover

The battery compartment cover (1) is located on the left side of the machine.

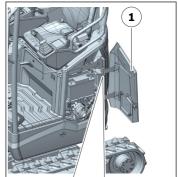
From this cover you can access: the battery.

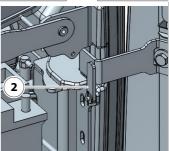
To **open** the cover:

- make sure that the engine hood is closed;
- insert the key into the lock and turn it counterclockwise;
- pull the cover to the right to open it;
- when the cover is completely open, turn the stop (2) upwards all the way to keep the cover open.

To **close** the cover:

- push the cover to the right and turn the stop (2) downwards;
- slowly close the cover to the left until it stops;
- lock the cover by turning the key clockwise and then remove it.







Open the battery compartment cover only if the engine hood is closed; they may collide and get damaged.

8.3.4 - Hydraulic oil tank cap protection

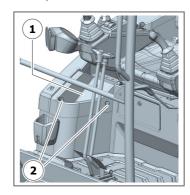
The hydraulic oil tank cap protection (1) is located under the right control console. From this protection, you can access: the hydraulic oil refill cap.

To **remove** the guard:

- unscrew and remove the screws (2);
- remove the protection by pulling it out upwards.

To **refit** the guard:

- insert the protection in its seat;
- insert and tighten the screws.



8.3.5 - Fuse and relay compartment guard

The fuse and relay compartment guard (1) is located on the front of the operator seat, under the seat on the right.

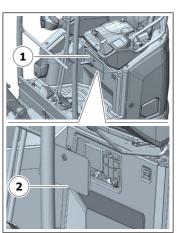
It allows access to: relays and fuses of the electrical system.

To **remove** the guard:

- insert the key into the lock and turn it counterclockwise;
- 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.



8.4 - Protective structure opening procedure

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:

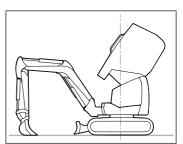
- position the machine on a flat, level surface;
- rest the dozer blade on the ground and position the boom as shown in the figure;
- stop the engines, lift the controls cut-out lever;
- leave the driving position;
- for the cab version, close the cover;
- remove the rubber foot board (1), pulling it using the handle provided (2);
- loosen the screws (3);
- check that there are no people near the machine, especially behind it; make sure that there are no obstacles within the tip-over range of the protective structure;
- lift the structure upwards by pushing it from the front uprights (4) towards the back of the machine, until it has been tipped-over completely;

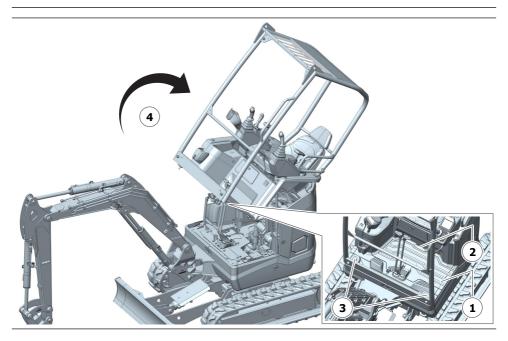


WARNING

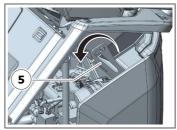
Crushing/shearing hazard.

Handle the protective structure away from the tip-over hinge.





- make sure that the safety stop (5), placed on the left side, is correctly in the locking position by turning it forwards slightly; this is to prevent the structure from moving unintentionally;
- to reposition the structure, repeat the procedure in reverse order. Insert the screws (1) of the type indicated in the table and tighten them to the indicated torque using the appropriate spanner.



Characteristics	
Bolt size	M16 x 2.00 x 100
Bolt strength class	10.9
Tightening torque Nm	170



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 the work headlights and LED strips, see sections "9.2 Work lights replacement" to page 9-6 and "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 extended periods near rivers, lakes or the sea, protect connectors with suitable anti-corrosives.

8.6 - Tracks

Inspect the condition of the tracks periodically and check their tension.

If the track is too tight, there will be more friction on the rolling components and, as a consequence, more power will be needed for travel.

If the track is too loose, there will be more friction while reversing and, as a consequence, more power will be needed for travel. The track may also come out of the guide edges of the rolling components, causing the travel to stop.

Make sure that the tracks have equal tension: a different tension can cause a deviation of the machine from the travel trajectory.

8.7 - Refilling

8.7.1 - Refilling quantity table



NOTICE

Before each change or refill of the liquids/oils used by the machine, check to see if the system is filled with mineral or organic products.

Never mix different types of products so as not to alter their characteristics.

For further information on the lubricants and fuels required, see section "8.7.2 - Products for lubrication" to page 8-18.

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	Туре	Brand	Quantity
Diesel Engine (with filter change)	SAE 10W40 ACEA E9	NO.1 ENGINE OIL™ SAE 10W- 40 CK-4 SEMI-SYNTHETIC	2.4 (CX17D - CX18D) 2.8 (CX19D-CX20D)
Diesel engine	ASTM D6210 TYPE I-FF	EXTENDED LIFE OAT COOLANT/ANTIFREEZE CONCENTRATE	4,5
cooling system	ASTM D6210 TYPE III-FF	EXTENDED LIFE OAT COOLANT/ANTIFREEZE 50/50 PREMIXED	4,51
Hydraulic circuit	ISO 11158 L-HV46	PREMIUM HYDRAULIC OIL HV46 MULTI-GRADE ANTIWEAR	29 (CX17D - CX18D-CX19D) 30 (CX20D)
Hydraulic oil tank			20 I
Track tensioner grease nipples Joints greasing	NLGI 2 (**)	MULTI-PURPOSE MOLY GREASE EP / AW / NLGI 2	-
points Fuel tank	EN 590	-	25 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	Туре	Brand	Quantity
Diesel Engine (with filter change)	SAE 10W-40	PANOLIN BIOMOT LX 10W-40	2.4 (CX17D - CX18D) 2.8 (CX19D-CX20D)
Hydraulic circuit	ISO 46	PANOLIN HLP SYNTH E46	29 (CX17D - CX18D-CX19D) 30 (CX20D)
Hydraulic oil tank Track tensioner grease nipples		PANOLIN	20
Joints greasing points	EP 2	BIOGREASE EP 2	-

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 8-34.

Do not mix different types of oil, if there is no certainty about the type of oil used, avoid topping up and proceed with changing.

Filling quantity specifications:

For further information on the filling quantities and specifications on the lubrication and products required for the operation of the machine, see section "8.7.1 - Refilling quantity table" to page 8-15.



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.

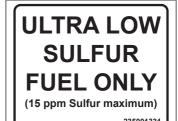
Always refill at the end of the day.

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.





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

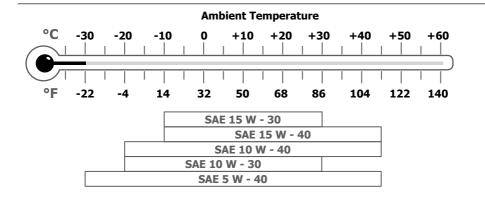
The lubricant oil viscosity is chosen according to the SAE (Society of Automotive Engineers) classification.

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



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.



The cooling liquid must be also suitable to minimum temperatures reached during shut down periods, to avoid serious damage to the engine and cooling system.

Adapt the mixture, antifreeze liquid/distilled water as required, as indicated in the following table:

ANTIFREEZE % VOLUME	DISTILLED WATER % VOLUME	FREEZING POINT °C	BOILING POINT °C
25	75	-12	105
33	67	-18	106
50	50	-38	109
60	40	-50	113

To dilute the additives, use distilled water or drinkable tap water.

The tap water must be: colourless, clear and free of mechanical impurities.

Seawater, brackish water, salt solutions and industrial waste water are not suitable.

The cooling system works in a reliable manner only if operating under pressure. Therefore it is essential that the system is kept clean and airtight, that the radiator and overflow tank caps work correctly and that the required level of cooling liquid is maintained.

The recommended anti-corrosion/antifreeze additives guarantee sufficient protection against cold temperatures, corrosion and cavitation, they do not corrode the seals and flexible hoses and they are non-foaming.

Cooling liquids containing an anti-corrosion/antifreeze additive that is inadequate, insufficient or has been prepared incorrectly, may cause damage to the construction elements of the cooling circuit. Moreover, deposits may form on the construction elements of the radiator that reduce the heat exchange, thus causing overheating and resulting in engine failure.

Operation in warm weather conditions (temperature that never drops below $+5^{\circ}$ C).

Always use a glycol-based cooling liquid (antifreeze) even when the engine is operated in places where antifreeze protection is not required.

8.7.6 - Hydraulic system oils

The following maintenance is required on the hydraulic system:

- periodic check of the oil level in the tank;
- periodic replacement of the oil filters;
- periodic oil change.

When seals and O-Rings are removed, replace them with new ones and clean the sealing surfaces well. After the maintenance operations, check the seals and make sure there are no leaks.

When a cylinder or hydraulic system component is removed, bleed out the air as follows after refitting:

- start the engine and let it idle for a while;
- allow all cylinders to perform their full stroke 4/5 times, slowly and without insisting on the limit switch.

The machine is first equipped with mineral or synthetic eco-friendly hydraulic oil with a high viscosity index. The choice between the two products is made at the request of the customer depending on the intended use of the machine.

Eco-friendly hydraulic oil is suitable for use in environmentally sensitive areas, it reduces the risk of contamination in the event of accidental spillage, while minimising direct and indirect legal consequences, additionally, it has longer drain intervals than mineral oil if the requirements indicated are met.

The use of regenerated or re-refined base oil is not recommended.

Hydraulic oils with characteristics equal to or greater than the following are recommended:

Hydraulic oil type	Performance specifications	Environmental specifications
Mineral	ISO-L-HV DIN 51524 3rd part (HVLP) or ISO 11158:2009 (HV) Viscosity index ≥150 and <170 VICKERS M-2950	No requirement
Eco-friendly (Synthetic ester)	ISO 15380 HEES Viscosity index ≥145 and <155 Zinc-free ASTM D943 dry TOST > 3000 h ASTM D 2070 (mod. 1680 h) Test FZG A/8.3/90 12° fill level VICKERS V104 C	Biodegradable as per OCSE 301 B >70% Water hazard class according to VwVwS: WGK1



Always check the correct type of oil for the machine in use by consulting the liquids table.

VISCOSITY OF THE LUBRICATING OIL

The lubricant oil viscosity is chosen according to the ISO classification.

In order to choose the correct ISO class, knowing the **operating temperature** of the oil is essential.

The ISO classification does not determine the quality of a lubricating oil.

If the viscosity is too high, the hydraulic system may not work correctly or get damaged; if the viscosity is too low, the performance of the machine may be reduced.

The viscosity of the hydraulic oil changes as its temperature changes. The oil can work at a viscosity ranging from 13 to 860 mm²/s, the optimum conditions for which maximum performance is achieved occur at a viscosity ranging from 15 to 35 mm²/s.

It is difficult to correlate the ambient temperature with the operating temperature of the hydraulic oil, because the operating temperature is linked, in addition to the ambient temperature, to the way the machine is used and to the type of work being carried out. The table below gives the indicative values that can help in the selection of the oil, if in doubt contact the *Service Centre*.

Viscosity	Reference viscosity at +40°C	Ambient te	temperature		
class	mm²/s	min. °C	max °C		
ISO VG 32	32	-20	+30		
ISO VG 46	46	-5	+40		
ISO VG 68	68	+5	+50		

8.7.6.1 - Requirements for using ecological 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 predefined intervals and sending it to the oil manufacturer's laboratory.

The laboratory will check the functional parameters of the sample, issuing a report with the results and indicating whether the oil needs to be replaced.

The oil check intervals are as follows:

Check interval after commissioning/oil change	Normal use	Heavy duty use (example demolition hammer or shredder head)
1st check after	500 hours	200 hours
2nd check after	1000 hours	500 hours
Following checks after	1000 hours or at least once a year	500 hours or at least once a year

The actual need to change the oil will be indicated by the laboratory.



NOTICE

In the absence of regular periodical checks, the replacement interval is the one indicated in the periodical maintenance table.

8.7.6.3 - Requirements for the sampling of ecological 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 8-52.

The following are additional requirements on which the reliability of the oil analysis depends.

CONTAINERS

Use sterile, new, clean and originally sealed sample containers (500 ml capacity). Containers must have a label with the following data:

- company name;
- machine model;
- machine serial number;
- identification of the content (type of oil);
- sampling date.

To the side is an example of a label and recommended container.



ACCOMPANYING DOCUMENT

The document accompanying the oil sample must be sent with the sample. In the absence of a correct accompanying document it is not possible to perform an exact evaluation of the sample. An accompanying document must be filled in completely for each sample submitted.

The form for the sample accompanying document is shown below.

Electronic format for printing can be downloaded from the PANOLIN website:

www.panolin.com

Accompanying document for samples of eco-friendly hydraulic oil:

Oil sample consignment form



Use separate form for each sample Please write in block letters! Please send to: PANOLIN Production AG Tec Center/Laboratory *Serial/chassis number _____ Blaesimuehle 2 - 6 Inventory number/code ___ CH-8322 Madetswil of lubricant used _____ *mandatory Machine/vehicle/device Machine, vehicle, type (e.g. power shovel) Oil sampling point ☐ Engine ☐ Compressor ☐ Gearbox ☐ Centralised lubricating system ☐ Axle ☐ Recirculation ☐ Hydraulic Minimess/warm oil ☐ Bottom hydraulic-tank/cold oil ☐ Top hydraulic-tank/warm oil Other ___ Working time/oil volume _____ Working time Kilometer Mileometer reading _____ Working time since last oil drain _____ \(\sqrt{Working time } \sqrt{Kilometer} \) Top up quantity since last oil drain ___ Grounds for oil analysis ☐ Oil condition monitoring ☐ Sample after conversion ☐ Sample after filtration/dewatering ☐ Comparison ☐ Other Remarks ☐ by mail ☐ by e-mail Please send the analysis report Name: ____ Signature: ___ No signature required if sent by email. E-Mail: To be completed by PANOLIN UB-Nr.

PACKING

Containers should be placed inside plastic bags to contain any spills. Store the containers inside a cardboard box with filling material to protect the contents.

Samples must be shipped within 48 hours to the following address:

PANOLIN International Inc.

Bläsimühle 2 - 6 CH-8322 Madetswil Switzerland Tel. 044 956 65 65 info@panolin.com

8.8 - Battery

If the machine does not start due to low battery power, please follow the instructions below.

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.



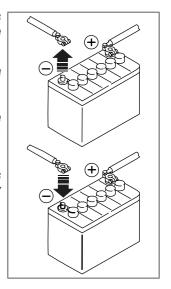
WARNING

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

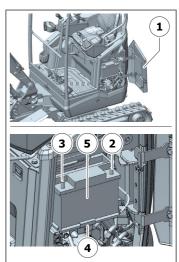


WARNING

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 described in section "6.2 -Battery disconnect switch" to page 6-3;
- disconnect the earth cable (2) from the negative terminal (-);
- disconnect the cable (3) from the positive terminal (+);
- loosen the screws and remove the brackets (4) holding the battery;
- remove the battery (5).

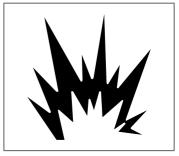


INSTALLATION:

- Install the battery (5) in the specified position;
- tightly secure the battery using the fixing brackets (4) and make sure it is stable and does not move;
- connect the cable (3) to the positive (+) terminal of the battery;
- connect the earth cable (2) to the negative terminal (-) of the battery;
- close the battery cover (1).

8.8.2 - Recharging the battery

When charging the battery, always follow the instructions given in section "8.8 - Battery" to page 8-30 and the indications in the instruction manual of the battery charger.





WARNING

While recharging the battery, hydrogen is generated, which is a flammable gas and which may explode, therefore the battery must be removed from the machine and taken to a well ventilated area before charging it.

Replace the battery immediately if the casing is damaged.

Adjust the battery charger voltage so it is the same as the voltage of the battery to be charged. If the voltage is not correctly set, the battery charger may overheat and cause an explosion.

Connect the positive (+) terminal of the charger to the positive terminal (+) of the battery and the negative (-) terminal of the charger to the negative terminal (-) of the battery. Make sure the terminals are securely fastened.

Adjust the charging current to 1/10 of the battery nominal capacity; When applying a quick charge, regulate it to a lower level than the battery nominal capacity. If the charging current is too high, the electrolyte can escape or dry out and the battery may catch fire and explode.

If the battery electrolyte is frozen, do not charge the battery or run the engine with a different power adapter. A different power adapter will ignite the electrolyte and cause the battery to explode.

8.9 - Tightening torque tables

Refer to these tables when no specific tightening torques are given. The following specifications apply to clamping devices with metric threads supplied, either dry or lubricated with motor oil.

Values are given in Nm, tolerance is \pm 10%.

METRIC COARSE THREADS								
THREAD	8.8	10.9	12.9					
M6	10	14.5	17.5					
M8	25	35	42					
M10	48	68	82					
M12	86	120	145					
M14	135	190	230					
M16	215	300	360					
M18	295	410	490					
M20	410	580	690					
M22	550	780	930					
M24	720	1,000	1,200					
M27	1,040	1,450	1,750					
M30	1,400	2,000	2,400					

METRIC FINE THREADS								
THREAD	8.8	10.9	12.9					
M8x1	27	38	44					
M10x1.25	52	72	88					
M12x1.25	95	135	165					
M12x1.5	90	125	150					
M14x1.5	150	205	250					
M16x1.5	220	310	380					
M18x1.5	320	460	550					
M20x1.5	460	670	770					
M22x1.5	620	880	1,050					
M24x2	800	1,100	1,300					
M27x2	1,100	1,600	1,300					
M30x2	1,500	2,100	2,500					

8.10 - 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	2-50	•					
2	Check of safety signs	2-5	•					
3	Check of guards	8-8	•					
4	Check of engine oil level	8-36	•					
5	Check of cooling liquid level	8-42	•					
6	Check of hydraulic oil level	8-48	•					
7	Check for air filter clogging	8-66	•					
8	Clean radiator	8-47	•					
9	Lubricate pins	8-75	•					
10	Performance check (speed of machine movements)	8-36		Δ				
11	Hydraulic system operating pressures check	8-36		Δ				
12	Track tension check	8-60		Δ	•			
13	Check that the screws of the drive wheel/ rollers are tight	8-57		Δ	•			
14	Check the alternator/fan belt tension	8-65		Δ	•			
15	Check of cooling liquid sleeves	8-46		Δ	•			
16	Replacement of engine oil	8-38		Δ	•1			

Reference	OPERATION DESCRIPTION	Page	DAILY	AFTER 100 HOURS	EVERY 250 HOURS	EVERY 500 HOURS	EVERY 1,000 HOURS	EVERY 2,000 HOURS
17	Replacement of engine oil filter	8-40		Δ	•1			
18	Replacement of fuel filter	8-70		Δ	•1			
19	Replacement of air filter	8-66		Δ	•1			
20	Replacement of drain circuit hydraulic oil filter	8-50		Δ		•2		
21	Replacement of cab ventilation system air filter (if present)	8-68			•1			
22	Replacement of cooling liquid	8-44				•2		
23	Drain fuel tank Replacement of water separator filter	8-71 8-72				•2		
24	Hydraulic system oil sampling / replacement	8-52					•2*	
25	Replacement of intake circuit hydraulic oil filter	8-54					•2	
26	Replace alternator/fan belt	8-65					•3	
27	Clean filter on fuel suction	8-73						•2
28	Check of cooling liquid sleeves	8-46						•3

To be carried out at the indicated work time interval or at the latest within:

- $\mathbf{1} = 1$ year
- **2** = 2 years
- 3 = 3 years
- Δ = only the first time
- * = different replacement interval if eco-friendly lubricant is used, see dedicated section

8.10.1 - 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 of engine oil level



WARNING

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



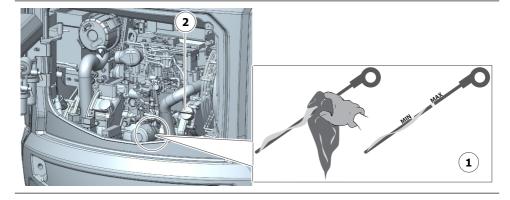
WARNING

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 the top filler (2), following the indications in section "8.7.4 - Engine oil" to page 8-20.

When adding oil, NEVER exceed the MAX mark.



If the level is above the MAX mark, there may be serious faults. Contact the Service Centre.

8.10.3 - Replacement of engine oil



WARNING

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



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 $(+25 \text{ to } +40^{\circ})$, as this improves the drainage of the old oil.

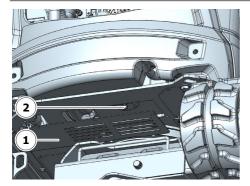
When it is cold, the oil drainage may be compromised or prove to be difficult.

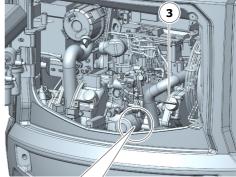
This would cause the mixing of old oil and new oil, resulting in a reduction of the life of the engine.

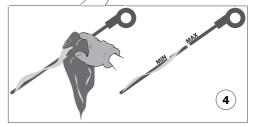
To **replace** the engine oil:

- unscrew the screws and remove the protective cover (1);
- unscrew the engine oil drain plug (2) located under the engine and let the oil flow out into a suitable container and dispose of it in compliance with the standards in force;
- open the engine compartment hood;
- unscrew the filler cap (3) to help the oil to drain out;
- wait for the oil to flow out completely;
- clean the caps (2-3) and the oil dipstick (4);
- tighten the drain plug (2) and refit the protective cover (1);
- add more oil through the inlet (3) according to the type and amount indicated in the liquids table;

- check that the level is correct on the dipstick (4);
- replace the oil filler cap (3);
- start the engine and let it run for a few minutes, then shut it down and check the level again;
- close the engine compartment hood.









NOTICE

Change the oil filter every time you change the engine oil.



The engine oil and the related filter are highly pollutant products; do not discard them into the environment.

8.10.4 - Replacement of engine oil filter



WARNING

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



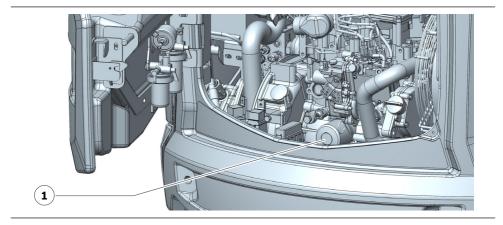
WARNING

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.





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 of cooling liquid level



WARNING

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



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.

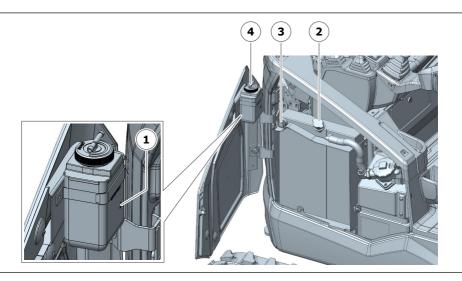
If the cooling liquid level drops constantly and significantly, check the seal of the couplings between the engine and radiator, or the radiator itself, for leaks.

To **check the level** of cooling liquid:

- open the radiator compartment 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 radiator compartment cover.





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 - Replacement of cooling liquid



WARNING

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



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.



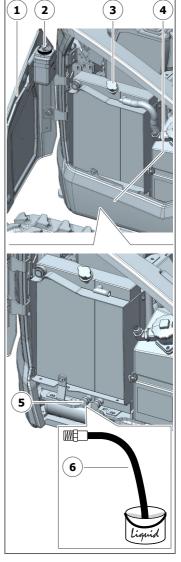
NOTICE

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 cover (1);
- unscrew the overflow tank plug (2), remove it and let the liquid flow into a suitable container, then dispose of it in compliance with the Standards currently in force;
- put the overflow tank back in place;
- remove the radiator cap (3);
- remove the right side panel (4);

- unscrew the protection cap of the quick discharge valve* (5);
- screw the special discharge hose (6) 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* (5);
- refit the right side panel (4);
- 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 (2), bringing the level between the MIN and MAX marks and screw the plug back in;
- close the radiator compartment cover (1).
- Run the engine on minimum for 5 minutes in order to expel any air left inside the circuit then stop the engine;
- open the radiator compartment cover, check the fluid level and if necessary top up as described in section "8.10.5 - Check of cooling liquid level" to page 8-42;
- close the radiator compartment cover and start the engine at 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 (6).

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.

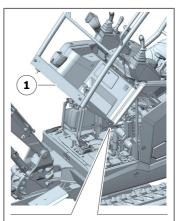
To prevent the cooling liquid from leaking and damaging the engine, it is necessary to periodically check and, if necessary, replace the sleeves that connect the engine to the radiator.

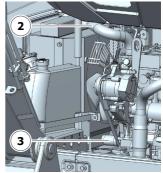
To **check** the sleeves:

- tip the protective structure (1);
- check the upper sleeve (2);
- check the lower sleeve (3);
- if they are both intact and are not cracked or leak, the check is over;
- close the protective structure.

If the sleeves are damaged:

- drain the cooling system as indicated in section "8.10.6 - Replacement of cooling liquid" to page 8-44:
- loosen the clamps on the ends of the sleeve;
- remove the damaged sleeve;
- insert a new sleeve;
- reposition the clamps;
- fill the cooling system and check that the cooling liquid level is correct, by completing the procedure described in section "8.10.6 Replacement of cooling liquid" to page 8-44.





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.



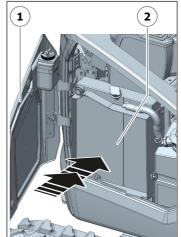
NOTICE

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 radiator compartment cover (1);
- check the radiator fins (2);
- 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 of hydraulic oil level



WARNING

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



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**:

- remove the cover (2) by unscrewing the knobs;
- unscrew the hydraulic oil tank cap (3);
- add more oil according to the type indicated in the liquids table until the level has been reached;
- Once oil has been added, screw the cap (3) back on following the procedure in reverse order;
- put the cover back on.

MODELS CX18D- CX19D MODEL CX20D

8.10.10 - Change discharge circuit hydraulic oil filter



WARNING

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



WARNING

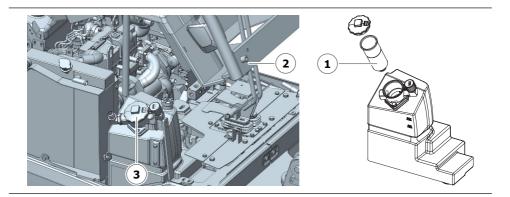
Immediately after using the machine, the temperature of the components and of the hydraulic oil may be high and may cause burns, after stopping, wait until the temperature drops below 40°C before proceeding with maintenance operations.

Before carrying out any maintenance work on the hydraulic system, the residual pressure must be released as indicated in the specific section.

The discharge circuit hydraulic oil filter (1) is housed inside the hydraulic oil tank at the top.

To **replace** the filter:

- tip the protective structure (2);
- open the radiator compartment cover;
- unscrew the filter cover (3);
- remove the old filter and dispose of it in compliance with the applicable Standards;
- clean the surrounding area and insert the new filter;
- screw the filter cover;
- make sure that the hydraulic oil level is correct;
- start the engine and let it run for a few minutes, then shut it down 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 protective structure once more.





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 $(+25 \text{ to } +40^{\circ})$, 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 8-15.

Never start the engine with the tank empty as this will definitely damage the pump.

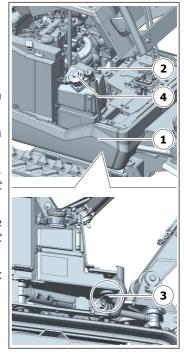
To take **samples** of the eco-friendly oil:

- start the machine and make movements until the hydraulic oil has reached a temperature of approximately +40°C, then stop the machine;
- open the radiator compartment cover;
- remove the right side panel (1);
- tip the protective structure;
- unscrew the hydraulic oil tank filler cap (2);
- 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 "8.7.6.1 Requirements for using ecological hydraulic oil" to page 8-25) replace the oil if necessary.

To **replace** the oil:

- The oil must be at a temperature of 40°C, if it is hotter leave it to cool down or alternatively move the machine until this temperature is reached. Working with the oil at this temperature there will be no risk of being burnt and all the used oil will be drained from the system;
- open the radiator compartment cover;
- remove the right side panel (1);
- tip the protective structure;
- unscrew the hydraulic oil tank filler cap (2);
- remove the drain plug (3) and let the oil flow into a suitable container;
- wait for all of the oil to flow out, then dispose of it in compliance with the standards in force;
- replace the discharge circuit hydraulic oil filter (4), refer to section "8.10.10 Change discharge circuit hydraulic oil filter" to page 8-50;
- replace the intake circuit hydraulic oil filter, see section "8.10.12 Replacement of intake circuit hydraulic oil filter" to page 8-54.
- clean the drain plug (3) as there may be metallic deposits on it and then put it back in place;



- fill up with oil, of the type and quantity indicated in the liquids table, until the level is reached as described in section "8.10.9 - Check of hydraulic oil level" to page 8-48, and then screw on the cap (2);

- Close the protective structure, reposition the right side panel (1) and close the radiator compartment 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.

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.

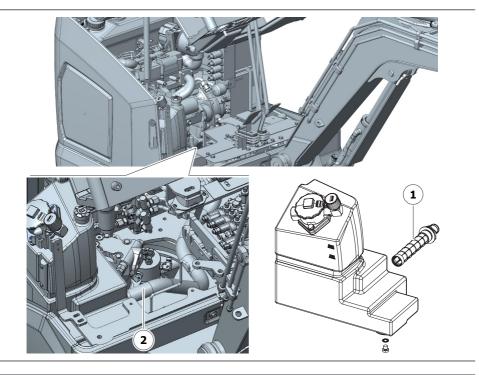
Only use the allowed lubricating oils indicated by CASE in the dedicated table in section "8.7 - Refilling" to page 8-15.

The intake circuit hydraulic oil filter (1) is housed inside the hydraulic oil tank at the bottom.

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 8-52;

- 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);
- restore the hydraulic oil level;
- Close the protective structure once more;
- start the engine and let it run for a few minutes, then shut it down and check the level again;
- check for leaks.





Old filters and hydraulic fluid are highly pollutant items; do not discard them into the environment, but put them in sealed containers and deliver them to the specialised waste disposal centres.

8.10.13 - Check of hydraulic line condition



WARNING

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



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.

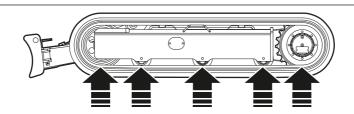
8.10.14 - Check that the screws of the drive wheel/rollers are tight



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.

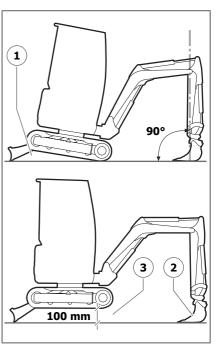


WARNING

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 deportè 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:

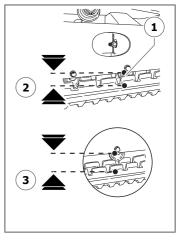
- wear of undercarriage components (tracks, drive wheels, idlers, rollers) caused by normal working operations;
- the type of soil on which the machine is positioned, e.g. muddy or compacted soil;
- accumulation of mud, sand or other material on the surface (inside and outside) of the tracks.

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.

ТҮРЕ		min	max
Rubber tracks m	m	10	15

- the machine can now be removed from the track service position and placed onto the ground;
- should the track tension be wrong, see section "8.10.17 Adjusting the track tension" to page 8-62.

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.**

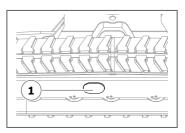
Track tension is adjusted by increasing or reducing the grease loading of a hydraulic cylinder (also known as a track tensioner) that applies a thrust to the idler wheel.

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

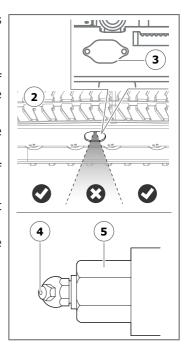
DO NOT remove the grease nipple on the end of the valve, or attempt to turn the valve body by hand.

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.



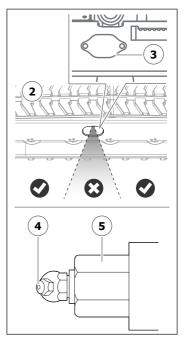
If the tension corresponds to the values indicated, the adjustment is complete.

If the tension is still insufficient, repeat the procedure.

If the tension is too high, follow the procedure described below.

To decrease track tension

- STAND TO THE SIDE of the valve access cover as shown in figure (2);
- remove the cover (3) located on the track frame;
- using a spanner that allows adequate clearance from the opening, slowly unscrew the valve body (5) counter-clockwise by 0.5/1.0 turn to allow the grease to escape;
- When the tension reaches the indicated value, screw the valve in a clockwise direction with the indicated tightening torque, then replace the cover;
- carry out the procedure on the other track, if necessary.
- Start the machine and drive straight ahead for at least 20 m;
- stop the machine and check the tension of the tracks.



If the tension corresponds to the values indicated, the adjustment is complete.

If the tension is still too high, repeat the procedure.

If the tension is insufficient, follow the procedure described above.

8.10.18 - 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.

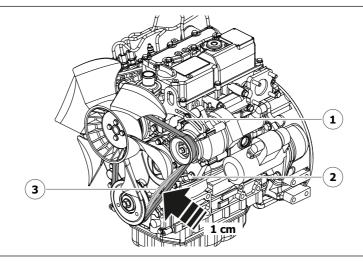
To **check** the tension of the belt, press the longer section of the belt with your thumb (between the engine pulley and the alternator pulley).

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.



NOTICE

When the machine works in very dusty environments, check filter clogging more frequently.

In these conditions the replacement interval should be halved with respect to the indications given in the periodic maintenance table.

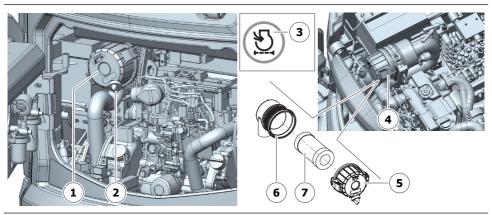
The air filter (1) is housed inside the engine compartment.

To **check** the status of the air filter:

- remove dust from the breather valve (2) by squeezing both sides, opening the valve and allowing loose particles to fall out;
- 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 (optional)



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 an air filter (2), which is located on the right side of the cab.



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.



NOTICE

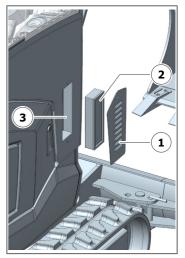
When the machine works in very dusty environments, check filter clogging more frequently.

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 **external filter**:

- unscrew the screws holding the cover (1);
- pull out the filter (2) and check for any breaks 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 inner surface of the fixed part (3) making sure that all impurities are removed before inserting the clean new element;
- reposition the filter and the casing.



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.



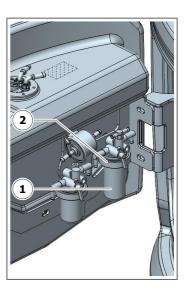
WARNING

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 replace the filter:

- open the engine compartment hood;
- close the tap located on the filter itself;
- unscrew the ferrule (2) to remove the cup where the old filter is housed, then dispose of it according to current Standards;
- clean the surrounding area and insert the new filter;
- Reposition the cup and tighten the ferrule (2);
- bleed out the air as indicated in section "8.10.25 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

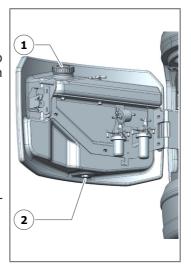
Immediately after using the machine, the temperature of the components and of the hydraulic oil may be high and may cause burns, after stopping, wait until the temperature drops below 40°C before proceeding with maintenance operations.

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.

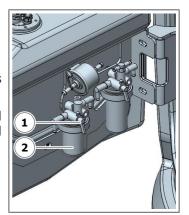
The water separator filter is housed in the engine hood.

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 separator filter there is a **red float** that rises and becomes clearly visible in the presence of water, in this case proceed with discharge.

In this case, drain the water:

- open the engine compartment hood;
- close the tap (1) located on the separator;
- unscrew the cup (2), pour out the liquid it contains and clean thoroughly;
- if necessary, remove the old filter element and dispose of it according to the Standards in force and replace it with a new one;
- screw the cup back in and tighten it firmly;
- open the tap (1);



- bleed out the air as indicated in the dedicated section;
- close the 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.

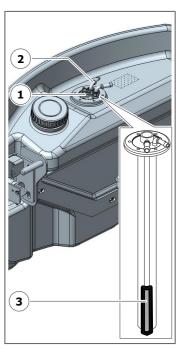
If you spill fuel during this operation, clean up the spill to avoid the risk of fire.

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 oil tank cover;
- 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 oil tank cover;
- 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

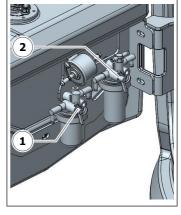
Immediately after using the machine, the temperature of the components and of the hydraulic oil may be high and may cause burns, after stopping, wait until the temperature drops below 40°C before proceeding with maintenance operations.

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 - Translation motors and rotation gear motors

The translation motors and the rotation gear motor are lubricated internally by the same hydraulic oil as the machine system. Therefore, these components require no maintenance.

8.10.27 - 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 8-15.

Couplings between certain parts of the machine must be lubricated using grease, inserted via special accessories called grease nipples (in accordance with UNI 7663).

Clean the grease nipples before attaching the grease gun.

Clean off any excess worn grease after lubrication.

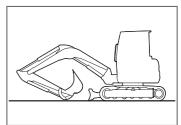
If you use the machine under critical operating conditions, carry out this maintenance task more frequently.

As a general rule it is well to remember that each cylinder has two grease nipples located on the connecting hitch and that each pin that acts as a pivot for movement has at least one grease nipple.

After carrying out operations with the boom immersed in water or after cleaning the machine with water, always lubricate pins that have been in contact with water.

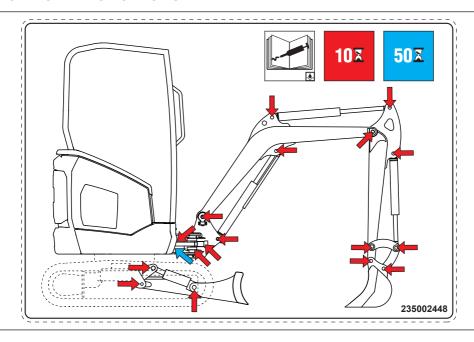
To **lubricate** the machine:

- position the machine as shown in the figure;
- lower the equipment to the ground and turn off the engine;
- Grease nipples are located at the points indicated by the grease nipple label on the machine and shown below.

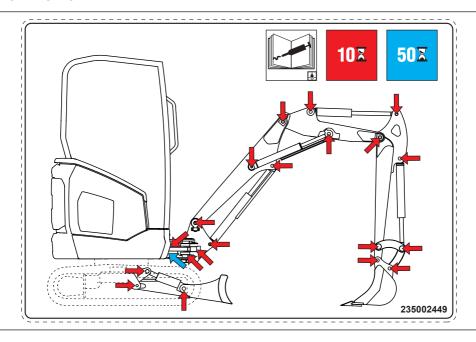


POSITION OF LUBRICATION POINTS

MODEL CX17D - CX18D - CX19D



MODEL CX20D



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 8-34;
- when a vehicle stands idle for an extended period, the humidity in the air could get into the oil. Ensure that there is no water in the oil before and after starting the engine. If any water is found in the oil, replace the oil;
- take the cover off the end of the exhaust pipe, start the engine and let it idle for about 20 minutes without applying any loads;
- before moving the machine, check that the instruments, indicator lights and work lights are working properly;
- check the condition of all hoses and connections;
- carry out complete cycles of all the hydraulic functions several times.

8.12 - 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.

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 8-14.

9.1 - Fuses and relays



WARNING

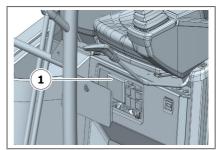
Secure the machine as indicated in section "8.1.1 - Putting the machine out of service for maintenance" to page 8-5.

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.

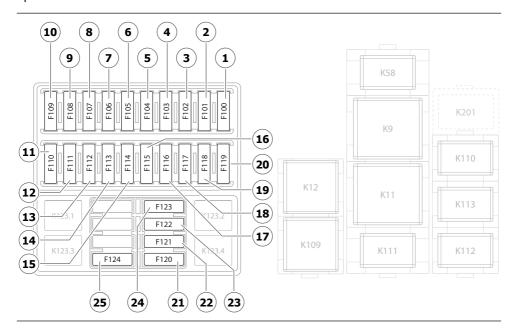
Always replace a fuse with another of the same capacity.

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.



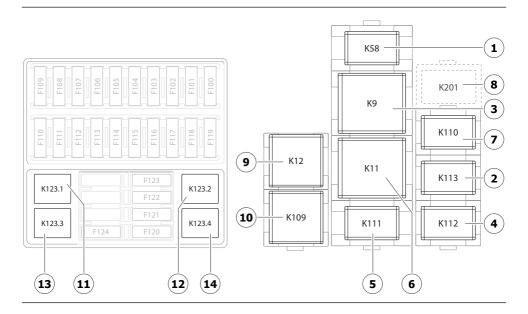
ELECTRICAL COMPONENTS

List of fuses

1	F100	5A	+30 - Starter panel	
2	F101	5A	+30 - Head unit / glass bowl	
3	F102	5A	5A +30 - Hour meter / OBDII / Industry 4.0	
4	F103	5A	A +30 - Control panel	
5	F104	2A	+15 key - Industry 4.0	
			+15 key - Control panel	
6	F105	5Λ -	(models CX17D - CX18D)	
U	1 103		+15 key - Ve (I/O EXT STD and OPT) / Control panel / TPR	
			(models CX19D- CX20D)	
7	F106		+15 services - safety devices (servo-controls enabling, start-up	
			anti-repeater control unit, second speed)	
8	F107		+15 services - Backlighting D.100/switches/Head unit/Altitude	
			KIT	
9	F108		+15 services - Rotating head lamp	
_10	F109		+30 Front work lights/Boom	
11_	F110	15A	+30 Rear work lights	
12	F111	10A -	- (models CX17D - CX18D)	
	=440		+15 services - VP (I/O EXT STD) (models CX19D- CX20D)	
13	F112		+15 services - Wipers	
14	F113		+15 services - Head unit	
15	F114		+15 services - A/C unit	
16	F115		+15 services - Cigarette lighter	
17_	F116		+15 services - Alternator / Bougie timer / Engine cut-off timer	
			+15 services - Quick release selector	
18	F117	15A -	(models CX17D - CX18D)	
			+15 services - Quick release selector/AUX3 (models	
19	F118		CX19D- CX20D) +15 services - cab (front/rear work headlights switch)	
20	F119		+50A start-up	
21	F119	7.5A	•	
22	F120		Triple/AUX1 switch (models CX19D- CX20D)	
23	F121		+15 services - VP(I/O EXT OPT) (models CX19D- CX20D)	
			+15 services - VP(1/O EXT OPT) (models CX19D- CX20D) +15 services - Travel	
24	F123			
_ 25	F124	5A	+15 services - sensors (Man. BLADE - LH arm rest micro)	

9.1.2 - Control unit relays

To access the relays, remove the fuse and relay compartment cover, located under the operator's seat.

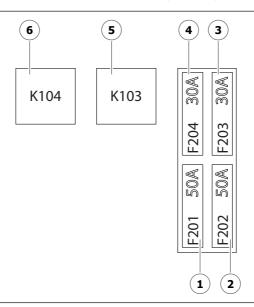


List of relays

1	K58	Front work headlights/Boom
2	K113	Rear working lights
3	К9	+15 services - safety devices (Second speed)
4	K112	+15 services - safety devices (Servo-controls enabling)
5	K111	+50A start-up
6	K11	+15 services - safety devices
		(Start-up anti-repeater control unit)
7	K110	+30 - Satellite
8	K201	Shredder (models CX19D- CX20D)
9	K12	Starter relay
10	K109	Service relay
11	K123.1	Boom swing/AUX2 switch
12	k123.2	Triple/AUX1 switch (models CX19D- CX20D)
13	K123.3	Track widening
14	K123.4	Horn

9.1.3 - Engine fuses and relays

There are other fuses and relays for the management of the engine, inside the turret next to the battery; to access them, remove the right side panel.



List of fuses

1	F201	50A +30 - Main power supply
2	F202	50A Bougie relay fuse
3	F203	30A Engine stop relay fuse
4	F204	30A Starter relay fuse

List of relays

5	K103	Engine cut-off relay
6	K104	Bougie relay

9.2 - Work lights replacement



WARNING

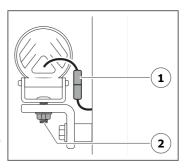
The permissible operations on the electrical system are indicated in section \$8.1.1

- 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;
- activate the emergency stop button;
- if the work light is not accessible from the ground, use a suitable approved ladder;
- disconnect the electrical connector (1);
- unscrew the mounting screw/s (2);
- remove the damaged light;
- to fit the new working light, follow the procedure described in reverse order.





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9.3 - LED strip replacement



WARNING

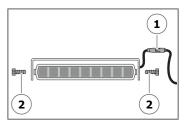
The permissible operations on the electrical system are indicated in section "8.1.1 - Putting the machine out of service for maintenance" to page 8-5.

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.



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.

10.1 - Distributor

DISTRIBUTOR			
Problems	Possible causes	Solutions	
Inability to hold the load	Oil leaks from inside the PISTON.	Replace valve-housing assembly.	
	Oil leaks from the relief valve.	Disassemble and clean or replace relief valve.	
Load falls when piston is shifted from neutral to	Debris has entered the load safety valve.	Disassemble and clean the load check valve.	
"raise" position	The poppet or seat of load check valve is damaged.	Replace the poppet or lap valve seat.	
Spool jams	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.	
		Loosen the mounting bolts, check and adjust.	

DISTRIBUTOR			
Problems	Possible causes	Solutions	
Spool jams	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.	
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 retighten 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

HYDRAULIC ENGINE			
Problems	Possible causes	Solutions	
Hydraulic engine does not run at all	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.	
Hydraulic engine runs in one direction only	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.	
		Replace the hydraulic pump.	
		Replace the main relief valve.	
Hydraulic engine does not run fast enough	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.	

HYDRAULIC ENGINE			
Problems	Possible causes	Solutions	
Hydraulic engine makes abnormal noise	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. Remove the cause of cavitation.	
Oil leaks from shaft seal	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

HYDRAULIC CYLINDER			
Problems	Possible causes	Solutions	
Hydraulic cylinder has inadequate power	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.	
Hydraulic cylinder external oil leak	Hydraulic cylinder gaskets are defective.	Replace the hydraulic cylinder gaskets.	
	Hydraulic cylinder rod is damaged.	Replace hydraulic cylinder rod.	
Piston does not move	Oil temperature is too high.	Lower oil temperature.	
smoothly	Air is sucked into the engine.	Add oil and tighten the intake joint.	

10.4 - Limit valves

MAXIMUM PRESSURE VALVES			
Problems	Possible causes	Solutions	
Pressure does not rise at all	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.	
Limit valve is not stable	Pilot poppet seat is damaged.	Replace the worn parts.	
	Pilot piston is jammed against the main poppet.	Disassemble, clean and eliminate surface flaws.	
Limit valve does not work properly	Valve is worn because of foreign bodies.	Replace the worn parts.	
	The lock nut and adjusting screw are loose.	Adjust the pressure.	
Oil leaks	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	
Overall operating power	Engine power is low.	Refer to engine manual.	
decreases	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.	
All functions are faulty	Hydraulic pump is faulty.	Replace the hydraulic pump.	
	The hydraulic oil level is low.	Add oil.	
Accessory's power is down	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	
Attachment falls under its own weight	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.	
Accessory connections	Oil or grease level is low.	Add oil or grease.	
are noisy	The connecting pin vibrates.	Replace the bush or the pin.	

10.6 - Travelling

TRAVELLING			
Problems	Possible causes	Solutions	
Travelling power is low	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	
Machine moves	Track tension is too high.	Adjust the track tension.	
erratically	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.	
Machine does not run in a straight line	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

OPERATION LEVERS			
Problems	Possible causes	Solutions	
Levers hard to operate	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

HYDRAULIC PUMP			
Problems	Possible causes	Solutions	
No oil flows from hydraulic pump	The hydraulic oil level is low.	Add oil.	
	Intake filter is clogged.	Replace filter. If oil is dirty, replace it with fresh oil.	
Hydraulic pump pressure does not rise	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.	
Abnormal noise from hydraulic pump	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.	
		Replace oil with fresh oil.	
Oil leaks out from hydraulic pump	Hydraulic pump seal is defective.	Replace seal or replace hydraulic pump.	

10.9 - Swivel joint

SWIVEL JOINT					
Problems Possible causes Solutions					
Operating power is low	The swivel joint gaskets is damaged.	Replace the swivel joint gasket.			
	The rotor of the swivel joint is damaged.	Replace the swivel joint.			
Oil leaking out of Swivel joint	The swivel joint gaskets is damaged.	Replace the swivel joint gasket.			

10.10 - Rotation

ROTATION				
Problems	Possible causes Solutions			
Swivel power is low	The performance of the hydraulic engine has dropped.	Replace the hydraulic engine.		
	Swivel ring is jammed.	Oil/grease or replace the swivel ring.		
Swivel retarder keeps turning	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.		
Swivelling continues with retarder activated	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.		
Abnormal noise when swivelling	The hydraulic engine sucks air.	Add oil.		
	Swivel bearing is not well lubricated.	Add oil/grease.		

10.11 - Engine and related parts

E	ENGINE AND RELATED PARTS		
Problems	Possible causes Solutions		
Engine does not start	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	Check and remedy.	
	oil.	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.	

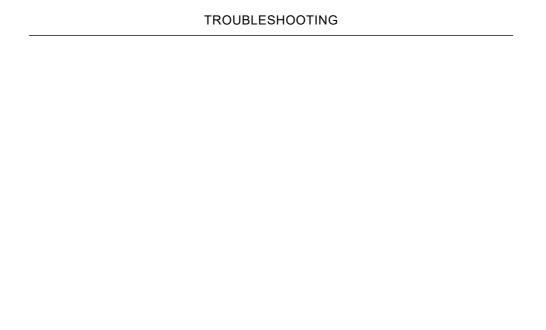
ENGINE AND RELATED PARTS			
Problems	Possible causes	Solutions	
Engine stops suddenly	No fuel in tank.	Add fuel.	
when running	Fuel filter clogged.	Clean or replace.	
	Air in the fuel supply system.	Tighten the joints on fuel system pipes.	
Oil pressure is defective	Oil shortage.	Add oil.	
	Oil leaks 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.	
Engine overheating	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.	

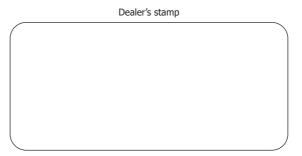
ENGINE AND RELATED PARTS		
Problems	Possible causes	Solutions
Defective charging of	Wrong fan belt tension.	Adjust tension.
battery	Faulty cables.	Repair.
	Faulty indicator light.	Replace it.
	Battery failure.	Check the connections, recharge, replace.
	Regulator failure.	Replace it.
	Alternator failure.	Repair or replace.
White or blue smoke coming from the	Too much oil.	Lower the quantity to the specified level.
exhaust	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.
Black or dark grey smoke coming from the	Poor fuel quality.	Replace with better quality fuel.
exhaust	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	
Excessive fuel consumption	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.	
Oil consumption is too high	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	
With the engine running the display shows nothing	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.	
With the engine running and the cut-out lever lowered, no functions work when the command rollers are moved.	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.	
moved.	Faulty roller.	Replace the roller.	
	Faulty control box.	Replace the control box.	
The buttons on the display do not perform the functions stated in	Faulty or broken buttons.	Replace the pushbutton panel on the display dashboard.	
this manual	Faulty display.	Replace the display.	
	Faulty control box.	Replace the control box.	





The manufacturer and its authorized representative reserves the right to make improvements in design and changes in specifications at any time without notice and without incurring any obligation to install them on units previously sold. Specifications, descriptions, and illustrative material herein are as accurate as known at the time of publication, but are subject to change without notice.

Availability of some models and equipment builds varies according to the country in which the equipment is being used. For exact information about any particular product, please consult your Case dealer.

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