

VOLVO CONSTRUCTION EQUIPMENT

OPERATOR'S MANUAL

EC35/EC45

EC35/EC45



VOLVO
Volvo Construction Equipment

Ref.No. VOE21B1002144 English
Printed in Sweden CST

MORE CARE. BUILT IN.



**California
Proposition 65 Warning**

Diesel engine exhaust and some of its constituents are known to the State of California to cause cancer, birth defects, and other reproductive harm.

**California
Proposition 65 Warning**

Battery posts, terminals and other related accessories contain lead and lead compounds, chemicals known to the State of California to cause cancer and other reproductive harm.

Wash hands after handling.

Foreword

This Operating Manual is intended as a guide to the correct use and maintenance of the machine. You should therefore thoroughly read this manual driving the machine, or before performing any maintenance tasks.

Keep the manual in the cab so that it is always at hand. It should be immediately replaced if it has been lost.

These operating instructions describe the applications the machine is mainly intended for. It has been written in such a way, that it is valid for all markets. Sections without any relevance for your machine should therefore be disregarded and skipped.

NOTE! The information contained in these operator's instructions applies for machine types EC35 (from serial number: 283 18963) and EC45 (from serial number: 284 17799), if not specified differently.

Many hours of design work and development activities were spent to produce a machine which meets the highest demands with respect to safety and power. Accidents occurring in spite of this are in most cases caused by human error. A safety conscious person and a well maintained machine make up a safe, efficient and profitable team. **You should therefore read and strictly observe the safety regulations.**

We continually strive to improve our products and enhance their efficiency by changing their design. We retain the right to implement such changes without any commitment of introducing these improvements for machines in the field. We also reserve the right to change data and equipment, as well as instructions for service and maintenance without prior notice.

Safety regulations

The operator is obliged to know the applicable national and local safety regulations. The safety regulations in this manual only apply if there are no applicable national or local regulations in effect.



WARNING!

The symbol above appears at various points in the manual together with a warning text and has the following meaning:

Warning, be alert! Your personal safety is involved! It is the duty of the operator to make sure that all warning decals are legible and correctly in place on the machine. Accidents may otherwise occur.

Become acquainted with the working capacity and the limits of your machine!

OPERATOR'S MANUAL

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Operating instructions

Operating techniques



Safety when servicing

Service and maintenance

Specifications

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Identification numbers

Enter the identification number of machine and machine parts. This number must be specified when contacting the manufacturer to order spare parts. Positions and explanation of the PIN plates, see page 9.

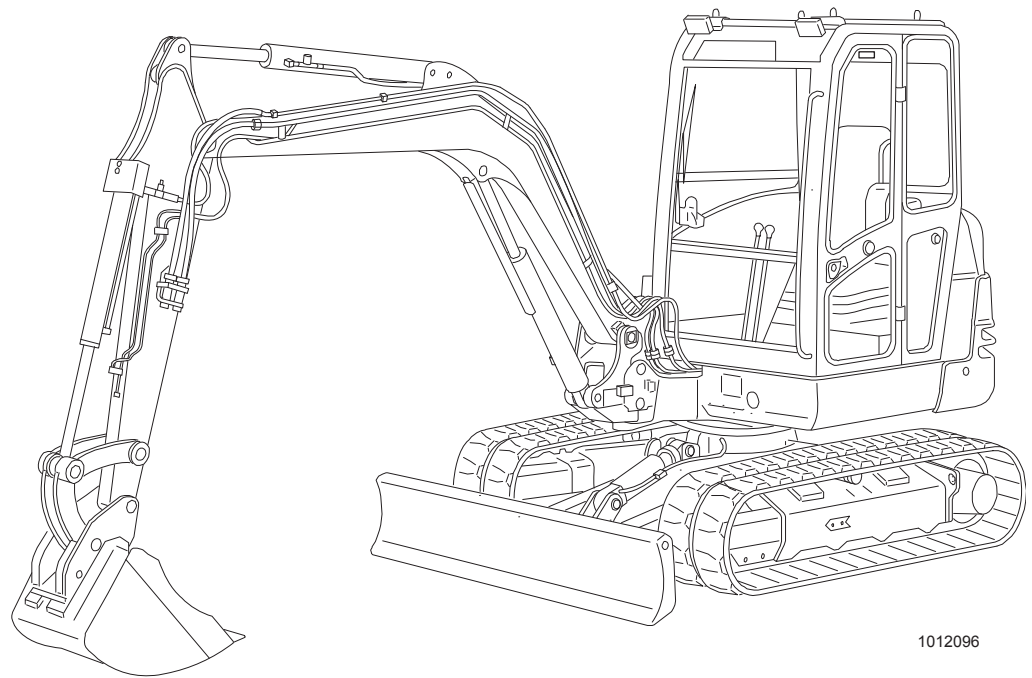
Manufacturer:	Volvo Compact Equipment SAS Rue Pierre Pingon BP 119 F - 01303 Belley Cedex
PIN (Product Identification Number) of machine:	
Engine:	

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Presentation



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Intended use

The machine has been designed and built in accordance with the latest technical standard and its safety has been tested according to the generally accepted technical rules and regulations.

The machine must only be operated in technically perfect condition and by trained operating personnel, in strict compliance with applicable safety regulations and accident prevention instructions. This applies also for the compliance with the notes on safety concerning maintenance, care and repair in this operating instruction manual.

For use in special applications, such as explosive environments or in areas characterised by asbestos containing dust one must comply with particular safety regulations and the machine must be equipped for such work.

For further information please contact the manufacturer or your dealer.

Environmental requirements

Bear the environment in mind when operating and during service and maintenance of the machine. Always follow local and national environmental legislation concerning all handling of the machine.

Engine

EC35/EC45

The engine is a 4-cylinder VOLVO D2.2 type diesel engine with water cooling.

Travel system

The travel motion is accomplished by the main chassis via two rubber tracks (steel tracks optionally available). The tracks are each driven by a two speed travel motor.

Hydraulic system

Closed circuit hydraulic load sensing system, allowing full independence of the individual movements.

Slewing system

The slewing ring is driven by a hydraulic motor, the oil supply of which is overpressure protected by high pressure relief valves. In case of a leak or hose rupture the slewing facility is hydraulically braked.

Equipment

A standard or quick-release equipment carrier (option) accommodates quick fitting of bucket (or other attachments).

Anti-theft device (option)

The installed anti-theft device seriously hampers stealing the machine.

Volvo CE supplies the anti-theft device as optional equipment. If your machine is not yet fitted with such a device you should check a possible retrofit by your dealer.

CE marking, EMC directives

CE-Sign

(Declaration of Conformity)

(Applies only for machines to be sold within the European Community)

"The machine was awarded with a CE-Sign".

This means that the machine fulfils the applicable "General Health and Safety Requirements" of the so-called EC machine directive.

An EC Declaration of Conformity accompanies the machine as evidence for the fulfilment of the above mentioned requirements. If any conversions are made which have an adverse effect on the safety of the machine, the person introducing this modification is fully responsible for the resulting effects.

If the machine is used for purposes other than the ones mentioned in these operating instructions, the safety of the machine must be assured in any case. The person applying such measures takes full responsibility. In certain cases it may be necessary to obtain a new CE-Sign and to issue a new Declaration of Conformity.

Volvo is only reliable for machines which are operated with the attachments, equipment and spare parts specified by us.

Attachments (optional equipment) manufactured by us are adapted integral parts of the machine. The CE-Sign therefore also covers our attachments. We do not assume liability for attachments made by other manufacturers.

Materials having an effect on noise, such as noise insulating, noise reducing or noise absorbing materials, must not be altered or removed. It is also prohibited to cut holes into cabin or engine compartment, since this would have a negative effect on the noise level.

EMC Regulations of the EC

Under certain conditions the electronic equipment may have an interfering effect on other electronic equipment, or other electronic equipment may interfere with the electronic equipment on the machine, which may affect safety. The EMC regulations of the EC concerning the "Electromagnetic Conformity" contain a general description of the requirements, which may be appropriate for the safety of a machine, the limits of which are specified in international standards. Machines or apparatuses which meet these demands are awarded with the CE-Sign. Our machines have been especially tested for electromagnetic interference. Both the CE-sign and the declaration of conformity refer to the EMC regulations. If another piece of electronic equipment is to be fitted to the machine it must have the CE-Sign and the machine must have been checked for the effect of electromagnetic interference



Communication equipment, installation

IMPORTANT! Any installation of optional communication equipment must be carried out by trained professionals and in compliance with the instructions supplied by Volvo CE with the machine.

Protection against electromagnetic interference

This machine has been tested in accordance with EC directive 89/336/EEC concerning electromagnetic interference. It is therefore very important that all non-approved electronic accessories, such as communication equipment, should be tested before installation and use, since such equipment can cause interference with the electronic systems of the machine.

Mobile phones

For a reliable function the mobile phone must be permanently connected to the electrical system of the machine. Apart from that a fixed aerial must be mounted to the outside of the machine, as specified by the manufacturer. If a portable mobile phone is used, you should bear in mind that it may constantly transmit information to its base station, even when not used. For this reason, it should not be placed next to electronic equipment in the machine, such as directly on a control panel etc.

Guidelines

The guidelines specified below must be followed during installation:

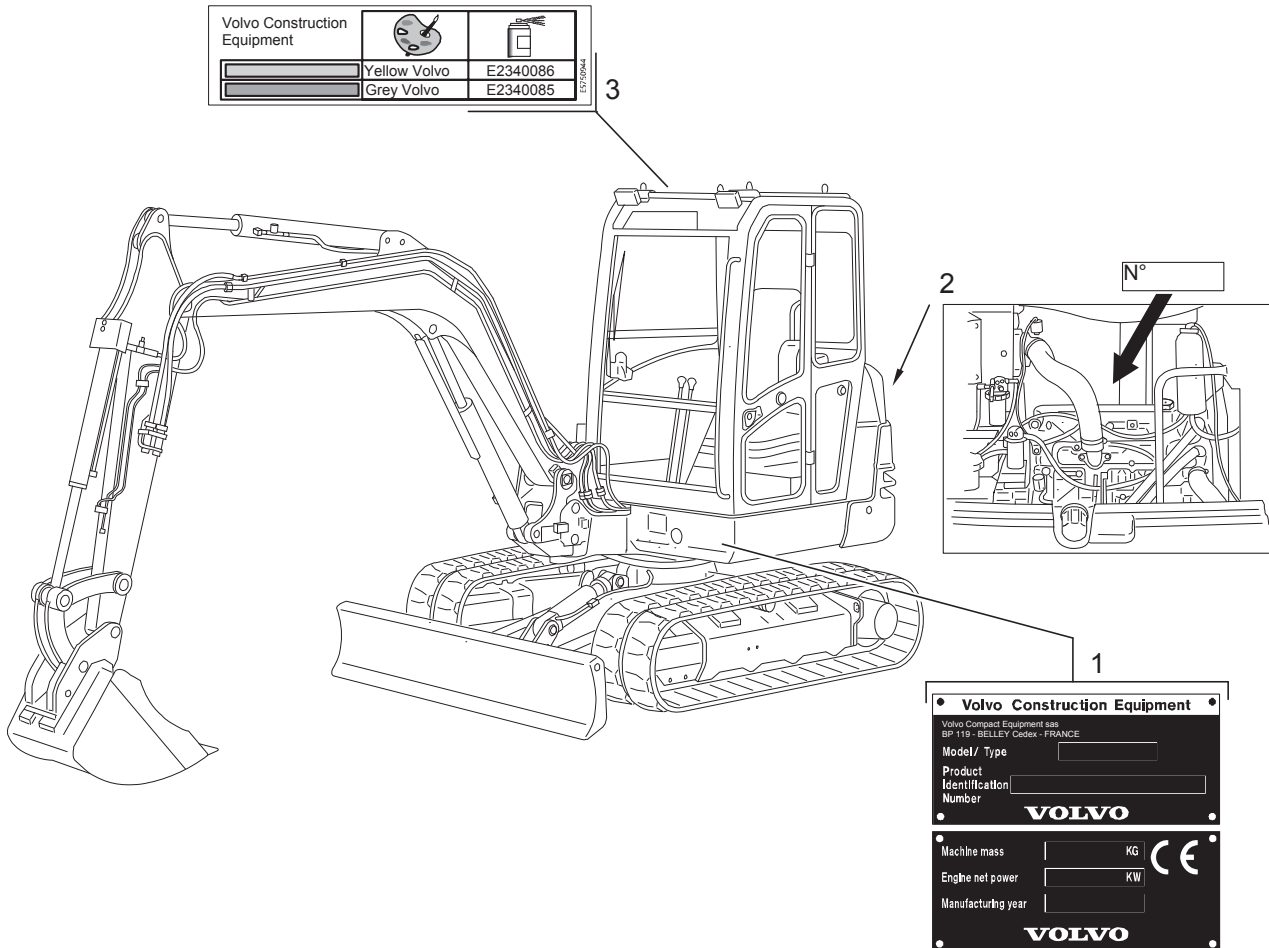
- The position of the aerial should be chosen in such a way, that it is well adapted to the environment.
- The down lead from the aerial should be of coaxial cable type. Make sure that the cable is undamaged, that the screen is not split up at the ends, but thoroughly encased in the connector and has good galvanic contact with the same.
- The mating surface between the aerial mounting bracket and the bodywork must be free of dirt and oxides. After installation protect the mating surfaces against corrosion, as a measure to maintain good galvanic contact.

Remember to keep interfering cables away from cables susceptible for interference. Interfering cables are the power supply cable and the aerial cable to the communication equipment. Cables susceptible for interference are cables to and from electronic units on the machine. Install cable harnesses as close to grounded plate surfaces as possible, since these have a screening effect.

Product plates

The following illustrations and descriptions show the product plates on the excavator.

When ordering spare parts or for short enquiries by phone and in correspondence you should always specify model designations and product identification number.



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1 Product plate

The product plate contains name and address of manufacturer, model/type designation, product identification number, weight of machine, engine power, year of manufacture, as well as CE-sign (only in EC countries).

2 Engine identification plate

The engine identification plate is located on the valve cover.

3 Colour code

The colour code is specified on a sticker stuck to the cabin roof.

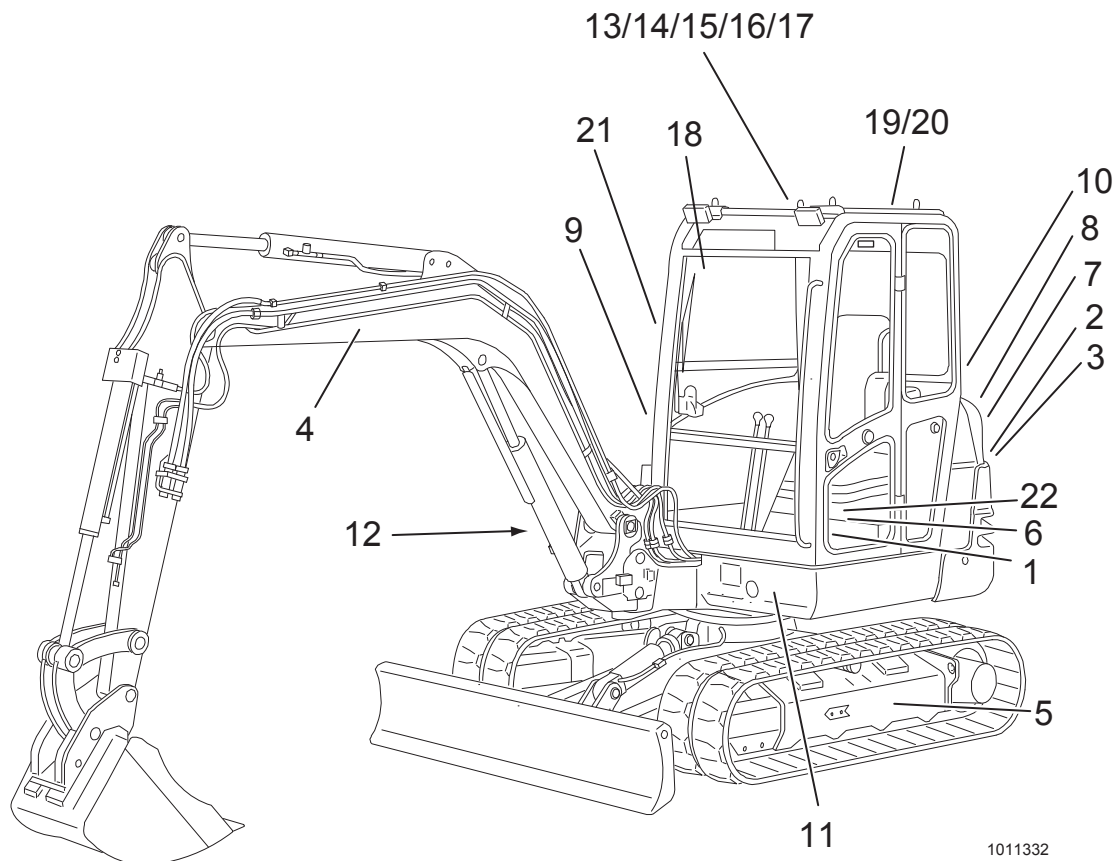
Decals and stickers

Warning and information decals

The driver must be acquainted with and observe all warning and information decals, which are attached to the machine.

Decals and stickers, which are missing or have been damaged, must be immediately replaced. Apart from that the decals must be kept in a legible, i. e. clean condition.

The spare parts number (ordering number) is printed on the respective decal or can be found in the spare parts catalogue.



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1 Warning decal! Operation and maintenance.

The warning decal is located under the driver's seat. The instructions and warnings in the operator's manual must be read carefully before using the machine for the first time. The technical documentation can be found under the driver's seat.



1011262

2 Warning decal! Open engine hood only with engine stopped.

This warning decal is located on the engine hood. Due to the risk of being injured by rotating parts it is dangerous to open the engine hood while the engine is running.



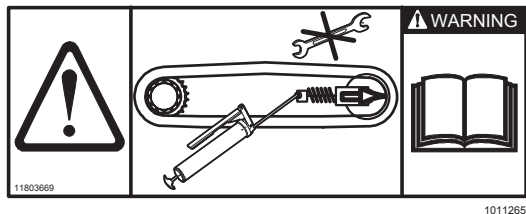
3 Warning decal! Safety distance from the area of action.

This warning decal is located on the rear covering and emphasizes that a sufficient safety distance to the area of action of the machine must be maintained to avoid injury.



4 Warning decal! Safety distance to the zone of motion.

This decal is attached to the digger arm and emphasizes that a sufficient safety distance to the zone of motion of the digger arm must be maintained, in order to rule out any danger of injury.



5 Warning decal! Track tension.

This warning decal is attached to the main chassis. It indicates that the tension of the tracks must be checked every day.



6 Warning decal! Boom.

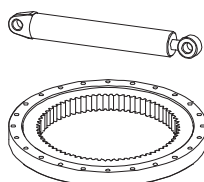
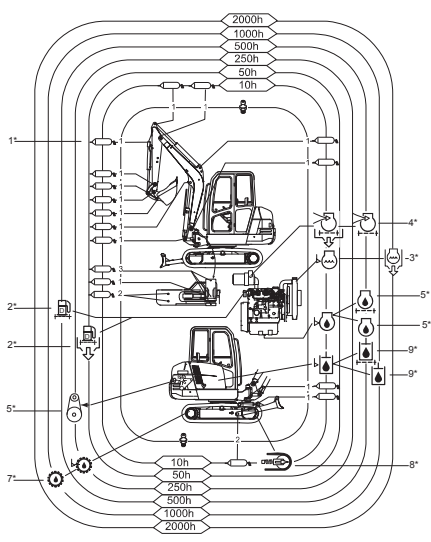
This warning decal is located under the operating console. Operate the boom only from the driver's seat! (North America only).



7 Warning decal! No ether.

This warning decal is located in the engine compartment.

Do not use ether! Danger of injury! The engine is equipped with electric preheating. (North America only).



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8 Information decal - Fuel.

This information decal is located inside the engine compartment on the fuel tank filler neck. Fuel quality, see table of fuels and lubricants on page 107.

9 Information decal - Hydraulic oil.

This information decal is located on the front of the right hand hood and points to the location of the hydraulic oil level gauge. For quality of hydraulic oil please refer to the table of fuels and lubricants on page 107.

IMPORTANT! If the hydraulic system is filled with biodegradable hydraulic oil from the factory (see sticker on filler neck), only the oil quality specified on the sticker must be used to fill up or when changing the oil.

10 Information decal - Lubrication and maintenance plan.

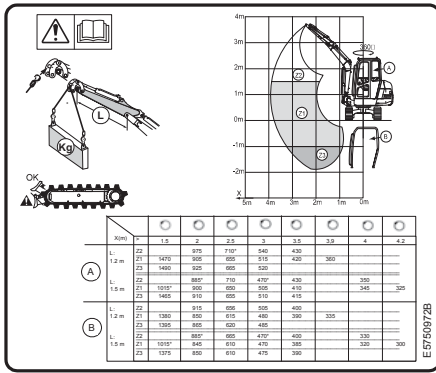
The lubrication and maintenance plan with information on lubrication and maintenance intervals is located under the engine hood; see page 104.

11 Information decal - Sound capacity level.

This information decal is located on the front side of the frame and contains information about the sound capacity level (**L_{WA}**) around the machine.

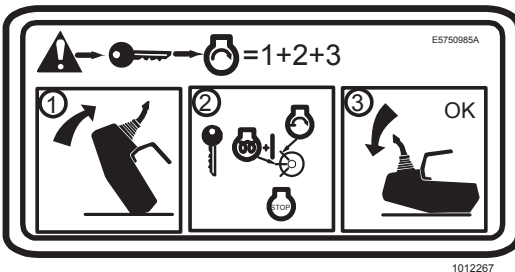
12 Information decal - Slewing ring lubrication.

This information decal is located on the front of the frame and indicates the lubrication points in this area.



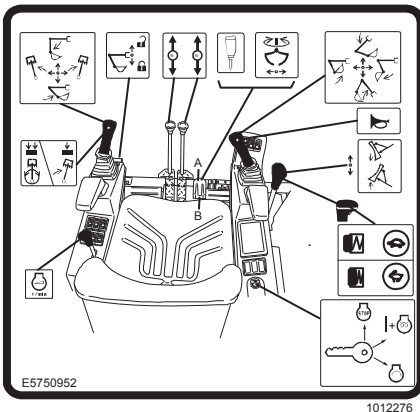
13 Information decal - Nominal lifting loads.

This information decal contains information about the nominal transport loads of the machine and is stuck to the ceiling of the operator's cab or the protection roof.



14 Information decal – Locking console.

This information decal is stuck to the ceiling of the operator's cab and explains the starting procedure.

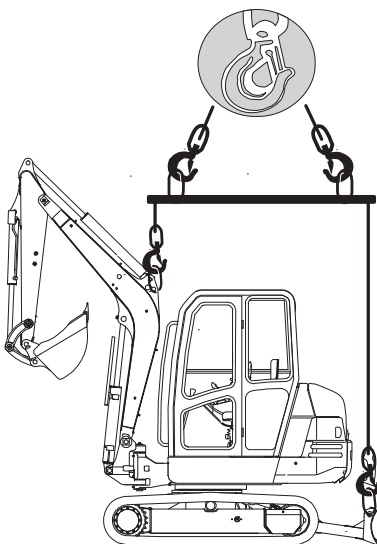


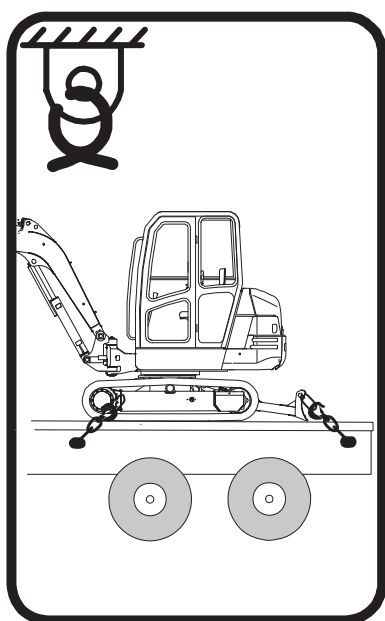
15 Information decal - Operator's stand control elements.

This information decal contains information about the control elements on the machine and is stuck to the ceiling of the operator's cab.

16 Information decal – Loading, Unloading/Lifting the machine.

This information decal is stuck to the ceiling of the operator's cab and indicates the loading/lifting points on the machine.





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17 Information decal – Tie down.

This information decal contains information about the tie-down points for transporting the machine and is stuck to the ceiling of the operator's cab.



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18 Information decal – Emergency exit.

In events of emergency leave the cab through the emergency exit.

Volvo Construction Equipment	
Volvo Compact Equipment sas BP 119 - 01303 BELLEY Cedex - FRANCE	
Identification	TOPS ISO 12117
	ROPS ISO 3471 and SAE J1040
Maximum mass	4560 KG (10055 LBS)
Type	283-284
VOLVO	

1011329

19 Information decal - TOPS and ROPS.

This information decal is located on the cab above the rear windscreen. TOPS (Tip-Over-Protection-Structure) and ROPS (Roll-Over-Protection-Structure) provide roll over protection in case the machine should turn over.

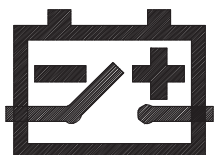
IMPORTANT! Therefore, hold firmly onto the machine if the machine should tip or roll over. Do not jump off!

Volvo Construction Equipment	
Volvo Compact Equipment sas BP 119 - 01303 BELLEY Cedex - FRANCE	
Identification	FOPS SAE J1043
	FOPS Level I ISO 3449 and ISO 10262
Type	283-284
VOLVO	

1011328

20 Information decal - FOPS.

This information decal is located on the cab above the rear windscreen. FOPS (Falling-Object-Protection-Structure) provides protection against falling down objects.



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21 Information decal - Battery disconnecting switch.

This information decal is located on the ride hand side cover. The battery disconnecting switch is used to interrupt the electric power supply.



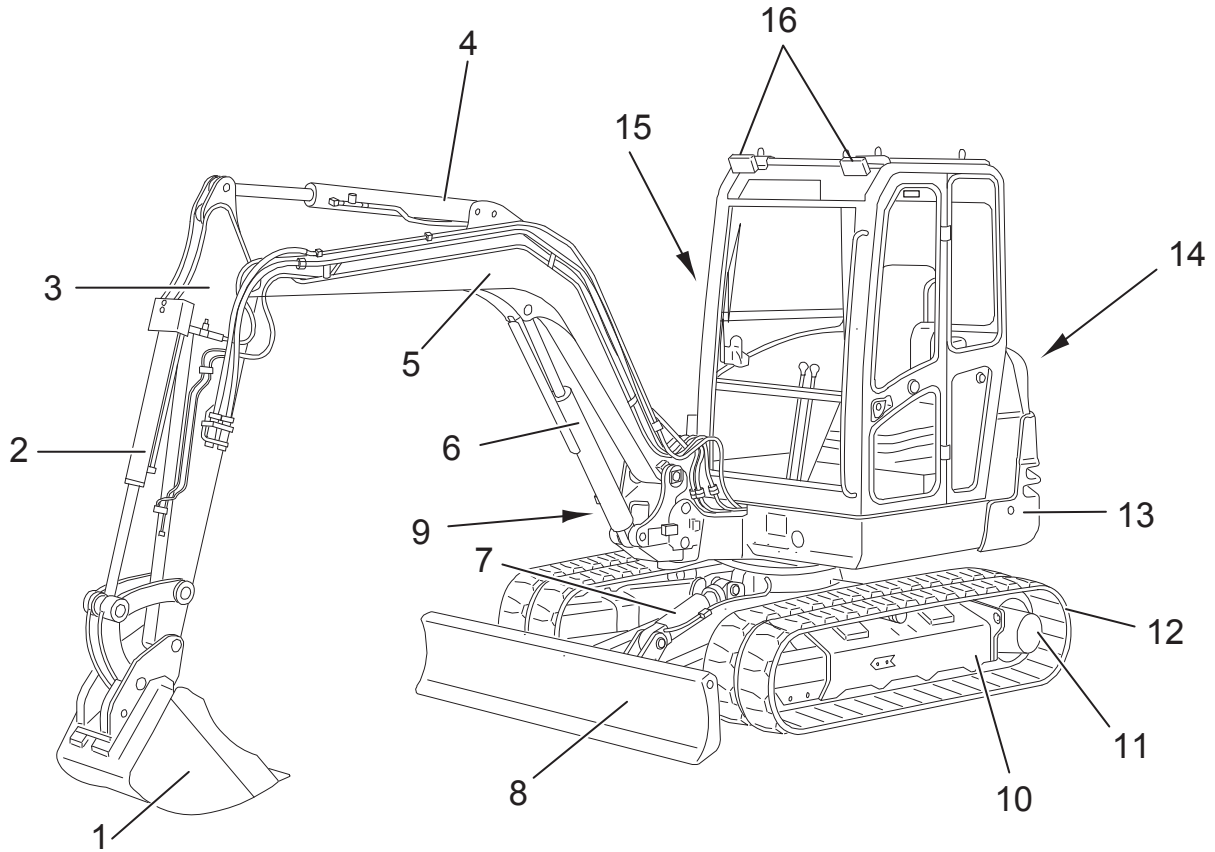
1011271

22 Information decal - Seat height adjustment.

This information decal is located on the driver's seat and informs about the height adjustment feature.

General view

Position of the various machine components



1012221

1	Bucket
2	Bucket cylinder
3	Dipper arm
4	Dipper cylinder
5	Boom
6	Boom cylinder
7	Dozer blade cylinder
8	Dozer blade
9	Boom offset cylinder
10	Main chassis
11	Travel system
12	Tracks
13	Upper structure
14	Engine hood
15	Hydraulic system cover
16	Working headlights

The USA Federal Clean Air Act

The Federal Clean Air Act Section 203 (a) (3) prohibits the removal of air pollution control devices or the modification of an EPA-certified non-road engine to a non-certified configuration.

The Federal regulations implementing the Clean Air Act for non-road engines, 40 C.F.R. Section 89.1003(a)(3)(i), reads as follows:

The following act and the causing thereof are prohibited:

For a person to remove or render inoperative a device or element of design installed on or in a non-road engine vehicle or equipment in compliance with regulations under this part prior to its sale and delivery to the ultimate purchaser or for a person knowingly to remove or render inoperative such a device or element of design after the sale and delivery to the ultimate purchaser.

The law provides a penalty of up to \$2,500 for each violation.

An example of a prohibited modification is the recalibration of the fuel system so that the engine will exceed the certified horsepower or torque.

You should not make a change to an EPA-certified non-road engine that would result in an engine that does not match the engine configuration certified to meet the Federal Standards.

Customer Assistance

Volvo Construction Equipment wishes to help assure that the Emission Control System Warranty is properly administered. In event that you do not receive the warranty service to which you believe you are entitled under the Emission Control System Warranty, you should contact your nearest Volvo Construction Equipment Regional office for assistance.

Normal Non-Road Engine Use

The Maintenance Instructions are based on the assumption that this conventional machine will be used as designated in the Operator's Instruction Manual and operated only with the specified fuel and lubrication oils.

Non-Road Engine Maintenance

The non-road engine is of conventional design and any local dealer may perform the necessary non-road engine emission control maintenance defined in this manual.

Volvo recommends that the purchaser use the service program for the non-road engine, known as Preventative Maintenance, including the recommended engine emission control maintenance.

In order to document that the proper regular maintenance has been performed on the non-road engine, Volvo recommends that the owner keep all records and receipts of such maintenance. These records and receipts should be transferred to each subsequent purchaser of the non-road engine.

Service Performed By Your Local Dealer

Your local dealer is best qualified to give you good, dependable service since he has trained service technicians and is equipped with genuine original manufacturer's parts and special tools, as well as the latest technical publications. Discuss your servicing and maintenance requirements with your local dealer. He can tailor a maintenance program for your needs.

For regular scheduled service or maintenance, it is advisable to contact your local dealer in advance to arrange for an appointment to ensure availability of the correct equipment and service technician to work on your machine. This will aid your local dealer in efforts to decrease service time on your machine.

Preventative Maintenance Program

To retain the dependability, noise level and exhaust emission control performance originally built into your conventional non-road engine, it is essential that the non-road engine receive periodic service, inspections, adjustments and maintenance.

Fuel System

Fuel Recommendations

The fuel used must be clean, completely distilled, stable and non-corrosive. Distillation range, cetane level and sulfur content are most important when selecting fuel for optimum combustion and minimum wear.

Engine working conditions and ambient temperature influence the selection of the fuel with respect to cold handling properties and cetane levels.

In cold weather conditions, below 32 °F (0 °C), the use of lighter distillate or higher cetane level fuel are recommended. (Final boiling point max. 660 °F (349 °C) and a cetane min 45).

To avoid excessive deposit formation and to minimize the emissions of sulfur dioxide into the ambient air, the sulfur content of the fuel should be the lowest available. The diesel fuels recommended for use in Volvo engines should meet ASTM designation: D 975 No. 1D (C-B) or No. 2D (T-T); with a cetane level above 42 and sulfur content not exceeding 0.5 percent by weight.

Check for fuel leaks (while the engine is running at fast idle):

- Visually check unions and hose connections.

Check the conditions of the fuel hoses for:

- Aging
- Cracks
- Blisters
- Scuffing

Check the condition of the fuel tank:

- Drain water condensation.
- Check for cracks.
- Check for leaks.
- Check the mounting.

Check the turbocharger:

Visually check for leaks in the intake hoses and exhaust pipe of the turbocharger.

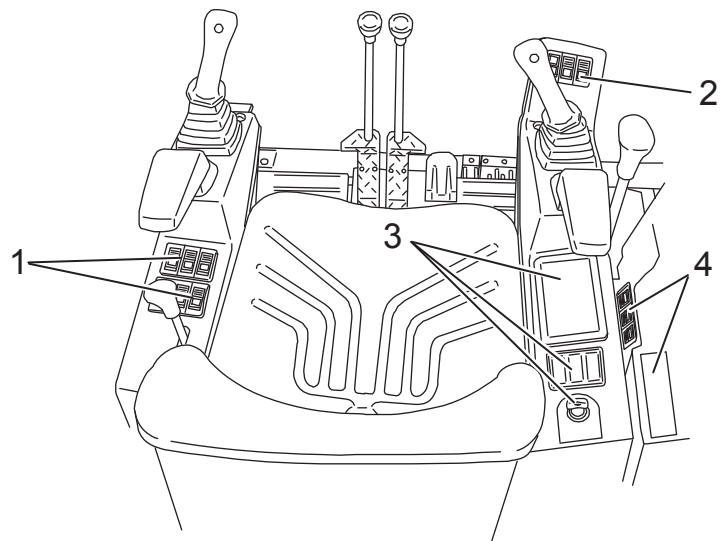
Instrument panels



WARNING!

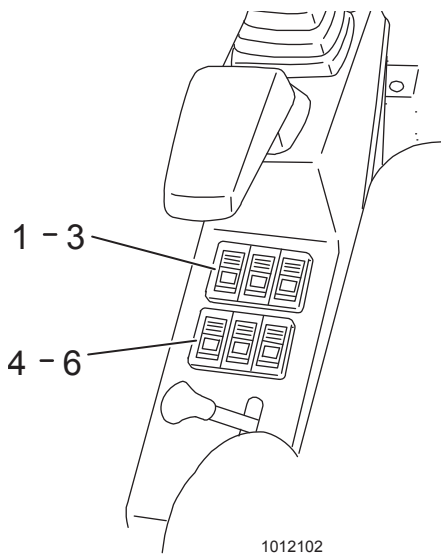
Before taking the machine into operation you should become familiar with the location and function of all gauges and control elements. You should therefore thoroughly read these operating instructions. Your personal safety is concerned!

Keep the manual in the cab so that it is always at hand when needed.



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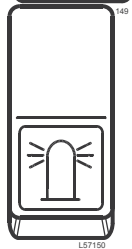
1	Left hand instrument panel
2	Front instrument panel
3	Right hand instrument panel
4	Rear instrument panel



Left hand instrument panel

The left hand instrument panel contains switches for the operation of attachments and optional equipment.

- 1 Quick release system unlocking switch (option).
- 2 Switch for rotating beacon (option).
- 3 Quick release system unlocking switch (option).
- 4 Reserve (option).
- 5 Switch for working head lights.
- 6 Reserve (option).



1 Quick release system unlocking switch (option)

- Switch to unlock the quick release system. This function is activated by simultaneous pressing of the two unlocking switches.

2 Switch for rotating beacon (option)

- Operation switches the rotating beacon on and off.

NOTE! When shutting the engine down while the rotating beacon is on, the rotating beacon will stay on.

3 Quick release system unlocking switch (option)

- Switch to unlock the quick release system. This function is activated by simultaneous pressing of the two unlocking switches.

4 Reserve (option).

5 Switch for working lights on cabin

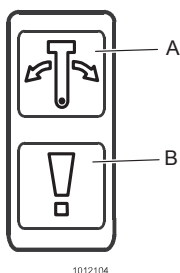
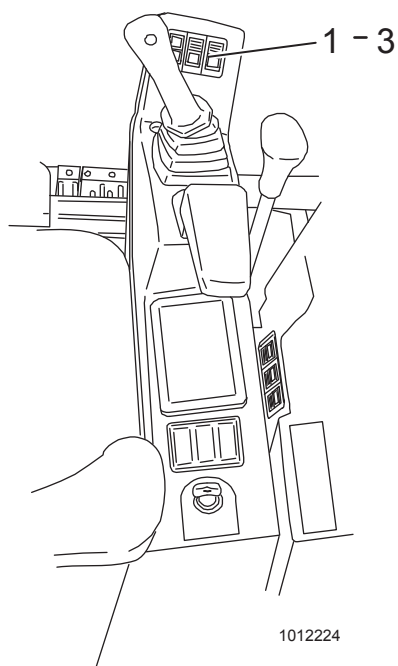
- When actuated the working lights on the cab can be switched on and off.

NOTE! The working lights can only be switched on if the ignition has been activated (running position/position 2). If the excavator is fitted with a protection roof this switch also activates the rear working light.

6 Reserve (option).

Front instrument panel

- 1 Offset/slewing control light. Control light (reserve, option).
- 2 Switch for working head lights.
- 3 Switch for fast travel speed.



1 (A) Offset/slewing control light

1 (B) Control light (reserve, option).



2 Switch for working lights on boom (option)

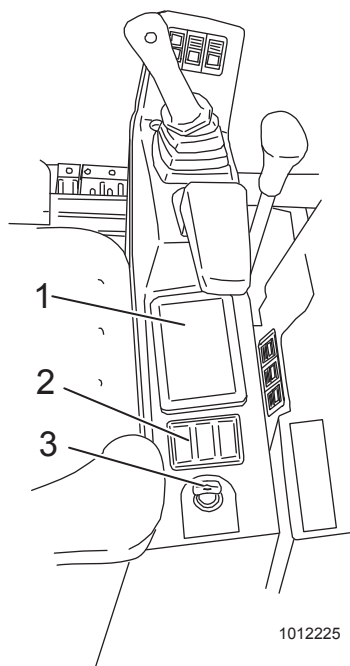
- When actuated the working light on the boom can be switched on and off.

NOTE! The working lights can only be switched on if the ignition has been activated (running position/position 2).



3 Switch for fast travel speed

- When actuated the travel speed changes.



Right hand instrument panel

The right hand instrument panel contains control elements to start, stop and secure the machine.

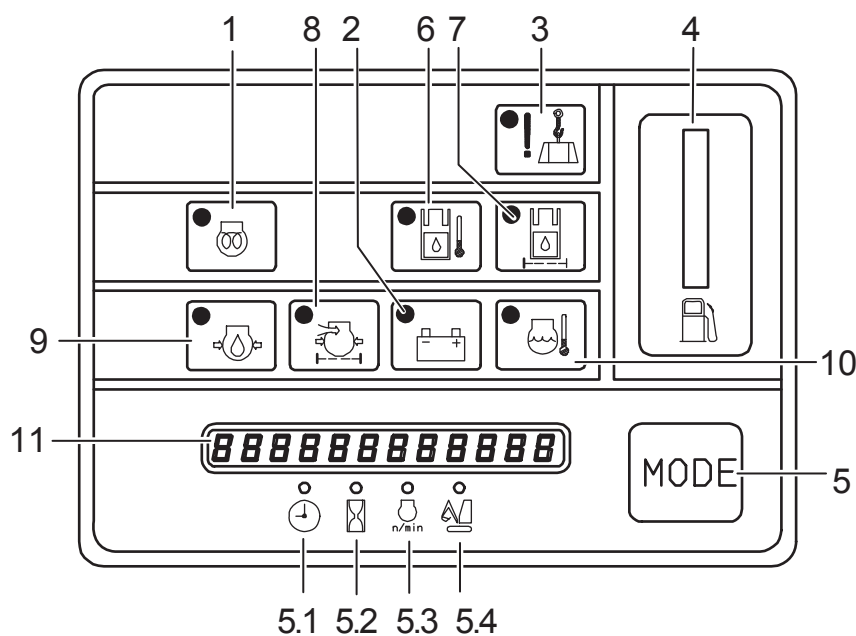
- 1 "PUMA" instrument panel
- 2 Anti-theft device (option)
- 3 Ignition switch

1 "PUMA" instrument panel

The "PUMA" (Processing Unit Monitoring Assistance) instrument panel contains gauges, control and warning lights.

During operation 3 different audible warning signals (peep-sounds) may sound:

- An extended warning signal after shut-down (with the ignition key), which signalizes deactivation of the functions.
- A triple warning signal indicates that the machine needs to be serviced (standard maintenance).
- 4 successive high pitch warning signals indicate a severe fault, which needs to be rectified immediately (high urgency alarm).



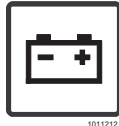
Control lights and buttons with an audible warning signal (Deactivation or confirmation of function)

1 Preheating control light



Ignition key in "Running/Preheating" position, the control light lights up and goes out as soon as the engine has reached the specified operating temperature. Preheating see page 41.

2 Battery control light - charge control



- The control light indicates the charge condition of the battery. The control light goes out as soon as the engine is running. The control light lights up if the battery is not being charged.
- If the control light lights up during operation shut down the engine, perform trouble shooting, if necessary inform our customer service department.

3 Button and control light Overload warning (option)



- Press the button once to deactivate the function.
- The control light flashes.

NOTE! If the weight of the load is below the calibrated value the control light is permanently on. If the weight of the load is higher than the calibrated value, the control light flashes. A peep signal sounds at the same time.

- Press the button again to disable this function.
- The control light goes out.

4 Fuel level gauge



- The fuel level gauge shows the filling level in the fuel tank.
- Always refuel in due time, thus to prevent air from entering into the fuel system.
- A red control light indicates when the reserve filling level is reached. An audible warning signal is emitted.

5 "Mode" button



This button is permanently active, even when the ignition switch is in position 1/ Stop position. Each actuation of the button is confirmed by an audible signal.

The following functions are selected by successively pressing the button:

5. 1 Daily operating hour meter

Resetting the daily operating hour meter to zero:

- The engine is off. The display is in position "Daily operating hour meter".
- Press buttons "MODE" and "Overload warning" (5 and 3) together.

5. 2 Operating hour meter

(This meter cannot be reset to zero!)

5. 3 Engine speed

5. 4 Display of machine serial number



Control lights with 3 audible warning signals (standard warning)



6 Hydraulic oil temperature control light

- Control light flashes (without audible warning signal) if the oil temperature is too low.
- The control light comes on if the temperature is too high.



7 Hydraulic oil filter control light

- The control light comes on if the hydraulic oil filter is clogged.
- In this case replace the filter element immediately, even if the scheduled filter change interval has not yet been reached.



8 Air filter control light

- The control light informs about the condition of the air filter.
- If the control light lights up during operation shut down the engine, clean or replace the air filter immediately, if necessary inform our customer service department.

Control lights with 4 audible warning signals (high urgency warning)



9 Engine oil pressure control light

- This control light normally lights with the engine stopped and should go out when the engine is running.
- If the control light lights up during operation shut down the engine immediately, perform trouble shooting, if necessary inform our customer service department.



10 Engine temperature control light

This control light flashes if the coolant temperature is too low (without peep signal) or too high (with peep signal) and finally lights permanently (with peep signal), if the coolant temperature has reached the critical level. In this case shut down the engine immediately!



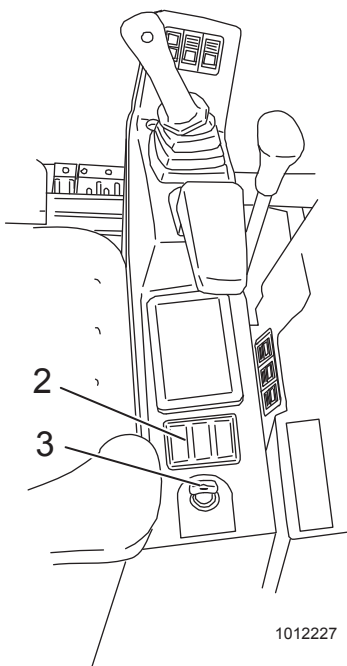
11 Digital display

Shows the different functions or "codes and fault messages".

During normal operation of the machine the display shows the selected function (e. g.: time or engine speed). If a fault is detected, the corresponding message will be displayed in form of a fault code. This message will be displayed with priority, until the fault is eliminated. Fault messages see section Relays and fuses on page 115.

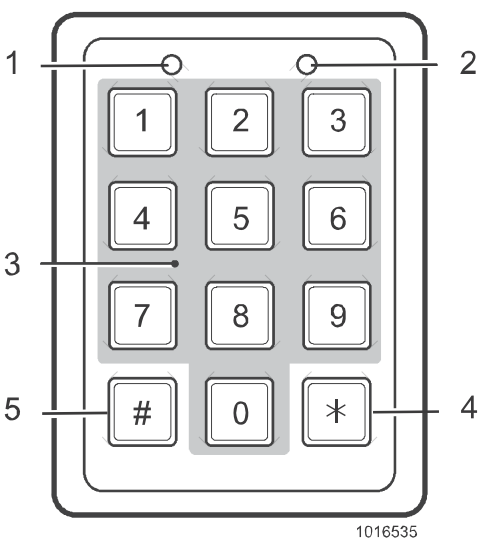
PUMA self-test

NOTE! After switching off the electric power supply, manually by means of the battery disconnecting switch (optional equipment) or by the internal function of the "PUMA"-control, the control will run a self-test after switching the electric power supply back on with the battery disconnecting switch or by turning the ignition key to position "2". This test normally takes about 2 seconds. In exceptional cases it may take up to 40 seconds. However, in this phase the engine can be started. After the self-test the display shows the excavator type and the software version for a short moment.



2 Anti-theft device (optional equipment)

- 1 Green LED (Light Emitting Diode) shows the function of the keyboard.
 - Lights for a moment when pressing one of the keys.
- 2 Red function LED shows the status of the anti-theft device.
 - Flashes, if the machine can be started without entering the code.
 - Lights permanently if the anti-theft device is activated. The machine cannot be started.
- 3 Keys for input of code.
 - The system allows for the use of a maximum of two 4-digit codes. The machine can be protected by either one or two codes. In either of these cases the engine can be started after one of the two codes is entered. Both codes can be individually changed.
- 4 Key to confirm or release a code.
- 5 Key to edit a stored code.








Function

- 1 Insert the ignition key into the ignition switch and turn it to "Running" position (position 2), the red LED (2) lights permanently.
 - 2 Enter the code (4-digit), press key (4) and start the engine. The red LED (2) flashes.
- When shutting down the engine (ignition key in stop position (position 1)) the anti-theft device is activated after 15 minutes. After this the code must be entered again for starting.
 - However, the anti-theft device can also be activated directly, which requires to enter the code and press key (4) before switching off the ignition.
 - If the pause between the input of each digit exceeds ten seconds, the input of the code must be repeated from the beginning.
 - The input of the code must also be repeated if the input is interrupted by switching off the ignition or the battery.
 - Disconnecting the battery automatically activates the anti-theft device.

Changing the code

- 1 Insert the ignition key into the ignition switch and turn it to "Travel Position" (position 2). Enter the current code and press key

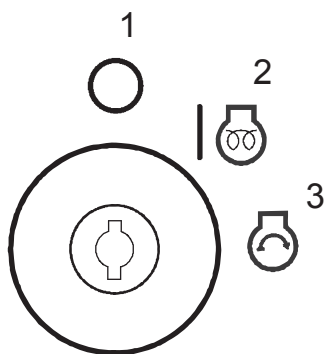
1	Code (current) + 	Unlocking or enabling the anti-theft device.
2	Code (current) + 	Preparing the anti-theft device to change the code.
	Code (current) + 	
3	Code (new) + 	Setting the new code for the anti-theft device.
	Code (new) + 	

(4) to unlock or enable the anti-theft control. The red function LED flashes.

- 2 Enter the current code, press key (5), enter the current code again and press key (5) again to confirm the programming (both control lights light up for approx. 1 sec.).
- 3 Enter the new code, press key (5), enter the new code again and press key (5) again to confirm programming of the new code (both control lights light up for approx. 1 sec.).

Factory code

- If both codes are unknown, or have been inadvertently edited, you must inform the customer service department of Volvo about the serial number of the machine, so that the anti-theft device can be deactivated.
- After validation you will receive the auxiliary code, which enables you to delete both programmed codes. After this you can again individually program one or two codes.

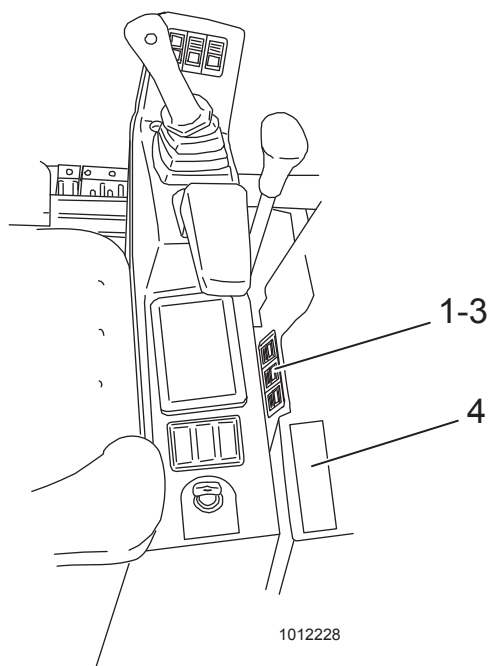


1012231

3 Ignition switch

The ignition switch is used for preheating and starting. The ignition switch has three positions:

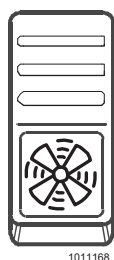
- 1 Stop position
- 2 Running position (activation of electric system)/
Preheating position
- 3 Start position



Rear instrument panel

The rear instrument panel contains switches for cabin ventilation, cleaning of windscreens and optional functions.

- 1 Cab ventilation switch.
- 2 Switch for cleaning of windscreen.
- 3 Reserve.
- 4 Radio with cassette player (option).



1 Cab ventilation switch

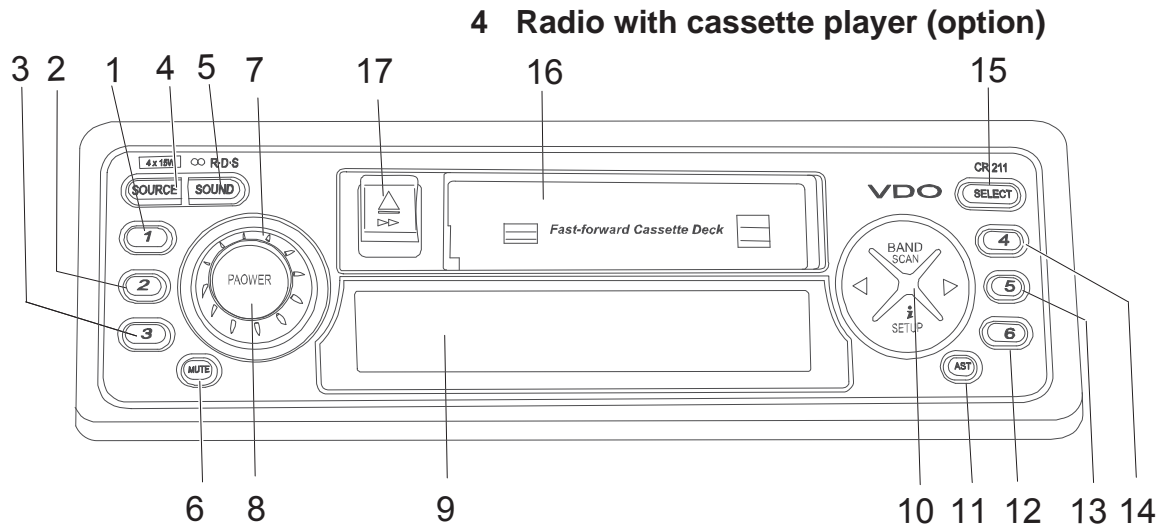
- Two-stage switch for cab ventilation.



2 Switch for cleaning of windscreen

- Switch for windscreen wiper and washing water.

3 Reserve (option).



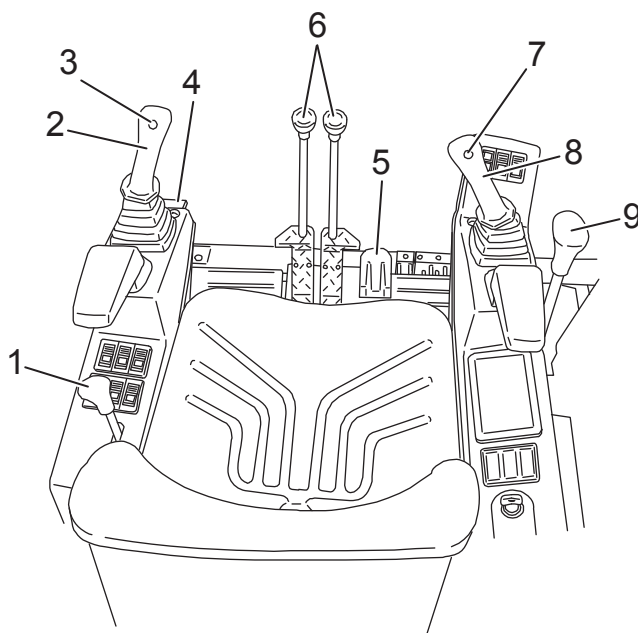
1011246

- 1 Memory button
- 2 Memory button
- 3 Memory button
- 4 Search/ fast search
- 5 Volume - volume type
- 6 Mute - mute on/off
- 7 Volume control
- 8 On / Off
- 9 Display
- 10 Cassette player / station selection
- 11 Automatic saving
- 12 Memory button
- 13 Memory button
- 14 Memory button
- 15 Selection
- 16 Eject tape
- 17 Tape eject/ Fast forward

NOTE! For further information on operation of the radio and cassette unit please refer to the operating instructions issued by the manufacturer.

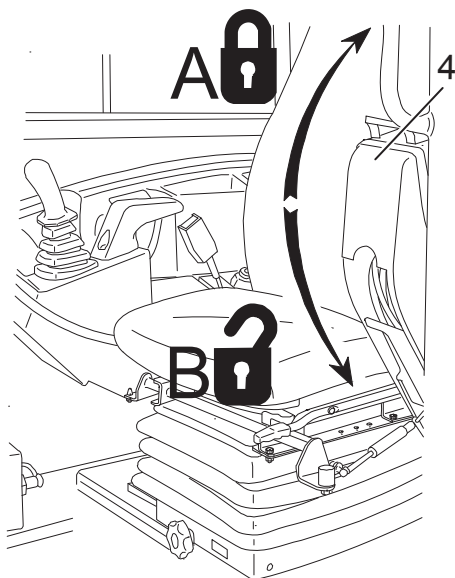
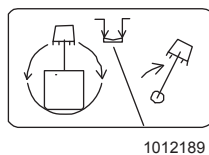
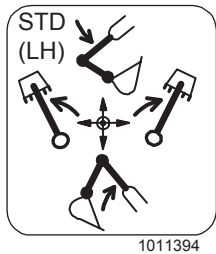
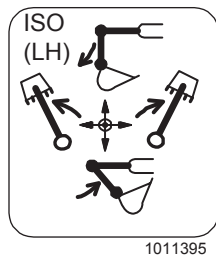
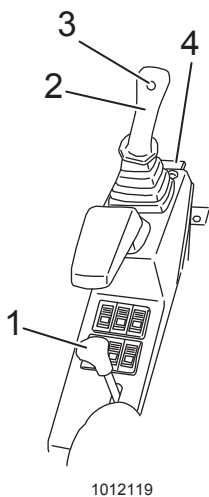
Other controls

Controls



1012118

1	Throttle lever
2	Left hand control lever for excavator attachment
3	Selector switch "Slewing or Offset"
4	Safety lock for working and travel hydraulics
5	Pedal for optional equipment
6	Control levers for travel motion
7	Warning horn switch
8	Right hand control lever for excavator attachment
9	Dozer blade control lever



1 Throttle lever

- Pull the lever back to raise the engine speed.
- Push the lever fully forward before shutting down the engine.

2 Left hand control lever for excavator attachment (ISO control pattern)

- Lever forward: Extending the dipper arm.
- Lever backward: Retracting the dipper arm.
- Lever to the right: Slewing movement to the right (or lateral offset).
- Lever to the left: Slewing movement to the left (or lateral offset).

2 Left hand control lever for excavator attachment (STD control pattern, optional equipment)

- Lever forward: Boom down.
- Lever backward: Boom up.
- Lever to the right: Slewing movement to the right (or lateral offset).
- Lever to the left: Slewing movement to the left (or lateral offset).

NOTE! Market dependent optional equipment. North America only. Control pattern selector switch, see page 32.



WARNING!

Read and understand the corresponding control pattern before starting operation!

3 Selector switch "Slewing or Offset"

- When actuating this switch the control lever control changes as follows, depending on the position:
- Actuation: "Excavating attachment offset" or "Slewing movement".

NOTE! The slewing function is the initial control!

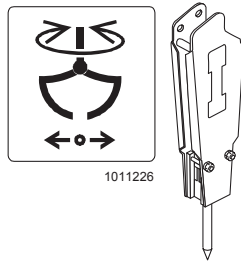
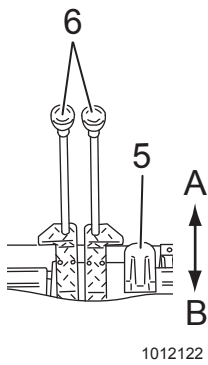
4 Safety lock for working and travel hydraulics

- Move the console back to position (A). The operating levers for working and travel hydraulics are locked (no movement possible).
- Move the console forward to position (B). The operating levers for working and travel hydraulics are unlocked (working position).

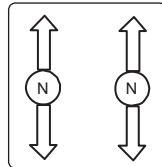


WARNING!

Before leaving the cab lower the excavating attachment to the ground. Pull the safety locking lever back to lock the control functions.



1012190



5 Pedal for optional equipment

- Pedal for optional equipment, such as hammer or clamshell (option).
- Actuation of the pedal executes the function of the optional equipment.

6 Control levers for travel motion

- Push both levers forward: Forward travel.
- Pull both levers backward: Reverse travel.
- Pull left lever backward: Turn left.
- Pull right lever backward: Turn right.



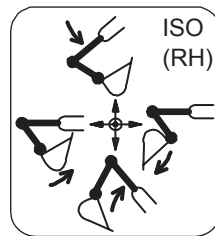
WARNING!

If the dozer plate is in rear position (180 degree rotation), travel system operation is reversed.



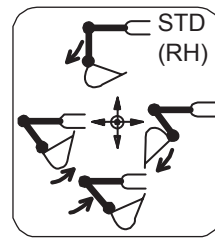
7 Warning horn switch

- Button depressed: Horn signal.



8 Right hand control lever for excavator attachment (ISO control pattern)

- Lever forward: Boom down.
- Lever backward: Boom up.
- Lever to the right: Empty the bucket (opening).
- Lever to the left: Fill the bucket (closing).



8 Right hand control lever for excavator attachment (STD control pattern, option)

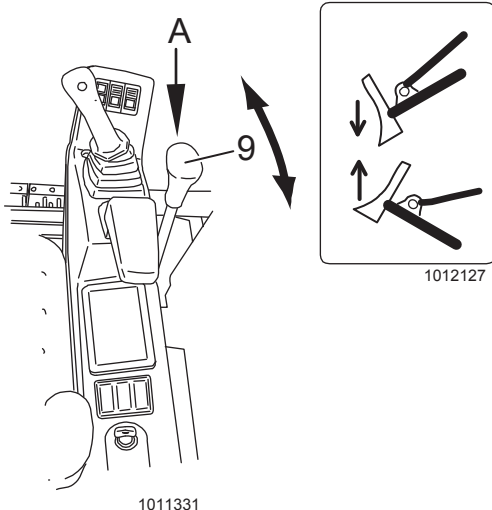
- Lever forward: Extending the dipper arm.
- Lever backward: Retracting the dipper arm.
- Lever to the right: Empty the bucket (opening).
- Lever to the left: Fill the bucket (closing).

NOTE! Market dependent optional equipment. North America only. Control pattern selector switch, see page 32.



WARNING!

Read and understand the corresponding control pattern before starting operation!



9 Dozer blade control lever

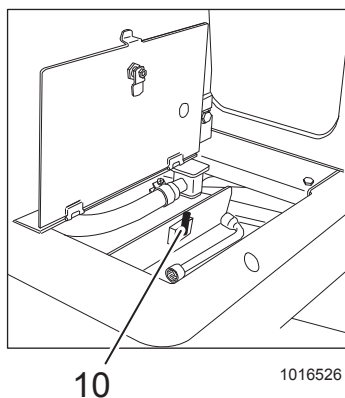
The control lever controls the height of the dozer blade.

- Lever forward: Dozer blade down.
- Lever backward: Dozer blade up.

A Button to activate fast travel speed gear.

- Hold button depressed: Fast speed is activated.
- Button released: Fast speed is deactivated.

NOTE! Fast speed is automatically disabled when the button is released. The switch for fast speed in the front instrument panel does not need to be activated!



10 Control pattern selector switch (ISO/STD) (option)



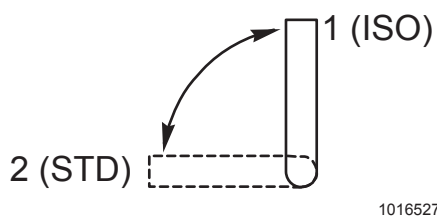
WARNING!

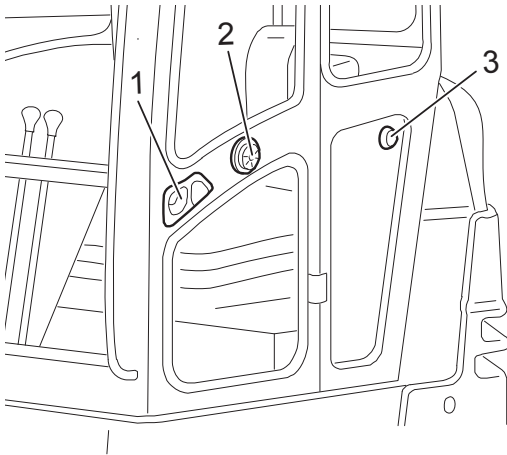
Read and understand the control pattern before switching the control pattern selector switch over.

The control pattern selector switch (10) is located in the tool rack. This rack is located in travel direction right above the offset cylinder.

- Lever in vertical position (1): ISO control pattern.
- Lever in horizontal position (2): STD control pattern (option).

NOTE! Market dependent optional equipment. North America only.





1012132

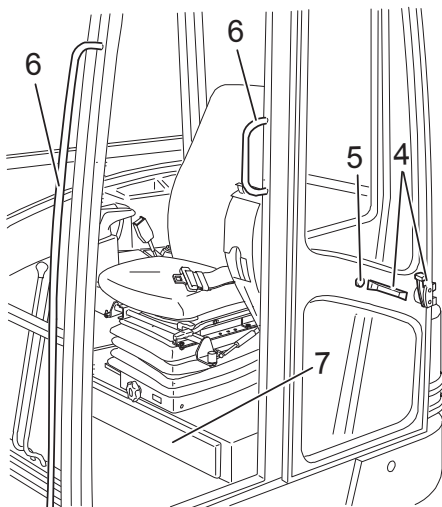
Cabin

Access to cab

- The cab door is fitted with an external door handle with a lock (1) and an internal door handle (4).
- The door can be locked in open position by application of manual force (a fixed locking bolt (3) on the cab engages in the round bolt receptacle (2) in the door).
- By pressing the unlocking button (5) the cab door can be unlocked and closed.

IMPORTANT! Use handholds (6) to access the cab. Always use the "3-point approach" to access or leave the cab, i.e. two hands and one foot or one hand and both feet.

NOTE! On machines with protective roof use the frame to access or leave the machine.



1012233

Cab equipment

Working lights

- The working lights (8) are used to illuminate the working area under insufficient light conditions. The working lights are mounted at the front (standard) and rear (option) of the cab.

Drawer

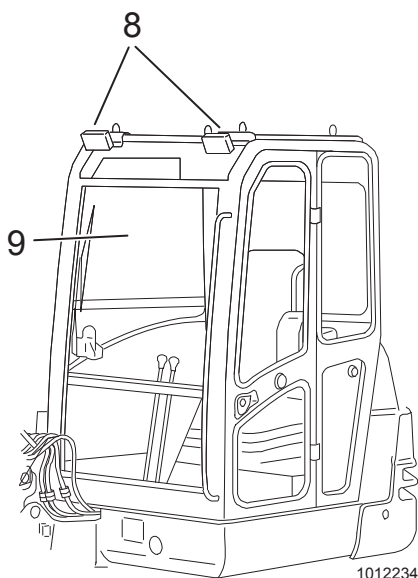
- The drawer (7) is used to store documents and onboard tools.

Windscreen

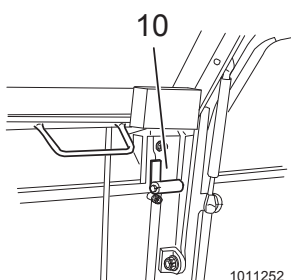
- The windscreen (9) can be loosened by turning the turning locks (10) and push up under the cab roof.

IMPORTANT! Secure the windscreen under the cab roof with turning locks, thus to prevent unintended closing.

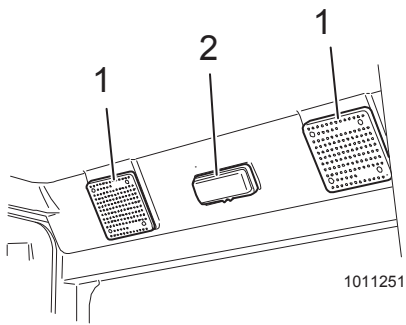
- To close the windscreen (9) proceed in reverse order.



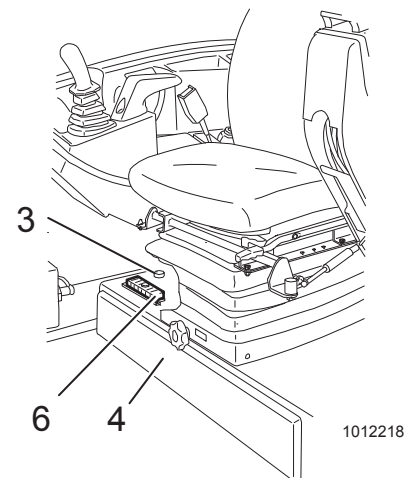
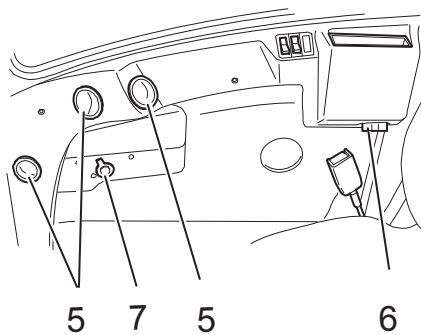
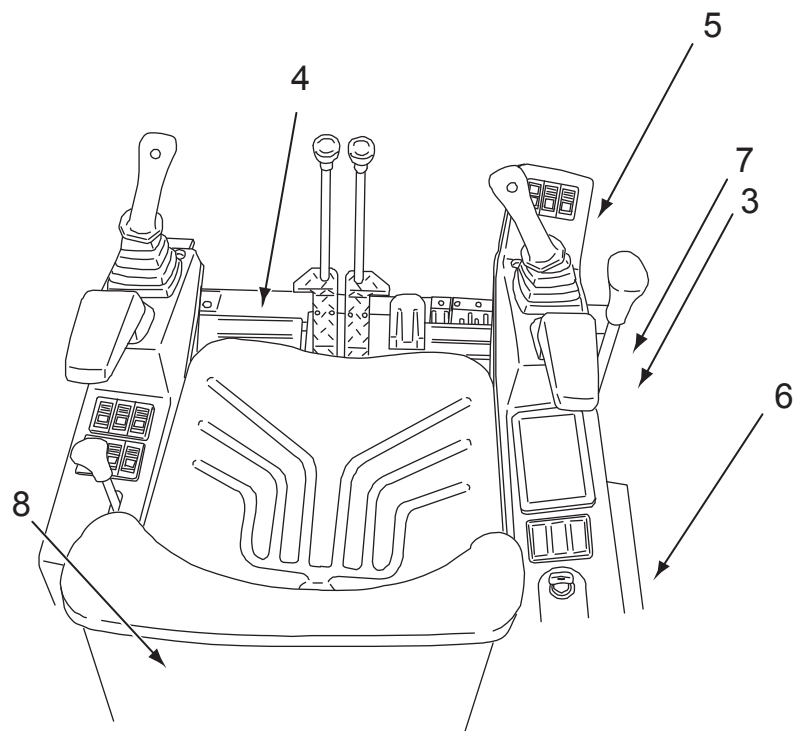
1012234



1011252

**Interior equipment**

- 1 Loudspeaker
- 2 Cab light
- 3 Adjustment of the heating at the right under the operator's seat.
- 4 Storage compartment for operator's manuals
- 5 Ventilation or warm air nozzle.
- 6 Fuses in cab.
- 7 Washing water tank filler neck.
- 8 Possible location for fastening a fire extinguisher.



Operator's seat

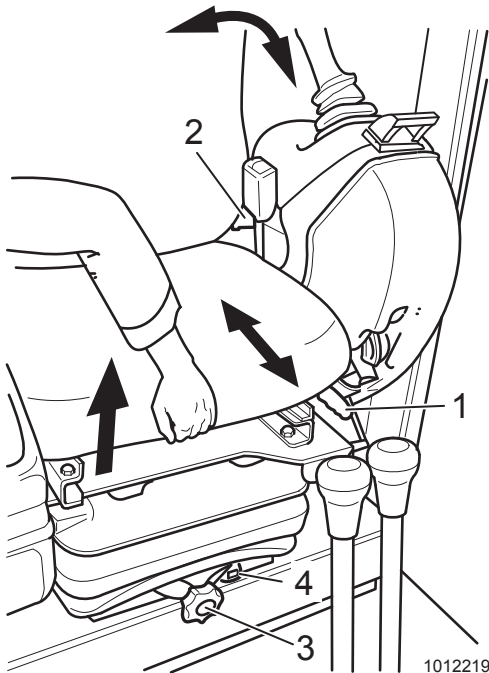
A correctly adjusted operator's seat is an essential contribution to operator comfort and safety!

Operator's seat settings



WARNING!

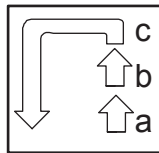
Do not adjust the operator's seat while the machine is moving.



1012219



1011271



1011176

Horizontal adjustment

- Pull lever (1) slightly up:
- Adjust the seat to the desired position.
- Check that the seat has properly engaged.

Backrest adjustment

- Pull lever (2) slightly up.
- Adjust the inclination of the backrest.
- Once the backrest is locked in position, the inclination can no longer be changed.
- Pull the lever up again to unlock and adjust the backrest.

Weight adjustment

- By turning the little wheel (3) clockwise or anti-clockwise a lighter or heavier weight of the operator can be adjusted on the scale (4).
- The value displayed by the scale (4) corresponds with the different seat hardness settings.

Adjusting the seat height

The seat height is adjusted without having to operate a lever. Pull the seat with both hands up to a higher position.

To raise the seat:

- Lift the seat with both hands, until it clicks audibly into place. 3 positions (a), (b) and (c) are possible.

To lower the seat:

- Lift the seat with both hands fully up; it will then engage again in lowest position.

Seat belt



WARNING!

The seat belt must be replaced immediately if it is damaged or has been strained in an accident.

IMPORTANT! Due to soiling by water and dirt the seat belt must be replaced every 3 years!

Operating instructions

General instructions

The following text is a compilation of rules which should be followed and recommendations which are intended to be of assistance when operating the machine.

However, the rules do not relieve the operator from obeying local laws and other national safety regulations. Alertness, sensible action and compliance with the safety regulations that apply for construction sites and work places as is mandatory in order to avoid the risk of accidents and to enable safe work with the machine.



Safety regulations for operation

Duties of the driver

- Before starting to drive read the operating instructions to become familiar with the machine.
- The operator should know and take into consideration the requirements and risks at the workplace and discuss these with the site management.
- In order to avoid personal injuries and material damage the driver must therefore memorize the following basic regulations.
- Never allow untrained or unqualified persons to operate the machine.
- The operator may not drive the machine when under the influence of alcohol, medication or other drugs.
- The operator is fully responsible for the load or the loading of the machine on construction sites.
 - During operation there should not be a risk of the load falling off.
 - Do not pick up loads which represent an apparent safety risk.
 - Observe the specified load limit or loading limit for the machine. Consider the effect of different distances and observe the centre of gravity of the attachments.
- Do not allow anyone to remain in the working range of the machine.
 - Do not allow persons to stand under lifted loads, unless the load is secured or safely supported.
 - Do not allow persons to enter or remain in the danger zone, i.e. a distance of at least 7 m to all directions around the machine in operation must be maintained. The operator may allow a person to remain in the danger zone only when the person is within his range of vision.
- Accidents and incidents should be immediately reported to the site management.
 - If possible leave the machine in its position.
 - Only take necessary action so as to reduce the effect of damage, especially personal damage or to treat injuries.
 - Refrain from any action which would complicate a later investigation of the incident.



WARNING!

Drivers of construction equipment and the responsible site management are responsible for the working area of the machine and have the power to order unauthorized persons to leave such areas while work is in progress. During work highest attentiveness to front and rear is required in order to avoid collisions.



WARNING!

It is not permitted to sit or stand in an inadequate place on the machine, i.e. on the attachment (bucket, fork, platform etc.) or on any optional equipment, thereby impairing the possibilities of the driver to operate the machine in a safe way.

Safety of the operator

- The machine must be in functional condition. Faults that may lead to accidents must be rectified.
- Wear suitable protective clothing for safe operation of the machine.
- A mobile phone should not be used if it could interfere with the functions of the electronic system. The mobile phone must be connected to the electrical system of the machine. Apart from that an aerial must be mounted to the outside of the machine as specified by the manufacturer.
- Start the engine only from the operator's seat.
- Keep your hands away from areas where there is a risk of crushing.
- Always wear your seat belt.
- Always climb onto or off the machine with your face towards the machine and use access steps and grips, always have both hands and one foot or both feet and one hand on the machine. Do not jump off!
- Check that attachments are properly attached and locked.
- Operation related vibrations may be harmful to the operator. Reduce these by:
 - Correct adjustment of operator's seat and seat belt.
 - Condition of terrain for operation, dips and potholes (level if necessary).
 - Match travel and engine speed.
- The cabin serves as protection for the operator and meets the requirements for the TOPS and ROPS testing standard. Therefore, hold firmly onto the machine if the machine should roll over. Do not jump off!
- The cabin is also designed to meet the requirements for protection against falling objects according to the FOPS standard level 1.
- The operator must be informed about underground pipes or power cables when working in such an area.
- Power cables must be appropriately protected against damage, if necessary switch off the power supply.
- Information about shut-off taps for gas and water should be made available, so that these supplies can be quickly shut off, in case of a pipe damage.

Measures before operation

- 1 Before taking the machine into operation you should become familiar with the location and function of all gauges and control elements. You should therefore thoroughly read these operating instructions. Your personal safety is concerned!
- 2 Before starting the engine walk around the machine and check for any leaks and damaged or loose parts which could cause damage.
- 3 Perform the daily maintenance according to the lubrication and maintenance plan. Apart from that check or perform the following points.
 - Fuel level in fuel level (check only with ignition switch in running position ("position 2")).
 - Engine oil level
 - Hydraulic oil level
 - Coolant level
- 4 Clean warning and information decals, hand grips and access steps.
- 5 Check that the battery disconnect switch (option) is switched on.

Additional measures under cold weather conditions

- Make sure that the recommended minimum temperature of the coolant complies with the weather conditions.

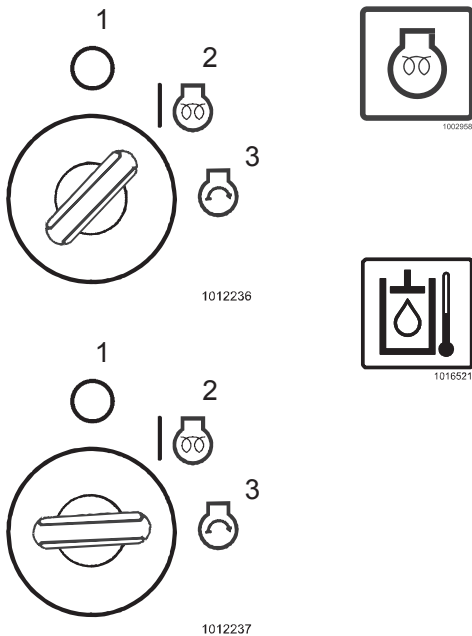
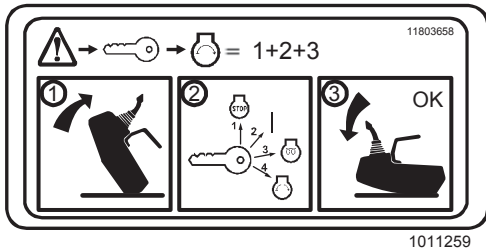
After operation

- The fuel tank should be filled at the end of each work day. This prevents the formation of condensation water, as far as possible.
- The fuel tank should never be "run dry". Fill in only clean fuel!

Maintenance

IMPORTANT! Keep the machine operational and clean. This preserves the reliability and a fully functional and clean machine is less susceptible for injuring the driver or damaging the environment.

- Inspect the machine before starting the working day. Make sure that any damage is repaired immediately, that possible leaks are sealed and that the necessary guards and safety installations are correctly in place.
- Keep cab floor and access points free of clay, grease or loose objects, which could be a source for slipping or stumbling.



Starting the engine

- 1 Insert the ignition key into the ignition switch and turn it to "Running Position/ Preheating (I)" (position 2). All control and function lights light up for a period of approx. 3 seconds.
- 2 The control lights (1) preheating, (3) engine oil pressure and (5) battery charge control must light up.
- 3 Turn the ignition key to position "Running Position/Preheating" (position 2). The "Preheating " control light (1) lights up. Pre-heat depending on engine temperature.
EC35: 15 seconds.
EC45: 15 seconds.
The preheating control light goes out after preheating. However, if the ignition key remains in "Preheating" position (position 2), the preheating function remains active, even though the control light is off.
- 4 Once the "Preheating" control light (2) has gone out turn the ignition key to position "Ignition" (position 3) and start the engine. As soon as the engine starts to run by its own power, release the ignition key (the ignition key returns to "Running Position/ Preheating" (position 2)). Do not continue to start for longer than 25 seconds without interruption.
- 5 If the engine does not start turn the ignition key back to "Stop Position" and repeat the starting procedure.

NOTE! Avoid excessive loading of the engine immediately after starting. Observe the warm-up instructions.

Warm-up instructions

- 1 Start the engine.
- 2 After a longer period of standstill and particularly at temperatures around or below the freezing point the engine must be warmed up at medium speed.
- 3 Run the engine warm for about 5...10 minutes at approx. 1/2 engine speed. During this period frequently operate the levers for the working hydraulics, whenever possible.



WARNING!

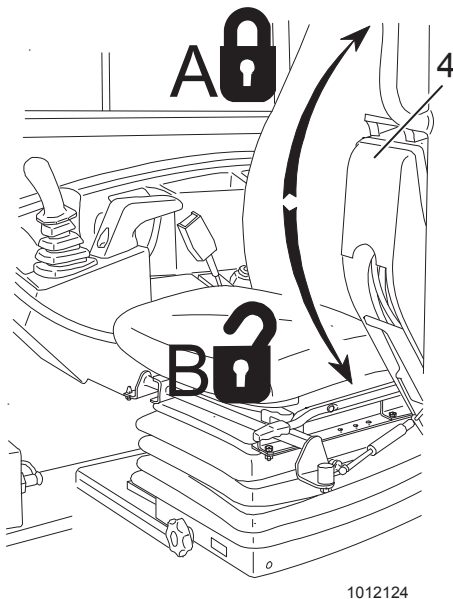
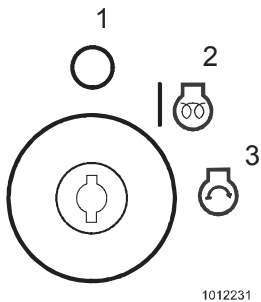
Do not turn the ignition key while the engine is running, because this will generate a surge voltage and damage the electrical system.

Stopping the engine

- 1 If possible park the excavator on a solid, level base and lower the working attachment to the ground.
- 2 Reduce the engine speed: Set the throttle lever to "idle speed position".

NOTE! Do not shut the engine down all of a sudden from full load, but let it idle for a short while for temperature equalization.

- 1 To shut the engine down turn the ignition key in the ignition switch to "Stop position" (position 1)!
- 2 All control lights go out.
- 3 Check whether all switches and control elements are switched off or out of function.
- 4 Pull the ignition key out of the ignition switch when it is in "Stop position" (position 1).
- 5 Position console (4) in position (A) for interlocking. The operating levers for working and travel hydraulics are locked (no movement possible).
- 6 Interrupt the electric supply with the battery disconnecting switch (option).



WARNING!

Before leaving the cab lower the excavating attachment to the ground. Pull the safety locking lever back to lock the control functions.

Please consider that the risk of theft or burglary can be minimized by applying the following precautions:

- Remove the key from the ignition switch if the machine is unattended.
- Close doors, hoods and covers after work.
- Interrupt the electric power supply with the battery disconnecting switch (option) and remove the handle of the battery disconnecting switch (option).
- Park the machine at a place where the risk of theft or burglary is only minimal.
- Remove all valuables from the cab.
- Fasten the machine with a chain.

Long-term parking

IMPORTANT! If the machine is not going to be used every day, all cylinders should be greased as protection against corrosion.

- 1 Wash the machine down and touch up any damaged paint finish to avoid rusting.
- 2 Treat unprotected parts with an anti-corrosion agent. Lubricate the machine thoroughly and grease bright surfaces (lifting/tipping cylinders etc.).
- 3 Fill the fuel tank and the hydraulic oil tank to the max. marks.
- 4 Cover the exhaust pipe (for outdoors parking).
- 5 Make sure the coolant level in the cooling system is high enough (in case of frost).
- 6 Park the machine on level and firm ground. Locations with a high risk of earth slides or flooding and the danger of freezing to the ground should be avoided. Do not park the machine on slopes.

Check after long-term parking

- All oil and fluid levels
- Tension of all belts
- Air cleaner unit
- Track tension

Loading and unloading the machine

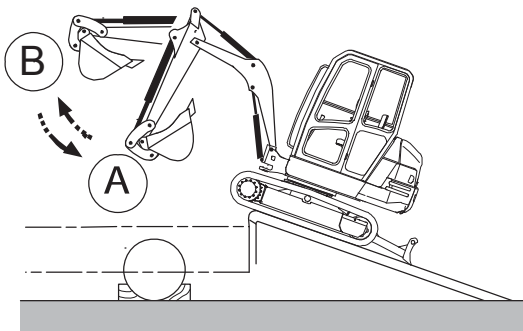


WARNING!

When transporting the machine pay attention to applicable regulations regarding weight, width, height, length and securing the load. Make sure that the ramp is of ample width, stability, thickness and length.

Remove sludge, grease, oil etc. from ramp and trailer in order to avoid slipping of the machine

Block both crawler tracks after loading and lash the machine down with chains and belts of sufficient capacity for the respective load.



1012137

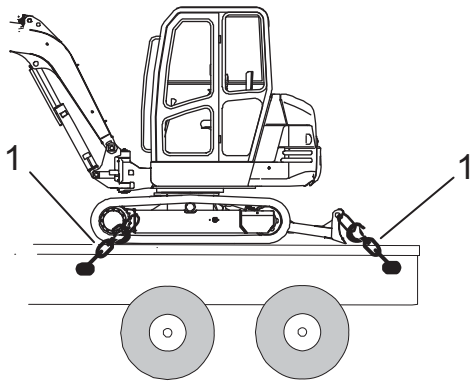
Loading

- 1 Align the machine's crawler tracks to the ramp, the dozer blade to the rear (to serve as a support in case of an operating error) and the excavating equipment to the front "position (A)".



WARNING!

If the dozer plate is in rear position (180 degree rotation), travel system operation is reversed.



1012138

- 2 Drive to the end of the ramp, extend the excavating equipment to "position (B)", so that the machine tips on to the loading platform of the trailer. Lower the excavating equipment and the dozer blade to the loading platform.
- 3 Secure both crawler tracks with wheel chocks and tie the machine with chains (1) and belts to the loading platform of the trailer. The illustration shows the location of the lifting points.

Unloading

- 1 Raise excavating equipment and dozer blade, rotate the slewing superstructure by 180 degrees.
- 2 Slowly drive to the beginning of the ramp, extend the excavating equipment "position (B)" and drive forwards until the machine tips on to the ramp.
- 3 Drive down slowly until the machine reaches level ground.

Lifting

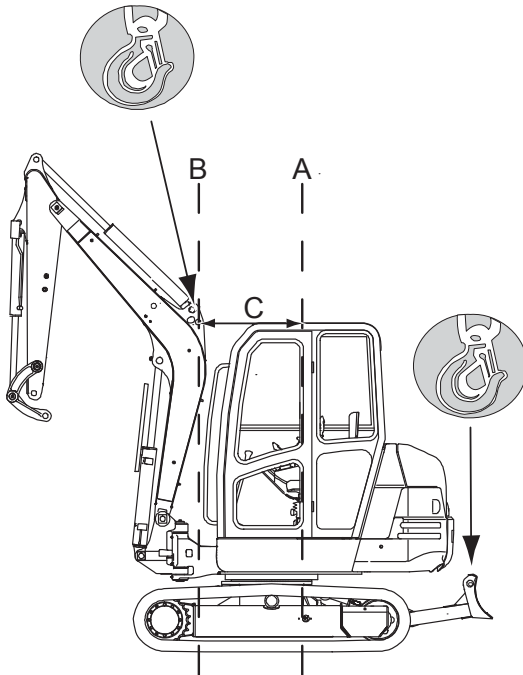


WARNING!

Do not lift the machine if there are persons inside the cab or in the immediate vicinity of the machine.

Use only lifting tackle of suitable stability.

Only lift the machine as shown. Incorrect lifting can result in dislocation of the load, which could lead to damage or injury.

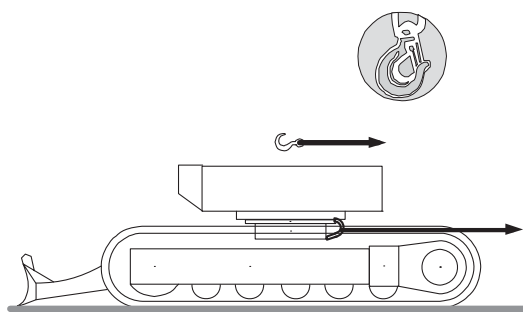


1011327

Use the specified lifting points to lift the machine. Two lifting points on the dozer blade and one lifting point on the boom. The illustration shows the location of the lifting points.

- Park the machine on ground as solid and level as possible.
- Use suitable lifting gear to lift the machine.
- Position dipper arm, boom and blade as shown in the illustration.
- Remove any attachments.
- The distance (C) between axis (A) and axis (B) at the lifting point on the boom must be observed when lifting.

Type	Distance (C) mm
EC35	635
EC45	855



1011227

Towing



WARNING!

Use a steel rope of suitable strength to tow the machine.

The machine should be towed at low speed and keep the towing distance as short as possible (the crawler tracks do not move).

In case the machine needs to be recovered, either for safety reasons, or under certain operational conditions, the machine can be towed by using the towing eye located on the lower frame.

Towing	EC35	EC45
N MAX	72000	88000

Operating techniques

The following pages contain pieces of advice and instructions on how to operate the machine as well as examples of how to use the most common attachments. The employment of the correct operating technique is of utmost importance for safe and efficient operation of the machine.



Whole-body vibrations

Whole-body vibration emissions on construction machinery are affected by a number of factors, such as the working mode, ground conditions, speed, etc.

To a large extent the operator can influence the actual vibration levels, because the operator controls the speed of the machine, its working mode, the travel path, etc.

Therefore, the result can be a range of different vibration levels for the same type of machine. For cab specifications, see page 118.

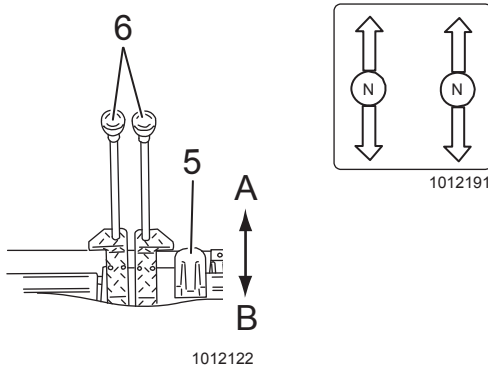
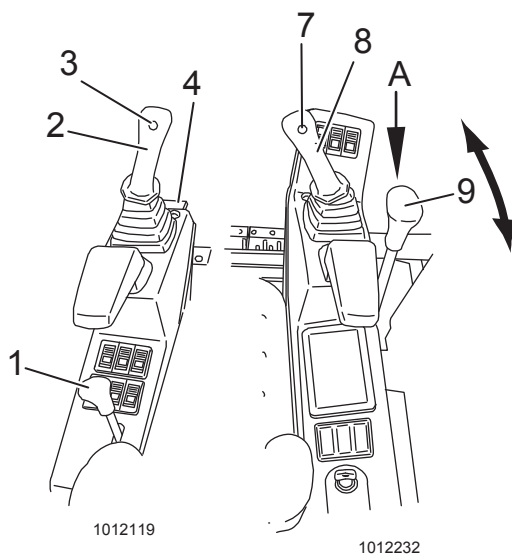
Guidelines for reducing vibration levels on earthmoving machines

- Use the proper type and size of machine, with optional equipment and attachments for the application.
- Keep the terrain and haul roads in good condition.
 - Remove any large rocks or obstacles.
 - Fill any ditches and holes.
 - Provide equipment and schedule time to maintain terrain conditions.
- Adjust the speed and travel path to minimize the vibration level.
 - Drive around obstacles and rough terrain conditions.
 - Reduce the speed when it is necessary to go over rough terrain.
- Maintain machines according to the manufacturer's recommendations.
 - Track tension.
 - Brake and steering systems.
 - Controls, hydraulic system and linkages.
- Keep the seat maintained and adjusted.
 - Adjust the seat and its suspension according to the weight and size of the operator.
 - Inspect and maintain the seat suspension and adjustment mechanisms.
 - Use the seat belt and adjust it correctly.
- Steer, brake, accelerate, shift gears, and move the attachments smoothly.
- Minimize vibrations for long work cycle or long distance traveling.
 - If no suspension system is available, reduce speed to prevent bouncing.
 - Transport machines when there are long distances between worksites.

Back pain associated with whole-body vibrations may be caused by other risk factors.

The following guidelines can be effective to minimize risks of back pains:

- Adjust the seat and controls to achieve good posture.
- Adjust the mirrors to minimize twisted posture.
- Provide breaks to reduce long periods of sitting.
- Avoid jumping down from the machine.
- Minimize repeated handling and lifting of loads.
- Maintain reasonable weight and physical condition.



Operation of the machine

- Adjust the engine speed with the throttle lever (1).
- Raise excavator equipment and dozer blade with control levers (8) and (9).
- Forward travel: Press both travel levers (6) forward.
- Reverse travel: Pull both travel levers (6) backward.
- Turn left: Pull the left lever backward.
- Turn right: Pull the right lever backward.



WARNING!

If the dozer plate is in rear position (180 degree rotation), travel system operation is reversed.

NOTE! When operating the travel levers the travel alarm (option) emits a warning signal.

Stability when working

The stability of the excavator is subjected to considerable changes. The operator himself must observe all special regulations applicable to every operation in order to obtain full working safety.

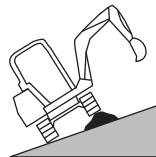
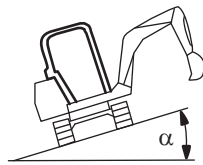


WARNING!

Prerequisite for good stability is that the machine is parked on level ground of sufficient load bearing capacity. Care should be taken if the ground is soft and uneven, sloped, in danger of collapsing, side stress and other dangerous situations.

Operating in uneven terrain or on slopes

- Make sure that the angle of the gradient is not increased by an obstacle.
- On when digging a trench in a sloping position start work at the highest point (dozer blade positioned on the ground behind the excavator for support). Empty the bucket facing the slope.
- Do not drive backwards downhill.
- Do not change the travel direction and do not travel transverse when driving on a slope.
- If the machine starts to slip immediately lower the bucket to the ground.



1012194



WARNING!

Make sure that the machine's tipping limit is not exceeded before starting work on uneven ground or on a slope.

Type	Permissible inclinations during work*	Manageable gradients (engine lubrication)
EC35	$\alpha = 31,5\% (17,5^\circ)$	$\alpha = 58\% (30^\circ)$
EC45	$\alpha = 34,5\% (19^\circ)$	$\alpha = 58\% (30^\circ)$

* ($\alpha = 50\%$ of tipping limit)



WARNING!

Make sure that the inclination angle is not increased by an obstacle.

Digging a trench

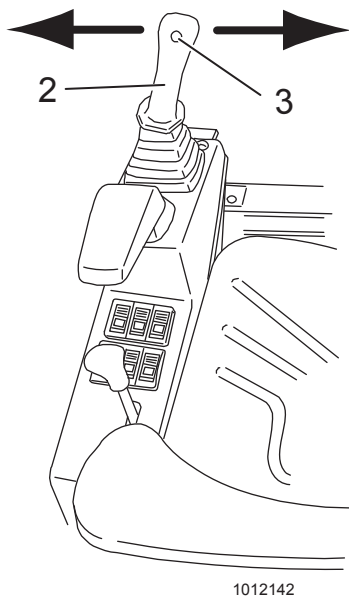
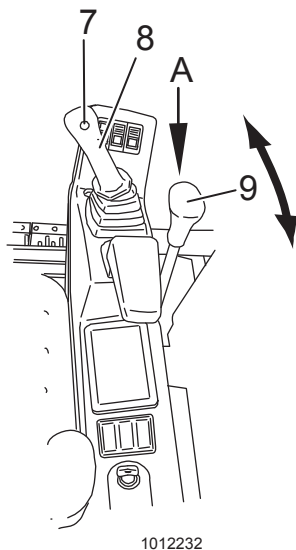
When excavating a trench it is recommended to dig in layers, thus to obtain a level trench bottom. Use a combination of bucket, dipper and boom motions to maintain the angle of the bucket while digging.

- 1 Anchor the dozer blade into the ground behind the excavator.
- 2 Extend the excavating equipment and place the bucket vertically with teeth on the ground.
- 3 Start digging by operating the bucket cylinder. Simultaneously operate the bucket and the dipper arm cylinders once half of the digging cycle has been reached.

NOTE! Do not dig the bucket too deep into the ground, since this would block the digging action. However, should this occur, slightly raise the boom.

Avoid working jerkily.

Completely close the bucket when filled. Raise the boom and simultaneously start the swing motion, until the unloading position is reached.



Backfilling or grading

- 1 In order to backfill a trench, position the machine vertically to the trench and press the dozer blade against the ground.
- 2 Once the machine starts to push correctly do not leave the control lever (9) in maximum position, but release it.



WARNING!

Do not use the bottom of the bucket to level the ground by swinging it back and forth. This is the duty of the dozer blade.

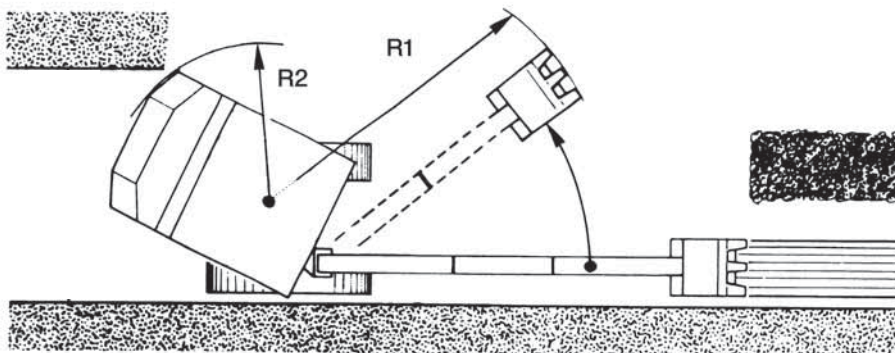
Working with offset excavating equipment

When it comes to digging a trench along a wall, one utilizes the lateral offsetting function. With reference to the axis of the slewing superstructure the offset can have the following values.

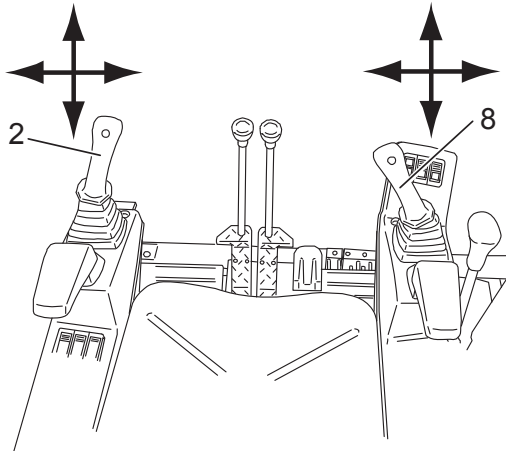
- Operation of switch (3) on control lever (2) switches over to the "offset" function.
- Lever to the right: Lateral offset to the right.
- Lever to the left: Lateral offset to the left.

This work can be accomplished under confined spatial conditions. The minimum radius R1 of the excavator equipment is as follows.

	EC35		EC45	
Offset in degree (°)				
to left	80°		80°	
to right	60°		60°	
Minimum radius (mm)				
Type	Arm 1400 mm	Arm 1700 mm	Arm 1400 mm	Arm 1700 mm
R1	1575	1600	1858	1911
R2	1380	1380	1420	1420



Stopping and parking the machine

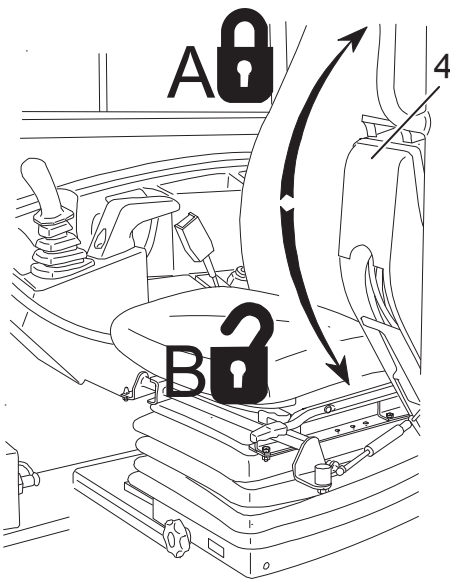


1012144

- Use control levers (2) and (8) to park the excavator on a solid, level base and lower the working attachment to the ground.
- Reduce the engine speed: Set the throttle lever to "idle speed position".

NOTE! Do not shut the engine down all of a sudden from full load, but let it idle for a short while for temperature equalization.

- 1 To shut the engine down turn the key in the ignition switch to "Stop position" (position 1)!
- 2 All control lights go out.
- 3 Check whether all switches and control elements are switched off or out of function.
- 4 Pull the ignition key out of the ignition switch when it is in "Stop position" (position 1).
- 5 Close or lock all covers.
- 6 Shift lever (4) of the safety interlock to position (A). The operating levers for working and travel hydraulics are locked (no movement possible).
- 7 Interrupt the electric supply with the battery disconnecting switch (option).

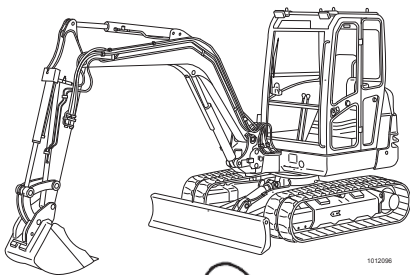


1012124



WARNING!

Before leaving the cabin lower the excavating equipment to the ground. Pull the safety locking lever back to lock the control functions.



1012096



Lowering the attachment

In technical incidents the attachment can be lowered to the ground.

Lowering the attachment using accumulator pressure

In case of standstill or engine defect.

If the electric power circuit is available and the accumulator is pressurized, it is possible to lower the attachment with the control elements.

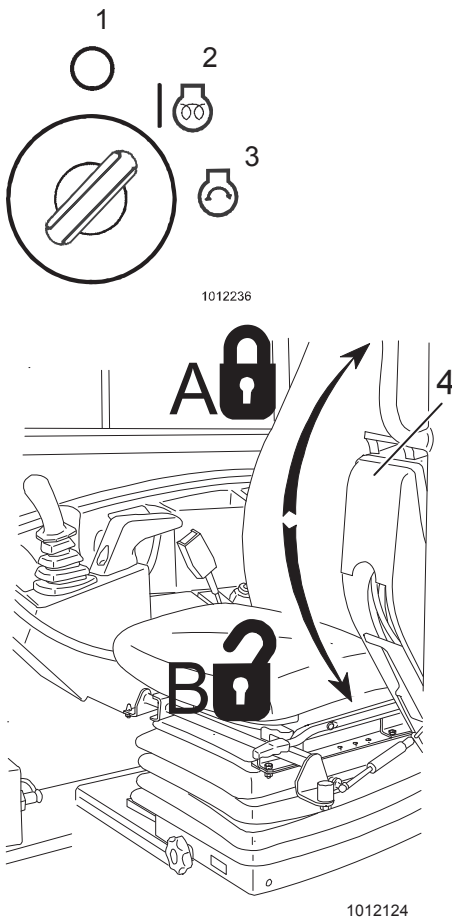
- 1 Insert the ignition key into the ignition switch and turn it to "Travel Position" (position 2).
- 2 Shift lever (4) for safety interlock to position (B). The control levers for working and travel hydraulics are unlocked (movement possible).
- 3 The control elements (2) and (8) (see page 53) can be used to lower the attachment.

NOTE! If lowering of the attachment is not possible because the accumulator is depressurized, restart the engine to pressurize the accumulator.

Lowering the attachment in case of problems with the electric circuit

In case of standstill or engine defect and power failure.

- 1 Open the lateral hood.
- 2 Slacken screw (A) on the solenoid valve.
- 3 The control elements (2) and (8) can be used to lower the attachment.



WARNING!

Once the attachment has been lowered retighten the screw, as otherwise the lowering protection is out of function.

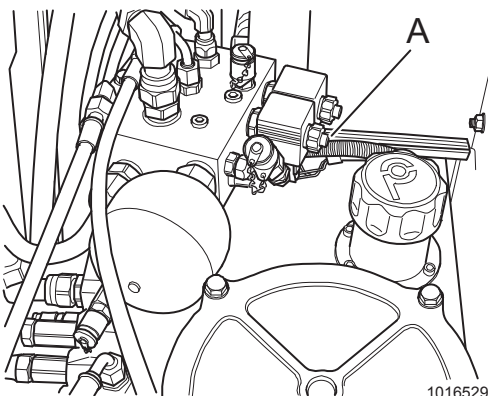
Relieving the residual pressure from the accumulator

- Move the control elements (2) and (8) for boom, arm, bucket and accessories to all directions.



WARNING!

Before lifting the lever for safety interlock and the console to position A lower the attachment to the ground.



Hose breakage protection

Hose rupture protection (option)

If the machine is equipped with a hose rupture protection (1)/(2), the boom cannot drop to the ground if a hose bursts.

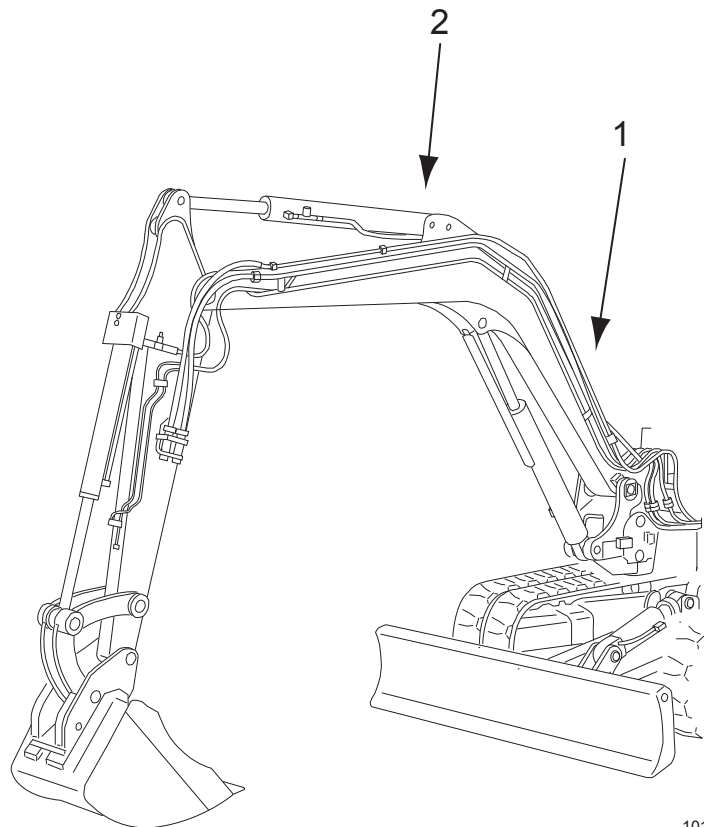
Lowering the boom with hose rupture protection

In case of standstill or engine defect and power failure during loading operation the accumulator pressure is sufficient to lower the attachment to the ground with the control levers.



WARNING!

If the pressure in the accumulator is no longer high enough for lowering the attachment, you should secure the working area and consult an authorized Volvo CE workshop. Ensure that no persons are near the working area of the machine.



1012269

Attachments

Using the correct attachment for a particular job is a decisive factor for the capability of the machine.

The machine has either a direct-mounted attachment, or attachment mounted to an attachment carrier, to enable quick attachment changes.

The EC Directive concerning the safety of machines is stated on the product plate of the machine by way of the CE-Sign. This certification therefore also covers the attachments, which are designed and marketed by Volvo CE, as they are an integral part of the machine and have been adapted to the machine.

Volvo CE is not reliable for attachments from other manufacturers.

Attachments from other manufacturers must have the CE-Sign and should be accompanied by a Declaration of Conformity and an operation manual.

Attaching and removing attachments



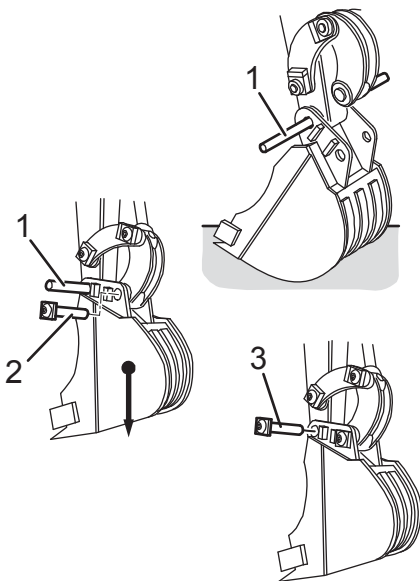
WARNING!

Never use any attachment, unless you have checked that it is securely fastened and that the attachment including hydraulic hoses, hose connections and other components is free of damage. Your personal safety is concerned.

Installing a bucket with manual fastening

- 1 Position the excavating equipment to the bucket to be installed.
- 2 Align bores in dipper arm and bucket.
- 3 Insert a $\varnothing 20$ mm assembly rod into the bore.
- 4 Raise the excavating equipment and operate the bucket cylinder until the bores in bucket and toggle link are in line.
- 5 Insert locking bolt (2) and secure it with the split pin.
- 6 Remove assembly rod (1), insert locking bolt (3) and secure it with the split pin.

NOTE! Disassembly of the bucket takes place in reverse order.

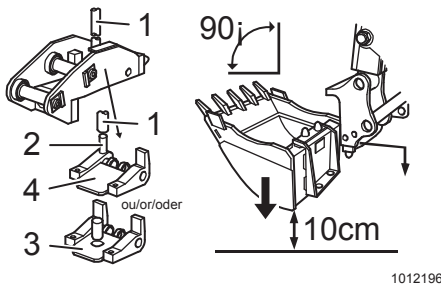
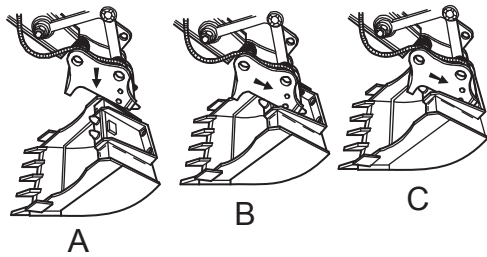


1012195



WARNING!

Check whether the attachment is properly locked and secured by pressing it against the ground, so that the machine slightly lifted.



1012196

Bucket installation with manual quick release system

Fastening the bucket

- 1 Position the excavating equipment to the bucket to be installed (Fig. A).
- 2 Align the tapered pins on the equipment carrier to the fitting groove on the bucket (Fig. B).
- 3 Extend the dipper arm (Fig. C).
- 4 Once the tapered pin is located in the fitting groove the attachment carrier automatically locks the bucket.



WARNING!

Check whether the attachment is properly locked and secured by pressing it against the ground, so that the machine slightly lifted.

Removing the bucket

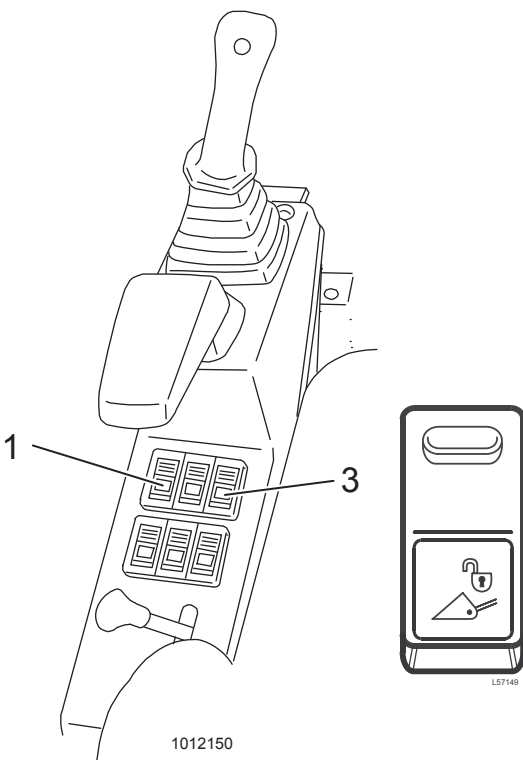
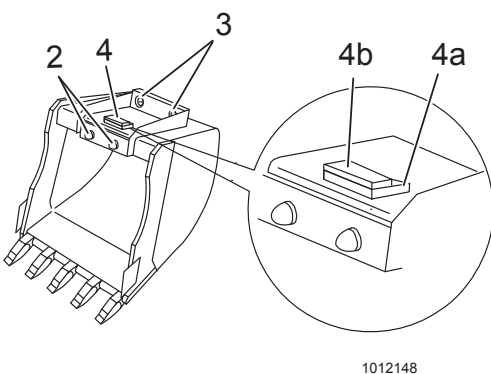
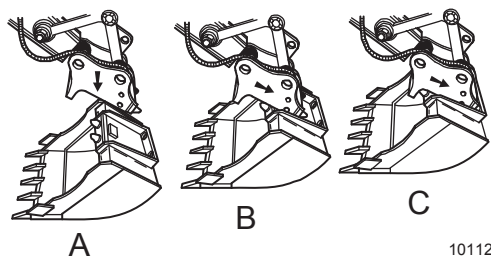
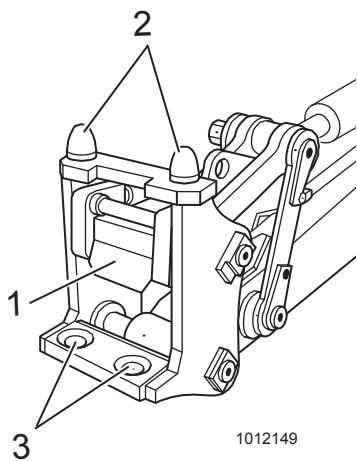
The bucket is removed outside the machine with the help of a metal bar (1) (part of the on-board equipment), which is used to operate the releasing mechanism on the interlocking plate (4).

- 1 Position the quick release device under an angle of 90°.
- 2 Position the bucket 10 cm above the ground.
- 3 Position the bar (1) on the welded bolt (2) or (depending on the machine type) in the opening (3) and pull the lever to unlock the plate (4).



WARNING!

Keep your feet out of the danger zone of the bucket. If the attachment does not stand firmly without any additional supports, it must be properly secured before unlocking, thus to prevent others from being hurt.



Bucket installation with quick release system

The quick release system consists of the special attachment carrier mounted to the dipper arm. The moveable plate (1) on the carrier locks the system in place. Attachment carrier and bucket have tapered pins (2) and fitting grooves (3) for fastening.

The locking system works mechanically (spring). Hydraulic unlocking is controlled from the operator's stand with the unlocking switches (1) and (3).

Fastening the bucket

- 1 Position the excavating equipment to the bucket to be installed (Fig. A).
- 2 Align the tapered pins on the equipment carrier to the fitting groove on the bucket (Fig. B).
- 3 Extend the dipper arm (Fig. C).
- 4 Once the tapered pin is located in the fitting groove the attachment carrier automatically locks the bucket.



WARNING!

In order to rule out any risk of an accident caused by unhooking of the bucket, move the bucket (slightly above the ground) to check whether the locking is correctly positioned. Excessive clearance indicates that the locking system in position (4a) has failed and the unit is held in safety position (4b). In this case the process must be repeated, until the bucket is properly locked in position (4a).

Removing the bucket

- 1 Lower the bucket to level ground.



WARNING!

The bucket may only be unhooked when it is resting on the ground.

- 2 Press unlocking switches (1) and (3) together.
- 3 This lifts the moveable plate (1) and unlocks the system. At this time the bucket is no longer positively connected, the arm can be retracted and another attachment can be fastened.

Hydraulic tools

Volvo CE offers a wide range of hydraulic tools. All tools and options are described in the Attachment Catalogue. Please consult your authorized Volvo CE dealer for more detailed information.



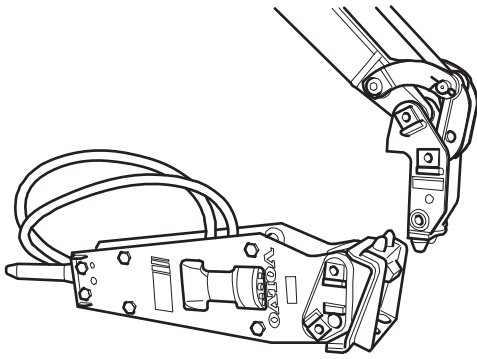
WARNING!

Before removing or connecting hydraulic hoses the engine must be shut down and the control levers shifted to all directions, in order to relieve any trapped pressure. It must be strictly assured that the engine cannot be started after hydraulic couplings have been opened.

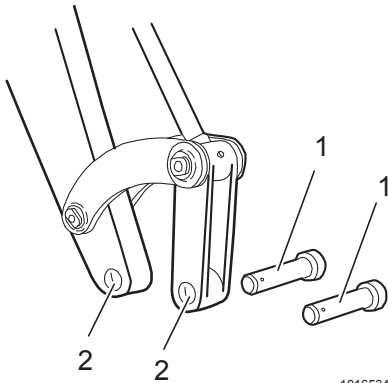


WARNING!

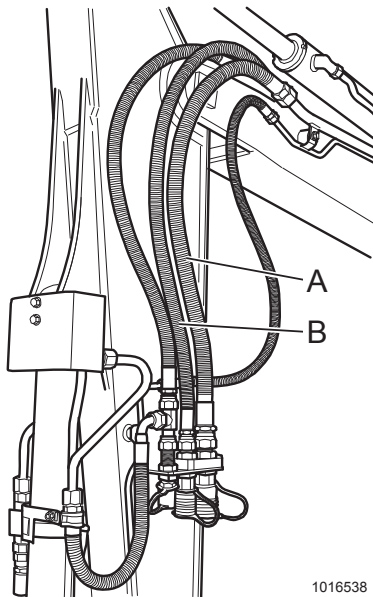
Any persons involved in the process of changing attachments must be familiar with the operation of the machine and should know the signalling pattern, see also page 70.



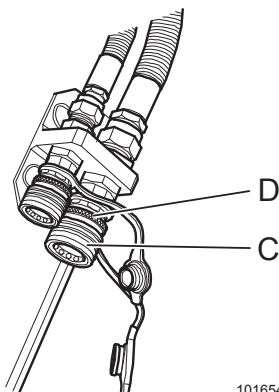
1016543



1016534



1016538



1016542

Hammer (option)

The hammer is mainly used in road construction, in demolishing work and work with rock material. Different hammer chisels are available to suit a vast variety of applications.



WARNING!

Safety regulations, operating instructions and maintenance instructions issued by the hammer manufacturer must be strictly observed!

Attachment and removal of hammer

Attachment and removal of hammer with manual fastening

Attaching the hammer

- 1 Place the machine on firm and level ground. Position the machine as required for the hammer laying flat on the ground.
- 2 Slowly lower and align the boom, until the fastening bores of the hammer are flush with the holes in the boom.
- 3 Insert bolts (1) into the fastening bores (2).



WARNING!

Before removing or connecting hydraulic hoses the engine must be shut down and the control levers shifted to all directions, in order to relieve any trapped pressure. It must be strictly assured that the engine cannot be started after hydraulic couplings have been opened.

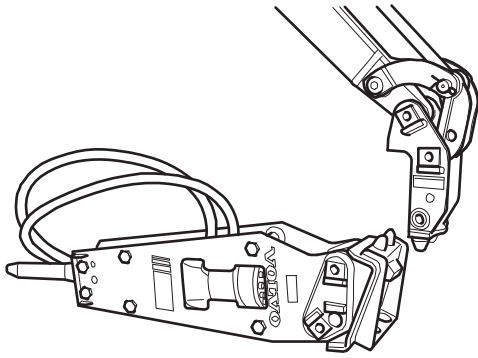
- 4 Clean the hydraulic connections on hammer and boom.

IMPORTANT! Protect the hydraulic connections against dirt, because only this will ensure the correct function of hydraulic connections and hydraulic system.

- 5 Connect the hydraulic hoses of the hammer to the hydraulic connections (return line (A) and pressure line (B)) on the boom by sliding the hydraulic coupling (C) accordingly. Then lock the hydraulic coupling (C) by turning the black safety rings (D).

IMPORTANT! Ensure correct engagement of the hydraulic connections.

NOTE! Depending on the equipment the hydraulic connections on the boom can vary from the illustration and the description.



1016543

Detaching the hammer

- 1 Place the machine on firm and level ground.
- 2 Lower the boom and lay the hammer flat on the ground.

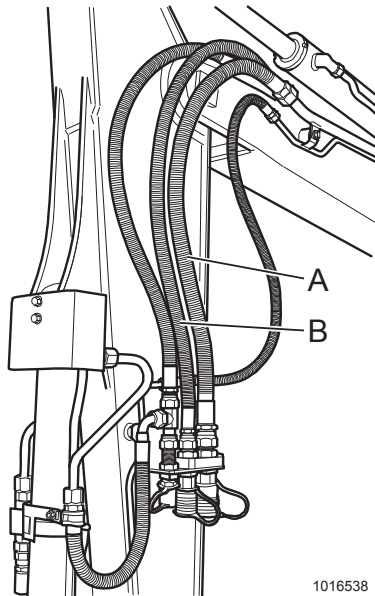


WARNING!

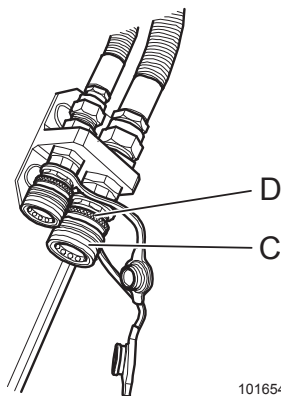
Before removing or connecting hydraulic hoses the engine must be shut down and the control levers shifted to all directions, in order to relieve any trapped pressure. It must be strictly assured that the engine cannot be started after hydraulic couplings have been opened.

- 3 Turn the black safety rings (D) and pull them back to unlock the hydraulic couplings (C).
- 4 Disconnect the hydraulic hoses of the hammer from the hydraulic connections on the boom.
- 5 Drive the bolts (1) out of the fastening bores (2) on the boom to loosen the hammer.

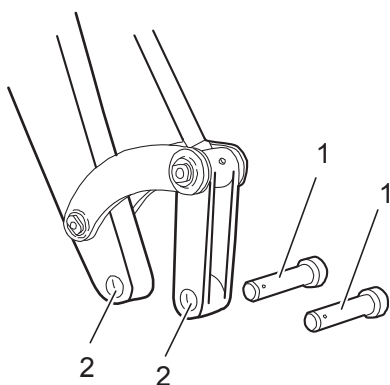
NOTE! Lay the hammer on a pallet. This enables easier transport of the hammer after disassembly.



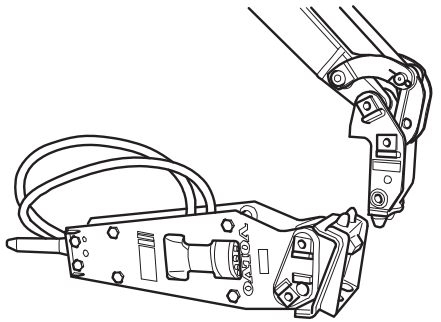
1016538



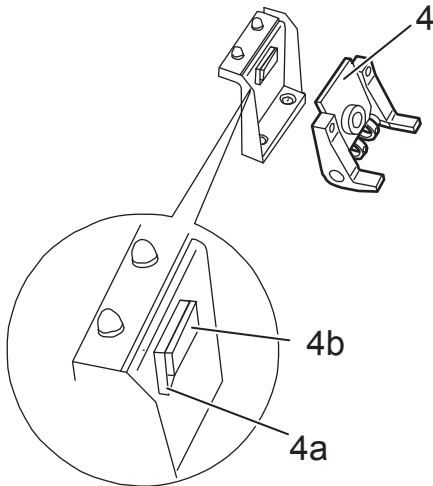
1016542



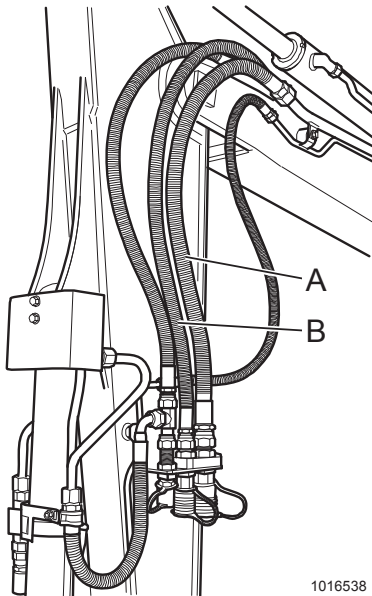
1016534



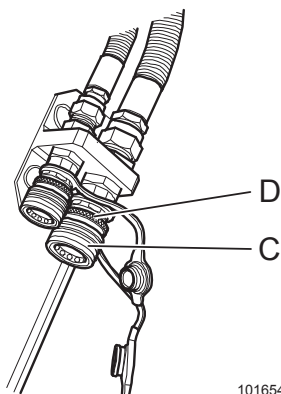
1016543



1016533



1016538



1016542

Attachment and removal of hammer with quick fastening

Attaching the hammer

- 1 Place the machine on firm and level ground. Position the machine as required for the hammer laying flat on the ground.
- 2 Slowly lower the boom, until the tapered journals of the attachment carrier are in line with the fitting grooved on the hammer.
- 3 Once the tapered pins are located in the fitting groove the attachment carrier automatically locks the hammer.



WARNING!

In order to rule out any risk of an accident caused by unhooking of the hammer, move the hammer (slightly above the ground) to check whether the locking is correctly positioned. Excessive clearance indicates that the locking system in position (4a) has failed and the unit is held in safety position (4b). In this case the process must be repeated, until the hammer is properly locked in position (4a).



WARNING!

Before removing or connecting hydraulic hoses the engine must be shut down and the control levers shifted to all directions, in order to relieve any trapped pressure. It must be strictly assured that the engine cannot be started after hydraulic couplings have been opened.

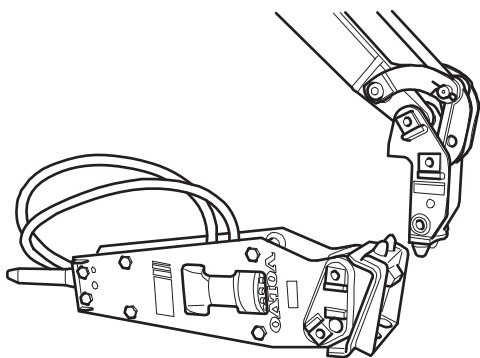
- 4 Clean the hydraulic connections on hammer and boom.

IMPORTANT! Protect the hydraulic connections against dirt, because only this will ensure the correct function of hydraulic connections and hydraulic system!

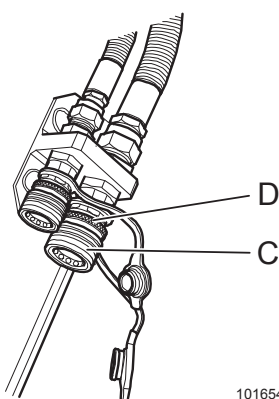
- 5 Connect the hydraulic hoses of the hammer to the hydraulic connections (return line (A) and pressure line (B)) on the boom by sliding the hydraulic coupling (C) accordingly. Then lock the hydraulic coupling (C) with the black safety rings (D).

IMPORTANT! Ensure correct engagement of the hydraulic connections.

NOTE! Depending on the equipment the hydraulic connections on the boom can vary from the illustration and the description.



1016543



1016542

Removing the hammer (manual quick fastening)

The hammer is removed outside the machine with the help of a metal bar (1) (part of the on-board equipment), which is used to operate the releasing mechanism on the interlocking plate (4).

- 1 Place the machine on firm and level ground.
- 2 Lower the boom and lay the hammer flat on the ground.



WARNING!

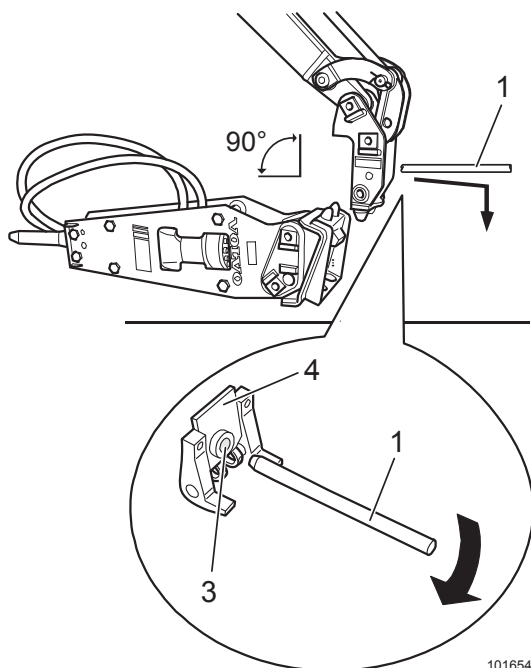
Before removing or connecting hydraulic hoses the engine must be shut down and the control levers shifted to all directions, in order to relieve any trapped pressure. It must be strictly assured that the engine cannot be started after hydraulic couplings have been opened.

- 3 Turn the black safety rings (D) and pull them back to unlock the hydraulic couplings (C).
- 4 Disconnect the hydraulic hoses of the hammer from the hydraulic connections on the boom.
- 5 Position the quick release device with the hammer under an angle of 90°.
- 6 Insert the bar (1) into the opening (3) and press it down to unlock the plate (4).

NOTE! The metal bar (1) is stored between the windscreen and the control levers for travel operation.

NOTE! Lay the hammer on a pallet. This enables easier transport of the hammer after disassembly.

NOTE! Depending on the equipment the hydraulic connections on the boom can vary from the illustration and the description.



1016541

Removing the hammer (quick fastening)

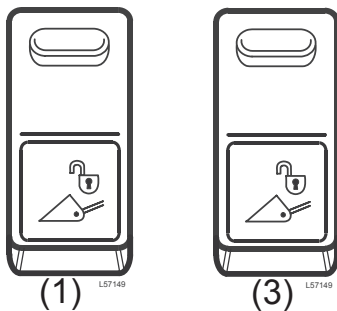
The hammer is operated from the operator's stand via the hydraulically actuated unlocking device.

- 1 Place the machine on firm and level ground.
- 2 Lower the boom and lay the hammer flat on the ground.



WARNING!

Before removing or connecting hydraulic hoses the engine must be shut down and the control levers shifted to all directions, in order to relieve any trapped pressure. It must be strictly assured that the engine cannot be started after hydraulic couplings have been opened.



- 3 Turn the black safety rings and pull them back to unlock the hydraulic couplings.
- 4 Disconnect the hydraulic hoses of the hammer from the hydraulic connections on the boom.
- 5 Position the quick release device with the hammer under an angle of 90°.
- 6 Press the unlocking switches (1) and (3) together to activate the hydraulic unlocking of the hammer from the quick fastening.

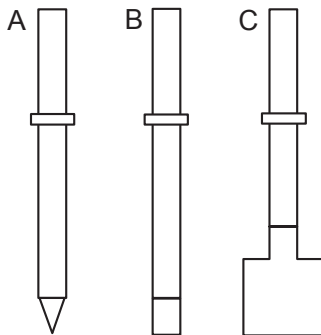
Changing the hammer tool



WARNING!

Safety regulations, operating instructions and maintenance instructions issued by the hammer manufacturer must be strictly observed!

Three tools are available for the hammer: Pointed chisel (A), flat chisel (B) and spade (C). The hammer tools are suitable for various applications.

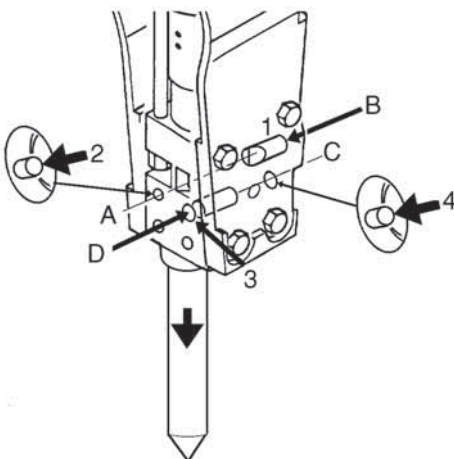


1016540

Changing the hammer tool

The hammer tool can be changed by loosening the retaining tapers.

- 1 Insert a screwdriver through opening (A), press on latch (2) and slide it completely back into its receptacle. Hold the latch depressed.
- 2 Insert a rod into opening (B) and knock out taper (1), which is no longer locked by latch (2).
- 3 Follow the same procedure, but through openings (C) and (D), to unlock and remove the second retaining taper.
- 4 Pull the hammer tool out of its receptacle and replace it with the desired tool.
- 5 Clean and crease the retaining tapers before assembly.



1016539

Working with the hammer

Precautions

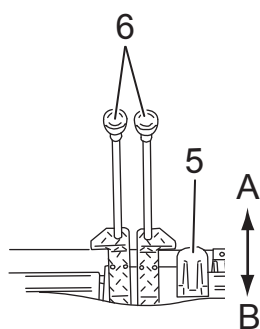
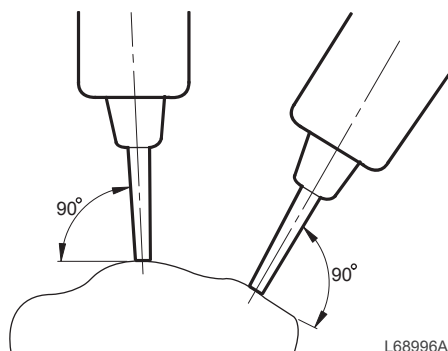


WARNING!

When working with the hammer no other persons should remain in the danger zone! Wear suitable protective clothes to protect yourself against flying stone chips. Danger of severe injury!

IMPORTANT! If the hammer is connected to an attachment carrier the attachment carrier must be regularly inspected for damage!

- The windscreen must be kept closed and locked during hammer operation. Make sure that no persons are in the working range of the machine, rock chips may fly around.
- Keep other persons out of the danger zone when using the hammer. During hammer operation the danger zone is the area around the machine and at least 15 m beyond the reach of the machine.
- Do not operate the hydraulic cylinders closer than 50 mm (2 in) from their end positions.
- Park the machine on a level surface and lower the dozer blade to the ground.
- Listen the hammering noise. The hammer blows must have a regular rhythm. Without delays or interruptions.
- Avoid loads on the hammer in diagonal or vertical direction, since this can increase the wear on the hammer's bushings.
- Do not swing the hammer against rocks, concrete etc.
- Keep the tool under a right angle to the surface of the object. Apply the feed force in line with the tool. Avoid minor unevenness of the objects which could easily break off and cause idle blows or incorrect working angles. If vertical structures (e.g. brick walls) are to be demolished, the tool must be maintained in a vertical position to the wall.
- Do not use the hammer or hammer tools for lifting loads. Lifting eyes on the hammer are for storage and maintenance purposes only.
- Do not use near embankments and trenches where the soil could give way.
- Do not use the hammer under water.



Hammer operation

The hammer is operated with the control pedal for attachments.

- 1 Kick down the control pedal (5) to activate the hammer function.
- 2 Release the control pedal (5) to deactivate the hammer function.

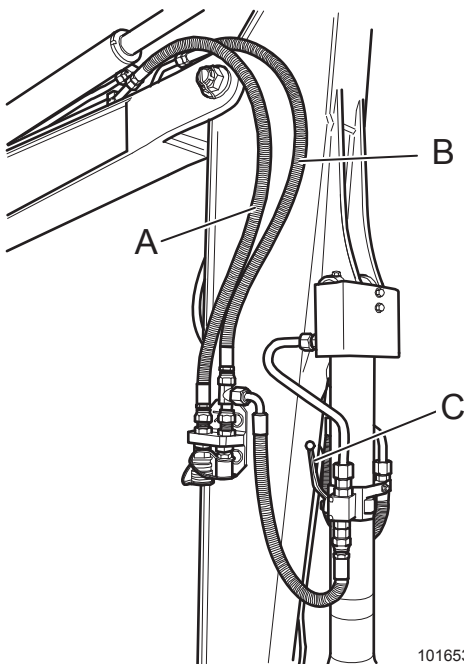
Hydraulic equipment for clamshell (option)

The hydraulic equipment for the clamshell enables the connection and use of a clamshell.

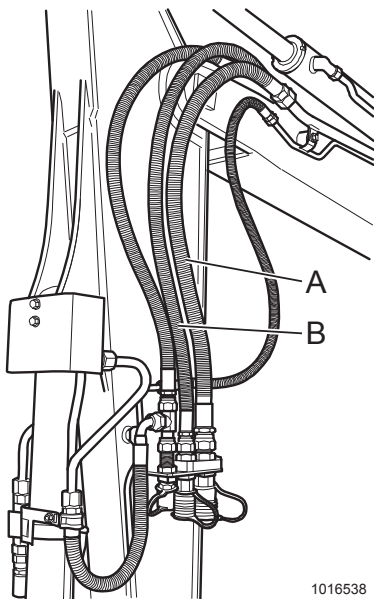


WARNING!

Safety regulations, operating instructions and maintenance instructions issued by the clamshell manufacturer must be strictly observed!



1016537



1016538

Installing the clamshell

- 1 Place the machine on firm and level ground. Position the machine as required for the clamshell laying flat on the ground.
- 2 Slowly lower and align the boom, until the fastening bores of the clamshell are flush with the holes in the boom.
- 3 Carefully retract the dipper arm.
- 4 Close the shut-off valve (C) on the dipper arm cylinder.



WARNING!

Before removing or connecting hydraulic hoses the engine must be shut down and the control levers shifted to all directions, in order to relieve any trapped pressure. It must be strictly assured that the engine cannot be started after hydraulic couplings have been opened.

- 5 Connect the hydraulic hoses of the clamshell to the hydraulic couplings (return line (A) and pressure line (B)) on both sides of the dipper arm.

IMPORTANT! Protect the hydraulic connections against dirt, because only this will ensure the correct function of hydraulic connections and hydraulic system!

NOTE! Depending on the equipment the hydraulic connections on the boom can vary from the illustration and the description.

Removing the clamshell

- 1 Place the machine on firm and level ground.
- 2 Lower the boom and lay the clamshell flat on the ground.

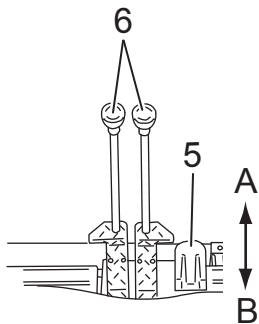
**WARNING!**

Before removing or connecting hydraulic hoses the engine must be shut down and the control levers shifted to all directions, in order to relieve any trapped pressure. It must be strictly assured that the engine cannot be started after hydraulic couplings have been opened.

- 3 Disconnect the hydraulic hoses of the clamshell from the hydraulic connections on the boom.

NOTE! Lay the clamshell on a pallet. This enables easier transport of the clamshell after disassembly.

NOTE! Depending on the equipment the hydraulic connections on the boom can vary from the illustration and the description.



1012122

Clamshell operation

The clamshell is operated with the control pedal for attachments.

- 1 Kick down the control pedal (5) to activate the clamshell function.
- 2 Release the control pedal (5) to deactivate the clamshell function.

Lifting

IMPORTANT! Various countries have their own regulations concerning the use of the machine for lifting work, e.g. to lift freely suspended loads. For more detailed information you should contact your authorized Volvo CE dealer.

IMPORTANT! Observe the nominal transport loads of the machine on page 126!

Stability

The stability of the machine changes during work and may vary considerably.

For safe performance of work the driver himself must strictly observe the respective conditions and prerequisites.

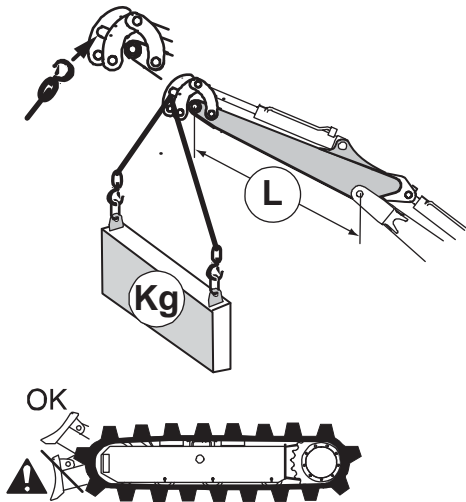
- Standing the machine on a horizontal, stable and secure surface is one prerequisite for high stability.
- On soft, uneven or sloping surfaces, if there is a risk of collapsing, application of transverse loads or other dangers of similar nature greatest care must be exercised. If the machine is standing on a sloping surface the centre of gravity is displaced and during lifting a position may be reached in which the machine will turn over.

IMPORTANT! For safe engine lubrication the machine must not be tilted by more than the values specified in these operating instructions (see page 51). However, please note that the machine under certain load conditions may even not be able to work on such gradients.

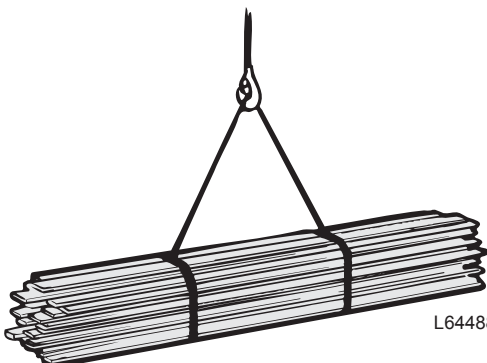
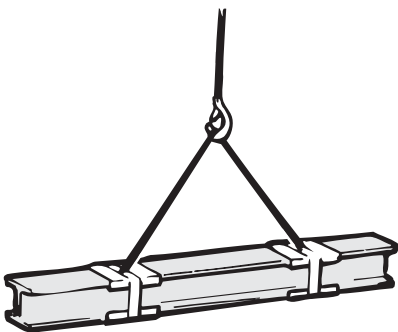
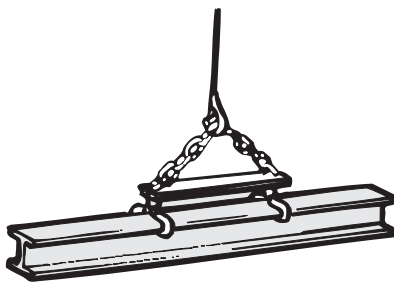
- Make sure that the ground is stable and safe. Unstable ground, e.g. loose sand or wet earth can make work unsafe.
- Do not perform any sudden swinging movements with suspended loads. Observe the centrifugal force.

Fastening long lifting slings

- Boards, planks, steel reinforcement or similar should have the sling arranged so that they cannot fall out of the loops.
- Girders should generally be lifted with a clamping device.
- Intermediate layers, e.g. made of a split compressed air hose.
- The slings should be well tightened.



1011235



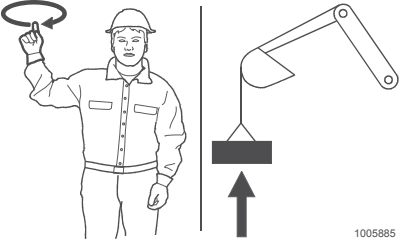
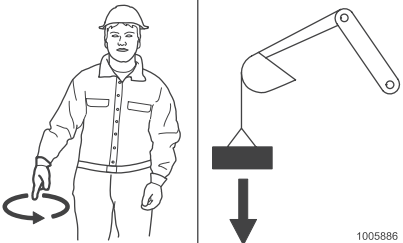
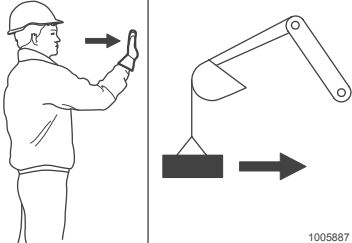
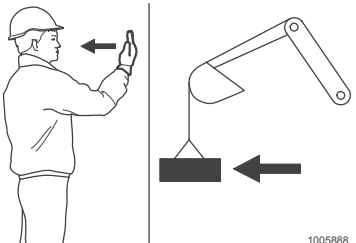
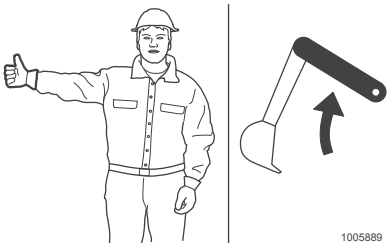
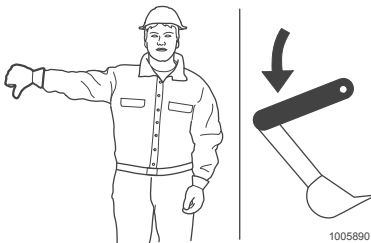
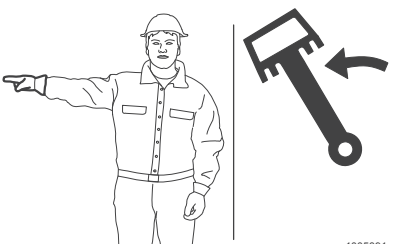
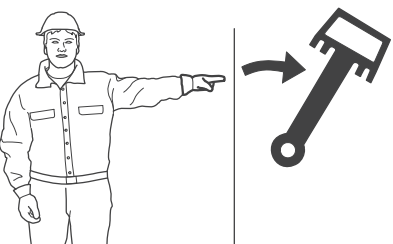
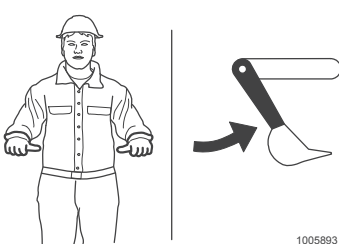
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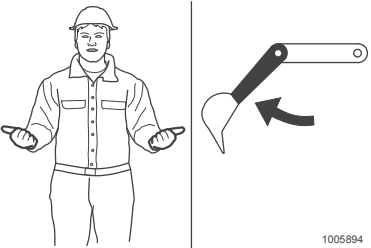
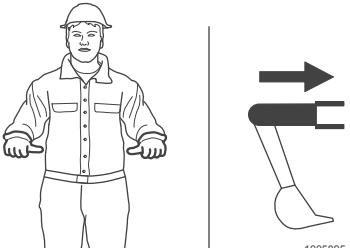
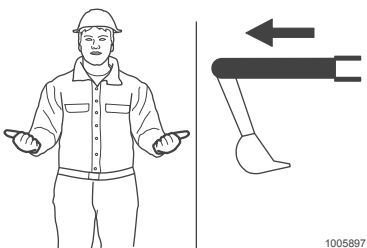
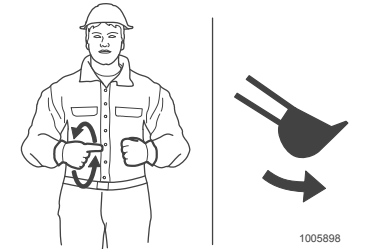
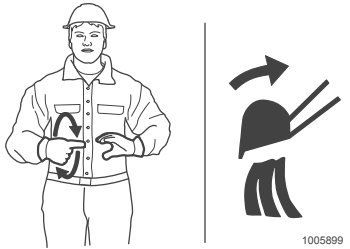
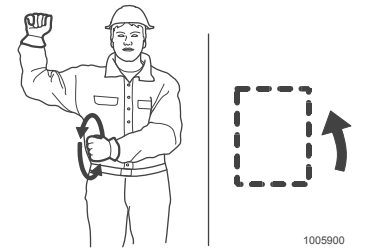
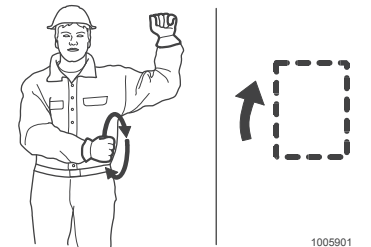
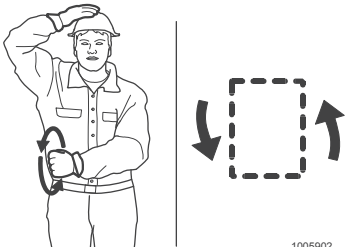
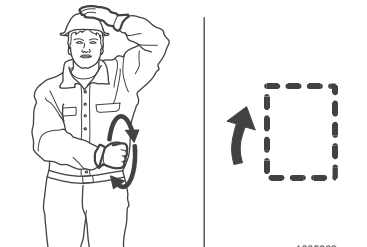
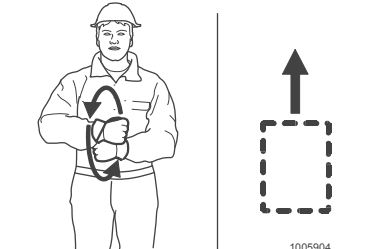
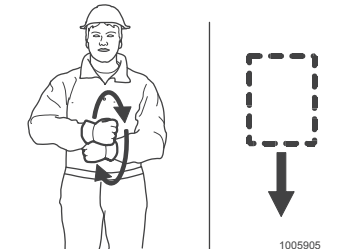
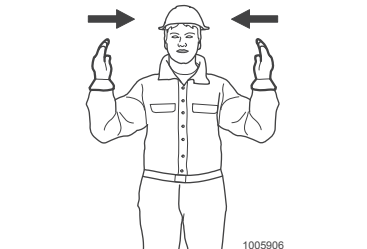
Signalling pattern

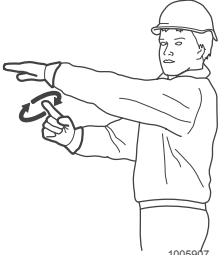
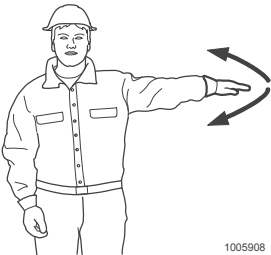
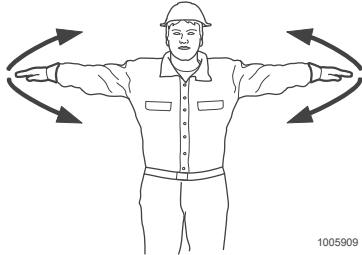

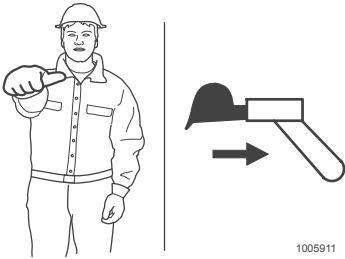
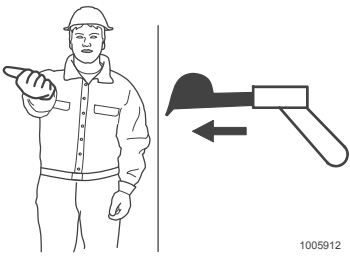
Manual signals to the driver of a mobile excavator acc. to SAE J1307.

Hand signals are mainly used by the signalling person as a means to direct the lifting, handling and positioning of loads fastened to the attachment. Hand signals may also be used during earth moving work and/or when moving the machine with limited visibility.

If quick lifting, lowering or driving is required, the movements must be made more vividly. If a load is to be loaded by two machines it must be determined how lifting is to be performed and how the respective machine operators are to be signalled.

 <p>1005885</p>	 <p>1005886</p>	 <p>1005887</p>
<p>LOAD UP Forearm vertical, index finger pointing up. The hand moves in small horizontal circles.</p>	<p>LOAD VERTICAL DOWN Once arm stretched down, index finger pointing down. The hand moves in small horizontal circles.</p>	<p>MOVE LOAD HORIZONTALLY TOWARDS MACHINE One arm stretched out, hand raised and open in direction of motion. Move the hand to the desired direction.</p>
 <p>1005888</p>	 <p>1005889</p>	 <p>1005890</p>
<p>MOVE LOAD HORIZONTALLY AWAY FROM MACHINE One arm stretched out, hand raised and open in direction of motion. Move the hand to the desired direction.</p>	<p>RAISE BOOM One arm stretched horizontally, the hand forms a fist. The thumb points up.</p>	<p>LOWER BOOM One arm stretched horizontally, the hand forms a fist. The thumb points down.</p>
 <p>1005891</p>	 <p>1005892</p>	 <p>1005893</p>
<p>MACHINE One are stretched horizontally, the index finger points in direction of swing.</p>		<p>RETRACT ARM Both hands form fists, thumbs point inward.</p>

 <p>1005894</p>	 <p>1005895</p>	 <p>1005897</p>
<p>EXTEND ARM Both hands form fists, thumbs point outward.</p>	<p>RETRACT TELESCOPIC BOOM Both hands form fists, thumbs point inward.</p>	<p>EXTEND TELESCOPIC BOOM Both hands form fists, thumbs point outward.</p>
 <p>1005898</p>	 <p>1005899</p>	 <p>1005900</p>
<p>CLOSE BUCKET One hand closed without movement. The other hand performs small vertical circles, while the index finger points to the closed hand.</p>	<p>OPEN BUCKET One hand open without movement. The other hand performs small vertical circles, while the index finger points to the open hand.</p>	<p>SWING THE COMPLETE MACHINE Raise the forearm with the hand closed, indicate the inside of the swinging movement. The other hand performs a vertical circle. Indicate the direction of rotation of tracks or wheels.</p>
 <p>1005901</p>	 <p>1005902</p>	 <p>1005903</p>
<p>SWING THE COMPLETE MACHINE Raise the forearm with the hand closed, indicate the inside of the swinging movement. The other hand performs a vertical circle. Indicate the direction of rotation of tracks or wheels.</p>	<p>COUNTER ROTATION Put one hand on your head to indicate the side at which the track or wheels should turn backwards. Use the other hand to perform a vertical circle to indicate that the track or wheels on the other side should turn forward.</p>	
 <p>1005904</p>	 <p>1005905</p>	 <p>1005906</p>
<p>MOVE Raise the forearm with the hand closed, indicate the inside of the swinging movement. The other hand performs a vertical circle. Indicate the direction of rotation of tracks or wheels.</p>		<p>THIS MUCH CLEARANCE Both hands raised and opened to the inside. Move the hands sideways to indicate the remaining distance.</p>

 <p>1005907</p>	 <p>1005908</p>	 <p>1005909</p>
<p>SLOW MOVEMENT Hold one hand still in front of the hand that signals a movement. The illustration shows "Load Slow Up".</p>	<p>STOP One arm stretched out to the side, the hand open downwards, the arm moves forward and back.</p>	<p>EMERGENCY STOP Both arm stretched out to the side, the hand open downwards, the arm moves forward and back.</p>
 <p>1005910</p>	 <p>1005911</p>	 <p>1005912</p>
<p>SHUT DOWN ENGINE Move thumb or forefinger across your throat</p>	<p>RETRACT TELESCOPIC ARM One arm stretched out horizontally in front of the body. Close the hand and point the thumb to the desired direction of movement.</p>	<p>EXTEND TELESCOPIC ARM One arm stretched out horizontally in front of the body. Close the hand and point the thumb to the desired direction of movement.</p>

Safety when servicing

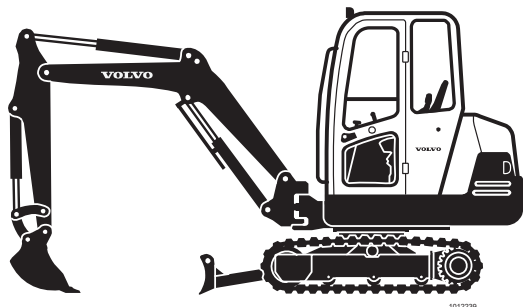
This section is a compilation of safety regulations which must be followed when checking and servicing the machine.

Volvo CE disclaims any liability if tools, lifting gear or working methods are used other than those described in these operating instructions.

Service position

Thorough maintenance and care (as well as the immediate rectification of possibly occurring faults) are the best prerequisites for a permanent availability of the machine and low repair requirements.

Before starting maintenance or repair work the machine must be parked on level ground, the working attachments lowered to the ground and the hydraulic system depressurized, i.e. shut down the engine and actuate the levers for the working hydraulics several times.



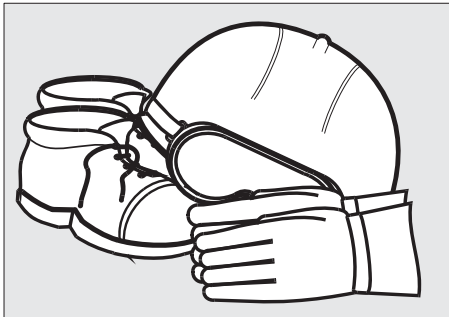
WARNING!

If work has to be carried out on the machine before it has cooled down, care must be taken with regard to hot liquids and hot machine parts - risk of burns.

- Pull the ignition key off in order to eliminate the risk of unintended starting of the machine.
- The stability of the machine is a prerequisite for safe assembly, maintenance and repair work.
- When replacing spare parts make sure to use genuine Volvo spare parts. Do not use any spare parts of lower quality.
- Cleanliness is decisive for the operating safety of the complete machine. Always keep the maintenance location clean and tidy.



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L64527A

Read before servicing

- Read the operating instructions to familiarize yourself with the warning and information decals on the machine to obtain the required knowledge and information about the machine.
- For correct servicing of the machine the use of proper tools and jigs is of utmost importance. Replace or repair damaged tools and faulty equipment.
- Use a hard hat, safety goggles, safety boots, gloves and approved respiratory equipment (dust mask) or other protective articles when required.
- Do not wear loose clothing or jewellery.
- Keep surfaces, steps and hand rails in the servicing and repair area free of oil, dirt and ice.
- Use the steps provided with anti-skid protection to avoid the risk of slipping.
- Steps covered with anti-skid protection are:
- Cab entrance on left and right-hand side of the machine - tool box/battery box and fuel tank.
- When starting the engine in closed rooms always ensure an adequate supply of fresh air.
- Do not stand in front of or behind the machine while the engine is running.
- Use a window scraper or brush with extended handle or a ladder when cleaning the outside of the windows.
- Radio, mobile phone or similar equipment must only be installed by a skilled person.
- When performing service work under a raised loader arm or backhoe, these units must be reliably secured (lifting arm or boom support) or the bucket must be resting on the ground to prevent the arms from lowering. The safety lock for the working and travel hydraulic must be engaged and the parking brake applied.
- Be careful when changing oil in engine, hydraulic system or transmission, because oil may be hot and cause burns.
- Modifications to the machine are not permitted. Please talk to your authorized Volvo CE dealer.
- When emptying/draining oil or fuel, collect the fluids in a suitable vessel. Spillage will damage the environment and may cause a fire. Old oil and other contaminated fluids must be disposed of by an authorized waste disposal company.
- For operation in contaminated or health threatening areas the machine must be specially equipped for this purpose. Such areas are subject to special local safety regulations, which also have an effect on maintenance and repair work on the machine.

- Shut the engine down before opening the engine hood and other covers. Make sure that no tools or other objects, which could cause damage, are left behind in or on the machine.
- Check that the equipment you are using for lifting or supporting parts of the machine, e.g. straps, slings, ratchet blocks and trestles, are of sufficient load bearing capacity for the strain they are exposed to and meet the applicable safety regulations.
- Carefully relieve the pressure from pressure accumulators, components and systems as specified, so that any residual pressure can escape without risk.
- When connecting hydraulic hoses, check that the hydraulic function operates correctly.
- Hoses, pipes and hydraulic attachment carrier may still be under pressure, even when the machine is stationary and the engine has been shut down. Such pipes and hoses must therefore only be disconnected by trained personnel.
- When checking for leaks, do not use your bare hand, but a piece of cardboard or something similar.
- Never adjust a pressure relief valve to a higher pressure than specified by the manufacturer.

Fire protection measures

There is always a risk of fire. It is very important to use a fire extinguisher of appropriate capacity for the machine and the working environment. It is also highly important to learn how to use the fire extinguisher.

If the machine is provided with a hand-held fire extinguisher, it should be of the ABE type (ABC in the USA).

Effectiveness grade I means that the time the extinguisher is effective must not be less than 8 seconds, grade II at least 11 seconds and grade III at least 15 seconds.

A hand-held fire extinguisher ABE I (in the USA type ABC) normally has a powder content of 4 kg (EN-grade 13A89BC), standard EN 3-1995, parts 1, 2, 4 and 5.

Even with the slightest signs of a fire you should apply the following measures, if this is possible for you without affecting your own personal safety:

- 1 Move the machine out of the endangered area.
 - 2 Lower the loader arm or the excavating equipment to the ground.
 - 3 Shut down the engine and leave the cabin.
 - 4 Turn off the battery disconnect switch
 - 5 Apply fire fighting measures and, if necessary, alarm the fire brigade.
- Smoking or the use of open fire near the machine is not permitted when refuelling or if the fuel system has been opened and is in contact with the surrounding air.
 - Diesel fuel oil is flammable and must not be used for cleaning. Only use approved solvents and do not inhale the fumes. Also bear in mind that certain solvents can cause skin rashes and constitute a fire hazard.
 - Store inflammable starting aids in cool, well ventilated environments. Such starting aids must not be used in combination with the electric combustion air preheating system.
 - Keep the servicing and repair area clean and tidy. Oil and water

make the floor slippery and are also dangerous in connection with electrical equipment or electric power tools. Oily or greasy clothes are a serious fire hazard.

- Check every day that machine and equipment, such as guards, are free off dirt and oil. This reduces the risk of fire and also helps to detect faulty and loose components.
- If a high-pressure water jet is used for cleaning, take great care as the insulation of electric leads can be damaged even with moderate pressure and temperature. Protect electrical leads appropriately.
- In extremely inflammable working environments, such as saw mills, on sanitary landfill sites and similar the machine must be in a particularly clean condition. In such kind of working environments suitable equipment against the formation of deposits and self-ignition should be installed (e. g. exhaust silencer guard, cyclone filter etc.).
- Check hoses and pipes for fuel, hydraulic oil and brake fluid at regular intervals for leaks and visible external damage, replace if necessary.
- Electric wires must be protected against wear and checked for possible damage, replace if necessary. Unprotected electric wires must not be routed in contact with oil or fuel lines.
- It is of particular importance to keep the area around the battery and the electrical equipment free of oil and grease. Make sure that battery poles are protected by insulating caps and that the insulation of electric cables is intact.
- The following applies for welding and grinding work:
 - A fire extinguisher should be kept close at hand.
 - Sufficient ventilation must be assured for indoor works.
 - Approved respiratory equipment should be used.
 - Work surface must be cleaned.
 - Do not weld or grind on components which are filled with flammable liquids, such as tanks and hydraulic lines. Work in such areas must also be carried out with highest care.

Environmental considerations

Be conscious of the environment when carrying out service and maintenance. Oil and other liquids dangerous to the environment and released into the environment will cause damage. Oil degrades very slowly in water and sediment. One litre of oil can destroy millions of litres of drinking water.

NOTE! In common for all points below is that all waste is to be handed over to a treatment and disposal firm approved by the authorities.

- When draining, oils and liquids must be collected in suitable vessels and steps taken to avoid spillage.
- Used filters must be drained of all liquid before they are passed on as waste. Used filters from machines which work in environments with asbestos or other dangerous dust, must be placed in the bag supplied with the new filter.
- Batteries contain substances dangerous to the environment and health. Used batteries must therefore be handled as waste dangerous to the environment.
- Consumables, e.g. used rags, gloves and bottles may also be contaminated with oils and liquids dangerous to the environment and must in that case be treated as waste dangerous to the environment.

Working on surfaces with paint finish



WARNING!

When welding, grinding and torch cutting in the vicinity of spray painted surfaces, rubber or plastic parts extreme care should be exercised. The heating of paints and polymeric materials may generate health affecting and environmentally hazardous substances.

Before welding, grinding and torch cutting all paint must be stripped in an area of at least 10 cm around the affected location. Heated paints emit health threatening vapours which could cause irritations and highly health damaging effects in case of repetitive contact.

Apart from the health damaging effects, paint also results in a poor connection of the weld which could cause a later failure of the component. Therefore you should never weld directly on painted surfaces.

Methods and precautions before stripping paint:

- Shot blasting
 - Use respiratory equipment and eye protection
- Paint stripper or other chemicals
 - Use a portable air extractor, respiratory equipment and protective gloves
- Grinding machine
 - Use a portable air extractor, respiratory equipment, protective gloves and eye protection

Environmentally hazardous wastes

- Painted parts or parts made of plastic or rubber to be scrapped must never be burnt, but should be returned to an approved refuse incineration plant.
- Batteries, plastic objects and any other environmentally hazardous substances must be disposed of in an environmentally friendly way.

Fluorinated rubber

Exercise extreme care when handling suspected fluorinated rubber.

Certain seals, which have to withstand high operating temperatures (e.g. in engines, transmissions, axles, hydraulic pumps), may be made from fluorinated rubber, which, when exposed to strong heat (fire), forms hydrogen fluoride and hydrofluoric acid. This acid is highly caustic and cannot be rinsed or washed off from the skin. It causes severe caustic burns which take a long time to heal.

It usually means that damaged tissue must be surgically removed. After contact with the acid several hours may pass before any symptoms appear and a direct skin contact is not immediately apparent. The acid may remain on machine parts for several years after a fire.

If swelling, redness or a stinging feeling is experienced and one suspects that the cause may be the contact with heated fluorinated rubber, seek medical advice immediately. If a machine, or part of a machine, has been exposed to fire or severe heat, it should be handled by specially trained personnel. When handling a machine after a fire, thick rubber gloves and protective goggles must be used.

The area around a part which has been heated up to high temperatures and which may be made of fluorinated rubber should be decontaminated by thorough and ample washing with lime water (a solution or suspension of calcium hydroxide, i.e. slaked lime in water). After the work has been completed, the gloves should be washed in lime water and then disposed of.

Rubber and plastics

Polymer materials when heated can generate chemical combinations, which are harmful for health and environment. These must therefore never be burnt for the purpose of waste disposal. Care should also be taken when handling machines which have been subjected to fire or other extreme heat.

If torch cutting or welding work is to be carried out near such materials, the following safety instructions must be strictly observed:

- Protect the material from heat.
- Use protective gloves, protective goggles and an approved respiratory equipment.

Measures to be taken after a fire

When handling a machine which has been damaged by fire or the exposure to intense heat, the following protective measures be strictly observed must under any circumstances:

- Use thick gloves made of rubber and wear goggles which will definitely protect your eyes.
- Never touch burnt components with your bare hands, as there is a risk that you may come into contact with melted polymer materials. First wash thoroughly with plenty of lime water (a solution or suspension of calcium hydroxide, i.e. slaked lime in water).
- As a precaution, seals (O-rings and other oil seals) should always be handled as if they were made of fluorinated rubber.
- If there is a suspicion that skin has come into contact with burnt fluorinated rubber, treat these skin parts with Hydrofluoric Acid Burn Jelly or something similar. Seek medical advice. Symptom may not appear until several hours later.
- Dispose of gloves, cloths etc. which may have been in contact with burnt fluorinated rubber and do not use again.

Diesel fuel and hydraulic fluid

Diesel fuel or hydraulic fluid under pressure can penetrate skin or eyes and cause serious injury.



Service and maintenance

Thorough maintenance and care as well as the immediate rectification of possible faults are the best guarantee for permanent availability of the machine.

Lubrication and service chart

This section of the operating instructions describes the maintenance work that can be carried out by the operator. If certain operations require trained personnel and special equipment, this will be specially mentioned in the text.

Service history

Every service performed in a workshop of a dealer authorized by Volvo CE should be recorded in the service schedule, see page 132. The service schedule is a valuable document, which could e.g. serve as a reference when selling the machine.

Arrival and delivery inspections

Before leaving the factory the machine is tested and adjusted. The dealer must additionally carry out an arrival and delivery inspection.

Delivery instructions

When handing the machine over to the customer, the dealer must browse through and sign the delivery instructions together with the customer.

Service programmes

The service program is to be used for inspections and maintenance work during the warranty period carried out in the workshop of a dealer authorized by Volvo CE.

The intervals between inspections, oil changes and lubrication apply as long as the machine is used under normal environmental and operating conditions.

Warranty inspection

Two warranty inspections according to operating hours should be carried out in a workshop authorized by Volvo CE. The first at 50/100 and the second at 1000 operating hours.

In order to keep the warranty valid all warranty inspections must be performed. The performance of these inspections is a prerequisite for the validity of the warranty.

Maintenance

The intervals for maintenance and care should follow the "Maintenance Program" or the lubrication and maintenance plan in this chapter.

Cleaning the machine

Clean the machine regularly with commercially available car cleansers in order to avoid damage to paintwork and other surfaces.

IMPORTANT! Do not use strong chemical cleansing agents. This avoids damage to painted surfaces.

NOTE! Daily cleaning of areas susceptible for the accumulation of dust, chips and other dirt reduces the fire hazard.

Recommendations for cleaning the machine

- Park the machine in an area where the cleaning agents can be collected.
- Use conventional car cleansing agents and follow the corresponding instructions.
- The water temperature should not exceed 60 °C (140 °F).
- When using a pressure cleaner keep a minimum distance of 20 - 30 cm (8 - 12 in) between nozzle and machine surface.
- Use a soft sponge.
- Rinse the machine subsequently with clear water.

Paintwork care

- Machines subjected to extreme environmental conditions will corrode much quicker than other machines. We recommend to treat the spray painted surfaces every six month as a preventive measure.
- Clean the machine.
- Apply Dinol 77B (or any compatible commercially available corrosion protection agent).
- Apply a protective layer of Dinitrol 447 (or any other compatible commercially available corrosion protection agent) to heavily strained surfaces.

Repairing paint damage

- Check the painted surface for damage.
- Clean the machine.
- Repair each damage professionally.

Service points

Counterweight

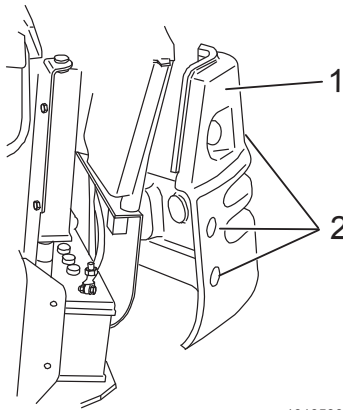
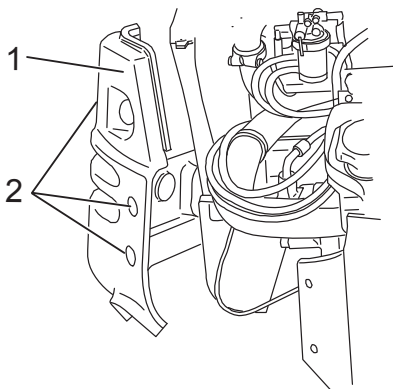
The service points are accessible in the engine compartment behind the counter weight and under the hood on the right hand side.

NOTE! After loosening the screws at the fastening points the left and right hand counterweights can be folded away from the machine. This enables better access to the maintenance points.



WARNING!

The machine must only be operated with properly mounted counterweights.

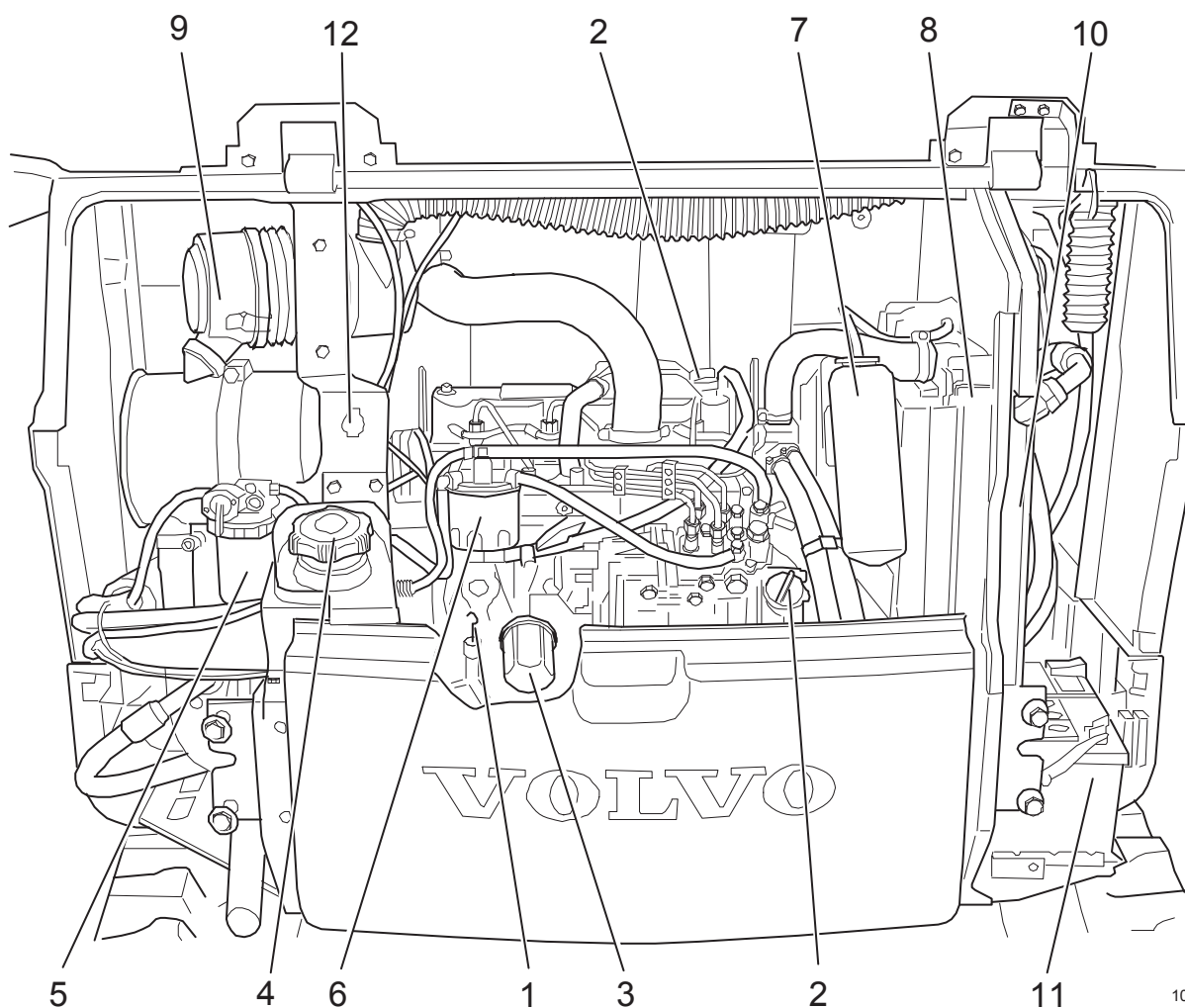


1016530

- 1 Counterweight
- 2 Counterweight fastening points

Service point in the engine compartment

The service points can be accessed in the engine compartment.

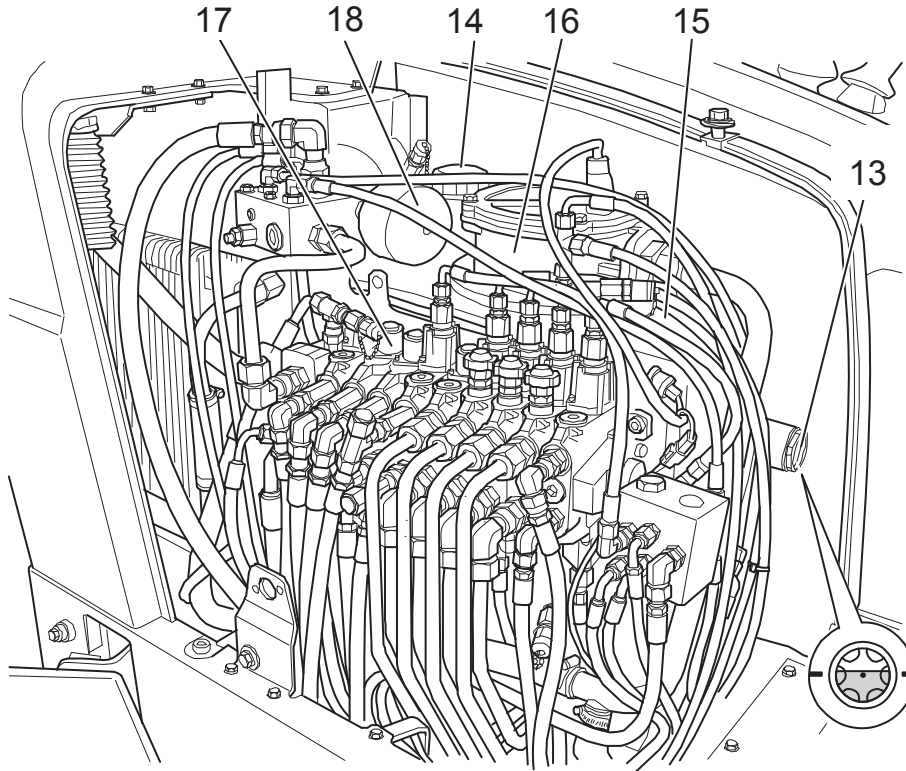


1016531

- 1 Engine oil level
- 2 Engine oil filler neck
- 3 Engine oil filter
- 4 Fuel filler neck
- 5 Fuel prefilter / water separator
- 6 Fuel filter
- 7 Coolant compensation tank
- 8 Radiator
- 9 Air filter
- 10 Hydraulic oil cooler
- 11 Battery
- 12 Hand lamp socket

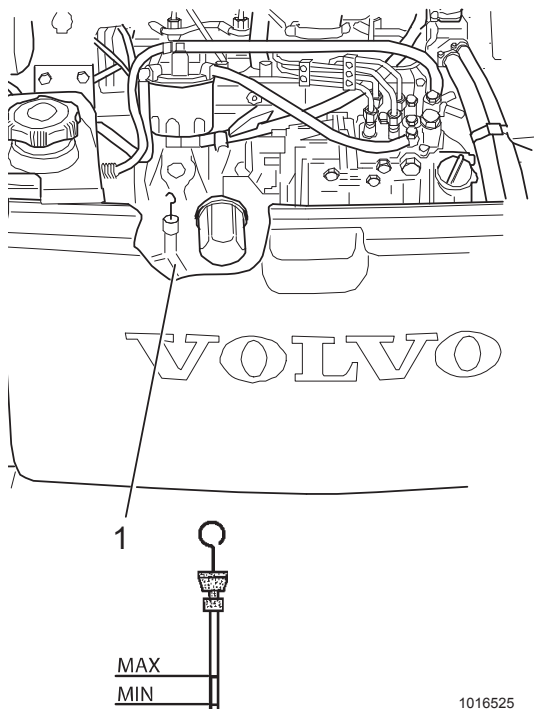
Service points under the right hand hood

The service points for the hydraulic system components are located under the right hand hood.



1016528

- 13 Hydraulic oil level gauge
- 14 Hydraulic oil filler neck
- 15 Hydraulic oil tank
- 16 Hydraulic oil filter
- 17 Main control valve
- 18 Pressure accumulator



Engine

Checking the engine oil level

Check the engine oil level every 10 operating hours.

- 1 Stand the machine on level ground.
- 2 Pull out dipstick (1) and wipe it clean with a lint-free cloth, reinsert it until it bottoms and pull it back out.
- 3 The oil level should reach the upper mark (MAX).
- 4 If the oil level is near or even below the bottom mark (MIN), top up oil immediately to avoid severe engine damage (for quality of oil refer to the table of fuels and lubricants, page 107).

Changing the engine oil

Oil change intervals acc. to the number of operating hours, but at least once per year

Type	Operating hours
EC35	1. Service after 100h, then every 500h.
EC45	1. Service after 100h, then every 500h.

IMPORTANT! Change the oil at operating temperature and with the engine shut down.



WARNING!

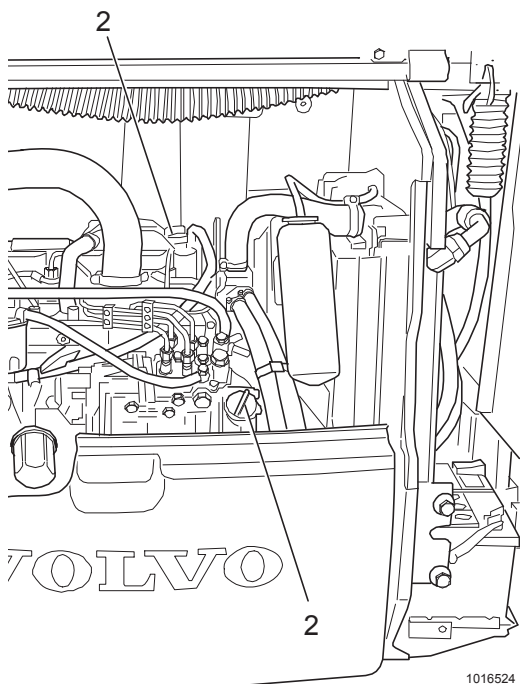
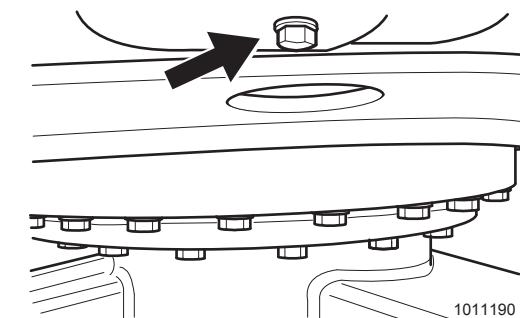
**Hot oil – danger of scalding!
Catch running out oil and dispose of environmentally.**

- 1 Unscrew the drain plug and let the old oil drain out.
- 2 Turn the drain plug back in with a new seal ring.
- 3 Fill new oil in through filler neck (2), until it reaches the top dipstick mark (MAX).

Oil filling capacity in case of oil change with filter (oil quality see table of fuels and lubricants on page 107).

Type	Filling capacity
EC35	8 litre
EC45	8 litre

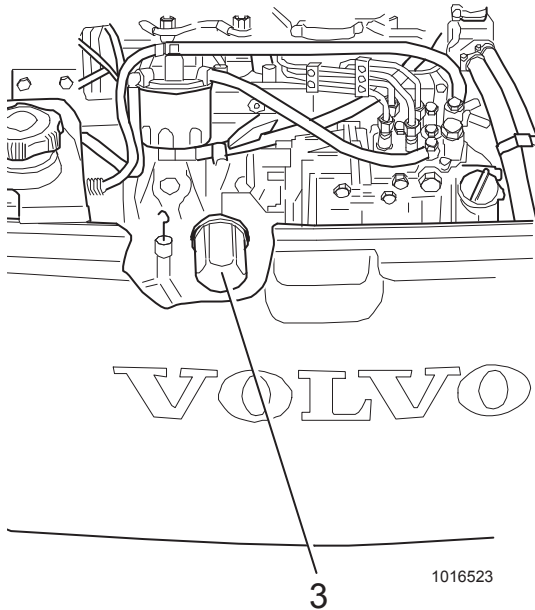
- 4 Check the oil level after a short test run (approx. 2 minutes at low idle), if necessary fill up to the top mark.



Changing the engine oil filter

Oil change intervals acc. to the number of operating hours, but at least once per year

Type	Operating hours
EC35	1. Service after 100h, then every 500h.
EC45	1. Service after 100h, then every 500h.

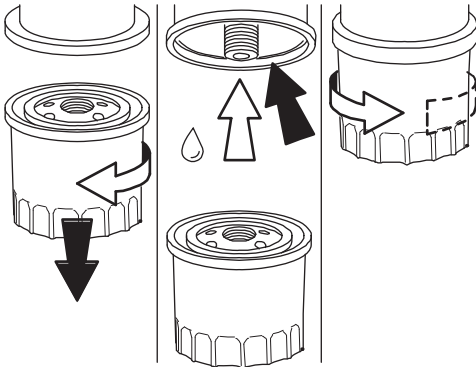


WARNING!

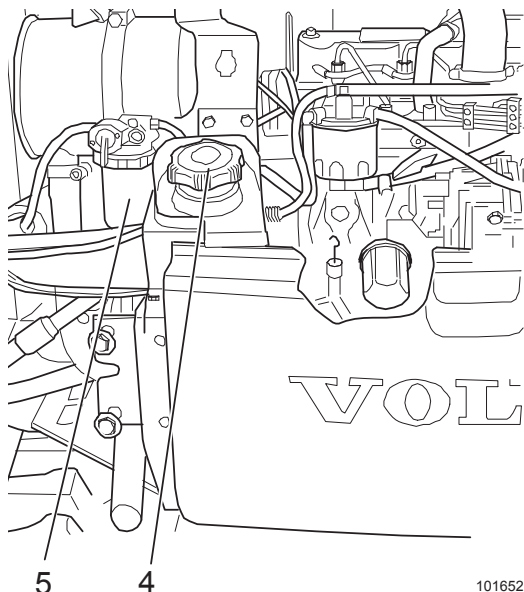
Hot oil – danger of scalding!
Catch running out oil and dispose of environmentally together with the filter cartridge.

- 1 Slacken the lubrication oil filter cartridge (3) with a filter wrench and unscrew it.
- 2 Clean the sealing surface of the filter carrier from any dirt.
- 3 Apply some oil to the rubber seal on the new oil filter cartridge.
- 4 Screw the cartridge on by hand until the seal touches the surface.
- 5 Tighten the oil filter cartridge for another half turn.
- 6 Check the oil filter cartridge for leaks.

IMPORTANT! Excessive tightening of the oil filter cartridge may damage the thread or the seal of the filter.



Fuel system



Checking the fuel level

NOTE! The fuel tank should be filled through the fuel filter neck (4) at the end of each working day. This prevents the formation of condensation water, as far as possible. In case of excessive contamination of the fuel the fuel tank can be drained via the drain plug (under the left hand side of the frame).

Type	Filling capacity
EC35	66 litre
EC45	66 litre



WARNING!

When working on the fuel system do not use open fire. Do not smoke!

Draining the fuel prefilter / water separator

Drain the fuel prefilter every 50 operating hours.

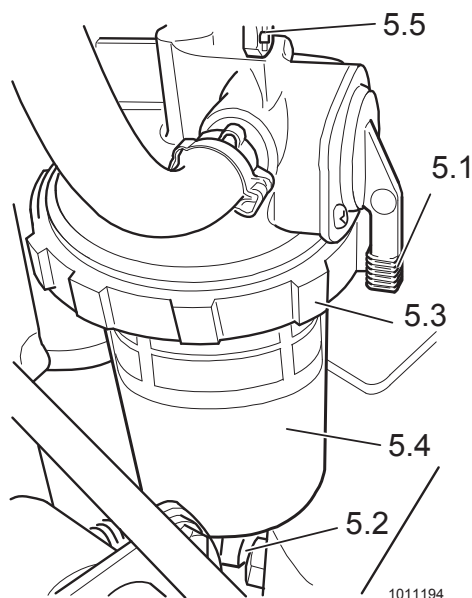
Before starting the engine check the sight glass of the fuel prefilter (5) for the presence of water and dirt, drain through the drain valve (5.2) if necessary. A ring indicates the condensation water level in the prefilter.

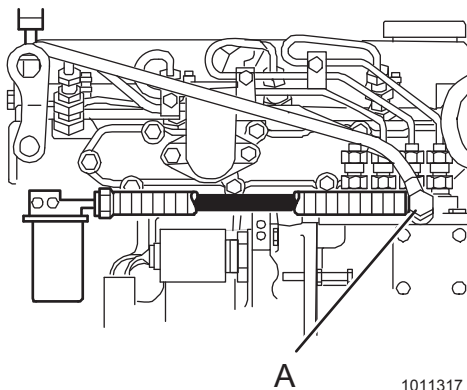
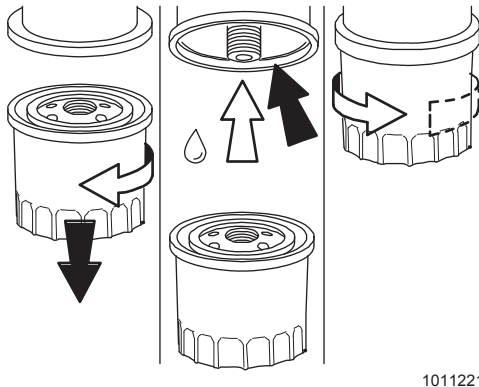
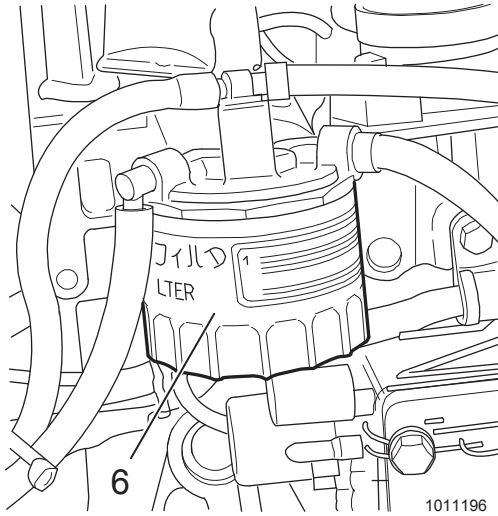
- 1 Close fuel tap (5.1). Turn the fuel tap clockwise.
- 2 Open the drain valve (5.2) and let the collected water flow out.
- 3 Loosen spigot nut (5.3), remove the fuel prefilter element from the fuel prefilter glass bowl (5.4) and clean it.
- 4 Empty the fuel prefilter bowl (5.4). After this reassemble the fuel prefilter.
- 5 Close the drain valve (5.2) again.

Replacing the fuel prefilter / water separator

Replace the fuel prefilter every 500 operating hours.

- 1 Close fuel cock (5.1). Turn the fuel tap clockwise.
- 2 Loosen spigot nut (5.3) and remove the fuel prefilter element from the fuel prefilter glass bowl (5.4).
- 3 Clean the fuel prefilter glass bowl (5.4) and insert the new fuel prefilter element.
- 4 Tighten the fuel prefilter glass bowl (5.4) with the spigot nut (5.3).
- 5 Open the fuel cock (5.1) again. Turn the fuel cock anti-clockwise.
- 6 Bleeding the fuel system (see page 89).





Changing the fuel filter

Change the fuel filter every 500 operating hours, but at least once every year.

- 1 Close the fuel cock (5.1) on the fuel prefilter/water separator (5) by turning it one turn in clockwise direction.
- 2 Loosen the fuel filter with a filter wrench.



WARNING!

Catch running out fuel and dispose of environmentally together with the fuel filter.

- 3 Carefully clean the fuel filter receptacle and wet the sealing ring of the new fuel filter slightly with engine oil or diesel fuel.
- 4 Screw the fuel filter (6) on by hand, until the seal touches the surface.
- 5 Tighten the fuel filter (6) half a turn with a filter wrench.

Bleeding the fuel system

Bleeding of the fuel system is necessary after the fuel tank has run empty or if air has entered into the fuel system for any other reason.



WARNING!

Take care that no pressurized fuel comes in contact with unprotected parts of your body.

IMPORTANT! Do not start the engine before the fuel system has been bled, as otherwise the injection pump may be damaged.

- 1 Check the fuel level. Replenish if required.
- 2 Turning the ignition switch to "Travel position/Preheating" (position 2) (see page 41) activates the fuel pump. Hold the ignition switch in this position.
- 3 Loosen the bleeding screw (A) on the injection pump.
- 4 When fuel runs out clear and without air bubbles, retighten the bleeding screw (A).

NOTE! After bleeding let the engine run for about 10 minutes and check the fuel system for leaks.

- 5 Turn the ignition switch to "Stop"-position (position 1).

Cooling system

Coolant

The cooling system is either filled with Volvo Coolant VCS or Volvo Coolant. To avoid damage to engine and cooling system it is very important to continue using the same coolant, when topping up or changing, as the system was filled with beforehand.

IMPORTANT! To avoid damage to engine and cooling system different coolants or corrosion protection must not be mixed.

To be able to differentiate between the coolants apply the following:

The cooling system is filled with Volvo Coolant VCS if

- it is yellow
- there is a decal at the filling point with the text “Volvo Coolant VCS” (see figure).

The cooling system is filled with Volvo Coolant if

- it is green
- if the above mentioned decal is not positioned at the filling point.

If concentrated coolant and clean water (see page 109) are used, the table below shows the approximate amount of concentrated coolant that is required to achieve freeze protection. The amount of concentrated coolant must never be less than 40 % of the total mixture.

If there are doubts as to the quality of the water, use ready-mixed coolant.

IMPORTANT! If ready-mixed coolant is used, it is very important that the correct kind is used. Damage to engine and cooling system may be caused if different kinds of coolant are mixed.

Freeze protection down to	Mixed-in amount of concentrated coolant
–25 °C (–13 °F)	40 %
–35 °C (–31 °F)	50 %
–46 °C (–51 °F)	60 %

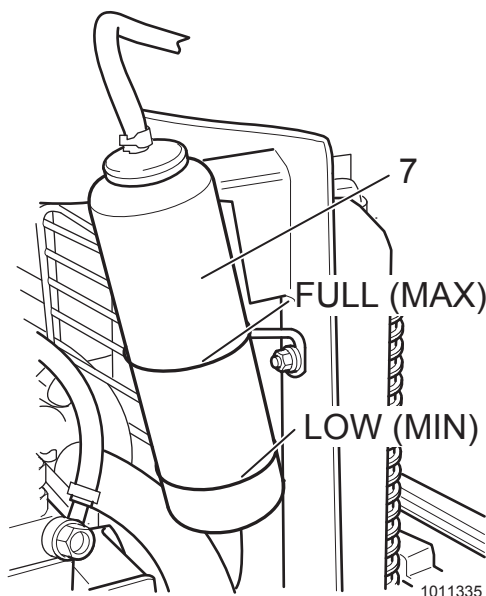
Take care of filters/oils/liquids in an environmentally safe way, see page 76.

Check the coolant level

Check coolant level every 10 operating hours.

NOTE! Check the coolant level only after the engine has cooled down.

Once the cooling system has cooled down the coolant level must be between the FULL (MAX) and LOW (MIN) marks in the coolant compensation tank (7).



Topping up coolant



WARNING!

Make sure that the cooling system has cooled down before removing the radiator cap, as otherwise there is a risk of injury by hot coolant squirting out.

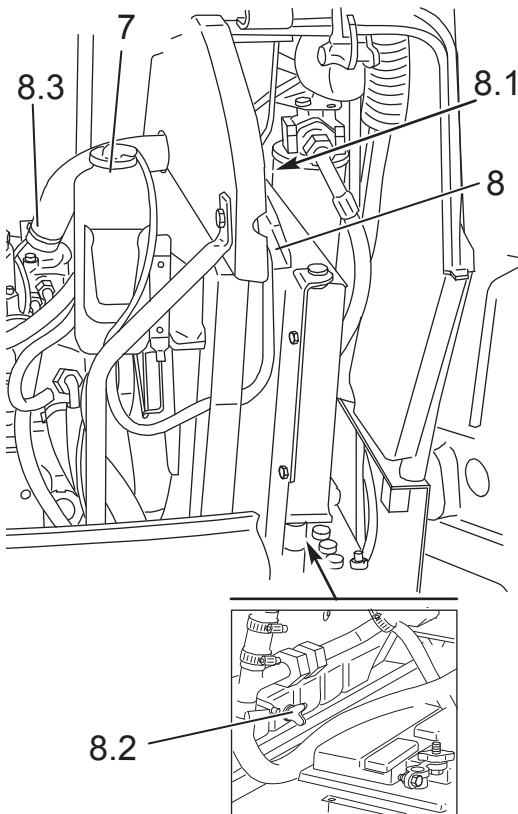
IMPORTANT! If the temperature gauge is in the red section or the engine temperature control light (10) lights up, coolant needs to be added immediately.

IMPORTANT! To avoid damage to engine and cooling system different coolants or corrosion protection must not be mixed, see page 90.

- 1 Shut down the engine.
- 2 Slowly remove the compensation tank cap and relieve the pressure in the cooling system.
- 3 Top up coolant.
- 4 Check the radiator hoses for leak tightness. Replace defective parts and tighten loose hose clamps.

NOTE! Change coolant every 2000 hours or every second year if the system is filled with Volvo Coolant VCS.

NOTE! Change coolant every 2000 hours or every second year if the system is filled with Volvo Coolant.



1012249

Coolant change

IMPORTANT! To avoid damage to engine and cooling system different coolants or corrosion protection must not be mixed, see page 90.

Change coolant every 2000 hours or every second year if the system is filled with Volvo Coolant VCS.

Change coolant every 2000 hours or every second year if the system is filled with Volvo Coolant.



WARNING!

When opening the caps on compensation tank and radiator there is a risk of scalding because of the overpressure in the cooling system. Catch running out coolant and dispose of environmentally.

- 1 Loosen and remove the radiator cap (8.1) on the radiator (8).
- 2 Unscrew the drain plug (8.2) and let the coolant run out.
- 3 Take the compensation tank (7) out of bracket and empty it.

NOTE! On machines with heating open the heating tap in the cab.

- 4 Screw the drain plug tightly back in once all fluid has run out.
- 5 Loosen the coolant return hose (8.3).
- 6 Fill coolant into the radiator (8) through the filler neck (8.1), until the coolant starts to run out through the return hose (8.3).

- 7 Fasten the return hose (8.3) again and fill the radiator up to the filler neck (8.1).
- 8 Fill the compensation tank (7) up to the FULL (MAX) mark with coolant and close all caps.
- 9 Start the engine and let it run at idle speed for approx. 2 minutes.
- 10 Fill up coolant in radiator (8) and compensation tank (7) up to FULL (MAX) mark on the compensation tank (7).

NOTE! Check rubber hose and cap on compensation tank for leaks!

Type	Filling capacities
EC35	6 litre
EC45	6 litre



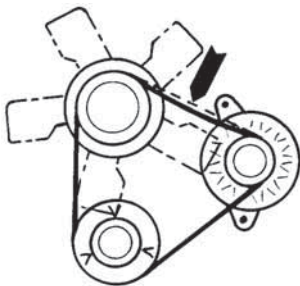
WARNING!

Dispose of collected coolant environmentally.

Checking the fan belt tension

The tension of the fan belt should be checked every 250 operating hours.

- Appropriate belt tension is an essential prerequisite for the correct function of the alternator and a long lifetime of the belt itself.
- A belt of poor condition must be replaced immediately.
- A correctly tensioned belt must be compressible by 10 to 12 mm between the two outer pulleys.



1012201



Air filter

If control light (7) in the instrument panel lights up the filter must be immediately cleaned or, if necessary, replaced.

Check the air lines (filter - engine) for leaks during every maintenance. Replace defective parts and tighten loose hose clamps.

IMPORTANT! The air filter maintenance intervals depend on the amount of dust in the air and can therefore not be determined precisely. Under extremely dusty conditions daily cleaning may be required.

Cleaning the dust valve

Clean the dust valve every 10 operating hours.

- 1 Empty the dust valve (9.1) by squeezing the slot together.
- 2 Remove possible dust deposits by squeezing the upper part of the valve.

Cleaning the air filter cartridge

Clean the air filter cartridge every 250 hours.

- 1 Open the locking hooks for the housing lid and remove the filter cartridge (9.2).
- 2 Bang the filter cartridge several times with the front face vertically against the palm of your hand or against a flat and soft surface.

NOTE! Avoid damaging or denting of the front face of the cartridge.

- 3 Blow the cartridge out with dry compressed air (pressure not higher than 5 bar) from inside under an oblique angle, until the out flowing air is free of dust.
- 4 Then inspect the filter with a lamp from inside to outside for possible cracks.



WARNING!

Do not try to clean the filter cartridge by banging it against a hard object.

NOTE! Use only genuine filter cartridges. Non-genuine filters do not fit and cause danger to the engine!

Replacing the air filter cartridge

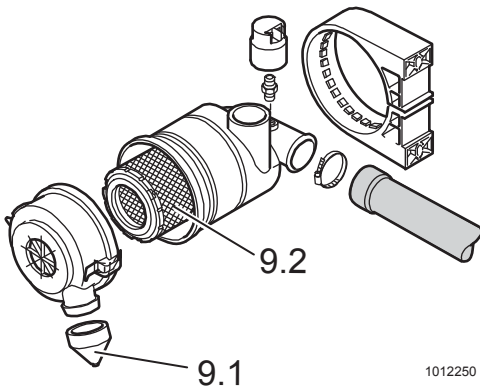
Air filter change interval every 500 operating hours, but at least once every year.

- 1 Open the locking hooks for the housing lid and remove the filter cartridge (9.2).
- 2 Replace the filter cartridge and close the housing lid with the locking hooks.

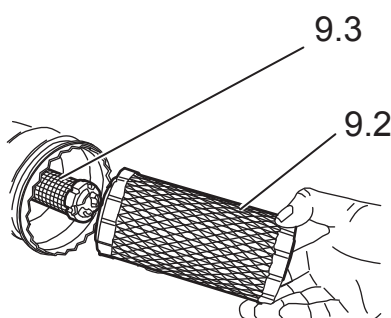
Auxiliary filter cartridge (option)

Change interval every 500 operating hours.

IMPORTANT! The safety cartridge (9.3) must not be cleaned. The engine must not be operated just with the safety cartridge installed.



1012250



1011231

Electrical system

Safety regulations

Work on the electrical system must only be performed by specially trained persons and by using specified tools and testing equipment.

The engine must be shut down and the battery disconnected before attempting work in the electrical system of the machine.

If running of the engine and a connected battery is required for certain test procedures, special precautions must be taken to rule out dangers for persons.

All electrical consumers must be switched off before installing or removing the battery. For removal disconnect the ground cable first, for installation connect the positive cable first.

Cables and plugs must be marked before disconnecting and secured against contact with metal parts, e. g. by plugging on safety caps or by insulating.

Faults in the electrical system, e. g. damaged insulation, must be rectified immediately.



WARNING!

In the vicinity of the battery any sparking must be avoided! No open fire! Do not smoke! No ignition! DANGER OF EXPLOSION!



M300091A

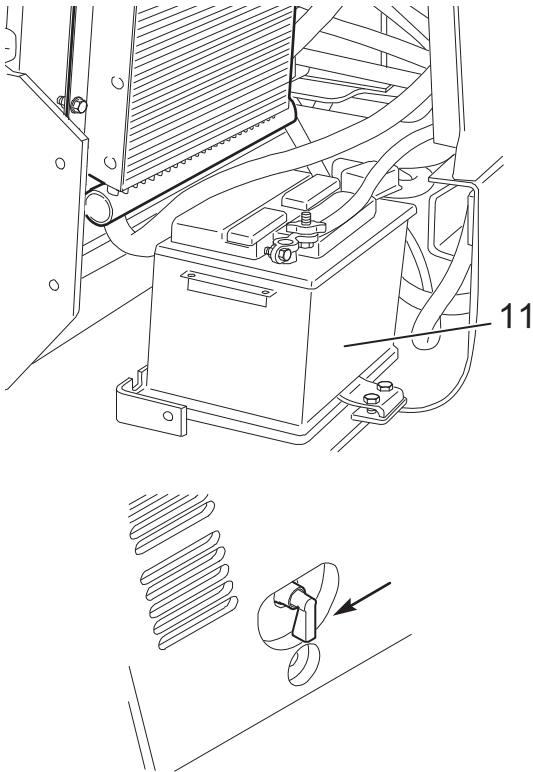


WARNING!

The battery electrolyte contains caustic sulphuric acid. If this comes in contact with your skin rinse it off with soap and lots of water. If acid has come in contact with your eyes or other sensitive parts of your body rinse off with lots of water and seek medical advice as quickly as possible.

Battery

The battery (11) is located at the right under the side covering.



- 1 To remove the battery, disconnect the negative terminal (-) first. To install the battery, connect the positive terminal (+) first. Any contact between a tool and the cable connecting the positive pole and the frame, may cause sparks.
- 2 For longer storage periods disconnect the battery.



WARNING!

**Keep sparks and open fire away from the battery!
DANGER OF EXPLOSION!**

In case of contact with battery acid flush off immediately with lots of water. In case of caustic injury of the eyes seek medical advice.

Battery disconnecting switch (option)

The battery disconnecting switch must always be switched off for longer resting periods of the machine and for repair work in the electric system.

Three-phase generator

- The connecting poles of the battery must never be mixed up by mistake. The poles are distinctly marked with (+) or (-). Incorrect connection immediately damages the rectifier in the generator.
- Check whether cable lugs and poles are clean, well tightened and greased with Vaseline or similar.



WARNING!

Dispose of old batteries environmentally.

Electric welding

For electric welding the earth terminal must be connected directly to the part to be welded. Disconnect the battery completely and pull of or unscrew all plug connections from the central electric system.

1012251

Charging the battery



WARNING!

During the charging process oxyhydrogen will develop inside the battery. A short circuit, an open flame or sparks in the vicinity of the battery can cause an explosion. The charging current must always be interrupted before removing the charging clamps. Excellent ventilation must be assured, especially when recharging the battery in a closed room.

The battery electrolyte contains caustic sulphuric acid. If this comes in contact with your skin rinse it off with soap and lots of water. If acid has come in contact with your eyes or other sensitive parts of your body, rinse off with lots of water and seek medical advice.

Jump starting with a spare battery

When using spare batteries for jump starting you must always make sure that the batteries or other current sources used as starting aids have the same voltage as the standard battery.

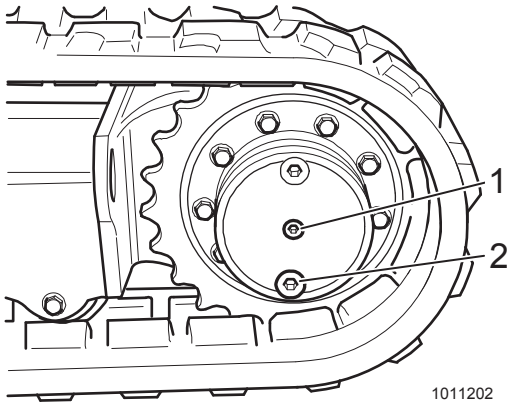
Do not interrupt the cables to the standard batteries!



WARNING!

When connecting a fully charged battery to an almost discharged battery there is a risk that the batteries may explode.

- 1 Connect the plus cable from the spare battery with the plus pole on the discharged battery. Then connect the second cable from the minus pole on the spare battery with ground.
- 2 Start the engine.
- 3 Once the engine starts disconnect the cable between ground and minus pole on the spare battery and then the cable between the plus poles.



Track reduction gear

Checking the oil level in the track reduction gear

Check the travel gear oil level every 250 operating hours.

- 1 Park the machine on horizontal ground.
- 2 Before unscrewing the plugs thoroughly clean the respective areas.
- 3 Carefully slacken the level control plug (1), release pressure before unscrewing the plug.
- 4 The oil level must reach the overflow point of the control opening.

Changing the track reduction gear oil

Change interval every 1000 operating hours.

Gear oil must be drained off at operating temperature.



WARNING!

Hot oil – danger of scalding!

Catch running out oil and dispose of environmentally.

- 1 Before unscrewing the plugs thoroughly clean the respective areas.
- 2 Carefully slacken the level control plug (1), release pressure before unscrewing the plug.
- 3 Unscrew the drain plug (2) and let the gear oil run out.
- 4 Screw drain plug (2) back in.
- 5 Fill in oil up to the overflow point of the level inspection bore (1).

Type	Filling capacities
EC35	2 x 0.6 litre (2 x 60 in ³)
EC45	2 x 0.8 litre (2 x 60 in ³)

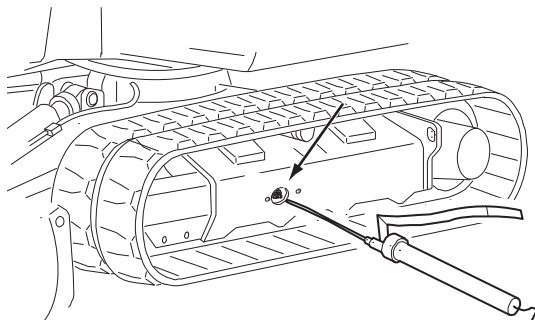
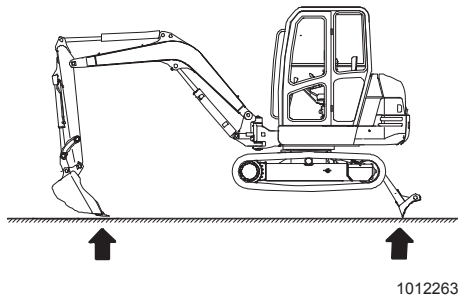
(For quality of gear oil please refer to the table of fuels and lubricants on page 107).

- 6 Screw the level control plug (1) back in.
- 7 Check the oil level after a few minutes and, if necessary, top up until the specified oil level is reached and remains constant.

Tracks

Checking the track tension

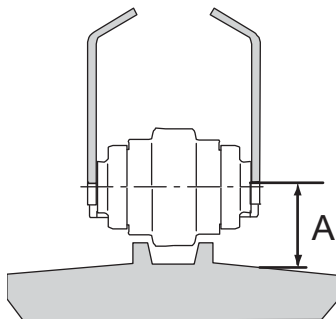
Check and adjust the track tension every 10 operating hours



WARNING!

Incorrect tension reduces the lifetime of the tracks. A too low track tension increases the risk of the tracks jumping off.

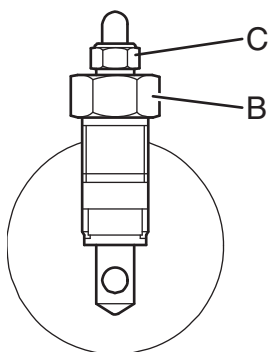
- 1 Park the machine on horizontal ground.
- 2 Lower the dozer blade at the rear to the ground until the tracks are slightly raised. Lower the bucket to the ground, operate the boom until the front of the machine is raised (see Fig.).
- 3 Run the track several times in forward and reverse.
- 4 Measure the sag (A) in the middle of the main chassis between track pad and track roller face.
- 5 The track is correctly tensioned when a sagging (A) of 140 to 150 mm (steel tracks) or 100 to 110 mm (rubber tracks) is reached.
- 6 In order to reduce sagging of the track, press grease through grease nipple (C) into the adjustment cylinder.
- 7 In order to increase sagging of the track loosen the valve unit (B) by one revolution, so that the grease can be drained off. Tighten the valve unit when the sag of the track is correct.

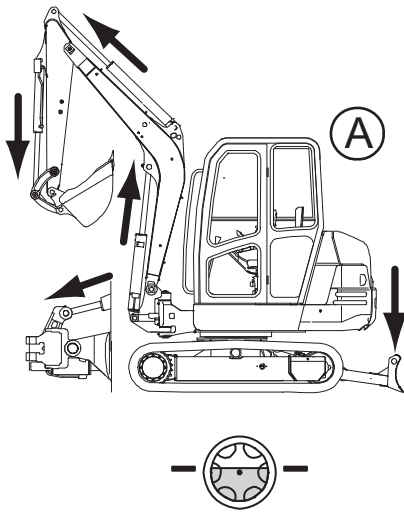


WARNING!

The grease in the track adjustment cylinder is under high pressure. Do not remove the nipple or the valve unit to drain off grease. Never loosen the valve by more than two turns, as otherwise it will be ejected together with the grease.

NOTE! For quality of grease please refer to the table of fuels and lubricants on page 107.





1012165

Hydraulic system

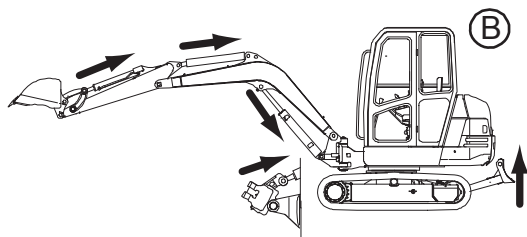
Checking the hydraulic oil level

Check the hydraulic oil level every 10 operating hours.

- 1 Park the machine on horizontal ground.
- 2 Operate all cylinders to both directions while the engine is running.
- 3 Operate all cylinders until they are fully extended (see Fig. A). Lower the boom to level ground. The dozer blade must be lowered for safety reasons.
- 4 Check the hydraulic oil level in sight glass (13). The hydraulic oil level must now comply with the level shown in the illustration.
- 5 If necessary, fill hydraulic oil through filler neck (14) on the hydraulic oil tank (15) (see page 83 "Service points").

For quality of hydraulic oil please refer to the table of fuels and lubricants on page 107.

NOTE! If the hydraulic system is filled with biodegradable hydraulic oil from the factory (see sticker on filler neck), only the oil quality specified on the sticker must be used to fill up or when changing the oil.



1012166

Changing the hydraulic oil

Change the hydraulic oil every 1000 hours.

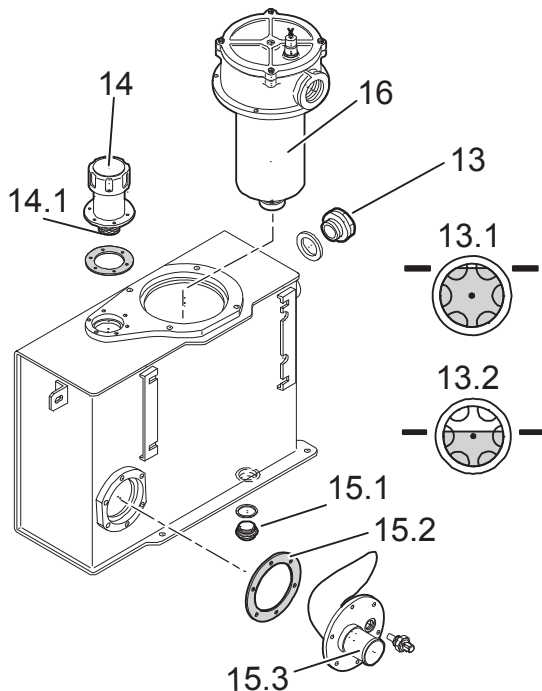
Operate all cylinders until they are fully retracted (see Fig. B). Lower the excavating equipment to the ground and shut down the engine. The dozer blade must be lowered for safety reasons.



WARNING!

Hot oil – danger of scalding!

Catch running out oil and dispose of environmentally.

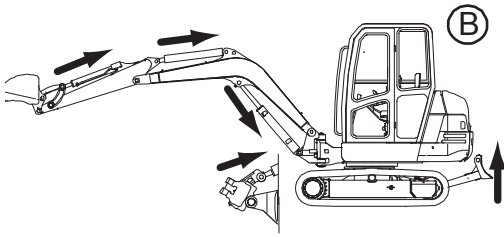


1011334

- 1 Hydraulic oil must be drained off at operating temperature.
- 2 Slightly slacken the filler neck cap (14) to vent the hydraulic oil tank (15). Take the screen filter (14.1) out of the filler neck, clean it and reinsert it into the filler neck. Check the seals.
- 3 Unscrew the drain plug (15.1) and let the hydraulic oil run out.
- 4 Screw the drain plug (15.1) back in with a new seal ring.
- 5 Fill in new oil through the filler neck (14) up to the top of the inspection glass (13.1).
- 6 Close filler neck (14).
- 7 After a short test run check the hydraulic oil level in the sight glass (13), it must reach the middle of the sight glass (13.2); top up if necessary.

Type	Filling capacities
EC35	62 litre
EC45	62 litre

NOTE! (Quality of hydraulic oil see table of fuels and lubricants on page 107). If the hydraulic system is filled with biodegradable hydraulic oil from the factory (see sticker on filler neck), only the oil quality specified on the sticker must be used to fill up or when changing the oil.



1012166

Changing the hydraulic oil filter

Check the hydraulic oil filter acc. to the operating hours.

Type	Operating hours
EC35	1. Service after 100h, then every 500h.
EC45	1. Service after 100h, then every 500h.

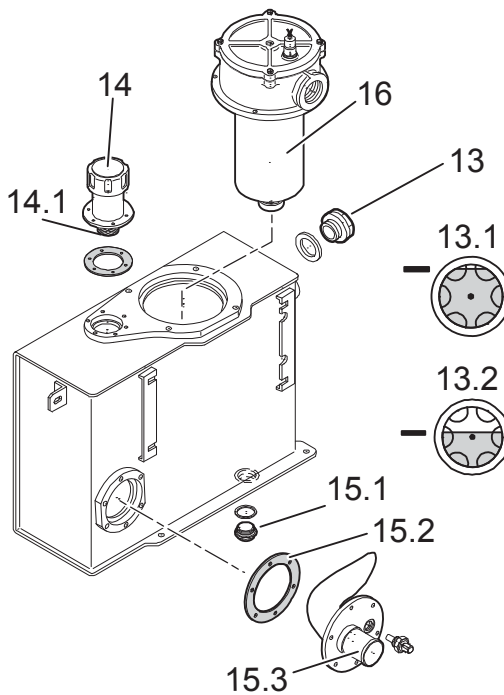
- 1 Operate all cylinders, until they are fully retracted (see Fig. B). Lower the excavating equipment to the ground and shut the engine down. The dozer blade must be lowered for safety reasons.
- 2 Shut down the engine and move the operating lever for the excavating equipment to all directions, to relieve the residual pressure.
- 3 Slacken and unscrew the hydraulic oil filter (16) with a filter wrench.



WARNING!

Hot oil – danger of scalding!

Catch running out oil and dispose of environmentally together with the filter cartridge.



1011334

- 4 Clean the sealing surface of the filter carrier from any dirt.
 - 5 Apply some oil to the rubber seal on the new oil filter cartridge.
 - 6 Screw the cartridge on by hand until the seal touches the surface.
 - 7 Tighten the oil filter cartridge for another half turn.
 - 8 Check the oil filter cartridge for leaks.
- NOTE! Excessive tightening of the oil filter may damage the thread or the seal of the filter.**
- 9 Check hydraulic oil level, top up if necessary

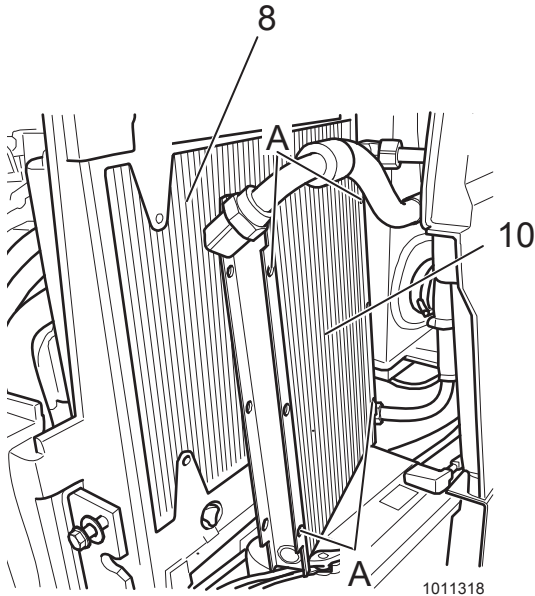
Cleaning the radiator cooling fins

Clean the radiator cooling fins every 250 operating hours.

Always clean the cooling fins on radiator (8) and hydraulic oil cooler (10) by blowing out with compressed air from inside to outside.

IMPORTANT! Preferably clean the radiator fins only with compressed air! Cleaning with water only when the engine is cold!

For better cleaning of the cooling fins the hydraulic oil cooler may be removed from the radiator.



WARNING!

Please make sure that the cooling fins on radiator and hydraulic oil cooler have cooled down before you remove the hydraulic oil cooler, as otherwise there is a risk of burning.

Unscrew the hydraulic oil cooler

- 1 Loosen the screws (A) on the hydraulic oil cooler (10).
- 2 Swing the hydraulic oil cooler (10) carefully to the side.

Cleaning the cooling fins

Clean the cooling fins on radiator (8) and hydraulic oil cooler (10) with compressed air.

Fasten the hydraulic oil cooler again

- 1 Position the hydraulic oil cooler (10) correctly.
- 2 Tighten the screws (A) on the hydraulic oil cooler (10).

Greasing the bearings

The service life of bushings and pivot pins can be considerably extended, by regularly greasing the machine in the correct way.

Bearing lubrication has two main purposes:






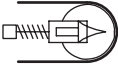












- To add grease to the bearing to reduce friction between pin and bushing.
- To replace old grease which may contain dirt. The grease in the space inside the outer seal collects dirt and prevents dirt and also water from penetrating into the bearing.

Therefore, grease the bearing until new, clean grease is forced out through the outer seal. For recommended lubrication grease refer to table of fuels and lubricants.

Wipe grease nipples and grease gun clean before greasing, to keep dirt and sand out.

Explanation of symbols

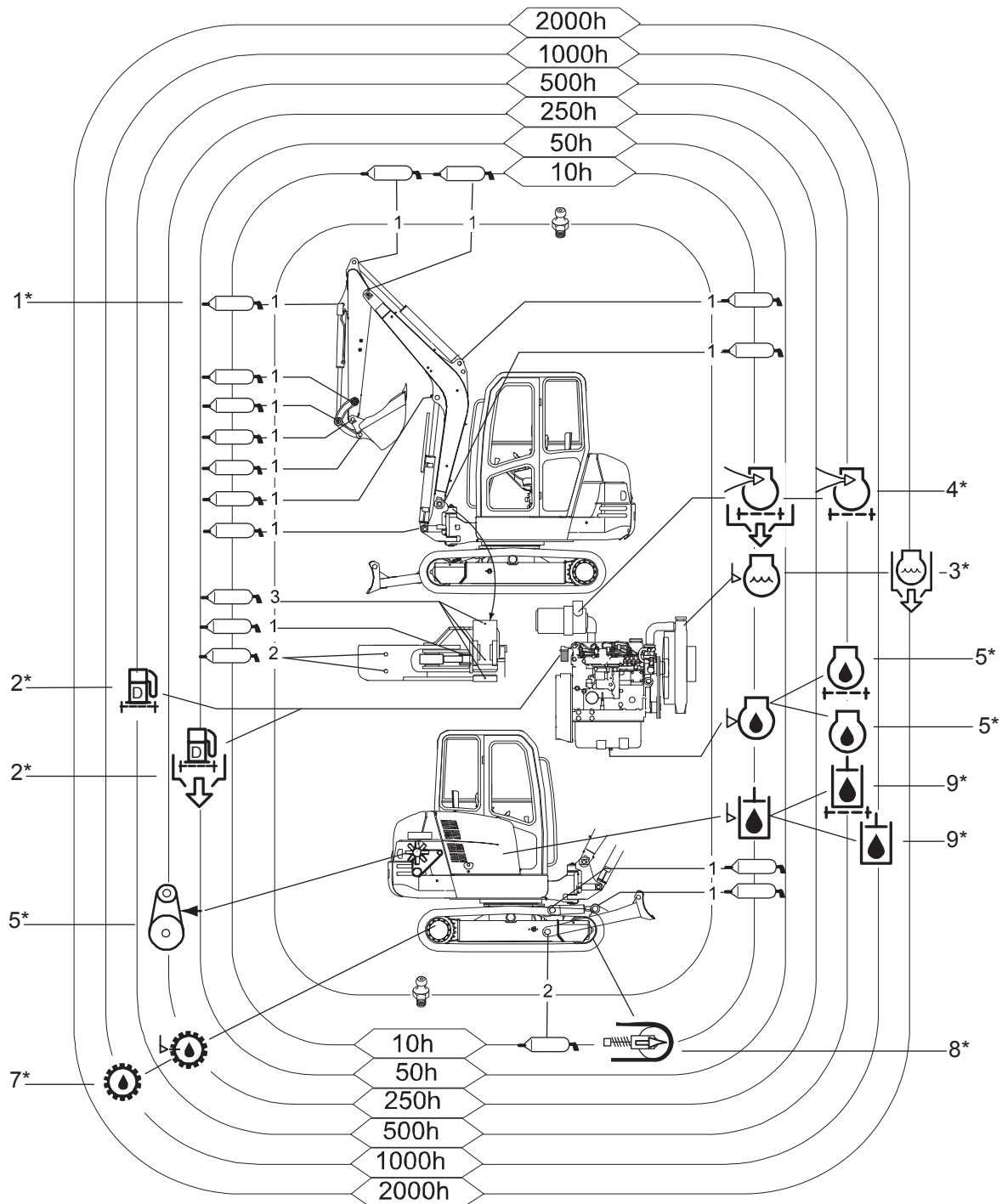
The following standard symbols are used in the lubrication and maintenance plan.

	Lubrication		Change travel gear oil
	Fuel system		Check travel gear oil
	Drain condensation water		Check track tension
	Change the fuel filter		Check hydraulic oil
	Check the coolant level		Change the hydraulic oil
	Change coolant		Change the hydraulic oil filter
	Clean filter element		
	Change the filter element		
	Check the engine oil level		
	Change the engine oil		
	Change the engine oil filter		
	Check the V-belt tension		

Lubrication and service chart

Inspection, oil change and lubrication intervals EC35/ EC45

Every: 10, 250, 500, 1000 and 2000 operating hours.



1011315

*See tabular overview.

Position	Measures every 10 operating hours	Page
	General inspection (Oil, water and fuel leaks, machine components and hoses, fittings and hydraulic connections, function of control elements, working lights, control lights and diesel engine).	
1	Lubrication chart (see lubrication and maintenance plan)	104
2	Checking the fuel level	88
3	Check the coolant level	90
4	Cleaning the dust valve	93
5	Checking the engine oil level	86
8	Checking the track tension	98
9	Checking the hydraulic oil level	99

Position	Measures every 50 operating hours	Page
2	Draining the fuel prefilter / water separator	88

Position	Measures after the first 100 operating hours	Page
2	Draining the fuel prefilter / water separator	88
5	Changing the engine oil (1st service)	86
5	Changing the engine oil filter (1st service)	87
9	Changing the hydraulic oil filter (1st service)	101
	Check the valve rocker arms for correct adjustment (1st service)*	
	Check tightening torques for engine fastening screws (1st service)*	

Position	Measures every 250 operating hours	Page
5	Checking the fan belt tension	92
4	Cleaning the air filter cartridge	93
3	Cleaning the radiator cooling fins	102
7	Checking the oil level in the track reduction gear	97

Position	Measures every 500 operating hours	Page
5	Changing the engine oil	86
5	Changing the engine oil filter	87
2	Replacing the fuel prefilter / water separator	88
2	Changing the fuel filter	89
4	Replacing the air filter cartridge	93
4	Auxiliary filter cartridge (option)	93
9	Changing the hydraulic oil filter	101
	Check the hydraulic system pressure*	

Position	Measures every 1000 operating hours	Page
7	Changing the track reduction gear oil	97
9	Changing the hydraulic oil	100
	Check starter and generator*	
	Check the tightening torque of the engine mounting screws*	
	Check the valve rocker for correct adjustment*	
	Check the injection nozzles for correct adjustment*	

Position	Measures every 2000 operating hours	Page
3	Coolant change	91

*Workshop jobs (should be carried out by an authorised workshop)

Lubrication points	Lubrication grease ISO 6743/0	<table><tr><td>°C</td><td>-30</td><td>-20</td><td>-10</td><td>0</td><td>+10</td><td>+20</td><td>+30</td><td>+40</td><td>+50</td></tr><tr><td>°F</td><td>-22</td><td>-4</td><td>+14</td><td>+32</td><td>+50</td><td>+68</td><td>+86</td><td>+104</td><td>+122</td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td colspan="9">Multi purpose NLGI2</td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr></table>	°C	-30	-20	-10	0	+10	+20	+30	+40	+50	°F	-22	-4	+14	+32	+50	+68	+86	+104	+122												Multi purpose NLGI2																		
°C	-30	-20	-10	0	+10	+20	+30	+40	+50																																											
°F	-22	-4	+14	+32	+50	+68	+86	+104	+122																																											
	Multi purpose NLGI2																																																			
Cooling system	Coolant	Use the same coolant as filled before, see page 90.																																																		

ASTM: American Society of Testing and Material

SAE: Society of Automotive Engineers

ISO: International Standardization Organization

API: American Petroleum Institute

* Acc. to ISO 6743/4 HV or DIN 51524-HVLP

** Panolin HLP synth

NOTE! Use engine oil of type SAE 10W, SAE 10W/30 or SAE 15W/40, if the engine is to be started under an ambient temperature of less than 0 °C, even if the daytime temperature rises up to 10 °C.

Fuel, quality requirements

The fuel should at least meet the legal requirements, and national and international standards for marketed fuels, for example EN590 (with nationally adapted low temperature requirements), ASTM D 975 No 1D and 2D, JIS KK 2204.

Sulphur content: According to legal requirements (the sulphur content must not exceed 0.3 percent by weight).

Bio diesel fuel

Vegetable oil and/or ester, also referred to as "Bio-Diesel", e.g. methyl ester or rapeseed (RME) is in some markets offered both as pure product or for mixing with diesel fuel.

Volvo CE permits an additive quantity of max. 5% of bio-diesel to the diesel fuel, mixed in by the oil manufacturer.

An additive component of more than 5 % of bio-diesel may have the following effects:

- increased emission of nitrogen oxides (beyond the legally specified limits)
- reduced lifetime of engine and injection system
- increased fuel consumption
- change in engine power
- halving of time between oil change intervals
- reduced lifetime of rubber elements in the fuel system
- affected low temperature properties of the fuel
- limit storage time of the fuel. Clogging of the fuel system may occur, if the machine is not used for a longer period of time.

Warranty

The warranty does not cover damaged caused by the admixture of more than 5 % of bio-diesel.

Coolant

Use the same coolant as the system was filled with previously. To avoid damage to engine and cooling system, different coolants or corrosion protection must not be mixed.

When using concentrated coolant and clean water, the mixture must contain 40–60 % concentrated coolant and 60–40 % clean water. The amount of concentrated coolant must not be less than 40 % of the total mixture, see table below.

Freeze protection down to	Mixed-in amount of concentrated coolant
–25 °C (–13 °F)	40 %
–35 °C (–31 °F)	50 %
–46 °C (–51 °F)	60 %

The concentrated coolant must not be mixed with water that contains a high degree of lime (hard water), salt or metals.

The clean water for the cooling system must also meet the following requirements:

Description	Value
Total number of soild particles	< 340 ppm
Total hardness	< 9.5 ° dH
Chloride	< 40 ppm
Sulphate	< 100 ppm
pH value	5.5–9
Silica	< 20 mg SiO ₂ /litre
Iron	< 0.10 mg Fe/litre
Manganese	< 0.05 mg Mn/litre
Electrical conductivity	< 500 µS/cm
Organic content, COD-Mn	< 15 mg/litre

If there are doubts as to the quality of the water, ready-mixed coolant must be used. To avoid damage to the engine, different kinds of ready-mixed coolant must not be mixed.

Capacities, change intervals

Filling capacities	Litres	
	EC35	EC45
Fuel tank	66	66
Cooling system (complete)	6	6
Engine oil including filter	8.6	8.6
Hydraulic oil tank (tank and hydraulic system)	62	62
Travel gear	2 x 0.6	2 x 0.8

Oil and fluid changes	Operating hours	
	EC35	EC45
Engine oil	100* / 500	100* / 500
Coolant	2000	2000
Hydraulic oil	1000	1000
Travel gear	1000	1000
(* 1. service)		

Filter changes	Operating hours	
	EC35	EC45
Engine oil filter	100* / 500	100* / 500
Fuel filter	500	500
Air filter	500	500
Hydraulic oil filter	100* / 500	100* / 500
(* 1. service)		

Engine

EC35

Designation	VOLVO D2.2
Combustion method	Diesel with direct injection system
Engine power, net ISO 9249	26 kW / 34.8 PS at 2200/min
Max. torque	140 kW at 1100 rpm
Number of cylinders	4
Bore x stroke	88 x 90 mm
Displacement	2190 cm ³
Compression ratio	19
Fuel consumption	approx. 4.5 l/h
Firing sequence	1-3-4-2
Cooling	Water

EC45

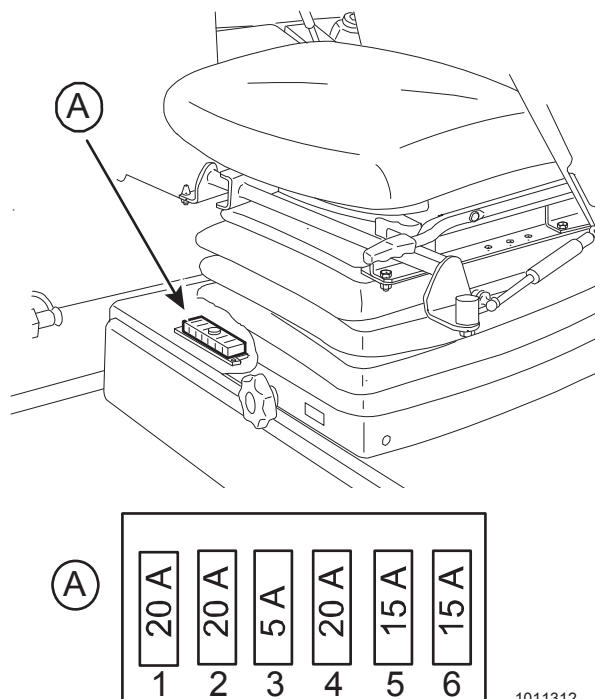
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Max. torque	140 kW at 1100 rpm
Number of cylinders	4
Bore x stroke	88 x 90 mm
Displacement	2190 cm ³
Compression ratio	19
Fuel consumption	approx. 4.5 l/h
Firing sequence	1-3-4-2
Cooling	Water

Electrical system

Electrical system	
System voltage	12 V
Batteries	1
Battery voltage	12 V
Battery capacity	74 Ah
Three-phase generator	EC35: 12V x 55A EC45: 12V x 55A
Starter motor	EC35: 12V / 2.3 kW EC45: 12V / 2.3 kW

Relays and fuses

Relay and fuses are located under the driver's seat and on the rear side of the right hand operating console in the cab.

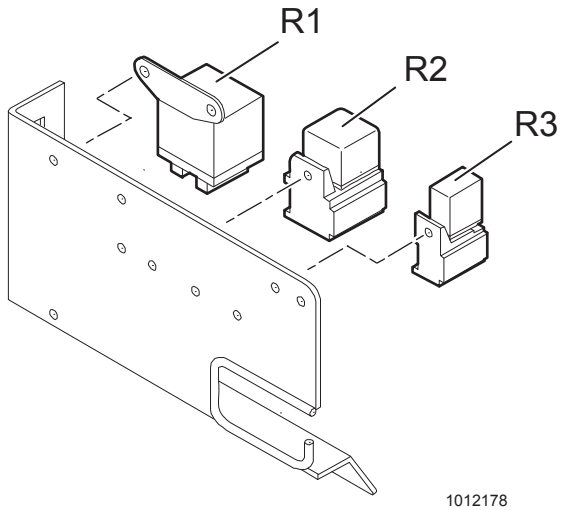


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For functions of relays and fuses please refer to the following pages.

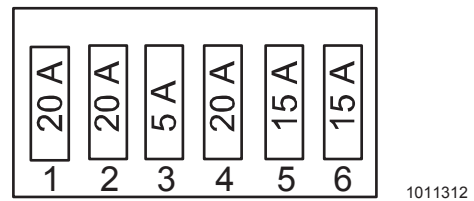
Relays and fuses (assignment plan)

Relay under the driver's seat

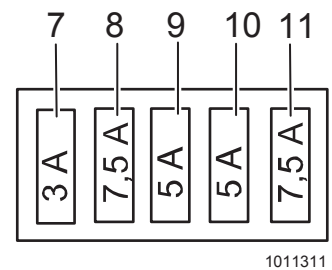


Fuses in cab

The fuse strip is located under the driver's seat.



Fuse strip on right hand control console (see also page 34).



114 Electrical system

Relay

No.	Relay	Relay function
1	R1	Engine preheating
2	R2	Starting the engine
3	R3	Working headlights/lighting system

Fuses

No.	Lock	Ampere	Function
1	FU 20A	20 A	Electric power supply for control unit
2	FU 20A	20 A	Electric power supply for control unit
3	FU 5A	5 A	Electric power supply for control unit, engine preheating relay
4	FU 20A	20 A	Electric power supply for lighting relay
5	FU 15A	15 A	Electric power supply for cab
6	FU 15A	15 A	Rotating beacon, horn, hand lamp

Fuse for cabin equipment

No.	Lock	Ampere	Function
7	FU 3A	3 A	Radio
8	FU 7.5A	7.5 A	Windscreen wiper, windscreen washer system
9	FU 5A	5 A	Cab light
10	FU 5A	5 A	Radio with tape player
11	FU 7.5A	7.5 A	Cabin heating

NOTE! Use only fuses of specified capacity (Ampere rating).

Fault messages in the digital display of the “PUMA” instrument panel

Fault messages without warning signal

The digital display shows a fault message in form of a fault code.

Fault code	Warning signal	Fault/ Incident	Cause	Remedy
SECURIT	no warning signal	The starter cannot be operated.	1. Engine running. 2. Left hand control console is lowered.	Lift the left hand control console
ENTER CODE	no warning signal	Interruption of machine by activated anti-theft device.	Anti-theft device active.	Enter the 4-digit code and unlock the anti-theft device.

Fault message with warning signal

If a technical fault or defect occurs a fault message in form of a fault code is displayed by the digital display and 4 audible warning signals will be emitted.

The following fault messages in connection with a technical fault in the electric system can be rectified by the driver with minimum effort.

Fault code	Warning signal	Fault/ Incident	Cause	Remedy
FC1.01	4 audible warning signals	Fault in main supply.	20A fuse defective (main fuse)	Check and replace fuse
FC1.02	4 audible warning signals	Auxiliary supply for unit.	20A fuse defective (main fuse)	
FC1.03	4 audible warning signals	Supply fault starter and preheating relay.	5A fuse defective	



WARNING!

If the fault could not be remedied by application of the corrective measures you should consult your Volvo CE dealer.

Power Transmission

Travel system	EC35	EC45
Travel speed	1. Gear: 2.8 km/h 2. Gear: 4.3 km/h	1. Gear: 3 km/h 2. Gear: 4.4 km/h
Max. traction power	3630 daN	4080 daN
Chassis braking system		
Primary brake	Hydrostatic brake. If the levers of the chassis control are released, the machine will come to a halt.	
Secondary brake	The secondary brake is automatically applied if a fault occurs in the master brake circuit.	
Parking brake	Automatic	Automatic

Slewing system

Slewing system	EC35	EC45
	Slewing ring (ball bearing ring gear) with internal gearing and remote lubrication.	
Slewing speed (directly driven Orbitrol hydraulic motor without reduction gear)	10 rev./min	10 rev./min
Brake system for slewing gear		
Parking brake	Automatic (interlocking of slewing superstructure spring friction brake).	
Primary brake	Hydrostatic brake. Release slewing gear control lever in order to stop the slewing gear.	

Cabin

Vibration and sound information

Hand-arm vibrations

Emission of hand-arm vibration during real operating conditions at its intended use is less than 2.5 m/s^2 RMS (root mean square) acceleration according to ISO 8041.

Whole-body vibrations

Emission of Whole-Body Vibration during real operating conditions at its intended use is according to the table below.

Typical operating conditions	Vibration emission value $1.4 \cdot a_{w,eqx}$ (m/s^2 RMS)	Vibration emission value $1.4 \cdot a_{w,eqy}$ (m/s^2 RMS)	Vibration emission value $a_{w,eqz}$ (m/s^2 RMS)
Excavating	0.33	0.21	0.19
Hydraulic breaker app.	0.49	0.28	0.36
Transfer movement	0.45	0.39	0.62

The following vibration directions are defined:

x = fore and aft

y = lateral

z = vertical

The whole-body vibration values given above have been taken from ISO/CEN Technical Report.

NOTE! These whole-body vibration emission values were determined at particular operating and terrain conditions and is therefore not representative for all the various conditions in accordance with the intended use of the machine and should not alone be used to determine the whole-body vibration exposure to the operator using the machine. For this purpose the information in ISO/CEN Technical Report is recommended.

To ensure that the whole-body vibration emission during machine use is kept to a minimum, see page 48.

Sound information

	EC35 Cabin	EC35 Canopy	EC45 Cabin	EC45 Canopy
Sound pressure level (LpA) at operator position (Measurement according to ISO 6396)	78 LpA dB(A)	80 LpA dB(A)	78 LpA dB(A)	80 LpA dB(A)
Sound power level (LwA) around the machine (Measurement according to 2000/14/EC with applicable appendices and measuring method according to ISO 6395)	96 LwA dB(A)	96 LwA dB(A)	96 LwA dB(A)	96 LwA dB(A)

Hydraulic system

EC35	
Hydraulic pump	90 l/min.
Bucket cylinder	54/35 l/min
Dipper cylinder	64/43 l/min
Boom cylinder	45/40 l/min
Offset cylinder	23/15 l/min
Dozer blade cylinder	38/29 l/min
Travel movement left/right	60 l/min (one track)
Optional equipment	60 l/min.
Rotation	23 l/min.
Operating pressure: Hydraulic system	230 bar
Secondary pressure: at boom at dipper arm	300 bar 300 bar

EC45	
Hydraulic pump	90 l/min.
Bucket cylinder	60/51 l/min
Dipper cylinder	70/48 l/min
Boom cylinder	52/40 l/min
Offset cylinder	23/15 l/min
Dozer blade cylinder	39/29 l/min
Travel movement left/right	60 l/min (one track)
Optional equipment	60 l/min.
Rotation	23 l/min.
Operating pressure: Hydraulic system	260 bar
Secondary pressure: at boom at dipper arm	300 bar 300 bar

Cylinder

EC35			
Cylinder (mm)	Bore-Ø (mm)	Rod-Ø (mm)	Stroke (mm)
Bucket cylinder	70	45	490
Dipper cylinder	80	50	670
Boom cylinder	90	50	570
Offset cylinder	80	45	475
Dozer blade cylinder	100	60	130

EC45			
Cylinder (mm)	Bore-Ø (mm)	Rod-Ø (mm)	Stroke (mm)
Bucket cylinder	70	45	565
Dipper cylinder	80	50	670
Boom cylinder	90	50	570
Offset cylinder	80	45	475
Dozer blade cylinder	100	60	130

Weights

(including operator with 75 kg)

EC35		
Version	Rubber tracks 300 mm	Steel tracks 300 mm
Cabin	3540 kg	3582 kg
Cabin	3422 kg	3464 kg

EC45		
Version	Rubber tracks 400 mm	Steel tracks 400 mm
Cabin	4550 kg	4687 kg
Cabin	4413 kg	4550 kg

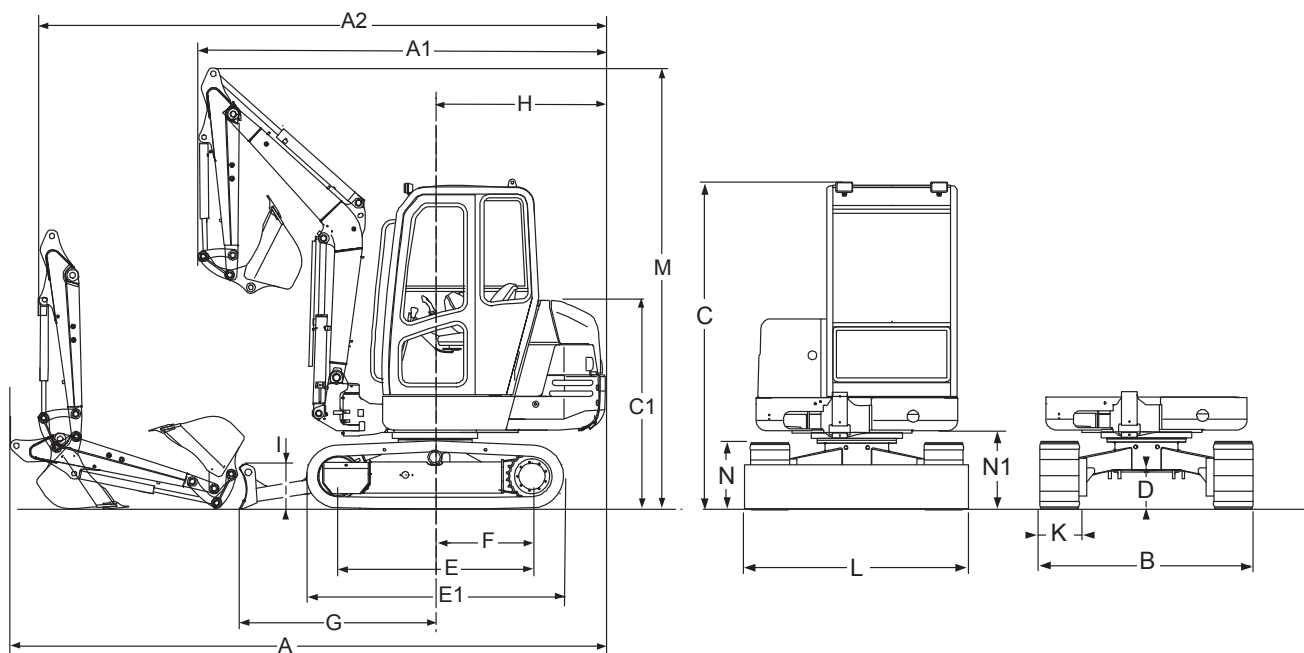
Ground pressure

(including operator with 75 kg))

EC35		
Version	Rubber tracks 300 mm	Steel tracks 300 mm
Cabin	0.33 kg/cm ² (0.033 MPa)	0.34 kg/cm ² (0.034 MPa)
Cabin	0.31 kg/cm ² (0.031 MPa)	0.34 kg/cm ² (0.034 MPa)

EC45		
Version	Rubber tracks 400 mm	Steel tracks 400 mm
Cabin	0.25 kg/cm ² (0.025 MPa)	0.26 kg/cm ² (0.026 MPa)
Cabin	0.24 kg/cm ² (0.024 MPa)	0.25 kg/cm ² (0.025 MPa)

Dimensions EC35

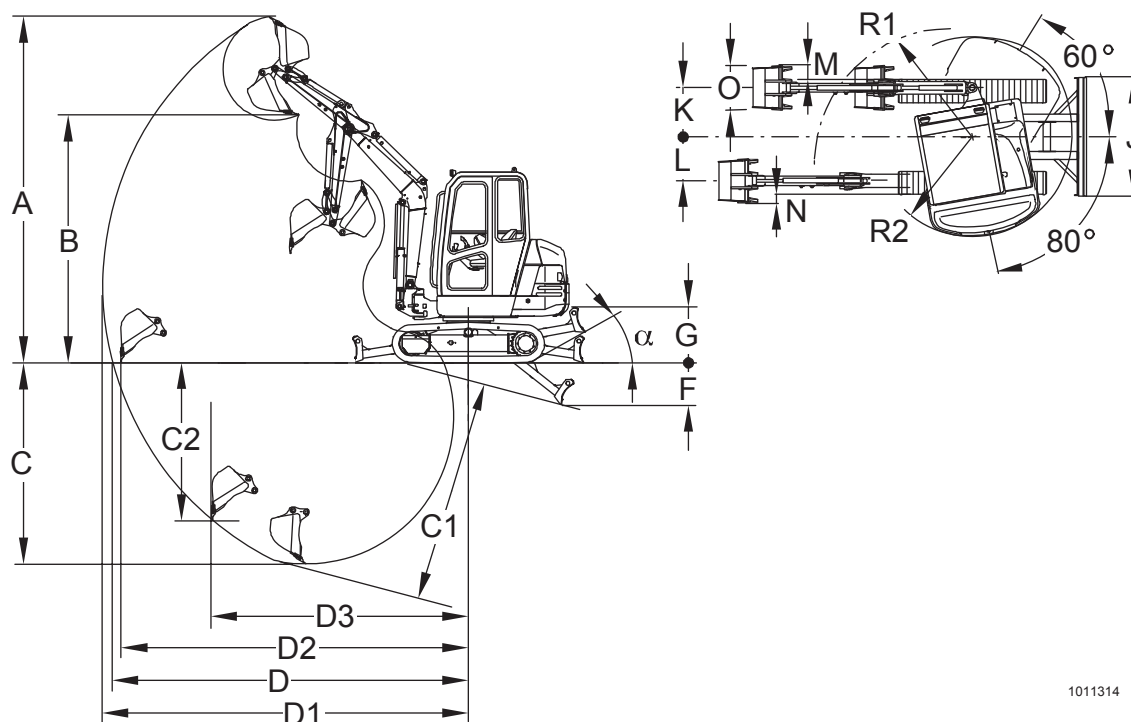


1012170

Dimensions (mm)

The technical data of the machine serve for the purpose of information only and can be changed by the manufacturer without prior notification.

Version	EC35	
Arm	1400	1700
A	5025	5055
A1	3400	3430
A2	4750	4590
B	1620	1620
C	2490	2490
C1	1550	1550
D	290	290
E	1600	1600
E1	2070	2070
F	800	800
G	1620	1620
H	1360	1360
I	370	370
K	300	300
L	1650	1650
M	3690	3690
N	510	510
N1	600	600



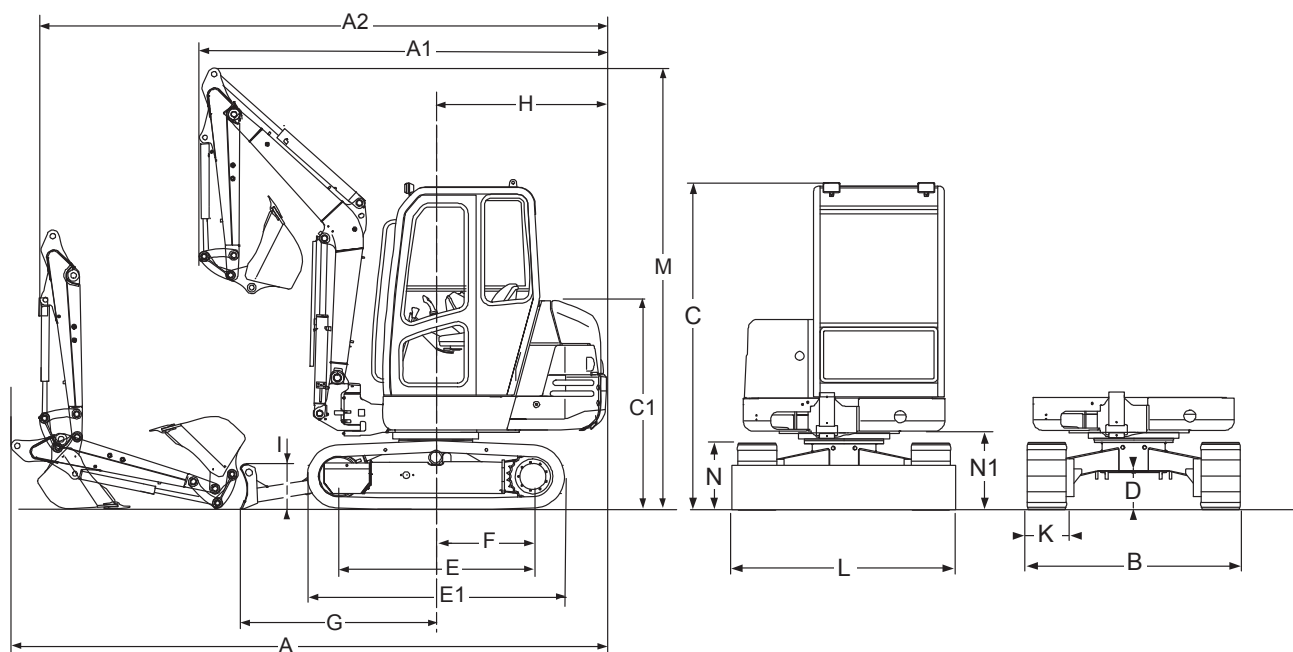
1011314

Dimensions (mm)

The technical data of the machine serve for the purpose of information only and can be changed by the manufacturer without prior notification.

Version	EC35	
Arm	1400	1700
A	4840	5020
B	3530	3720
C	3170	3470
C1	3420	3710
C2	2200	2500
D	5130	5420
D1	5240	5530
D2	5090	5380
D3	3800	3900
F	510	510
G	710	710
J	1650	1650
K	700	700
L	500	500
M	190	190
N	10	10
O	600	600
R1	1575	1600
R2	1380	1380
Digging force (daN)	2920 (daN)	
Ripping force (daN)	2190 (daN)	
Offsetting angle	60° / 80°	
Total swashing angle	360°	

Dimensions EC45

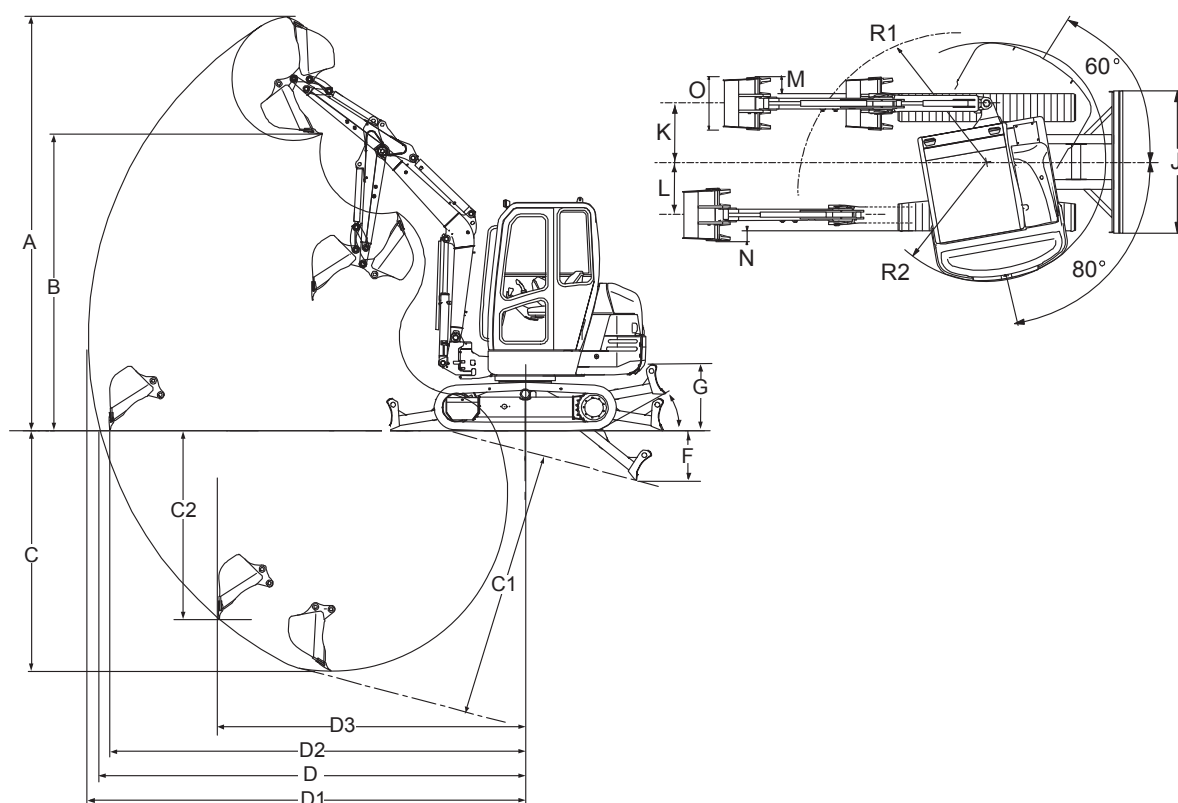


1012259

Dimensions (mm)

The technical data of the machine serve for the purpose of information only and can be changed by the manufacturer without prior notification.

Version	EC45	
Arm	1400	1700
A	5284	5286
A1	3735	3794
A2	5018	4875
B	1800	1800
C	2539	2539
C1	1550	1550
D	320	320
E	1770	1770
E1	2284	2284
F	890	890
G	1616	1616
H	1412	1412
I	367	367
K	400	400
L	1850	1850
M	3863	3863
N	552	552
N1	651	651



1011316

Dimensions (mm)

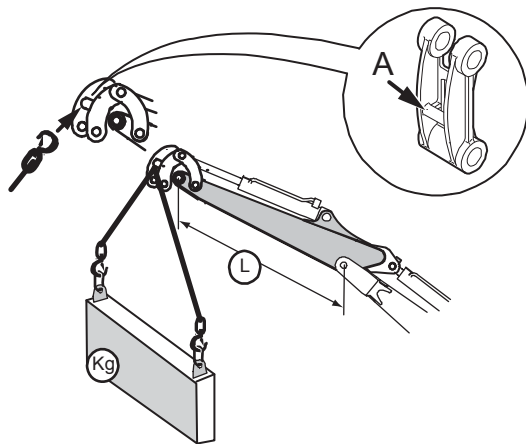
The technical data of the machine serve for the purpose of information only and can be changed by the manufacturer without prior notification.

Version	EC45	
Arm	1400	1700
A	4929	5081
B	3522	3674
C	3454	3753
C1	3619	3906
C2	1992	2267
D	5382	5666
D1	5501	5778
D2	5335	5616
D3	4356	4476
F	479	479
G	744	744
J	1850	1850
K	697	697
L	499	499
M	97	97
N	101	101
O	600	600
R1	1858	1911
R2	1420	1420
Digging force (daN)	3358 (daN) 2424 (daN) 60° / 80° 360°	
Ripping force (daN)		
Offsetting angle		
Total swashing angle		

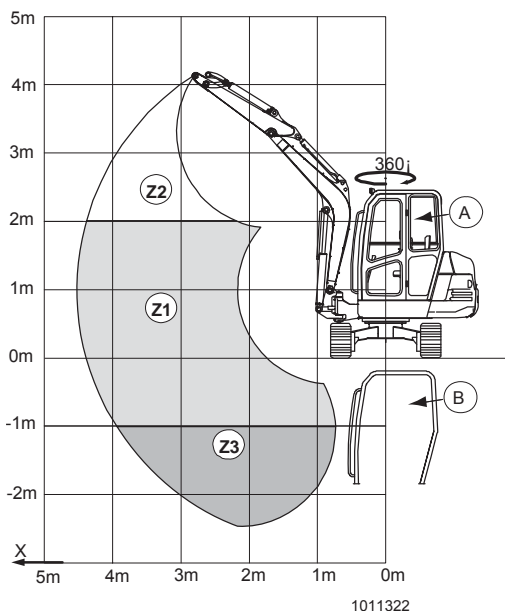
Nominal lifting loads EC35

Nominal lifting loads Europe

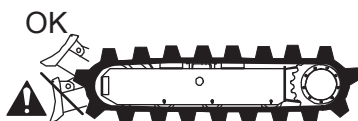
Nominal lifting loads in kg, i.e. 75% of the tipping load or 87% of the hydraulic limit. These loads apply for the complete height (Z.) and for the specified reach. Increase of loads by 3% for steel tracks, except the marked values (* = hydraulic limits).



1011325



1011322



WARNING!

The transport of objects in lifting gear operation is prohibited if the machine is not equipped with a "Safety" Kit, which is optionally available and includes the following:

- a safety valve on the boom,
- a load safety device (see switch in instrument panel),
- a table stating the nominal loads for lifting gear operation, fastened inside the operator's stand.

The assembly of the "Safety" Kit must only be carried out by an authorized person.



WARNING!











Lift objects only with the lifting tackle provided for this purpose, which consists of a rod (A) between both sides.

The specified values are valid for a machine:

- without attachment and without quick coupling.

NOTE! If handling is accomplished in lifting gear operation the weight of the attachments must be subtracted from the values stated in the table

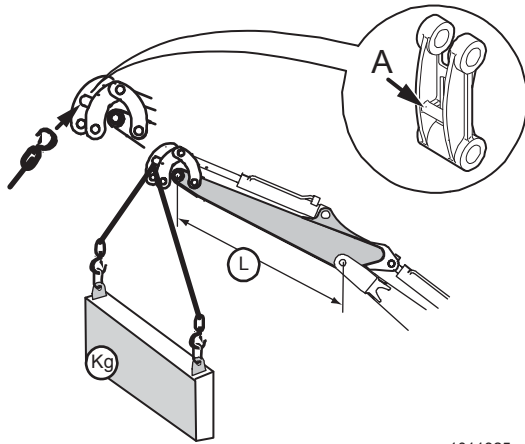
- On level and firm ground
- With rubber tracks.
- Equipment during full rotation.
- Equipment parallel to the axis of the superstructure.
- With a 75 kg driver in the cab.

<div>1012172</div> <div></div>			<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>
X(m)			>	1.5	2	2.5	3	3.5	4	4.5	4.8
A	L: 1.40m	Z2				955	720	570	465		
		Z1	1555*	1190	845	655	530	445	380		
		Z3	2040*	1215	855	660	535				
	L: 1.70m	Z2				730	575	465	385		
		Z1	1395*	1175	835	645	520	435	370	340	
		Z3	1945*	1190	840	645	520	435			
B	L: 1.40m	Z2				895	675	538	440		
		Z1	1465*	1100	785	615	498	415	355		
		Z3	1950*	1120	795	615	503				
	L: 1.70m	Z2				685	543	440	365		
		Z1	1305*	1085	775	605	488	410	350	320	
		Z3	1855*	1100	780	605	488	410			

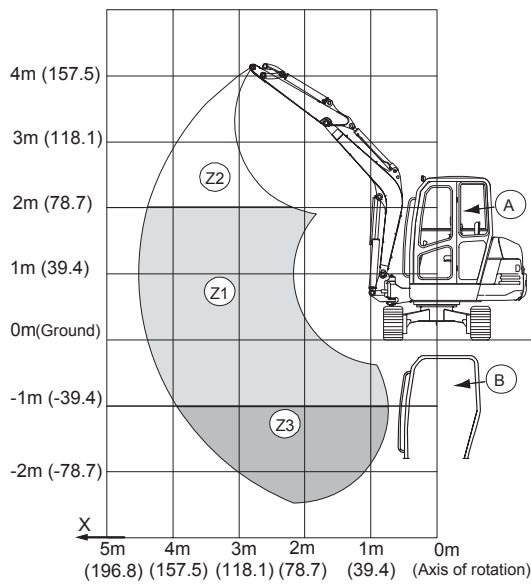
1011323

Nominal lifting loads Northern America

Nominal lifting loads in kg, i.e. 75% of the tipping load or 87% of the hydraulic limit. These loads apply for the complete height (Z.) and for the specified reach. Increase of loads by 3% for steel tracks, except the marked values (* = hydraulic limits).



1011325



1012214



WARNING!

The transport of objects in lifting gear operation is prohibited if the machine is not equipped with a "Safety" Kit, which is optionally available and includes the following:

- a safety valve on the boom,
- a load safety device (see switch in instrument panel),
- a table stating the nominal loads for lifting gear operation, fastened inside the operator's stand.

The assembly of the "Safety" Kit must only be carried out by an authorized person.



WARNING!

Lift objects only with the lifting tackle provided for this purpose, which consists of a rod (A) between both sides.

The specified values are valid for a machine:

- without attachment and without quick coupling.

NOTE! If handling is accomplished in lifting gear operation the weight of the attachments must be subtracted from the values stated in the table

- On level and firm ground
- With rubber tracks.
- Equipment during full rotation.
- Equipment parallel to the axis of the superstructure.

With a 75 kg driver in the cab.

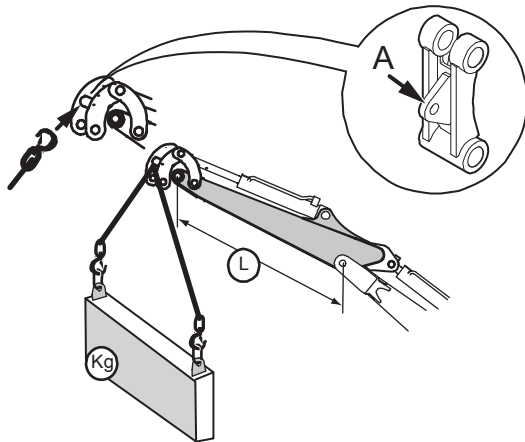
→ X m (in)		>	2 (78.7)	3 (118.1)	4 (157.5)	Maxi	
			Kg (Lbs)	Kg (Lbs)	Kg (Lbs)	Kg (Lbs)	
A	L: 1.40m (55.1)	Z2		720 (1590)	465 (1025)		
		Z1	1190 (2625)	655 (1445)	445 (980)	380 (850)	
		Z3	1215 (2680)	660 (1455)			
	L: 1.70m (66.9)	Z2		730 (1610)	465 (1025)		
		Z1	1175 (2590)	645 (1420)	435 (960)	340 (750)	
		Z3	1190 (2625)	645 (1420)	435 (960)		
B	L: 1.40m (55.1)	Z2		675 (1490)	440 (970)		
		Z1	1100 (2425)	615 (1355)	415 (915)	355 (785)	
		Z3	1120 (2470)	615 (1355)			
	L: 1.70m (66.9)	Z2		685 (1510)	440 (970)		
		Z1	1085 (2390)	605 (1335)	410 (905)	320 (705)	
		Z3	1100 (2425)	605 (1335)	410 (905)		
A and B	L: 1.40m (55.1)	Z2		770* (1700*)	805* (1775*)		
		Z1	1570* (3460*)	925* (2040*)	845* (1865*)	910* (2005*)	
		Z3	1595* (3515*)	1190* (2625*)			
	L: 1.70m (66.9)	Z2		765* (1685*)	680* (1500*)		
		Z1	1440* (3175*)	765* (1685*)	750* (1655*)	825* (1820*)	
		Z3	1875* (4135*)	1395* (3075*)	1085* (2390*)		

1011321

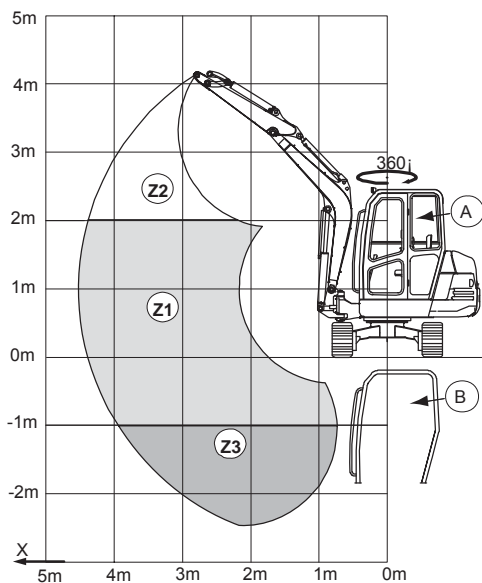
Nominal lifting loads EC45

Nominal lifting loads Europe

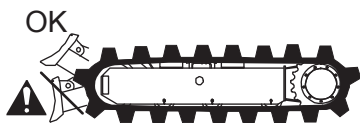
Nominal lifting loads in kg, i.e. 75% of the tipping load or 87% of the hydraulic limit. These loads apply for the complete height (Z.) and for the specified reach. Increase of loads by 3% for steel tracks, except the marked values (* = hydraulic limits).



1011326



1011322



WARNING!

The transport of objects in lifting gear operation is prohibited if the machine is not equipped with a "Safety" Kit, which is optionally available and includes the following:

- a safety valve on the boom,
- a load safety device (see switch in instrument panel),
- a table stating the nominal loads for lifting gear operation, fastened inside the operator's stand.

The assembly of the "Safety" Kit must only be carried out by an authorized person.



WARNING!









Lift objects only with the lifting tackle provided for this purpose, which consists of a lifting eye (A) between both sides.

The specified values are valid for a machine:

- without attachment and without quick coupling.

NOTE! If handling is accomplished in lifting gear operation the weight of the attachments must be subtracted from the values stated in the table

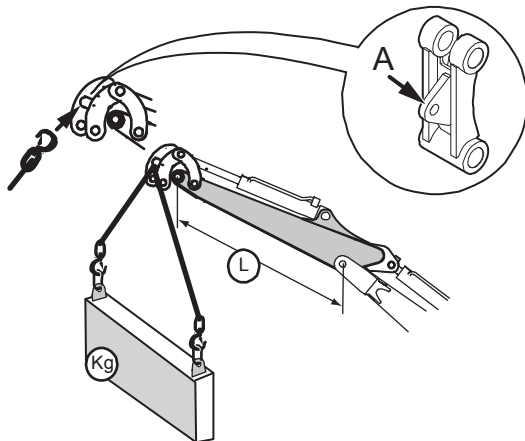
- On level and firm ground
- With rubber tracks.
- Equipment during full rotation.
- Equipment parallel to the axis of the superstructure.
- With a 75 kg driver in the cab.

		<div>1012172</div>								
<div><div></div><div>X(m)</div></div>		>	<div></div> 1.5	<div></div> 2	<div></div> 2.5	<div></div> 3	<div></div> 3.5	<div></div> 4	<div></div> 4.5	<div></div> 4.9
A	L: 1.40m	Z2			1165*	805*	735*	700	595	
		Z1	1690*	1825	1290	1000	815	680	585	
		Z3	2515*	1840	1305	1005	815	690		
	L: 1.70m	Z2			1320*	830*	625*	675*	590	
		Z1	1530*	1650*	1275	985	800	670	575	515
		Z3	2150*	1805	1280	985	800	670		
B	L: 1.40m	Z2			1165*	810*	735*	675	571	
		Z1	1690*	1755	1240	960	810	655	563	
		Z3	2515*	1770	1255	965	785	660		
	L: 1.70m	Z2			1320	830*	810	670	565	
		Z1	1530*	1650*	1220	945	765	640	550	490
		Z3	2150*	1730	1230	945	765	640		

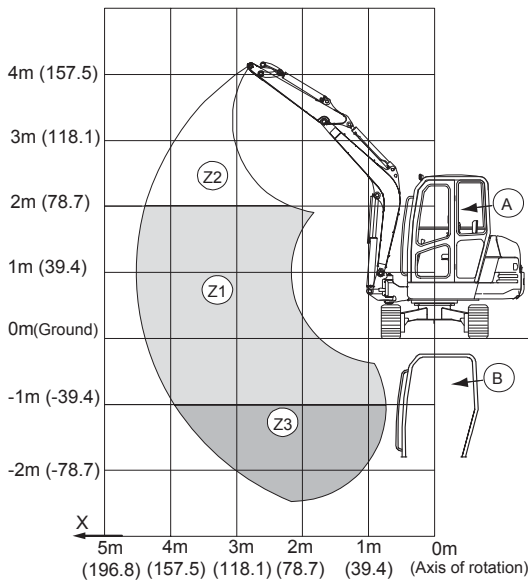
1011320

Nominal lifting loads Northern America

Nominal lifting loads in kg, i.e. 75% of the tipping load or 87% of the hydraulic limit. These loads apply for the complete height (Z.) and for the specified reach. Increase of loads by 3% for steel tracks, except the marked values (* = hydraulic limits).



1011326



1012214



WARNING!

The transport of objects in lifting gear operation is prohibited if the machine is not equipped with a "Safety" Kit, which is optionally available and includes the following:

- a safety valve on the boom,
- a load safety device (see switch in instrument panel),
- a table stating the nominal loads for lifting gear operation, fastened inside the operator's stand.

The assembly of the "Safety" Kit must only be carried out by an authorized person.



WARNING!

Lift objects only with the lifting tackle provided for this purpose, which consists of a lifting eye (A) between both sides.

The specified values are valid for a machine:

- without attachment and without quick coupling.

NOTE! If handling is accomplished in lifting gear operation the weight of the attachments must be subtracted from the values stated in the table

- On level and firm ground
- With rubber tracks.
- Equipment during full rotation.
- Equipment parallel to the axis of the superstructure.

With a 75 kg driver in the cab.

→ X m (in)		> 2 (78.7)		3 (118.1)		4 (157.5)		Maxi	
			Kg (Lbs)	Kg (Lbs)	Kg (Lbs)	Kg (Lbs)	Kg (Lbs)	Kg (Lbs)	Kg (Lbs)
A	L : 1.40m (55.1)	Z2		805* (1775*)	700 (1540)				
		Z1	1825* (4020*)	1000 (2205)	680 (1500)				
		Z3	1840 (4055)	1005 (2215)	690 (1520)				
		Z2		830* (1830*)	675* (1490*)				
		Z1	1650* (3635)	985 (2170)	670 (1475)	515 (1135)			
		Z3	1805 (3980)	985 (2170)	670 (1475)				
	L : 1.70m (66.9)	Z2		810* (1785*)	675 (1490)				
		Z1	1755 (3870)	960 (2115)	655 (1445)				
		Z3	1770 (3900)	965 (2125)	660 (1455)				
		Z2		830* (1830*)	670 (1475)				
		Z1	1650* (3635*)	945 (2080)	640 (1410)	490 (1080)			
		Z3	1730 (3815)	945 (2080)	640 (1410)				
B	L : 1.40m (55.1)	Z2		810* (1785*)	810* (1785*)				
		Z1	2370* (5225*)	1485* (3275*)	1070* (2360*)				
		Z3	1870* (4120*)	1500* (3305*)					
		Z2		830* (1830*)	675* (1490*)				
		Z1	1650* (3635*)	1330* (2930*)	990* (2180*)	880* (1940*)			
		Z3	2366* (5215*)	1650* (3640*)	1180* (2600*)				
A and B	L : 1.40m (55.1)	Z2		810* (1785*)	810* (1785*)				
		Z1	2370* (5225*)	1485* (3275*)	1070* (2360*)				
		Z3	1870* (4120*)	1500* (3305*)					
		Z2		830* (1830*)	675* (1490*)				
		Z1	1650* (3635*)	1330* (2930*)	990* (2180*)	880* (1940*)			
		Z3	2366* (5215*)	1650* (3640*)	1180* (2600*)				
	L : 1.70m (66.9)	Z2		810* (1785*)	810* (1785*)				
		Z1	2370* (5225*)	1485* (3275*)	1070* (2360*)				
		Z3	1870* (4120*)	1500* (3305*)					
		Z2		830* (1830*)	675* (1490*)				
		Z1	1650* (3635*)	1330* (2930*)	990* (2180*)	880* (1940*)			
		Z3	2366* (5215*)	1650* (3640*)	1180* (2600*)				

1011319

Attachments

Bucket

EC35					
mm	Coupling type	Tooth	Content (l) (struck)	Content (l) (heaped)	Weight (kg)
300	STD	AT	41	50	68
450	STD	AT	62,8	80	77
600	STD	AT	82,3	110	97
750	STD	AT	111,5	153	112
300	QC	AT	41,5	48	66
350	QC	AT	47	58	68
450	QC	AT	62,4	78	76
600	QC	AT	84	110	95
750	QC	AT	110	147	110
1300	STD		117	175	125
1300	QC		117	175	130

STD: Standard coupling / manual fastening

QC: Quick coupling / quick fastening

AT: Bucket teeth with adapter and locking element

EC45					
mm	Coupling type	Tooth	Content (l) (struck)	Content (l) (heaped)	Weight (kg)
350	STD	AT	58	70	87
450	STD	AT	78	98	100
600	STD	AT	110	142	122
750	STD	AT	141	187	143
350	QC	AT	64	71	95
450	QC	AT	78	98	103
600	QC	AT	110	142	125
750	QC	AT	141	187	146
1300	STD		123	180	126
1300	QC		123	180	130

STD: Standard coupling / manual fastening

QC: Quick coupling / quick fastening

AT: Bucket teeth with adapter and locking element

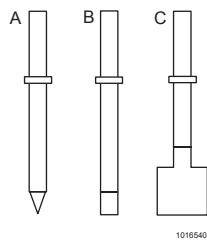
Hammer

EC35				
Type	Coupling type	Weight (kg)	Hydraulic oil flow (l/min)	Hydraulic pressure (bar)
HB260	STD	250	60	230
HB260	QC	250	60	230

EC45				
Type	Coupling type	Weight (kg)	Hydraulic oil flow (l/min)	Hydraulic pressure (bar)
HB260	STD	250	60	260
HB260	QC	250	60	260

Hammer tools

Type
Pointed chisel (A)
Flat chisel (B)
Spade (C)



Service history

Maintenance after 50 hours		Type of maintenance	Signature and stamp
Date	Hours	<input type="checkbox"/> Warranty inspection	

Maintenance after 100 hours		Type of maintenance	Signature and stamp
Date	Hours	<input type="checkbox"/> Warranty inspection	

Maintenance after 500 hours		Type of maintenance	Signature and stamp
Date	Hours	<input type="checkbox"/> Service and maintenance	

Maintenance after 1000 hours		Type of maintenance	Signature and stamp
Date	Hours	<input type="checkbox"/> Warranty inspection <input type="checkbox"/> Service and maintenance	

Maintenance after 1500 hours		Type of maintenance	Signature and stamp
Date	Hours	<input type="checkbox"/> Service and maintenance	

Maintenance after 2000 hours		Type of maintenance	Signature and stamp
Date	Hours	<input type="checkbox"/> Service and maintenance	

Maintenance after 2500 hours		Type of maintenance <input type="checkbox"/> Service and maintenance	Signature and stamp
Date	Hours		

Maintenance after 3000 hours		Type of maintenance <input type="checkbox"/> Service and maintenance	Signature and stamp
Date	Hours		

Maintenance after 3500 hours		Type of maintenance <input type="checkbox"/> Service and maintenance	Signature and stamp
Date	Hours		

Maintenance after 4000 hours		Type of maintenance <input type="checkbox"/> Service and maintenance	Signature and stamp
Date	Hours		

Maintenance after 4500 hours		Type of maintenance <input type="checkbox"/> Service and maintenance	Signature and stamp
Date	Hours		

Maintenance after 5000 hours		Type of maintenance <input type="checkbox"/> Service and maintenance	Signature and stamp
Date	Hours		

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Service history

Maintenance after 5500 hours		Type of maintenance <input type="checkbox"/> Service and maintenance	Signature and stamp
Date	Hours		

Maintenance after 6000 hours		Type of maintenance <input type="checkbox"/> Service and maintenance	Signature and stamp
Date	Hours		

Maintenance after 6500 hours		Type of maintenance <input type="checkbox"/> Service and maintenance	Signature and stamp
Date	Hours		

Maintenance after 7000 hours		Type of maintenance <input type="checkbox"/> Service and maintenance	Signature and stamp
Date	Hours		

Maintenance after 7500 hours		Type of maintenance <input type="checkbox"/> Service and maintenance	Signature and stamp
Date	Hours		

Maintenance after 8000 hours		Type of maintenance <input type="checkbox"/> Service and maintenance	Signature and stamp
Date	Hours		

Maintenance after 8500 hours		Type of maintenance <input type="checkbox"/> Service and maintenance	Signature and stamp
Date	Hours		

Maintenance after 9000 hours		Type of maintenance <input type="checkbox"/> Service and maintenance	Signature and stamp
Date	Hours		

Maintenance after 9500 hours		Type of maintenance <input type="checkbox"/> Service and maintenance	Signature and stamp
Date	Hours		

Maintenance after 10000 hours		Type of maintenance <input type="checkbox"/> Service and maintenance	Signature and stamp
Date	Hours		

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