

ECR50D

VOLVO CONSTRUCTION EQUIPMENT

OPERATOR'S MANUAL

ECR50D



VOLVO
Volvo Construction Equipment

Ref. no. PUB20036502-A English
2014.05
Volvo, Konz

English



ECR50D

Foreword

This operator's manual is intended as a guide for the correct use and maintenance of the machine. Read this manual carefully before you start and move the machine or before you carry out any preventive maintenance.

Keep this manual in the lockable storage compartment so that it is always available for easy reference. Replace it immediately if it is lost.

The operator's manual describes the applications for which the machine was primarily designed. It has been written to be valid on all markets. Therefore, please ignore any sections which do not relate to your machine or to the work that you do with your machine.

NOTE!

If the manual covers more than one machine, the information relates to all machines unless otherwise specified.

When designing this machine, much time has been invested in achieving the best possible efficiency and safety. But accidents do happen, and most of them can be attributed to human error. A safety-conscious person and a well-maintained machine make up a reliable, powerful, and profitable combination. **Therefore, read the safety instructions and follow them.**

We constantly strive to develop and improve the efficiency of our products by making changes to their design. We reserve the right to make design modifications to the products even after they have been delivered. Also, we reserve the right to change data and equipment, as well as the service and maintenance instructions, without prior notice.

OPERATOR'S MANUAL

Table of contents

Presentation

Instrument panels

Other controls

Operating instructions

Operating techniques

 Safety when servicing

Service and maintenance

Specifications

Alphabetical index

Ref. No. 20036502-A

The original language is English. Original instructions.
2014.05

Copyright © 2014, Volvo Construction Equipment. All rights reserved.

Safety regulations

The machine operator is responsible for being aware of and complying with the relevant, legally prescribed, national and regional safety instructions. The safety instructions in this operator's manual are applicable only in cases where no legislated safety instructions are in force.

DANGER

The safety symbol combined with this signal word indicates a hazardous situation which, if not avoided, ***will result in death or serious injury***. Danger is limited to the most extreme situations.

WARNING

The safety symbol combined with this signal word indicates a hazardous situation which, if not avoided, could result in ***death or serious injury***.

CAUTION

The safety symbol combined with this signal word indicates a hazardous situation which, if not avoided, could result in ***moderate or minor injury***.

NOTICE

Indicates a potentially hazardous situation which may result in machine damage.

NOTE!

Used in order to refer to installation, operating, or maintenance information which is important but not danger-related.

Get to know the capacity and limits of your machine!

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 20.

Manufacturer:	Volvo Construction Equipment sas rue Pierre Pingon BP 01303 Belley Cedex France
PIN (Product Identification Number) of machine:	
Engine:	



A series of horizontal dotted lines for writing, spanning the width of the page.



Table of contents

Foreword	1
Identification numbers	3
Presentation	9
Machine view	15
CE-marking, EMC-directive	16
Communication equipment, installation	19
Product plates	20
Information and warning decals	22
Instrument panels	26
Instrument panel, left	27
Display unit	28
Instrument panel, right	43
Other controls	48
Controls	48
ROPS	55
Operator comfort	57
Climate control system	65
Operating instructions	66
Safety rules when operating	68
Measures before operating	73
Starting engine	74
Stopping	76
Parking	77
Retrieving and towing	79
Attachments, alternative lowering	81
Transporting machine	83

Operating techniques	87
Eco driving	88
Whole-body vibrations	89
Rules for digging	91
Working within dangerous areas	92
Attachments	100
Attachments, connecting and disconnecting	102
Attachment brackets	103
Pressure release	106
Buckets	107
Offset boom	108
Special hydraulics	109
Hammer	110
Thumb	114
Clamshell bucket	118
Hose rupture valves	121
Tracks	122
Lifting objects	124
Signalling diagram	128
Safety when servicing	131
Service position	132
Before service, read	133
Entering, leaving and climbing the machine	136
Fire prevention	137
Handling hazardous materials	140
Handling line, tubes and hoses	143
Service and maintenance	144
Service points	149
Engine	151
Fuel system	152
Engine air cleaner	154
Cooling system	156
Electrical system	160
Travel gearbox	164
Track unit	165
Cab	167
Air conditioning	168
Bucket teeth	169
Hydraulic system	171
Greasing	172
Lubrication and service chart	173

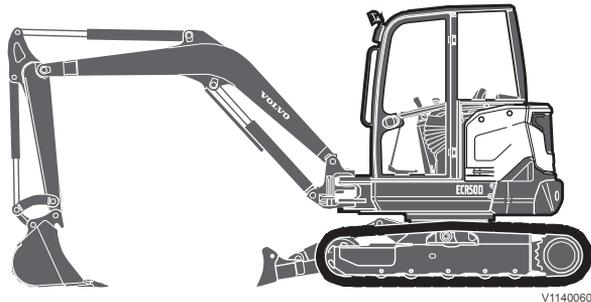
Specifications	179
Recommended lubricants	179
Fuel system	184
Service capacities and change intervals	186
Engine	187
Electrical system	188
Cab	190
Hydraulic system	193
Specifications	194
Machine weights	195
Ground pressure	196
Dimensions	197
Working ranges	199
Recommended bucket sizes	200
Digging forces	201
Lifting capacities	202
Hammer	205
Service history	206
Alphabetical index	211



A series of horizontal dotted lines for writing, spanning the width of the page.



Presentation



Intended use

This machine is intended to be used under normal conditions, at an ambient temperature between -20°C (-4°F) and $+40^{\circ}\text{C}$ (104°F) and for the applications described in the Operator's Manual. The engine can be started at a maximum of -15°C (5°F) in cold conditions.

If it is used for other purposes or in potentially dangerous environments, for example explosive atmospheres, flammable environment or areas with dust containing asbestos, special safety regulations are to be followed and the machine to be equipped for such use. Contact the manufacturer/dealer for further information.

Environmental requirements

Be aware of the environment when operating and during service and maintenance of the machine. Always follow local and national environmental legislation applicable to all handling of the machine.

Engine

The engine is a 4-cylinder D2.6A type diesel engine with water cooling.

Electrical system

The machine has four electronic units:

- V-ECU (vehicle unit)
- I-ECU (display unit)
- W-ECU (caretrack, optional)

- E-ECU (engine rpm control)

The display unit shows information, e.g machine status, control lamps, gauges, settings and information/warning lights. A buzzer is integrated in the I-ECU to warn the operator in addition to some warning lights.

To select various functions there are two instrument panels with a keypad, switches and controls, see page 26.

Most of the relays and fuses are grouped in the electrical box under the operator's seat.

Cab

The cab is approved as a protective structure according to the following standards:

- TOPS (Tip-Over Protective Structure), ISO 12117 / EN13531
- ROPS (Roll Over Protective Structure), ISO 3471-1
- OPG (Operator Protective Guard) Level 1 on top, ISO 10262

The OPG level 2 is available as an option.

These tests are based on the heaviest machine weight configuration, unless otherwise stated.

If any part of the cab's protective structure is affected by plastic deformation or rupture, the cab must be replaced immediately.

The cab is featured with heating and ventilation. The side window can be opened and used as exit in case of emergency.

Never carry out any unauthorised alterations to the cab without first, through a dealer, having discussed the alteration with personnel at the Volvo Construction Equipment Engineering Department. This department will decide whether the alteration may cause the TOPS-, ROPS- and OPG-approval to become void.

Hydraulic system

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

Equipment

The machine can be provided with different types of optional equipment, depending on the requirements of different markets. Examples of such equipment are attachment bracket and hammer.

Modifications

Modifications of this machine, including the use of unauthorized attachments, accessories, units, or parts, may affect the machine's integrity (condition) and/or the machine's ability to function in the way for which it is designed. Persons or organizations performing unauthorized modifications assume all responsibility for consequences that arise due to modifications or can be attributed to modifications, including damaging affect to the machine.

No modifications of any kind may be performed on this product unless each specific modification first has been approved in writing by Volvo Construction Equipment. Volvo Construction Equipment reserves the right to reject all warranty claims that have arisen due to or can be traced to unauthorized modifications.

Unauthorised modifications on the upperframe can have an influence on the ROPS protection system which is intended to secure the driver in case of an accident.

Modifications may be considered to be officially approved, if at least one of the following conditions has been met:

- 1 The attachment, the accessory, the unit, or the part has been manufactured or distributed by Volvo Construction Equipment and has been installed according to the factory-approved method described in a publication available from Volvo Construction Equipment; or
- 2 The modification has been approved in writing by the Engineering Department for the relevant product line at Volvo Construction Equipment.

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.

Slewing system

The slewing ring is driven by a hydraulic motor, which is protected against excess pressure by high pressure relief valves.

Anti-theft device

An anti-theft device makes it more difficult to steal the machine. Volvo offers an anti-theft device as optional equipment. If your machine is not yet equipped with it, check the possibility of having such a device activated by your dealer.

CareTrack

The machine may be equipped with CareTrack, a telematics system developed by Volvo Construction Equipment. The system stores machine data, e.g., machine position, operating hours, fuel consumption, fuel level, that can be sent by wireless transmission to a computer. CareTrack is available in different versions, depending on the required information level.

CareTrack makes it easier to plan for service and reduces costly downtime. Productivity is improved by knowing if machines are being operated correctly and how much fuel is being consumed. CareTrack also allows the customer to restrict the operating area of the machine, by using virtual fences. This helps to eliminate unauthorized machine use and theft. For further information, contact a Volvo Construction Equipment dealer.

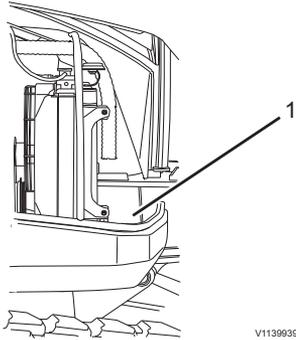
The CareTrack system transmits data, in the same way a mobile phone does, with a maximum output rate of 10 W. The transmitter is always on and the operator cannot switch it off.

Local precautions and restrictions applicable to mobile phones, for example safety distance, also apply to the CareTrack system.

Tool kit (optional equipment)

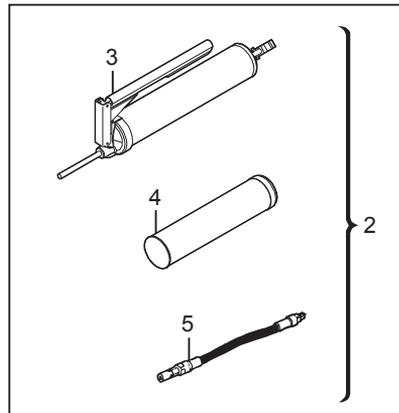
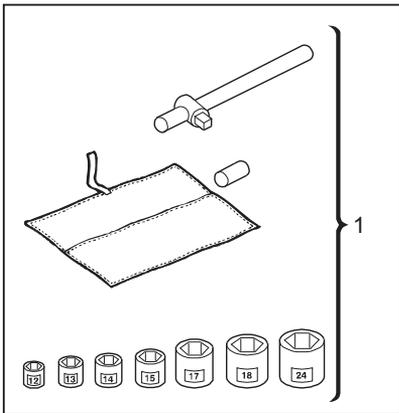
The toolbox is located on the right side of the machine in front of the cooling package. Open the engine hood to access it.

The machine comes with a number of tools, see below.



V1139939

1 Tool box

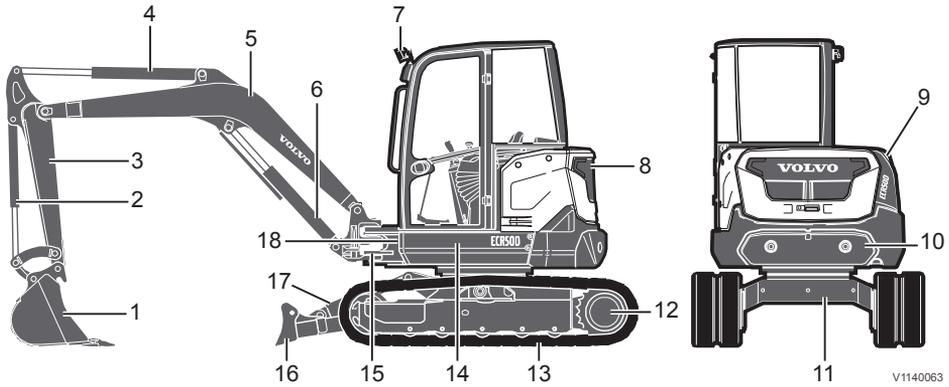


V1139940

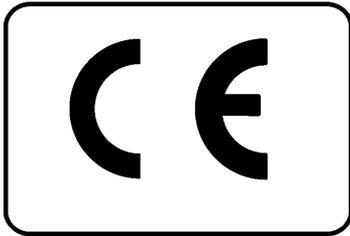
Tools in the toolbox

- 1 Wrench with different sizes of nuts
- 2 Grease gun (3) with cartridge (4) and extension (5)

Machine view



1	Bucket	10	Additional counterweight (optional)
2	Bucket cylinder	11	Undercarriage
3	Dipper arm	12	Travel motor
4	Dipper arm cylinder	13	Tracks
5	Boom	14	Superstructure
6	Boom cylinder	15	Boom offset cylinder
7	Working lights	16	Dozer blade
8	Rear hood	17	Dozer blade cylinder
9	Engine hood	18	Battery disconnect switch



CE-marking, EMC-directive

CE marking

(Declaration of Conformity)

This machine is CE-marked. This means that, when delivered, it meets the applicable "Essential Health and Safety Requirements", stated in EU's so-called Machine Safety Directive, 2006/42/EC.

Any person making changes that affect machine safety is also responsible for the same.

An EU Declaration of Conformity as well as a sound certificate regarding sound power in dB(A) are supplied as proof that the requirements are fulfilled. The sound certificate includes both measured external values and guaranteed sound power level. These declarations are issued by Volvo for every individual machine. This EU-declaration also includes attachments manufactured by Volvo. The documentation is a valuable document and shall be saved in a safe location for at least ten years. The documentation shall always accompany the machine when it is sold.

If the machine is used for other applications or with other attachments than described in this manual, safety must always be ensured in each individual case. A change may in certain cases require a new CE-marking and issuing of a new EU Declaration of Conformity. The person responsible for this is the same person who makes the change.

EU EMC Directive

The machine's electronic equipment may in some cases interfere with other electronic equipment, or be interfered with by external electromagnetic interference, which may result in safety risks.

EU's EMC directive about "Electromagnetic compatibility", 2004/108/EC, provides a general description of what requirements can be made of the machine from a safety perspective, where permitted limit values have been determined and stated in international standards.

A machine or device must meet the requirements to be CE-marked. Our machines have been specially tested for electromagnetic interference. The machine's CE-marking and the Declaration of Conformity also cover the EMC directive.

Presentation
CE-marking, EMC-directive 17

If other electronic equipment is fitted to this machine, the equipment must be CE marked and tested on the machine with regard to electromagnetic interference.



EU conformity certificate

We, the manufacturer

Volvo Construction Equipment sas
Rue Pierre Pingon
BP 01303 Belley Cedex
France

The technical documentation is maintained by:
Mr. Marc Gergaud, Volvo Construction
Equipment, Belley France

declare that the following equipment
Excavator

Model	Serial Number	Output	Representative Sound Power Level (LWA)	Guaranteed Sound Power Level (LWA)	Year of CE-Marking
ECR50D		31.2 kW	95 dB(A)	96 dB(A)	

complies with the following relevant directives:

- EC Directive "Machinery" 2006/42/EC
- EC Directive "Noise Emission" 2000/14/EC
- EC Directive "EMC" 2004/108/EC
- As well as EC Directive "Low Voltage" 2006/95/EC for electric heating / electric generator

Applied harmonized standards especially:

- EN 474-1 and EN 474-5
- The EN and ISO Standards specified under Chapter 2 of EN 474-1 and EN 474-5

The assessment of conformity method used to determine the guaranteed sound power level complies with Article 14 item 3 of Directive 2000/14/EC.

Certified European institute, Cofrac 1-0606,
LNE – France 1, rue Gaston Boissier 75724 Paris
Cédex 15

Belley, <dd.mm.yyyy>

<N. N.>

General Manager
Volvo Construction Equipment sas

Communication equipment, installation

NOTICE

All installation of optional electronic communication equipment must be performed by trained professionals and in accordance with the Volvo Construction Equipment instructions.

Protection against electromagnetic interference

This machine has been tested according to EU's directive 2004/108/EC that regulates electromagnetic interference. Therefore, it is very important that all non-approved electronic accessories, such as communication equipment, are tested before they are installed and used, since they may interfere with the machine's electronic system.

Guidelines for installing aerial

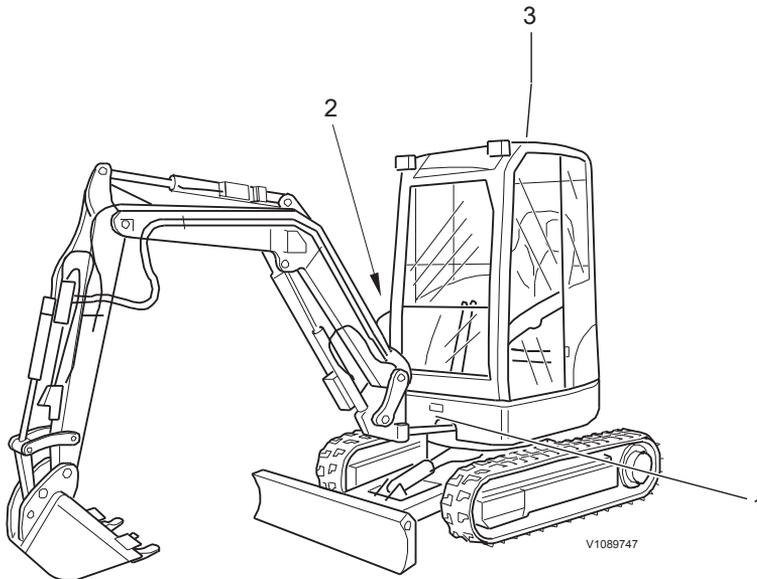
The guide lines listed below must be followed during installation:

- The position of the aerial must be selected to provide satisfactory adaptation to the surrounding area.
- The aerial downlead must be of the coaxial cable type. Make sure that the cable is undamaged, that the screen is not split at the ends and that it thoroughly surrounds the contact sheaths and has good galvanic contact with the same.
- The surface between the mounting bracket for the aerial and the point of attachment must be free from dirt and oxide. Apply corrosion protection to the surfaces after installation so that good galvanic contact is maintained.
- Take care to separate cables that may cause interference from those which may suffer interference. Cables that may cause interference are voltage feed cables and the aerial cable to the communication equipment. Cables that may suffer from interference are connecting cables for the electronics of the machine. Install cables as close as possible to plate surfaces which are connected to ground (earthed), as these have a screening effect.

Product plates

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

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



V	C	E	E	C	3	5	C	0	0	0	1	2	8	4	5
A			B			C			D						

V1076896

Example of 17 digit PIN number on PIN plate

- A World Manufacturing Code
- B Machine description
- C Check letters
- D Serial number

1 Product Identification plate (PIN) and supplementary PIN plate (EU countries only)

The product plate contains name and address of manufacturer, model/type designation and 17 digit PIN number.

The supplementary plate contains information about machine mass in kg, engine net power in Kw, manufacturing year, machine serial number and a CE-mark.

Machine mass

The machine mass in kg on the supplementary PIN plate is based on the most standard definition of the machine in accordance with ISO 6016.

For safety reasons, 103% of the machine mass will be shown on the supplementary PIN plate.

2 Engine identification plate

The engine identification contains information about manufacturer, designation and engine serial number.

3 TOPS/ROPS and OPG plate

The plate is located inside 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. OPG (Operator Protective Structure) provides protection against falling down objects.

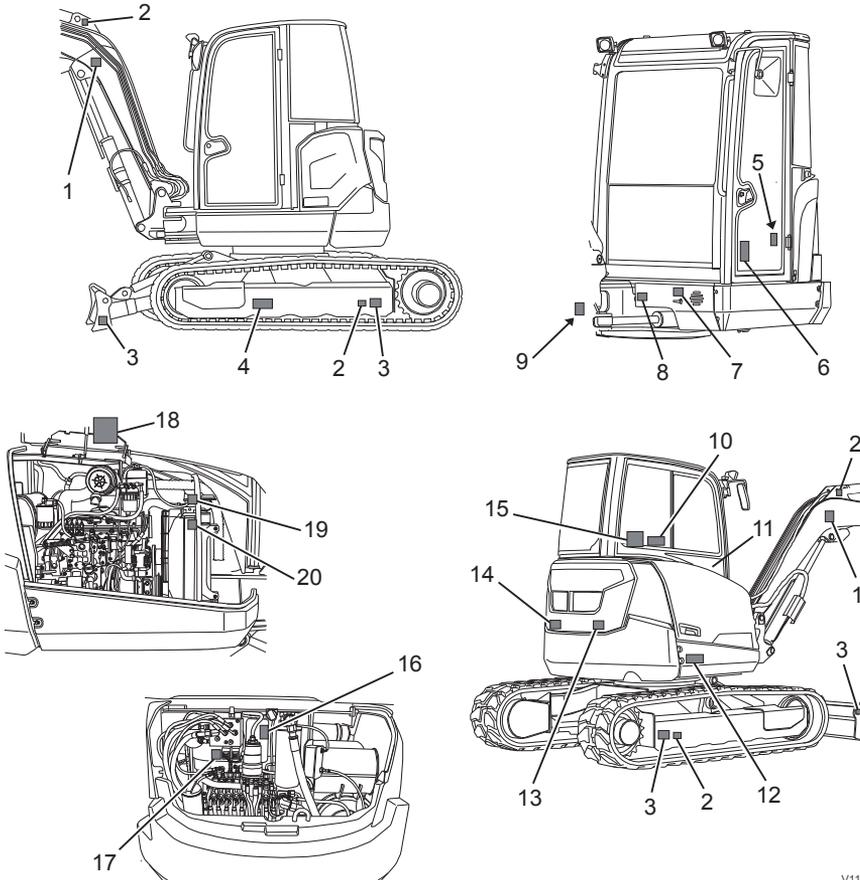


Information and warning decals

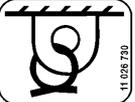
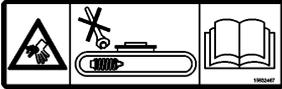
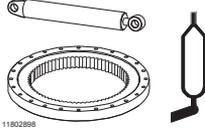
The operator should know and pay attention to the information and warning plates/decals which are positioned on the machine. All plates/decals are not installed on all machines, as they are market and machine dependent. The decals/plates must be kept free from dirt, so that they can be read and understood. If they have been lost or no longer are legible, they must be replaced immediately. The part number (order number) is given on the respective plates/decals and in the Parts Catalogue

NOTE!

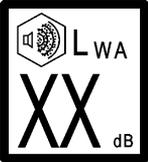
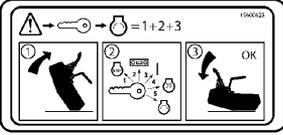
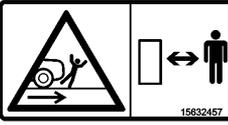
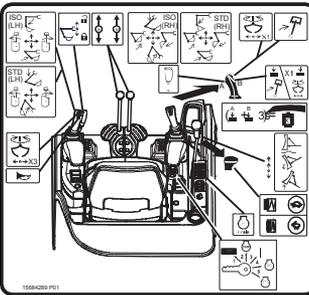
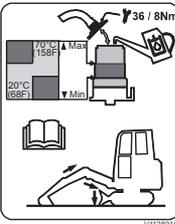
The word WARNING is given on the warning decals for North America.



Decal placement

 <p style="text-align: center;">V1142066</p> <p>1 WARNING Do not stand in the vicinity of a raised load. (decal on both sides of the boom)</p>	 <p style="text-align: center;">V1076978</p> <p>2 Lifting points. (2 lifting points undercarriage / 1 lifting point on boom)</p>
 <p style="text-align: center;">V1076979</p> <p>3 Tie down points. (2 tie down points on blade / 2 tie down points on undercarriage)</p>	 <p style="text-align: center;">V1076954</p> <p>4 WARNING! Track tension, check the tension every day – Read the Operator's Manual.</p>
 <p style="text-align: center;">V1129955</p> <p>5 WARNING Fasten seat belt when operating the machine.</p>	 <p style="text-align: center;">V1129954</p> <p>6 WARNING Move the control lockout lever up to lock the system securely when leaving the machine.</p>
 <p style="text-align: center;">V1142086</p> <p>7 Battery disconnect switch.</p>	 <p style="text-align: center;">V1089393</p> <p>8 Slewing ring lubrication</p>

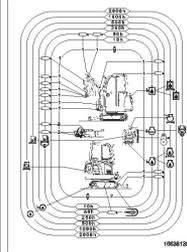
24 Presentation
Information and warning decals

 <p>V1076959</p> <p>9 Sound power level outside the machine.</p>	 <p>V1076984</p> <p>10 Locking console</p>
 <p>V1076977</p> <p>11 Alternative exit path.</p>	 <p>V1076909</p> <p>12 WARNING Rotating parts and hot surfaces.</p>
 <p>V1076952</p> <p>13 WARNING Do not enter the machine's working area. Risk for crushing!</p>	 <p>V1076958</p> <p>14 Fuel filler point.</p>
 <p>V1142089</p> <p>15 Operator's stand control elements.</p>	 <p>V1128016</p> <p>16 Read and understand the hydraulic oil filling instruction before filling.</p>



V1076957

17 Hydraulic oil filler point.



V1076956

18 Lubrication and maintenance chart.



V1065366

19 Volvo Coolant VCS (For coolant specifications see page 156)



V1065344

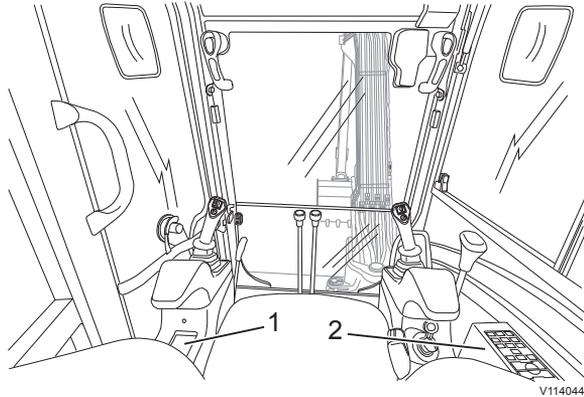
20 WARNING Hot coolant under pressure.

Instrument panels

NOTE!

Do not operate the machine until you know the function and position of the instruments and operating controls. Carefully read through this Operator's Manual, your safety is involved!

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



V1140444

1	Instrument panel, left
2	Instrument panel, right

Instrument panel, left

1. Attachment bracket unlocking switch (optional equipment)

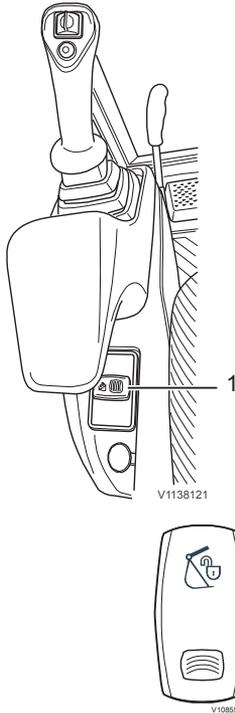
- Switch to unlock the attachment bracket with safety function. The switch is working differently depending on whether you have single acting or double acting system. The buzzer will sound as long as the attachment bracket is unlocked.

Single acting system:

- The attachment bracket is opened by pushing the red button up and pressing down the lower end of switch 1.
- As soon as you release the switch the attachment bracket is locked.

Double acting system:

- The attachment bracket is opened by pushing the red button up and pressing down the lower end of switch 1.
- When you release the button the attachment bracket will remain unlocked.
- To lock the attachment bracket; push the switch one more time.

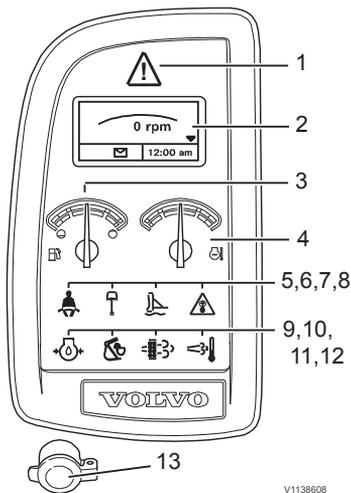


Display unit

The display unit contains a display panel, gauges and control lamps.

When the ignition key is turned to position 1, a test program starts to verify the system, all control lamps light up for two seconds, the pointers in the gauges then move to indicate the correct value for fuel level and temperature.

If the machine is equipped with anti-theft, the test program starts first and then the display shows a request for the code to be entered.



1	Central warning lamp
2	Display panel
3	Fuel level gauge
4	Engine coolant temperature gauge
5	Seat belt not fastened
6	Offset boom activated
7	Dozer blade floating — not applicable for ECR50D
8	Overload warning function activated
9	Engine oil pressure low
10	Attachment bracket open
11, 12	Regeneration symbols — not applicable for ECR50D
13	Power socket

1 Central warning lamp (red)

The central warning lamp in the display unit lights up when the ignition key is turned to running position and goes off when the engine is started.



2 Display panel

See page 31 for a detailed description of the display panel.



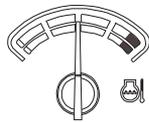


V1128170

3 Fuel level gauge

The fuel level gauge shows the filling level in the fuel tank and it has a red mark on the left end to indicate “fuel empty”. If the gauge is in this region there is about 10% fuel left from the total tank capacity. Refill with fuel immediately to avoid air entering the system

For fuel tank capacity see page *Service capacities and change intervals*.



V1128174

4 Engine coolant temperature gauge

The temperature gauge keeps you informed about the engine coolant temperature. It has a red mark on the right end to indicate “engine overheated”.

NOTE!

Shut down the engine immediately if the gauge shows an overheating of the engine and the central warning lamp (1) lights up.

5 Seat belt not fastened (red)

This lamp lights up if the seat belt is not fastened when the engine is running.

NOTE!

Never operate the machine without having the seat belt fastened, your safety is involved!



V1077664

6 Offset boom activated (green)

This lamp lights up if the offset boom is activated.



V1077661

7 Dozer blade floating (green) — not applicable for ECR50D

This lamp is not applicable for the ECR50D, it appears at every machine start and disappears again after 2 seconds.



V1128175



V1128179

8 Overload warning function activated (green) (optional equipment)

This lamp lights up if the overload warning function is activated.

NOTE!

Stop lifting immediately and reduce the load if the overload warning in the display appears accompanied by the auditory warning signal in the cab and the central warning lamp (1).

The overload warning (option) can be activated and deactivated with a button on the keypad (see page 43).



V1077662

9 Engine oil pressure low (red)

This lamp lights up if the engine oil pressure is too low.

NOTE!

Shut down the engine if this lamp lights up and contact a workshop authorized by Volvo Construction Equipment.



V1077663

10 Attachment bracket open (red)

This lamp lights up if the attachment bracket is open.

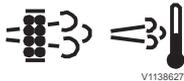
WARNING

Risk of crushing.

If the red warning lamp for open attachment bracket lights up while working, the attachment could fall off and cause serious crushing injury or death.

Stop working with the machine immediately and make sure the attachment bracket is properly locked before starting to work again.

11 & 12 Regeneration symbols (yellow) — not applicable for ECR50D



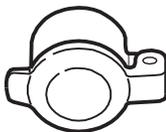
V1138627

These two lamps are not applicable for the ECR50D, they appear at every machine start and disappear again after 2 seconds.

13 Power socket

The power socket is used for electrical devices such as a mobile phone charger or to supply electricity to a lamp.

(Voltage: 12 V / Capacity: 10 A / Power: maximum 120 watt)



V1138628

14 Operating hour meter (optional equipment)

The operating hour meter shows the total number of hours with the engine running. It is located inside the cabin on the lower part of the right console.



V1138629

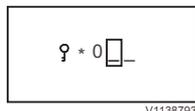
Display panel

Use the buttons on the keypad (see page 43) to control the display panel.

Pin authorisation (optional equipment)

The pin authorization screen appears after test program in the display unit when the ignition switch has been turned to ignition position.

- Use the keypad to enter the 4 digits anti-theft code. For further information on the anti-theft system see page 40.



V1138793

Main screen

After the anti-theft code has been entered correctly, the main screen will show up on the display.

The main screen is divided in three parts: The top part shows the engine speed in rpm. The lower parts shows the actual time and information icons like service, anti-theft, machine message or preheating.

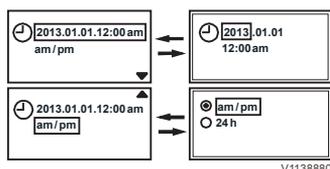


V1138802

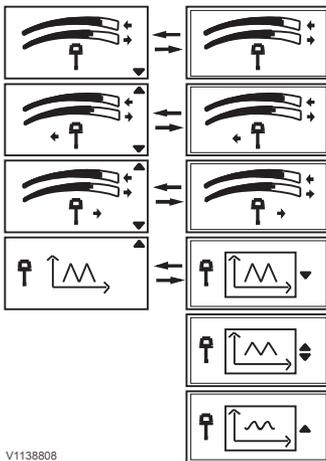
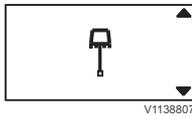
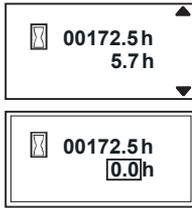
Setting date and time

The setting mode screen for the current date and time appears when pressing the SELECT button from the main screen.

- Use the arrow buttons to adjust and then press SELECT to move to the next position.
- Use the ESC button for returning to a previous position.
- Press the SELECT button to save the setting.
- The time can be shown as 12- or 24 hours format. Use the arrow buttons to choose the required format and press SELECT to save the setting.



V1138880



Machine hour and daily hour

The machine hour and daily hour screen appears when pressing arrow-down from the main screen. This screen shows the complete machine working hours and the daily working hours. The daily working hours value can be reset.

- Press the SELECT button to reset the daily working hours.

Hours left to service

The hours left to service screen appears when pressing arrow-down twice from the main screen.

Boom offset swing speed

The boom offset swing speed screen appears when pressing arrow-down three times from the main screen.

The setting mode screen for the boom offset swing speed appears when pressing the SELECT button from the boom offset screen.

- Select the boom speed setting for both directions (symmetrical), or independently left side or right side (non symmetrical) and press SELECT to adjust the speed with the arrow buttons.
- Use arrow-up for increasing and arrow-down for decreasing the speed. Each bar on the graph corresponds approximately 12.5% of maximum flow.
- Select the boom swing mode in the mode menu by choosing between active, normal and soft mode.
 - Active mode:** Max. flow is activated with rapid ramp up.
 - Normal mode:** Max. flow is activated with medium ramp up.
 - Soft mode:** Max. flow is activated with slow ramp up.

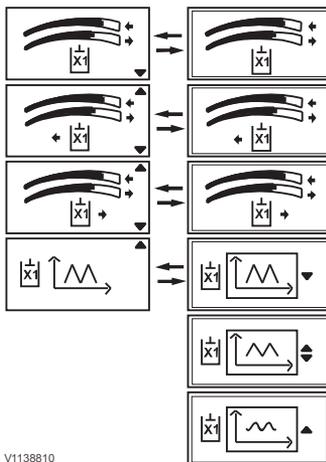
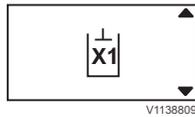
- Press the SELECT button to save the setting or press ESC to escape without saving.

NOTE!

The setting screen for the boom offset swing speed appears also when pressing the boom offset selection button on the right control lever.

Hydraulic max. flow for X1

The hydraulic maximum flow for X1 screen appears when pressing arrow-down four times from the main screen.



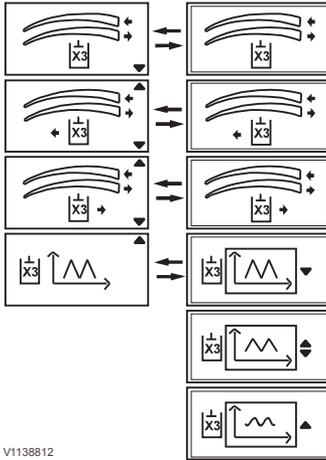
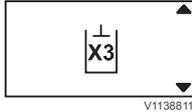
The setting mode screen for hydraulic maximum flow for X1 appears when pressing the SELECT button from the X1 screen.

- Select the hydraulic max. flow for X1 setting for both directions (symmetrical) or for the left side and the right side (non symmetrical) and press SELECT to adjust the flow with the arrow buttons.
- Use arrow-up for increasing and arrow-down for decreasing the maximum flow. Each bar on the graph corresponds approximately 12.5% of maximum flow.
- Select the characteristics of the X1 mode in the mode menu by choosing between active, normal and soft mode.
 - Active mode:** Max. flow is activated without ramp up.
 - Normal mode:** Max. flow is activated with small ramp up.
 - Soft mode:** Max. flow is activated with slow ramp up.
- Press the SELECT button to save the setting or press ESC to escape without saving.

See X1 setup page 43 to save the settings on the keypad.

NOTE!

It is possible to adjust the maximum flow for X1 with the proportional switch on the lever, see page 48.



Hydraulic max. flow for X3 (optional equipment)

The hydraulic maximum flow for X3 screen appears when pressing arrow-down five times from the main screen.

The setting mode screen for hydraulic maximum flow for X3 appears when pressing the SELECT button from the X3 screen.

- Select the hydraulic max. flow for X3 setting for both directions (symmetrical), left side or right side (non symmetrical) and press SELECT to adjust the maximum flow with the arrow buttons.
- Use arrow-up for increasing and arrow-down for decreasing the maximum flow. Each bar on the graph corresponds approximately 12.5% of maximum flow.
- Select the characteristics of the X3 mode in the mode menu by choosing between active, normal and soft mode.
 - Active mode:** Max. flow is activated without ramp up.
 - Normal mode:** Max. flow is activated with small ramp up.
 - Soft mode:** Max. flow is activated with slow ramp up.
- Press the SELECT button to save the setting or press ESC to escape without saving.

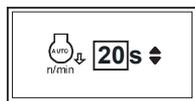
See X3 setup page 43 to save the settings on the keypad.

NOTE!

Use the proportional switch on the left control lever to check the actual hydraulic flow or speed of the tool.

NOTE!

It is possible to adjust the maximum flow for X3 with the proportional switch on the lever, see page 48.



V1138873



V1138874

Auto idle time

The auto idle time screen appears when pressing arrow-down six times from the main screen.

The basic concept of the auto idle system is to reduce the fuel consumption. The engine speed will be lowered automatically to idle mode if auto idle is activated and no control levers or pedals nor the control lockout lever or the engine speed control are operated for a certain time.

This time can be set from 3 up to 60 seconds.

- Press SELECT from the auto idle speed screen to enter the time setting screen.
- Use the arrow-up and arrow-down buttons to adjust the time setting.
- Press the SELECT button to save the setting or press ESC to escape without saving.

Automatic engine shutdown

The auto engine shut down screen appears when pressing arrow-down seven times from the main screen.

The basic concept of the automatic engine shut down is to reduce the fuel consumption and reduce maintenance cost by avoiding additional operating hours. The engine will be shut down automatically after a preselected amount of idling time if the function is activated and no control levers or pedals nor the control lockout lever or the engine speed control are operated.

This time can be set from 2 up to 30 minutes.

NOTE!

The automatic engine shut down function does not disconnect the battery, if the ignition key is not turned off the battery could be discharged after a while.

- Press SELECT from the automatic engine shut down screen to enter the time setting screen.
- Use the arrow-up and arrow-down buttons to adjust the time setting.
The function will be deactivated by selecting 0 minutes.
The function is activated if the time setting is between 2 and 30 minutes.

- Press the SELECT button to save the setting or press ESC to escape without saving.

NOTE!

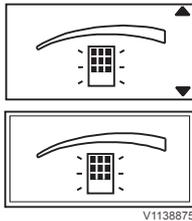
An information in the display comes up 1 minute before the shut down to inform that the automatic shut down sequence is started. Additionally the buzzer sounds 3 seconds before the end of the shut down sequence.

To stop the countdown you can press ESC or push down the control lockout lever.

Keypad backlight

The keypad backlight screen appears when pressing arrow-down eight times from the main screen.

- Press SELECT from the keypad backlight screen to enter the brightness setting screen.
- Use the arrow-up and arrow-down buttons to adjust the brightness of the keypad backlight. Each bar on the graph corresponds approximately 12.5%.
- Press the SELECT button to save the setting or press ESC to escape without saving.



V1138875



V1138877



V1138878



V1138879

Anti-theft screen

The anti theft screen appears when pressing arrow-down nine times from the main screen. For further info about the anti-theft see page 40.

Service mode

The service mode is only for the service technician, further information about the service mode menu functions can be found in the service manual.

Check

Check symbols in the display unit



Service

- This symbol is shown if the regular service is required.



Engine air cleaner clogged

- This symbol is shown if the engine air cleaner is clogged.
Clean or replace the primary engine air cleaner.



Fuel level low

- This symbol is shown if the fuel level is low.
Fill up fuel to prevent air entering the fuel system.



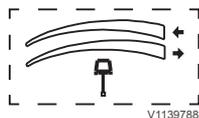
Attachment bracket closed (optional equipment)

- This symbol is shown when the attachment bracket is closed.
Check that the attachment is properly locked and press ESC for confirmation.



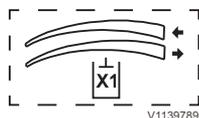
Engine controller issue

- This symbol is shown if an error occurs in the engine controller.
The engine rpm can not be changed anymore.
Put the machine in a safe place, turn it off and contact your authorized Volvo Construction Equipment workshop.



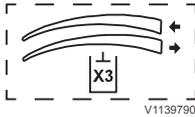
Boom swing max. flow setting

- This symbol is shown when the boom swing maximum flow is adjusted with the joystick, see page 48 for further information.
The symbol is shown also during working to show the actual setup value.



X1 max. flow setting

- This symbol is shown when the X1 maximum flow is adjusted with the joystick, see page 48 for further information or when the flow setting on the keypad is selected, see page 43 for further information.



The symbol is shown also during working to show the actual setup value.

X3 max. flow setting

- This symbol is shown when the X3 maximum flow is adjusted with the joystick, see page 48 for further information or when the flow setting on the keypad is selected, see page 43 for further information.

The symbol is shown also during working to show the actual setup value.



Automatic engine shut down countdown

- This symbol is shown 1 minute before the shut down to inform that the automatic shut down sequence is started. Additionally the buzzer sounds 3 seconds before the end of the shut down sequence.



Engine oil pressure low countdown

- This symbol is shown if the engine oil pressure is too low. The engine will shut down within 15 seconds (countdown shown) if the engine oil pressure is too low. Additionally the buzzer sounds during the countdown for the engine shut down.

The shut down can be postponed for 1 minute during the countdown by pressing the ESC button on the keypad. During this additional 1 minute the machine can be moved out of a possible dangerous area.

Investigate the cause and contact your authorized Volvo Construction Equipment workshop if necessary.



Engine high coolant temperature countdown

- This symbol is shown if the engine coolant temperature is too high. The engine will shut down within 15 seconds (countdown shown) if the engine coolant temperature is too high. Additionally the buzzer sounds during the countdown for the engine shut down.

The shut down can be postponed for 1 minute during the countdown by pressing the ESC button on the keypad. During this additional 1 minute the machine can be moved out of a possible dangerous area.

Investigate the cause and contact your authorized Volvo Construction Equipment workshop if necessary.

Warning

Warning symbols in the display unit



V1139795

Computer failure

- This symbol is shown if a computer failure appears.

Investigate the cause and contact your authorized Volvo Construction Equipment workshop if necessary.

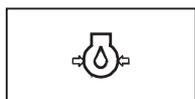


V1139796

Engine coolant temperature high

- This symbol is shown if the engine coolant temperature is too high.

Turn off the engine, investigate the cause and contact your authorized Volvo Construction Equipment workshop if necessary.

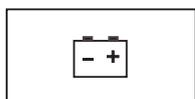


V1139797

Engine oil pressure low

- This symbol is shown if the engine oil pressure is too low.

Turn off the engine, investigate the cause and contact your authorized Volvo Construction Equipment workshop if necessary.



V1139798

Battery charge error

- This symbol is shown if the battery is not being charged or the system voltage is too low.

Investigate the cause and contact your authorized Volvo Construction Equipment workshop.



V1139799

Overload warning (optional equipment)

- This symbol is shown if the overload warning system is activated and the boom is overloaded. Stop the lifting operation immediately and reduce the load.



V1139800

Attachment bracket open (optional equipment)

- This symbol is shown when the attachment bracket is open.



V1139801

Preheating failure

- This symbol is shown if there is a failure in preheating.
Turn off the engine, investigate the cause and contact your authorized Volvo Construction Equipment workshop if necessary.



V1139802

Automatic engine shut down effective

- This symbol is shown when the automatic engine shut down function has shut down the engine (end of the countdown).



V1139803

Engine oil pressure low (countdown finished)

- This symbol is shown when the engine was shut down automatically due to low engine oil pressure.
Investigate the cause and contact your authorized Volvo Construction Equipment workshop if necessary.



V1139891

Engine high coolant temperature (countdown finished)

- This symbol is shown when the engine was shut down automatically due to high engine coolant temperature.
Investigate the cause and contact your authorized Volvo Construction Equipment workshop if necessary.

Theft protection

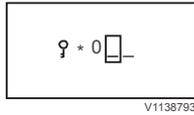
Anti-theft system

The anti-theft system prevents theft of the machine since the machine can only be started with the correct 4 digits code.

It is possible to have up to 3 different user codes for the anti-theft system.

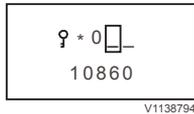
The machine saves user related settings and recognizes the user by the anti-theft code.

The user related settings are the X1 and X3 setup, RPM setup, auto idle mode, overload mode, travel speed mode and the ECO mode.



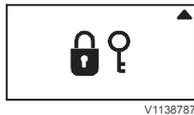
Enter code screen

- Use the keypad to enter the 4 digits anti-theft code and confirm it with the SELECT button. After the correct code is entered, the main screen shows up.
- If the engine is restarted 30 seconds after it was turned off, the code does not have to be entered again.



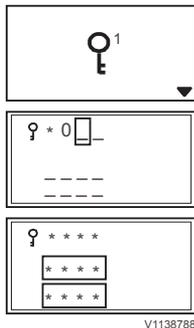
Recovery code screen

If the wrong code is entered more than 3 times, a recovery code consisting of 5 digits appears. Note down this code and contact your Volvo Construction Equipment dealer.



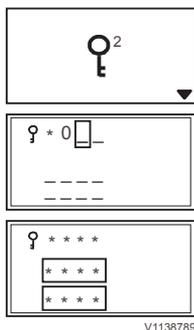
Anti-theft system: code change

The anti-theft screen appears when pressing arrow-down nine times from the main screen. In this menu the anti-theft system can be enabled or disabled and the 3 possible codes can be changed.



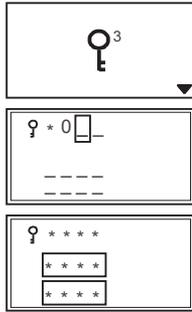
Change primary code

- Press SELECT when the main screen is shown. Select the first code and press SELECT to change this code. Enter the old primary code and press SELECT. Enter the new code and press SELECT. Repeat the new code and confirm with SELECT.
- A confirmation screen appears for 2 seconds if the old code is correct and the new code is correctly repeated. If the old code or the new code are incorrect, the change screen is shown again.



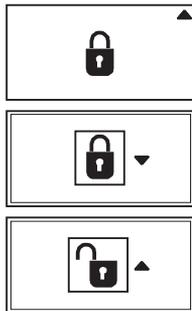
Change secondary code

- Press SELECT when the main screen is shown. Select the second code and press SELECT to change this code. Enter the old secondary code and press SELECT. Enter the new code and press SELECT. Repeat the new code and confirm with SELECT.
- A confirmation screen appears for 2 seconds if the old code is correct and the new code is correctly repeated. If the old code or the new code are incorrect, the change screen is shown again.



Change third code

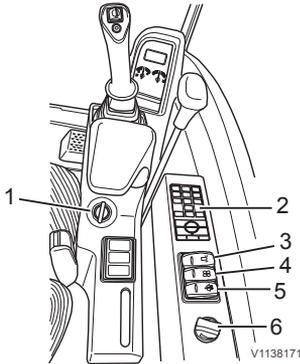
- Press SELECT when the main screen is shown. Select the third code and press SELECT to change this code. Enter the old third code and press SELECT. Enter the new code and press SELECT. Repeat the new code and confirm with SELECT.
- A confirmation screen appears for 2 seconds if the old code is correct and the new code is correctly repeated. If the old code or the new code are incorrect, the change screen is shown again.



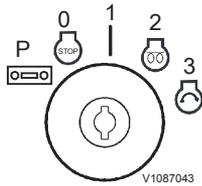
Enable or disable the anti-theft system

- Press SELECT when the main screen is shown. Select the fourth item press SELECT to enable or disable the anti-theft system. Select the first item with the locked symbol to enable the anti-theft and confirm with SELECT. Select the second item with the unlocked symbol to disable the anti-theft and confirm with SELECT.

Instrument panel, right



1	Ignition switch
2	Keypad
3	Switch for rotating warning beacon (optional equipment)
4	Switch for fan
5	Switch for windscreen wiper and washer
6	Temperature control (for air conditioning)



1. Ignition switch

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

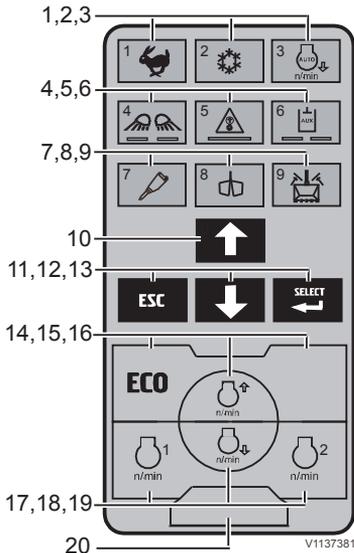
- P: Radio and cab interior light
- 0: Engine off
- 1: Running position / Ignition
- 2: Preheating
- 3: Start the engine

2. Keypad

The keypad is used for the display unit and also to directly control several functions. For information about the display unit see page 28.

NOTE!

The buttons with numbers (0–9) are also used to enter the code for the anti-theft system.



1	Fast travel speed
2	Air conditioning
3	Auto idle
4	Working lamps: front and boom / rear
5	Overload warning
6	X3 setup (if option is installed) or X1 setup 4 (if no X3 is installed on machine)
7	X1 setup 1
8	X1 setup 2
9	X1 setup 3

44 Instrument panels Instrument panel, right

10	Menu up
11	Escape
12	Menu down
13	Select
14	ECO mode
15	RPM up
16	not assigned
17	RPM user setup 1
18	RPM down
19	RPM user setup 2
20	not assigned

1 **Fast travel speed**

After switching to fast travel speed the automatic control of the travelling speed is activated.

The button is alight if the fast travel speed is activated.

When a certain resistance appears in front of the tracks or dozer blade, the travelling speed automatically drops down to low speed. When the resistance is gone the speed rises up to high speed again.

A high speed function push button is also located in the blade lever, see page 48.

2 **Air conditioning (optional equipment)**

Press this button to switch the air conditioning on and off.

The button is alight if the air conditioning is activated.

Use the regulator 6 (temperature control) to set up the desired temperature of the air conditioning.

3 **Auto idle (Automatic engine speed control)**

With this button the auto idle system can be activated or deactivated.

The button is alight if the auto idle function is activated.

If auto idle is activated, the engine speed will be lowered automatically to idle mode if no controls in the cabin are operated for a certain time. This time can be set from 3 to 60 seconds, see page 31.

When operating a control lever the engine speed will rise again up to the speed level set by the keypad.

4 Working lamps: front and boom / rear (boom and rear working lights: optional equipment)

Press this button once to switch on the front working lights.

Press it a second time to switch on the boom and rear working lights (optional equipment).

The small lights on the button indicate which working lights are switched on.

Press the button once more to switch off all working lights.

5 Overload warning system

Press this button to active or deactivate the overload warning system.

The button is alight if the overload warning system is activated.

6 X3 setup (if option is installed) or X1 setup 4 (if no X3 is installed on machine)

Press this button to activate X3 max flow (if option is installed) or X1 max flow setting 4 (if no X3 is installed on machine).

The button will be alight if X3 max flow or X1 max flow setting 4 is under use.

Press the button for 2 seconds to store new setting under this button.

Factory settings: 100% X1 X3

7 X1 setup 1

Press this button to activate X1 max flow setting 1.

The button will be alight if X1 max flow setting 1 is under use.

Press the button for 2 seconds to store new setting under this button.

8 X1 setup 2

Press this button to activate X1 max flow setting 2.

The button will be alight if X1 max flow setting 2 is under use.

Press the button for 2 seconds to store new setting under this button.

9 X1 setup 3

Press this button to activate X1 max flow setting 3.

The button will be alight if X1 max flow setting 3 is under use.

Press the button for 2 seconds to store new setting under this button.

- 10 Menu up**
Button for navigation in the display unit, see page 28.
- 11 Escape**
Button for navigation in the display unit, see page 28.
- 12 Menu down**
Button for navigation in the display unit, see page 28.
- 13 Select**
Button for navigation in the display unit, see page 28.
- 14 ECO mode**
Press this button to activate or deactivate the ECO mode.
With the ECO mode the fuel consumption can be reduced due to a decreased engine speed to maximum 90% of the normal full speed.
The button is alight if the ECO mode is activated.
- 15 RPM up**
Press this button to increase the engine RPM.
- 16 not assigned**
This key is not assigned on the ECR50D.
- 17 RPM user setup 1**
Press the RPM user setup 1 button to set the engine RPM to the value stored under this button.
The button is alight if the RPM user setup 1 is activated.
Press this button during 2s to store a new engine RPM value under this button.
- 18 RPM down**
Press this button to reduce the engine RPM.
- 19 RPM user setup 2**
Press the RPM user setup 2 button to set the engine RPM to the value stored under this button.
Press this button during 2s to store a new engine RPM value under this button.
The button is alight if the RPM user setup 2 is activated.
- 20 not assigned**
This key is not assigned on the ECR50D.



3. Switch for rotating warning beacon (optional equipment)

- Two position switch
- Press upper end of switch = The rotating warning beacon is on and the green indicator lamp on the lower end of the switch is alight.
- Press lower end of switch = The rotating warning beacon is off.

NOTE!

When turning off the engine while the rotating warning beacon is on, the rotating warning beacon will stay on.



4. Switch for fan

- Three position switch
- Press upper end of switch = The fan is in high position.
- Switch in middle position = The fan is in low position.
- Press lower end of switch = The fan is off.



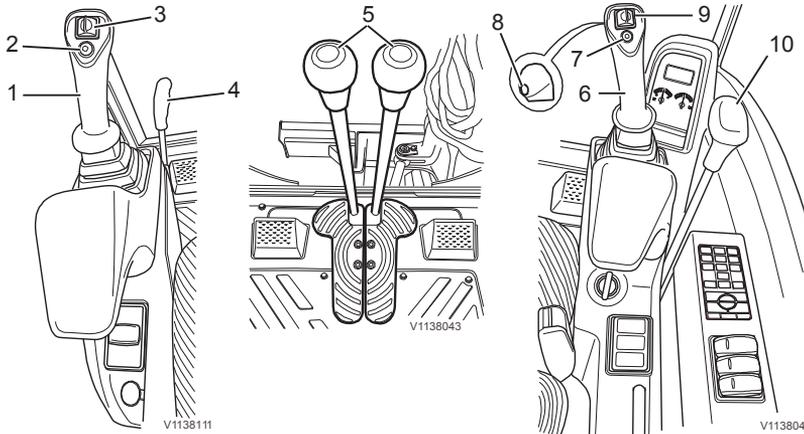
5. Switch for windscreen wiper and washer

- Three position switch
- Press upper end of switch = The windscreen wiper and windscreen washer is on, press and hold to activate and release to stop.
- Switch in middle position = The windscreen wiper is on.
- Press lower end of switch = The windscreen washer and wiper is off.

NOTE!

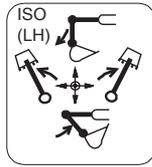
To activate the windscreen wiper and windscreen washer the upper windscreen needs to be closed.

Other controls Controls



1	Left hand control lever for working equipment
2	Horn
3	Proportional roller for rotating attachments
4	Control lockout lever for hydraulics
5	Control levers for travel motion
6	Right hand control lever for working equipment
7	Selector switch; offset boom or attachment movement
8	Switch for optional equipment, such as hammer
9	Proportional roller for optional equipment
10	Dozer blade control lever (with switch for fast travel speed)

1. Left control lever for working equipment (ISO control pattern)



V1087059



V1087060

WARNING

Risk of serious accidents.

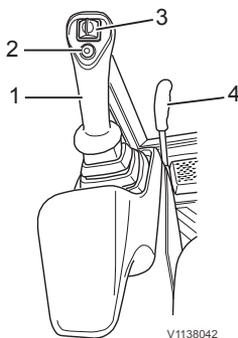
Unfamiliar control patterns could cause confusion and accidents resulting in serious injury.

Use extreme caution when using the control levers after changing the control pattern and until you become familiar with the new pattern.

- Lever forward: Extending the dipper arm.
- Lever backward: Retracting the dipper arm.
- Lever to the right: Slewing movement to the right.
- Lever to the left: Slewing movement to the left.

Left control lever for working equipment (SAE control pattern, optional equipment)

- Lever forward: Boom down.
- Lever backward: Boom up.
- Lever to the right: Slewing movement to the right.
- Lever to the left: Slewing movement to the left.



V1138042

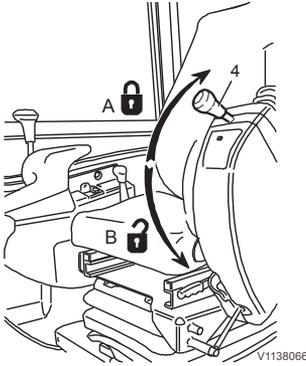
Left hand control lever



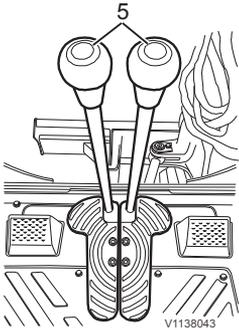
V1090261

2. Horn

- Button depressed: Horn signal.



Control lockout lever for hydraulics



Control levers for travel motion

3. Proportional roller for rotating attachments

- The proportional roller operates the optional equipment (X3, for example rototilt bucket).

4. Control lockout lever for hydraulics

WARNING

Risk of crushing.
A raised attachment could fall and cause crushing injury.

Before leaving the cab, always lower all attachments to the ground and lock the control functions.

- Control lockout lever fully in position A: The operating levers for working and travel hydraulics are locked (no movement possible).
- Control lockout lever fully in position B: The operating levers for working and travel hydraulics are unlocked (working position).

5. Control levers for travel motion

WARNING

Risk of fatal accidents.
Unexpected driving direction could lead to accidents resulting in serious injury or death.
Always check the driving direction before moving the machine.

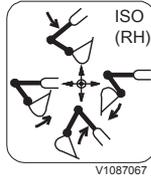
When the dozer plate is in rear position (180° rotation), the travel system operation is reversed.

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

NOTE!

When operating the travel levers the travel alarm (optional equipment) emits a warning signal.

6. Right control lever for working equipment (ISO control pattern)



WARNING

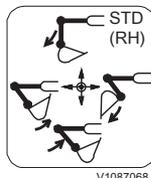
Risk of serious accidents.

Unfamiliar control patterns could cause confusion and accidents resulting in serious injury.

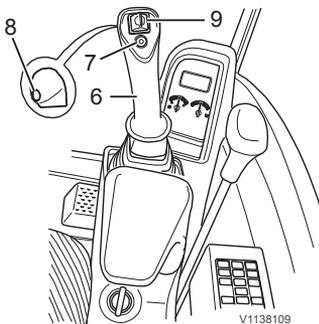
Use extreme caution when using the control levers after changing the control pattern and until you become familiar with the new pattern.

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

Right control lever for working equipment (SAE control pattern, optional equipment)



- 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).



Right hand control lever

7. Selector switch; offset boom or attachment movement

- When actuating this switch (2), the function of the proportional roller on the right hand control lever



Control lamp: offset boom

changes between offset boom and attachment movement.

The switching mode can operate only if the roller is in neutral position.

NOTE!

The control lamp in the front instrument panel lights up when operation with the offset boom is activated.

8. Switch for optional equipment, such as hammer.

- Actuation of the switch executes the function of the first auxiliary with maximum hydraulic flow.

9. Proportional roller – roll switch to control the hydraulic oil flow.

- Roller in central position (neutral): No oil flow.
- Roller to the left: Increases the oil flow for the function of optional equipment or boom offset to the desired direction. For example thumb opens or offset boom to the left.
- Roller to the right: Decreases the oil flow for the function of optional equipment or boom offset to the desired direction. For example thumb closes or offset boom to the right.

Hydraulic oil flow, changing maximum setting for X1 and X3

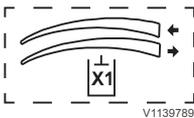
There is a possibility to set the maximum hydraulic oil flow used for the first auxiliary (X1) and for X3.

- 1 Select the boom offset mode.

NOTICE

Boom offset must be selected before changing the maximum hydraulic oil flow setting. If attachment movement is selected this can result in an unexpected movement of the optional equipment.

- 2 First press the selector switch for offset boom or optional equipment (7) and then at the same time press switch for optional equipment (8) on the right control lever. Keep both switches depressed for 3 seconds until the display is entering the setting menu of accessories (Full flow will not be activated by the optional equipment switch (8) during this process.) A



X1 menu settings

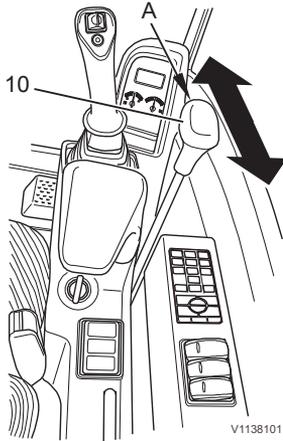
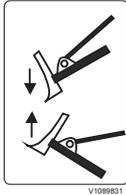
sound appears two times when the settings menu is activated.

The display shows the X1 menu settings and during this time the selector switch for offset boom or optional equipment (8) is only for validation but not full flow accessory activation.

- 3 To change the setting for the X1: Move the proportional roller (9) on the right control lever to the left or right until the wanted maximum hydraulic flow is reached. Keep the proportional roller in this position and press the selector switch for offset boom or optional equipment (8) to confirm.
- 4 To change the setting for the X3: Move the proportional roller (3) on the left control lever to the left or right until the wanted maximum hydraulic oil flow is reached. Keep the proportional roller in this position and press the selector switch for offset boom or optional equipment (8) on the right control lever to confirm.
- 5 The setting menu will turn off automatically after 5 seconds if no roller or switch is activated. To validate and exit menu: Press the selector switch for offset boom or optional equipment (7) and then at the same time press switch for optional equipment (8) on the right control lever. Keep both switches depressed for 3 seconds until exit the setting menu of accessories. With the ESC button on the keypad you can also leave the settings menu. By pressing the ESC button the menu settings done previously in 3 and 4 are not saved.
- 6 A sound appears two times when leaving the settings menu and the display will be back in the mode which was selected before the hydraulic oil flow adjustment.

NOTE!

It is possible to adjust the maximum flow for X1 and X3 on the keypad, see page 43.



Dozer blade control lever

10. Dozer blade control lever

The control lever controls the position of the dozer blade and activates the float blade.

- Lever forward: Dozer blade down.
- Lever backward: Dozer blade up.
- Lift the upper part of the lever and push forward to activate the float blade.

A Button to activate fast travel speed gear or to activate movement of the angle blade (if installed).

Function of the button for fast travel speed:

- 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 button for fast speed on the keypad does not have to be activated.

ISO / SAE selector (optional equipment)

WARNING

Risk of serious accidents.

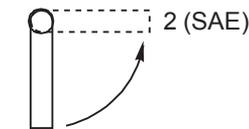
Unfamiliar control patterns could cause confusion and accidents resulting in serious injury.

Use extreme caution when using the control levers after changing the control pattern and until you become familiar with the new pattern.

The ISO / SAE selector valve (optional equipment) is located inside the cab behind the seat.

Loosen the screw with about 7–8 turns and turn the lever to the ISO or SAE position, then tighten the screw again.

- Lever in vertical position (1): ISO control pattern.
- Lever in horizontal position (2): SAE control pattern (optional equipment).



1 (ISO)

V1144340

ISO / SAE selector (pattern changer)

ROPS

ROPS Cab (Roll Over Protective Structure)

The cab is designed to ensure minimum crash protection space according to the standard currently being developed by the International Standard Organization.

NOTE!

Do not jump out of cab if the machine should roll over. Keep stay in seat wearing seat belt.

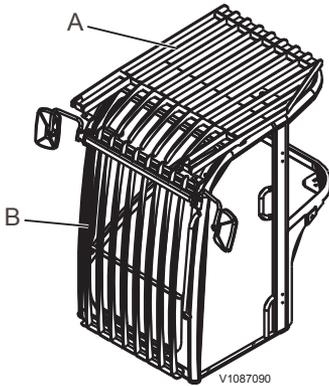
Protection from falling or scattering materials (optional equipment)

The cab is made from toughened glass. This allows the cab to be certified Operator Protective Guards level 1 (OPG1) when the front windscreens are in place and locked down.

Toughened glass will protect the operator from debris projection for example during breaker operations.

To comply with Operator Protective Guards level 2 (OPG2), machines must be equipped with:

- An additional top protective structure made of solid steel plates. This guard will protect the operator from an object of 227Kg (500lb) falling from 5.2 meter (17 ft) above the cab.
- An additional front protective structure made of solid steel plates. This guard must absorb 5800 J energy to protect the operator from large objects approaching from the front.



A OPG Top
B OPG Front

By installing OPG 2 top (A) and front (B), the cab and canopy is approved according to OPG Level 2.

Install the necessary protection guards in accordance with work site conditions and local government recommendations. Consult your local Volvo Construction Equipment dealer.

In working conditions where falling or scattering materials are capable of entering the cab, for example in mining applications and when operating with a hammer (hydraulic breaker), protective roof and window guards should be installed.

If you have a canopy version of the machine a hammer (hydraulic breaker) protection kit is also available. Consult your local Volvo Construction Equipment dealer for information about when the different options can be used.

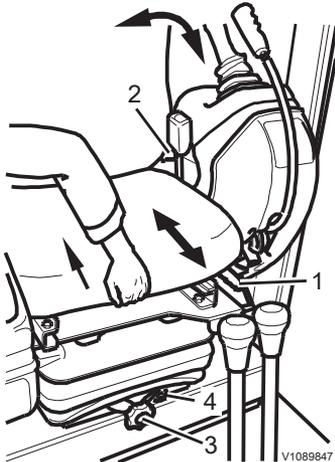
NOTICE

Always, check clearance between bucket and Cab/OPG guard. Slowly cycle bucket to check for interference with the Cab/OPG guard. Pay close attention when quick couplers are used and/or when buckets have lifting eyes welded.

Operator comfort

Operator's seat, adjusting

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



WARNING

Risk of serious accidents.
Sudden movement of operator's seat could cause loss of machine control. This could result in accidents with serious injuries.

Always stop the machine before adjusting the operator's seat.

WARNING

Risk of serious injury.
Uncontrolled touch of control levers could cause unexpected movement of machine or parts. This could result in serious injury.

Always lock the control lock out lever before adjusting the seat.

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

NOTE!

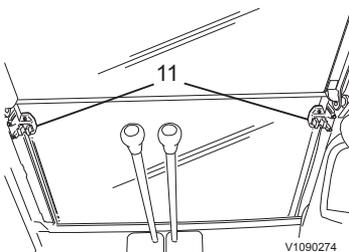
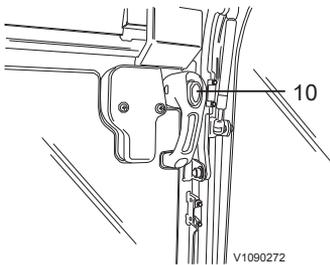
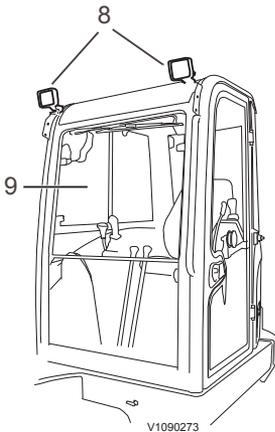
A seat belt that is damaged or has been stretched in an accident must be replaced immediately. Every 3 years the seat belt must be changed regardless of its condition.

The seat belt must be replaced by your Volvo dealer.

- Modifications to the belt or its mountings are not permitted.
- The belt is intended for one adult person only.
- Change the belt every three year regardless of its condition.

When the seat belt needs to be washed:

- Use a mild soap solution.
- Allow the belt to dry while it is fully pulled out, before retracting it.
- Make sure the belt is fitted in a correct way.



Windows

Upper windscreen

- The windscreen (9) can be loosened by pushing the buttons (10) on both sides and then slide the windscreen upwards under the cab roof.

NOTICE

The windscreen is fastened in the roof when you hear a click.

- To close the windscreen push the buttons again and slide the window down into closed position.
- To loosen the upper windscreen, push the buttons (10) on both sides.

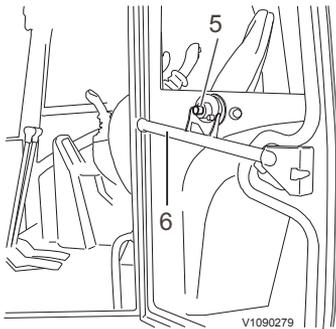
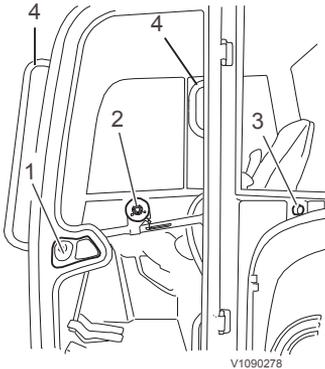
Lower windscreen

- The lower windscreen can be removed and placed under the cab roof.

- 1 Place the upper windscreen under the cab roof.
- 2 Push buttons (11) on both sides of the lower windscreen to remove it.
- 3 Loosen the upper windscreen from the roof and push it down.
- 4 Place the lower windscreen in front of the upper.
- 5 Push both of the windscreens up under the cab roof. Make sure you hear a click, then the windscreens are fastened.

Working lights

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 (optional equipment) of the cab and on the boom (optional equipment).



Door

WARNING

Risk of falling.

Careless mounting and dismounting of the machine could result in falling and injury.

Always use the three-point approach to access or leave the cab by using two hands and one foot or one hand and both feet. Use stepping surfaces and handholds. Always face the machine when entering or stepping down from the machine. Do not jump off!

- The cab door is fitted with an external door handle with a lock (1) and an internal door handle (6).
- 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).
- Press the button (5) to unlock and close the cabin door.
- Make sure that the cab is parallel to tracks when entering the machine. That allows best possible access situation.

Roof

If any part of the cab's protective structure is affected by plastic deformation or rupture, the cab shall be immediately replaced.

Do not jump out of cab if the machine should roll over. Keep stay in seat wearing seat belt.

Protection from falling or scattering materials (optional equipment)

Install the necessary protection guards according to working conditions where falling or scattering materials are capable of entering the cab.

The recommendations below are based on standard working, install the necessary additional protection guards in accordance with work site conditions and local government recommendations.

Consult your local Volvo Dealer.

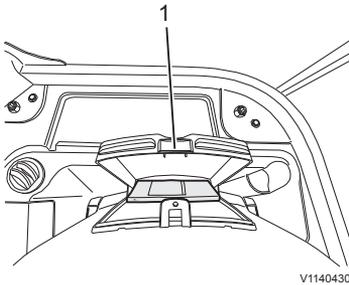
In mining applications, a protective roof guard should be installed. By installing FOPS, the cab is approved according to FOPS standard. When operating with a hammer, protective roof and window guards should be installed. By installing FOG, the cab is approved according to FOG standard

NOTICE

Always check clearance between bucket and Cab/FOG/FOPS guard. Slowly cycle bucket to check for interference with the Cab/FOG/FOPS guard. Pay close attention when quick couplers are used and/or when buckets have lifting eyes welded.

Operator's manual, storage

The Operator's Manual must be stored in the storage box (1) on the backside of the operator seat.



Fire extinguisher, location

Possible location for a fire extinguisher is behind the seat with a special fixation bracket offered by Volvo Construction Equipment. Contact your dealer for further information about this fire extinguisher fixation bracket.

Emergency exit

The alternative exit path is the sliding window on the right side (it's location marked with an information decal). In case of a turnover or accident, open the alternative exit path to leave the cab.



This information decal shows where the alternative exit path is located.

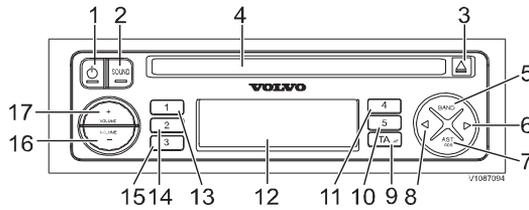
Audio system

(optional equipment)

The audio system (optional equipment) is located below the cab roof on the right hand side of the machine.

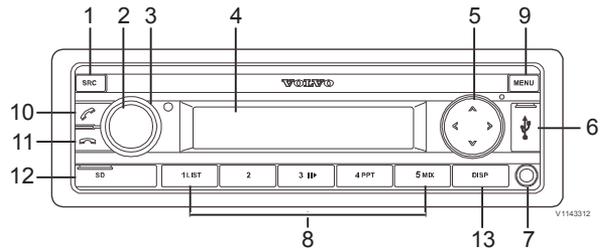
Check which of the two radio versions is built in your machine.

Radio with CD



1	Mute / Power	10	Preset 5
2	Sound styles	11	Preset 4
3	Eject	12	LCD
4	CD door	13	Preset 1
5	Band	14	Preset 2
6	Search up	15	Preset 3
7	AST / RDS	16	Volume -
8	Search down	17	Volume +
9	TA / AF		

Radio with USB, SD and Bluetooth



1	SCR button	8	Preset 1–5
2	ON/OFF button	9	MENU button
3	Volume control	10	Green phone button
4	Display	11	Red phone button
5	SEARCH/ CHANGE/SELECT button	12	SD card slot
6	USB socket	13	DISP button
7	Front AUX-IN socket		

1 SCR button

Select memory bank or audio source.

Short press: Select RADIO, BT STREAM, USB FRONT, USB REAR, SD, AUX FRONT or AUX REAR source.

Long press: Activate Travel-Store function in radio mode.

2 ON/OFF button

Short press: Switch on sound system.

In operation: Mute sound system.

Long press: Switch off sound system.

3 Volume control

Adjust the volume

In the menu: Change the settings.

Fast-Browse mode: Select folder and track.

4 Display

5 SEARCH/CHANGE/SELECT button

UP/DOWN

In the menu: Select menu item.

Radio mode: Start seek tuning.

MP3/WMA/iPod mode: Change to next or previous folder.

LEFT/RIGHT

In the menu: Change menu level.

Radio mode: Adjust the stations.

64 Other controls Operator comfort

- Other operating modes: Select a track.
- 6 **USB socket**
 - 7 **Front AUX-IN socket**
 - 8 **Preset 1-5**
 - Short press: Call up the stored station in radio mode.
 - Long press: Store station in the current memory bank in radio mode.
 - 9 **MENU button**
 - Short press: Open and close the menu.
 - Long press: Start the scan function.
 - 10 **Green phone button**
 - Short press: Answering a call, special dial
 - Long press: Activate voice dialing
 - 11 **Red phone button**
 - Ending, rejecting a phone call
 - 12 **SD card slot**
 - 13 **DISP button**
 - Switch display

Climate control system

Climate control system

The temperature control and the fan are only operable when the engine is running.

The air condition is switched on and off with a button on the keypad and the temperature is adjusted by a regulator on the right instrument panel.

For further information, see page 43.



Operating instructions

This chapter contains rules which must be followed in order to operate the machine safely. However, these rules are to be followed in conjunction with laws or other national regulations applicable to road safety and labour welfare.

Alertness, judgement and respect for applicable safety regulations are conditions for avoiding risk of accidents.

Visibility



Risk of serious accidents.

Machine parts, equipment or load could obstruct the operator's view. Operating or driving with obstructed operator's view could cause serious accidents.

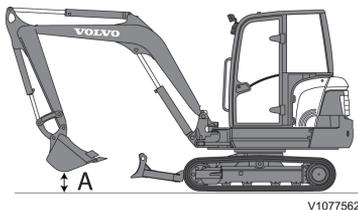
Use a signal man if operator's view is obstructed.

In order for you to have the best possible visibility when travelling with the machine, sit in the seat and place the boom as in the picture. The distance between bucket and ground (A) should be 400 mm (15.7 in).

It may not be possible to provide direct visibility to all areas around the machine. To achieve acceptable visibility, additional devices, such as warning systems and mirrors can be used.

In order to minimize hazards that may be caused by restricted visibility, rules or procedures should be established by the work site management. For example:

- Make sure that operators and workers on the site have received thorough safety instructions.
- Control the traffic flow of machines and other vehicles. Avoid travelling in reverse if possible.
- Limit the machine's operating area.
- Use a signalman to help the operator. Use signals according to the signal diagram, see 128.
- Provide two-way communication equipment if necessary.
- Make sure workers on site communicate with the operator before approaching the machine.



The distance between bucket and ground (A) should be 400 mm for best visibility when travelling.

Standard ISO 5006 "Earthmoving machinery – Operator's field of view" is dealing with the operator's visibility around the machine and is meant to be used for measuring and evaluate the visibility. Compliance with this standard gives improved visibility around the machine.

The machine is tested according to methods and criteria for this standard. The method used to evaluate visibility cannot cover all points regarding operator visibility, but it does give information to determine if optional devices for indirect visibility are needed, e.g., warning systems.

The test was conducted on stationary machines with standard equipment and standard attachments. If the machine is modified or retrofitted with other equipment or attachments which result in impaired visibility, it shall be tested again according to ISO 5006 and ISO 14401. And it shall be equipped with optional visibility-enhancing devices as needed.

Measures before and during operation

- Walk around the machine and check that there are no obstacles next to the machine.
- Check that mirrors and other visibility-enhancing devices are in good condition, clean, and correctly adjusted.
- Check that the horn, back-up/travel alarm and rotating warning beacon (optional equipment) are working properly.
- Check if the management has established rules or procedures for the work site.
- Always pay attention around the machine to identify any obstacles.
- Prevent persons from entering or remaining in the danger area, i.e. the area around the machine and at least 7 m (23 ft) beyond the maximum reach of the attachment. The operator may allow a person to remain in the risk zone, but should then observe caution and operate the machine only when the person is visible or has given clear indications of where he or she is.

Safety rules when operating

Follow the safety rules in the Operator's Manual before performing any operation.

Operator obligations

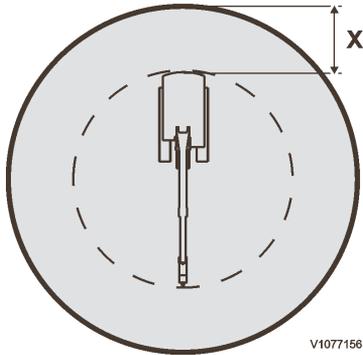
WARNING

Risk of fatal accidents.

Unauthorised persons within the work area around the machine could lead to serious crushing injury.

- **Clear all unauthorised personnel from the working area.**
- **Keep a lookout in all directions.**
- **Do not touch control levers or switches during start.**
- **Sound the horn before beginning operation.**

- The operator should operate the machine in such a way that the risk of accidents is minimized for both operator and persons present at the work site.
- The operator must be thoroughly familiar with how to operate and maintain the machine and should undergo adequate training on the machine.
- The operator must follow the Operator's Manual rules and recommendations, but also pay attention to any statutory and national regulations or specific requirements or risks which apply at the work site.
- The operator must be thoroughly rested and must never operate the machine when under the influence of alcohol, medicine or other drugs.
- The operator is responsible for any load while working with the machine.
 - There must be no risk of the load falling off while operating.
 - Refuse to take a load which is an obvious safety risk.
 - Respect the stated maximum load for the machine. Pay attention to the effect of different distances to the centre of gravity and the influence of different attachments.



- The operator must be in control of the working area of the machine.
 - Prevent persons from walking or standing under raised excavating equipment, unless it has been made safe or supported.
 - Prevent persons from entering or remaining in the danger area, that is a distance of at least 7 m (23 ft) in all directions from operating machines. The operator may allow a person to remain in the danger area, but should then observe caution and operate the machine only when the person is visible or has given clear indications of where he or she is.
 - Prevent persons from being in the cab of a vehicle which is placed so that there is a risk that the cab may be hit by other machines or falling objects, for example stones or logs. This does not apply if the cab is sufficiently strong or protected to withstand the impact of such external forces.
 - Make sure you know the weight limitation of working ground.

Only the operator, seated in the operator's seat, may be in the cab when operating. All other personnel must keep at a safe distance from the machine.

WARNING

Risk of fatal accidents.

Using attachments for lifting or transporting persons may lead to fatal accidents with serious crushing injury or death.

Never use attachments for lifting or transporting persons.

Accidents

- Accidents and also incidents should be reported to the site management immediately.
- If possible leave the machine in position.
- Only take necessary action so as to reduce the effect of damage, especially personal injuries. Avoid action which may make an investigation more difficult.
- Wait for further instructions from the site management.

Operator safety

WARNING

Risk of fatal accidents.

Unauthorised persons within the work area around the machine could lead to serious crushing injury.

• **Clear all unauthorised personnel from the working area.**

• **Keep a lookout in all directions.**

• **Do not touch control levers or switches during start.**

• **Sound the horn before beginning operation.**

■ Always sit in the operator seat with the seat belt fastened when starting the engine/machine and when operating controls, e.g. levers and switches.

■ Check that the seat belt is not worn, see page 58.

■ The machine must be operational, i.e. faults which can cause accidents must be rectified.

■ Suitable clothing for safe handling and a hard hat should be worn.

■ Keep your hands away from areas where there is a risk of crushing, e.g. covers, door and window.

■ Use steps and handholds when entering or leaving the machine. Use the three-point grip, i.e. two hands and one foot or two feet and one hand. Always face the machine – do not jump!

■ Check that the attachment is properly attached and locked.

■ The vibration (shaking) which arises when operating may be harmful to the operator. Reduce this by:

- adjusting the seat and tightening the seat belt.

- picking the smoothest operating surface for the machine (levelling the surface when necessary).

- adapting your speed.

■ The cab is designed to meet the requirements for falling objects, the weight of which agrees with testing methods according to ROPS-standard (Roll Over Protective Structure), OPGstandard

(Operator Protective Structure) and TOPS (Tip-Over Protective Structure), see page 10.

- During electrical storms, do not enter or exit the machine.
 - If you are off the machine, stay well away from the machine until the electrical storm passes.
 - If you are in the cab, remain seated with the machine stationary until the electrical storm passes. Do not touch controls or anything metal.
- Always wear approved respirator for the materials being used.
- When travelling on, for example, very rough and uneven ground, the operator may be thrown about and contact with the windshield is possible. Reduce this potential hazard by travelling at low speed and be extra careful under these conditions. Also wear a hard hat.

Stability when working

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

NOTE!

A pre requisite 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 on public roads

- Road signs, traffic restricting arrangements and other safety devices, which may be required when considering traffic speed and intensity or other local conditions, must be used.
- When moving the machine with a suspended load, special attention must be observed. When required, request the help of a signal man.
- Use lights, hazard flashers and rotating warning beacon according to national traffic regulations.

Periodic replacement of critical parts for safety

To ensure safety at all times when operating or driving the machine, periodic maintenance must always be carried out. To further improve safety, it is also recommended that periodic check or replacement of the parts given in the table below, is carried out.

These parts are closely connected to safety and fire prevention. The material changes as time passes, or they easily wear or deteriorate. However, it is difficult to judge the condition of the parts simply by periodic maintenance, so they should always be replaced after a fixed time has passed, regardless of their condition. It is necessary to ensure that they always maintain their function completely.

However, if these parts show any abnormality before the replacement interval has passed, they should be repaired or replaced immediately. If the hose clamps show any deterioration, such as deformation or cracking, replace the clamps at the same as the hoses. When replacing the hoses, always replace the O-rings, gaskets, and other related parts at the same time. The replacements should be carried out by trained personnel at a workshop.

Inspection interval	Item
Daily	Fuel / hydraulic hose - leakage of connections and end fittings
Monthly	Fuel / hydraulic hose - leakage, damage of connections and end fittings
Yearly	Fuel / hydraulic hose - leakage, damage, deformity and aging of connections and end fittings

Safety critical parts for periodic replacement		Replacement interval
Engine	Fuel hoses and clamps	Check every 250 hours, replace if required
	Air intake line	
Cab / Canopy	Seat belt	Every 3 years



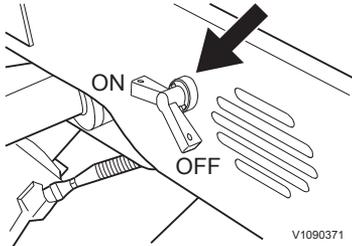
Measures before operating

For safety, observe the following rules.

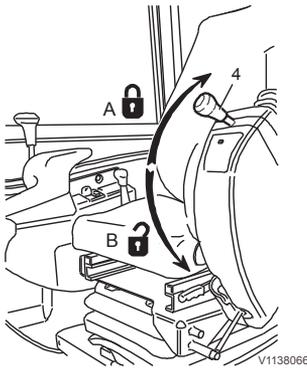
- Read the Operator's manual.
- Carry out daily service, see page 174. In cold weather, make sure that the freezing point of the coolant is sufficiently low and that the lubricating oil is intended for winter use.
- Clean / scrape ice off the windows.
- Clean the dust around engine, battery and cooler.
- Check the level of hydraulic fluid, refill if required.
- Check that there is sufficient fuel in the fuel tank.
- Check that there are no faulty, loose parts or leaks, which can cause damage.
- Check that the battery disconnected switch is switched on.
- Check for cracks on frame and tracks.
- Check that hoods and covers are closed.
- Make sure fire extinguisher if equipped is fully charged.
- Inspect steps and handholds for damage or loose parts. Make necessary repairs if needed.
- Check that there are no persons in the vicinity of the machine.
- Adjust the operator seat and fasten the seat belt.
- Adjust and clean the mirrors.
- Inspect working and other lights for proper operation.
- Travel alarm should be on before operating the machine.
- Inspect the failure of gauges in the instrument panels.
- Check the function of the attachment bracket (optional attachment).

Starting engine

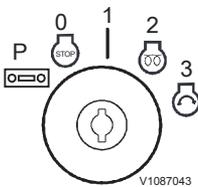
Starting engine



The battery disconnect switch is located in the front of the machine.



Control lockout lever (4)



Ignition switch

- P: Radio and cab interior light
- 0: Engine off
- 1: Running position / Ignition
- 2: Preheating
- 3: Start the engine



Control lamp for preheating

- 1 Turn on the electric supply with the battery disconnect switch.
- 2 Shift control lockout lever (4) to position (A). You are now able to start the engine and the operating levers for working and travel hydraulics are locked (no movement possible).
- 3 Insert the ignition key into the ignition switch and turn it to running position / ignition (1). All control and function lamps (except preheating lamp) light up for a period of approx. 3 seconds, see page 28.
- 4 Enter the anti-theft code (optional equipment) with the buttons on the keypad. The machine will take on the settings which were adjusted with this code.
- 5 Turn the key to preheating position (2).
- 6 Preheat depending on engine temperature. The preheating control light goes out after preheating. However, if the ignition key remains in preheating position (2), the preheating function remains active, even though the control lamp is off.
- 7 Once the preheating control lamp has gone out turn the ignition key to start position (3) and start the engine. As soon as the engine starts, release the ignition key. Do not continue to start for longer than 25 seconds without interruption.
- 8 If the engine does not start, turn the ignition key back to engine off position (0) and repeat the starting procedure.
- 9 Let the engine warm up during at least one minute before operating the machine.

10 Shift control lockout lever (4) to horizontal position to be able to operate the machine.

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

NOTE!

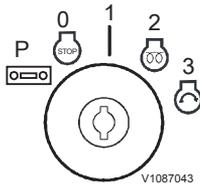
Never operate the machine without having the seat belt fastened, your safety is involved!

Warming up

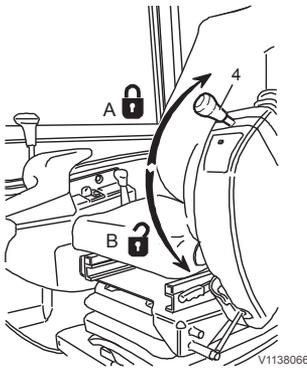
NOTICE

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

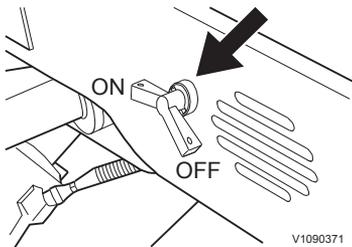
- 1 Start the engine.
- 2 After a longer period of standstill and particularly at temperatures around or below the freezing point the excavator must be warmed up by running the engine at medium speed.
- 3 Run the excavator warm for about 5 to 10 minutes at approx. 50% engine speed. During this period frequently operate the levers for the working hydraulics, whenever possible.



- Ignition key
P: Radio and cab interior light
0: Engine off
1: Running position / Ignition
2: Preheating
3: Start the engine



Control lockout lever (4)



The battery disconnect switch is located in the front of the machine.

Stopping

WARNING

Risk of crushing.
A raised attachment could fall and cause crushing injury.

Before leaving the cab, always lower all attachments to the ground and lock the control functions.

- 1 If possible park the machine on solid and level ground and lower the attachment and dozer blade to the ground.
- 2 Make sure that the cab is parallel to tracks, that allows best possible leaving situation.
- 3 Reduce the engine speed.

NOTE!

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

- 4 Raise the control lockout lever (4) to position locked position (A).
Turn the ignition key to engine off position (0) to shut down the engine.
- 5 All control lamps go out.
- 6 Check whether all switches and controls are switched off or deactivated.
- 7 Remove the ignition key to prevent unauthorised use of machine.
- 8 Interrupt the electric supply with the battery disconnect switch.

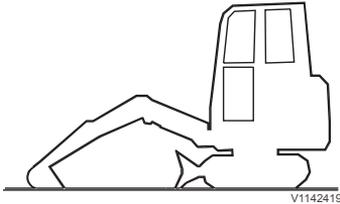
NOTE!

If you want to stop all movements of the machine quickly, without turning the ignition key, shift the control lockout lever (4) to the locked position (A).

After operation

- The fuel tank should not be left dry. This prevents the formation of condensation water.

Parking



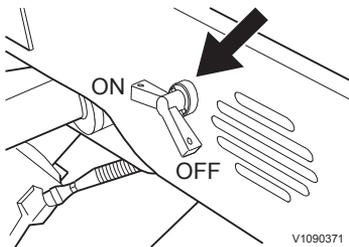
Parking position

WARNING

Risk of crushing.
A raised attachment could fall and cause crushing injury.

Before leaving the cab, always lower all attachments to the ground and lock the control functions.

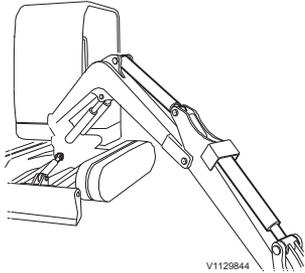
- 1 Park the machine on firm, horizontal ground.
- 2 Park the machine in the parking position as shown on the picture: open the bucket and lower it to the ground and lower the dozer blade to the ground.
If this is not possible, use the bucket and dozer blade to secure the machine to a fixed object.
- 3 Check that all switches and controls are in off position or in neutral.
- 4 Shut down the engine and pull out the ignition key.
- 5 Check that there is enough anti-freeze in the cooling system (see page 156) and in the windscreen washer reservoir if the temperature can fall below 0 °C (32 °F) during parking.
- 6 Close and lock windows, door and covers.
- 7 Disconnect the battery by turning the battery disconnect switch to off position and remove the key.



Battery disconnect switch

Keep in mind that the theft and burglary risk can be minimised by:

- removing the starter key when the machine is left unattended
- locking doors and covers after working hours
- turning off the current with the battery disconnect switch and removing the handle of the switch
- parking the machine where the risk of theft, burglary and damage is minimised
- removing all valuables from the cab such as cellular phone, computer, radio and bags
- chaining the machine.



Long-term parking position

By etching in the PIN-number or the national licence plate number of the machine on its windows, it is easier to identify stolen machines.

Long-term parking

If the machine is not going to be used for a longer period, all cylinder rods must be protected against corrosion.

- 1 Carry out the measures as described on previous page. Remember that the ground on which the machine is to stand may shift depending on the weather. Therefore take suitable action.
- 2 The temperature must not fall below $-40\text{ }^{\circ}\text{C}$ ($-40\text{ }^{\circ}\text{F}$) or exceed $+70\text{ }^{\circ}\text{C}$ ($158\text{ }^{\circ}\text{F}$).
- 3 Check that the batteries are fully charged.
- 4 Wash the machine and touch up any damaged paint finish to avoid rusting.
- 5 Rust-proof exposed components, lubricate the machine thoroughly and grease all unpainted surfaces like cylinder rods etc.
- 6 Fill the fuel tank and the hydraulic oil tank to the max. marks.
- 7 Cover the exhaust pipe (for outdoors parking).
- 8 Drain water from any compressed-air reservoirs (if installed).
- 9 Make sure the freezing point of the coolant is sufficiently low (in cold weather).
- 10 When storing machines in extreme cold temperatures, remove batteries and store them at room temperature. Make sure to place the batteries over a wooden/plastic/rubber surface.

Check after long-term parking

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

NOTE!

If a preservative has been used on the machine to prepare it for long term storage, follow the manufacturer's instructions for any necessary safety precautions and the method of removal.

Retrieving and towing

WARNING

Risk of runaway machine.

Improper towing methods or faulty equipment could cause the machine to break away from the towing vehicle, causing accidents, serious injury or death.

Carefully follow the towing instructions and use only certified towing equipment with adequate load rating.

WARNING

Risk of serious injury.

Release or breakage of the tow bars, chains or cables during the towing process could result in serious injury or death caused by flying pieces of steel.

Make sure the tow bars, chains or cables are correctly attached to the disabled machine and the tow vehicle. Instruct all personnel to stay clear of the tow vehicle and the disabled machine during the towing process.

In the event of slipping into swampy ground or towing heavy objects, proceed as follows:

- 1 Attach a wire rope to the machine to be retrieved or towed as shown in the illustration. Ensure that the towing linkage is properly connected, adequate for the purposes.

NOTE!

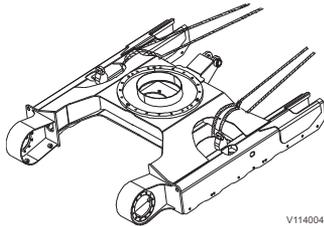
Put wood blocks between the wire rope and the machine to protect the machine and wire rope from damage.

- 2 Towing speed for short distance is maximum 2 km/h.
Use other transportation for long distance.

NOTE!

Select the slow travel mode. Slowly drive the machine when towing.

- 3 Keep the tow line angle as small as possible
Angle for pulling should not exceed 20° from the horizontal line of tow lope and longitudinal axis



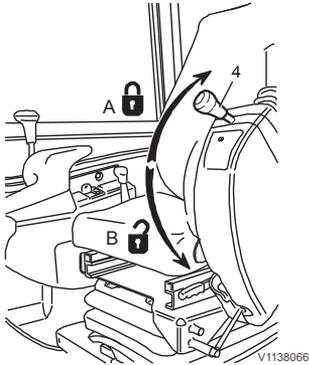
80 **Operating instructions**
Retrieving and towing

of the machine. Be careful there should not be also interference with parts of the machine.

NOTE!

Keep the cable horizontal, straight, and parallel to the tracks.

Attachments, alternative lowering



Control lockout lever

WARNING

Risk of crushing.
Incorrect function of the line rupture valves may cause uncontrolled lowering of the attachment.
Do not enter under the attachment when working with the alternative lowering function.

Even in technical incidents the attachment can be lowered to the ground.

Lowering attachment using accumulator pressure

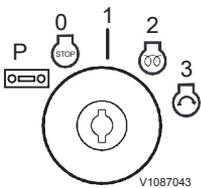
In case of standstill or engine defect.

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

- 1 Insert the ignition key into the ignition switch and turn it to running position / ignition.
- 2 Shift control lockout lever (4) to position (B). The control levers for working and travel hydraulics are unlocked (movement possible).
- 3 The control levers (see page 48) can be used to lower the attachment.

NOTE!

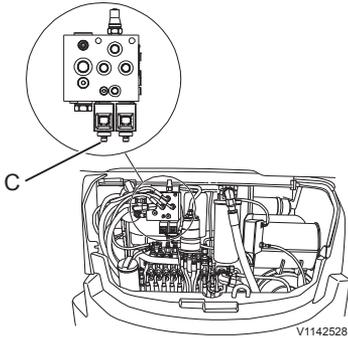
If lowering of the attachment is not possible because the accumulator is depressurized, restart the engine to pressurize the accumulator.



Ignition switch

- P: Radio and cab interior light
- 0: Engine off
- 1: Running position / Ignition
- 2: Preheating
- 3: Start the engine

82 Operating instructions Attachments, alternative lowering



Lowering attachment in case of problems with the electric circuit

In case of standstill or engine defect and power failure.

- 1 Open the rear hood.
- 2 Loosen screw (C) (end of the pin) on the left solenoid valve.

NOTE!

Operate with greatest care after loosening this screw (C), because the control levers can lower the boom without any additional action. This means that pushing forward any control lever can move the equipment down even if the control lockout lever is in locked position (A).

- 3 Use the control levers to lower the attachment.
- 4 Retighten the screw (C).

NOTE!

If you do not retighten the screw, the function of the control lockout lever will not work.

NOTE!

Before lifting the control lockout lever to position A, lower the attachment to the ground.

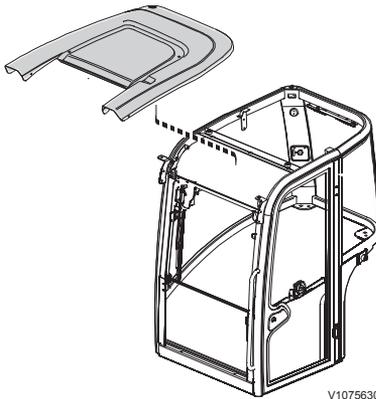
Transporting machine

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.

Transport of machines equipped with roof on the cab

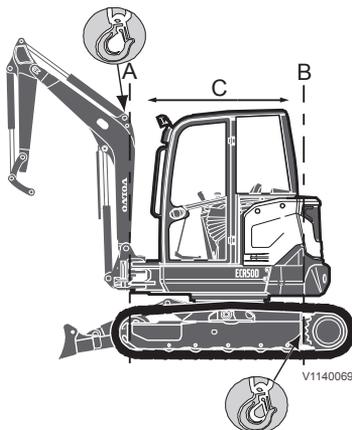
NOTICE

When transporting a machine equipped with roof on an open vehicle or trailer the maximum speed limit is 90 km/h (55 mph) according to European legislation. If the speed is higher than 90 km/h (55 mph) there is a risk of the roof coming apart during transport. In some countries (e.g. USA) the speed limit can be 130 km/h (80 mph). In this case add an additional belt to secure the roof.



V1075630

When the machine is equipped with air conditioning, a roof is added to the cab.



V1140069

Lifting machine

WARNING

Risk of personal injury.

Faulty or improper lifting equipment could cause the machine to break away from the lifting vehicle, causing accidents, serious injury or death.

Use certified cables, lifting straps, slings, shackles and hooks with adequate load capacity and never lift the machine with a person in or on the machine.

NOTE!

Only use lifting points intended for lifting.

84 Operating instructions Transporting machine



Make sure that the machine is in the same position as shown in the illustration. Use the specified lifting points to lift the machine. Two lifting points on the lower frame (one on each side) and one lifting point on the boom. The illustration shows the location of the lifting points.

- 1 Park the machine on ground as solid and level as possible.
- 2 Remove any attachments.
- 3 Position dipper arm, boom and blade as shown in the illustration.
- 4 Close and lock windows, doors and hoods securely.
- 5 Shut off the engine and put the control lockout lever fully in the upper end position.
- 6 Make sure that nobody is in the machine while lifting.
- 7 Use suitable lifting equipment to lift the machine. Make sure that the lifting chains are strong enough for the weight of the machine. For machine weight, see page 195.

NOTE!

Volvo is not responsible neither for lifting equipment nor for lifting techniques.

- 8 The distance (C) between axis (A) and (B) at the lifting point on the boom and distance (D) must be observed when lifting.

ECR50D	C	D
	937 mm (37 in)	1920 mm (76 in)

- 9 Maintain good visibility of the machine at all times during the lift.

NOTICE

The lifting equipment attached to the lower frame must be vertical when lifting to prevent any damage to the machine.

Loading

Loading machine on trailer

WARNING

Risk of fatal accidents.

Unexpected driving direction could lead to accidents resulting in serious injury or death.

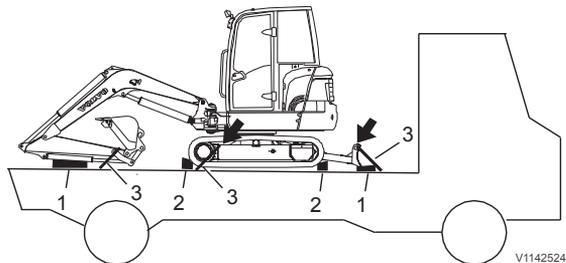
Always check the driving direction before moving the machine.

NOTE!

Make sure that loading ramps and platforms are free from oil, mud, ice and similar so that the machine does not begin to slip.

If the machine is too high to fit in the transporting vehicle it is possible to tilt the rotating warning beacon (optional equipment). This will reduce the total height of the machine.

Tying down machine



- 1 Align the machine's tracks to the ramp, the dozer blade to the front (facing the cabin of the truck) and the attachments to the front position.
- 2 Never operate any lever other than the travel levers (pedals) while the machine is on the loading ramp.
- 3 Park the machine on the trailer.
- 4 Rotate the slewing superstructure by 180 degrees.
- 5 Put a suitable wooden block (1) under the attachment and the dozer blade.
- 6 Place the attachment and the dozer blade on the wooden blocks (1) as shown on the illustration.
- 7 Stop the machine and remove the ignition key.

86 **Operating instructions**
Transporting machine

- 8 Switch off the battery disconnect switch.
- 9 Lock the cab door and all lockable covers.
- 10 Secure both tracks with wheel chocks (2) and tie the machine with chains and belts (3) with the cross tie down procedure to the loading platform of the trailer.

Unloading

- 1 Remove the chains, belts and wheel chocks.
- 2 Raise excavating equipment and dozer blade.
- 3 Remove the wooden blocks below the attachment and the dozer blade.
- 4 Slowly drive to the beginning of the ramp, lift the excavating equipment position and drive forwards until the machine tips on to the ramp.
- 5 Drive down slowly until the machine reaches level ground.

Operating techniques

The excavator is a multi-task machine capable of being fitted with multitude special attachments to perform many types of work. This chapter contains information and instructions regarding the best operating practices to improve efficiency, including examples on how the most common attachments are used. It is important that the correct technique is used to obtain safe and efficient use of the machine.

Eco driving

Operating in an environmental friendly way will reduce fuel consumption and emissions and can also lower wear on the machine.

Always try to:

- **Use the ECO mode if possible**

Use the ECO mode in your machine to reduce rpm's in order to stay in the most economical area.

- **Use the auto idle function if possible**

Use the auto idle function in your machine to reduce the fuel consumption.

- **Use the engine auto shut down function if possible**

Use the engine auto shut down function in your machine.

Do not idle unnecessarily, a machine turned off does not consume any fuel.

- **Plan your work site**

Take stock of your work area and plan its layout with regard to the machines that will work there. Your work will be much more productive and organized. Keep the ground even and free from larger stones or other objects that form obstacles.

- **Cooperate**

Consult with other operators so that machines and trucks work together in the most effective way.

- **Use the right equipment**

The right equipped machine saves on fuel and maintenance. See the operating techniques chapter for further information about equipment.

Contact your local Volvo Construction Equipment dealer for further information and the possibility to attend a Volvo training for fuel efficient machine operating.

Whole-body vibrations

Whole-body vibration emission on construction machinery are affected by a number of factors, such as working mode, ground conditions, speed, and so on.

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, and so on.

Therefore, the result can be a range of different vibration levels for the same type of machine. For cab specifications, see page 191.

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 travelling.
 - Use suspension systems if available.
 - If no suspension system is available, reduce speed to prevent bouncing.

90 Operating techniques Whole-body vibrations

- 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.

Rules for digging

WARNING

Risk of serious injury.

More than one person in the cab while operating could cause accidents and serious injury.

Only the operator, seated in the operator's seat, may be in the cab when operating. All other persons must keep at a safe distance from the machine.

First read the safety rules, see page 69.

- Always prepare work by carefully studying drawings and regulations that apply to the site. Also study the ground conditions and what the risk areas on the site look like. Turn off gas, electricity and water supplies, if this is necessary. Mark the position of cables and pipes.
- Fence off the area around the machine, if there is a risk that people may get too close.
- Look after your workmates! Make sure that they take care. No persons, apart from the operator, may, unnecessarily, be present within the working area of the machine. Teach them to be on their guard against collapsing banks and rolling stones and to be prepared to dash for safety. Changes in stress in a bank immediately prior to a landslip are indicated by small streams of loose material just where the cracks are forming.
- If the machine is provided with optional equipment, which is operated with the control levers, the operator must assure him or her self of that the anticipated movements are obtained when actuating control levers. An unexpected movement may entail risk of an accident.

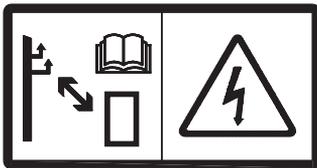
NOTICE

With certain attachment combinations there is a risk that the attachment may strike the cab. Avoid damage by being careful when working close to the machine.

- Never swing the bucket or load above people.

Working within dangerous areas

- Observe great care at marked danger areas.
- Do not operate too close to the edge of a quay, ramp, and so on.
- Move slowly when working in confined spaces and check that there is sufficient room for machine and load.
- When working under ground, special equipment, for example certified engine is required within the EU and in EES countries. Talk to your dealer.
- When working in low light conditions, for example buildings and tunnels, use head light.
- Do not operate the machine when visibility is poor such as a heavy fog, snow or rain.
- When working in an area which is contaminated or dangerous to one's health, the machine must be especially equipped for this purpose. Talk to your dealer. Check also local regulations before entering the area.



High voltage overhead power line



Risk of electrocution

Working near or making contact with overhead power lines may lead to electrical flashover and electrocution.

Always keep the minimum clearance from overhead power lines.

High voltage is lethal and the current sufficiently strong to destroy both machine and attachments. Your life is in danger if you come into contact with or close to high voltage power lines. Always contact the power company responsible before beginning any work near high voltage power lines. Go through the special instructions issued by the power company for work/presence near the power lines.

Regard all power lines as if they were live even if they are supposed to be without current. Working when the machine or its load at any time is closer than the minimum safety distance to a power line, is taking a very serious risk.

- Remember that the voltage of the power line determines the safety distance. Electrical flash-over may occur and damage machine and

operator at fairly great distances from the power line.

Voltage	Minimum distance to power line
0 ~ 50 kV	3 m (10 ft)
50 ~ 69 kV	4.6 m (15 ft)
69 ~ 138 kV	5 m (16.4 ft)
138 ~ 250 kV	6 m (20 ft)
250 ~ 500 kV	8 m (26 ft)
500 ~ 550 kV	11 m (35 ft)
550 ~ 750 kV	13 m (43 ft)
750 kV~	14 m (46 ft)

NOTICE

The operator should have secure visibility when working around the power lines.

NOTICE

When transporting the machine also take overhead power lines into consideration.

NOTICE

Remember that the roof window may distort how distance is perceived.

- Keep the following in mind to ensure safety when operating.
 - Operate the machine slower than normal operation in the vicinity of power lines.
 - Consider the long-span power line, which can sway and reduce the clearance.
 - Pay attention when travelling over uneven ground that could cause the machine to lose balance.
 - Keep all persons away from the machine whenever it is close to power lines.
 - Prohibit persons from touching the machine or its load before it is confirmed to be safe.
- Find out what action to take if a person has been exposed to an electric shock.
- Procedure if a machine touches the power line.
 - The operator should stay inside the cab.

94 Operating techniques Working within dangerous areas

- All other persons should keep away from the machine, ropes, and load.
- The operator should try to remove the machine from contact by moving it in the reverse direction from that which caused the contact.
- If the machine cannot be moved away from contact, the operator should remain inside cab until the lines have been de-energized.

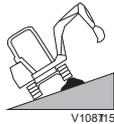
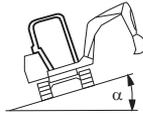
Overhead railway power lines

Loading and unloading is only permissible between the boundary signs. The signs may be mounted directly on the power line or on special posts.

- Contact authorised railway personnel to obtain permission to load or unload.
- After any breaks in the work, always contact the railway personnel again.

Underground cables and pipes

Make sure that authorities or companies responsible for cables and pipes have been contacted and that their instructions are followed. Also check which rules apply to ground personnel regarding exposing cables and pipes. Normally only the service companies' own personnel may expose and arrange provisional suspension of cables. Make use of a signal man when you cannot see the actual point where you are working or when the position of the pipe or cable is critical, see page 128. The position of the pipe or cable may deviate from the drawing or distances may be incorrectly determined. Regard all electrical cables as live.



Working on slopes

WARNING

Risk of tipping over.

When working on uneven slopes and ground the machine can tip over.

Make sure the maximum machine inclination is not exceeded and that the inclination angle is not increased by an obstacle.

NOTICE

In order not to jeopardise the lubrication of the engine, the machine must not be inclined more than 35 degrees in either direction. In addition it may be unsuitable to operate at this inclination as the machine may become unstable and unbalanced, depending on the load.

In any machine position the maximum machine inclination should not be more than ^(a)	Manageable gradients ^(b) (engine lubrication)	Manageable gradients ^(c) (engine lubrication)
$\alpha = 17.5^\circ$ (31.5 %)	$\alpha = 35^\circ$ (70%)	$\alpha = 30^\circ$ (57%)

a)(α = 50% of tipping limit)

b)manageable gradient for maximum 3 minutes

c)manageable gradient continuous

- Be careful when opening or closing the doors on a slope, operational force may be changed rapidly. Make sure to keep the doors closed.
- Do not descend backward on a slope.
- Operate the travel function slowly when approaching or descending a slope.
- Do not change direction or travel a cross on a slope. Change direction on level ground, if necessary first come down to level ground and make a detour.
- If the machine slides, immediately lower the bucket to the ground. The machine can turn over due to unbalance. Especially, do not swing with

loaded bucket. In unavoidable case, pile up earth on the slope, and then make the machine level and stable.

- While travelling on a slope, keep the angle between boom and arm at 90 - 110°, raise the bucket 20 - 30 cm (7.9–11.8 in) from the ground
- If the engine shuts down on a slope, lower the attachment to the ground. Do not operate the swing function since the superstructure may swing under its own weight and cause tipping or side slipping.
- Do not park the machine on a slope and leave it unattended.

Working in water and on boggy ground

When wading with the machine across a water course, use the bucket as a "feeler" if the water is muddy. The water course may have hidden obstacles under the surface or the depth may change suddenly, endangering the operator and the machine. While wading, stop the machine now and then and swing the bucket sideways just above the bottom. This operation reveals stones or other obstacles. Prod the bottom with the bucket to measure the depth in order to discover any dangerous hollows.

- After working in water, the lubrication points on the undercarriage, which have been under water, must be lubricated, so that the water is driven out. Check also that no water has entered the travel gearbox.

NOTICE

Risk of machine damage.

When operating the machine in water, the water can damage the machine parts.

When operating in water, do not exceed the maximum permissible water depth.

NOTE!

The water must not reach higher than the middle of the upper roller.

Heavy timber mats can be used to support the machine when working on boggy ground. The mats should be kept as flat and clean as possible.

Working where there is risk of landslide

Always check ground conditions before beginning to work. If the ground is soft, great care must be taken when positioning the machine. Thawing of frozen ground, rain, traffic, piling and blasting are factors which increase the risk of landslide. The risk also increases on sloping ground. If it is not possible to dig with sufficiently slanting trench sides, they must be shored up.

- Do not place excavated material too close to the edge as its weight may cause a landslide. Loose clay should be placed at least 5 m (16 ft) away from the edge.
- Do not dig under the machine.
- Do not operate too close to the edge of a steep slope or road bank. Take care when working in a place where the machine may tip.
- Take care when working on river banks or in other similar places where the ground is soft. There is a risk that the machine, because of its own weight and own vibrations, may sink and this could lead to accidents.
- Keep in mind that the ground conditions may have changed after heavy rain. Therefore, be careful when restarting work. This is particularly important when working near the edge of ditches, road verges or similar, as the ground may easily give way after it has been raining.

Working in cold weather

DANGER

Risk of electrical shock.
Personal injury results if a body part comes into contact with a machine that conducts electric power.

Disconnect the electrical engine heater before working on the machine.

WARNING

Risk of frostbite.
Bare skin can freeze stuck to cold metal which could cause injury.

Use personal protective equipment when handling cold objects.

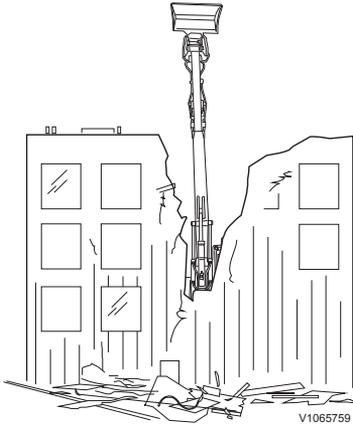
WARNING

Risk of crushing injury.
The hydraulic system could respond slowly at low temperatures and could cause unexpected machine movements.

Operate carefully until the hydraulic system has reached operating temperature.

Read the advice for starting, see page 74 .
The windows must be free from ice and snow before putting the machine to work.

- Watch out for ice on the machine causing slippery conditions. Step only onto anti-slip surfaces.
- Use an ice scraper on a long handle or a ladder when removing ice from the windows.



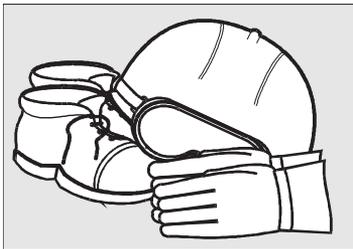
Demolition work

The machine is often used for demolition work. Be extremely careful and study the work site thoroughly. Use fall protection over the cab against falling objects.

- Make sure that the material, on which the machine is standing, cannot collapse or slide.
- Operate the machine on firm level ground, if necessary prepare the area with another machine first.
- Do not work close to free-standing walls, which may fall over the machine.
- At all times be aware of where your workmates are. Do not work if anyone is dangerously close to the demolition object.
- Leave sufficient space in front of the machine for debris to fall to the ground and not hit the cab.
- Fence off the dangerous part of the work site.
- Spray water over the demolition site to prevent harmful dust from spreading.

Boots with steel reinforcements in the soles and toe caps, protective goggles and a hard hat are obvious protective items to be worn on a demolition site.

If the machine is equipped with special demolition equipment, read the supplied instruction booklet about the safety risks that might occur and how the demolition equipment is used.



Attachments

WARNING

Risk of fatal accidents.
Using attachments for lifting or transporting persons may lead to fatal accidents with serious crushing injury or death.

Never use attachments for lifting or transporting persons.

NOTE!

For hydraulically controlled attachments:
Release the hydraulic pressure in the system before removing or connecting hydraulic hoses for hydraulically controlled attachments. See page 106 for the procedure to release the hydraulic system pressure.

WARNING

Risk of high pressure injection.
Residual pressure in the hydraulic system could lead to oil under high pressure jetting out and cause serious injury, even if the engine has not been running for some time.

Always release the pressure before any kind of service of the hydraulic system is carried out.

NOTE!

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

Using the correct attachment for a particular job is a deciding factor when it comes to the capacity of the machine. The machine has either direct-mounted attachments or attachments mounted in a hydraulically controlled bracket which allows rapid changes of attachments.

Always follow Volvo Construction Equipment recommendations when choosing attachments. If other attachments are used, follow the operator's manuals from the respective supplier.

EU Machine Safety Directive is stated on the product plate of the machine by the way of a CE marking. Therefore, this marking also covers attachments which are designed and marked by Volvo Construction Equipment, as they are an

integrated part of the machine and adapted to the machine. Volvo Construction Equipment is not responsible for attachments manufactured by other companies. Such attachments must be CE marked and accompanied by a Declaration of Conformity and user instructions.

It is the responsibility of the machine owner to make sure that the attachments are approved for mounting on the machine. The machine owner is responsible for the safety of the combination machine – attachment.

For more detailed information regarding the choice of attachments, contact a Volvo Construction Equipment dealer.

The machine is prepared for various different attachments, e.g. hammer (hydraulic breaker). In order to be able to connect these hydraulically to the machine, the pressure in the hydraulics must be released by moving the control levers in all directions.

NOTE!

Depending on the attachments the stability of the machine may vary.

The certification of each attachment and separate Operator's manual should be provided to the customers by the manufacturer of the attachment.

Attachments, connecting and disconnecting

WARNING

Risk of crushing.
Falling attachments could result in severe injury or death.

Make sure the attachment bracket is properly locked before starting work.

WARNING

Risk of crushing.
An unsecured attachment could fall and cause serious injury or death.

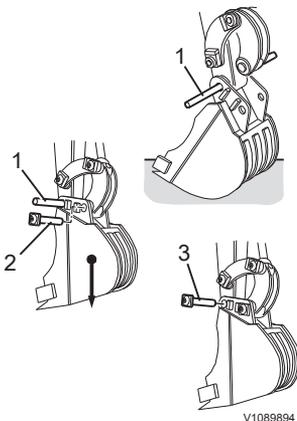
Always ensure the attachment is properly secured by pressing the front part of the attachment to the ground until the machine is slightly lifted.

WARNING

Risk of serious injury or death.
Worn or damaged machine parts can cause malfunction resulting in serious injury or death.
Check relevant machine parts regularly. If wear or damage occurs stop operating immediately and call for immediate corrective maintenance.

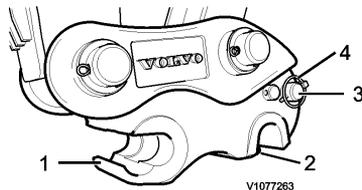
Installing a bucket with manual fastening

- 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 (0.787 in) 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.

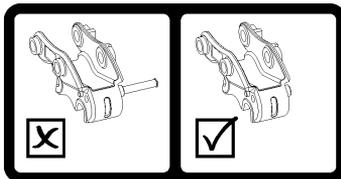


NOTE!

Disassembly of the bucket takes place in reverse order.



- 1 Front hook
- 2 Rotating hook
- 3 Locking pin
- 4 Linch pin



Working with extracted locking pin is hazardous and not allowed. Always make sure that the locking pin is securely fastened.

Attachment brackets

Volvo Attachment bracket

NOTE!

For other types of attachment brackets please refer to the separate attachment bracket Operator Manuals.

WARNING

Risk of crushing.

Raised equipment may drop if the hydraulic system fails or if the control is operated. Falling equipment may cause serious injury or death.

Always make sure that raised equipment is supported by a mechanical device before walking or working under it.

NOTICE

There is a risk of loss of stability and tip-over when the attachment bracket is in shovel position. The load is moved forward and may exceed the machine's lifting capacity.

NOTICE

The attachment bracket increases the total length of the dipper arm. Be careful when moving the bucket and dipper arm towards the machine, there is a risk of damaging the machine.

The attachment bracket is not designed as a lifting device. Do not use the front hook or the rotating hook for lifting. Only specially designed pin-on attachments may be hooked to the attachment bracket.

Mechanical attachment bracket, bucket installation

WARNING

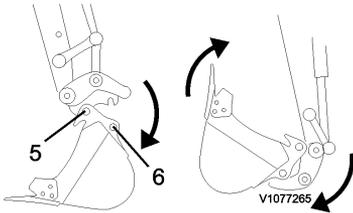
Risk of crushing.

An unsecured attachment could fall and cause serious injury or death.

Always ensure the attachment is properly secured by pressing the front part of the attachment to the ground until the machine is slightly lifted.

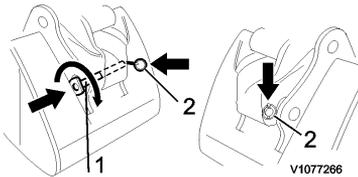
Connecting bucket

104 Operating techniques Attachment brackets



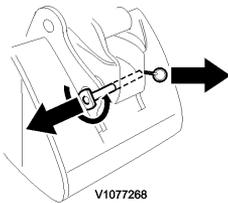
Lower the attachment bracket towards the rear bucket pin and tilt the bucket rearwards.

5 Front bucket pin
6 Rear bucket pin



Rotate the locking pin back 90°. Insert the locking pin. Insert the linch pin through the locking pin.

1 Locking pin
2 Linch pin

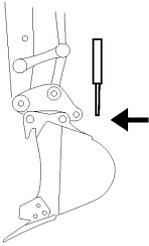


Extract the linch pin and the locking pin. Rotate the locking pin 90° to lock it in extracted position.

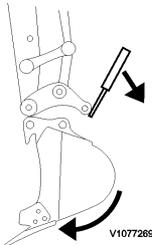
- 1 Remove the linch pin and extract the locking pin.
- 2 Rotate the locking pin 90° to lock it in extracted position.
- 3 Lower the dipper arm into a position where the attachment bracket connects with the front bucket pin.
- 4 Lower the attachment bracket towards the rear bucket pin. Tilt the bucket rearwards (bucket in) until the hook on the attachment bracket is in contact with the rear bucket pin.
- 5 Position the bucket 20 cm (8 in) above the ground.
- 6 Engage the bar in the bucket in the rotating hook and press it down to fully engage the rear bucket pin.
- 7 Lower the bucket to the ground.
- 8 Rotate the locking pin back 90°.
- 9 Insert the locking pin.
- 10 Insert the linch pin through the end of the locking pin.
- 11 Check that the bucket is securely fastened by simultaneously pressing the bucket to the ground and forward.

Disconnecting bucket

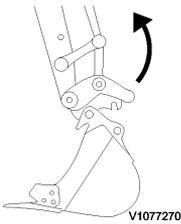
- 1 Lower the bucket to the ground.
- 2 Extract the linch pin and the locking pin.
- 3 Rotate the locking pin 90° to lock it in extracted position.
- 4 Position the bucket 10 cm (4 in) above the ground.



- 5 Insert the release bar into the hole at the back of the attachment bracket.



To release the attachment bracket, insert the release bar and pull.



Release the attachment bracket from the bucket.

- 6 Pull the release bar to release the attachment bracket from the rear bucket pin.

! WARNING

Risk of crushing.
The bucket is only attached in the front bucket pin. The bucket could fall and cause crushing injury.

Keep a safe distance.

- 7 Place the bucket on the ground.
8 Lift the attachment bracket in direction from the bucket to release the front bucket pin.

Pressure release

Pressure release

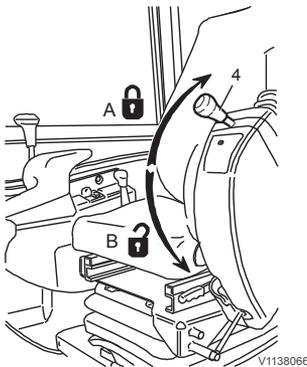
Before removing or connecting hydraulic hoses the pressure in the hydraulic system must be released.

WARNING

Risk of high pressure injection.
Residual pressure in the hydraulic system could lead to oil under high pressure jetting out and cause serious injury, even if the engine has not been running for some time.

Always release the pressure before any kind of service of the hydraulic system is carried out.

- 1 Place the machine on firm and level ground.
- 2 Lower the attachment and the blade to the ground.
- 3 Shut down the engine and turn the ignition key to running position/ignition.
- 4 Move the control lockout lever (4) down to unlock the system.
- 5 Shift the rollers on the joysticks a couple of times to the right and to the left.
- 6 Then move the joysticks and the driving levers in all directions a couple of times to release all residual pressure.
- 7 To release the pressure in the accessory line (X1) and boom offset:
Select function and shift the rollers on the joysticks to the right and to the left in accessory line (X1) position and in boom offset position.



Control lockout lever

NOTE!

It must be strictly assured that the engine cannot be started after hydraulic couplings have been opened.

Buckets

Working with buckets

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 machine.
- 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. Work in a smooth way and avoid quick movements.

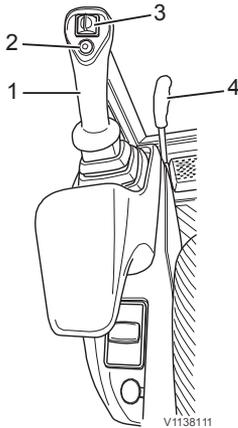
Completely close the bucket when filled. Raise the boom and simultaneously start the swing motion, until the unloading position is reached.

Backfilling or grading

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

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

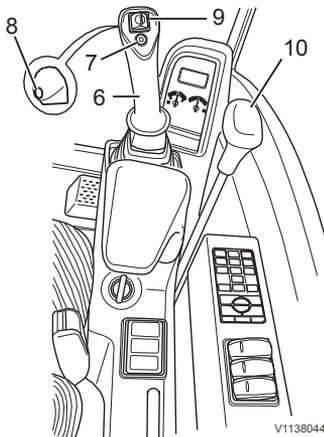
Offset boom



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

- 1 If the function for offset boom is not activated push button (2) to activate it. You know that the function is activated when the control lamp is alight.
- 2 Use the proportional roller (9) on the right hand lever to operate the offset boom.
 - Roller to the left: Offset boom to the left.
 - Roller to the right: Offset boom to the right.

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

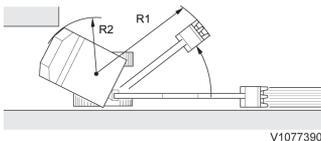


Offset in degree (°)	ECR50D
to left	76°
to right	56°

ECR50D minimum radius, mm (in)			
Type		Short dipper arm 1400 mm (55.12 in)	Long dipper arm 1800 mm (70.87 in)
R1	to left	1948 mm (76.69 in)	1984 mm (78.11 in)
	to right	2258 mm (88.90 in)	2299 mm (90.51 in)
R2		960 mm (37.80 in)	1042 mm (41.02 in)



Control lamp for offset boom



Boom offset function, settings

The settings for the boom offset function can be changed in the display, see page 31.

Special hydraulics

Special hydraulics

Release the hydraulic pressure in the system before removing or connecting hydraulic hoses for hydraulically controlled attachments. See page 106 for the procedure to release the hydraulic system pressure.

WARNING

Risk of high pressure injection.

Residual pressure in the hydraulic system could lead to oil under high pressure jetting out and cause serious injury, even if the engine has not been running for some time.

Always release the pressure before any kind of service of the hydraulic system is carried out.

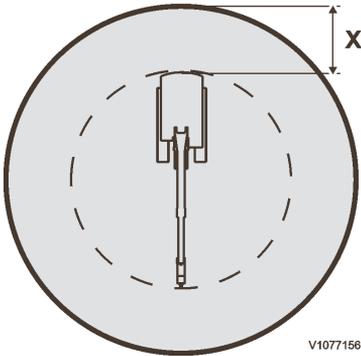
NOTE!

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

Volvo supplies a wide range of hydraulic tools. All tools and optional equipment are described in the Attachment Catalogue. Contact a Volvo dealer for further advice.

Hammer

Working with hammer (hydraulic breaker)



Risk zone when operating the hammer.
X = Must be determined by the operator.

WARNING

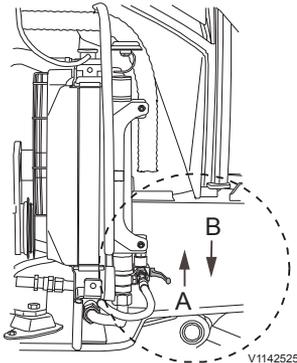
Risk of severe personal injury.
While working with the hammer flying chips of rock could cause severe injury.
Provide protective nets for the windscreens. Keep windows and door closed and prevent persons from entering the risk zone when operating the hammer.

NOTICE

The standard version of the hammer must not be used under water. If water fills the space where the piston strikes the tool, a strong pressure wave is generated and the hammer may be damaged.

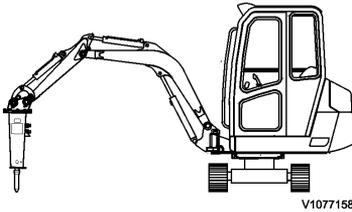
NOTICE

If the hammer is connected to an attachment bracket, the attachment bracket should be checked regularly for damage.

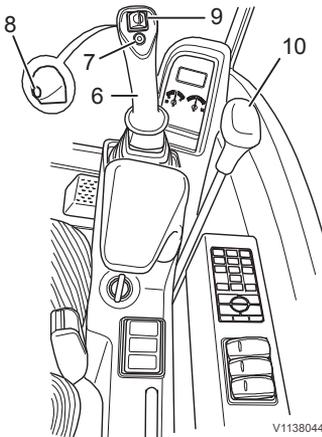
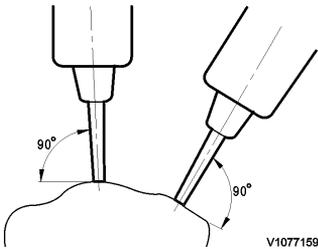


The hammer / shear valve is located in the engine compartment, in front of the cooling package.

- 1 Turn the hammer / shear valve counterclockwise to horizontal position (B) to set the hammer position (oil direct to tank).
- 2 Prepare the machine for normal excavation work. Move the machine to the required position. Lower the dozer blade to the ground
- 3 Set the engine speed to the recommended engine RPM for correct amount of oil supply.



Position for hammer use



4 Place the boom and hammer in the breaking position. Quick and careless boom movements could result in damage to the hammer.

5 Place the tool perpendicular to the surface of the object. Keep the feed force aligned with the tool. Avoid small irregularities on the object which will break easily and cause either idle strokes or an incorrect working angle. When demolishing vertical structures (e.g. brick walls), place the tool perpendicular to the wall.

6 Press the hammer firmly against the object. Do not pry the hammer with the boom. Do not press too hard or too gently with the boom.

7 Start the hammer.

■ Depress button (8) to activate the hammer function.

■ Release the button to deactivate the hammer function.

NOTE!

Listen to the sound of the hammer when you are using it. If the sound becomes weaker and the impact less efficient, the tool is misaligned with the material and/or there is not enough feed force on the tool. Realign the tool and press the tool firmly against the material.

Working with hammer

(hydraulic breaker)

For further information about the hydraulic breaker, refer to the hydraulic breaker Operator's Manual.

Connecting with pivot pins

Before removing or connecting hydraulic hoses the pressure in the hydraulic system must be released,

see page 106 for the procedure to release the hydraulic pressure.

WARNING

Risk of high pressure injection.
Residual pressure in the hydraulic system could lead to oil under high pressure jetting out and cause serious injury, even if the engine has not been running for some time.

Always release the pressure before any kind of service of the hydraulic system is carried out.

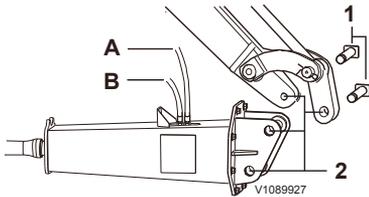
CAUTION

Risk of cutting and crushing.
Loose parts could cause crushing and cutting injury.
Never use your fingers for checking alignment between loose parts. Always use a tool.

NOTE!

The linkage could change position during changing attachment, pay attention on moving parts.

- 1 Place the machine on firm and level ground.
- 2 Slowly lower and align the boom, until fastening bores (2) of the hammer are flush with the holes in the boom.
- 3 Insert pivot pins (1) into fastening bores (2).
- 4 Clean the hydraulic connections on hammer and dipper arm.



Connecting with pivot pins

- A Pressure line
- B Return line

- 1 Pivot pins
- 2 Fastening bores

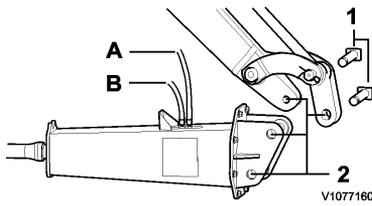
NOTICE

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

- 5 Release the pressure from the hydraulic system according to the procedure on page 106.
- 6 Connect the hydraulic hoses (pressure line (A) and return line (B)) of the hammer to the hydraulic connections on the boom.
- 7 Lock the hydraulic couplings.

NOTICE

The machine hydraulic oil level must be checked after the hammer has been operated for 2–3 minutes.



Connecting / disconnecting with pivot pins

A Pressure line
B Return line

1 Pivot pins
2 Fastening bores

Disconnecting with pivot pins

- 1 Place the machine on firm and level ground.
- 2 Lower the boom and place the hammer flat on the ground.
- 3 Release the pressure from the hydraulic system according to the procedure on page 106.
- 4 Remove the ignition key to make sure the engine cannot be started.
- 5 Unlock the hydraulic couplings.
- 6 Disconnect the hydraulic hoses (pressure line (A) and return line (B)) of the hammer from the hydraulic connections on the boom.
- 7 Drive pivot pins (1) out of fastening bores (2) on the boom to loosen the hammer.

Connecting to an attachment bracket

For connecting and disconnecting a hydraulic breaker from an attachment bracket, refer to the attachment bracket Operator's Manual.

NOTE!

Take care during disconnection, hydraulic breakers have a high inertia due to the weight and could fall out of the attachment bracket coupler during disconnection. Always connect and disconnect as close as possible to the ground.

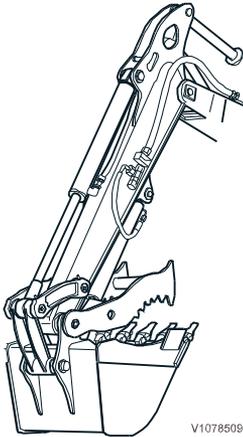
Release the pressure from the hydraulic system before opening any hydraulic connectors according to the procedure on page 106.

Thumb

Thumb attachment

Lubricate the thumb pivot pin every 50 hours or every 8 hours in aggressive, corrosive conditions (VOLVO Ultra Grease Moly EP2 or equivalent is recommended).

Check the hydraulic lines wear status every day.

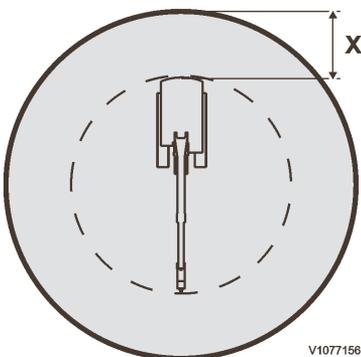


Safety

NOTE!

Do not operate the machine until you know the function and position of the instruments and operating controls. Carefully read through this Operator's Manual, your safety is involved!

- Prevent persons from staying in the risk zone (closer than 7 (23 ft) meters from the machine and its attachments).
- Wear protective equipment. If the machine has a canopy, a front protective guard must be used and operator must use safety glasses and a helmet.
- Never start the engine when the hydraulic couplings are disconnected.
- Never leave the machine with engine running and key inserted.
- Before shutting down the engine or leaving the machine, lower the bucket to the ground and open the thumb. It is dangerous to leave the thumb and bucket in the air with material inside.
- Before disconnecting or connecting hydraulic hoses the engine must be shut down. The ignition key must be switched to running position / ignition and the proportional rollers must be shifted right



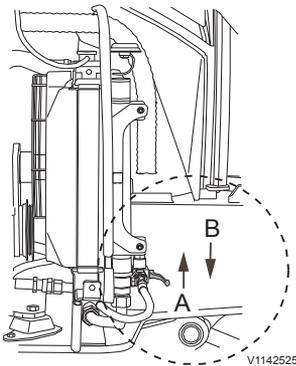
Prevent persons from staying in the risk zone.
X = 7 meters (23 ft)

and left. The control levers must be shifted to all directions to relieve trapped pressure.

- To prevent damage on the components and structure, a machine fitted with thumb must also be equipped with a pressure relief valve on the accessory circuit. Check with your Volvo Dealer that your machine is properly equipped.
- The thumb is only approved for use with Volvo designed or approved buckets and attachments. If the thumb is used with other buckets or attachments, it may not work properly.
- If the thumb is not used for some time, disconnect the hydraulic lines to prevent thumb cylinder drift.

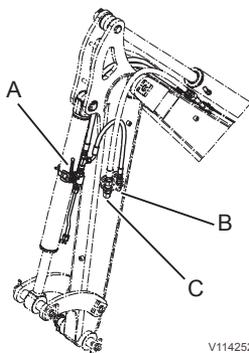
Connecting and disconnecting thumb

- 1 If the hammer / shear valve in the front of the cooling package is not in the correct position, turn it 90° clockwise to vertical position (A).



V1142525

Hammer / shear valve

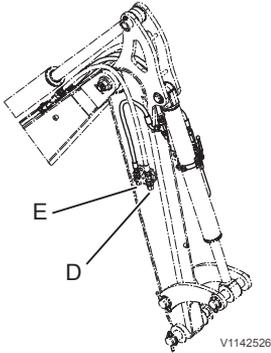


V1142527

Left side of the dipper arm

Operating techniques

116 Thumb



Right side of the dipper arm

- 2 Connect the hydraulic hoses to connection C and D.

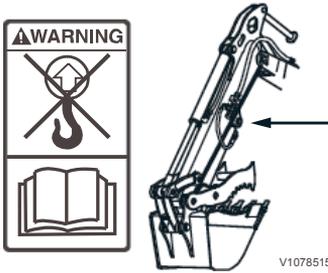
If another attachment is used, disconnect the hydraulic lines and put the quick couplings in their support (located on each side of the dipper arm).

NOTICE

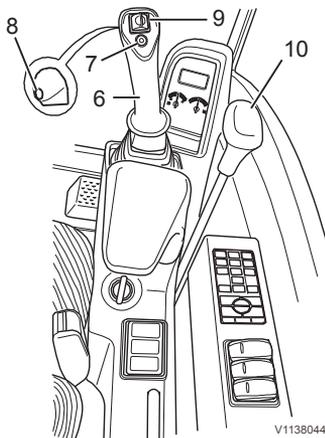
Protect the hydraulic connections against dirt, because only this will ensure the correct function of hydraulic connections and hydraulic system.

NOTE!

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



Control lamp for boom offset



Working with thumb

WARNING

Risk of crushing.
 A falling load could cause serious crushing. Lifting a load with the dipper arm's welded thumb plate could cause the plate to break and the load to fall.
Never use the welded thumb plate on the dipper arm as a lifting device.

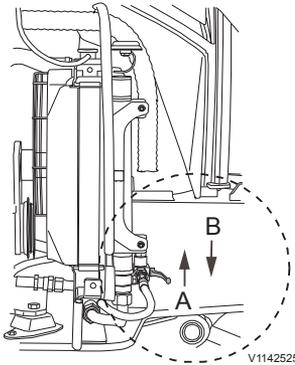
NOTE!

Refer to lifting capacities chart before using the thumb attachment.

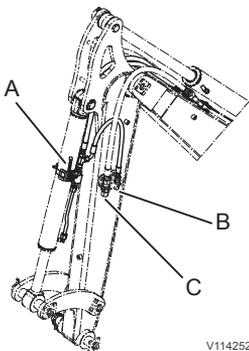
- 1 Push button (7) on right control lever (6). The control lamp for boom offset will go out and the proportional roller on the right lever is now activated for thumb operation.
- 2 Operate the thumb with the proportional roller (9) on the right lever.
 - Roller to the right: Open the thumb.
 - Roller to the left: Close the thumb.
- 3 To return to boom offset mode, push the button on the right lever again. The proportional roller is now activated for boom offset.

WARNING

Risk of crushing.
 Pressure interruption by mode shifting could cause the load to fall from the bucket.
Always lower the bucket to the ground before shifting from thumb mode to boom offset mode.



Turn the hammer / shear valve in the engine compartment 90° clockwise to vertical position (A).



Left side of the dipper arm

Clamshell bucket

Hydraulic equipment for clamshell

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

WARNING

Risk of high pressure injection.
The hydraulic oil is under high pressure.
Discharging hydraulic oil will cause serious injury when injected into the skin.

Depressurize the hydraulic system before connecting or disconnecting hydraulic hoses.

For the procedure to release the pressure from the hydraulic system see page 106.

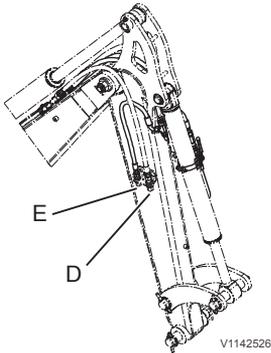
NOTICE

The safety regulations and operating instructions issued by the manufacturer must be strictly observed.

Connecting 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 Release the pressure from the hydraulic system.
- 4 If the hammer / shear valve in front of the cooling package (engine compartment) not is in the correct position, turn it 90° clockwise to the vertical position (A) to have the auxiliary line in the double acting position.
- 5 Connect two hoses to connection B and E (to open and close the clamshell).
- 6 Position C and D are used for the rotation function of the clamshell.
- 7 Fully retract bucket cylinder.
- 8 Close the valve (A) (pressure line) by turning it to the side in the horizontal position. When you

have done that you are able to use the connections B and E.



Right side of the dipper arm

NOTICE

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.

Disconnecting clamshell

- 1 Place the machine on firm and level ground.
- 2 Lower the boom and lay the clamshell flat on the ground.
- 3 Release the pressure from the hydraulic system.
- 4 Disconnect the hydraulic hoses of the clamshell from the hydraulic connections on the boom and close the hydraulic couplings with protective caps.
- 5 Turn the valve on the cylinder to unlock the bucket movement.

NOTE!

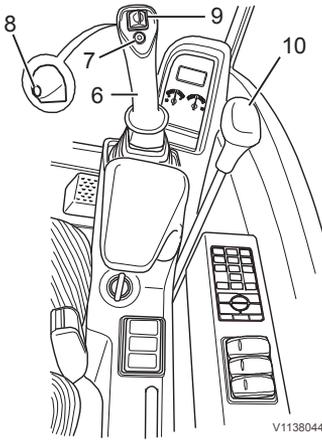
Lay the clamshell on a pallet. This enables easier transport of the clamshell after disassembly.

NOTE!

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

Operating techniques

120 Clamshell bucket



Clamshell operation

The clamshell is operated with proportional roller (9) on the right multi-function lever.

- With the proportional roller (9) the clamshell can be rotated in two directions.
- Control lever to the right: Empty the clamshell (opening).
- Control lever to the left: Fill the clamshell (closing).

Hose rupture valves

(optional equipment)

WARNING

Risk of crushing by falling attachments.
Hydraulic or mechanical failure could cause the attachments to fall, resulting in severe personal injury or death.

Ensure no persons can enter the danger zone until the failure is resolved.

If the machine is equipped with a hose rupture valves, it will reduce the falling speed of the boom 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.

NOTE!

Too low pressure in the accumulator may make it impossible to lower the attachment.

Blade float position

NOTE!

The blade float position has no function in combination with hose rupture valve on blade.



Tracks

When using rubber tracks

WARNING

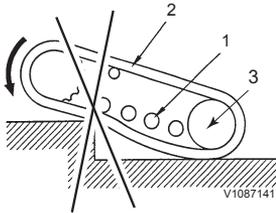
Risk of crushing.

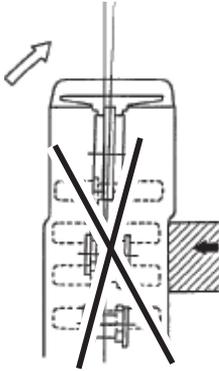
Moving tracks could cause serious crushing injury.

Always ensure that no persons are near the tracks while the machine is in motion.

Moving over obstacles

- When reversing over an obstacle, a gap is formed between the rollers (1) and track (2). There is a risk of the rubber tracks coming off.
- If the machine continues to reverse, a gap is formed between the rollers, idler (3) and the track. The track may then come off when turning in a condition where the track can not move to the side because of the obstacle it is passing over or because of some other object.



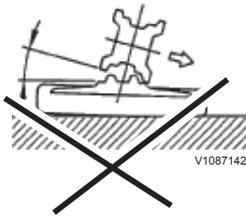
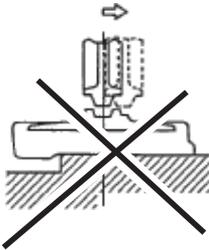


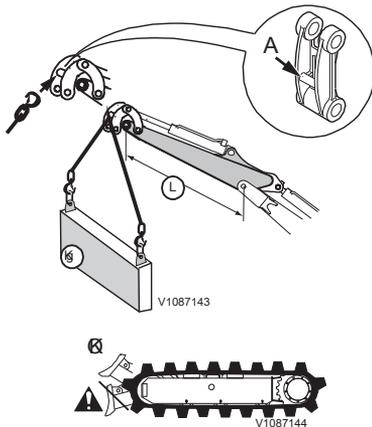
Misaligned tracks

The track may come off in the following conditions:
When the idler or track rollers are no longer aligned with the core because the track has moved out of alignment.

- If the machine is reversed in this condition, the track will come off.

If the machine is turned in this condition, the track will come off.





The blade must be in upper position during lifting operation if no hydraulic safety valve is installed. The hydraulic safety valve on the blade is an optional equipment, but mandatory in EU market if blade on floor is used.

Lifting objects

Always use appropriate lifting hook and read the table stating the lifting capacities for object handling operation. Within EU countries the transport of objects in lifting gear operation is prohibited if the machine is not equipped with a hydraulic safety valve on the boom (optional equipment). Various countries have their own regulations concerning the use of the machine for lifting work. For more detailed information you should contact your authorized Volvo dealer.

Only lift objects using the approved lifting point on the machine (A). Contact your Volvo dealer if any doubt.

WARNING

Risk of crushing.
Falling load could cause serious injury.
Do not stand under a suspended load. Use appropriate loading and lifting equipment.

NOTICE

Do not use damaged, broken or uncertified lifting devices.

WARNING

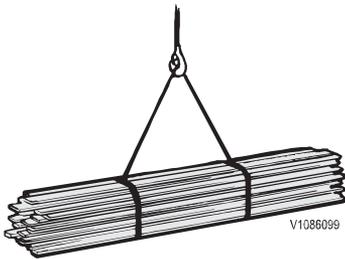
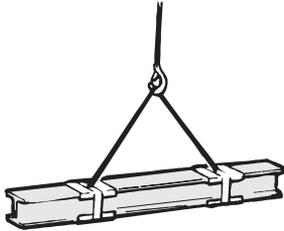
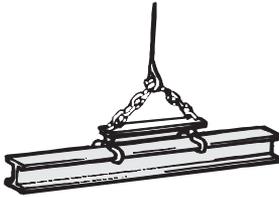
Risk of crushing.
Swinging objects could cause serious injury.
Always ensure no persons are in the danger zone before lifting or moving objects.

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

Read the below recommended steps before starting any lifting.

- Use qualified and properly trained operators who have:
 - Specific machine knowledge and training.
 - Read and understand the operator's manual and its load charts.

- Specific machine knowledge and training how to properly rig the load.
- Full responsibility for all aspects of the lift.
- Interrupt the lift if not fully confident of a safe lift.
- Select machine with sufficient capacity for the total expected load, reach and swing. Ideally, load should be less than the load listed on the load chart at maximum reach across the undercarriage.
 - Know the mass (weight) of the item to be lifted.
 - Know the start and finish positions, load lifting position and setting position.
 - Know the machine configuration, especially the dipper arm and boom lengths and track size.
 - Choose the correct lifting chart taking into account all attachments and rigging materials that will be used during the lift. The weight of the rigging materials and attachments, should be deducted from the load capacity.
- Warm up the machine to normal working temperatures.
- Position the machine on firm level ground.
- Properly set outriggers and blade when applicable.
- Once the load is properly rigged, ensure all ground workers are clear of the load and the machine. If guiding of the load is necessary, use ropes or other type of slings tied to the load to keep ground workers at a safe distance.
- Use a trained signalman to direct all aspects of the move.
- Do not use the swing or arm-in operation to drag a load.



Stability

The stability of working machines is highly changeable and exposed to great variations

In order to carry out the work safely, the operator must himself or herself think about and take into consideration the particular conditions that apply at a specific moment.

- Operate on solid, flat, level ground.
- Be ware of soft, uneven or sloping ground and of landslips, sideways loads and other similar risks. If the machine is standing on sloping ground, the centre of gravity is displaced and, when lifting, the machine may take up a position where it will be close to tipping over.

NOTICE

For safe engine lubrication the machine must not be tilted by more than the values specified in these operating instructions. In addition it may be unsuitable to operate at this inclination as the machine may become unstable and unbalanced, depending on the load.

- Make sure that the ground is firm and safe. Unstable ground, for example loose sand or soft earth, may make the work unsafe, if loads, close to the maximum values in the loading table, are taken.
- Do not make fast slewing movements with a suspended load. Bear the centrifugal force in mind.

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.
- Padding made from, for example, cut up compressed-air hoses, may be used in order to protect the slings.
- The slings should be well tightened.

Lifting capacities

Lifting capacities are 75% of the tipping load or 87% of the hydraulic limit.

NOTE!

If the overload warning lamp lights up, you have reached the maximum lifting limit. Immediately lower the equipment and unload some of the weight or move to a more safe position where the light does not illuminate.

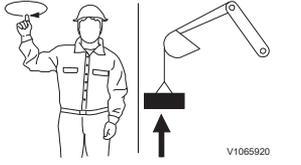
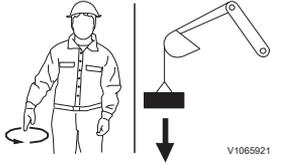
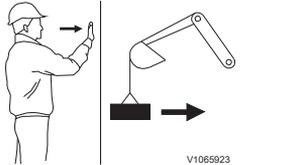
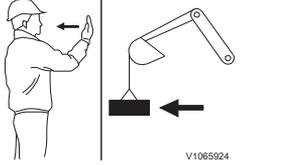
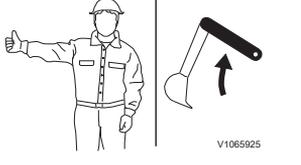
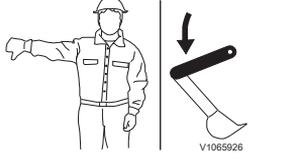
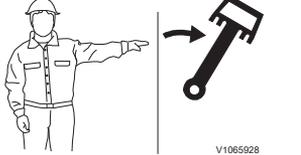
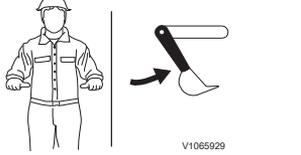
For lifting capacities specifications, see page 202.

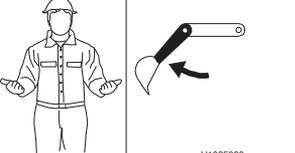
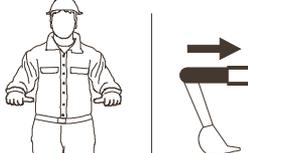
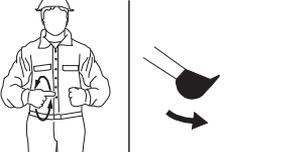
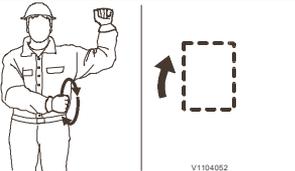
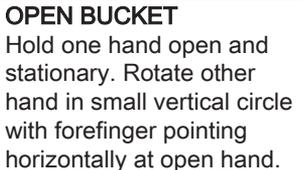
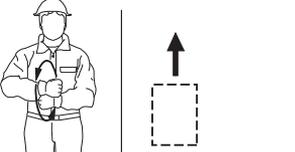
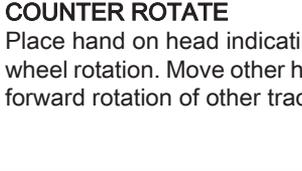
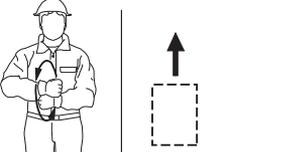
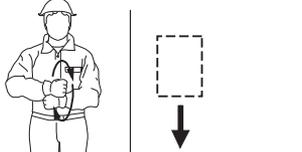
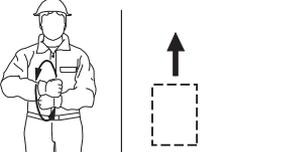
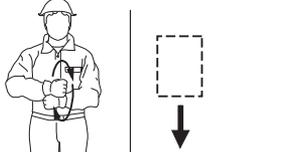
Signalling diagram

Manual signalling to an operator of a mobile excavator as per SAE J1307.

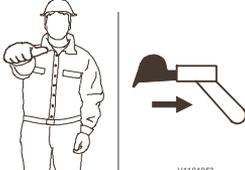
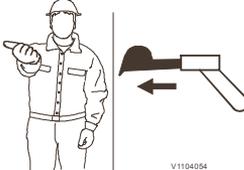
The primary use of hand signals is for a signalman to direct the lifting, handling, and placement of loads attached to working equipment. Hand signal usage may also be applicable to earth moving operations and/or machine travel when the operator's visibility is obstructed.

If a rapid lifting, lowering or moving movement is required, the dipper arm movements should be carried out more lively. If two different machines are used for lifting the same load, there should be an agreement beforehand how the lift should be carried out and what signals should be given to the respective operators.

 <p>V1065920</p>	 <p>V1065921</p>	 <p>V1065923</p>
<p>RAISE LOAD VERTICALLY With either forearm vertical, forefinger pointing up, move hand in small horizontal circles.</p>	<p>LOWER LOAD VERTICALLY With either arm extended downward, forefinger pointing down, move hand in small horizontal circles.</p>	<p>MOVE LOAD IN HORIZONTALLY With either arm extended, hand raised and open toward direction of movement, move hand in direction of required movement.</p>
 <p>V1065924</p>	 <p>V1065925</p>	 <p>V1065926</p>
<p>MOVE LOAD OUT HORIZONTALLY With either arm extended, hand raised and open toward direction of movement, move hand in direction of required movement.</p>	<p>RAISE BOOM With either arm extended horizontally, fingers closed, point thumb upward.</p>	<p>LOWER BOOM With either arm extended horizontally, fingers closed, point thumb downward.</p>
 <p>V1065927</p>	 <p>V1065928</p>	 <p>V1065929</p>

<p>SLEW With either arm extended horizontally, point with forefinger to direction of slew rotation.</p>	<p>DIPPER ARM INWARD With both hands clenched, point thumbs inward.</p>
 <p>V1065930</p>	 <p>V1104049</p>
<p>DIPPER ARM OUTWARD With both hands clenched, point thumbs outward.</p>	<p>RETRACT TELESCOPIC BOOM With both hands clenched, point thumbs inward.</p>
 <p>V1065931</p>	 <p>V1065932</p>
<p>CLOSE BUCKET Hold one hand closed and stationary. Rotate other hand in small vertical circle with forefinger pointing horizontally at closed hand.</p>	<p>EXTEND TELESCOPIC BOOM With both hands clenched, point thumbs outward.</p>
 <p>V1104052</p>	 <p>V1104051</p>
<p>TURN Hold one hand open and stationary. Rotate other hand in small vertical circle with forefinger pointing horizontally at open hand.</p>	<p>TURN Raise forearm with closed fist indicating inside of turn. Move other fist in vertical circle indicating direction of track or wheel rotation.</p>
 <p>V1065936</p>	 <p>V1065937</p>
<p>TURN Raise forearm with closed fist indicating inside of turn. Move other fist in vertical circle indicating direction of track or wheel rotation.</p>	<p>COUNTER ROTATE Place hand on head indicating side or reverse track or wheel rotation. Move other hand in vertical circle indicating forward rotation of other track or wheel.</p>
 <p>V1065939</p>	 <p>V1065940</p>
 <p>V1065935</p>	 <p>V1065935</p>

Operating techniques
130 Signalling diagram

<p>TRAVEL Raise forearm with closed fist indicating inside of turn. Move other fist in vertical circle indicating direction of track or wheel rotation.</p>	<p>THIS FAR TO GO With hands raised and open inward, move hands laterally, indicating distance to go.</p>	
		
<p>MOVE SLOWLY Place one hand motionless in front of hand giving motion signal. Raise load slowly is shown.</p>	<p>STOP With either arm extended laterally, hand open downward, move arm back and forth.</p>	<p>EMERGENCY STOP With both arms extended laterally, hands open downward, wave arms back and forth.</p>
		
<p>STOP ENGINE Draw thumb or forefinger across throat.</p>	<p>RETRACT TELESCOPIC DIPPER ARM With either arm outstretched horizontally in front of body, close fingers and point thumb in direction of required movement.</p>	<p>EXTEND TELESCOPIC DIPPER ARM With either arm outstretched horizontally in front of body, close fingers and point thumb in direction of required movement.</p>

Safety when servicing

This section deals with the safety rules which should be followed when checking and servicing the machine. It also describes the risks when working with unhealthy material and ways to avoid personal injuries.

Further safety rules and warnings texts are given within the respective sections.

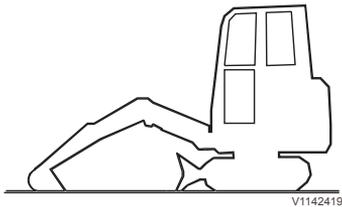
WARNING

Risk of burns!

Hot machine parts could cause burns.

Allow hot machine parts to cool before performing adjustments or service. Wear personal protective equipment.





Service position

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:

- Park the machine on level ground.
- Lower the working attachments and the dozer blade to the ground.
- Release the pressure in the hydraulic system according to procedure on page 106.

WARNING

Risk of burns!

Hot machine parts could cause burns.

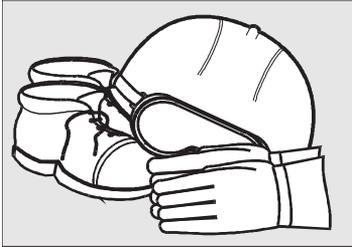
Allow hot machine parts to cool before performing adjustments or service. Wear personal protective equipment.

- Pull the ignition key off and pull down the control lockout lever in order to eliminate the risk of unintended starting of the engine.
- Turn the battery disconnect switch off when servicing 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.

Before service, read

Preventing personal injury

- Read the Operator's Manual before the service work is started. It is also important to read and follow information and instructions on plates and decals.
- Do not wear loose-fitting clothing or jewellery, which can get caught and cause injury.
- Always wear a hard hat, protective goggles, gloves, protective shoes and other protective articles when the work so requires.
- Make sure that the ventilation is sufficient when starting the engine indoors.
- Do not stand in front of or behind the machine when the engine is running.
- If service work has to be carried out under raised lifting arms, these must first be secured. (Engage the control lever lockout and apply the parking brake if the machine is equipped with one).
- Turn off the engine before opening the rear door and engine cover.
- When the engine is stopped, there is a remaining accumulated pressure in the pressurized systems. If a system is opened without having first released the pressure, liquid under high pressure will jet out.
- When checking for leaks, use paper or hardboard, not your hand.
- Make sure that stepping surfaces, handholds and anti-slip surfaces are free from oil, diesel fuel, dirt and ice. Never step on parts of the machine that are not intended for this.
- It is important to use correct tools and equipment. Broken tools or equipment should be repaired or changed.



V1065951

Preventing machine damage

- When lifting or supporting the machine or parts of the machine, use equipment with a sufficient lifting capacity.
- Lifting devices, tools, working methods, lubricants and parts prescribed in the Operator's Manual should be used. Volvo Construction Equipment will not accept any responsibility otherwise.
- Make sure that no tools or other objects, which may cause damage, have been forgotten in or on the machine.

134 **Safety when servicing**
Before service, read

- Release the pressure in the hydraulic system before starting the service work.

- Never set a relief valve to a higher pressure than that recommended by the manufacturer.
- Machines, which are used within a polluted or in another way insanitary area should be equipped for this kind of work. Special safety regulations apply when servicing such a machine.
- When installing two-way radio, mobile telephone or similar equipment, the installation should be carried out in accordance with the manufacturer's instructions in order to eliminate interference with the electronic system and components intended for the function of the machine, see page 19.
- Measures to be taken in connection with electric welding, see page 163.
- Make sure that all covers on the machine are in position before the engine is started and the machine is put to work.

Preventing environmental influence

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.

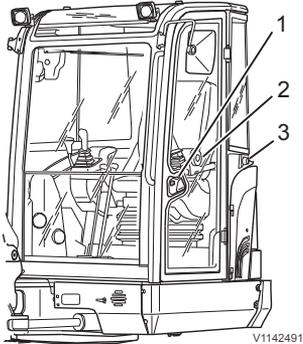
NOTE!

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, for example 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.

Entering, leaving and climbing the machine

Access to cab



- The cab door is fitted with an external door handle with a lock (1) and an internal door handle.
- 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 the cab door can be unlocked and closed.
- Always use the three-point approach to access the cab by using two hands and one foot or one hand and both feet. Use stepping surfaces and handholds. Always face the machine when entering the cab.

Leaving cab

- Stop engine and remove key before leaving the cab to prevent unauthorised use of machine.
- Make sure that the cab is parallel to tracks, that allows best possible leaving situation.
- Use the three-point approach to leave the cab by using two hands and one foot or one hand and both feet. Use stepping surfaces and handholds. Always face the machine when leaving the cab. Do not jump off!

Emergency exit path

The emergency exit path is the side window (it's location marked with an information decal). In case of a turnover or accident, open the side window to leave the machine.



Fire prevention

Using the machine in environments with high risk of fire or explosion requires special training and equipment.

There is always a risk of fire. Find out what kind of fire extinguisher is used on your working site and how to use it. If the machine is equipped with a fire extinguisher, it should be kept inside the cab.

If the machine is to be provided with a hand-held fire extinguisher, it should be of the ABE type (ABC in North America). The designation ABE means that it is possible to extinguish fires in both solid organic material and liquids, and that the fire extinguishing compound does not conduct electricity. Efficiency class I means that the effective operating time of the extinguisher must not be less than 8 seconds, class II at least 11 seconds and grade III at least 15 seconds.

A hand-held fire extinguisher ABE I normally corresponds to a powder content of 4 kg (8.8 lb) (EN-grade 13A89BC), standard EN 3-1995, parts 1, 2, 4 and 5.

Fire prevention measures

- Do not smoke or have an open flame near a machine when filling with fuel or when the fuel system is opened and in contact with the surrounding air.
- Diesel fuel is flammable and must not be used for cleaning. Use conventional car care products meant for cleaning or removing grease. Also bear in mind that certain solvents can cause skin rashes, damage to the paint finish and constitute fire hazard.
- Keep the place clean where the service is to be carried out. Oil and water can make the floor slippery and is also dangerous in connection with electrical equipment or electrically powered tools. Oily and greasy clothes are a serious fire hazard.
- Check daily that the machine and the equipment, for example underbelly plates are free from dust

138 Safety when servicing Fire prevention

and oil. Besides reducing the risk of fire, it is also easier to detect faulty or loose components.

NOTE!

Take great care if a high-pressure wash is used for cleaning. Electrical components and electrical leads can be damaged even at a moderately high pressure and temperature. Protect electrical leads in an appropriate way.

- Take extra care when cleaning a machine working in a fire-sensitive environment, for example saw-mill and refuse dumps. The risk of spontaneous combustion can be further reduced by installing insulation of the silencer guard.
- It is important that the fire extinguisher is maintained in order to work when it is needed.

- Check that fuel lines, hydraulic and brake hoses and electrical cables have not been damaged by chafing or are not in danger of being damaged in that way because of incorrect installation or clamping. This applies particularly to unfused cables, which are red and marked R (B+) and routed:
 - between the batteries
 - between battery and starter motor
 - between alternator and starter motorElectrical cables must not lie directly against oil or fuel lines.
- Do not weld or grind on components which are filled with flammable liquids, for example tanks and hydraulic pipes. Exercise care with such work also in the proximity of such places. A fire extinguisher should be kept near to hand.

Actions in case of fire

If the circumstances permit and your own safety is not jeopardised, take the following steps at the slightest sign of fire:

- 1 Stop the machine, if the machine is in motion.
- 2 Lower attachments to the ground.
- 3 Move the control lockout lever to locked position, if so equipped.
- 4 Turn the ignition key to stop position.
- 5 Exit the cab.
- 6 Call the fire brigade.
- 7 If possible to access safely, turn off the battery disconnect switch.
- 8 Attempt to put out the fire, if possible. Otherwise, move away from the machine and out of the danger zone.

Actions after fire

When handling a machine which has been damaged by fire or been exposed to intense heat, the following protective measures must be followed:

- Use thick, protective gloves made of rubber and wear goggles.
- Never touch burnt components with your bare hands in order to avoid contact with melted polymer materials. First wash thoroughly with plenty of lime water (a solution consisting of calcium hydroxide, that is slaked lime in water).
- Handling heated fluoro-carbon rubber, see page 140.

Handling hazardous materials

Heated paint



Risk of toxin inhalation.

Burning of painted, plastic or rubber parts produces gases that could damage respiratory tracts.

Never burn painted or rubber parts or any plastics.

Heated paint gives off poisonous gases. Therefore, paint must be removed from an area with a radius of at least 10 cm (4 in) before carrying out welding, grinding or gas cutting. In addition to the health hazard, the weld will be of inferior quality and strength, which, in the future, may cause the weld to break.

Methods and precautionary measures when removing paint

- Blasting
 - use respiratory protective equipment and protective goggles
- Paint remover or other chemicals
 - use a portable air extractor, respiratory protective equipment and protective gloves
- Grinding machine
 - use a portable air extractor, respiratory protective equipment and protective gloves and goggles

Never burn painted parts after they have been discarded. They should be disposed of by a licensed disposal plant.

Heated rubber and plastics

Polymer materials can, when heated, form compounds which are dangerous to health and environment and must therefore never be burned when scrapped.

If gas cutting or welding is to be carried out near such materials, the following safety instructions must be followed:

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

Heated fluoro-carbon rubber

WARNING

Risk of serious injury.

At very high temperatures fluoro-carbon rubber forms substances which are very corrosive to skin and lungs.

Always wear personal protective equipment.

When handling a machine which has been damaged by fire or been exposed to intense heat, the following measures should be taken:

- Use thick, rubber gloves and wear protective goggles.
- Discard gloves, rags and other items that have been in contact with heated fluoro-carbon rubber after first having washed these items in lime water (a solution of calcium hydroxide, that is slaked lime in water).
- The area around a part which has been very hot and which may be made of fluoro-carbon rubber should be decontaminated by thorough and ample washing with lime water.
- As a precaution, all seals (O-rings and other oil seals) should be handled as if they were made of fluoro-carbon rubber.
- The hydrofluoric acid may remain on the machine parts for several years after a fire.
- If swelling, redness or a stinging feeling appears and one suspects that the cause may be contact with heated fluoro-carbon rubber, contact a medical doctor immediately. Several hours may pass, however, before any symptoms appear and there is no immediate warning.
- The acid cannot be rinsed or washed off from the skin. Treat instead with Hydrofluoric Acid Burn Jelly or similar before contacting a medical doctor.

Batteries



Risk of chemical burns.

The battery electrolyte contains corrosive sulphuric acid which could cause severe chemical burns.

If electrolyte spilled on your bare skin, remove it immediately and wash the affected area with soap and plenty of water. If it gets into your eyes or any other sensitive body part, rinse with plenty of water and seek immediate medical attention.

- Do not smoke near batteries as these give off explosive gases.
- Make sure that metal objects, e.g. tools, rings and watch straps, do not come into contact with the battery pole studs.
- Make sure the protections are always installed over the battery pole studs.
- Do not tilt a battery in any direction. Battery electrolyte may leak out.
- Do not connect a discharged battery in series with a fully charged battery. Risk for explosion.
- Discarded batteries must be taken care of according to national environmental requirements.

Starting with booster batteries, see page *Starting with booster batteries*.

Charging batteries, see page 162.

Crystalline silica (quartz) dust

Crystalline silica is a basis component of sand and granite. Therefore, many activities at construction and mining sites, such as trenching, sawing and boring, produce crystalline silica dust. This dust can cause silicosis.

The employer or working site management should provide the operator with information about the presence of crystalline silica in the work site along with specific work instructions and precautions and also necessary personal protective equipment. Also check the local / national regulations regarding silica / silicosis.

Handling line, tubes and hoses

WARNING

Risk of high pressure injection.

Oil or fuel leaks from high pressure hoses could cause serious injury caused by high pressure injection.

If oil or fuel leaks from high pressure hoses or loose screws is found, stop operations immediately and contact an authorized Volvo dealer workshop.

- Do not bend high pressure lines.
- Do not strike high pressure lines.
- Do not install any lines that are bent or damaged.
- Check lines, tubes and hoses carefully.
- Do not reuse hose, tube and fittings.
- Do not use your bare hand to check for leaks.
- Tighten all connections. Consult your Volvo dealer for the recommended tightening torque.

If any of the following conditions are found, replace the parts. Consult your Volvo dealer.

- End fittings are damaged or leaking.
- Outer coverings are chafed or cut.
- Strengthening wires are exposed.
- Outer coverings are ballooning.
- Flexible part of the hoses are kinked.
- End fittings are displaced.
- Foreign material is embedded in the coverings.

NOTICE

Make sure that all clamps, guards and heat shields are correctly installed. This contributes to preventing vibrations, chafing against other parts and excessively strong generation of heat.

Service and maintenance

If the machine is to function satisfactorily and at lowest possible cost, it requires careful maintenance.



V1068256

Lubrication and service chart

The section "Lubrication and service chart" describes the maintenance work which the operator can carry out. If certain operations require trained workshop personnel and special equipment, this will be indicated. See page 174.

Service history

After each completed service at a workshop authorised by Volvo Construction Equipment, the service history should be filled in, see page 206. Service history is a valuable document, which can be referred to when for example selling the machine.



V1068257

Arrival and delivery inspection

Before the machine leaves the factory, it is tested and adjusted. The dealer must also, if the warranty is to apply, carry out "Arrival and delivery inspections" according to applicable form, which must be signed.

Delivery Instructions

When handing the machine over, the dealer must give the buyer "Delivery instructions" according to applicable form, which must be signed, if the warranty is to apply.

Service Programme

For any factory warranty to be valid, the machine shall be maintained according to the service program established by Volvo. The service program is continuous with fixed intervals. The operating time between intervals only applies if the machine is used in normal environment and operating conditions. Ask your Volvo dealer what is right for your specific machine.



Cleaning machine

The machine should be cleaned regularly with conventional car care products in order to eliminate the risk of damage to the paint finish and other surfaces on the machine.

NOTICE

Avoid using strong cleaning agents or chemicals in order to minimise the risk of damage to the paint finish.

NOTICE

Soil and clay may damage or cause wear to moving parts of the undercarriage. Therefore, all parts must be cleaned regularly from of soil and clay.

CAUTION

Risk of fire!

Waste between the machine components could be caused a fire.

To avoid fire hazards, remove all wastes daily.

Daily clean the areas on the machine where dust, chips and similar may collect in order to minimise the risk of fire, see page 137.

- Place the machine in a place intended for cleaning.
- Follow the instructions supplied with the car care product.
- The water temperature must not exceed 80 °C (176 °F).
- If high-pressure wash is used, keep a distance of at least 40 cm (16 in) between nozzle and machine surface. Nozzle pressure must not exceed 60 bar and jet time is less than 5 sec. Too high push and too short distance may cause damage. Protect electrical leads in an appropriate way.

NOTICE

Do not spray with high pressure into the sealing of the slewing ring, the water may penetrate and affect the characteristics of the grease.

- Use a soft sponge.

- Finish by rinsing the whole machine with only water.
- Always lubricate the machine after washing.
- Touch-up the paint finish when required.

Paint finish maintenance

Machines which are used in corrosive environment suffer more from rust than others. As a preventive measure it is recommended that the paint finish should be maintained every sixth months.

- At first clean the machine.
- Apply a transparent waxy anti-rust agent.
- A protective layer of underseal may be applied under the mudguards where mechanical wear is expected.

Touch-up painting

- Check if there are any damaged areas of the paint finish.
- At first clean the machine.
- Rectify any damage to paint finish in a professional way.

Cleaning engine compartment

WARNING

Risk of serious injury.

Moving parts could cause serious cutting or crushing injury.

Stop the engine before opening the engine hood and performing any work.

WARNING

Risk of burns.

Engine and exhaust system components get very hot and can cause severe burns.

Avoid contact with engine compartment covers, engine components and exhaust system until the engine is cooled down.

Machines operating in dusty environment or environment exposed to fire hazards for example, wood-processing, woodchip handling or grain handling and animal feed industries require daily attention and cleaning of the engine compartment and surrounding areas.

When operating in other environments, inspection and cleaning is required at least once a week.

Loose material is removed with for example compressed air.

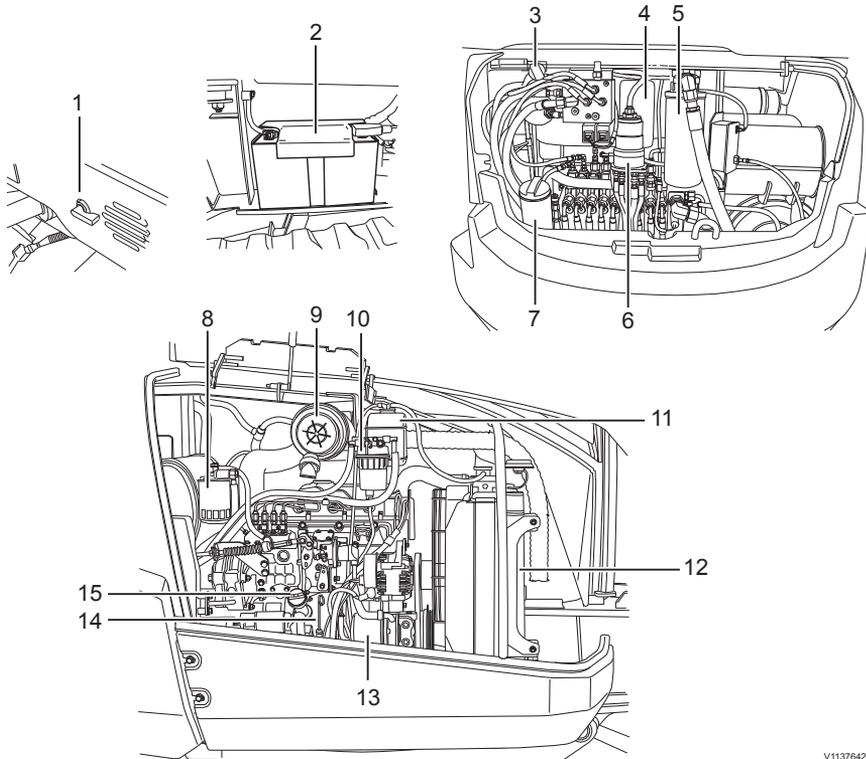
Cleaning should preferably be carried out at the end of the working shift before the machine is parked.

Use personal protective equipment such as protective goggles, gloves and respirator.

After cleaning, check and rectify any leaks. Close all covers and hoods.

Service points

Service points



V1137642

1	Battery disconnect switch
2	Battery
3	Hydraulic tank breather
4	Hydraulic oil tank
5	Hydraulic oil filter
6	Hydraulic oil level sight glass, filling and drain filter
7	Fuel filler neck
8	Fuel filter
9	Air filter
10	Water separator
11	Expansion tank
12	Radiator Hydraulic oil cooler
13	Engine oil filter

Service and maintenance
150 Service points

14	Engine oil dipstick
15	Engine oil filler neck

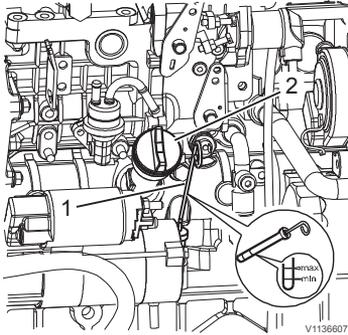
Engine

Engine oil level, checking

Check the engine oil level every 10 hours.

NOTE!

Check the engine oil level when the engine is cold.



- 1 Park the machine on level ground and place it in service position, see page 132.
- 2 Turn the battery disconnect switch off.
- 3 Open the engine hood.
- 4 Pull out the dipstick (1) and wipe it clean with a lint-free cloth, reinsert it until it bottoms and pull it back out.
- 5 The oil level should reach the upper mark (MAX).
- 6 If the oil level is near or even below the bottom mark (MIN), top up oil immediately through the engine oil filler neck (2) to avoid severe engine damage (for quality of oil refer to the table of fuels and lubricants, page 179).

Fuel system

Clean fuel is essential for trouble-free of the diesel engine.

For fuel quality, see page 184.

Fuel tank

Any repair or modification of the fuel tank must be done by persons authorized by Volvo, contact your Volvo Construction Equipment dealer.

Fuel level, checking



Risk of explosion!

Flammable liquids could explode.

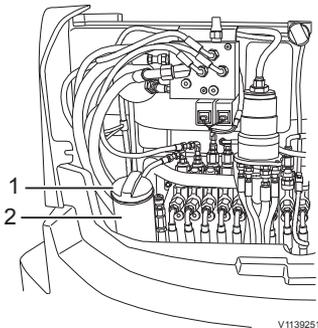
Smoking, open flame and fire are prohibited.

Check the fuel level on the instrument panel while the engine is running.

NOTE!

The fuel tank should be filled 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 tank on the left hand side of the frame) by a service technician.

Check the fuel tank capacity on page 186.



Fuel, filling

- 1 Park the machine on level ground and place it in service position, see page 132.
- 2 Turn the battery disconnect switch off.
- 3 Open the rear hood.
- 4 Open the fuel tank filler cap (1)
- 5 Fill through the fuel filler neck (2).
- 6 Reinstall the fuel tank filler cap (1) and close the rear hood.

Fuel system, bleeding

The machine has a selfbleeding system.

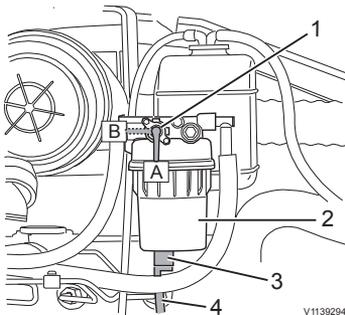
Water separator, draining

WARNING

Risk of explosion!

Flammable liquids could explode.

Smoking, open flame and fire are prohibited.



- 1 Park the machine on level ground and place it in service position, see page 132.
- 2 Turn the battery disconnect switch off.
- 3 Open the engine hood.
- 4 Check the sight glass (2) of the water separator for water and dirt accumulations. A ring indicates the maximum condensation water level in the water separator.
- 5 Place a suitable container underneath the drain hose (4) of the water separator.
- 6 Close the fuel valve (1) by turning it clockwise to position B.
- 7 Turn and loosen the drain cock (3) on the underside of the water separator with your hand.
- 8 Drain the accumulated water through the drain hose (4) into the container.

NOTE!

Carry out the work in an environmentally safe manner.

- 9 Tighten the drain cock (3) again.
- 10 Open the fuel valve (1) by turning it counterclockwise to position A.



Engine air cleaner

Air filter



If control lamp for air filter in the instrument panel lights up the filter is clogged and must be cleaned immediately and replaced if necessary. Contact your Volvo Construction Equipment dealer.

Check the air lines (filter - engine) for leaks during every maintenance. Defective parts must be replaced and loose hose clamps must be tightened.

NOTICE

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.

Primary air filter, cleaning and replacing

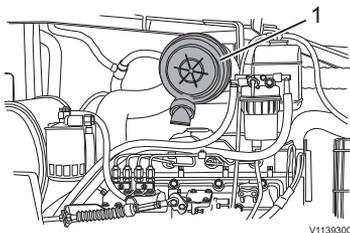
Primary air filter, cleaning

NOTE!

Avoid damaging or denting of the front face of the filter.

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

Clean the primary filter as needed.



- 1 Park the machine on level ground and place it in service position, see page 132.
- 2 Turn the battery disconnect switch off.
- 3 Open the engine hood.
- 4 Open the locking hooks for the housing lid (1) and remove filter from the housing.
- 5 Bang the filter several times with the front face vertically against the palm of your hand or against a flat and soft surface.
- 6 Blow the filter out with dry compressed air (pressure not higher than 5 bar (75.5 psi)) from inside under an oblique angle, until the out flowing air is free of dust.

- 7 Then inspect the filter with a lamp from inside to outside for possible cracks.

NOTE!

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

Primary air filter, replacing

The primary filter must be replaced once a year or earlier if clogging signal goes on. Contact your Volvo Construction Equipment dealer.

**Secondary air filter, replacing
(optional equipment)**

The secondary filter must be replaced when the primary air filter was replaced three times or every second year. Contact your Volvo Construction Equipment dealer.

NOTE!

The secondary filter must not be cleaned. The engine must not be operated just with the secondary filter installed.



Cooling system

Coolant

The coolant contents (%) must be checked every 2000 hours and the coolant needs to be changed every 6000 hours. This work must be done by a service technician.

NOTICE

If the warning of high coolant temperature is shown on the display unit, the engine must be stopped immediately.



The cooling system is filled with Volvo Coolant VCS, which fulfils the highest requirements regarding freeze-, corrosion-, and cavitation protection. To avoid damage to the engine, it is very important that Volvo Coolant VCS is used when filling or changing the coolant.

Volvo Coolant VCS is yellow and a decal by the filling point shows that the system is filled with this coolant (see picture).

NOTICE

Volvo Coolant VCS must never be mixed with any other coolant or corrosion protection to avoid damage to the engine.

The cooling system capacity when changing, see page 186.

If concentrated Volvo Coolant VCS and clean water (see page 182) is used, the table below shows the approximate amount of concentrated coolant needed for freezing protection. The content of Volvo Coolant VCS must never be less than 40% of the total mixture.

If in doubt of the water's quality, use the ready-mixed Volvo Coolant VCS, which contains 40% concentrated coolant.

NOTICE

In order to avoid damage to engine and cooling system, different brands of coolant or corrosion protection must not be mixed.

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

Coolant level, checking

Check the coolant level every 10 hours.

! WARNING

Risk of scalding and severe burns to unprotected skin.

High pressurized hot coolant may rush out of expansion tank and cause severe burns. Before removing the expansion tank pressure cap:

- Shut down the engine.
- Allow the engine to cool
- Turn the pressure cap slowly to release any pressure.

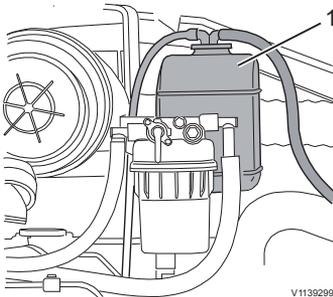
The coolant expansion tank is located under the engine hood on the right hand side of the machine.

Once the cooling system has cooled down the coolant level must be between the FULL (MAX) and LOW (MIN) marks in the coolant expansion tank (1).

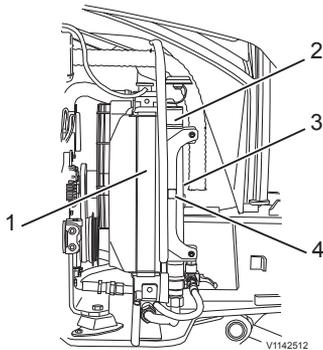
If the coolant level is near the LOW (MIN), top up with coolant, see page 158.

Radiator and coolers, cleaning

Clean the radiator, hydraulic oil cooler and the AC unit evaporator (optional equipment) every 500 hours or earlier if needed.



V1139299



Cooling package

WARNING

Risk of burns!

Hot machine parts could cause burns.

Allow hot machine parts to cool before performing adjustments or service. Wear personal protective equipment.

- 1 Park the machine on level ground and place it in service position, see page 132.
- 2 Turn off the battery disconnect switch.
- 3 Open the engine hood.
- 4 Check the cooler fins of the radiator (1), hydraulic oil cooler (2) and AC unit evaporator (3) (optional equipment) for damage and dirt accumulations.
Damaged parts in the cooling package must be replaced immediately, contact your Volvo Construction equipment dealer.
- 5 Clean the cooler fins with compressed air by blowing the dirt outwards from the side.

NOTE!

To facilitate the cooler fin cleaning, the hydraulic oil cooler (2) and the AC unit evaporator (3) (optional equipment) can be removed.

- 6 Loosen and remove the hydraulic oil cooler fixation screw (4).
- 7 Carefully move the hydraulic oil cooler including the AC unit evaporator to the side.
- 8 Use compressed air to clean the radiator cooler fins from the inside outwards.
- 9 Use compressed air to clean the cooler fins of the hydraulic oil cooler and the AC unit evaporator (optional equipment) from the inside outwards.
- 10 Position the hydraulic oil cooler including the AC unit evaporator (optional equipment).
- 11 Reinstall the fixation screw (4).

Coolant, topping up

WARNING

Risk of scalding and severe burns to unprotected skin.

High pressurized hot coolant may rush out of expansion tank and cause severe burns. Before removing the expansion tank pressure cap:

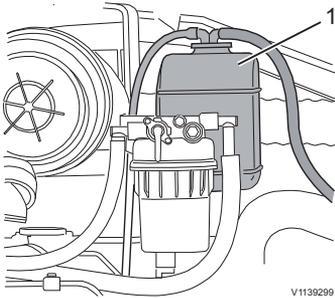
- Shut down the engine.
- Allow the engine to cool
- Turn the pressure cap slowly to release any pressure.

NOTICE

In order to avoid damage to engine and cooling system, different brands of coolant or corrosion protection must not be mixed.

- 1 Shut down the engine.
- 2 Open the engine hood.
- 3 Slowly remove the cap from the expansion tank (1) and relieve the pressure in the cooling system.
- 4 Top up coolant.
- 5 Reinstall the cap on the expansion tank.

If the warning of high coolant temperature is shown on the display unit stop the engine immediately. Check the coolant level and top up as explained if necessary.



Electrical system

Check the function of all electrical components such as lights, instruments, warning lamps, wiper, washer, horn, travel alarm, heater and other optional equipment daily.

In case of a blown fuse it must be replaced with a fuse of the correct ampere rating, see page 188.

Safety regulations

WARNING

Risk of chemical burns.

The battery electrolyte contains corrosive sulphuric acid which could cause severe chemical burns.

If electrolyte spilled on your bare skin, remove it immediately and wash the affected area with soap and plenty of water. If it gets into your eyes or any other sensitive body part, rinse with plenty of water and seek immediate medical attention.

WARNING

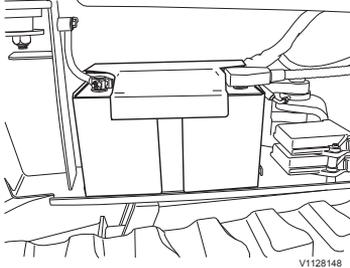
Risk of fire and explosion.

Battery gas contains hydrogen and is flammable and could explode.

Do not open a battery close to sources of fire such as open flames, cigarettes or sparks.

- Do not smoke near batteries as these give off flammable and explosive gases.
- Make sure that metal objects, for example tools, rings and watch straps, do not come into contact with the battery pole studs.
- Make sure the protections are always installed over the battery pole studs.
- Do not tilt a battery in any direction. Battery electrolyte may leak out.
- Do not connect a discharged battery in series with a fully charged battery. Risk for explosion.
- When removing a battery, disconnect the ground cable first and when installing, connect the ground cable last in order to reduce the risk of sparks.
- Discarded batteries must be taken care of according to national environmental requirements.
- Charging batteries, see page 162.

- Starting with booster batteries, see page *Starting with booster batteries*.



The battery is located on the left side of the machine.

Battery

WARNING

Risk of fire and explosion.
Battery gas contains hydrogen and is flammable and could explode.

Do not open a battery close to sources of fire such as open flames, cigarettes or sparks.

WARNING

Risk of chemical burns.
The battery electrolyte contains corrosive sulphuric acid which could cause severe chemical burns.
If electrolyte spilled on your bare skin, remove it immediately and wash the affected area with soap and plenty of water. If it gets into your eyes or any other sensitive body part, rinse with plenty of water and seek immediate medical attention.

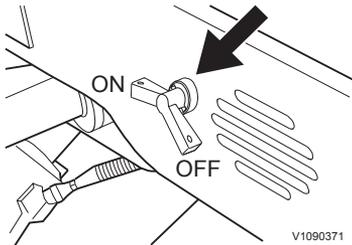
The battery is located on the left side of the cab. To get access to the battery; remove the left body by unscrewing the four screws (not thoroughly, then it will be easier to install).

The battery is maintenance free. For longer storage periods disconnect the battery.

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.

NOTE!

Dispose old batteries environmentally.



The battery disconnect switch is located in the front of the machine.

Battery disconnect switch

The battery disconnect switch must always be switched off for longer resting periods and for all repair and maintenance work on the machine.

Battery, charging

WARNING

Risk of serious injury.
Short-circuit, open flames or sparks near a charging battery could lead to an explosion.

Switch off charge current before disconnecting charging cable clamps. Never charge a battery near open flames or sparks. Always charge a battery in well-ventilated areas.

WARNING

Risk of chemical burns.
Contact with battery acid causes serious chemical burns.

Always wear personal protective gloves, goggles and clothing when handling batteries.

WARNING

Risk of chemical burns.
The battery electrolyte contains corrosive sulphuric acid which could cause severe chemical burns.
If electrolyte spilled on your bare skin, remove it immediately and wash the affected area with soap and plenty of water. If it gets into your eyes or any other sensitive body part, rinse with plenty of water and seek immediate medical attention.

Alternator

- The alternator is sensitive to incorrect connections. 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 alternator.

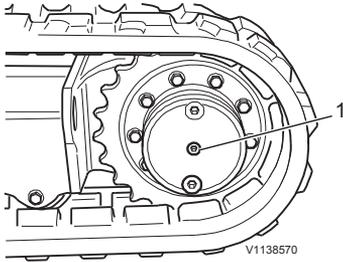
- Make sure that cable lugs and poles are clean, well tightened and greased with Vaseline or similar.

Electrical welding

NOTE!

Welding on the machine is not allowed. If welding on the machine is needed it has to be approved by Volvo Construction Equipment. Otherwise all additional welding is under customer responsibilities. Any unauthorized welding could lead to a loss of warranty.





Travel gearbox

Travel gearbox oil level, checking

Check the travel gear oil level every 250 hours.

- 1 Park the machine on horizontal ground and place it in service position, see page 132.
- 2 Turn the battery disconnect switch off and make sure the machine cannot be started during maintenance step.
- 3 Before unscrewing the plugs thoroughly clean the respective areas.
- 4 Carefully slacken the level control plug (1), release pressure before unscrewing the plug.
- 5 The oil level must reach the overflow point of the control opening.
- 6 If the oil level is too low, top up oil immediately to avoid damage on the travel gearbox (for quality of oil refer to the table of fuels and lubricants, page 179). Fill in oil up to the overflow point through the level control opening.
- 7 Screw the level control plug (1) back in.
- 8 Check the oil level after a few minutes and, if necessary, top up until the specified oil level is reached and remains constant.

Take care of filters/oils/liquids in an environmentally safe way, see page 133.

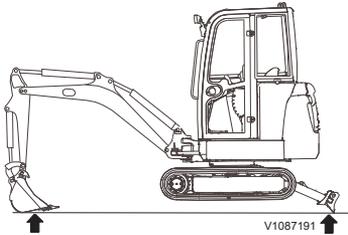
Track unit

Track unit, checking tension

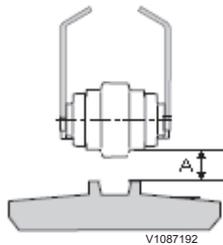
Check and adjust the track tension every 250 hours

NOTE!

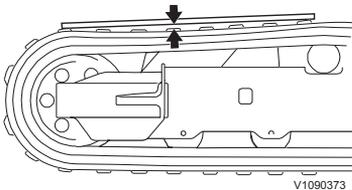
Incorrect tension reduces the lifetime of the tracks. A too low track tension increases the risk of detracking.



Machine position for track tension check



Rubber tracks: Correct tension if (A) is between 15 and 25 mm (0.59 and 0.98 in)

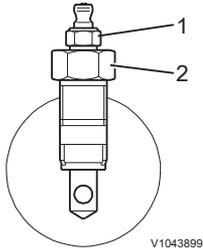


Steel tracks: Correct tension if distance between the arrows is between 15 and 25 mm (0.59 and 0.98 in)

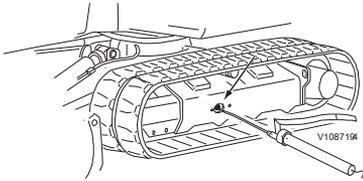
- 1 Park the machine on horizontal ground.
- 2 Lower the dozer blade in the back to the ground until the tracks are slightly raised.
- 3 Lower the bucket to the ground, operate the boom until the machine is raised.
- 4 Run the tracks several times in forward and reverse.
- 5 For rubber tracks, measure on both tracks sag (A) under the roller which is the closest to the center of the undercarriage, between the track pad and the track roller.
For steel tracks, measure on both tracks the upper sag.
- 6 For rubber tracks: The track is correctly tensioned if the distance (A) is between 15 to 25 mm (0.59 to 0.98 in).
For steel tracks: The track is correctly tensioned if the distance between the measurement tool and the track is between 15 to 25 mm (0.59 to 0.98 in).
- 7 To reduce track slack on both rubber and steel tracks, inject grease through the nipple (1) into the adjustment cylinder.

Service and maintenance

166 Track unit



- 1 Nipple
- 2 Valve assembly



Inject grease

NOTICE

Risk of environmental pollution!

The grease in the track adjustment cylinder is under high pressure and large quantities of grease will be quickly released if the valve is loosened too much. Never loosen the valve by more than two turns when draining the grease.

- 8 To enlarge the track slack on both rubber and steel tracks, loosen the valve assembly (2) through one turn so the grease can drain off. Tighten the valve unit when the track slack is correct.
- 9 Adjust the other track unit in the same way.
- 10 Run the track several times in forward and reverse and measure again if the track tension is correct after the adjustment.

NOTE!

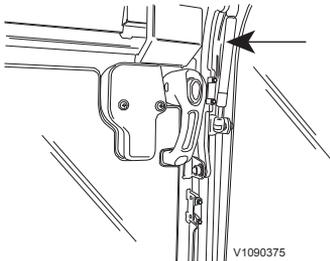
For quality of grease please refer to the table of fuels and lubricants on page 179.

Cab

Washer reservoir

The washer reservoir is located in the back of the cab on the right side cab post.

- 1 Open the cap (1) of the washer reservoir filling device.
- 2 Fill up the washer reservoir with washing fluid.
- 3 Close the cap (1) of the washer reservoir filling device.



Front windscreen rails

The front windscreen rails must be kept lubricated.

Start at one end of the rail and lubricate with grease all the way to the other end.



Air conditioning

The air conditioning (optional equipment) should be checked and the cabin filter should be changed every 1000 hours. This work must only be done by authorised personnel in the dealer workshop

Safety when handling refrigerant, see page 140.

Bucket teeth

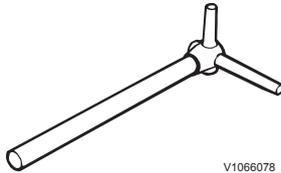
Bucket teeth, replacing

WARNING

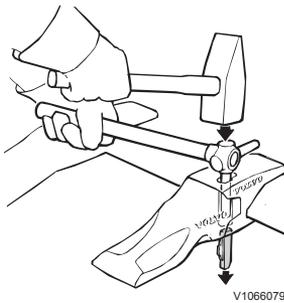
Risk of splinter injury.
 When striking metal objects with a hammer, flying metal chips could cause serious splinter injury to eyes and other body parts.

Always wear personal protective equipment and eye protection when replacing bucket teeth.

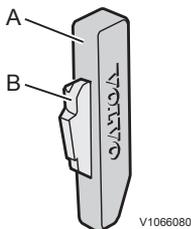
A special tool may be ordered to facilitate replacement of teeth. The tool are available in different sizes depending on tooth size. Contact your dealer for further information.



Special tool



Knock out the locking device



Locking device

- 1 Steel pin
- 2 Lock retainer

Removing tooth

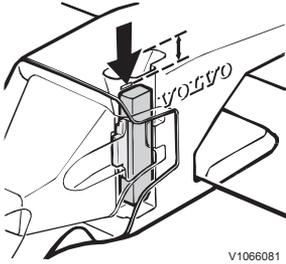
- 1 Lower the bucket to the ground and angle it slightly upward.
- 2 Clean the opening for tooth adapter locking device.
- 3 Knock out the locking device with a hammer and the tool or other suitable drift.
- 4 Remove tooth.

Installing tooth

- 1 Clean the front part of the tooth adapter and the hole for the locking device.
- 2 Install the tooth so that the guide lugs fit in the tooth adapter recesses.
- 3 Replace lock retainer (B) with a new part.
- 4 Install the locking device so that the chamfered part points downward and the lock retainer points forward.
- 5 Knock down the locking device with a hammer until it is level with the upper part of the tooth adapter.

Service and maintenance

170 Bucket teeth



The locking device should be just below the scored line

- 6 Knock down the locking device further with a hammer and the tool or other suitable drift until the upper part is just below the scored line in the hole.

NOTE!

Replace the steel pin in connection with replacement of tooth adapter.

Hydraulic system

Hydraulic oil level, checking

Check the hydraulic oil level every 10 hours.

When you check the oil, the temperature of the oil must be between 20 °C (68 °F) and 50 °C (122 °F) [± 5 °C (9 °F)].

- 1 Park the machine on horizontal ground.
- 2 Operate all cylinders to both directions while the engine is running.
- 3 Arrange the machine as shown on the decal:
 - dozer blade on the ground
 - equipment parallel to the axis of the machine
 - bucket cylinder out and dipper arm cylinder in
 - equipment lowered to the ground

4 Open the rear hood.

5 Check the hydraulic oil level in the sight glass.

- At 20 °C (cold machine), the hydraulic oil level must be above the minimum level and well below the maximum level (A).

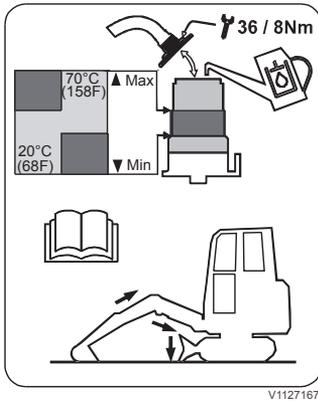
- At 50 °C (hot machine), the hydraulic oil level must be below the maximum level and well above the minimum level (B). If necessary, fill hydraulic oil through filler neck on the hydraulic oil level sight glass.

For quality of hydraulic oil please refer to the table of fuels and lubricants on page 183.

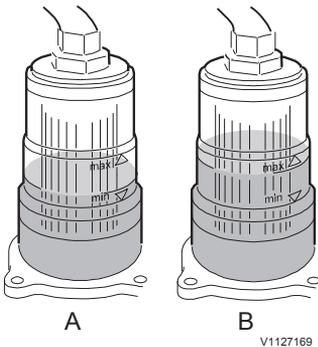
NOTE!

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.

Take care of filters/oils/liquids in an environmentally safe way, see page 133.



Decal on hydraulic oil tank



- A Correct hydraulic oil level (cold machine)
B Correct hydraulic oil level (hot machine)





Greasing

Bearings, greasing

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

Before greasing, place the machine on horizontal ground and extend the equipment in the front, so that all cylinder grease points are accessible.

The greasing of bearings has two main purposes:

- Add grease to the bearing to reduce friction between pin and bushing.
- 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 grease, see page 179.

Wipe off grease nipples and grease gun before greasing, so that dirt and sand is not introduced through the grease nipples.

Lubrication and service chart

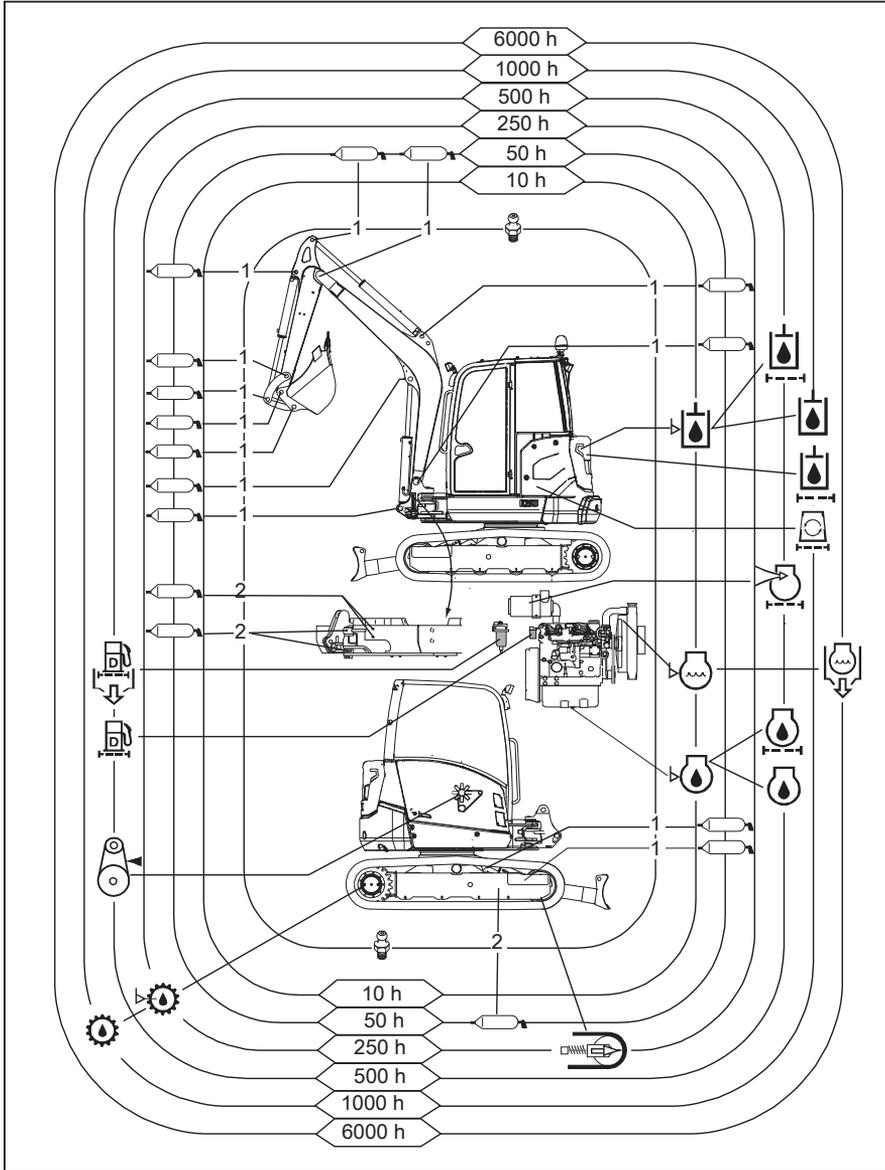
Symbol key

The following standard symbols are used in the lubrication and service chart.

 V1072402	Lubrication	 V1077055	Check travel gear oil
 V1072398	Fuel system	 V1077033	Check track tension
 V1077018	Drain condensation water	 V1077029	Check the hydraulic oil level
 V1077017	Replace fuel filter	 V1077024	Change the hydraulic oil
 V1077020	Check coolant level	 V1077020	Replace the hydraulic oil filter
 V1077022	Change coolant	 V1077036	Check the V-belt tension
 V1087231	Clean filter element	 V1077016	Check engine oil level
 V1087232	Change filter element	 V1072363	Change engine oil
 V1087233	Replace cab ventilation filter	 V1077016	Replace engine oil filter
 V1077034	Change travel gear oil	 V1072403	Grease nipple

174 Service and maintenance Lubrication and service chart

Every: 10, 50, 250, 500, 1000, 1500, 2000 and 3000 operating hours (according to Service Programme of the machine).



Service and maintenance
Lubrication and service chart **175**

Measure	Page
DAILY (every 10 hours)	
Test-run and check (start, stop, instruments, warning lamps, lights, wiper, washer, horn, decals, reflectors, back-up/travel alarm, heater and so on)	
Machine, visual check for leakages, loose connections, external damages, cracks and wear damages	
Engine oil level, check	151
Coolant level, check	157
Hydraulic oil level, check	171
Fan belt, visual check for cracks and interferences	
Water separator, check and drain if necessary	152

Measure	Page
EVERY 50 hours After carrying out daily service	
Machine, lubricate according to lubrication chart	172
Thumb pivot pin, lubricate	172
Hydraulic oil filter, replace (once after the first 50 hours , then every 500 hours)	workshop job

FIRST 50 hours inspection
These inspections shall be performed by an authorized Volvo dealer.

Measure	Page
EVERY 250 hours After carrying out daily and 50 hours services	
Tracks, check tension and condition	165
Track gearbox oil level, check	workshop job

Measure	Page
EVERY 500 hours After carrying out daily, 50 and 250 hours services	
Fan belt, check and adjust tension	workshop job
Engine oil and filter, change (change interval depending on fuel sulphur content, see page 181)	workshop job
Water separator filter element, clean	152
Fuel filter, replace (at least once a year)	workshop job
Radiator and hydraulic oil cooler, check visually if coolers are clogged with dirt or debris and clean if necessary	157

Service and maintenance
176 Lubrication and service chart

Measure	Page
EVERY 1000 hours	
After carrying out daily, 50, 250 and 500 hour services	
Hydraulic oil, change (750 hours with bio oil)	workshop job
Hydraulic oil filter in filling device, replace	workshop job
Hydraulic pressure, check (with every hydraulic oil change)	workshop job
Air cleaner primary filter, replace (according to signal, at least once a year)	workshop job <i>154</i>
Valve clearance, check and adjust	workshop job
Track gearbox oil, change	workshop job
Cab filter, replace (clean when necessary)	workshop job
EVERY 1000 hours or at least ONCE A YEAR	
Radiator hoses and clamp bands, check and replace if necessary (check at least once a year)	workshop job
Fuel hoses and clamps, check and replace if necessary (check at least once a year)	workshop job
Exhaust manifold, check for cracks, gas leakage and loose mounting screws (check at least once a year)	workshop job
Air intake line, check and replace if necessary (check at least once a year)	workshop job

Measure	Page
EVERY 1500 hours	
After carrying out daily, 50, 250, 500 and 1000 hour services	
Injection nozzle pressure, check	workshop job

Measure	Page
EVERY 2000 hours	
After carrying out daily, 50, 250, 500, 1000 and 1500 hour services	
Secondary air filter, replace (after 3 primary filter replacements or every second year)	workshop job <i>154</i>
Coolant mixture, check and adjust if necessary	workshop job <i>156</i>

Measure	Page
EVERY 3000 hours	
After carrying out daily, 50, 250, 500, 1000, 1500 and 2000 hour services	
Seat belt, replace (at least every third year)	workshop job
Injection pump, check	workshop job
Injection timing, check	workshop job

Service and maintenance
Lubrication and service chart 177

Measure	Page
EVERY 6000 hours After carrying out daily, 50, 250, 500, 1000, 1500, 2000 and 3000 hour services	
Coolant, change (or every fourth year with Volvo coolant VCS)	workshop job



Maintenance under special environmental conditions

Conditions	Maintenance
Water or near the ocean	Before operating, check the tightness of plugs and all drain hoses and cocks.
	After working, replenish the grease to the attachment pins or the areas affected by the water.
	When operating the machine, make sure to check and lubricate attachment points affected by water regularly.
	After working near the ocean, clean the machine thoroughly with fresh water and service the electrical parts to prevent from corrosion. It is highly recommended to use dielectric grease in all harness connecting points for better sealing and to prevent corrosion.
Freezing weather	After working, fill up the fuel tank to prevent water from condensing in the tank.
	Use the recommended lubricants.
	Fully charge the batteries regularly, electrolyte may freeze. Ventilate well especially when the batteries are charged in a confined space.
	When storing machines in extremely cold temperature, remove batteries and parking them at room temperature.
	Before parking, remove the mud and the dirt from the tracks.
Demolition work	Use fall protection over the cab against falling objects.
Low fuel quality	Drain the sediments in fuel tank at shorter service intervals.
	Change the engine oil and engine oil filter at shorter service intervals.
Dusty atmosphere	Check regularly that hose and pipe connections from the air cleaner to the engine induction manifold do not leak.
	Clean the air filter at shorter service intervals.
	Clean the clogging net for radiator and oil cooler at shorter service intervals.
	Clean the areas on the machine where dust, chips and similar may collect at shorter service intervals in order to minimize the risk of fire.
	Pay attention to and clean the engine compartment and surrounding areas regularly.

Specifications Recommended lubricants

The Volvo lubricants have been specially developed to fulfil the demanding operating conditions, in which Volvo CE's machines are used in. The oils have been tested according to Volvo CE's specifications and therefore meet the high requirements for safety and quality.

Other mineral oils can be used if they conform to our viscosity recommendations and meet our quality requirements. The approval of Volvo is required, if any other oil base quality (e.g. biologically degradable oil) is to be used.

NOTE!

BIO-OIL and mineral oil must be disposed separately. Mixing is prohibited!

	Oil quality	Viscosity under different ambient temperatures																																																																						
Engine	Engine oil Volvo Ultra Diesel Engine Oil API / CD, CF, CF-4, CI-4	<table border="1"> <thead> <tr> <th>°C</th> <th>-30</th> <th>-20</th> <th>-10</th> <th>0</th> <th>+10</th> <th>+20</th> <th>+30</th> <th>+40</th> <th>+50</th> </tr> <tr> <th>°F</th> <th>-22</th> <th>-4</th> <th>+14</th> <th>+32</th> <th>+50</th> <th>+68</th> <th>+86</th> <th>+104</th> <th>+122</th> </tr> </thead> <tbody> <tr> <td colspan="10" style="text-align: center;">SAE 10W</td> </tr> <tr> <td colspan="10" style="text-align: center;">SAE 10W-30</td> </tr> <tr> <td colspan="10" style="text-align: center;">SAE 15W-40</td> </tr> <tr> <td colspan="10" style="text-align: center;">SAE 30</td> </tr> <tr> <td colspan="10" style="text-align: center;">SAE 40</td> </tr> </tbody> </table> <p style="text-align: right; font-size: small;">V1087236</p>	°C	-30	-20	-10	0	+10	+20	+30	+40	+50	°F	-22	-4	+14	+32	+50	+68	+86	+104	+122	SAE 10W										SAE 10W-30										SAE 15W-40										SAE 30										SAE 40									
°C	-30	-20	-10	0	+10	+20	+30	+40	+50																																																															
°F	-22	-4	+14	+32	+50	+68	+86	+104	+122																																																															
SAE 10W																																																																								
SAE 10W-30																																																																								
SAE 15W-40																																																																								
SAE 30																																																																								
SAE 40																																																																								
Hydraulic system	Hydraulic oil Acc. to ISO 6743/4 HV or DIN 51524-HVLP Volvo Super Hydraulic Oil ISO 6743/4 Volvo Biodegradable Hydraulic oil	<table border="1"> <thead> <tr> <th>°C</th> <th>-30</th> <th>-20</th> <th>-10</th> <th>0</th> <th>+10</th> <th>+20</th> <th>+30</th> <th>+40</th> <th>+50</th> </tr> <tr> <th>°F</th> <th>-22</th> <th>-4</th> <th>+14</th> <th>+32</th> <th>+50</th> <th>+68</th> <th>+86</th> <th>+104</th> <th>+122</th> </tr> </thead> <tbody> <tr> <td colspan="10" style="text-align: center;">ISO VG 32</td> </tr> <tr> <td colspan="10" style="text-align: center;">ISO VG 46</td> </tr> <tr> <td colspan="10" style="text-align: center;">ISO VG 68</td> </tr> <tr> <td colspan="10" style="text-align: center;">Bio oil VG 32</td> </tr> <tr> <td colspan="10" style="text-align: center;">Bio oil VG 46</td> </tr> </tbody> </table> <p style="text-align: right; font-size: small;">V1087237</p>	°C	-30	-20	-10	0	+10	+20	+30	+40	+50	°F	-22	-4	+14	+32	+50	+68	+86	+104	+122	ISO VG 32										ISO VG 46										ISO VG 68										Bio oil VG 32										Bio oil VG 46									
°C	-30	-20	-10	0	+10	+20	+30	+40	+50																																																															
°F	-22	-4	+14	+32	+50	+68	+86	+104	+122																																																															
ISO VG 32																																																																								
ISO VG 46																																																																								
ISO VG 68																																																																								
Bio oil VG 32																																																																								
Bio oil VG 46																																																																								
Travel gear	Gear oil Volvo Super Transmission Oil API GL5	<table border="1"> <thead> <tr> <th>°C</th> <th>-30</th> <th>-20</th> <th>-10</th> <th>0</th> <th>+10</th> <th>+20</th> <th>+30</th> <th>+40</th> <th>+50</th> </tr> <tr> <th>°F</th> <th>-22</th> <th>-4</th> <th>+14</th> <th>+32</th> <th>+50</th> <th>+68</th> <th>+86</th> <th>+104</th> <th>+122</th> </tr> </thead> <tbody> <tr> <td colspan="10" style="text-align: center;">SAE 90</td> </tr> <tr> <td colspan="10" style="text-align: center;">SAE 140</td> </tr> <tr> <td colspan="10" style="text-align: center;">SAE 80W-90 or 85W-90</td> </tr> </tbody> </table> <p style="text-align: right; font-size: small;">V1087238</p>	°C	-30	-20	-10	0	+10	+20	+30	+40	+50	°F	-22	-4	+14	+32	+50	+68	+86	+104	+122	SAE 90										SAE 140										SAE 80W-90 or 85W-90																													
°C	-30	-20	-10	0	+10	+20	+30	+40	+50																																																															
°F	-22	-4	+14	+32	+50	+68	+86	+104	+122																																																															
SAE 90																																																																								
SAE 140																																																																								
SAE 80W-90 or 85W-90																																																																								

Engine oil

Oil grade	Sulphur content in the fuel		
	< 0.3 %	0.3 % ~ 0.5 %	> 0.5 %
	Oil changing interval		
Volvo Ultra Diesel Engine Oil or VDS-3 or VDS-2 + ACEA-E7 or VDS-2 + API CI-4 or VDS-2 + EO-N Premium plus	500 hour	250 hour	125 hour
VDS-2	250 hour	125 hour	75 hour
VDS + ACEA-E3 or ACEA : E7, E5, E4 or API : CI-4, CH-4, CG-4	125 hour	75 hour	50 hour



Specifications
182 Recommended lubricants

Coolant

Only use Volvo Coolant VCS when topping up or changing coolant. To avoid damage to engine and cooling system, different coolants or corrosion protection must not be mixed. When using concentrated Volvo Coolant VCS and clean water, the mixture should contain 40–60% concentrated coolant and 60–40% clean water. The amount of concentrated coolant must never 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 solid 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 material, COD-Mn	< 15 mg/litre

If there is any doubt about the water quality, use ready-mixed Volvo Coolant VCS, which contains 40% concentrated coolant. Do not mix with any other ready-mixed coolants since this may result in engine damage.

Hydraulic oil

Only use Volvo genuine hydraulic oil approved by Volvo Construction Equipment must be used. Do not mix different brands of hydraulic oil as this can lead to damage in the hydraulic system.

For the hydraulic oil specification, see page 179.

	Ambient temperature											
	°C	-40	-30	-20	-10	0	+10	+20	+30	+40	+50	+60
	°F	-40	-22	-4	+14	+32	+50	+68	+86	+104	+122	+140
Oil grade	(B)		(A)				(C)					
	(B)			(A)					(C)			
	(B)				(A)				(C)			

(A) : Ambient temperature recommended for general use of hydraulic system and components.

(B) : Ambient temperature guide for machine operation from a hydraulic oil viewpoint only, it does not guarantee the completion machine for other conditions like engine starting performance. In this range a warming-up period is needed to obtain proper performance.

(C) : Ambient temperature range to operate machine under special conditions, not a recommendation for general use conditions.

Additional recommendation for severe cold areas

A field solution for severe cold condition of ambient temperature between -40°C and +20°C.

- Type : Anti-wear type hydraulic oil
- Viscosity characteristic
 - Viscosity index : More than 130
 - Kinematic Viscosity : Less than 5,000cSt at -40°C, More than 5.6cSt at +90°C

NOTE!

This value is approximately equivalent to ISO Viscosity grade #22.

NOTE!

It is minimum theoretical recommendation without the guarantee of machine condition.



Fuel system

Fuel

For fuel specification according to the working temperature, please contact a workshop authorized by Volvo Construction Equipment.

Fuel

For fuel specification according to the ambient temperature, please contact a workshop authorized by Volvo Construction Equipment.

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 current USA legal requirement, the sulphur content in the diesel fuel must not exceed 0.0015 percent (15 ppm) by weight.

According to current EU legal requirements, the sulphur content in the diesel fuel must not exceed 0.001 percent (10 ppm) by weight.

For fuel specification according to the working temperature, please contact a workshop authorized by Volvo Construction Equipment.

Biodiesel fuel

Vegetable oils and/or ester, also referred to as bio-diesel, e.g. methyl ester or rapeseed (RME), are in some markets offered both as a pure product or for mixing with diesel fuel.

Volvo Construction Equipment accept an additive quantity of max. 7 % bio-diesel fuel to the diesel fuel ready-mixed from the oil manufacturers.

An additive component of more than 7% of bio-diesel may have the following effects:

- increased emission of nitric oxides (therefore does not meet existing legislation requirements)
- shorter lifetime of engine and injection system
- increased fuel consumption

- change in engine power
- halving of the interval between engine oil changes
- shortened lifetime of rubber materials in the fuel system
- impaired cold handling properties of the fuel
- limited storage life of the fuel which may lead to clogging of the fuel system, if the machine has not been used over a long period.

Warranty

The warranty does not apply to damage caused by an admixture of more than 7% of biodiesel fuel.



Service capacities and change intervals

Change capacities

Filling capacities	ECR50D
Fuel tank	64.5 l (17 US gal)
Cooling system (total)	8 l (2.1 US gal)
Engine oil including filter	10.2 l (2.7 US gal)
Hydraulic oil tank	50 l (13.2 US gal)
Hydraulic system (total)	63 l (16.6 US gal)
Travel gear	1 l (0.3 US gal)

Change intervals

Please see lubrication and service chart on page 174.

Engine

Engine

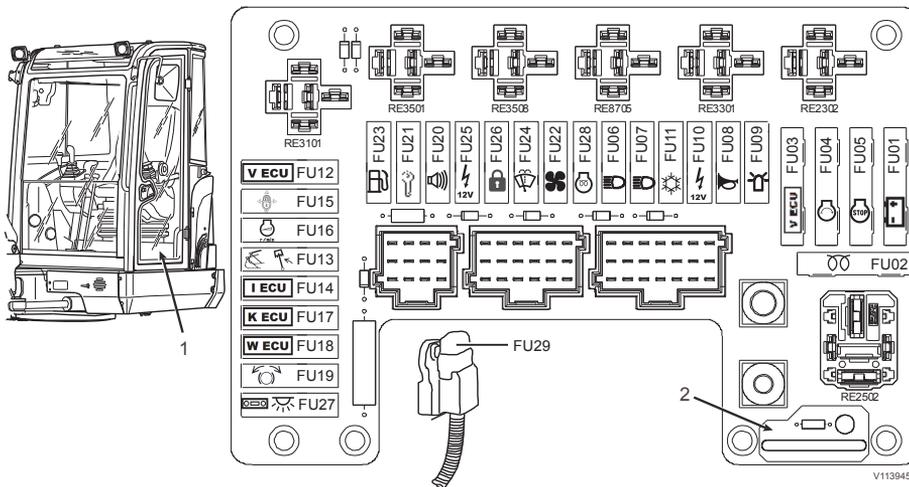
Designation	D2.6A
Combustion method	Reentrant Type, Center Direct Injection Type (E-CDIS)
Emission certification	EU stage 3a
Engine power, net (ISO 3046-1 for EU market) (SAE J1995 for US market)	29.7 kW (40.4 PS) / 2200 rpm
Engine power, gross (ISO 3046-1 for EU market) (SAE J1995 for US market)	31.2 kW (42.5 PS) / 2200 rpm
Max. torque ISO 3046-1	155 Nm at 1600 rpm
Number of cylinders	4
Cylinder bore	87 mm (3.43 in)
Stroke	110 mm (4.33 in)
Displacement	2615 cc
Compression ratio	19 bar
Firing sequence	1-3-4-2
Idling speed, low	1100 rpm
Idling speed, high	2420 rpm or less

Electrical system

Electrical system

Electrical system	ECR50D
System voltage	12 V
Batteries (Quantity)	1
Battery voltage	12 V
Battery capacity	75 Ah
Alternator (Rated voltage / Power output)	12 V / 70 A
Starter motor (Rated voltage / Capacity)	12 V / 2.5 kW

Relays and fuses



Relays and fuses are located on the left side in the cab (1), under the driver's seat. There is also a fuse tester (2) included in the fuse box.

Relays

Relay	Relay function
RE2302	Engine stop
RE2502	Power supply, engine
RE3101	Main relay 1
RE3301	Starter motor
RE3501	Working lights front

Relay	Relay function
RE3508	Working lights second
RE8705	Air conditioner compressor

Fuses

Fuse	Ampere	Function
FU01	30 A	Main supply
FU02	30 A	Glow plug
FU03	30 A	Main supply key
FU04	20 A	Starter motor
FU05	20 A	Stop valve (pull)
FU06	10 A	Working light front
FU07	10 A	Working light rear and boom
FU08	10 A	Horn
FU09	10 A	Beacon
FU10	10 A	Power outlet
FU11	10 A	Compressor, air conditioning relay
FU12	20 A	VECU Main supply
FU13	3 A	Boom swing / X1 joystick, travel speed switch, quick attach switch
FU14	3 A	Cluster supply
FU15	5 A	Armrest switch, safety pilot valve, VECU
FU16	10 A	Motor controller supply
FU17	3 A	Keypad supply
FU18	5 A	VCADS, caretrack supply
FU19	5 A	Orientation pressure switch
FU20	5 A	Travel alarm
FU21	3 A	+15/54 key status
FU22	15 A	Heater an switch, heater fan motor, AC motor
FU23	5 A	Refueling pump / alternator
FU24	10 A	Wiper and washer
FU25	5 A	Spare socket for power outlet (comm)
FU26	7.5 A	Electronic coded valve supply
FU27	10 A	Interior light and radio supply
FU28	3 A	Preheater check
FU29	10 A	Caretrack supply

NOTE!

Use only fuses of specified capacity (Ampere rating).

Cab

Cab

General	
Cab interior, upholstery and insulation	Fire retardant (fire resistant) ISO 3795-1989 and EN 474:1
Cab filter	Conforms to 43m ³ /hour (1519 cu ft)
Operator seat	
Operator seat	Operators seat meets the criteria of EN ISO 7096. Seat belt meets criteria of EN ISO 6683
Adjustment for operator weight	50–130 kg (110–287 lb)
Upholstery	Fire resistant
Lap type seat belt with reel	Yes (optional equipment)

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/s² RMS (root mean square) (8.1 ft/s²) 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 1.4a _{w,eqx} RMS	Vibration emission value 1.4a _{w,eqy} RMS	Vibration emission value a _{w,eqz} RMS
Excavating	0.33 m/s ² (1.08 ft/s ²)	0.21 m/s ² (0.69 ft/s ²)	0.19 m/s ² (0.62 ft/s ²)
Hydraulic breaker app.	0.49 m/s ² (1.61 ft/s ²)	0.28 m/s ² (0.92 ft/s ²)	0.36 m/s ² (1.18 ft/s ²)
Transfer movement	0.45 m/s ² (1.48 ft/s ²)	0.39 m/s ² (1.28 ft/s ²)	0.62 m/s ² (2.03 ft/s ²)

192 Specifications Cab

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 values was determined at particular operating and terrain conditions and it is therefore not representative for the various conditions in accordance with the intended use of the machine. Consequently this whole body vibration emission value declared by the manufacturer in accordance with European Standard is not intended to determine the whole body vibration exposure to the operator using this machine.

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

Sound information

	Cab
Sound pressure level (LpA) at operator position (Measurement according to ISO 6396)	78 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)

Hydraulic system

Hydraulic system

Type	Load Sensing
Capacity hydraulic system (complete) if cold	62 l (16.38 US gal)
Servo pressure	35 bar (508 psi)
Standby pressure	20 bar (290 psi)
Operating pressure (HP pressure)	260 bar (3771 psi)
Secondary pressure	
Boom cylinder	300/300 bar (4351/4351 psi)
Dipper arm cylinder	300/300 bar (4351/4351 psi)
Bucket cylinder	300/300 bar (4351/4351 psi)
Boom offset cylinder	350/350 bar (5076/5076 psi)
Accessory	220/220 bar (3191/3191 psi)

Specifications

Transmission

Travel system	ECR50D
Travel speed	1. Gear: 2.9 km/h (1.8 mph) 2. Gear: 4.4 km/h (2.7 mph)
Braking system	
Primary brake	Hydrostatic brake on both motors. If the traveling levers are released, the machine will come to a stop after a few seconds.
Secondary brake	Hydrostatic brake on one motor (in case one counterbalance valve fails). If the traveling levers are released, the machine will come to a stop after a few seconds.
Parking brake	Place the bucket and the blade to the ground.

Slewing system

Slewing system	ECR50D
	Slewing ring with internal gearing and remote lubrication.
Slewing speed	6,3 s/tr
Brake system	
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.

Machine weights

Machine weights

The total machine weight (as specified on the machine's PIN plate) is calculated according to ISO 6016.

Configuration	Weight
Standard operational weight (Machine with 400 mm (15.75 in) rubber tracks, cab, short arm, pin-on bucket 600 and 75 kg (165 lb) operator.)	5010 kg (11045 lb)
Maximum machine weight (Machine with 380 mm (14.96 in) steel tracks, cab, long arm, additional counterweight, 120 kg (264.55 lb) operator, hydraulic breaker HB300 with quick attach, OPG level 2 and several other options.)	5750 kg (12677 lb)
MuC* (without operator)	4930 kg (10869 lb)

* MuC = Most usual configuration



Ground pressure

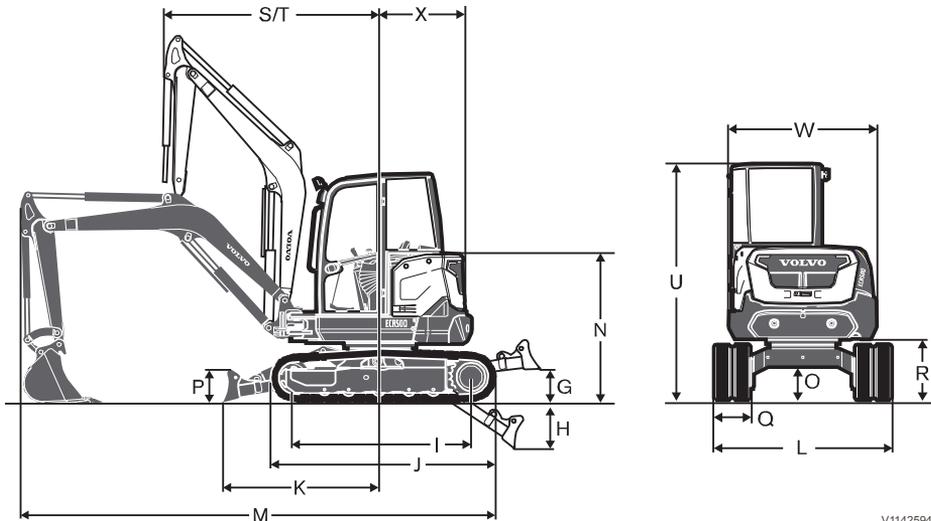
Ground pressure

The ground pressure value is based on the MuC (Most usual configuration) weight of the machine.

ECR50D	
Version	Ground pressure
MuC with 400 mm (15.75 in) rubber tracks	0,29 kg/cm ²

Dimensions

Dimensions



V1142594

Version	ECR50D	
Dipper arm	Short arm 1400 mm (55.12 in)	Long arm 1800 mm (70.87 in)
G. Highest position dozer blade	441 mm (17.36 in)	
H. Lowest position dozer blade	580 mm (22.84 in)	
I. Tumbler length	1955 mm (76.97 in)	
J. Track length	2507 mm (98.70 in)	
K.	1748 mm (68.82 in)	
L. Overall width	1920 mm (75.59 in)	
M. Overall length	4602 mm (181.18 in)	4420 mm (174.02 in)
N. Overall height of engine hood	1678 mm (66.06 in)	
O. Minimum ground clearance	360 mm (14.17 in)	
P. Dozer blade height	367 mm (14.45 in)	
Q. Shoe width	400 mm (15.75 in)	
R. Ground clearance to superstructure	666 mm (26.22 in)	
S. Front slew radius	2442 mm (96.14 in)	2489 mm (97.99 in)

Specifications
198 Dimensions

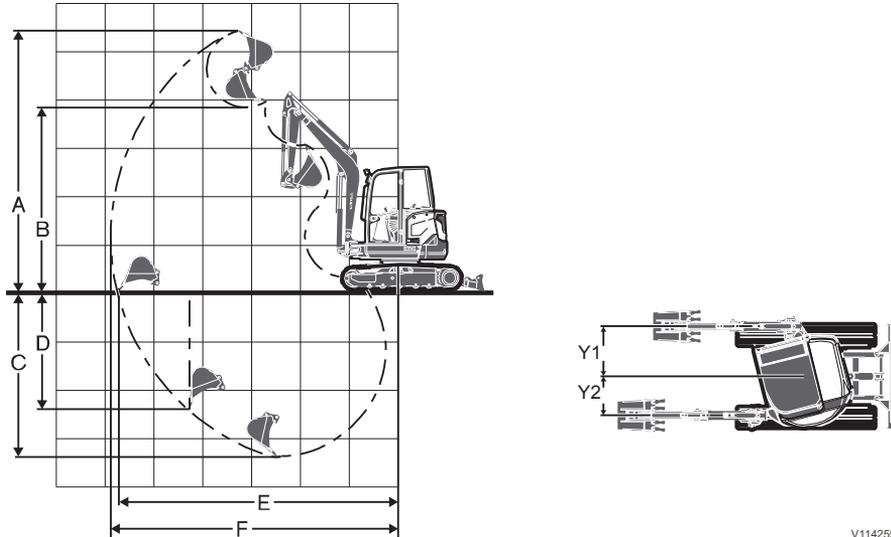
Version	ECR50D	
Dipper arm	Short arm 1400 mm (55.12 in)	Long arm 1800 mm (70.87 in)
T. Front slew radius with max. offset	1948 mm (76.69 in)	1984 mm (78.11 in)
U. Overall height of superstructure (with Cab)	2582 mm (101.65 in)	
W. Overall width of superstructure (with Cab)	1603 mm (63.11 in)	
X. Tail slew radius	960 mm (37.79 in)	

NOTE!

The machine specifications are given for information only and may be amended by the manufacturer at any time without prior notice.

Working ranges

Working ranges



V1142595

Version	ECR50D	
	Short arm 1400 mm (55.12 in)	Long arm 1800 mm (70.87 in)
A. Maximum cutting height	5400 mm (212.60 in)	5656 mm (222.68 in)
B. Maximum dumping height	3937 mm (154.99 in)	4193 mm (165.08 in)
C. Maximum digging depth (with dozer blade lowered to ground)	3400 mm (133.86 in)	3800 mm (149.61 in)
D. Maximum vertical wall digging depth	2416 mm (95.11 in)	2791 mm (109.88 in)
E. Maximum digging reach at ground level	5718 mm (225.12 in)	6104 mm (240.31 in)
F. Maximum digging reach	5908 mm (232.59 in)	6288 mm (247.56 in)
Y1	922 mm (36.29 in)	
Y2	726 mm (28.58 in)	

Recommended bucket sizes

Recommended bucket sizes

X = compatible with this machine model

Buckets

Volvo General purpose buckets (with bucket transport system)							
	Volvo teeth	Side cutters	350 mm	450 mm	600 mm	750 mm	900 mm
			14 in	18 in	24 in	30 in	36 in
ECR50D	X	X	X	X	X	X	X
Contact your dealer to define the optimal tool for your business.							
Volvo Hydraulic Thumbs							
GP bucket compatibility							
ECR50D	X (for direct fit mounting or with mechanical Volvo coupler)						
Volvo ditch cleaning buckets (fixed version)							
	1300 mm			1500 mm			
	51 in			60 in			
ECR50D	X			X			
Volvo Tilt-able ditch buckets							
	Bolt on edge			1300 mm			
				51 in			
ECR50D	available			X			

Attachment brackets (Volvo Quick Couplers)

	Direct fit	Volvo Quick Couplers		
		Mechanical	Hydraulic (fully auto)	Specific local offer (talk to your Volvo dealer)
ECR50D	X	X	X	X

Digging forces

Version	ECR50D	
Dipper arm	1400 mm (55.12 in)	1800 mm (70.87 in)
Bucket radius (at the tooth)	806 mm (31.73 in)	
Bucket radius (at the blade)	696 mm (27.40 in)	
Break-out force (at bucket blade)	3612 daN (8120 lbf)	
Break-out force ISO/SAE	3119 daN (7012 lbf)	
Tear-out force (at bucket blade) daN	2593 daN (5829 lbf)	2177 daN (4896 lbf)
Tear-out force ISO/SAE	2490 daN (5598 lbf)	2105 daN (4732 lbf)
Angle of rotation, bucket	204°	



Lifting capacities

Lifting capacities

NOTE!

Do not transport objects in lifting gear operation if the machine is not equipped with a line rupture valve on the boom, appropriate lifting hook, an overload warning function and a table stating the nominal lifting loads for lifting gear operation. The lifting table is a decal inside the cab.

Lifting capacities are 75% of the tipping load or 87% of the hydraulic limit.

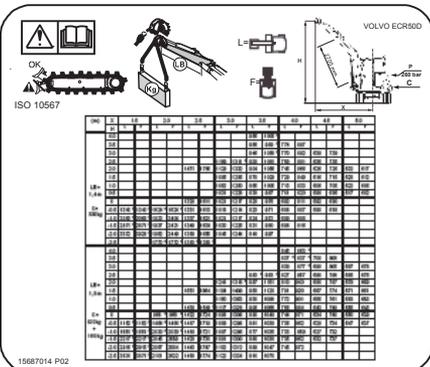
The specified values are valid for a machine:
 ■ without attachment and without attachment bracket.

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 (165 lb) driver in the cab.

Lifting capacity decals (inside cab)

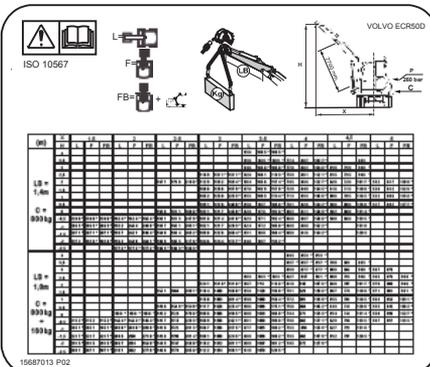


VOLVO ECR50D

ISO 10567

Lift height (m)	1.0		1.5		2.0		2.5		3.0		3.5		4.0		4.5		5.0	
	kg	lb																
1.0	1000	2200	1000	2200	1000	2200	1000	2200	1000	2200	1000	2200	1000	2200	1000	2200	1000	2200

V1144533



VOLVO ECR50D

ISO 10567

Lift height (m)	1.0		1.5		2.0		2.5		3.0		3.5		4.0		4.5		5.0	
	kg	lb																
1.0	1000	2200	1000	2200	1000	2200	1000	2200	1000	2200	1000	2200	1000	2200	1000	2200	1000	2200

V1144534

Decal: Lifting capacities, ECR50D

Decal: Lifting capacities, ECR50D with safety valve on blade

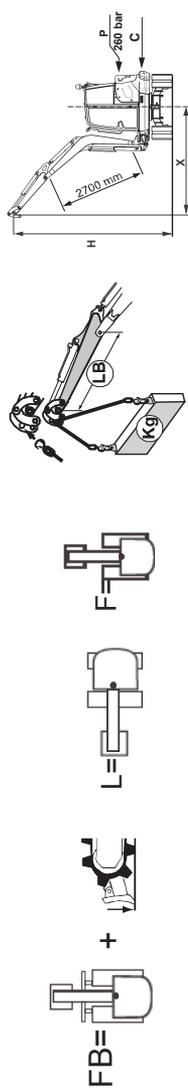
Table: Lifting capacities, ECR50D

X	1.5			2			2.5			3.0			3.5			4			4.5			5			
	L	F	H	L	F	H	L	F	H	L	F	H	L	F	H	L	F	H	L	F	H	L	F	H	
4																									
3.5																									
3																									
2.5																									
2																									
1.5																									
1																									
0.5																									
0																									
-0.5	1340*	1340*	1340*	1624*	1624*	1624*	1331	1613	1613	1613	1613	1613	1018	1214	1214	823	971	688	807	590	688				
-1	2063*	2063*	2063*	1922	2404	1337	1621	1621	1621	1621	1621	1621	1021	1217	824	972	689	808							
-1.5	2871*	2871*	2871*	1937	2421	1634	1634	1634	1634	1634	1634	1634	1030	1226	831	980	698	816							
-2	3372	3028*	1962	2449	1369	1655	1046	1244	848	997															
-2.5				1772*	1772*	1383*																			
4																									
3.5																									
3																									
2.5																									
2																									
1.5																									
1																									
0.5																									
0																									
-0.5	1152*	1152*	1152*	1464*	1464*	1464*	1417	1719	1089	1298	881	1039	736	862	629	734	547	637							
-1	1651*	1651*	1651*	2030*	2030*	2030*	1419*	1721	1087	1296	877	1035	733	859	627	732									
-1.5	2217*	2217*	2217*	2045	2559	1428	1730	1091	1300	880	1038	735	862	632	737										
-2	2915*	2915*	2067	2584	1443	1747	1102	1312	889	1047	745	872													
-2.5	3601	3601	2101	2622	1468	1774	1122	1334	910	1070															

V1139698

C = additional counterweight, LB = length of dipper arm

Table : Lifting capacities, ECR50D with safety valve on blade



X (m)	1.5		2		2.5		3.0		3.5		4		4.5		5											
	L	FB																								
4									956	1005*	1005*															
3.5									956	989*	989*	774	897	1027*		893										
3									946	1058*	1058*	770	892	1048*	639	739	900*									
2.5								1169	1311*	1311*	928	1081	1193*	759	881	1121*	635	735	946*							
2							1471	1766	2186*	1129	1332	1634*	904	1056	1374*	745	866	1227*	626	726	1017*	532	617	1100*		
1.5									1086	1286	1979*	878	1029	1570*	729	849	1345*	616	715	1100*	528	612	1126*			
1									1052	1250	2253*	855	1005	1744*	713	833	1454*	606	705	1185*	522	606	1158*			
0.5									1031	1228	2406*	838	987	1868*	701	820	1542*	598	696	1260*	517	602	1177*			
0									1328	1611	1698*	1021	1217	2450*	828	976	1928*	692	811	1589*	592	690	1314*			
-0.5	1340*	1340*	1624*	1624*	1624*	1624*	1624*	1624*	1331	1613	2479*	1018	1214	2410*	823	971	1924*	688	807	1588*	590	688	1335*			
-1	2063*	2063*	2063*	1922	2404	2460*	1337	1621	2931*	1021	1217	2293*	824	972	1850*	689	808	1522*					1310			
-1.5	2871*	2871*	2871*	1937	2421	3484*	1349	1634	2632*	1030	1226	2084*	831	980	1684*	698	816	1342*					1203			
-2	3372	3928*	3928*	1962	2449	2841*	1369	1655	2176*	1046	1244	1727*	848	997	1332*											
-2.5			1772*	1772*	1772*	1383*	1383*	1383*																		
4																										
3.5																										
3																										
2.5																										
2																										
1.5																										
1																										
0.5																										
0																										
-0.5	1152*	1152*	1464*	1464*	1464*	1464*	1464*	1464*	1417	1719	2263*	1089	1298	2421*	881	1039	1908*	736	862	1571*	629	734	1335*	547	637	1155*
-1	1651*	1651*	2030*	2030*	2030*	2030*	2030*	2030*	1419	1721	2913*	1087	1296	2375*	877	1035	1892*	733	859	1559*	627	732	1310*			
-1.5	2217*	2217*	2217*	2045	2559	2718*	1428	1730	2914*	1091	1291	2245*	880	1038	1802*	735	862	1475*	632	737	1203*					
-2	2915*	2915*	2915*	2067	2584	3560*	1443	1747	2580*	1102	1312	2011*	889	1047	1612*	745	872	1279*								
-2.5	3601	3601	3601	2101	2622	2770*	1468	1774	2058*	1122	1334	1601*	910	1070	1205*											

C = additional counterweight, LB = length of dipper arm

Hammer

Hammer (Hydraulic breaker)

X = compatible with this machine model

Volvo Hydraulic breakers					
	breaker brackets	Ready to use breaker			
		Volvo hydraulic breaker	Hydraulic hoses	Hydraulic connectors	1 moil point
ECR50D	Different models available (for all quick coupler provided by Volvo)	X	X	X	X

For further information about the Hydraulic breakers please refer to the separate attachment Operator Manuals.



Service history

Service 50 hours		Type of service	Signature and stamp
Date	Hours	<input type="checkbox"/> 50 hours inspection	

Service 250 hours		Type of service	Signature and stamp
Date	Hours	<input type="checkbox"/> Service and Maintenance	

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

Service 750 hours		Type of service	Signature and stamp
Date	Hours	<input type="checkbox"/> Service and maintenance	

Service 1000 hours		Type of service	Signature and stamp
Date	Hours	<input type="checkbox"/> Service and maintenance	

Service 1250 hours		Type of service	Signature and stamp
Date	Hours	<input type="checkbox"/> Service and maintenance	

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

Service 1750 hours		Type of service	Signature and stamp
Date	Hours	<input type="checkbox"/> Service and maintenance	

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

Service 2250 hours		Type of service	Signature and stamp
Date	Hours	<input type="checkbox"/> Service and maintenance	

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

Service 2750 hours		Type of service <input type="checkbox"/> Service and maintenance	Signature and stamp
Date	Hours		

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

Service 3250 hours		Type of service <input type="checkbox"/> Service and maintenance	Signature and stamp
Date	Hours		

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

Service 3750 hours		Type of service <input type="checkbox"/> Service and maintenance	Signature and stamp
Date	Hours		

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

Service 4250 hours		Type of service <input type="checkbox"/> Service and maintenance	Signature and stamp
Date	Hours		

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



Specifications
208 Service history

Service 4750 hours		Type of service	Signature and stamp
Date	Hours	<input type="checkbox"/> Service and maintenance	

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

Service 5250 hours		Type of service	Signature and stamp
Date	Hours	<input type="checkbox"/> Service and maintenance	

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

Service 5750 hours		Type of service	Signature and stamp
Date	Hours	<input type="checkbox"/> Service and maintenance	

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

Service 6250 hours		Type of service	Signature and stamp
Date	Hours	<input type="checkbox"/> Service and maintenance	

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

Service 6750 hours		Type of service	Signature and stamp
Date	Hours	<input type="checkbox"/> Service and maintenance	

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

Service 7250 hours		Type of service	Signature and stamp
Date	Hours	<input type="checkbox"/> Service and maintenance	

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

Service 7750 hours		Type of service	Signature and stamp
Date	Hours	<input type="checkbox"/> Service and maintenance	

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

Service 8250 hours		Type of service	Signature and stamp
Date	Hours	<input type="checkbox"/> Service and maintenance	

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

Service 8750 hours		Type of service	Signature and stamp
Date	Hours	<input type="checkbox"/> Service and maintenance	

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

Service 9250 hours		Type of service	Signature and stamp
Date	Hours	<input type="checkbox"/> Service and maintenance	

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



Specifications
210 Service history

Service 9750 hours		Type of service	Signature and stamp
Date	Hours	<input type="checkbox"/> Service and maintenance	

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

Alphabetical index

A

Access to cab.....	136
Accidents.....	69
Air conditioning.....	168
Air filter.....	154
Alternator.....	162
Anti-theft device	13
Arrival and delivery inspection.....	145
Attachment brackets.....	103
Attachments.....	100
Attachments, alternative lowering.....	81
Attachments, connecting and disconnecting.....	102
Audio system.....	62

B

Battery.....	161
Battery disconnect switch.....	162
Battery, charging.....	162
Bearings, greasing	172
Before service, read.....	133
Bucket teeth.....	169
Bucket teeth, replacing.....	169
Buckets.....	107

C

Cab.....	10, 167, 190, 191
CareTrack.....	13
CE-marking, EMC-directive.....	16
Change capacities.....	186
Change intervals.....	186
Check.....	37
Clamshell bucket.....	118
Cleaning engine compartment.....	147
Cleaning machine.....	146
Climate control system.....	65
Communication equipment, installation..	19
Connecting to an attachment bracket...	113
Connecting with pivot pins.....	111
Controls.....	48
Coolant.....	156, 182
Coolant level, checking.....	157
Coolant, topping up.....	159
Cooling system.....	156

D

Delivery Instructions.....	145
Demolition work.....	99
Digging forces.....	201
Dimensions.....	197
Disconnecting with pivot pins.....	113
Display panel.....	31
Display unit.....	28
Door.....	60

E

Eco driving.....	88
Electrical system.....	9, 160, 188
Electrical welding.....	163
Emergency exit.....	61
Engine.....	9, 151, 187
Engine air cleaner.....	154
Engine oil.....	181
Engine oil level, checking.....	151
Entering, leaving and climbing the machine.....	136
Environmental requirements.....	9
Equipment.....	11
EU conformity certificate.....	18

F

Fire extinguisher, location.....	61
Fire prevention.....	137
Front windscreen rails.....	167
Fuel.....	184
Fuel level, checking.....	152
Fuel system.....	152, 184
Fuel system, bleeding.....	152
Fuel tank.....	152

G

Greasing.....	172
Ground pressure.....	196

H

Hammer.....	110, 205
Handling hazardous materials.....	140
Handling line, tubes and hoses.....	143
High voltage overhead power line.....	92
Hose rupture valves.....	121
Hydraulic equipment for clamshell.....	118
Hydraulic oil.....	183
Hydraulic oil level, checking.....	171
Hydraulic system.....	10, 171, 193

I

Information and warning decals.....	22
Instrument panel, left.....	27
Instrument panel, right.....	43
Intended use.....	9

L

Leaving cab.....	136
Lifting capacities.....	202
Lifting machine.....	83
Lifting objects.....	124
Loading.....	85
Long-term parking.....	78
Lubrication and service chart.....	144, 173

M

Machine view.....	15
Machine weights.....	195

Alphabetical index

212

Maintenance under special environmental conditions.....	178	Touch-up painting.....	147
Measures before operating.....	73	Track unit.....	165
Modifications.....	11	Track unit, checking tension.....	165
O		Tracks.....	122
Offset boom.....	108	Transmission.....	194
Operating on public roads.....	71	Transporting machine.....	83
Operator comfort.....	57	Travel gearbox.....	164
Operator obligations.....	68	Travel gearbox oil level, checking.....	164
Operator safety.....	70	Travel system.....	11
Operator's manual, storage.....	61	U	
Operator's seat, adjusting.....	57	Underground cables and pipes.....	94
P		V	
Paint finish maintenance.....	147	Visibility.....	66
Parking.....	77	W	
Periodic replacement of critical parts for safety.....	72	Warming up.....	75
Pressure release.....	106	Warning.....	39
Primary air filter, cleaning and replacing.....	154	Washer reservoir.....	167
Product plates.....	20	Water separator, draining.....	153
R		When using rubber tracks.....	122
Radiator and coolers, cleaning.....	157	Whole-body vibrations.....	89
Recommended bucket sizes.....	200	Windows.....	59
Recommended lubricants.....	179	Working in cold weather.....	98
Retrieving and towing.....	79	Working in water and on boggy ground..	96
Roof.....	60	Working on slopes.....	95
ROPS.....	55	Working ranges.....	199
ROPS Cab (Roll Over Protective Structure).....	55	Working where there is risk of landslip...	97
Rules for digging.....	91	Working with buckets.....	107
S		Working with hammer.....	110, 111
Safety regulations.....	160	Working within dangerous areas.....	92
Safety rules when operating.....	68		
Seat belt.....	58		
Secondary air filter, replacing.....	155		
Service capacities and change intervals.....	186		
Service history.....	144, 206		
Service points.....	149		
Service position.....	132		
Service Programme.....	145		
Signalling diagram.....	128		
Slewing system.....	12, 194		
Special hydraulics.....	109		
Starting engine.....	74		
Stopping.....	76		
Symbol key.....	173		
T			
Theft protection.....	40		
Thumb.....	114		
Thumb attachment.....	114		
Tool kit.....	14		