



OPERATOR'S MANUAL

OPERATOR'S MANUAL

EC15E, EC18E, ECR18E, EC20E

EC15E, EC18E, ECR18E, EC20E

English



⚠ WARNING: Breathing diesel engine exhaust exposes you to chemicals known to the State of California to cause cancer and birth defects or other reproductive harm.

- Always start and operate the engine in a well-ventilated area.
- If in an enclosed area, vent the exhaust to the outside.
- Do not modify or tamper with the exhaust system.
- Do not idle the engine except as necessary.

For more information go to www.P65warnings.ca.gov/diesel.

⚠ ADVERTENCIA: Respirar los gases del escape de motores a diésel le expone a químicos conocidos por el Estado de California como causantes de cáncer y defectos de nacimiento u otros daños reproductivos.

- Siempre encienda y opere el motor en un área bien ventilada.
- Si es en un área cerrada, ventile el orificio del escape hacia el exterior.
- No modifique ni altere el sistema de escape.
- No encienda el motor, excepto cuando sea necesario.

Para mayor información visite www.P65warnings.ca.gov/diesel.

⚠ WARNING: Operating, servicing and maintaining a passenger vehicle or offroad vehicle can expose you to chemicals including engine exhaust, carbon monoxide, phthalates, and lead, which are known to the State of California to cause cancer and birth defects or other reproductive harm. To minimize exposure, avoid breathing exhaust, do not idle the engine except as necessary, service your vehicle in a well-ventilated area and wear gloves or wash your hands frequently when servicing your vehicle. For more information go to www.P65Warnings.ca.gov/passenger-vehicle.

⚠ ADVERTENCIA: Operar, dar servicio y mantenimiento a un vehículo de pasajeros o vehículo todo terreno puede exponerle a químicos incluyendo gases del escape, monóxido de carbono, ftalatos y plomo, los cuales son conocidos por el Estado de California como causantes de cáncer y defectos de nacimiento u otros daños reproductivos. Para minimizar la exposición, evite respirar los gases del escape, no encienda el motor excepto si es necesario, dé servicio a su vehículo en un área bien ventilada y utilice guantes o lave sus manos frecuentemente cuando dé servicio a su vehículo. Para mayor información visite www.P65Warnings.ca.gov/passenger-vehicle.



EC15E/EC18E/EC20E/ECR18E

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

Maintenance

Specifications

Alphabetical index

Ref. No. 20051662-A

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2018.09

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Foreword

2

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 spanning the width of the page, intended for writing or drawing.

Table of contents

Foreword	1
Identification numbers	3
Presentation	9
Machine view	14
CE-marking, EMC-directive	15
Communication equipment, installation	18
Safety components	19
Product plates	20
Information and warning decals	21
USA federal clean air act	27
Instrument panels	30
Instrument panel, left	31
Display unit	34
Instrument panel, right	38
Other controls	45
Controls	45
ROPS	54
Operator comfort	56
Operating instructions	64
Safety rules when operating	68
Measures before operating	73
Starting engine	74
Stopping	78
Parking	79
Retrieving and towing	82
Attachments, alternative lowering	83
Transporting machine	85

Table of contents

6

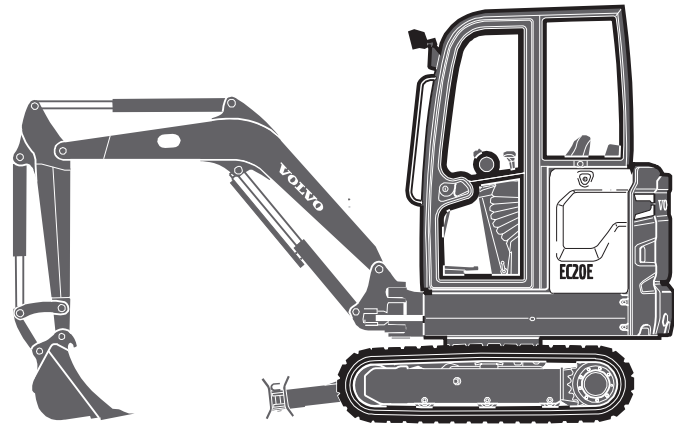
Operating techniques	91
Eco driving	92
Whole-body vibrations	93
Rules for digging	95
Working within dangerous areas	96
Attachments	106
Attachments, connecting and disconnecting	108
Attachment brackets	109
Hydraulic attachment bracket	112
Pressure release	114
Buckets	115
Offset boom	116
Special hydraulics	118
Hammer	119
Hose rupture valves	125
Tracks	126
Lifting objects	127
Signalling diagram	132
Safety when servicing	135
Service position	136
Before service, read	137
Entering, leaving and climbing the machine	140
Fire prevention	141
Handling hazardous materials	144
Handling line, tubes and hoses	147
Maintenance	148
Lubrication and service chart	151
Maintenance service, every 10 hours	157
Maintenance service, every 50 hours	160
Maintenance service, every 250 hours	161
Maintenance service, every 500 hours	163
Maintenance service, every 1000 hours	165
Maintenance service, when required	166

Specifications	179
Recommended lubricants	179
Fuel system	184
Service capacities and change intervals	190
Engine	191
Electrical system	192
Cab	195
Hydraulic system	197
Specifications	198
Machine weights	199
Ground pressure	200
Dimensions	201
Working ranges	204
Digging forces	206
Lifting capacities	207
Hammer	227
Service history	228
Alphabetical index	233



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Presentation



V1200431

Intended use

The machine is intended to be used under normal conditions for the applications described in this manual. If it is used for other purposes or in potentially dangerous environments, for example explosive atmosphere, flammable environment or areas with dust containing asbestos and so on, special safety regulations must be followed and the machine 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 Volvo engine is a 3-cylinder D0.9A type diesel engine with water cooling.

Electrical system

The machine might have six electronic units:

- I-ECU (Display/instrument control unit)
- A-ECU (Immobiliser system, anti-theft, optional)

- K-ECU (Immobiliser system, anti-theft key pad, optional)
- W-ECU (CareTrack control unit, optional)
- W-ECU 2 (Track unit, optional)

The display unit shows information, e.g machine status, control lamps, gauges, settings and information/warning lights.

To select various functions there are two instrument panels with switches and controls. Activation and control of the excavating functions is mostly done with the buttons on the control levers.

Most of the relays and fuses are grouped in the electrical box under the cover on the left side of the machine, close to the battery disconnect switch.

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
- OPG (Operator Protective Guard) Level 1 on top, ISO 10262

The OPG level 2 is 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 shall be immediately replaced.

If the machine is equipped with a cab, i.e. with side windows and side door, it will have heating and ventilation. The rear window can be broken with an emergency hammer and used as an emergency exit.

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 quick coupler and hydraulic breaker.

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 through the main chassis via two rubber tracks. The tracks for EC18E, ECR18E and EC20E are each driven by a two speed travel motor. The tracks for EC15E are each driven by a one 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

(optional equipment)

An installed anti-theft device makes it more difficult to steal the machine. Volvo CE supplies anti-theft devices as optional equipment. If your machine is not yet equipped with one, check the possibilities of having such a device installed by a qualified service technician.

CareTrack

(optional equipment)

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, daily usage hours, that can be sent by wireless transmission to a computer. The service history can be reviewed on a secure website and service reminders can be sent both by email and on a mobile phone. Part changes can be planned for specific wear parts and reminders can be sent when the changes are due.

The geofence and timefence functionality gives the opportunity to decide in which geographical boundaries and at which times the machine must operate. An alarm can be sent by email or to a mobile phone if it breaks those rules.

CareTrack makes it easier to plan for service and reduces costly downtime.

It 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. CareTrack is available in different versions,

depending on the required information level. For further information contact a Volvo Construction Equipment dealer.

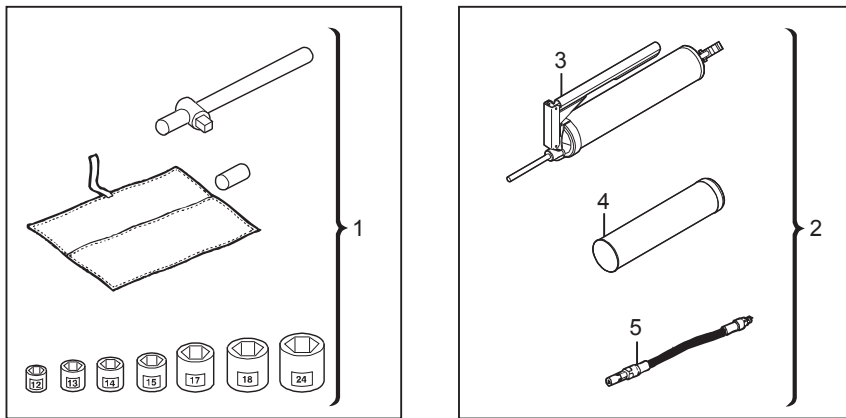
The CareTrack system transmits data, in the same way a mobile phone does, with a maximum output rate of 10 W. The transmitter is always on and the operator cannot switch it off.

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

Tool kit

(optional equipment)

The tool kit is located under the seat and consists of following tools:



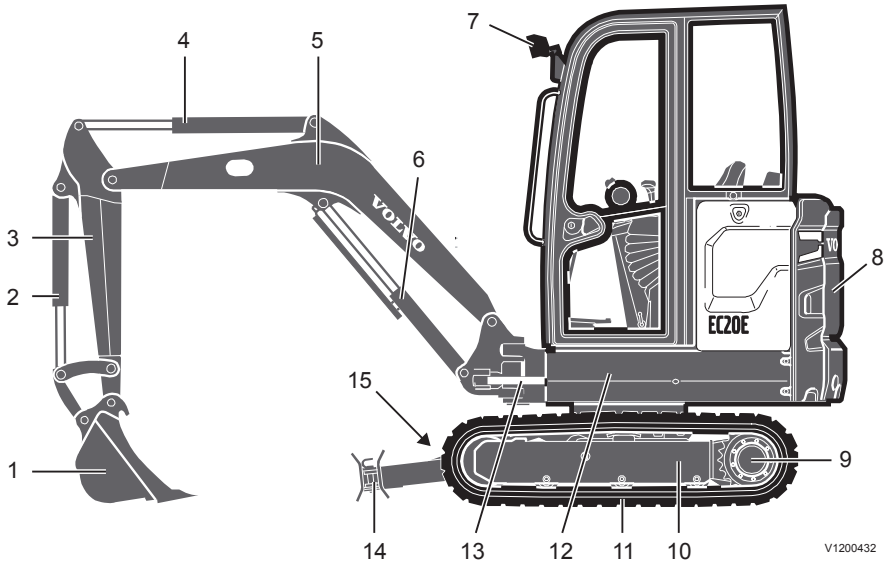
V1139940

Tools of the tool kit

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

14 Presentation
Machine view

Machine view



V1200432

1	Bucket	9	Travel motor
2	Bucket cylinder	10	Undercarriage
3	Dipper arm	11	Tracks
4	Dipper arm cylinder	12	Superstructure
5	Boom	13	Boom offset cylinder
6	Boom cylinder	14	Dozer blade
7	Working lights	15	Dozer blade cylinder
8	Rear hood (Engine hood)		



V1067840

CE-marking, EMC-directive

CE marking

(Declaration of Conformity : Only applies to machines marketed within the EU/EEA.)

This machine is CE marked. This means that when delivered the machine meets the applicable "Essential Health and Safety Requirements", which are given in the EU Machinery Safety Directive, 2006/42/EC.

Any person carrying out changes that affect the safety of the machine, is also responsible for the same.

As proof that the requirements are met, the machine is supplied with an EU Declaration of Conformity, issued by Volvo CE for each separate machine. This EU declaration also covers attachments manufactured by Volvo CE. The documentation is a valuable document, which should be kept safe and retained for at least ten years. The document should always accompany the machine when it is sold.

If the machine is used for other purposes or with other attachments than described in this manual, safety must at all times and in each separate case be maintained. The person carrying out such action is also responsible for the action which, in some cases, may require a new CE marking and the issue of a new EU Declaration of Conformity.

16 Presentation CE-marking, EMC-directive

EU EMC Directive

The electronic equipment of the machine may in some cases cause interference to other electronic equipment, or suffer from external electromagnetic interference, which may constitute safety risks.

The EU EMC directive about "Electromagnetic compatibility", 2014/30/EU, provides a general description of what demands can be made on the machine out of a safety point of view, where permitted limits have been determined and given according to international standards.

A machine or device which meets the requirements should be CE marked. Our machines have been tested particularly for electromagnetic interference. The CE marking of the machine and the declaration of conformity also cover the EMC directive.

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. Frédéric Broizat, 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
EC15E		11.8 kW	93 dB(A)	93 dB(A)	
EC18E					
ECR18E					
EC20E					

complies with the following relevant directives:

- EC Directive "Machinery" 2006/42/EU
- EC Directive "Noise Emission" 2000/14/EU
- EC Directive "EMC" 2014/30/EU
- As well as EC Directive "Low Voltage" 2014/35/EU 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/EU.

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 2014/30/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.

Safety components

Genuine Volvo spare parts guarantee the best service life, reliability, and safety for the machine and operator. If reliable and purpose-built parts are not used, your safety, health, and the machine's function may be compromised. Contact your dealer and state the machine's model designation/serial number (PIN-number) when ordering spare parts. Position of PIN-plate, see section "Product plates".

Your Volvo dealer always has up-to-date spare part information that is updated at regular intervals via the information system PROSIS.

Safety-classified machine and spare parts

Safety-classified machine and spare parts mean that the components are intended to fulfil a safety-related function.

Examples of safety-classified machine parts/ spare parts

- Removable protective devices/guards over rotating parts and hot surfaces
- Protective plates, rails, covers, and steps
- Components included in systems to reduce sound and vibrations
- Complete operator's seat incl. seatbelt
- Decals and plates
- Cab filter

NOTE!

Safety-classified machine and spare parts shall be reinstalled, repaired, or replaced immediately if they have been removed or damaged.

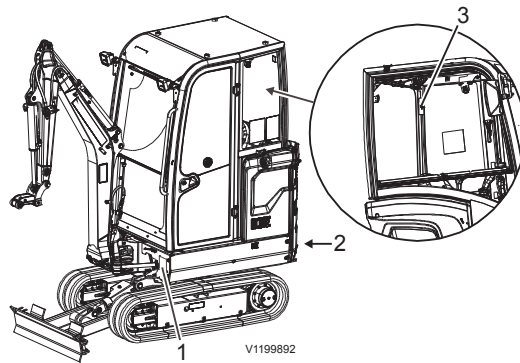
When changing machine operator/owner, malfunctions and defects of safety-classified machine and spare parts shall be reported immediately and an action plan shall be established.

There is more important information in this Operator's Manual about the components that are considered safety-classified.

Product plates

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

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



V	C	E	E	C	3	5	C	0	0	0	1	2	3	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)

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

It also 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 PIN plate is based on the most standard definition of the machine in accordance with ISO 6016.

2 Engine identification plate

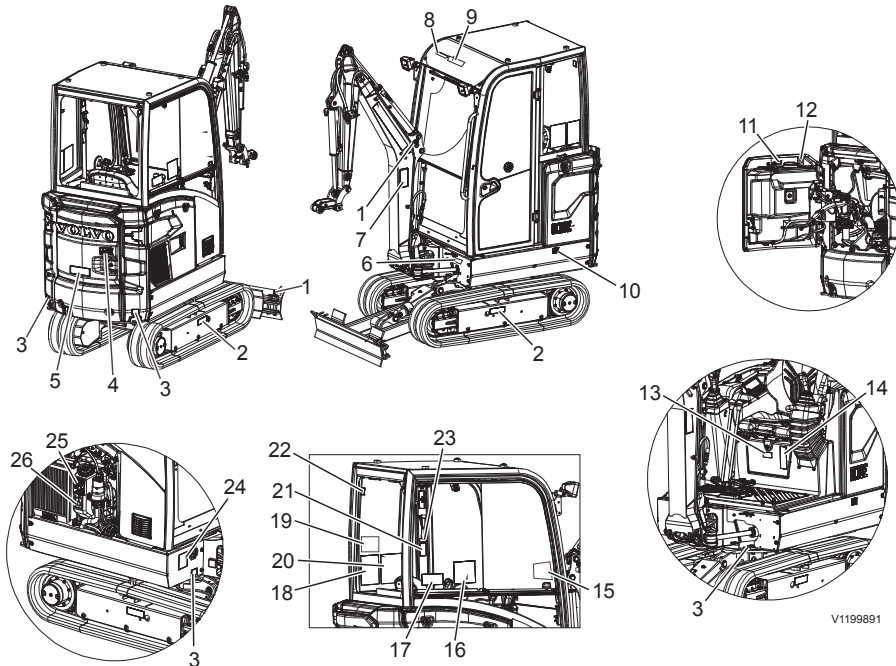
The engine identification contains information about manufacturer, designation and engine serial number.

3 TOPS/ROPS and OPG plate

The plate is located inside the cab on the left back column (in canopy under the roof). 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.

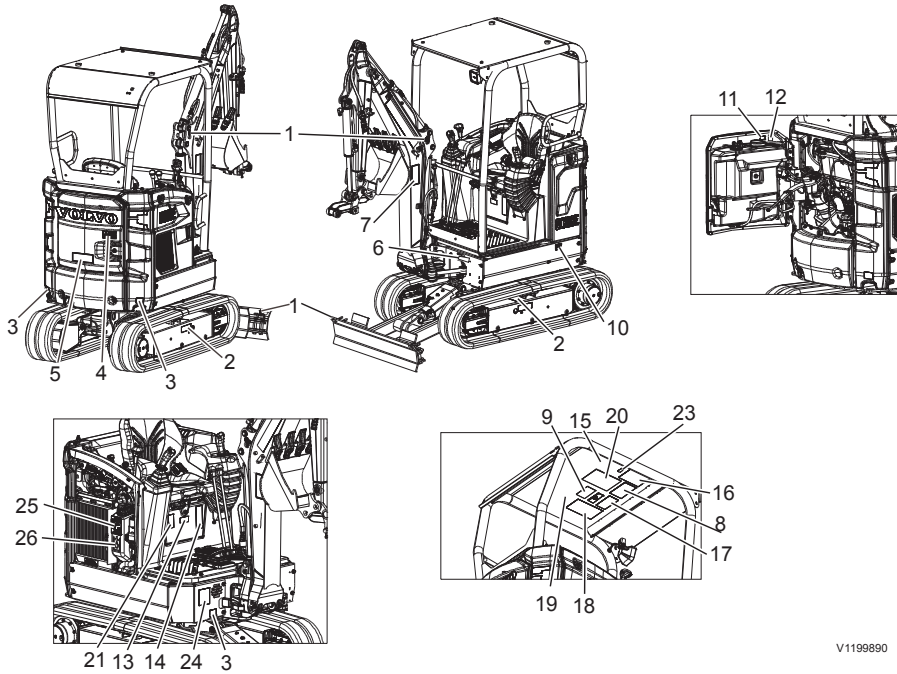
Information and warning decals

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.



Decal positions in Cab

22 Presentation Information and warning decals


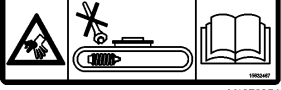
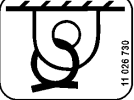
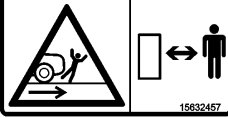



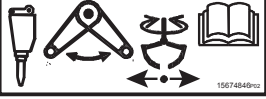



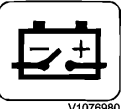
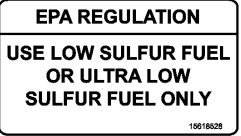

Decal positions in Canopy

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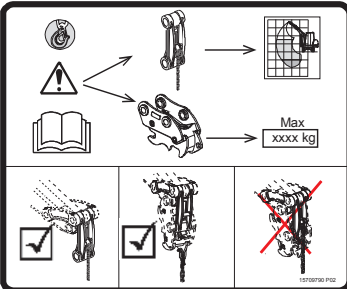
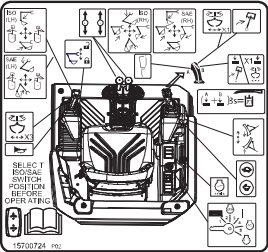
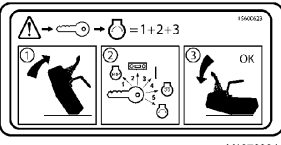
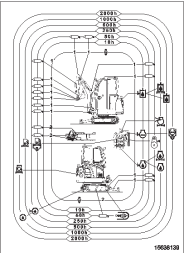
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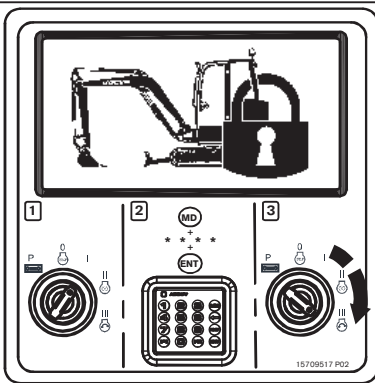
The word WARNING is given on the warning decals for North America.

 <p>V1076978</p> <p>1 Lifting points. (2 lifting points on blade / 2 lifting points on boom)</p>	 <p>V1076954</p> <p>2 WARNING! Track tension, check the tension every 250 hours – read the Operator's Manual (page 167).</p>
 <p>V1076979</p> <p>3 Tie down points (on superstructure, 2 in front, 2 on rear side)</p>	 <p>V1076952</p> <p>4 WARNING! Do not enter the machine's working area. Risk for crushing.</p>

 <p>15209219 V1076909</p> <p>5 WARNING! Rotating parts and hot surfaces</p>	 <p>15674849-02 V1199827</p> <p>6 Switch-over valve (hammer/clamshell)</p>
 <p>V1065351</p> <p>7 WARNING Do not stand in the vicinity of a raised load.</p>	 <p>V1129956</p> <p>8 WARNING! High voltage. Keep sufficient distance from electrical power lines.</p>
 <p>11802885 V1077000</p> <p>9 WARNING! Operate backhoe from operator's seat only (North America only).</p>	 <p>V1076980</p> <p>10 Battery quick (dis-) connector</p>
 <p>10618628 V1077005</p> <p>11 Use low sulfur fuel (North America only)</p>	 <p>11803664 V1076958</p> <p>12 Fuel filler point (molded on tank, not a decal).</p>

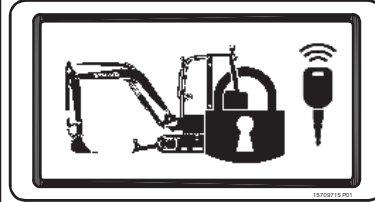
24 Presentation
Information and warning decals

 <p>11803665 V1076907</p> <p>13 WARNING! First read the Operator's Manual.</p>	 <p>V1129954</p> <p>14 WARNING! Move the control lockout lever up to lock the system securely when leaving the machine.</p>
 <p>V1198553</p> <p>15 Lifting with a Quick Coupler (if installed).</p>	 <p>V1199829</p> <p>16 Operator's stand control elements Read and understand control pattern before selecting switch position ISO or SAE functions (North America only).</p>
 <p>V1076984</p> <p>17 Locking console / procedure to start</p>	 <p>V1076956</p> <p>18 Lubrication and maintenance chart</p>



V1180545

19a Immobiliser System with keypad (optional equipment), see instructions on page 31.



V1180545

19b Immobiliser Antenna System (optional equipment), see instructions on page 38.

ISO 10567	1.0	1.2	1.4	1.6	1.8	2.0	2.2	2.4	2.6	2.8	3.0	3.2	3.4	3.6	3.8	4.0	4.2	4.4	4.6	4.8	5.0	5.2	5.4	5.6	5.8	6.0	6.2	6.4	6.6	6.8	7.0	7.2	7.4	7.6	7.8	8.0	8.2	8.4	8.6	8.8	9.0	9.2	9.4	9.6	9.8	10.0	
LB	1000	1200	1400	1600	1800	2000	2200	2400	2600	2800	3000	3200	3400	3600	3800	4000	4200	4400	4600	4800	5000	5200	5400	5600	5800	6000	6200	6400	6600	6800	7000	7200	7400	7600	7800	8000	8200	8400	8600	8800	9000	9200	9400	9600	9800	10000	
kg	450	550	650	750	850	950	1050	1150	1250	1350	1450	1550	1650	1750	1850	1950	2050	2150	2250	2350	2450	2550	2650	2750	2850	2950	3050	3150	3250	3350	3450	3550	3650	3750	3850	3950	4050	4150	4250	4350	4450	4550	4650	4750	4850	4950	5050

V1150751

20 Lifting capacities (not in machines without safety valves).



V1129955

21 WARNING! Fasten seat belt when operating the machine.



V1076977

22 Alternative exit path

Complies/Conformes
CAN ICES-2/NMB-2


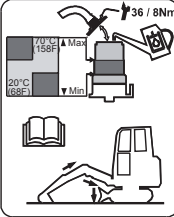

xxxxxxx

V1180289

23 Compliance with Canada's Interference-causing Equipment Standard (North America only).

Presentation

26 Information and warning decals

 <p>V1076959</p> <p>24 Sound power level outside the machine</p>	 <p>V1122016</p> <p>25 WARNING! Read and understand the hydraulic oil filling instruction before filling.</p>
 <p>4948103 V1076957</p> <p>26 Hydraulic oil filler point (molded on hydraulic tank, not a decal).</p>	

USA federal clean air act

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

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

The following acts and the causing thereof are prohibited:

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

The law prescribes a fine of up to \$2,750 USD for each violation.

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

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

Customer Assistance

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

Normal non-road engine use

The maintenance instructions are based on the assumption that this conventional machine will be used as designated in the operator's instruction manual and operated only with the specified fuel and lubrication oils.

28 Presentation USA federal clean air act

Non-road engine maintenance

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

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

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

Service performed by your local dealer

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

For scheduled service or maintenance, it is advisable to contact your local dealer in advance to arrange for an appointment to ensure availability of the correct equipment and service technician to work on your machine. In this way you will assist your local dealer in reducing the time required to do service on your machine.

Preventive maintenance program

In order for the conventional non-road engine to retain the reliability and performance parameters such as noise level and emission levels it had when delivered, it is essential that it receives regularly scheduled service, inspections, adjustments, and maintenance.

Fuel system

Fuel recommendations:

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

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

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

In order to avoid excessive sedimentation and to minimise the emissions of sulfur dioxide, the fuel's sulfur content should be as low as possible. The diesel fuels recommended for use shall meet ASTM designation: D 975 no. 1D (C-B) or no. 2D (T-T) with a cetane level above 42 and sulfur content not exceeding 0.05 percent by weight.

Check for fuel leaks (with the engine running at high idle):

- Visually check unions and hose connections.

Check the condition of the fuel hoses for:

- Ageing
- Cracks
- Blisters
- Scuffing

Check the condition of the fuel tank:

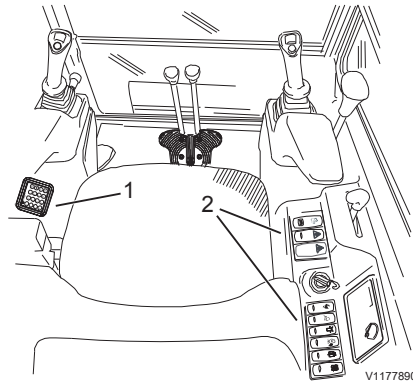
- Drain condensation water.
- Check for cracks.
- Check for leaks.
- Check the mounting.

Instrument panels

NOTE!

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

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



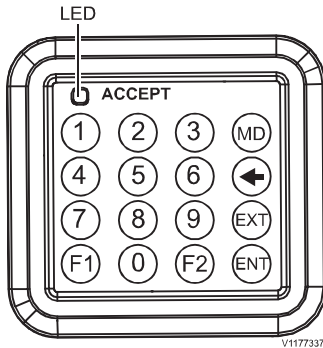
1	Instrument panel, left: Immobiliser system (optional equipment)
2	Instrument panel, right

Instrument panel, left

Immobiliser System (optional equipment)

NOTE!

The machine can be equipped with an Immobiliser System with keypad or an Immobiliser Antenna System at ignition (see page 38).



1. Keypad

- LED Shows system status by flash codes (see table below)
- 0-9 Number keys to enter codes
- F1 Function key 1
- F2 Function key 2
- MD MD key to enter Codes
- ← Arrow key
- EXT Exit key
- ENT Enter key

2. LED flash codes

No.	Status	Flash Code	Cyclic
0	disarmed	on for 3 s.	no
1	armed	flashes every 0.5 s. for 60 s.	
2	code stored/accepted	2 flashes	
3	code already in memory / program mode canceled	3 flashes	yes
4	program mode		no
5a	code failure	5 flashes + 4 flashes	yes
5b		4 flashes	
6	timeout	5 flashes	no
7	memory full	6 flashes	
8	all codes deleted	7 flashes	yes
9	memory empty	flash every 0.1 s.	
10	factory mode	flash every 0.5 s.	
11	monitoring mode	flash every 1 s.	

3. Concept

The Immobiliser System is delivered without Master or User Codes.

The 6-digit Master Code must be programmed to activate the system (follow item 4).

32 Instrument panels

Instrument panel, left

Then 4-digit User Code(s) must be programmed (follow item 5).

The machine can be started with User Code(s) only (6).

After you are logged in and ignition is off, you can start the engine again within 15 minutes (Flash Code 1, armed). If 15 minutes have elapsed (Flash Code 11, Monitoring), code must be entered again. If a Master Code is lost, contact a Volvo authorised dealer.



Key combination for 6-digit Master Code



Key combination for 6-digit Master Code



Key combination for 4-digit User Code



Key combination for 4-digit User Code

4. Programming 6-digit Master Code

- 1 Precondition: No Master Code in memory.
- 2 Insert ignition key into ignition switch and turn it to running position (position 1, see page 38).
→ Flash Codes 0 (disarmed) and then 10 (factory mode) appear.
- 3 Enter key combination for **6-digit Master Code** as shown.
- 4 Repeat step 3 to confirm.
→ Flash Code 2 (code stored/accepted) appears.
- 5 **4-digit User Code(s)** can be programmed now.

5. Programming 4-digit User Code(s)

- 1 Precondition: Master Code programmed.
- 2 Insert ignition key into ignition switch and turn it to running position (position 1).
→ Flash Code 1 (armed): Still logged in within 15 min. elapse time after ignition off.
→ Flash Code 11 (monitoring): Log in with key combination for **6-digit Master Code** as shown.
- 3 Enter new key combination for **4-digit User Code** as shown.
→ Flash Code 2 (code stored/accepted) appears.
- 4 Repeat step 3 for additional **4-digit User Code(s)**.
- 5 Engine can be started now.

6. Operating

NOTE!

Operating is only possible when you are logged in with 4-digit User Code!

- 1 Precondition: Master Code and User Code(s) programmed.
- 2 Insert ignition key into ignition switch and turn it to running position (position 1).

→ Flash Code 1 (armed): Still logged in within 15 min. elapse time after ignition off. Go to step 3.

→ Flash Code 11 (monitoring): Log in with key combination for **4-digit User Code** as shown.

3 You can start the engine now.

NOTE!

When a wrong User Code is used 5 times, the Immobiliser System will be locked for 10 minutes. The lock-out time will not be reset by switching off power for the A-ECU. The correct 4-digit User Code will reset the counter.

7. Deleting all 4-digit User Codes

NOTE!

Changing the 6-digit Master Code also deletes all 4-digit User Codes (see item 8).

1 Insert ignition key into ignition switch and turn it to running position (position 1).

2 Log in with key combination for **6-digit Master Code** as shown.

→ Flash Code 4 (program mode) appears.

3 Repeat step 2.

4 Press **EXT** and **F2**.

→ Flash Code 8 appears (all codes deleted).



Key combination for 6-digit Master Code



Key combination to delete all codes



Key combination to change 6-digit Master Code



Key combination for NEW 6-digit Master Code

8. Changing 6-digit Master Code with **F1**

NOTE!

All saved 4-digit User Codes will be deleted when the 6-digit Master Code is changed!

1 Precondition: Master Code programmed.

2 Insert ignition key into ignition switch and turn it to running position (position 1).

→ Flash Code 11 (monitoring)

3 Enter key combination to change **6-digit Master Code** as shown.

4 Enter key combination for **NEW 6-digit Master Code** as shown.

5 Repeat step 4 to confirm.

→ Flash Code 2 (code stored/accepted) appears.

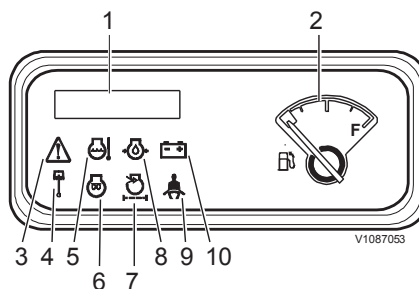
6 You can program new 4-digit User Code(s) now (see item 5.).

Display unit

The display unit is located on the right instrument panel.

An automatic test is performed on the I-ECU when the ignition key is turned to running position. For 3 seconds all the control lamps light up, buzzer sounds and fuel gauge needle goes to maximum position.

The preheating control lamp goes out as soon as the operating temperature is reached.



1	Operating hour meter
2	Fuel level gauge
3	Central warning lamp
4	Offset control lamp
5	Engine temperature control lamp
6	Preheating control lamp
7	Air filter control lamp
8	Engine oil pressure control lamp
9	Seat belt control lamp
10	Battery charge control lamp

1. Operating hour meter

- The operating hour meter shows the total number of machine operating hours.
- Maintenance work is to be carried out according to the reading of the operating hour meter.

2. Fuel level gauge

- The fuel level gauge shows the level in the fuel tank.
- Always refuel in due time, thus to prevent air from entering into the fuel system.



3. Central warning lamp (red)

The lamp lights up when control lamps 5, 7, 8 or 10 light up. The buzzer sounds when control lamp 5 and 8 lights up. If any red control lamp lights up, shut down the engine immediately, determine the cause and have the cause of the fault corrected as quickly as possible, or contact our service department.



4. Offset control lamp (green)

- The offset control lamp lights up green after offset switch on the right hand control lever has been switched to offset.
- If the accessory flow setting menu is activated, this symbol is flashing, in this case, this means that we are in settings menu.

The offset control lamp flashes 4 times per second to indicate one of the mistakes (1, 2 or 3) in X1, X3 or boom offset circuit:

- 1 Proportional valve mistake
- 2 Direction selector mistake
- 3 Mode selector mistake

If the mistake remains, contact a qualified service technician!

NOTE!

While turning ON the ignition switch or lowering the arm rest, a neutral detection is performed for the roller switch on the right control lever. The offset control lamp blinks when the roller is not in its neutral position and the proportional function (X1 or boom offset) is disabled.

The function becomes active (operational) once the roller comes back to its neutral position.



5. Engine temperature control lamp (red)

- The engine temperature control lamp lights up in case of impermissibly high engine temperatures and the buzzer sounds.
- Shut down the engine, perform trouble shooting, if necessary contact a qualified service technician.



6. Preheating control lamp (yellow)

- Ignition key in preheating position, the control lamp lights up and goes out as soon as the specified operating temperature is reached.



7. Air filter control lamp (yellow)

- The control lamp informs about the condition of the air filter.
- If the control lamp lights up during operation in connection with central warning lamp (3), shut down the engine, clean or replace the air filter immediately, if necessary contact a qualified service technician.



8. Engine oil pressure control lamp (red)

- The control lamp indicates low engine oil pressure.
- If the control lamp lights up during operation in connection with general control light (3), shut down the engine and perform trouble shooting. If necessary contact a qualified service technician.



9. Seat belt control lamp (red)

Always fasten your seat belt when operating the machine.

- The control lamp will illuminate when the seat belt is not fastened. The control lamp goes out as soon as the seat belt is fastened.



10. Battery control lamp (red)

- The control lamp indicates the charge condition of the battery. The control lamp lights up if the battery is not being charged.
- If the control lamp lights up during operation in connection with general control lamp (3), turn off the engine, perform trouble shooting. If necessary contact a qualified service technician.



Central warning lamp



Engine temperature control lamp



Engine oil pressure control lamp

Automatic engine shutdown function

This function is made to avoid engine damage. In case of low oil pressure or high water temperature (or both) the central warning lamp, the related lamps (engine temperature control or engine oil pressure control) and the buzzer are activated.

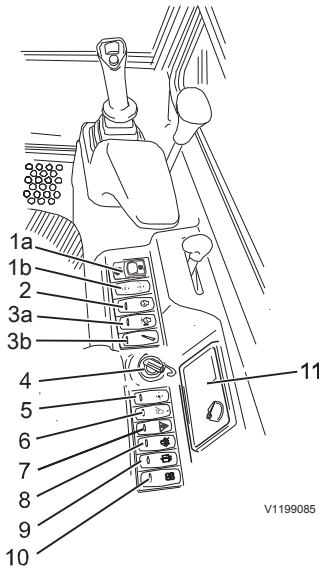
The engine will shut down automatically if these warning conditions are still valid after 15 seconds.

To retrieve the machine out of a dangerous area the engine can be restarted.

- Turn the key to off position and start the engine again. The countdown resets and if conditions are still valid it will shut down again after 15 seconds.



38 Instrument panels
Instrument panel, right



Instrument panel, right

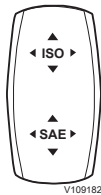
1a(a)	ISO / SAE selector switch (optional)
1b(a)	Attachment Quick Coupler switch (if installed, not for EC15E)
2	Switch for automatic engine speed control — auto idle (optional, not for EC15E)
3a(b)	Switch for automatic shutdown (optional, not for EC15E)
3b(b)	Switch for attachment (optional, if not assigned here, you can use the front button on the right lever, read chapter <i>Controls</i> on page 45)
4	Ignition switch (optional with Immobiliser Antenna System)
5	Hydraulic lock switch (optional)
6	Switch for working lights on cab (optional) and boom
7	Switch for variable tracks (not for EC15E)
8	Switch for rotating beacon (optional)
9	Switch for windscreen washer
10	Switch for fan
11	Display unit

a) alternatives, same position

b) alternatives, same position

1a. ISO / SAE selector switch

(optional)



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.

- Press upper end of switch: ISO control pattern is on.
- Press lower end of switch: SAE control pattern is on.

1b. Attachment Quick Coupler Switch (optional, not for EC15E)

WARNING

Risk of crushing!
Attachments that move unexpectedly can cause injuries.

Make sure people stay out of the working area when connecting or disconnecting attachments.

NOTE!

Here only the steps how to use the Attachment Quick Coupler are described. For the whole process of disconnecting and connecting Attachments with the Quick Coupler, read chapter *Attachment quick coupler* on page 112.

- 1 Make sure the switch is in position *Neutral* (B).
- 2 **To start** the process of opening the Attachment Quick Coupler:
Press down the lower end of the switch (A) and release.

→ The switch moves back to position *Neutral* (B).

Now and during the whole process:

→ The symbol of lower end of switch (A) illuminates.

→ The symbol of Attachment Quick Coupler in the display illuminates.

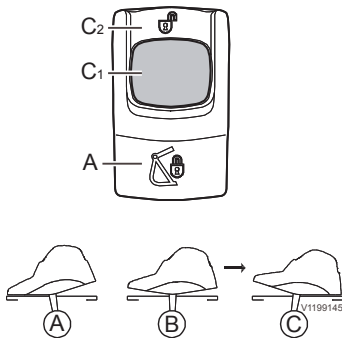
→ a beep sound arises.

NOTE!

If undesired action, the process can be cancelled at this point by pressing the lower end of the switch (A) again.

- 3 **To open** the Attachment Quick Coupler:
Unlock and press down the red button (C1) and the upper end of the switch (C2):
→ The Attachment Quick Coupler opens and the switch remains in position C.

The Attachment can be disconnected and the new one connected now. Read the instructions in chapter *Attachment quick coupler* on page 112.



Attachment Quick Coupler Switch, Positions

40 Instrument panels Instrument panel, right

- 4 **To close** the Attachment Quick Coupler, return the switch to position *Neutral* (B).

NOTE!

Before finishing the process, the correct lock has to be checked outside the machine directly at the Attachment Quick Coupler.

- 5 **To confirm** the correct lock and to finish the process:
Press down the lower end of the switch (A) and release.
→ The process is finished, when the illuminations and the beep end.

2. Switch for automatic engine speed control — auto idle

(optional, not for EC15E)

- Operation activates the automatic engine speed control. The throttle lever may remain in any desired position. With stopping the work load the automatic engine speed control reduces the engine speed to idle speed level after approx. 5 seconds
- When operating a control lever the engine speed will rise again up to the speed level set by the throttle lever



3a. Switch for automatic shutdown

(optional, not for EC15E)

- Press lower end of switch = automatic shutdown is off
- Switch in middle position = engine will shut down after 2 minutes of inactivity
- Press upper end of switch = engine will shut down after 10 minutes of inactivity



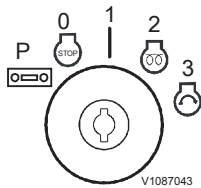
NOTE!

A countdown sound signal of around 10 beeps will appear before shutdown

To restart, the ignition switch must first be put in pos. 0. See also point 4.

3b. Switch for attachment (optional)

If not assigned here, you can use the front button on the right lever, read chapter *Controls* on page 45.)



- Press upper end of switch: the function of the (optional proportional) roller switch on the right hand control lever is set to attachment movement.
- Press lower end of switch: the function of the (optional proportional) roller switch on the right hand control lever is set to offset boom.

4. 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

NOTE!

Turn the key off before re-starting the engine to prevent starter damages.

Immobiliser Antenna System (optional equipment)

NOTE!

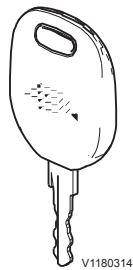
The machine can be equipped with an Immobiliser Antenna System at ignition or an Immobiliser System with keypad on left instrument panel (see on page 37).

Transponder Keys

The Immobiliser Antenna System is equipped with:

- 1 Master Key (red)
- 2 User Keys (blue)

These keys are delivered in taught status ready to be used. Up to nine User Keys can be taught/stored for the machine.



Transponder Key
Red: Master Key
Blue: User Key

Master Key (red)

The Master Key is needed to:

- Teach User Keys

42 Instrument panels Instrument panel, right

- Delete stored User Keys

NOTE!

The Master Key cannot be used for operating the machine.

NOTE!

Taught User Keys will be deleted after 20 seconds, when Master Key is inserted into ignition switch and turned to running position (position 1)!

User Key (blue)

Taught User Keys are recognized by the A-ECU and the machine is disarmed from the Immobiliser system.

Teaching User Key

- 1 Condition: The maximum of 9 User Keys in memory is not reached yet.
- 2 Insert Master Key into ignition switch and turn it to running position (position 1).

NOTE!

Continue with step 3 before 20 seconds have elapsed or stored User Keys will be deleted.

- 3 Turn ignition switch back to position 0 and remove the Master Key.

NOTE!

You now have 20 seconds (teaching mode) to continue with step 4. Otherwise, teaching mode is cancelled.

- 4 Insert User Key into ignition switch and turn it to running position (position 1).
→ User Key is taught/stored.

Now you can:

- teach the next User Key by removing the taught User Key and repeat step 4 inside 20 seconds, or
- start the machine.

Operating

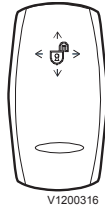
The machine is operated with the User Keys as usual.

NOTE!

When a not-taught User Keys is used 5 times, the Immobiliser System will be locked for 10 minutes. The lock-out time will not be reset by switching off power for the A-ECU. Any correct taught key will reset the counter.

Deleting all taught/stored User Keys

- 1 Condition: Taught/stored User Keys in memory.
- 2 Insert Master Key into ignition switch and turn it to running position (position 1).
- 3 Wait 20 seconds.
→ All User Keys are deleted.



5. Hydraulic Lock switch (optional)

When installed, after starting procedure with locking console in vertical position (read instruction in chapter *Starting engine*, page 74), also the **hydraulic lock switch** must be pressed to open the hydraulic circuit.

- Locking console in vertical position.
- Press hydraulic lock switch.
→ Hydraulic lock switch illuminates.
→ Machine can be operated (Hydraulic is unlocked).

If machine is equipped with a **Seat Sensor**, the hydraulic stops when getting up from seat.
→ To enable hydraulic back, sit down and press hydraulic lock switch.

6. Switch for working lights

- Press lower end of switch = working lights are off
- Switch in middle position = front working lights are on
- Press upper end of switch = front working lights, rear working light (optional equipment) and working light on boom (optional equipment) are on

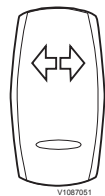
NOTE!

The working lights can only be switched on if the ignition has been activated (running position/ position 1).

7. Switch for variable tracks

(not for EC15E)

- Activate this switch and the track can be adjusted via the dozer blade control lever (see page 45)



44 Instrument panels Instrument panel, right



8. Switch for rotating warning beacon

- Press upper end of switch = the rotating warning beacon is on
- 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.



9. Switch for windscreen wiper and washer

- Press lower end of switch = windscreen washer and wiper are off
- Switch in middle position = windscreen wiper is on
- Press upper end of switch = windscreen wiper and windscreen washer is on

NOTE!

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



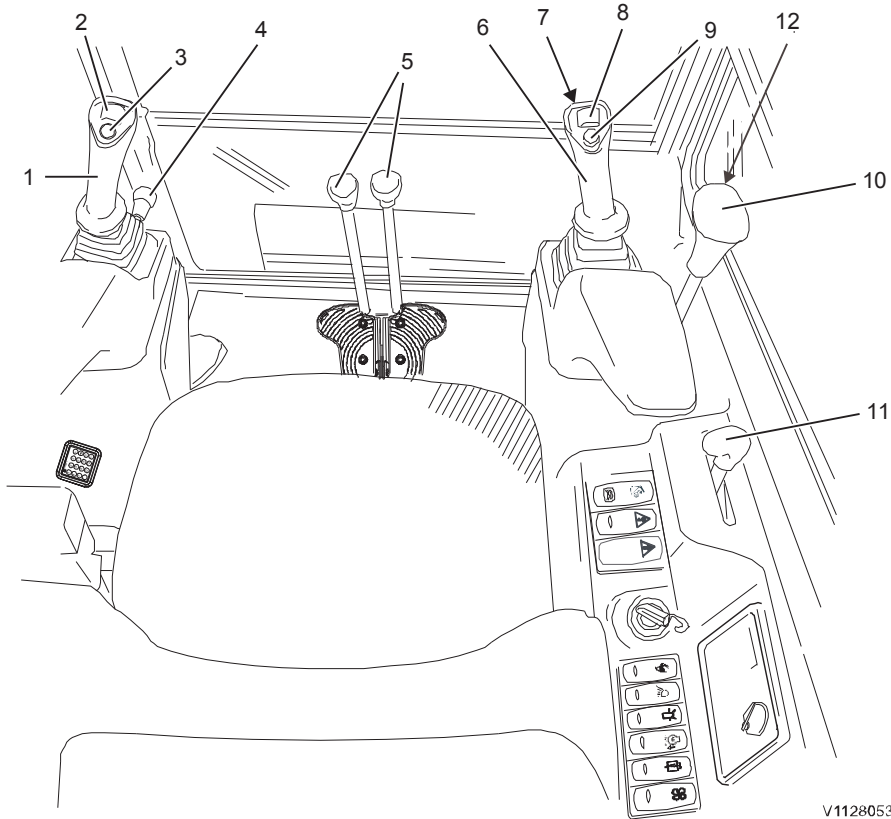
10. Switch for fan

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

11. Display unit

See page 34.

Other controls Controls

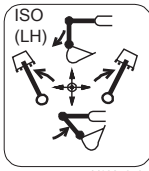


V1128053

1	Left hand control lever for attachments
2	Proportional roll switch to control X3 hydraulic flow (optional equipment)
3	Horn
4	Control lockout lever for hydraulics
5	Control levers for travel motion (pedals are optional equipment)
6	Right hand control lever for attachments
7	Push button for X1 max flow (optional equipment)
8	Rocker switch or proportional roll switch to control X1 or boom offset hydraulic flow

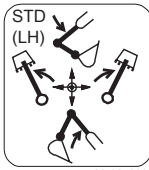
46 Other controls
Controls

9	Offset boom or X1 selection (optional equipment).
10	Dozer blade control lever (can be switched to extend tracks, optional, not for EC15E)
11	Throttle lever
12	Button to change between high travel speed and low travel speed (optional, not for EC15E)



V1087059

Decal ISO control pattern



V1087060

Decal STD control pattern

1. Left control lever for attachments (ISO control 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 attachments (STD control pattern, North America only)

- 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.

NOTE!

Market dependent optional equipment. North America only. See control pattern selector switch in chapter Instrument panels, right, on page 38.

WARNING

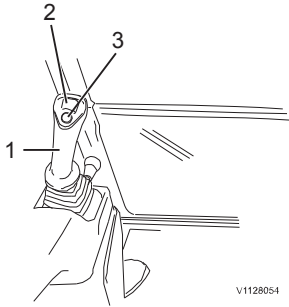
Risk of serious accidents.

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.

2. Proportional roll switch to control X3 hydraulic flow (optional equipment)

- Proportional roll switch to operate optional equipment (X3, for example rototilt bucket).



Left control lever

Hydraulic oil flow, changing maximum setting for X3

There is a possibility to set the maximum hydraulic oil flow used for X3, see “Hydraulic oil flow, changing maximum setting for X1 and X3” under the explanation of position 8.

3. Horn

- Button depressed: Horn signal.



V1087062

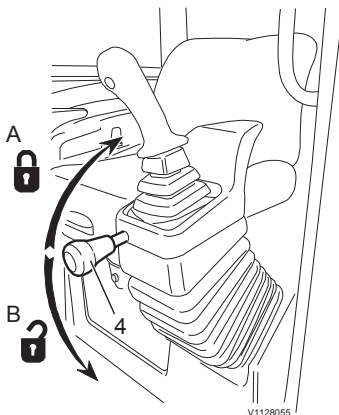
4. Control lockout lever for working and travel

- Shift the lever to position (A). The operating levers for working and travel hydraulics are locked (no movement possible).

NOTE!

The control lockout lever must be fully in the upper position to secure that the hydraulic is locked.

- Shift the lever forward to position (B). The operating levers for working and travel hydraulics are unlocked (working position).



V1128055



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.

5. Control levers for travel motion

(pedals are optional equipment)

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

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.

- 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!

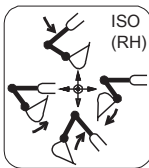
When operating the travel levers the travel alarm (optional, not for EC15E) emits a warning signal.

6. Right control lever for attachments (ISO control pattern)

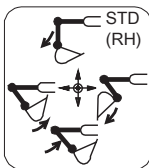
- Lever forward: Boom down.
- Lever backward: Boom up.
- Lever to the right: Empty the bucket (opening).
- Lever to the left: Fill the bucket (closing).

Right control lever for attachments (STD control pattern, North America only)

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



Decal ISO control pattern



Decal STD control pattern

- Lever to the left: Fill the bucket (closing).

NOTE!

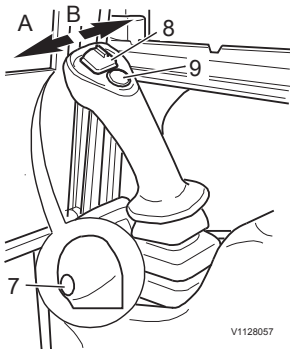
Market dependent optional equipment. North America only. See control pattern selector switch in chapter Instrument panels, right, on page 38.

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.

7. Push button for X1 max flow (optional, not for EC15E)

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



Right control lever



8. Rocker switch or proportional roll switch to control X1 or boom offset hydraulic flow

- Switch in central position: Neutral
- Switch to the left (A) in boom offset mode: offset boom to the left
- Switch to the right (B) in boom offset mode: offset boom to the right
- Switch to the left (A) in X1 mode: accessory flow through pipe on left side of boom

- Switch to the right (B) in X1 mode: accessory flow through pipe on right side of boom

NOTE!

While turning ON the ignition switch or lowering the arm rest, a neutral detection is performed for the roller switch on the right control lever. The offset control lamp blinks when the roller is not in its neutral position and the proportional function (X1 or boom offset) is disabled.

The function becomes active (operational) once the roller comes back to its neutral position.

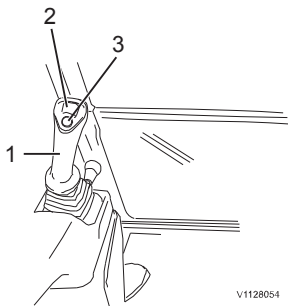
Hydraulic oil flow, changing maximum setting for X1 and X3

There is a possibility to set the maximum hydraulic oil flow used for the first auxiliary (X1) and for X3 (only for machines equipped with switches 7 and 9 and on 8 with a proportional roll switch).

- 1 Select the boom offset mode. The control lamp in the instrument panel lights up when the offset boom is activated.

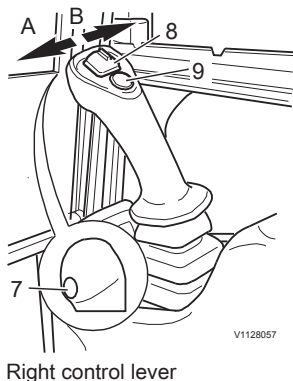
NOTICE

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.



Left control lever

V1128054



- 2 First press the switch for optional equipment (7) and then at the same time press selector switch (9) on the right control lever. Keep both switches depressed in 5 seconds until the boom offset control lamp is flashing in the instrument panel. As long as the control lamp flashes the attachment movement is activated and changing the maximum hydraulic oil flow setting is possible.
- 3 To change the setting for the X1: Move the proportional roller (8) on the right 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 switch for optional equipment (7) to confirm.
- 4 To change the setting for the X3: Move the proportional roller (2) 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 switch for optional equipment (7) on the right control lever to confirm.
- 5 Make sure that the control lamp for boom offset on the information panel has stopped flashing.

Exit without saving a new value:

- 1 Shift the control lockout lever upwards.
- 2 Turn the ignition key to off position.
- 3 Control lamp flashes more than 15 minutes.

9. Offset boom or X1 selection (optional, not for EC15E)

When actuating this switch (9), function of the proportional roller on the right hand lever changes between offset boom and attachment movement. The switching mode can operate only if the roller is in neutral position.

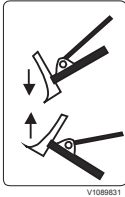
NOTE!

Machines without this button on the right hand control lever have a switch for attachment on the right instrument panel, see page 38.

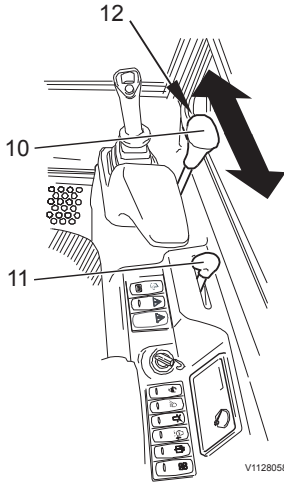
NOTE!

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

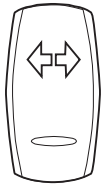
52 Other controls Controls



V1089831



V1128058



V1087051

Switch for variable tracks

10. Dozer blade control lever

The control lever controls the position of the dozer blade.

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

After pressing the switch for variable tracks (instrument panel right, read page 38), the control lever controls the variable tracks (optional, not for EC15E),

- Lever forward: Extending tracks.
- Lever backward: Reduction of tracks width.

11. Throttle lever

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

12. Button to change between high travel speed and low travel speed

(optional, not for EC15E)

- Hold button depressed for fast travel speed.
- Release button for low travel speed.



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.

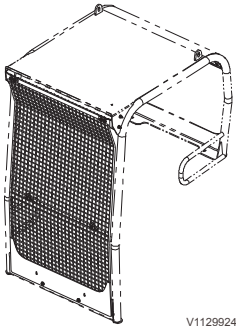
Protection from falling or scattering materials (optional equipment)

OPG Level 1

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.

The top of the canopy is approved as a protective structure according to the OPG (Operator Protective Guard) Level 1. OPG 1 front is available as option on canopy.



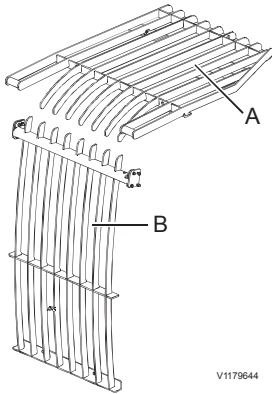
V1129924

OPG 1 front for canopy

OPG Level 2

To comply with OPG (Operator Protective Guards) Level 2, 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 2 top
B OPG 2 front

By installing OPG 2 top (A) and front (B), cab and canopy are 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 seat

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

NOTICE

To obtain maximum comfort and eliminate the risk of accidents, you must make sure that all seat adjustments have been carried out correctly before starting the machine.

NOTE!

The seat is intended for use by one seated occupant only.

Operator's seat, adjusting

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.

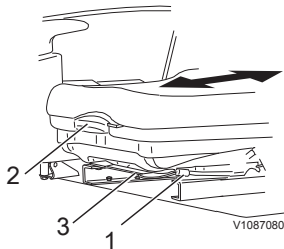
WARNING

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.

NOTICE

Installation and maintenance of the operator seat may only be carried out by authorised and competent personnel.



Operator's seat, option variant A

Horizontal adjustment

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

Backrest adjustment

- 1 Pull lever (2) slightly up.
- 2 Adjust the inclination of the backrest.

NOTE!

Adjusting the backrest automatically changes the horizontal adjustment of the seat!

Weight adjustment

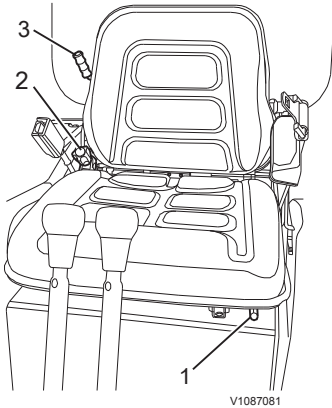
Resetting to zero:

Pull lever (3) fully back to reset the weight adjustment to the minimum weight.

Adjustment depending on the weight of the operator:

Pull lever (3), until the desired weight is displayed.

58 Other controls Operator comfort



Operator's seat, option variant B

Horizontal adjustment

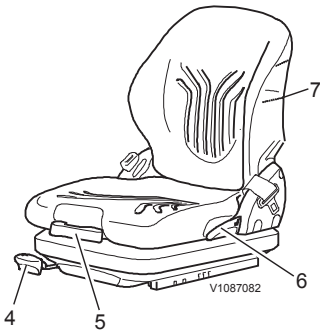
- 1 Pull lever (1) slightly up.
- 2 Adjust the seat to the desired position.
- 3 Check that the seat has properly engaged.

Backrest adjustment

Turn the knob (2) to the desired setting.

Weight adjustment

Pull lever (3) upwards or downwards until the desired adjustment is reached.



Operator's seat, option variant C

Horizontal adjustment

- 1 Pull lever (4) slightly up.
- 2 Adjust the seat to the desired position.
- 3 Check that the seat has properly engaged.

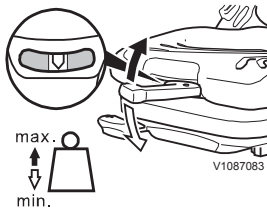
Backrest adjustment

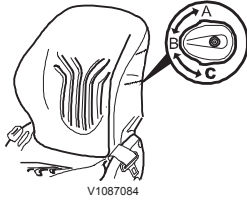
- 1 Pull up lever (6).
- 2 Adjust the inclination of the backrest. Release the lever to lock the backrest.
- 3 Check that the backrest has properly engaged.

Weight adjustment

The weight is adjusted with the operator sitting in the seat.

- 1 Pull lever (5) fully out, stay in this position and move lever upwards or downwards until the desired weight adjustment is reached. When the minimum/maximum has been reached you can notice an empty movement in the lever.
- 2 The weight has been set correctly when the arrow is in the middle of the viewing window.
- 3 Lock the lever again.





Lumbar support

By turning the adjustment knob (7) the curvature in the upper and lower part of the backrest is adjusted.

- A Maximum curvature on the upper part of the backrest
- B No curvature
- C Maximum curvature on the lower part of the backrest



Seat belt

NOTE!

A seat belt that is damaged or has been stretched in an accident must be replaced immediately.

NOTICE

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

- 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.

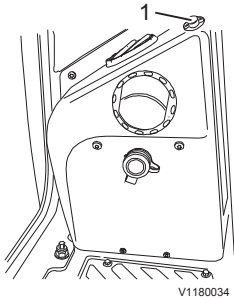
Power socket

The power socket is used for electrical devices such as a mobile phone charger or to supply electricity to a lamp. (Voltage: 12 V, Amperage: 5 A, Power: 60 W).

The power socket is placed on the left hand side of the operator's seat.



60 Other controls Operator comfort



1 Heater

Heater

The heater (1) is located inside the cab on the right side.

Windows

Upper windscreen

Loosen windscreen (1):

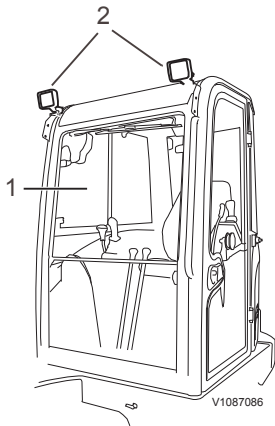
- 1 Push the buttons (3) on both sides.
- 2 Then push the windscreen upward under the cab roof.

NOTICE

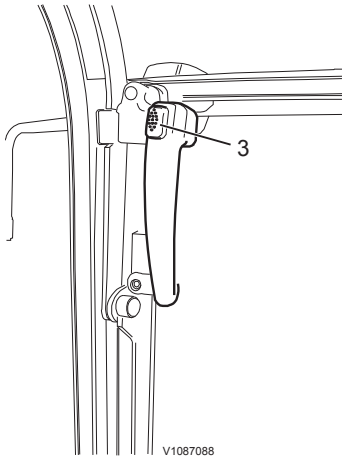
The windscreen is fastened in the roof when you hear a click.

Close windscreen:

- 1 Push the buttons (3) on both sides.
- 2 Push the windows down into position.



1 Windscreen
2 Working lights



V1087088

Working lights

Working lights (2) 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.

Door

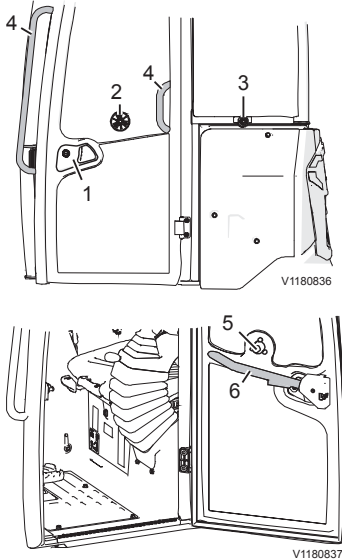
WARNING

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 machine 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).
- By pressing the unlocking button (5) the cab door can be unlocked and closed.
- Make sure that the cab is parallel to tracks when entering the machine. That allows best possible access situation.



Operator's manual, storage

The operator's manual is stored in the lockable storage box under the operator seat. Keep the manual in the storage box so that it is always at hand.

Fire extinguisher, location

Possible location for a fire extinguisher is, if you have a canopy, behind the seat against the rear plate and, if you have a cab, along the right hand rear pillar.



Emergency exit

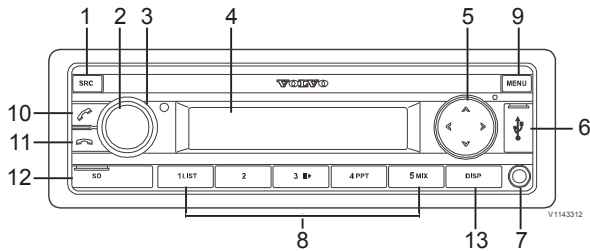
The alternative exit path is through the rear window (its location is marked with the information decal shown to the left). In case of a turnover or accident, if the door is blocked, use the emergency hammer, located on the rear pillar on the left hand side of the machine, to brake the window and leave the cab.

Audio system

(optional equipment)

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

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.
 - 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



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.

Running-in instructions

During the first 100 hours, the machine should be operated with a certain care. It is important to check oil and fluid levels often during the running-in period.

Visibility



Risk of serious accidents.

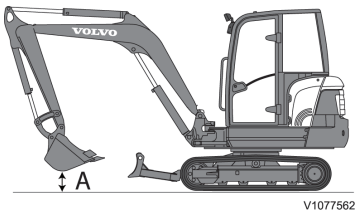
Machine parts, equipment or load could obstruct the operator's view. Operating or driving with obstructed operator's view could cause serious accidents.

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, mirrors, and closed-circuit television cameras (CCTV) may be used.

In order to minimize hazards that may be caused by restricted visibility, rules or procedures shall be



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

established by the job site management. For example:

NOTE!

Some parts of the basic machine may restrict visibility, for example, the cab's pillars, frames, exhaust pipe, engine hood, as well as optional equipment such as buckets, pallet forks, grapples, and so on. The load that is handled with these attachments may also restrict visibility.

- Ensure that operators and job site workers have received thorough safety instructions.
- Control the traffic patterns for the machine and other vehicles. Avoid travelling in reverse if possible.
- Restrict the machine's operating area.
- Use a signalman to help the operator. Use signals according to the signal diagram, see page 132.
- Provide two-way communication equipment if necessary.
- Ensure that job site workers communicate with the operator before approaching the machine.
- Use warning signs.

Standard ISO 5006 "Earthmoving machinery- Operator's field of view" deals with the operator's visibility around the machine and is meant to be used for measuring and evaluating the visibility.

The machine is tested by methods and performance criteria according to this standard. The visibility method used may not include all aspects of the operator's visibility, but provides information for determining if additional devices for indirect visibility, such as warning systems, are necessary.

The test was performed on machines with standard equipment and attachment. If the machine is modified or fitted with other equipment or attachment, which results in impaired visibility, it should be re-tested according to ISO 5006.

If other equipment or attachments are used and the visibility has been impaired, the operator should be informed.

Conforming to the standard is a requirement in EU-countries and provides for improved visibility around the machine.

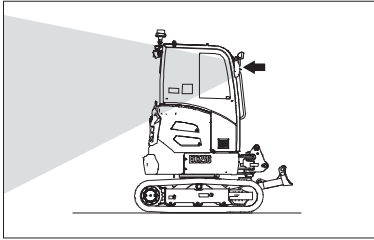
Operating instructions

66

Mirror setting

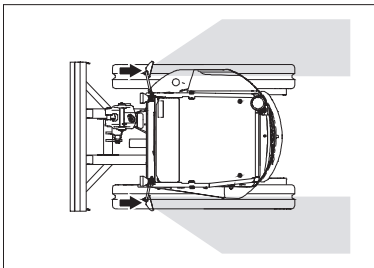
Mirrors (optional), adjusting

Rear-view mirrors (optional)



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Machine's right view (mirrors optional)



V1180769

Machine's top view (mirrors optional)

Using rear-view mirrors helps to get more comfortable visibility without torso rotation. Adjust it as good surrounding visibility is obtained while operating.

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 beacon (optional equipment) are working correctly.
- 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 work area, i.e., the area around the machine and at least 7 m (23 ft) beyond the maximum reach of the attachment. However, depending on the job site's organization, the operator may allow a person to remain in the work area, but must then observe caution and operate the machine only when the person can be seen or has given clear indications of where he or she is.

Never allow any person to walk or stand under raised equipment or suspended loads.

Safety rules when operating

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

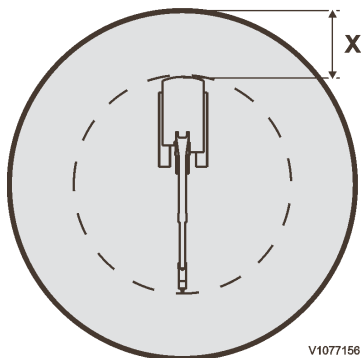
Operator obligations

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.

70 Operating instructions Safety rules when operating

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.**

■ Never leave the working station to egress even partially from the cabin or canopy by the front or side during operation. The left armrest shall always be in upright position before unfasten the seat belt and moving within the operator station. It is recommended to always bring the equipment to ground and stop the engine before entering or leaving the machine for short term job purposes.

■ Check that the seat belt is not worn, see page 59.

■ 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.

Operating instructions Safety rules when operating 71

- 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.

NOTICE

Risk of machine damage!

Improper use could cause serious machine damage.

Never anchor or fix the undercarriage to the ground or any object when digging or lifting.

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

72 **Operating instructions** **Safety rules when operating**

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.



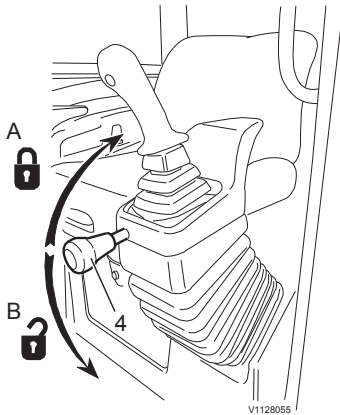
V1065709

Measures before operating

For safety, observe the following rules.

- Read the Operator's manual.
- Carry out daily service, see page *Lubrication and service chart*. 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 quick coupler (optional equipment).

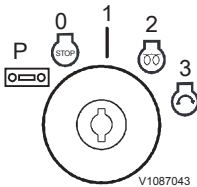
Starting engine



- 1 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).
- 2 Insert the ignition key into the ignition switch and turn it to running position (position 1). All control and function lamps (except preheating lamp) light up for a period of approx. 3 seconds.

NOTE!

The control lockout lever must be fully in the upper end position to secure that the hydraulic is locked.

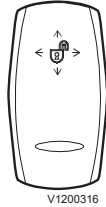


- P: Radio and cab interior light
0: Engine off
1: Running position / Ignition
2: Preheating
3: Start the engine

- 3 The control lamps engine oil pressure and battery charge control must light up.
- 4 Adjust the throttle lever to the minimum engine speed.
- 5 Turn the key to preheating (position 2).
- 6 Preheat depending on engine temperature. At colder temperatures longer preheating is needed. The preheating control light goes out after 5 seconds. However, if the ignition key remains in preheating position, 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 position start the engine (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 and repeat the starting procedure.

NOTE!

Turn the key off before re-starting the engine to prevent starter damages.



V1200316

Hydraulic lock switch (optional)



V1085793

Control lamp for preheating



V1085821



V1085818

These control lamps must light up when you turn the ignition key to position 1.

- 9 Let the engine warm up during at least one minute before operating the machine.
- 10 Shift control lockout lever to horizontal position to be able to operate the machine.

NOTE!

In case the machine is equipped with a hydraulic lock switch and/or a seat sensor, read the instruction to unlock the hydraulic in chapter *Instrument panel, right* on page 38.

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

Warm-up instructions

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

NOTE!

Do not disconnect the battery when the engine is running.

NOTE!

Turn the key off before re-starting the engine to prevent starter damages.



Starting with booster batteries

WARNING

Risk of explosion.

Batteries could explode due to the current surge if a fully charged battery is connected to a completely discharged or frozen battery.

Do not boost start a machine with a completely discharged or frozen battery.

When starting with booster batteries, check that the booster batteries or other power source have the same voltage as the batteries of the machine. If the batteries in another machine are used the engine of that machine must be turned off.

NOTICE

Do not attempt to start the engine while the battery charger is still connected to the mains. This may cause serious damage to the electronic control units.

- 1 Disconnect the battery by removing the quick connector (see page 79).
- 2 Remove the protections from the battery pole studs.
Connect two 12 V batteries as follows :
- 3 Connect one of the jump leads between (+) terminal on the battery of the machine and the (+) terminal on the booster battery.
- 4 Connect the other jump lead between the (-) terminal of the booster battery and a grounding point on the machine.

NOTICE

Do not connect ground to the undercarriage on the machine. This may seriously damage the swing bearing.

- 5 Connect the batteries to the machine.
- 6 Start the engine with the ignition switch in a cab.
- 7 Leave the batteries connected for 5-10 minutes after starting the engine.
- 8 Disconnect the jump lead from the chassis connection on the machine, and then disconnect the other end of the jump lead from the (-) terminal on the booster battery.

- 9 Finally disconnect the jump lead between the (+) terminals.
- 10 Re-install the battery pole stud protections.

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.

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: Set the throttle lever to idle speed position.

NOTE!

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

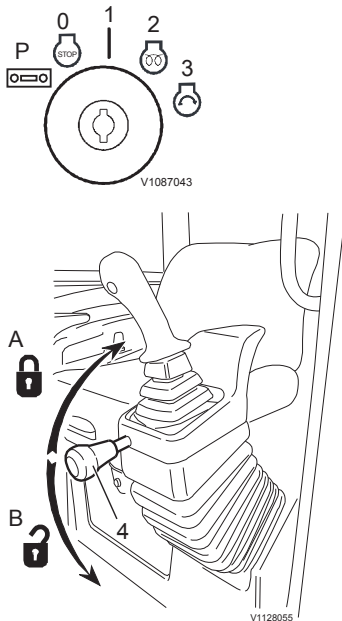
- 4 To shut the engine down turn the ignition key to "Stop engine" (position 0). The control levers for working and travel hydraulics are locked (no movement possible).
- 5 All control lamps go out.
- 6 Check whether all switches and controls are switched off or deactivated.
- 7 Remove the ignition key to prevent unauthorised use of machine.

NOTE!

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

After operation

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



Parking

WARNING

Risk of crushing.

A raised attachment could fall and cause crushing injury.

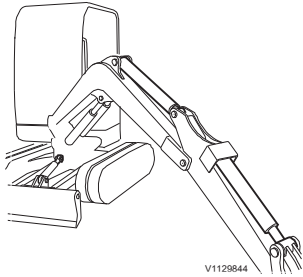
Before leaving the cab, always lower all attachments to the ground and lock the control functions.

- 1 Park the machine on firm, horizontal ground.
- 2 Open the bucket totally and lower it to the ground. 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 Turn off the engine and pull out the ignition key.
- 5 Check that there is enough anti-freezing solution in the cooling system (see page 103) and in the windscreen washer reservoir if the temperature can fall below -20 °C (-4 °F) during parking.
- 6 Close and lock windows, door and covers.
- 7 The battery can be disconnected, read the instruction in next chapter *Long-term parking*.

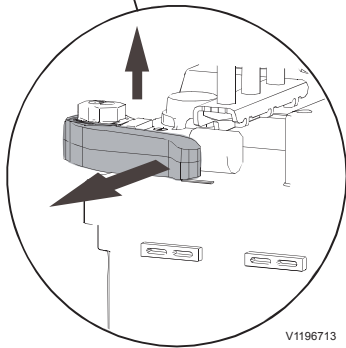
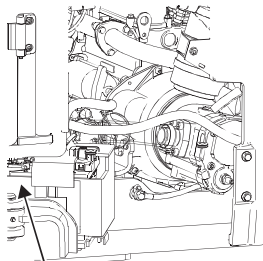
Keep in mind that the theft and burglary risk can be minimised by:

- removing the starter key when the machine is left unattended
- locking doors and covers after working hours
- turning off the current with the battery quick connector (see page 79).
- 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.

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 position



Battery Quick connector under left hood

Long-term parking

NOTICE

If the machine is not going to be used every day, all cylinders should 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 Disconnect the battery by removing the Quick connector. Open the left hood with the ignition key.
- 5 Wash the machine and touch up any damaged paint finish to avoid rusting.
- 6 Rust-proof exposed components, lubricate the machine thoroughly and grease all unpainted surfaces like cylinder rods etc.
- 7 Fill the fuel tank and the hydraulic oil tank to the max. marks.
- 8 Cover the exhaust pipe (for outdoors parking).
- 9 Drain water from any compressed-air reservoirs.
- 10 Make sure the freezing point of the coolant is sufficiently low (in cold weather).
- 11 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

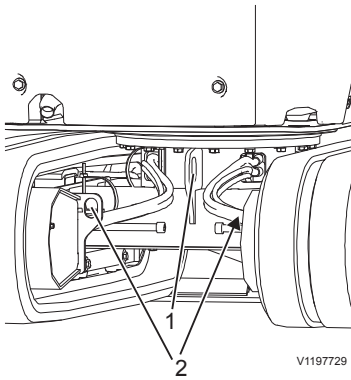
- Track tension

NOTE!

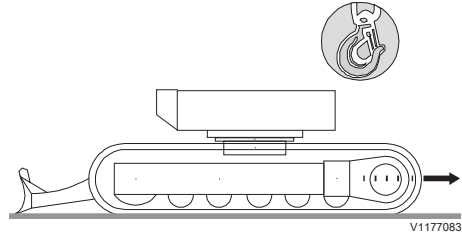
If a preservative has been used on the machine to prepare it for long term storage, follow the manufacturer's instructions for any necessary safety precautions and the method of removal.

Retrieving and towing

Towing



Towing eye (1) on lower frame
The outer eyelets (2) are not suitable for
towing or tying down.



In case the machine needs to be retrieved, either for safety reasons, or under certain operational conditions, the machine can be towed by using the towing eye located on the lower frame. Before towing ensure that the towing linkage is properly connected, adequate for the purposes.

NOTE!

Use a steel chain of suitable strength to tow the machine. The machine should be towed at low speed and keep the towing distance as short as possible (the crawler tracks do not move).

The angle for pulling should not exceed 20° from the horizontal line of tow lope and longitudinal axis of the machine. Be careful there should not be also interference with parts of the machine.

Towing force: 2350 daN MAX

Attachments, alternative lowering

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.

WARNING

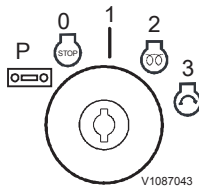
Risk of crushing.
A raised lift arm can drop down. This can result in serious injuries. Lower the lift arm to the ground before performing any service or adjustment.

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

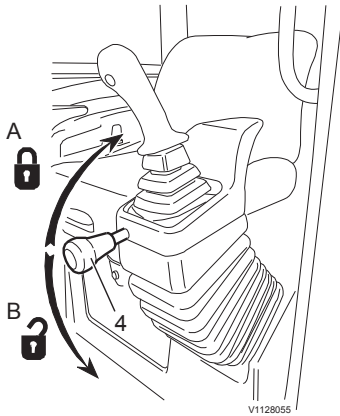
Lowering attachment using accumulator pressure

In case of standstill or engine defect.
If the electric power circuit is available and the accumulator is pressurised, 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 (position 1).



84 Operating instructions Attachments, alternative lowering



- 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 (1) and (6) (see page 45) 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.

Relieving residual pressure from the accumulator

- 1 Turn the ignition key to running position (1).
- 2 Move the control lockout lever down to unlock the system.
- 3 Shift the rollers on the joysticks to the right and to the left.
- 4 Then move the joysticks in all directions a couple of times to release all residual pressure.

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.

Lifting machine

WARNING

Risk of personal injury.

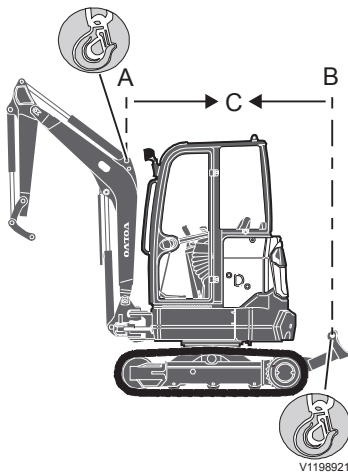
Faulty or improper lifting equipment could cause the machine to break away from the lifting vehicle, causing accidents, serious injury or death.

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.

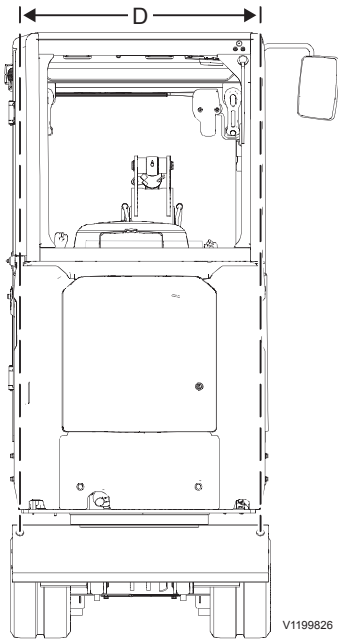
Make sure that the machine is in the same position as shown in the illustration. Use the specified lifting points to lift the machine. Two lifting points on the blade and one lifting point on the boom. The illustration shows the location of the lifting points.



Lifting points and Distance C

- 1 Park the machine on ground as solid and level as possible.
- 2 Remove any attachments.

86 Operating instructions
Transporting machine



Distance D

- 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 199.

NOTE!

Beware of interference between tying material (e.g. chains) and machine parts. Volvo is not responsible neither for lifting equipment nor for lifting techniques.

- 8 The distance (C) between axis A (lifting points on boom) and B (lifting points on blade) and distance (D, lifting points on blade) must be observed when lifting.

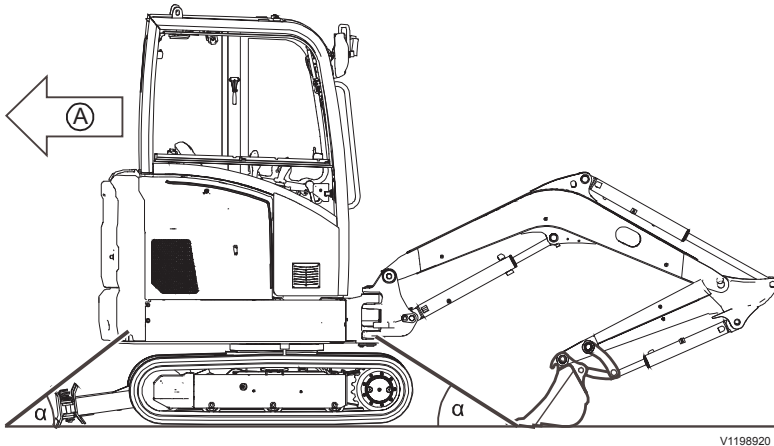
mm (in)	blade	C	D
EC15E		1633 (64.29)	930 (36.61)
EC18E	short	1683 (66.26)	
	long	1863 (73.35)	
ECR18E	short	1803 mm (70.98)	
	long	1983 (78.07)	
EC20E		1753 (69.02)	

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

NOTICE

Risk of contact between the lifting equipment and the machine when lifting.
This can lead to uncontrolled rocking of the machine and falling.
The lifting device on the blade must always be held vertically.

Loading machine on truck or trailer



Transporting Direction (A) and tie down angles (α)

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.

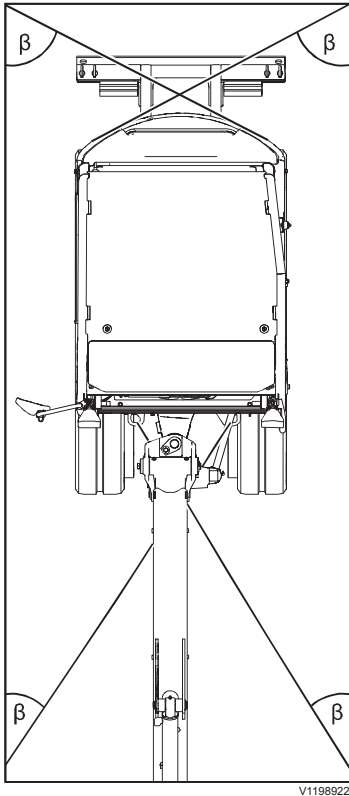
NOTE!

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.

- 1 Drive the machine onto the truck or small trailer (3.5 t).

88 Operating instructions Transporting machine



V1198922

Only ECR18E: Cross tying down both sides, Angles (β)

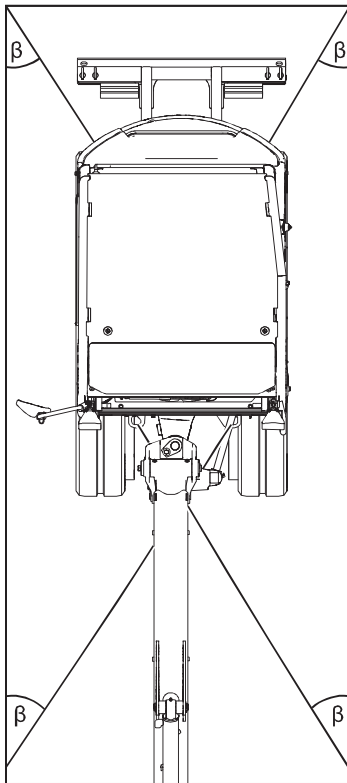
NOTE!

To avoid tilting, the boom must be in direction towards the ramp.

NOTE!

Never operate any lever other than the travel levers (pedals) while the machine is on the loading ramp.

- 2 Align the machine's tracks to the ramp.
- 3 Park the machine on the truck or trailer.
- 4 Place the attachment and the dozer blade on the wooden blocks as shown on the illustration.
- 5 Stop the machine and remove the ignition key.
- 6 Disconnect the battery (under left hood, remove battery quick (dis-) connector).
- 7 Lock the cab door and all lockable covers.
- 8 Secure both tracks with wheel chocks.
- 9 Tie the machine with chains and belts according the illustrations and the tie down procedure (see following instructions) to the loading platform of the truck/trailer. Use the indicated angles in the tables below and tie down forces indicated for truck or trailer!



Tying down EC15E, EC18E, EC20E;
Angles (β)

Tying down machine

NOTE!

On the rear part of upper frame, tie down devices **must not** be in contact with surrounding structural parts (pillars, hoods or other parts of the upper frame). If there is interference, use another device or change the tie down configuration.

NOTE!

For rail, maritime or container transportation, in addition to tying down devices, using blocks to restrain the machine is mandatory.

NOTE!

Depending on the transportation trailer geometry and on tying down points configuration, it may not be possible to fulfill the angles requirements. In this case, please refer to generic rules for cargo transportation (EN 12195).

90 Operating instructions
Transporting machine

- 1 Fix the chains and belts to the tie down points of machine and truck/trailer as shown in illustrations.
- 2 Tight the chains and belts in a loose way first.
- 3 Then tight the chains and belts solidly one after the other obliquely opposite.

NOTE!

During transportation the fixture has to be re-checked and probably tight again.

Tying-down on small trailer (3.5t)		EC15E and retracted tracks		Extended tracks		
Tracks		steel	rubber	steel	rubber	
Anti-slide mat		x	o	x	o	x ($\mu=0.6$)
Mechanical stops		x	x	x	x	—
Tie-down angles	α	10°–60°	10°–50°	10°–60°	10°–60°	10°–60°
	β		50°–90°		15°–90°	
Max. tie-down forces with these angles (DIN 75410)		400 daN				

Tying-down on truck			
Tracks		steel	rubber
Anti-slide mat		x ($\mu=0.6$)	x ($\mu=0.6$)
Mechanical stops		x	x
Tie-down angles	α	10°–40°	10°–60°
	β	50°–80°	15°–90°
Max. tie-down forces with these angles (DIN-EN 12640)		2000 daN	

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:

- **Stay in the most economical area**
Reduce rpm's in order to stay in the most economical area.
- **Do not idle unnecessarily**
A machine turned off does not consume any fuel.
- **Plan your work site**
Take care 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 195.

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.

94 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.

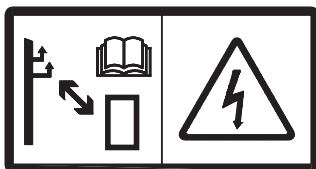
NOTICE

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, ditch 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

Operating techniques

Working within dangerous areas 97

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.

Operating techniques

98 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

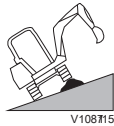
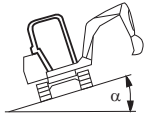
Loading and unloading is only permissible between the boundary signs. The signs may be mounted directly on the power line or on special posts.

- 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 132. The position of the pipe or cable may deviate from the drawing or distances may be incorrectly determined. Regard all electrical cables as live.

100 Operating techniques
Working within dangerous areas



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

Follow the recommendations for maximum permitted angle in the table below. Machine function may be compromised, e.g., lubrication, if recommendations are not followed. This may result in machine damage.

	In any machine position the maximum machine inclination should not be more than (a)	Manageable gradients (b) (engine lubrication)	Manageable gradients (c) (engine lubrication)
EC15E	$\alpha = 10^\circ$ (18%)	$\alpha = 20^\circ$ (37%)	$\alpha = 30^\circ$ (58%)
EC18E	$\alpha = 12^\circ$ (21%) $\alpha = 18^\circ$ (32%) (d)		
ECR18E	$\alpha = 19^\circ$ (34%) $\alpha = 24^\circ$ (45%) (d)		
EC20E	$\alpha = 11^\circ$ (19%) $\alpha = 15^\circ$ (27%) (d)		

a) $\alpha = 50\%$ of tipping limit

b) manageable gradient continually

c) manageable gradient for max. 10 minutes

d) with tracks in widest position

Operating techniques

Working within dangerous areas 101

Caution on slopes

- 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 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.

102 Operating techniques Working within dangerous areas

Check also that no water has entered the travel gearbox.

NOTICE

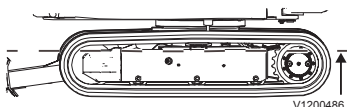
Risk of machine damage.

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 designated level on undercarriage (see illustration left).



Highest water level

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 landslip

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 landslip. 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 landslip. 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,

Operating techniques
Working within dangerous areas 103

road verges or similar, as the ground may easily give way after it has been raining.



Working in cold weather

 **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.

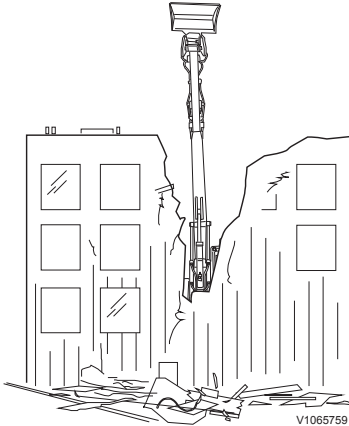
Operate carefully until the hydraulic system has reached operating temperature.

Read the advice for starting, see page 74 .

Use appropriate fluids for the ambient working temperatures. (see recommended fluids in specification section.)

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.



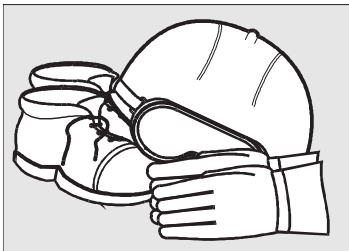
Demolition work

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 114 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.

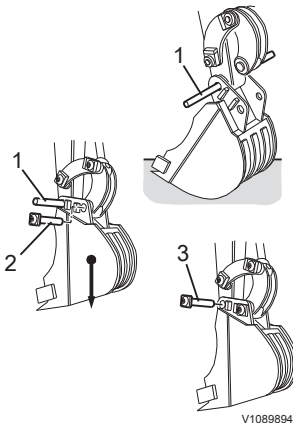
Always ensure the attachment is properly secured by pressing the front part of the attachment to the ground until the machine is slightly lifted.

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.

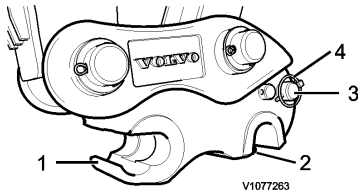
Installing a bucket with manual fastening

- 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.

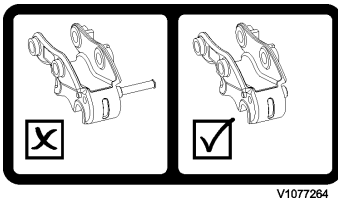


NOTE!

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.

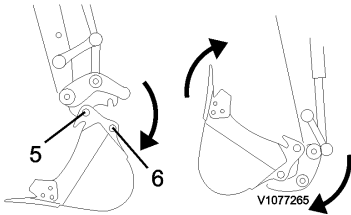
An unsecured attachment could fall and cause serious injury or death.

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

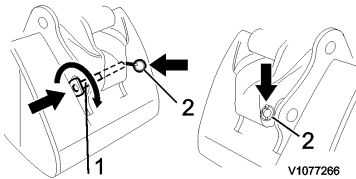
Operating techniques

110 Attachment brackets



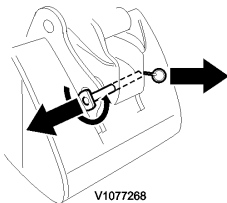
Lower the attachment bracket towards the rear bucket pin and tilt the bucket rearwards.

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



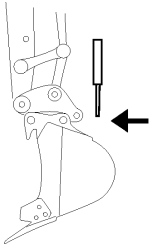
Extract the linch pin and the locking pin. Rotate the locking pin 90° to lock it in extracted position.

- 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.

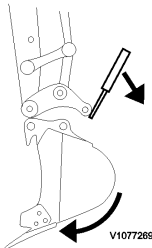
Disconnecting bucket

- 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.

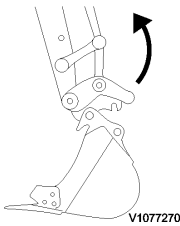
Operating techniques Attachment brackets 111



- 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.

Hydraulic attachment bracket

Attachment quick coupler

(optional equipment, not for EC15E)

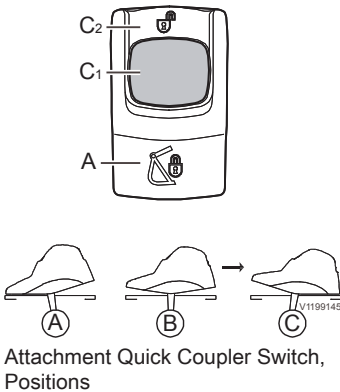
Disconnecting & connecting a bucket

WARNING

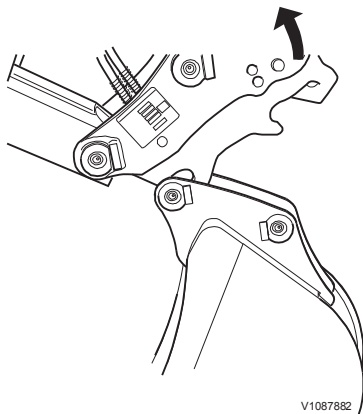
Risk of crushing!

Attachments that move unexpectedly can cause injuries.

Make sure people stay out of the working area when connecting or disconnecting attachments.



Attachment Quick Coupler Switch, Positions



Attachment quick coupler, hook off

- 1 Place the machine on firm and level ground.
- 2 Lower the dozer blade and the boom to the ground.
- 3 Curl in the bucket completely towards the dipper arm (to release the locking mechanism).
- 4 **To start** the process of opening the Attachment Quick Coupler:
Press down the lower end of the switch (A) and release.
→ The switch moves back to position *Neutral* (B).
Now and during the whole process:
→ The symbol of lower end of switch (A) illuminates.
→ a beep sound arises.

NOTE!

If undesired action, the process can be cancelled at this point by pressing the lower end of the switch (A) again.

- 5 **To open** the Attachment Quick Coupler:
Unlock and press down the red button (C1) and the upper end of the switch (C2):
→ The Attachment Quick Coupler opens and the switch remains in position C.
- 6 Lower the bucket and curl out to lift up the attachment quick coupler from the bucket.
- 7 Place the bucket flat on the ground and unhook it.

Operating techniques Hydraulic attachment bracket 113

To connect another bucket: Go on with item 11.

To finish without connecting: Finish following items 8, 9 & 10..

- 8 **To close** the Attachment Quick Coupler, return the switch to position *Neutral* (B).
- 9 Press the bucket against the ground. In this position, curl the bucket in and out to check that it is locked in the correct position. If not properly engaged and firmly locked in working position, press the switch back to position C to re-open the attachment quick coupler.
- 10 **To confirm** the correct lock and to finish the process:
Press down the lower end of the switch (A) and release.
→ The process is finished, when the illuminations and the beep end.
- 11 Curl out the attachment quick coupler and hook it onto the bucket pin.
- 12 Slowly curl in the attachment quick coupler fully towards the bucket.
- 13 **To close** the Attachment Quick Coupler, return the switch to position *Neutral* (B).

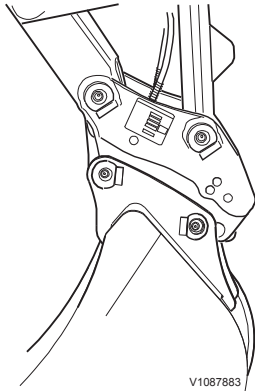
NOTE!

Before ending the process, always check the locking indicator whenever available at the quick attachment coupler, and by mechanical check to ground to ensure the safe coupling of the attachment

- 14 **To confirm** the correct lock and to finish the process:
Press down the lower end of the switch (A) and release.
→ The process is finished, when the illuminations and the beep end.

NOTICE

Do not use the machine, if the attachment bracket is not working correctly.



Bucket in locked position

Pressure release

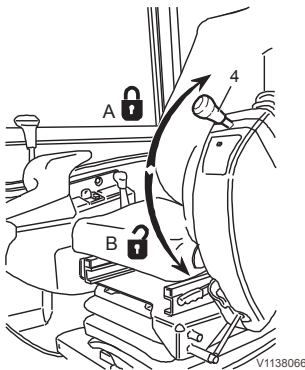
Before removing or connecting hydraulic hoses the pressure in the hydraulic system must be released.

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!

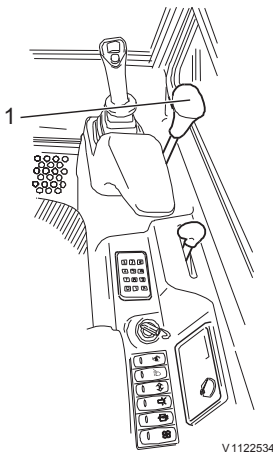
Do not dig the bucket too deep into the ground, since this would block the digging action. However, should this occur, slightly raise the boom. Work in a smooth way and avoid quick movements.

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

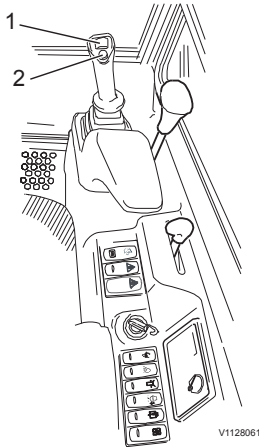
Backfilling or grading

- 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 (1) in maximum position, but release it.

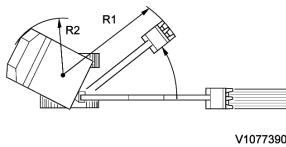
Do not use the bottom of the bucket to level the ground by swinging it back and forth. This is the purpose of the dozer blade.



1 Control lever



Control lamp for offset boom



Offset boom

When it comes to digging a trench along a wall, you can use the lateral offsetting function.

- 1 If the function for offset boom is not activated, push button (2) or press the switch for attachment in instrument panel (both optional equipment) to the lower position to activate it. You know that the function is activated when the control lamp is on.
- 2 Use the roller switch/proportional roller switch (1) on the right hand lever to operate the offset boom:

- Switch to the left: Offset boom to the left.
- Switch to the right: Offset boom to the right.

This work can be accomplished under confined spatial conditions. With reference to the axis of the slewing superstructure the offset can have the following values.

Offset in degree (°)	to left	to right
	75°	55°

EC15E minimum radius, mm (in)			
Type		Dipper arm 950 mm (37.4 in)	Dipper arm 1150 mm (45.3 in)
R1	to left	1181 (46.5)	1184 (44.6)
	to right	1327 (52.2)	1346 (53.0)
R2		1018 (40.1)	

EC18E minimum radius, mm (in)			
Type		Dipper arm 950 mm (37.4 in)	Dipper arm 1150 mm (45.3 in)
R1	to left	1181 (46.5)	1198 (47.2)
	to right	1327 (52.2)	1346 (53.0)
R2		1018 (40.1)	

ECR18E minimum radius, mm (in)			
Type		Dipper arm 950 mm (37.4 in)	Dipper arm 1150 mm (45.3 in)
R1	to left	1269 (50.0)	1287 (50.7)
	to right	1429 (56.3)	1449 (57.0)
R2		688 (27.1)	

EC20E minimum radius, mm (in)			
Type		Dipper arm 1050 mm (41.3 in)	Dipper arm 1350 mm (53.2 in)
R1	to left	1401 (55.2)	1450 (57.1)
	to right	1553 (61.1)	1606 (63.2)
R2		1018 (40.1)	

Special hydraulics

Release the hydraulic pressure in the system before removing or connecting hydraulic hoses for hydraulically controlled attachments. See page 114 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.

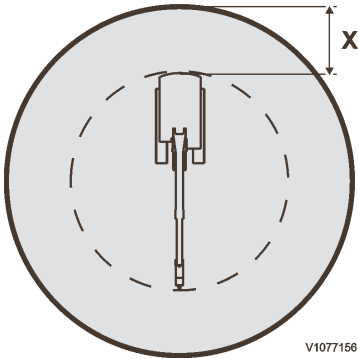
NOTE!

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)



V1077156

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

WARNING

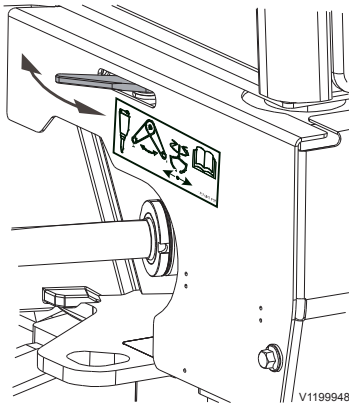
Risk of severe personal injury.
While working with the hammer flying chips of rock could cause severe injury.
Provide protective nets for the windscreens. Keep windows and door closed and prevent persons from entering the risk zone when operating the hydraulic breaker.

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

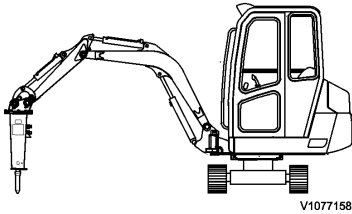
If the hammer is connected to an attachment bracket, the attachment bracket should be checked regularly for damage.



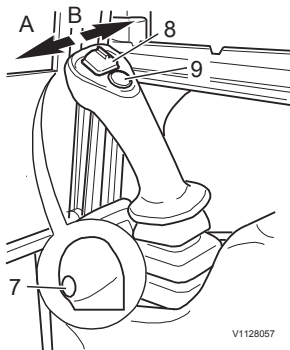
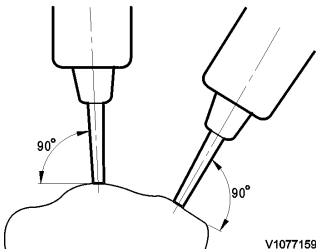
The switch-over valve in front

- 1 Turn the shut off valve to the left facing the machine (as shown on the decal).
- 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.

Operating techniques 120 Hammer



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.

- Press button (7) or move the roller switch to the right (B) to activate the hammer function.

- Release the button or roller switch 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.

Connecting with pivot pins

Before removing or connecting hydraulic hoses the pressure in the hydraulic system must be released, see page 114 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.

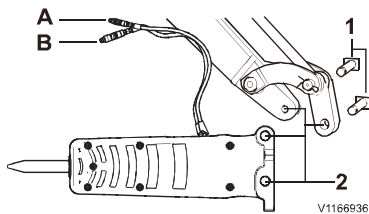
CAUTION

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.

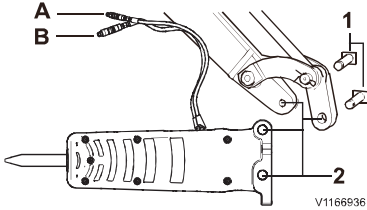
- 5 Release the pressure from the hydraulic system according to the procedure on page 114.
- 6 Connect the hydraulic hoses (pressure line (A) and return line (B)) of the hammer to the hydraulic connections on the boom.
- 7 Lock the hydraulic couplings.

NOTICE

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

Operating techniques

122 Hammer



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 114.
- 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.

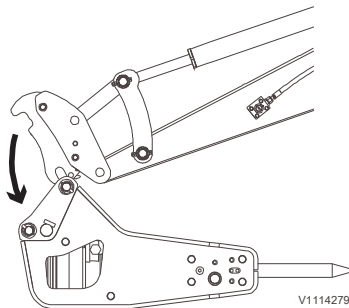
Connecting to an attachment bracket

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 114.



Attachment quick coupler, hook on



Connecting to an attachment quick coupler, hydraulic

WARNING

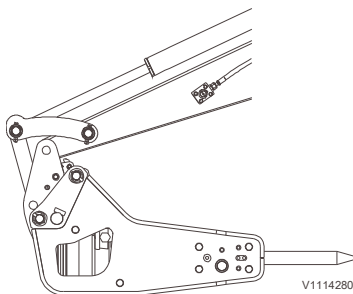
Risk of crushing.
Falling attachment could result in severe injury or death.

Make sure that the attachment, hydraulic hoses and connections are undamaged and securely fastened.

- 1 Place the machine on firm and level ground.
- 2 Lower the dozer blade and the boom to the ground.
- 3 Hook the attachment quick coupler onto the hammer pin.
- 4 Press the attachment quick coupler switch to open the attachment quick coupler (unlock position). See page 38 for operating of the attachment quick coupler switch. Then follow the same procedure as for connecting to a bucket, see page 112.

NOTICE

Do not use the machine, if the attachment bracket is not working correctly.



Hammer in locked position

Disconnecting from an attachment quick coupler, hydraulic

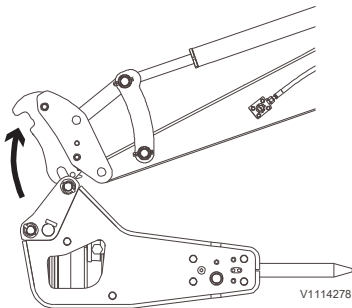
WARNING

Risk of crushing!

Attachments that move unexpectedly can cause injuries.

Make sure people stay out of the working area when connecting or disconnecting attachments.

- 1 Place the machine on firm and level ground.
- 2 Lower the dozer blade and the boom to the ground.
- 3 Curl in the hammer completely towards the dipper arm (to release the locking mechanism).
- 4 Press the attachment quick coupler switch to open the attachment quick coupler (unlock position). See page 38 for operating of the attachment quick coupler switch. The follow the same instructions as whe connecting to a bucket, see page 112



Attachment quick coupler, hook off

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!

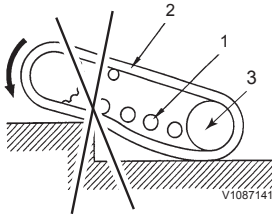
Too low pressure in the accumulator may make it impossible to lower the attachment.

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.

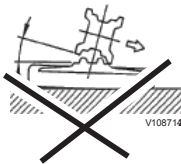
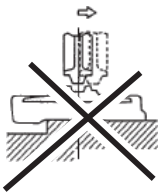
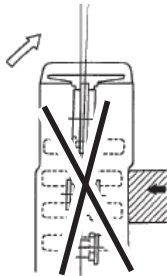


Moving over obstacles

- 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.

NOTE!

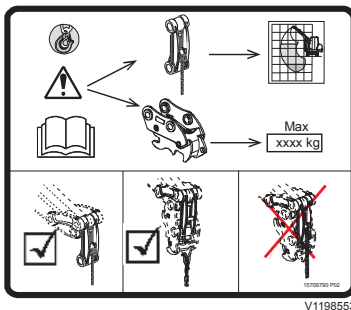
Ensure the tracks are always aligned with rollers and idler. Avoid turning and reversing movements when going over obstacles. Avoid obstacles that load the tracks unilaterally.



Lifting objects

The machine can be optionally equipped with independent or combined systems, allowing the lifting of various loads as from the excavator working equipment.

- A connecting rod featuring a lifting device across its structure, in order to proceed the lashing with appropriate lifting accessories.
- A quick coupler featuring a lifting device, in a form of one or two related eyes, or a lifting hook add-on either removable or welded.



Decal on front window right

Always refer to the corresponding manufacturer user manual delivered with the quick coupler, to foresee what kind of lifting means are fit for use. This hardware implies a limitation of the payload that can be safely lifted by the machine featuring quick coupler systems, as shown in the decal 15709790.

When using the connecting rod without a quick coupler, the lifting chart provided at the operator station shall be used as reference in relation to the lifting point coordinates, in order to determine the permissible lifted load.

When using a quick coupler providing a lifting device, the permissible load of the ensemble is limited to the lower value of the load chart related lifting coordinates and the limit value usually engraved next to the lifting point of the attachment quick coupler.

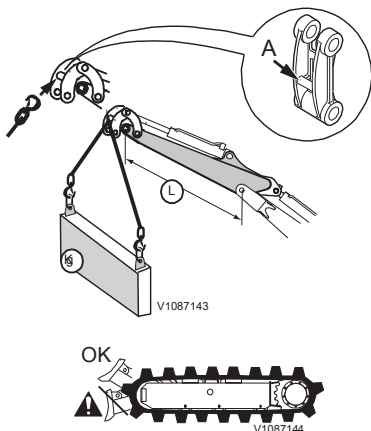
The lifted load shall be preferably lashed from the quick coupler lifting device if available, with lashing precaution as shown. In this case, it is advisable to bring up this Safe Working Load information (SWL) at the operator station as well.

NOTE!

In the European Community countries, it is forbidden to proceed load lifting operation, if the machine is not equipped with due lifting safety devices on the working equipment and the blade (optional devices). Always refer to the national safety-at-work regulation of the machine work site, to apply additional safety requirements where necessary.

Operating techniques

128 Lifting objects



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.

Always use appropriate lifting hook.

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.

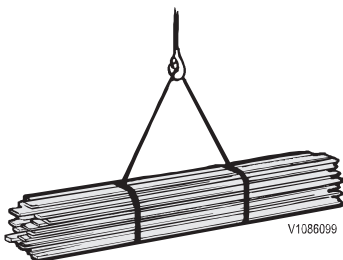
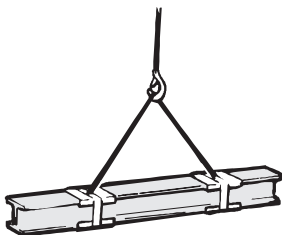
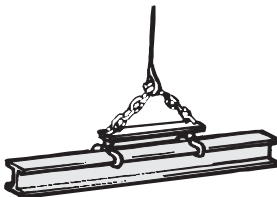
Read the below recommended steps before starting any lifting.

- It is the operator whole responsibility to ensure the machine's safe and adequate configuration with regards to the work site environment before proceeding lifting operations.
- 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.

Operating techniques Lifting objects 129

- 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.

130 Operating techniques Lifting objects



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.

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.

NOTICE

Risk of machine damage!

Improper use could cause serious machine damage.

Never anchor or fix the undercarriage to the ground or any object when digging or lifting.

- 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.

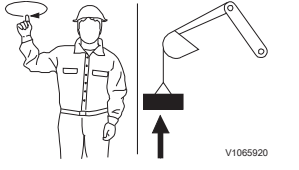
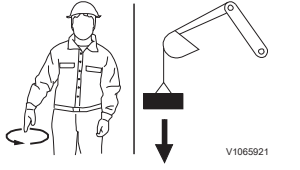
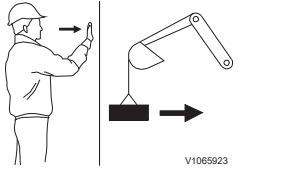
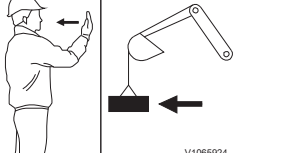
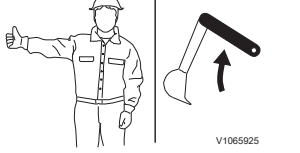
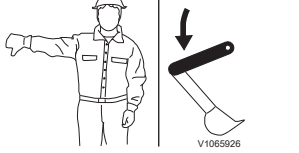

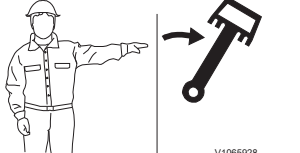
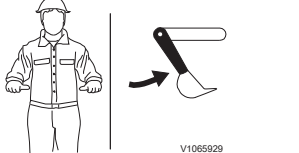
For lifting capacities specifications, see page 207.

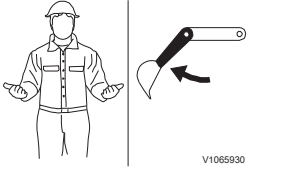
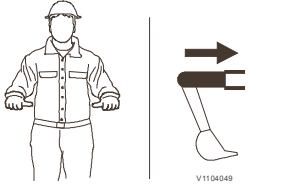
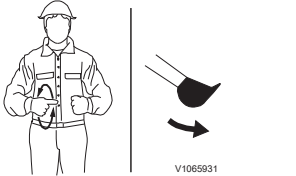

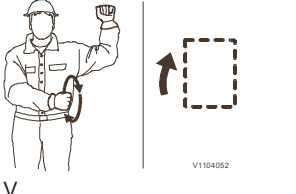
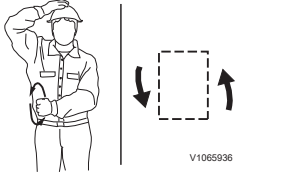
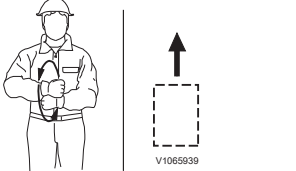
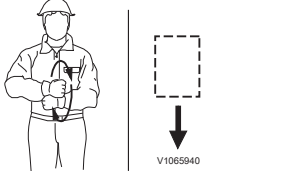
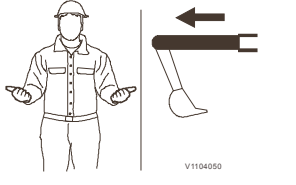
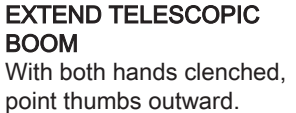
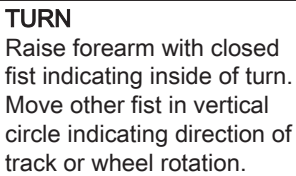
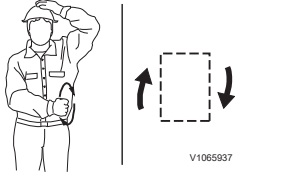
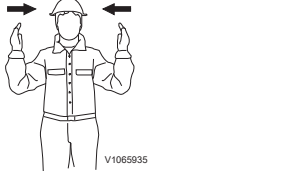
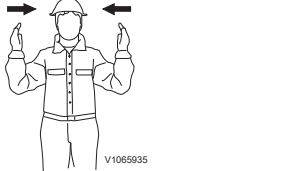
Signalling diagram

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



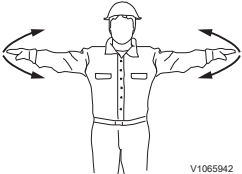

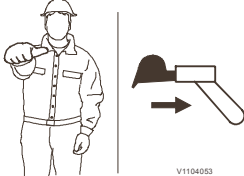
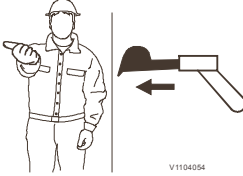
The primary use of hand signals is for a signalman to direct the lifting, handling, and placement of loads attached to working equipment. Hand signal usage may also be applicable to earth moving operations and/or machine travel when the operator's visibility is obstructed.

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>OPEN BUCKET Hold one hand open and stationary. Rotate other hand in small vertical circle with forefinger pointing horizontally at open hand.</p>
 <p>V1104052</p>	 <p>V1065936</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>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>V1065939</p>	 <p>V1065940</p>
<p>DIPPER ARM INWARD With both hands clenched, point thumbs inward.</p>	<p>EXTEND TELESCOPIC BOOM With both hands clenched, point thumbs outward.</p>
 <p>V1104050</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>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>V1104051</p>	 <p>V1065937</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>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>V1065935</p>	

Operating techniques
134 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>V1065938</p>	 <p>V1065941</p>	 <p>V1065942</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>V1065922</p>	 <p>V1104053</p>	 <p>V1104054</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.

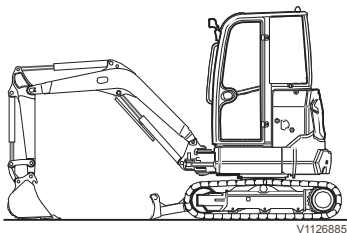
WARNING

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

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 blade to the ground.
- Depressurize the hydraulic system according to procedure on page 114.

WARNING

Risk of burns!

Hot machine parts could cause burns.

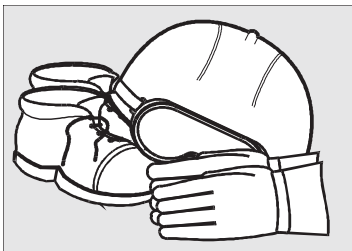
Allow hot machine parts to cool before performing adjustments or service. Wear personal protective equipment.

- 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.

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

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

Safety when servicing Before service, read 139

- 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 18.
- Measures to be taken in connection with electric welding, see page *Welding*.
- 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!

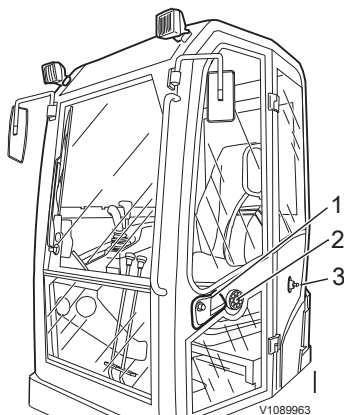
In common for all points below is that all waste is to be handed over to a treatment and disposal firm approved by the authorities.

- 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.

140 Safety when servicing Entering, leaving and climbing the machine

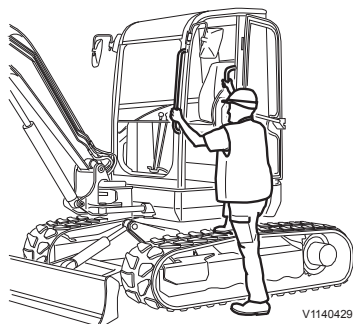
Entering, leaving and climbing the machine

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!

Alternative exit path

The alternative exit path is the rear window (its location is marked with an information decal). In case of a turnover or accident and when the door is blocked, break the glass with the hammer attached to the rear wall inside the cab.

Never leave the working station to egress even partially from the cabin or canopy by the front or side during operation. It is recommended to always bring the equipment to ground and stop the engine before entering or leaving the machine for short term job purposes.

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 on the left side of the operator.

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 oil is flammable and must not be used for cleaning. Use conventional car care products meant for cleaning or degreasing. 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

142 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.

Safety when servicing Fire prevention 143

- 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, disconnect the battery (read explanation on page 79).
- 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 144.

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.

146 Safety when servicing Handling hazardous materials

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 76.

Charging batteries, see page 167.

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.

Leaks from high pressure hoses could cause serious injury to skin and eyes.

If high pressure hoses are loose or leaking, contact a qualified service technician.

Keep away from fluid that is spraying out.

Use a stiff piece of cardboard to check for leaks.

Never use your hands to check for leaks.

- 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.



Maintenance

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

This section describes maintenance and service jobs that the operator can do. Other maintenance and service jobs require trained workshop personnel, special equipment or spare parts and should be done by a qualified service technician.

The chapter "Lubrication and service chart" (see page 152) presents all the jobs and actions that are included in the machine's service program.

Service history

After each completed service by a qualified service technician, the service history should be filled in, see page 228. Service history is a valuable document, which is referred to when selling the machine.

Arrival Inspection

Before the machine leaves the factory, it is tested and adjusted. The dealer or distributor must also carry out arrival inspections according to the applicable form.

Delivery Inspection

Before the machine leaves the factory, it is tested and adjusted. The dealer or distributor must also carry out delivery inspections according to the applicable form.

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.

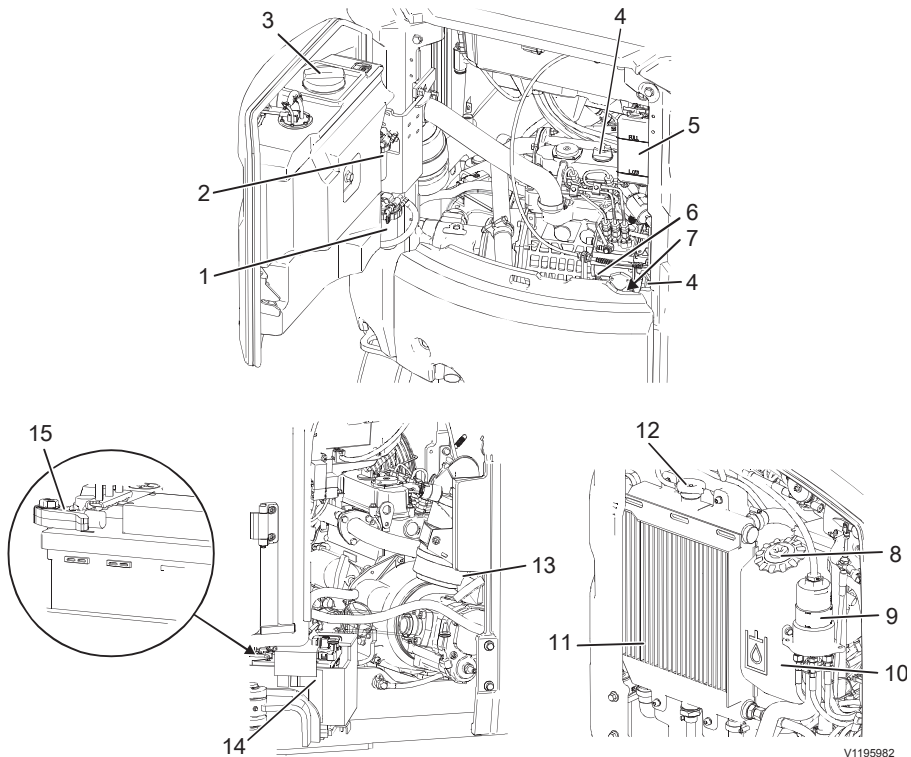
Service Programme

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.

Service points

Service positions rear, left side and right side.



V1195982

1	Fuel prefilter / water separator
2	Fuel filter
3	Fuel filler neck
4	Engine oil filler necks (two)
5	Expansion tank
6	Engine oil dipstick
7	Engine oil filter
8	Hydraulic oil filter
9	Hydraulic oil level sight glass including filler neck and filter
10	Hydraulic oil tank

Maintenance













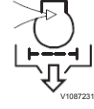







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11	Radiator
12	Coolant filler neck
13	Air filter
14	Battery
15	Battery quick-connector

Lubrication and service chart

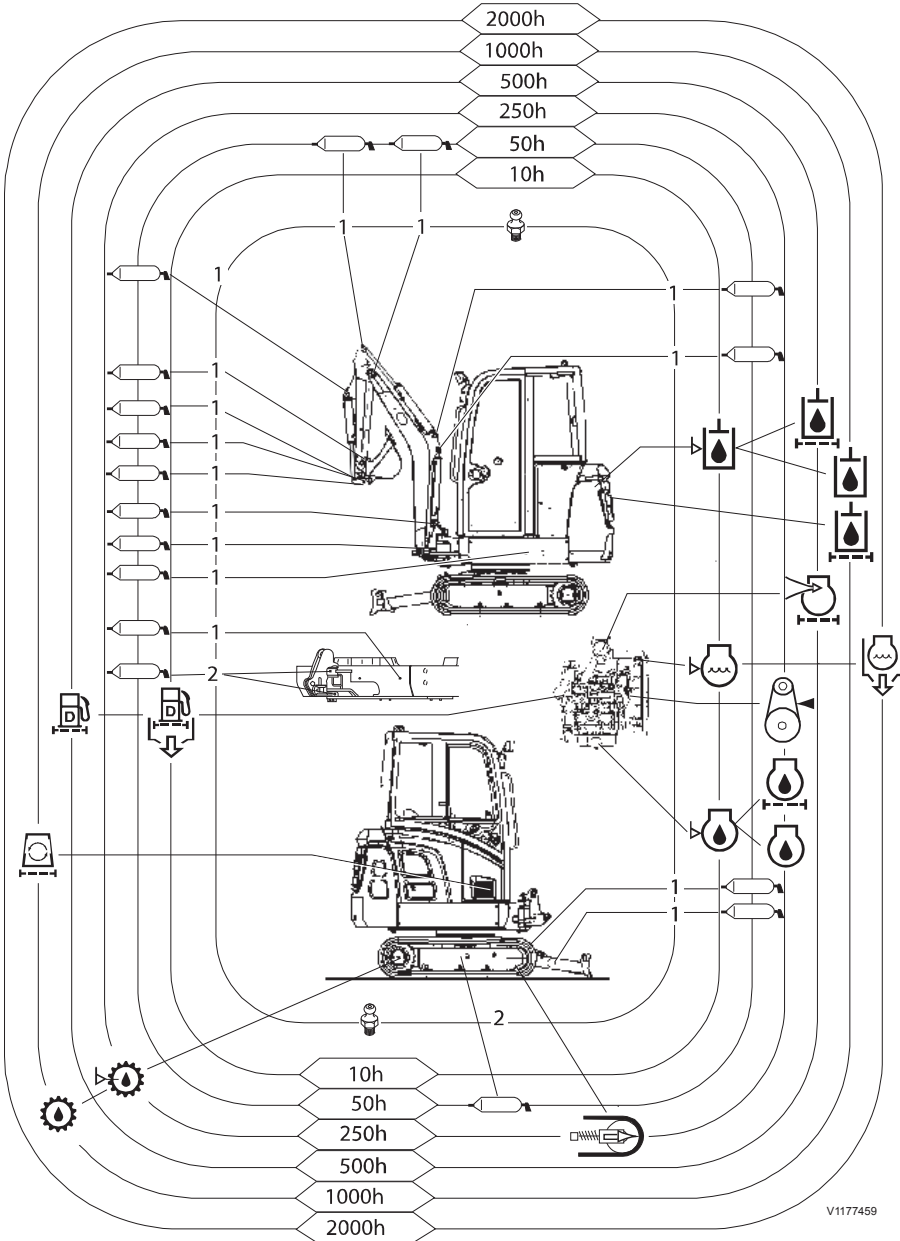
Symbol key

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 air filter	 V1077016	Check engine oil level
 V1087232	Change air filter	 V1072363	Change engine oil
 V1087233	Replace cab ventilation filter	 V1077016	Replace engine oil filter
 V1077034	Change travel gear oil	 V1072403	Grease nipple

Maintenance 152 Lubrication and service chart

Every: 10, 50, 250, 500, 1000, 1500, 2000 and 3000 operating hours (according to Service Programme of the machine).



V1177459

**Maintenance
Lubrication and service chart 153**

When required	Page
Fuel, filling	166
Batteries, charging	167
Alternator	169
Welding. Any unauthorized welding leads to a loss of warranty.	169
Cleaning machine	169
Paint finish maintenance	171
Touch-up painting	171
Cleaning engine compartment	172
Washer reservoir	172
Front windscreen rail, lubricate	173
Bucket teeth, replacing	173
Seat belt, replace (minimum every third year or latest after 1500 hours)	Workshop job ⁽¹⁾

DAILY (every 10 hours)	Page
General inspection (machine, leakages, connections, function of control elements, lights, loose or lost of bolts)	
Test-run and check (start, stop, instruments, warning lamps, lights, wiper, washer, horn, decals, reflectors, back-up/travel alarm, heater and so on) (check end-position dampening, cylinder at boom)	
Machine, visual check (for leakages, loose connections, external damages, cracks and wear damages)	
Fan belt, visual check (for cracks and interferences)	
Engine oil level, check	158
Coolant level, check	157
Water separator, check and drain if necessary	159
Hydraulic oil level, check	157

EVERY 50 hours	Page
After carrying out daily service	
Lubrication according to Lubrication chart	see Lubrication chart and page 160
Hydraulic oil filter, replace (once after the first 50 hours , then every 500 hours)	workshop job ⁽¹⁾

1. Contact a qualified service technician.

Maintenance 154 Lubrication and service chart

FIRST 50 hours inspection
This inspection shall be performed by a qualified service technician.

EVERY 250 hours After carrying out daily and 50 hours services	Page
Engine oil, change	workshop job ⁽¹⁾
Engine oil filter, replace (with every engine oil change)	workshop job ⁽¹⁾
Track unit, check tension and condition	161
Track gearbox oil level, check	workshop job ⁽¹⁾
Fan belt, check and adjust tension	workshop job ⁽¹⁾

EVERY 500 hours After carrying out daily, 50 and 250 hours services	Page
Fuel hoses and clamps, check and replace when necessary (minimum once a year)	workshop job ⁽¹⁾
Radiator and hydraulic oil cooler, check, clean when necessary (check more often when working under dirty or dusty conditions!)	163
Radiator hoses and clamps, check and replace when necessary (minimum once a year)	workshop job ⁽¹⁾
Hydraulic oil filter, replace (first after 50 hours)	workshop job ⁽¹⁾
Hydraulic pump, suction hose and pressure hose, check and replace if necessary	workshop job ⁽¹⁾
Water separator filter element, draining and cleaning	workshop job ⁽¹⁾ , see instruction after daily check on page 159
Fuel filter element, replacing (minimum every year)	workshop job ⁽¹⁾
Hoses for boom-, dipper-, and bucket-cylinder, check and replace if necessary	workshop job ⁽¹⁾
Hose on boom for X1 and X3, check and replace if necessary	workshop job ⁽¹⁾

1. Contact a qualified service technician.

**Maintenance
Lubrication and service chart 155**

EVERY 500 hours After carrying out daily, 50 and 250 hours services	Page
Quick coupler lock mechanism, check and replace if necessary	workshop job ⁽¹⁾
Primary air filter, cleaning and replace (or earlier when warning light illuminates)	163
Exhaust manifold, check for damages and leakages, mounting screws (minimum once a year)	workshop job ⁽¹⁾
Intake air line, replace (minimum once a year)	workshop job ⁽¹⁾
Coolant, check and adjust if necessary (only VOLVO coolant VCS, minimum every year)	workshop job ⁽¹⁾

EVERY 1000 hours After carrying out daily, 50, 250 and 500 hour services	Page
Hydraulic oil, change (if using bio oil, every 750 hours)	workshop job ⁽¹⁾
Hydraulic oil filter in filling device, replace (if using bio oil, every 750 hours)	workshop job ⁽¹⁾
Hydraulic pressure, check	workshop job ⁽¹⁾
Valve clearance, check and adjust	workshop job ⁽¹⁾
Track gearbox oil, change	workshop job ⁽¹⁾
Cab, main filter, replace	workshop job ⁽¹⁾
Secondary air filter, replace (or earlier when primary filter is replaced the third time, minimum every second year, optional equipment)	165

EVERY 1500 hours After carrying out daily, 50, 250 and 500 hour services	Page
Injection nozzle pressure, check	workshop job ⁽¹⁾
Fuel injectors, check and clean if necessary	workshop job ⁽¹⁾
Crankcase breather system, check	workshop job ⁽¹⁾
Seat belt, replacing (minimum every third year)	workshop job ⁽¹⁾

1. Contact a qualified service technician.

Maintenance
156 Lubrication and service chart

EVERY 2000 hours After carrying out daily, 50, 250, 500, and 1000 hour services	Page
Coolant, change (minimum every fourth year, only VOLVO coolant VCS)	workshop job ⁽¹⁾

EVERY 3000 hours After carrying out daily, 50, 250, 500, 1000, and 1500 hour services	Page
Injection timing, check	workshop job ⁽¹⁾
Injection pump, check	workshop job (1)

1. Contact a qualified service technician.

Maintenance service, every 10 hours

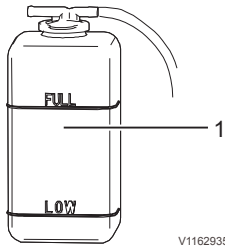
Coolant level, checking

The coolant expansion tank (1) is located under the rear hood.

- 1 Shut down the engine.
- 2 Allow the engine to cool.

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.



Coolant level, topping up

NOTICE

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

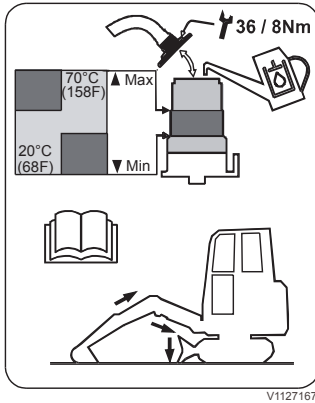
- 1 Remove the cap from the expansion tank (1).
- 2 Top up coolant.
- 3 Reinstall the cap on the expansion tank.

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.

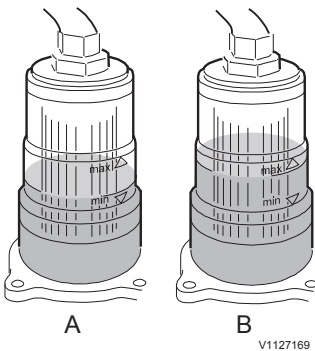


Maintenance

158 Maintenance service, every 10 hours



Decal on hydraulic oil tank



- A Correct hydraulic oil level (cold machine)
- B Correct hydraulic oil level (hot machine)

Hydraulic oil level, checking

When you check the oil, the temperature of the oil must be between 20 °C (68 °F) and 70 °C (158 °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 right 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 70 °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 (not into hydraulic main filter opening).

For quality of hydraulic oil please refer to the table of fuels and lubricants on page 183.

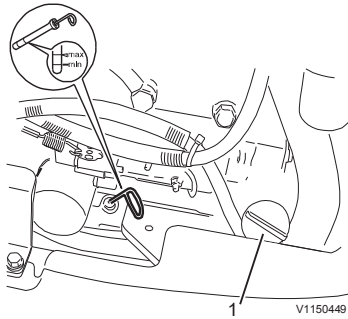
NOTE!

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 137.

Engine oil level, checking

- 1 Stand the machine on level ground.

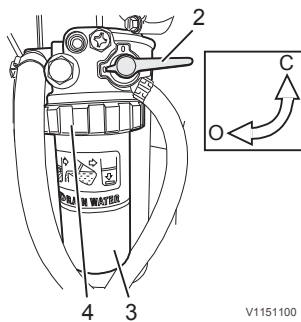
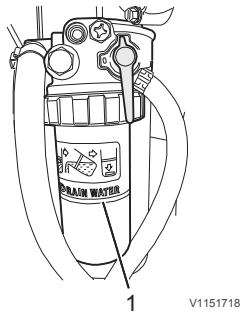


- 2 Open the rear hood.
- 3 Pull out the dipstick and wipe it clean with a lint-free cloth, reinsert it until it bottoms and pull it back out.
- 4 The oil level should reach the upper mark (MAX).
- 5 If the oil level is near or even below the bottom mark (MIN), top up oil immediately through the oil filler (1) to avoid severe engine damage. Don't fill over upper mark (MAX)! For quality of oil refer to the table of fuels and lubricants, page 179.

Water separator, checking and draining

Water separator, checking

- 1 Open the rear hood.
- 2 Check the sight glass of the water separator for water and dirt accumulations.
- 3 If the water level is over or near the drain water mark (1) or dirt accumulations can be seen, the water separator must be drained and cleaned.



Water separator, draining and cleaning

- 1 Close the fuel valve (2) by turning it counterclockwise to position C.
- 2 Place a suitable collecting vessel underneath the water separator.
- 3 Release the swivel nut (4) and remove the sight glass (3).
- 4 Drain the content into the collecting vessel.

NOTE!

Do the work in an environmentally safe manner.

- 5 Clean the sight glass (3) and install it again with the swivel nut (4).
- 6 Open the fuel valve (2) by turning it clockwise to position O.

160 **Maintenance**
Maintenance service, every 50 hours

Maintenance service, every 50 hours

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.

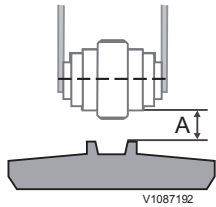
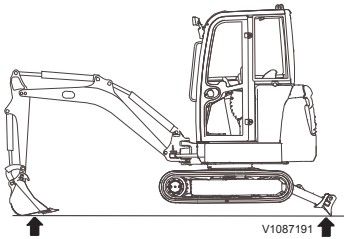


Maintenance service, every 250 hours

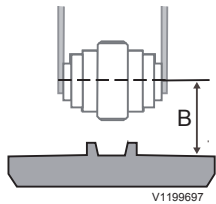
Track unit, checking tension

NOTE!

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



Sag A for rubber tracks



Sag B for steel tracks (only EC18E/
ECR18E)

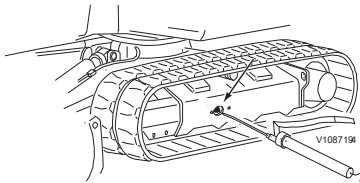
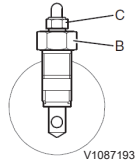
- 1 Park the machine on horizontal ground.
- 2 Lower the dozer blade in the back to the ground until the tracks are slightly raised (see picture).
- 3 Lower the bucket to the ground, operate the boom until the machine is raised (see picture).
- 4 Run the tracks several times in forward and reverse.
- 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.
- 6 The rubber track is correctly tensioned when a sag (A) of 15 to 25 mm (0.59 to 0.98 in), target: 20 mm (0.79 in) is reached.
- 7 For steel tracks (only for EC18E/ECR18E), measure (on both tracks) sag (B) from the frame of undercarriage under a roller until the surface of steel tracks.
- 8 The steel track is correctly tensioned when a sag (B) of 110 to 120 mm (4.33 to 4.72 in), target: 115 mm (4.53 in) is reached.

Maintenance 162 Maintenance service, every 250 hours

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.



Inject grease

- 9 In order to reduce sagging of the track, press grease through grease nipple (C) into the adjustment cylinder.
- 10 In order to increase sagging of the track loosen valve unit (B) by one revolution, so that the grease can be drained off. Tighten the valve unit when the sag of the track is correct.
- 11 Run the track several times in forward and reverse and verify that the sag is still correct.

NOTE!

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

Maintenance service, every 500 hours

Radiator and coolers, cleaning

WARNING

Risk of burns!

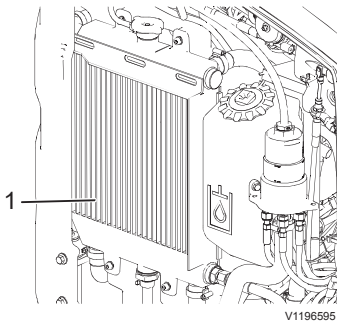
Hot machine parts could cause burns.

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

Remove the panel on the right hand side of the machine to access the radiator/hydraulic oil cooler unit as follows:

- 1 Remove the screws of the panel.
- 2 Pull the upper area of panel and remove it.
- 3 Reinstall the panel after the service is done.

Clean radiator/hydraulic oil cooler unit (1) with compressed air from inside the engine compartment (through the fan) to outside.



1 Radiator/hydraulic oil cooler unit

NOTICE

Preferably only clean the radiator fins with compressed air! Only clean the engine with water, when it is cold!

Primary air filter, cleaning and replacing

Air filter, cleaning

NOTE!

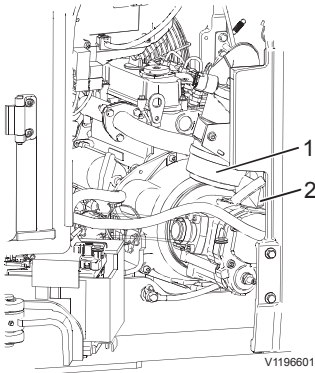
Avoid damaging or denting of the front face of the filter.

Never clean the filter by knocking it against a hard object.

Clean the primary filter as needed.

Maintenance

164 Maintenance service, every 500 hours



- 1 Housing lid
- 2 Dust valve

- 1 Open the locking hooks for the housing lid (1) and remove filter from the housing.
- 2 Bang the filter several times with the front face vertically against the palm of your hand or against a flat and soft surface.
- 3 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.
- 4 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!

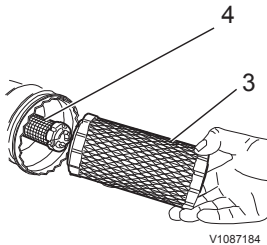
NOTE!

Operating the machine without air filter can lead to major damage. Make sure an air filter is always fitted!

Air filter, replacing

Replace the primary filter once a year or earlier if clogging signal goes on.

- 1 Open the locking hooks for the housing lid and remove filter (3).
- 2 Replace the filter and close the housing lid with the locking hooks.



- 3 Primary filter

Take care of filters/oils/liquids in an environmentally safe way, see page 137.

Maintenance service, every 1000 hours

Secondary air filter, replacing (optional equipment)

NOTE!

Read full instruction according to primary air filter on page 163.

NOTE!

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

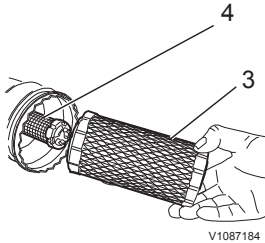
NOTE!

Operating the machine without air filter can lead to major damage. Make sure an air filter is always fitted!

Replace secondary filter (4) when you have replaced the primary air filter three times or every second year.

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

Take care of filters/oils/liquids in an environmentally safe way, see page 137.



Maintenance service, when required

Fuel, filling

Clean fuel is essential for trouble-free of the diesel engine. For fuel quality, see page 184, for alternative fuels and their maintenance intervals requirements, see page 186.

Fuel tank

Any repair or modification of the fuel tank must be done by a qualified service technician.

WARNING

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.

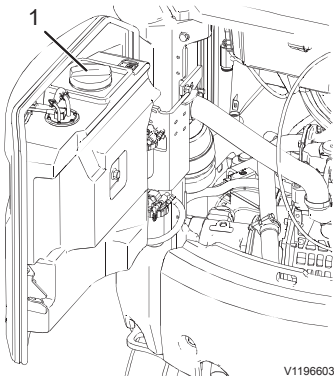
NOTE!

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 qualified service technician.

Check the fuel tank capacity on page 190.

Fuel, filling

- 1 Park the machine on level ground and place it in service position, see page 136.
- 2 Open the rear hood.
- 3 Open the fuel filler cap (1).
- 4 Fill through the fuel filler neck.
- 5 Reinstall the fuel filler cap (1).



1 Fuel filler cap at the rear hood

Maintenance
Maintenance service, when required 167

Fuel system, bleeding

The machine has a self-bleeding system.



168 Maintenance
Maintenance service, when required

Batteries, charging

 **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 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.

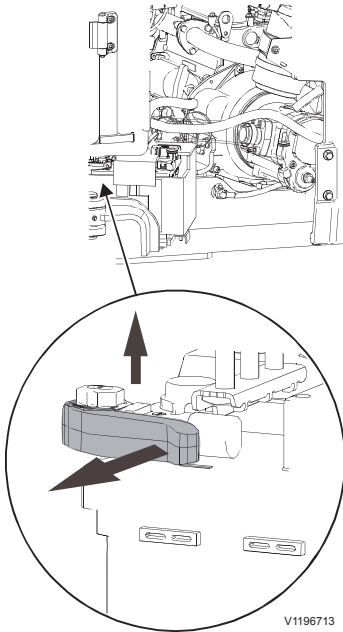
Always wear personal protective gloves, goggles and clothing when handling batteries.

 **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.



Battery Quick Connector

Access to the battery

The battery is located under the left hood.

- 1 Open the left hood with the key.
- 2 Remove the hood.
- 3 Turn the hook of the Battery Quick Connector to the left (approximately 90°).
- 4 Disconnect the negative terminal (-) first, then the positive.
- 5 Any contact between a tool and the cable connecting the positive terminal and the frame may cause sparks.
- 6 To re-install the Battery, connect the positive terminal (+) first, then the negative.

The battery is maintenance free.

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.

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.

Maintenance

170 Maintenance service, when required

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.

NOTE!

Daily clean the areas on the machine where dust, chips and similar may collect in order to minimise the risk of fire, see page 141.

- 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 the seals and the nozzle. Keep a distance of 30 cm (12 in) between nozzle and other machine surface. Too high pressure and too short distance may cause damage.

Maintenance Maintenance service, when required 171

NOTE!

Protect electrical leads in an appropriate way and be careful not to damage the cab prefilter when cleaning the machine.

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.
- 

172 Maintenance Maintenance service, when required

Cleaning engine compartment

WARNING

Risk of serious injury.
Rotating parts could cause serious cutting or crushing injury.
Never open the engine hood when the engine is running.

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.

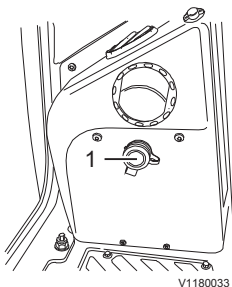
Machines operating in dusty environment or environment exposed to fire hazards for example, wood-processing, woodchip handling or grain handling and animal feed industries require daily attention and cleaning of the engine compartment and surrounding areas.

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

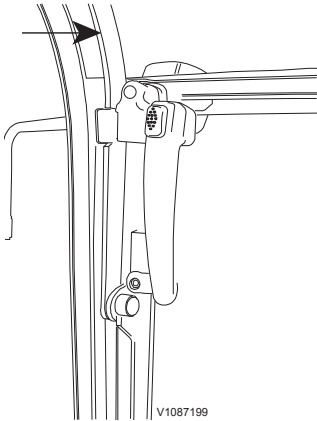
Loose material is removed with for example compressed air.
Cleaning should preferably be carried out at the end of the working shift before the machine is parked.
Use personal protective equipment such as protective goggles, gloves and respirator.
After cleaning, check and rectify any leaks. Close all covers and hoods.

Washer reservoir

Fill up with washing fluid in the washer reservoir (1).
It is located inside the cab on the right side.

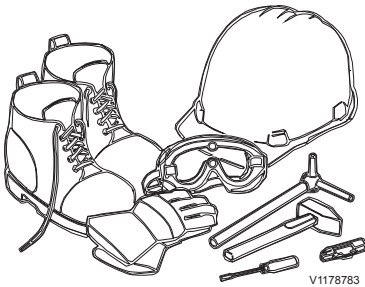


1 Washer reservoir



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.



Needed tools incl. Special tool

Bucket and ripper teeth, replacing

WARNING

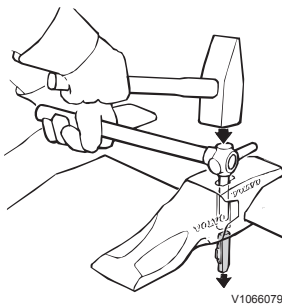
Risk of splinter injury. When striking metal objects with a hammer, flying metal chips could cause serious splinter injury to eyes and other body parts.

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.

Removing bucket tooth

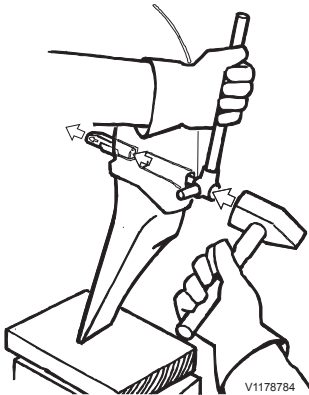
- 1 Lower the bucket to the ground and angle it slightly upward.
- 2 Clean the opening for tooth adapter locking device.
- 3 Knock out the locking device with a hammer and the special tool or other suitable drift.
- 4 Remove tooth.



Removing bucket tooth

Maintenance

174 Maintenance service, when required



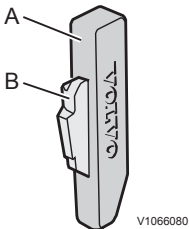
Removing ripper tooth

Removing ripper tooth

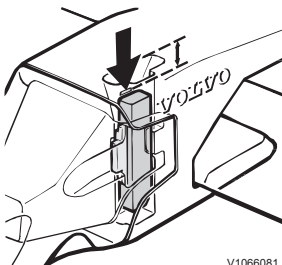
- 1 Lower the tooth onto stable ground as shown.
- 2 Clean the opening for tooth adapter locking device.
- 3 Knock out the locking device with a hammer and the special tool or other suitable drift.
- 4 Remove tooth.

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.
- 6 Bucket tooth: 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.

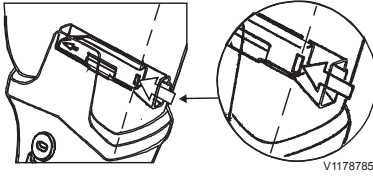


Locking device
A Steel pin
B Lock retainer



Locking device in bucket tooth
The locking device should be just below the scored line.

Maintenance
Maintenance service, when required 175



Locking device in ripper tooth

- 7 **Ripper tooth:** Knock down the locking device further with a hammer and the tool or other suitable drift until the upper part is just below the shown line in the hole and is engaged.

NOTE!

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



Maintenance
176 Maintenance service, when required

Recommended intervals for critical parts

To ensure safety at all times when operating or driving the machine, periodic maintenance must always be carried out. To maintain safety over time, 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 ages or materials are wearing with foreseeable deterioration. If these parts show any abnormality before the recommended 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 a qualified service technician.

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

Critical parts list for periodic replacement	Recommended interval
Fuel hoses	Every 2 years or 4000 hours, which occurs first
Hydraulic hoses	Every 6 years or 6000 hours, which occurs first
Seat belt	Every 3 years

Maintenance under special environmental conditions

Conditions	Maintenance	Related page
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.	101
	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.	179
	Fully charge the batteries regularly, electrolyte may freeze. Ventilate well especially when the batteries are charged in a confined space.	167
	When storing machines in extremely cold temperature, remove batteries and store them at room temperature.	79
	Before parking, remove the mud and the dirt from the tracks.	-
Demolition work	Use fall protection over the cab against falling objects.	105
Low fuel quality	Drain the sediments in fuel tank at shorter service intervals.	Workshop job ⁽¹⁾
	Change the engine oil and engine oil filter at shorter service intervals.	Workshop job ⁽¹⁾

1. Contact a qualified service technician.

Maintenance
178 Maintenance service, when required

Conditions	Maintenance	Related page
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.	163 165
	Clean the clogging net for radiator and oil cooler at shorter service intervals.	163
	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.	169
	Pay attention to and clean the engine compartment and surrounding areas regularly.	172

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"> <tr> <td>°C</td> <td>-30</td> <td>-20</td> <td>-10</td> <td>0</td> <td>+10</td> <td>+20</td> <td>+30</td> <td>+40</td> <td>+50</td> </tr> <tr> <td>°F</td> <td>-22</td> <td>-4</td> <td>+14</td> <td>+32</td> <td>+50</td> <td>+68</td> <td>+86</td> <td>+104</td> <td>+122</td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td colspan="3" style="text-align: center;">SAE 10W</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> <td colspan="3" style="text-align: center;">SAE 10W-30</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td colspan="3" style="text-align: center;">SAE 15W-40</td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td colspan="3" style="text-align: center;">SAE 30</td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td colspan="3" style="text-align: center;">SAE 40</td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </table>	°C	-30	-20	-10	0	+10	+20	+30	+40	+50	°F	-22	-4	+14	+32	+50	+68	+86	+104	+122													SAE 10W											SAE 10W-30											SAE 15W-40											SAE 30											SAE 40													
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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"> <tr> <td>°C</td> <td>-30</td> <td>-20</td> <td>-10</td> <td>0</td> <td>+10</td> <td>+20</td> <td>+30</td> <td>+40</td> <td>+50</td> </tr> <tr> <td>°F</td> <td>-22</td> <td>-4</td> <td>+14</td> <td>+32</td> <td>+50</td> <td>+68</td> <td>+86</td> <td>+104</td> <td>+122</td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> <td colspan="3" style="text-align: center;">ISO VG 32</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td colspan="3" style="text-align: center;">ISO VG 46</td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td colspan="3" style="text-align: center;">ISO VG 68</td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td colspan="3" style="text-align: center;">Bio oil VG 32</td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td colspan="3" style="text-align: center;">Bio oil VG 46</td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </table>	°C	-30	-20	-10	0	+10	+20	+30	+40	+50	°F	-22	-4	+14	+32	+50	+68	+86	+104	+122														ISO VG 32											ISO VG 46											ISO VG 68										Bio oil VG 32										Bio oil VG 46														
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Travel gear	Gear oil Volvo Super Transmission Oil API GL5	<table border="1"> <tr> <td>°C</td> <td>-30</td> <td>-20</td> <td>-10</td> <td>0</td> <td>+10</td> <td>+20</td> <td>+30</td> <td>+40</td> <td>+50</td> </tr> <tr> <td>°F</td> <td>-22</td> <td>-4</td> <td>+14</td> <td>+32</td> <td>+50</td> <td>+68</td> <td>+86</td> <td>+104</td> <td>+122</td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> <td colspan="3" style="text-align: center;">SAE 90</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td colspan="3" style="text-align: center;">SAE 140</td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td colspan="3" style="text-align: center;">SAE 80W-90 or 85W-90</td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </table>	°C	-30	-20	-10	0	+10	+20	+30	+40	+50	°F	-22	-4	+14	+32	+50	+68	+86	+104	+122														SAE 90											SAE 140										SAE 80W-90 or 85W-90																																			
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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	250 hour	125 hour	75 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)						

(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

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

Specifications
Fuel system 185

- 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.



Alternative fuels

This statement is only valid for Volvo branded engines, but also includes engines for DD25 and C-series Skid Steer Loaders where warranty is provided by Volvo.

Hydro-treated vegetable oil (HVO) and fatty acid methyl ester (FAME) biodiesel are both made from renewable raw materials such as vegetable oils and animal fats, but they are chemically processed in different ways.

Hydro-treated vegetable oil (HVO)

HVO is created using a chemical process called hydro-treating. Hydro-treating creates an oxygen-free hydrocarbon product that is very similar to distillate diesel fuel and is well suited for use in diesel engines. HVO that conforms to CEN prEN 15940 is approved for use in all Volvo Construction Equipment diesel engines with no changes to maintenance intervals.

Biodiesel

Biodiesel is a product made from renewable resources such as vegetable oils or animal fat. Biodiesel that has been chemically processed into fatty acid methyl ester (FAME) can be blended with distillate diesel fuel and used in some diesel engines. Unblended biodiesel is referred to as B100 because it is 100% biodiesel.

Rapeseed methyl ester (RME) is the most common type of FAME used in Europe. Soy methyl ester (SME) and sunflower oil methyl ester (SOME) are the most common types of FAME used in the US. Although use of FAME biodiesel is now a legal requirement in some markets, it is not as suitable for use in diesel engines as conventional diesel fuel or HVO (hydro-treated vegetable oil).

Biodiesel fuel requirements

The FAME biodiesel blends specified in the table below are approved for use if:

- The biodiesel is pre-blended by the fuel supplier
- The biodiesel used in the blend conforms to EN14214 or ASTM D6751
- The distillate fuel used in the blend meets fuel sulphur requirements
- The distillate fuel used in the blend conforms to EN590 or ASTM D975

- B1-B5 biodiesel blends conform to EN590 or ASTM D975
- B6-B7 biodiesel blends conform to EN590 or ASTM D7467
- B8-B20 biodiesel blends conform to ASTM D7467

Engine emission designation	Engine size	Acceptable blend
EU Stage II / US Tier 2 * EU Stage IIIA / US Tier 3 * EU Stage IIIB / US Tier 4 interim EU Stage IV / US Tier 4 final	Below D4 / 4 litres	Up to B7
EU Stage II / US Tier 2 * EU Stage IIIA / US Tier 3 * EU Stage IIIB / US Tier 4 interim EU Stage IV / US Tier 4 final	D4–D8	Up to B7
EU Stage IIIB / US Tier 4 interim, equipped with High Sulphur Fuel Conversion Kit (only available in unregulated markets) EU Stage IV / US Tier 4 final, equipped with High Sulphur Fuel Conversion Kit (only available in unregulated markets)		
EU Stage II / US Tier 2 * EU Stage IIIA / US Tier 3 *	D9–D16	Up to B20
EU Stage IIIB / US Tier 4 interim EU Stage IV / US Tier 4 final	D11–D16	Up to B10
EU Stage IIIB / US Tier 4 interim, equipped with High Sulphur Fuel Conversion Kit (only available in unregulated markets) EU Stage IV / US Tier 4 final, equipped with High Sulphur Fuel Conversion Kit (only available in unregulated markets)		Up to B20
* As Tier 2 and Tier 3 emissions regulations ended in 2005 and 2010 respectively, engines produced since then typically meet Stage II / Stage IIIA regulations , allowing their sale in less regulated markets.		

NOTE!

Failures directly caused by the use of poor quality biofuel, or any other fuel not conforming to standards, are not factory defects and the manufacturer's warranty does not apply.

Maintenance interval requirements

Additional service actions and shorter maintenance intervals are mandatory when using biodiesel blends above B10.

Specifications

188 Fuel system

Every 10 hours
<ul style="list-style-type: none">- Check the engine oil and change if it rises above the maximum fill level- Inspect the fuel system components and replace as necessary
Half of original interval
<ul style="list-style-type: none">- Change the engine oil and filter- Replace the fuel filter(s)
Every year, regardless of operating hours
<ul style="list-style-type: none">- Change the engine oil and filter- Clean the fuel tank

Effects of biodiesel on engine oil

Using biodiesel can lead to increased oil dilution. Use engine oil analysis tools frequently to check for fuel dilution and monitor engine oil condition. Check the engine oil level daily. Always change the engine oil if the oil level rises above the maximum fill level.

Effects of biodiesel on fuel systems

Biodiesel dissolves and loosens some fuel system deposits. During the initial conversion to biodiesel, loosened deposits will travel to the fuel filters and require more frequent fuel filter replacements. Start with new fuel filters when using biodiesel for the first time.

Biodiesel is aggressive to some materials used in fuel system components. Inspect seals, hoses, rubber and plastic components every 10 hours. Repair or replace any components that are damaged, softened or leaking. Clean biodiesel from painted surfaces immediately to prevent paint damage.

Biodiesel is more sensitive to bacteria and water contamination than distillate diesel fuel.

- Use as much fuel as possible before refilling the fuel tank in order to prevent bacteria growth if a machine is in regular use, e.g. regularly uses up a tank of fuel within a week. In climates where condensation is a risk, or when the machine is working for short durations, keep the fuel tank full.
- Do not use biodiesel in machines with low utilization or operating time.
- Do not store machines for more than 4 weeks without flushing biodiesel out of the fuel system by operating the machine through at least one full tank of distillate diesel fuel.

- Always follow the manufacturer's storage recommendations and "best-before" dates for each delivery of biodiesel.

Effects of biodiesel on exhaust after-treatment systems

Biodiesel leaves higher levels of ash in diesel particulate filters and may require more frequent diesel particulate filter (DPF) regeneration and cleaning. Biodiesel can cause deviations in temperatures and functionality of the DPF burner and may cause fault codes or errors.

Biodiesel exhaust gas is aggressive to some materials used in selective catalytic reduction systems (SCR) and may require more frequent cleaning, repairing or replacing of SCR parts.

Effects of biodiesel on cold weather operation

Biodiesel has a high viscosity at temperatures below 0 °C (32 °F) and may cause problems starting the engine. Use a fuel heater or park machines in a heated building if possible.

Effects of biodiesel on emissions compliance

Engines are certified to comply with U.S. EPA, California and EU emissions standards based upon the use of test fuels with specifications established by these regulatory agencies. Alternative fuels, including biodiesel, that are not substantially similar to the required test fuels may adversely affect engine emissions compliance. As a result, Volvo does not warrant that the engine will conform to applicable Federal or California and EU emissions limits when operated on, or having previously being operated on, biodiesel or other alternative fuels that are not substantially similar to specified test fuels used for certification, nor if biodiesel / regular diesel is used in blends that exceed the recommendations.



Specifications
190 Service capacities and change intervals

Service capacities and change intervals

Changing capacities in litres (US gal)	
Fuel tank	21 (5.55)
Cooling system (total)	4 (1.06)
Engine oil including filter	3.7 (0.98)
Hydraulic oil tank	15.6 (4.12)
Hydraulic system (total)	21 (5.55)
Track gearbox	2 x 0.33 (2 x 0.09)

Oil and fluid changes	Operating hours
Engine oil	50 (1st time inspection) / 250
Hydraulic oil	1000 (750 if biodegradable oil is used)
Track gearbox	1000

Change intervals

Please see lubrication and service chart on page 152.

Engine

Designation	VOLVO D0.9A
Combustion method	Indirect injection system
Emission certification	EPA TIER4F / EU Stage IV
Engine power, net (ISO 3046-1 for EU market) (SAE J1995 for US market)	11.2 kW at 2300 rpm
Engine power, gross (ISO 3046-1 for EU market) (SAE J1995 for US market)	11.8 kW at 2300 rpm
Max. torque ISO 3046-1	52 Nm at 1800 rpm
Number of cylinders	3
Cylinder bore	72 mm (2.83 in)
Stroke	73.6 mm (2.9 in)
Displacement	898 cm ³ (54.8 cu in)
Compression ratio	24 : 1
Firing sequence	1-2-3
Idling speed, low	1500 rpm (+/- 50 rpm)
Idling speed, high	2740 rpm

Specifications
192 Electrical system

Electrical system

Electrical System	EC15E	EC18E/ECR18E	EC20E
System voltage	12 V		
Batteries	1		
Battery voltage	12 V		
Battery capacity	42 Ah	42 / 70 Ah ^(a)	70 Ah
Alternator	12 V / 40 A		
Starter motor	12 V / 1.4 kW		

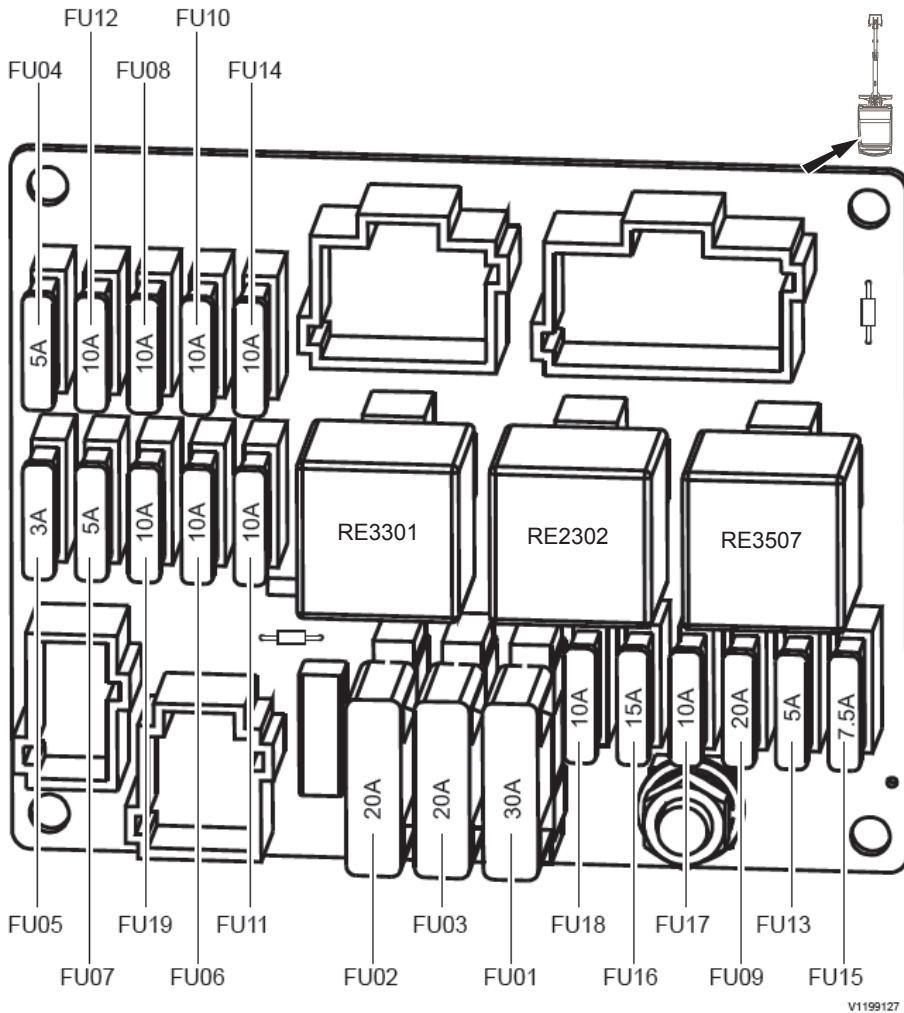
a) Depending on machine configuration

Relays and fuses

Relays and fuses are located on the left hand side of the machine behind the side cover.

Relays

Relay	Function
RE 3301	Starter motor
RE 2302	Engine stop
RE 3507	Working lights



Fuses

Fuse	Ampere	Function
FU01	30 A	Main fuse
FU02	20 A	Fuse, starter motor
FU03	20 A	Main fuse, engine stop solenoid
FU04	5 A	Instrument cluster supply Solenoid, engine stop Relay, engine stop Relay, working lights
FU05	3 A	Preheating

Specifications 194 Electrical system

Fuse	Ampere	Function
FU06	10 A	Hydraulic functions V-ECU ^(a) Auto idle ^(a)
FU07	5 A	Alternator I-ECU Fuel filling pump
FU08	10 A	Fuse, hydraulic safety valve, control lock (safety lock) Hydraulic functions
FU09	20 A	Main relay, working lights
FU10	10 A	Hydraulic functions
FU11	10 A	Cab fan
FU12	10 A	Windscreen wiper and washer
FU13	5 A	Instrument cluster supply
FU14	10 A	Hydraulic functions Rotating warning beacon, green
FU15	7.5 A	Radio equipment ^(b) , interior light ^(b)
FU16	15 A	Power outlet, horn Combined switch (right joystick) ^(b)
FU17	10 A	Rotating warning beacon
FU18	10 A	A-ECU, W-ECU, Hydraulic safety
FU19	10 A	A-ECU, W-ECU

a) only Standard machines with electronic

b) optional equipment

NOTE!

Use only fuses of specified capacity (Ampere rating).

Cab

General	
Cab interior, upholstery and insulation	Fire retardant (fire resistant) ISO 3795 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)

196 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

	Canopy	Cab
Sound pressure level (LpA) at operator position (Measurement according to ISO 6396)	78 LpA dB(A)	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)	93 LwA dB(A)	93 LwA dB(A)

Hydraulic system

	EC15E	EC18E	ECR18E	EC20E
Load Sensing flow sharing hydraulic system.				
Type	Open circuit			
Servo pressure	35 bar (508 psi)	31 bar (450 psi)		35 bar (508 psi)
Standby pressure	18 bar (261 psi)			20 bar (290 psi)
Operating pressure: Hydraulic system	170 bar (2466 psi)			210 bar (3046 psi)
Secondary pressure				
Boom cylinder, full bore or piston side	250 bar (3626 psi)			
Boom cylinder, rod side	250 bar (3626 psi)	280 bar (4061 psi)		
Dipper arm cylinder, full bore or piston side	250 bar (3626 psi)			280 bar (4061 psi)
Dipper arm cylinder, rod side	280 bar (4061 psi)			250 bar (3626 psi)



Specifications

Transmission

Travel system	EC15E	EC18E	ECR18E	EC20E
Travel speed				
1st gear	1.75 km/h (1.09 mph)	2.5 km/h (1.55 mph)	2.5 km/h (1.55 mph)	2.5 km/h (1.55 mph)
2nd gear	-	4.6 km/h (2.86 mph)	4.6 km/h (2.86 mph)	4.5 km/h (2.80 mph)
Braking system				
Primary brake	Hydrostatic brake on both motors. If the travelling 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 travelling 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	
	Slewing ring with internal gearing and remote lubrication.
Slewing speed	9.4 +0.8 / -0.6 rpm
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

The total machine weight (as specified on the machine's PIN plate) is calculated according to ISO 6016.

Configuration	EC15 E	EC18 E	ECR1 8E	EC20 E
Most usual configuration (MuC) (Machine with 230 mm (9.06 in) rubber tracks, cab*, long arm, pin-on bucket 450/500**, worklight on boom and tools kit)	1468 kg (3236 lb)	1729 kg (3812 lb)	1617 kg (3565 lb)	1887 kg (4160 lb)
Standard operational weight (Machine with 230 mm (9.06 in) rubber tracks, cab***, short arm, pin-on bucket 450/500** and 75 kg (165 lb) operator)	1638 kg (3611 lb)	1809 kg (3988 lb)	1697 kg (3741 lb)	1967 kg (4336 lb)
Maximum machine weight (Machine with 230 mm (9.06 in) rubber tracks, cab, long arm, 38 kg (84 lb) additional counterweight, 140 kg (308.6 lb) hammer breaker HB02TLN with pin-on attach, OPG level 2, 3% of the operational weight for options and 120 kg (265 lb) operator)	2002 kg (4414 lb)	2256 kg (4974 lb)	2141 kg (4720 lb)	2360 kg (5203 lb)
Weight reduction with canopy	84 kg (185 lb)		-	84 kg (185 lb)

* EC15E/ECR18E: Canopy

** 500 is value for EC20E

*** ECR18E: Canopy



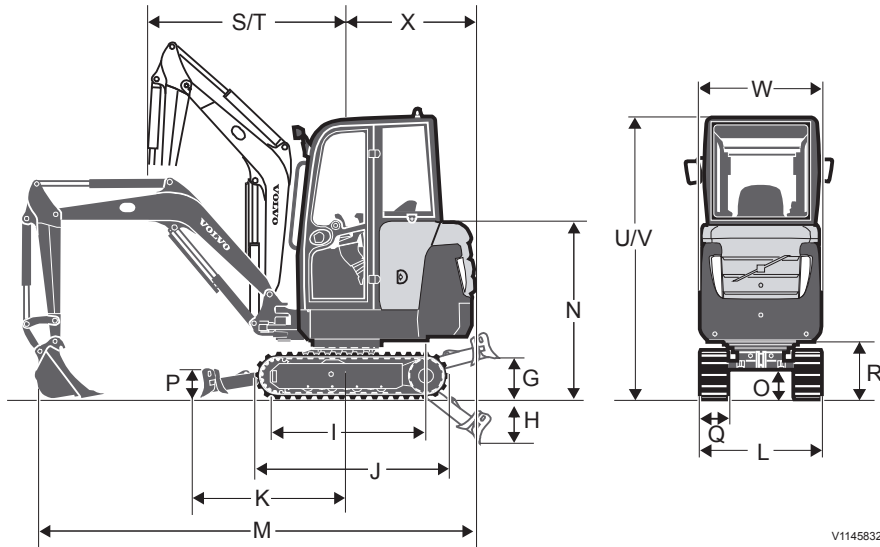
Specifications
200 Ground pressure

Ground pressure

(based on MuC/most usual configuration weight)

Version	EC15D	EC18D	ECR18E	EC20D
Cab	0.29 kg/cm ² (28.4 kPa)	0.29 kg/cm ² (28.4 kPa)	—	0.31 kg/cm ² (30.4 kPa)
Canopy	0.28 kg/cm ² (27.5 kPa)	0.27 kg/cm ² (26.5 kPa)	0.27 kg/cm ² (26.5 kPa)	0.30 kg/cm ² (29.4 kPa)

Dimensions



V1145832

	EC15E, mm (in)		EC18E, mm (in)		ECR18E, mm (in)		EC20E, mm (in)	
Dipper arm	Short arm	Long arm	Short arm	Long arm	Short arm	Long arm	Short arm	Long arm
	950 (37.4)	1150 (45.3)	950 (37.4)	1150 (45.3)	950 (37.4)	1150 (45.3)	1050 (41.3)	1350 (53.1)
G Highest position dozer blade (short blade / long blade)	221 (8.7) / —*		225 (8.86) / 267 (10.51)				—* / 259 (10.2)	
H Lowest position dozer blade (short blade / long blade)	267 (10.51) / —*		296 (11.65) / 386 (15.2)				—* / 404 (15.91)	
I Tumbler length	1081 (42.56)				1240 (48.82)			
J Track length	1462 (57.56)				1620 (63.78)			

Specifications 202 Dimensions

	EC15E, mm (in)		EC18E, mm (in)		ECR18E, mm (in)		EC20E, mm (in)	
	Short arm	Long arm	Short arm	Long arm	Short arm	Long arm	Short arm	Long arm
Dipper arm	950 (37.4)	1150 (45.3)	950 (37.4)	1150 (45.3)	950 (37.4)	1150 (45.3)	1050 (41.3)	1350 (53.1)
K Dozer blade, maximum reach at ground level (short blade / long blade)	1028 (40.47) / —*		1082 (42.60) / 1272 (50.08)				—* / 1288 (50.71)	
L Overall width min./max	990 (38.98) / —*		994 (39.13) / 1352 (53.23)					
M Overall length	3548 (139.69)	3432 (135.12)	3550 (139.76)	3431 (135.08)		3309 (130.28)	3707 (145.94)	3554 (139.92)
N Overall height of engine hood	1439 (56.65)				1433 (56.42)		1439 (56.65)	
O Minimum ground clearance	182 (7.17)		162 (6.38)					
P Dozer blade height (short blade / long blade)	221 (8.70) / —*		231 (9.09) / 231 (9.09)				—* / 241 (9.49)	
Q Shoe width	230 (9.06)							
R Ground clearance to superstructure	453 (17.83)		456 (17.95)					
S Front slew radius	1455 (57.28)	1476 (58.11)	1455 (57.28)	1476 (58.11)	1575 (62.01)	1568 (61.73)	1679 (66.10)	1732 (68.29)
T Front slew radius with maximum offset	1181 (46.50)	1184 (46.61)	1181 (46.50)	1198 (47.17)	1269 (49.96)	1287 (50.67)	1401 (55.16)	1450 (57.09)
U Overall height (canopy)	2298 (90.47)				2296 (90.39)		2298 (90.47)	
V Overall height (cab)	2334 (91.89)				-		2334 (91.89)	

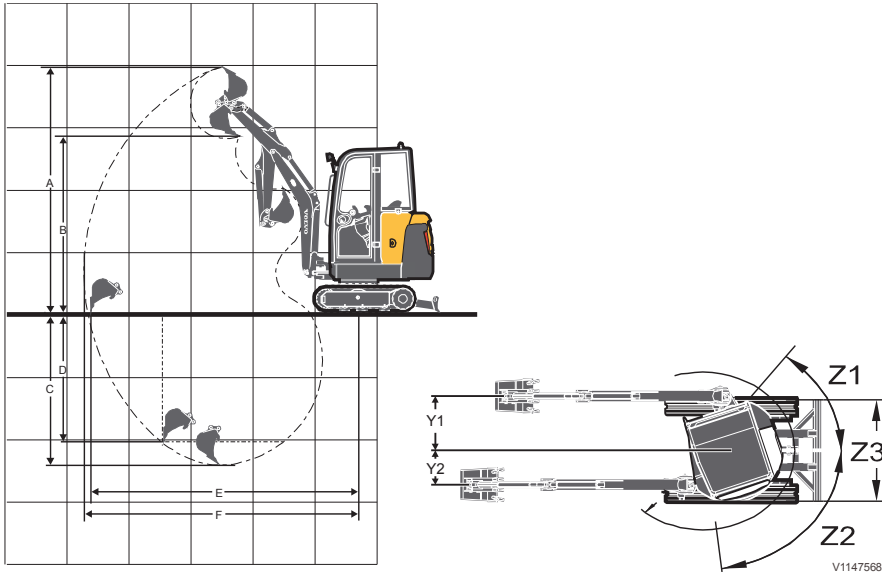
Specifications
Dimensions 203

	EC15E, mm (in)		EC18E, mm (in)		ECR18E, mm (in)		EC20E, mm (in)	
Dipper arm	Short arm 950 (37.4)	Long arm 1150 (45.3)	Short arm 950 (37.4)	Long arm 1150 (45.3)	Short arm 950 (37.4)	Long arm 1150 (45.3)	Short arm 1050 (41.3)	Long arm 1350 (53.1)
W Overall width of superstructure	1000 (39.37)							
X Tail slew radius	1018 (40.08)				688 (27.09)		1018 (40.08)	

*not available



Working ranges



	EC15E, mm (in)		EC18E, mm (in)		ECR18E, mm (in)		EC20E, mm (in)	
	Short arm	Long arm	Short arm	Long arm	Short arm	Long arm	Short arm	Long arm
Dipper arm	950 (37.4)	1150 (45.3)	950 (37.4)	1150 (45.3)	950 (37.4)	1150 (45.3)	1050 (41.3)	1350 (53.1)
A. Maximum cutting height	3439 (135.39)	3582 (141.02)	3439 (135.39)	3582 (141.02)	3442 (135.51)	3582 (141.02)	3793 (149.33)	3968 (156.22)
B. Maximum dumping height	2482 (97.72)	2625 (103.35)	2482 (97.72)	2625 (103.35)	2485 (97.83)	2625 (103.35)	2733 (107.60)	2908 (114.49)
C. Maximum digging depth (with dozer blade lowered)	2234 (87.95)	2434 (95.83)	2234 (87.95)	2434 (95.83)	2234 (87.95)	2434 (95.83)	2279 (89.72)	2579 (101.54)
D. Maximum vertical wall digging depth	1880 (74.02)	2091 (82.32)	1898 (74.72)	2091 (82.32)	1897 (74.69)	2091 (82.32)	1713 (67.44)	1999 (78.70)
E. Maximum digging reach at ground level	3800 (149.61)	3993 (157.20)	3799 (149.57)	3993 (157.20)	3921 (154.37)	4113 (161.93)	3976 (156.54)	4266 (167.95)
F. Maximum digging reach	3853 (151.69)	4043 (159.17)	3853 (151.69)	4043 (159.17)	3974 (156.46)	4163 (163.90)	4080 (160.63)	4362 (171.73)

Specifications
Working ranges 205

	EC15E, mm (in)		EC18E, mm (in)		ECR18E, mm (in)		EC20E, mm (in)	
	Short arm	Long arm	Short arm	Long arm	Short arm	Long arm	Short arm	Long arm
Dipper arm	950 (37.4)	1150 (45.3)	950 (37.4)	1150 (45.3)	950 (37.4)	1150 (45.3)	1050 (41.3)	1350 (53.1)
W. Machine width, min./ max.	1000 (39.37)							
X. Tail slew radius	1018 (40.08)				688 (27.09)		1018 (40.08)	
Y1. Boom offset	525 (20.67)				640 (25.20)		545 (21.46)	
Y2. Boom offset	418 (16.46)				516 (20.31)		389 (15.57)	
Z1. Max. boom angle left	55°							
Z2. Max. boom angle right	75°							
Z3. Min./Max.	^{-(a)} /990 (38.98)		994 (39.13) / 1352 (53.23)					

a)no variable tracks



206 Specifications
Digging forces

Digging forces

Digging forces with direct mounted buckets		EC15E/EC18E/ ECR18E		EC20E	
Dipper arm		950 mm (37.4 in)	1150 mm (45.3 in)	1050 mm (41.3 in)	1350 mm (53.1 in)
Bucket radius	at bucket tooth	499 mm (19.6 in)		600 mm (23.6 in)	
	at bucket blade	443 mm (17.4 in)		539 mm (21.2 in)	
Break-out force	at bucket blade	12.90 kN (2900 lbf)		18.27 kN (4107 lbf)	
	ISO/SAE	11.45 kN (2574 lbf)		16.44 kN (3696 lbf)	
Tear-out force	at bucket blade	7.95 kN (1787 lbf)	6.95 kN (1562 lbf)	12.29 kN (2763 lbf)	10.33 kN (2322 lbf)
	ISO/SAE	7.70 kN (1731 lbf)	6.76 kN (1520 lbf)	11.93 kN (2682 lbf)	10.08 kN (2266 lbf)
Angle of rotation, bucket		196°		199°	

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 and a table stating the nominal lifting loads for lifting gear operation.

The lifting table is a decal inside the cab (not in machines without safety valves).

The specified values are valid for a machine:

- without attachment and without attachment bracket.

NOTE!

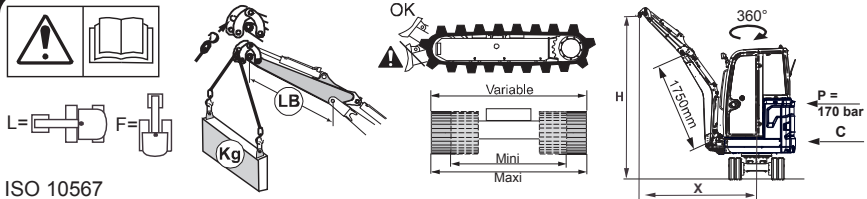
If handling is accomplished in lifting gear operation the weight of the attachments must be subtracted from the values stated in the table.

- 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.



208 Specifications
Lifting capacities

Lifting capacities, EC15E, Cab, with safety valves on dipper arm and boom, without safety valve on dozer blade



ISO 10567


	X(m)	1.0		1.5		2.0		2.5		3.0		3.5		Max		Xmax	
		L	F	L	F	L	F	L	F	L	F	L	F	L	F		
LB= 0,95m C=33kg	3,5																
	3																
	2,5							273 *	273 *					275 *	275 *	2537	
	2							244 *	244 *					228	274	2945	
	1,5					269 *	269 *	283 *	283 *	219	264			200	241	3195	
	1					374	441 *	277	335	216	260			187	225	3325	
	0,5					357	439	269	326	212	256			182	220	3354	
	0			324 *	324 *	349	430	263	320	209	252			185	224	3287	
	-0,5			514	644 *	347	428	260	318	208	251			198	239	3117	
	-1			519	630 *	349	427 *	262	308 *					225	238 *	2815	
	-1,5			497 *	497 *	327 *	327 *							242 *	242 *	2311	
	-2																
LB= 1,15m C=33kg	3,5																
	3													233 *	233 *	2160	
	2,5							196 *	196 *					243 *	243 *	2777	
	2							188 *	188 *	222	241 *			203	228 *	3153	
	1,5							235 *	235 *	221	250 *			183	220	3388	
	1					364 *	364 *	279	308 *	216	261	173		172	207	3512	
	0,5					360	442	269	327	211	255	171		206	168	203	3543
	0			382 *	382 *	348	430	262	319	207	251			171	206	3486	
	-0,5	390 *	390 *	507	595 *	343	425	258	315	205	249			180	218	3330	
	-1	626 *	626 *	511	649	344	425	258	315	206	235 *			202	225 *	3082	
	-1,5			519	563 *	349	369 *	255 *	255 *					231 *	231 *	2630	
	-2																

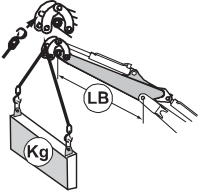
VOLVO - EC15E 15711149 P02

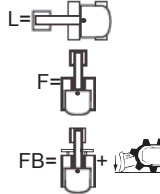
C = additional counterweight, LB = length of dipper arm
* = Limited by machine's hydraulic lifting capacity rather than tipping load.

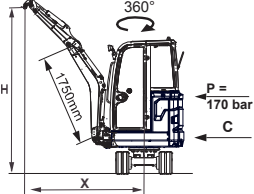
Specifications
Lifting capacities 209

Lifting capacities, EC15E, Cab, with safety valves on dipper arm, boom and dozer blade

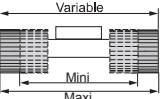








Variable



Mini
Maxi

ISO 10567

	X(m)	1.0			1.5			2.0			2.5			3.0			3.5			Max			X(m)
		L	F	FB	L	F	FB	L	F	FB	L	F	FB	L	F	FB	L	F	FB	L	F	FB	
LB = 0,95m C=33kg	3.5																						
	3																						
	2.5																						
	2																						
	1.5																						
	1																						
	0.5																						
	0																						
	-0.5																						
	-1																						
-1.5																							
-2																							
LB = 1,15m C=33kg	3.5																						
	3																						
	2.5																						
	2																						
	1.5																						
	1																						
	0.5																						
	0																						
	-0.5																						
	-1																						
-1.5																							
-2																							


VOLVO - EC15E 15711152 P02

V1197658

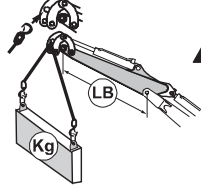
C = additional counterweight, LB = length of dipper arm
* = Limited by machine's hydraulic lifting capacity rather than tipping load.

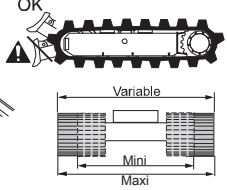
210 Specifications Lifting capacities

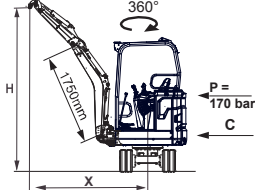
Lifting capacities, EC15E, Canopy, with safety valves on dipper arm and boom, without safety valve on dozer blade



ISO 10567







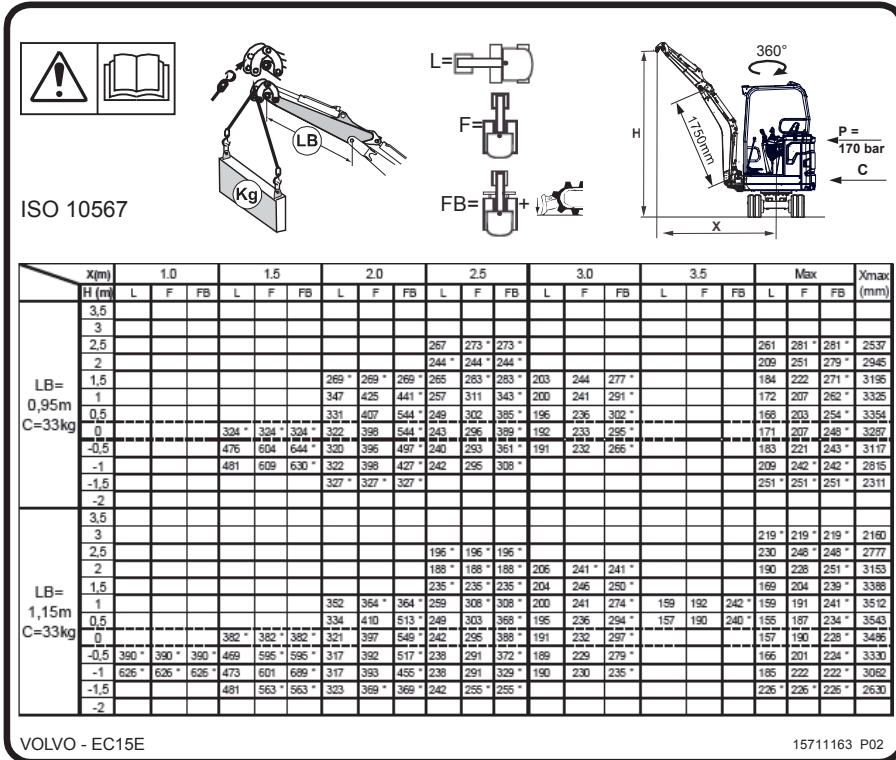
	X(m)	1.0		1.5		2.0		2.5		3.0		3.5		Max		Xmax	
		L	F	L	F	L	F	L	F	L	F	L	F	L	F		
LB=0,95m C=33kg	H (m)																
	3,5																
	3																
	2,5							267	273 *						261	281 *	2537
	2							244 *	244 *						209	251	2945
	1,5					269 *	269 *	265	283 *	203	244				184	222	3195
	1					347	425	257	311	200	241				172	207	3325
	0,5					331	407	249	302	196	236				168	203	3354
	0			324 *	324 *	322	398	243	296	192	233				171	207	3287
	-0,5			476	604	320	396	240	293	191	232				183	221	3117
-1			481	609	322	398	242	295						209	242 *	2815	
-1,5					327 *	327 *								251 *	251 *	2311	
-2																	
LB=1,15m C=33kg	H (m)																
	3,5																
	3														219 *	219 *	2160
	2,5							196 *	196 *						230	248 *	2777
	2							188 *	188 *	206	241 *				190	228	3153
	1,5							235 *	235 *	204	246				169	204	3388
	1					352	364 *	259	308 *	200	241	159	192	159	191	3512	
	0,5					334	410	249	303	195	236	157	190	155	187	3543	
	0			382 *	382 *	321	397	242	295	191	232				157	190	3496
	-0,5		390 *	390 *	469	595 *	317	392	238	291	189	229				166	201
-1		626 *	626 *	473	601	317	393	238	291	190	230				185	222	3062
-1,5				481	563 *	323	369 *	242	255 *						226 *	226 *	2630
-2																	

VOLVO - EC15E 15711155 P02

C = additional counterweight, LB = length of dipper arm
* = Limited by machine's hydraulic lifting capacity rather than tipping load.

Specifications
Lifting capacities 211

Lifting capacities, EC15E, Canopy, with safety valves on dipper arm, boom and dozer blade



C = additional counterweight, LB = length of dipper arm
* = Limited by machine's hydraulic lifting capacity rather than tipping load.

15711163 P02

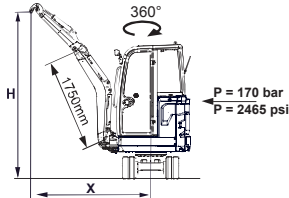
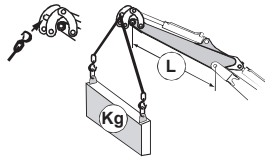
V1197660

212 Specifications Lifting capacities

Lifting capacities, EC18E, Cab, North America only

X m (ft-in)		1 (3-3.6)				2 (8-7)				3 (8-10)				Max1 (X)				
		Min		Max		Min		Max		Min		Max		Min		Max		
		Kg	Lbs	Kg	Lbs	Kg	Lbs	Kg	Lbs	Kg	Lbs	Kg	Lbs	Kg	Lbs	Kg	Lbs	
L= 0.95m (37.4 in)	H m (ft-in)																	
	3.0 (9-10)																	
	2.0 (6-7)																	
	1.0 (3-3.5)																	
	0 (0)	338 *	745	338 *	745	407	897	546 *	1204	242	534	302	666 *	213	469	254 *	560	3,28 (10-9)
	-1.0 (-3-3.5)	597	1316	661 *	1457	400	882	494 *	1089 *	238	525	264 *	582 *	239 *	527 *	241 *	532 *	2,81 (9-3)
	-2.0 (-6-7)																	
	3.0 (9-10)																	
	2.0 (6-7)																	
	1.0 (3-3.5)	564 *	1243 *	564 *	1243 *	373 *	822 *	373 *	822 *	251 *	553 *	276 *	608 *	208	459	240 *	530 *	3,32 (10-11)
L= 1.15m (45.3 in)	H m (ft-in)																	
	3.0 (9-10)																	
	2.0 (6-7)																	
	1.0 (3-3.5)	380 *	860 *	390 *	860 *	410	904	548 *	1208 *	241	531	297	655 *	196	431	234 *	516	3,48 (11-5)
	0 (0)	638 *	1407 *	684 *	1508 *	395	871	515 *	1135 *	235	518	278	613 *	222 *	490 *	224 *	494 *	3,05 (10-0)
	-1.0 (-3-3.5)	638 *	1407 *	684 *	1508 *	395	871	515 *	1135 *	235	518	278	613 *	222 *	490 *	224 *	494 *	3,05 (10-0)
	-2.0 (-6-7)	556 *	1226 *	556 *	1226 *	365 *	805 *	365 *	805 *					226 *	498 *	226 *	498 *	2,61 (8-7)
	3.0 (9-10)																	
	2.0 (6-7)																	
	1.0 (3-3.5)																	
0 (0)	338 *	745	338 *	745	546 *	1204 *	546 *	1204 *	302 *	666 *	302 *	666 *	254 *	560 *	254 *	560 *	3,28 (10-9)	
L= 0.95m (37.4 in)	H m (ft-in)																	
	3.0 (9-10)																	
	2.0 (6-7)																	
	1.0 (3-3.5)																	
	0 (0)	338 *	745	338 *	745	546 *	1204 *	546 *	1204 *	302 *	666 *	302 *	666 *	254 *	560 *	254 *	560 *	3,28 (10-9)
	-1.0 (-3-3.5)	661 *	1457 *	661 *	1457 *	494 *	1089 *	494 *	1089 *	264 *	582 *	264 *	582 *	241 *	532 *	241 *	532 *	2,81 (9-3)
	-2.0 (-6-7)																	
	3.0 (9-10)																	
	2.0 (6-7)																	
	1.0 (3-3.5)	564 *	1243 *	564 *	1243 *	373 *	822 *	373 *	822 *	276 *	608 *	276 *	608 *	240 *	530 *	240 *	530 *	3,52 (11-6)
L= 1.15m (45.3 in)	H m (ft-in)																	
	3.0 (9-10)																	
	2.0 (6-7)																	
	1.0 (3-3.5)	390 *	860 *	390 *	860 *	548 *	1208 *	548 *	1208 *	297 *	655 *	297 *	655 *	234 *	516 *	234 *	516 *	3,48 (11-5)
	0 (0)	684 *	1508 *	684 *	1508 *	515 *	1135 *	515 *	1135 *	278 *	613 *	278 *	613 *	224 *	494 *	224 *	494 *	3,05 (10-0)
	-1.0 (-3-3.5)	684 *	1508 *	684 *	1508 *	515 *	1135 *	515 *	1135 *	278 *	613 *	278 *	613 *	224 *	494 *	224 *	494 *	3,05 (10-0)
	-2.0 (-6-7)	556 *	1226 *	556 *	1226 *	365 *	805 *	365 *	805 *					226 *	498 *	226 *	498 *	2,61 (8-7)
	3.0 (9-10)																	
	2.0 (6-7)																	

ISO 10567



VOLVO - EC18E

15710704

V1197896

L = length of dipper arm

* = Limited by machine's hydraulic lifting capacity rather than tipping load.

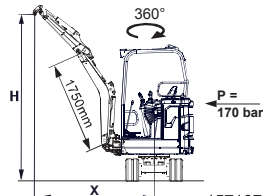
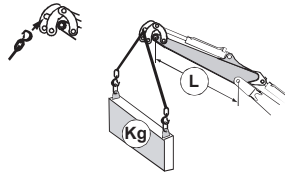
Lifting capacities, EC18E, Canopy, North America only

X m (ft-in)		1 (3-3.5)				2 (6-7)				3 (9-10)				Maxi (X)				
		Min		Max		Min		Max		Min		Max		Min		Max		
		Kg	Lbs	Kg	Lbs	Kg	Lbs	Kg	Lbs	Kg	Lbs	Kg	Lbs	Kg	Lbs	m (ft-in)		
L = 0.95m (37.4 in)	3.0 (9-10)					269	593	269	593					277	610	278	613	2.64 (8-4)
	2.0 (6-7)					396	873	448	988	232	511	292	644	212	466	271	598	3.32 (10-11)
	1.0 (3-3.5)	338	745	338	745	379	836	546	1204	221	494	302	666	197	435	254	560	3.28 (10-9)
	0 (0)	556	1226	661	1457	372	820	494	1093	220	485	264	582	239	527	241	532	2.81 (9-3)
	-1.0 (-3-3.5)																	
	-2.0 (-6-7)					321	708	321	708					245	541	245	541	2.31 (7-3)
	3.0 (9-10)													223	491	223	491	2.2 (7-3)
	2.0 (6-7)					194	428	194	428	235	518	241	531	250	551	250	551	3.17 (10-5)
	1.0 (3-3.5)	564	1243	564	1243	373	822	373	822	233	514	276	608	194	427	240	530	3.52 (11-6)
	0 (0)	390	860	390	860	382	842	548	1208	224	494	297	655	181	400	234	516	3.48 (11-5)
L = 1.15m (45.3 in)	3.0 (9-10)	638	1407	684	1508	367	809	515	1135	219	483	278	613	215	474	224	494	3.05 (10-0)
	2.0 (6-7)	556	1226	556	1226	365	805	365	805					228	498	228	498	2.61 (8-7)
	1.0 (3-3.5)																	
	0 (0)																	
	-1.0 (-3-3.5)																	
	-2.0 (-6-7)																	
	3.0 (9-10)					269	593	269	593					278	613	278	613	2.54 (8-4)
	2.0 (6-7)					448	988	448	988	292	644	292	644	271	598	271	598	3.32 (10-11)
	1.0 (3-3.5)	338	745	338	745	546	1204	546	1204	302	666	302	666	254	560	254	560	3.28 (10-9)
	0 (0)	661	1457	661	1457	494	1093	494	1093	264	582	264	582	241	532	241	532	2.81 (9-3)
L = 1.15m (45.3 in)	-1.0 (-3-3.5)																	
	-2.0 (-6-7)					321	708	321	708					245	541	245	541	2.31 (7-3)
	3.0 (9-10)													223	491	223	491	2.2 (7-3)
	2.0 (6-7)					194	428	194	428	241	531	241	531	250	551	250	551	3.17 (10-5)
	1.0 (3-3.5)	564	1243	564	1243	373	822	373	822	276	608	276	608	240	530	240	530	3.52 (11-6)
	0 (0)	390	860	390	860	382	842	548	1208	297	655	297	655	234	516	234	516	3.48 (11-5)
	-1.0 (-3-3.5)	684	1508	684	1508	515	1135	515	1135	278	613	278	613	224	494	224	494	3.05 (10-0)
	-2.0 (-6-7)	556	1226	556	1226	365	805	365	805					228	498	228	498	2.61 (8-7)

ISO 10567



VOLVO - EC18E



15710707 P02

V1197897

L = length of dipper arm

* = Limited by machine's hydraulic lifting capacity rather than tipping load.

214 Specifications Lifting capacities

Lifting capacities, EC18E, Cab, with safety valves on dipper arm and boom, without safety valve on dozer blade

ISO 10567

	X(m)	1.0		1.5		2.0		2.5		3.0		3.5		Max		Xmax			
		L		F		L		F		L		F		L					
		mini	Max	mini	Max	mini	Max	mini	Max	mini	Max	mini	Max	mini	Max				
LB= 0,95m C=33kg	3																		
	2,5							269 *	269 *	269 *					277 *	277 *	2538		
	2							245 *	245 *	245 *					278 *	278 *	2947		
	1,5						277 *	277 *	277 *	286 *	286 *	249	277 *	277 *	228	271 *	3192		
	1						424	448 *	448 *	314	346 *	346 *	246	292 *	292 *	213	263 *	3322	
	0,5						407	546 *	546 *	306	386 *	386 *	242	302 *	302 *	208	254 *	3352	
	0						338 *	338 *	338 *	399	542 *	542 *	300	388 *	388 *	238	294 *	3284	
	-0,5						592	661 *	661 *	397	494 *	494 *	298	359 *	359 *	238	264 *	3113	
	-1						597	625 *	625 *	400	423 *	423 *	300	305 *	305 *	238	264 *	2811	
	-1,5									321 *	321 *	321 *				245 *	245 *	2306	
LB= 1.15m C=33kg	3,5																		
	3														223 *	223 *	2200		
	2,5								194 *	194 *	194 *				250 *	250 *	2806		
	2								189 *	189 *	189 *	241 *	241 *	241 *	231	245 *	3171		
	1,5								238 *	238 *	238 *	251 *	251 *	251 *	208	240 *	3395		
	1								373 *	373 *	373 *	312 *	312 *	246	276 *	198	242 *	3519	
	0,5								410	517 *	517 *	307	370 *	370 *	241	295 *	295 *	3543	
	0								390 *	390 *	390 *	398	548 *	548 *	299	388 *	388 *	3480	
	-0,5	400 *	400 *	400 *	584	607 *	607 *	394	515 *	515 *	295	371 *	371 *	235	278 *	278 *	207	224 *	3321
	-1	638 *	638 *	638 *	588	684 *	684 *	395	452 *	452 *	295	327 *	327 *	232 *	232 *	232 *	222 *	222 *	3048
-1,5				556 *	556 *	556 *	365 *	365 *	365 *	251 *	251 *	251 *				226 *	226 *	2608	
-2																			

VOLVO 3E 15711150 P02

C = additional counterweight, LB = length of dipper arm
* = Limited by machine's hydraulic lifting capacity rather than tipping load.

Specifications
Lifting capacities 215

Lifting capacities, EC18E, Cab, with safety valves on dipper arm, boom and dozer blade

ISO 10567

Y (m)	1.0			1.5			2.0			2.5			3.0			3.5			Max			X(m) ax
	L	F	FB	L	F	FB	L	F	FB	L	F	FB	L	F	FB	L	F	FB	L	F	FB	
3.5																						
3																						
2.5										289	289	289	289						277	277	277	277
2										249	249	249	249						239	239	239	239
1.5																			212	212	212	212
1										219	219	219	219						198	198	198	198
0.5										229	229	229	229						198	198	198	198
0										229	229	229	229						198	198	198	198
-0.5										229	229	229	229						211	211	211	211
-1										229	229	229	229						229	229	229	229
-1.5										229	229	229	229						245	245	245	245
-2										229	229	229	229						245	245	245	245
3.5																			229	229	229	229
3																			229	229	229	229
2.5										194	194	194	194						229	229	229	229
2										159	159	159	159						215	215	215	215
1.5										129	129	129	129						194	194	194	194
1										99	99	99	99						169	169	169	169
0.5										69	69	69	69						139	139	139	139
0										39	39	39	39						109	109	109	109
-0.5										9	9	9	9						79	79	79	79
-1										0	0	0	0						49	49	49	49
-1.5										0	0	0	0						19	19	19	19
-2										0	0	0	0						0	0	0	0

VOLVO - EC18E 15711153 P02

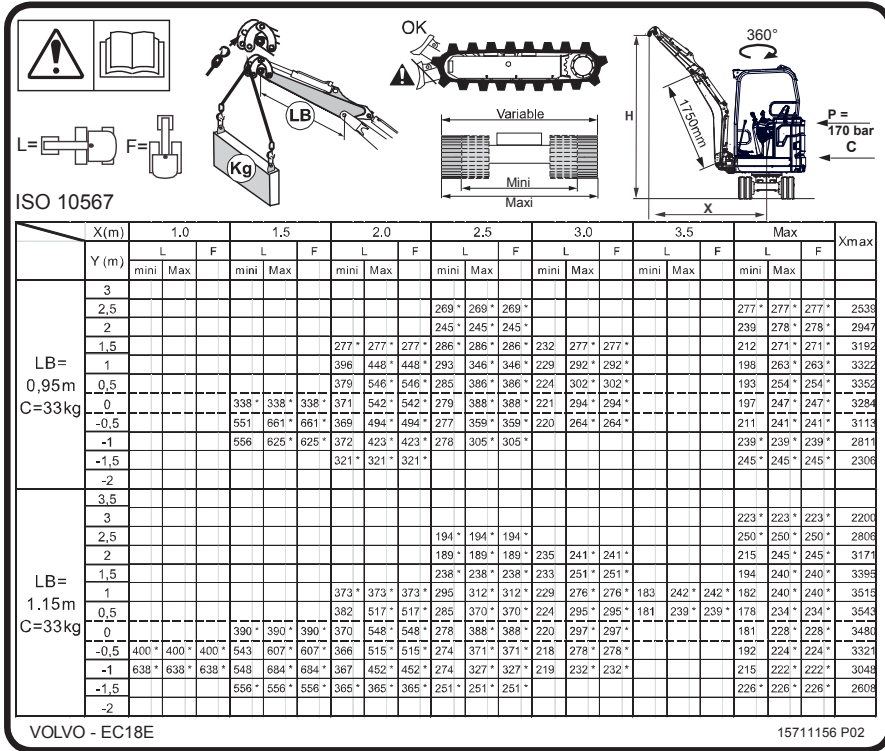
V1197662

C = additional counterweight, LB = length of dipper arm
 * = Limited by machine's hydraulic lifting capacity rather than tipping load.

Specifications

216 Lifting capacities

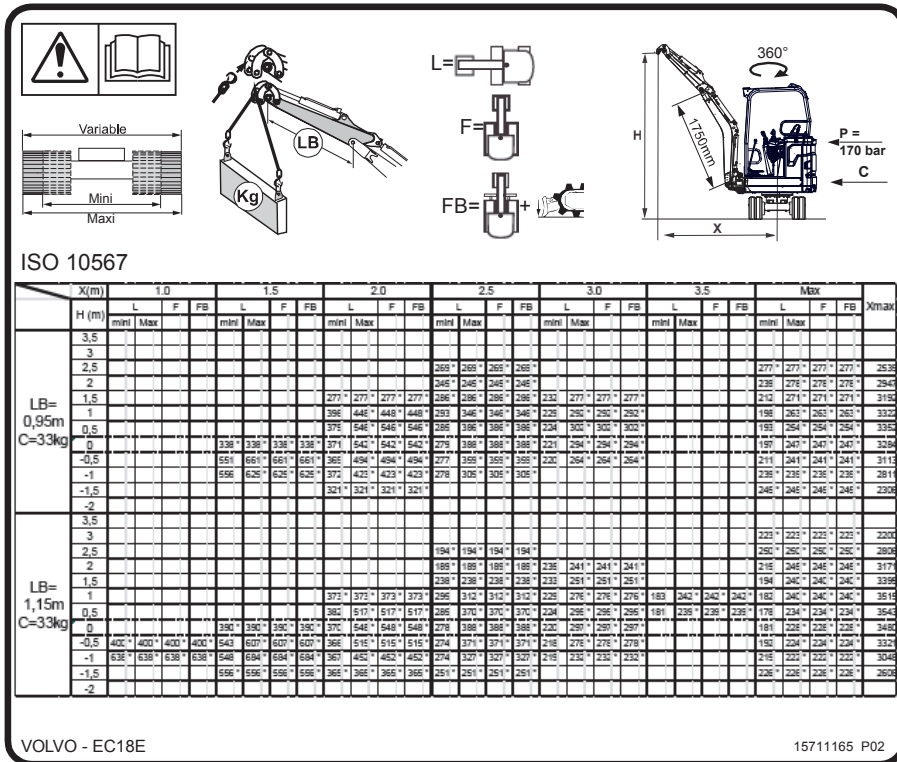
Lifting capacities, EC18E, Canopy, with safety valves on dipper arm and boom, without safety valve on dozer blade



C = additional counterweight, LB = length of dipper arm
 * = Limited by machine's hydraulic lifting capacity rather than tipping load.

Specifications
Lifting capacities 217

Lifting capacities, EC18E, Canopy, with safety valves on dipper arm, boom and dozer blade



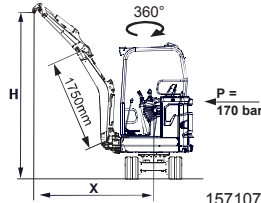
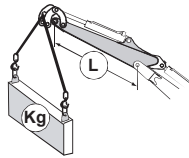
C = additional counterweight, LB = length of dipper arm
* = Limited by machine's hydraulic lifting capacity rather than tipping load.

218 Specifications
Lifting capacities

Lifting capacities, ECR18E, Canopy, North America only

X m (ft-in)		1 (3-3.5)				2 (6-7)				3 (9-10)				Max (X)				
		Min		Max		Min		Max		Min		Max		Min		Max		
		Kg	Lbs	Kg	Lbs	Kg	Lbs	Kg	Lbs	Kg	Lbs	Kg	Lbs	Kg	Lbs	Kg	Lbs	m (ft-in)
L= 0.95m (37.4 in)	3.0 (9-10)																	
	2.0 (6-7)					214	472	238 *	525 *	160	353	259	571	193	424	270 *	596 *	3.06 (10-1)
	1.0 (3-3.5)					274	604	458	1010	159	351	258	569	136	299	222	490	3.44 (11-3)
	0 (0)					258	569	440	970	151	333	250	551	127	279	210	463	3.47 (11-4)
	-1.0 (-3-3.5)	392	864	699	1541	258	569	440	970	149	328	248	547	156	348	243 *	536 *	3.23 (10-7)
L= 1.15m (45.3 in)	3.0 (9-10)																	
	2.0 (6-7)					162 *	357 *	162 *	357 *	174	384	228 *	503 *	179	394	244 *	539 *	3.29 (10-9)
	1.0 (3-3.5)					299	659	390 *	860 *	172	379	270	595	133	293	216	475	3.63 (11-1)
	0 (0)	303 *	668 *	303 *	668 *	280	617	468	1032	163	359	265	584	125	276	205	451	3.66 (12-0)
	-1.0 (-3-3.5)	611 *	1347 *	727	1603	271	597	459	1012	160	353	259	571	150	331	225 *	497 *	3.44 (11-3)
L= 0.95m (37.4 in)	3.0 (9-10)																	
	2.0 (6-7)					238 *	525 *	238 *	525 *	270 *	595 *	270 *	595 *	274 *	604 *	274 *	604 *	2.54 (8-4)
	1.0 (3-3.5)					447	985	447	985	292 *	644 *	292 *	644 *	269	592 *	269	592 *	3.32 (10-1)
	0 (0)	338 *	745 *	338 *	745 *	545	1202	545	1202	301 *	664 *	301 *	664 *	253	558 *	254	560 *	3.28 (10-9)
	-1.0 (-3-3.5)	624 *	1376 *	624 *	1376 *	493 *	1087 *	493 *	1087 *	264 *	582 *	264 *	582 *	240	529 *	241	531 *	2.81 (9-3)
L= 1.15m (45.3 in)	3.0 (9-10)																	
	2.0 (6-7)					162 *	357 *	162 *	357 *	228 *	503 *	228 *	503 *	244	539 *	244	539 *	3.17 (10-5)
	1.0 (3-3.5)	564 *	1243 *	564 *	1243 *	372 *	820 *	372 *	820 *	275 *	606 *	275 *	606 *	240	529 *	240	529 *	3.52 (11-6)
	0 (0)	303 *	668 *	303 *	668 *	547 *	1206 *	547 *	1206 *	296 *	653 *	296 *	653 *	234	515 *	234	515 *	3.48 (11-5)
	-1.0 (-3-3.5)	683 *	1506 *	683 *	1506 *	514 *	1133 *	514 *	1133 *	277 *	611 *	277 *	611 *	224	494 *	224	494 *	3.05 (10-0)
-2.0 (-6-7)	555 *	1224 *	555 *	1224 *	364 *	802 *	364 *	802 *					226	498 *	226 *	498 *	2.81 (9-7)	

ISO 10567



VOLVO - ECR18E

15710708 P02

V1197898

L = length of dipper arm

* = Limited by machine's hydraulic lifting capacity rather than tipping load.

Specifications
Lifting capacities 219

Lifting capacities, ECR18E, Canopy, with safety valves on dipper arm and boom, without safety valve on dozer blade

ISO 10567

Y (m)	1.0		1.5		2.0		2.5		3.0		3.5		Max		Xmax
	L	F	L	F	L	F	L	F	L	F	L	F	L	F	
3															
2.5								213	238	238 *				193	270 *
2								214	225	225 *	160	259	270 *	154	251
1.5							261 *	261 *	261 *	280 *	159	256	273	136	222
1							274	458	484 *	201	331	353	155	254	269
0.5							226	440	476	194	322	344	151	250	265
0							253	434	467	189	317	336	148	245	262
-0.5							385	579	579 *	253	435	470	188	316	337
-1							392	609	700 *	258	440	465 *	191	320	333 *
-1.5							404	570 *	570 *	267	381 *	381 *			
-2															
3.5															
3															
2.5									161 *	161 *	161 *			213 *	213 *
2									162 *	162 *	162 *	174	226 *	228 *	179
1.5									225 *	225 *	225 *	172	246 *	246 *	148
1									280	390 *	390 *	167	270	280 *	133
0.5									280	468	507	208	341	365	163
0									270	457	496	202	334	357	158
-0.5	390 *	390 *	360 *	404	528 *	528 *	268	455	494	200	332	355	158	259	275
-1	611 *	611 *	611 *	411	700	700 *	271	458	497 *	201	333	355 *	160	257 *	297 *
-1.5									279	406 *	406 *	207	281 *	281 *	
-2															

VOLVO - ECR18E

15711157 P02

V1197665


C = additional counterweight, LB = length of dipper arm

* = Limited by machine's hydraulic lifting capacity rather than tipping load.

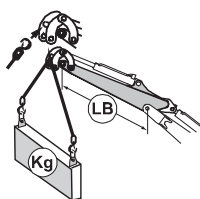
Specifications

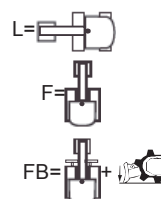
220 Lifting capacities

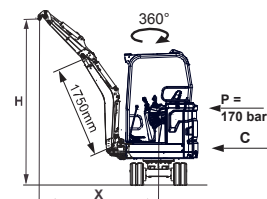
Lifting capacities, ECR18E, Canopy, with safety valves on dipper arm, boom and dozer blade



Variable
Mini
Maxi







ISO 10567

X(m)	1.0			1.5			2.0			2.5			3.0			3.5			Max			Xmax (mm)	
	L		FB	L		FB	L		FB	L		FB	L		FB	L		FB	L		FB		
	mini	Max		mini	Max		mini	Max		mini	Max		mini	Max		mini	Max		mini	Max			
LB= 0,95m C=33kg	3,5																						
	3																						
	2,5									213	238 *	238 *	238 *								193	270 *	
	2									214	225 *	225 *	225 *	180	258	270 *	270 *				154	261	
	1,5							261 *	261 *	261 *	261 *	269	300 *	280 *	280 *	159	258	273	278 *			136	222
	1							274	458	484 *	484 *	201	331	353	358 *	155	254	269	300 *			127	269
	0,5							250	440	478	503 *	194	322	344	411 *	151	250	265	317 *			124	265
	0							253	454	498	523 *	159	317	336	417 *	149	248	262	313 *			127	210
	-0,5				365	579 *	579 *	279 *	279 *	353	435	470	539 *	188	318	337	388 *	149	248	262	287 *		136
	-1				362	566	700 *	700 *	359	440	465 *	465 *	191	320	333 *	333 *							158
-1,5				404	570 *	570 *	270 *	270 *	367	361 *	361 *	361 *										206	
LB= 1,15m C=72kg	3,5																						
	3																						
	2,5																					213 *	
	2																					179	
	1,5																					149	
	1																					133	
	0,5																					133	
	0																					135	
	-0,5	380 *	390 *	380 *	380 *	404	528	528 *	528 *	360	455	494	564 *	200	332	355	399 *	150	258	275	286 *	133	
	-1	611 *	611 *	611 *	611 *	411	700 *	700 *	700 *	271	458	497 *	497 *	201	333	355 *	355 *	160	257 *	257 *	257 *	150	
-1,5					422	646 *	646 *	646 *	279	405 *	408 *	408 *	207	351 *	351 *	351 *					187		

VOLVO - ECR18E 15711166 P02

V1197666

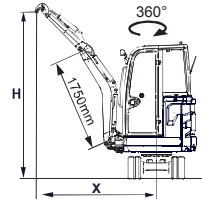
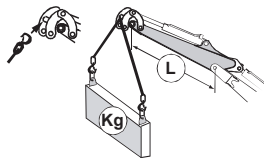
C = additional counterweight, LB = length of dipper arm
 * = Limited by machine's hydraulic lifting capacity rather than tipping load.

Specifications
Lifting capacities 221

Lifting capacities, EC20E, Cab, North America only

X m (ft-in)		1 (3-3.5)				2 (6-7)				3 (9-10)				Max I (X)					
		Min		Max		Min		Max		Min		Max		Min		Max			
		Kg	Lbs	Kg	Lbs	Kg	Lbs	Kg	Lbs	Kg	Lbs	Kg	Lbs	Kg	Lbs	Kg	Lbs	m (ft-in)	
L = 0.95m (37.4 in)	3.0 (9-10)																		
	2.0 (6-7)					319	703	400	* 882	*				241	530	360	793	3.25 (10-8)	
	1.0 (3-3.5)					417	919	608	1340		229	505	346	763	187	412	284	626	3.48 (11-5)
	0 (0)	543	1197	794	* 1750	* 371	818	586	1292	216	478	331	730	182	402	281	620	3.46 (11-4)	
	-1.0 (-3-3.5)	554	1221	919	2026	366	807	580	1279	210	463	326	719	236	520	365	804	3.13 (10-3)	
	-2.0 (-6-7)					377	831	584	1310						328	723	510	1124	2.23 (7-4)
	3.0 (9-10)														290	552	340	* 749	* 2.91 (9-7)
	2.0 (6-7)									238	525	333	* 734		203	448	306	675	3.55 (11-8)
	1.0 (3-3.5)					399	880	618	1362	231	509	349	769	163	358	250	551	3.76 (12-4)	
	0 (0)	529	1166	809	* 1784	* 372	820	589	1299	214	472	330	728	157	347	246	543	3.74 (12-3)	
-1.0 (-3-3.5)	1032	2275	1125	* 2480	* 353	778	567	1250	205	452	320	705	193	426	301	664	3.45 (11-4)		
-2.0 (-6-7)	546	1204	911	2008	360	794	575	1268						245	539	381	840	2.68 (8-9)	
L = 1.15m (45.3 in)	3.0 (9-10)					398	877	* 398	* 877	*				400	* 881	* 400	* 881	* 2.91 (9-7)	
	2.0 (6-7)					400	882	* 400	* 882	* 396	* 873	* 396	* 873	404	* 891	* 404	* 891	* 2.96 (9-9)	
	1.0 (3-3.5)					774	1708	* 774	* 1708	* 474	* 1045	* 474	* 1045	429	* 945	* 429	* 945	* 3.41 (11-2)	
	0 (0)	794	* 1750	* 794	* 1750	* 964	* 2125	* 964	* 2125	* 540	* 1190	* 540	* 1190	465	* 1026	* 465	* 1026	* 3.46 (11-4)	
	-1.0 (-3-3.5)	1450	* 3197	* 1450	* 3197	* 942	* 2077	* 942	* 2077	* 527	* 1162	* 527	* 1162	511	* 1127	* 511	* 1127	* 3.13 (10-3)	
	-2.0 (-6-7)	912	* 2011	* 912	* 2011	* 631	* 1381	* 631	* 1381	*				520	* 1146	* 520	* 1146	* 2.23 (7-4)	
	3.0 (9-10)														340	* 749	* 340	* 749	* 2.91 (9-7)
	2.0 (6-7)									350	* 772	* 350	* 772	353	* 778	* 353	* 778	* 3.3 (10-10)	
	1.0 (3-3.5)					647	* 1426	* 647	* 1426	* 426	* 939	* 426	* 939	377	* 832	* 377	* 832	* 3.7 (12-2)	
	0 (0)	809	* 1784	* 809	* 1784	* 928	* 2046	* 928	* 2046	* 519	* 1144	* 519	* 1144	412	* 907	* 412	* 907	* 3.74 (12-3)	
-1.0 (-3-3.5)	1374	* 3029	* 1374	* 3029	* 952	* 2099	* 952	* 2099	* 533	* 1175	* 533	* 1175	457	* 1008	* 457	* 1008	* 3.45 (11-4)		
-2.0 (-6-7)	1617	* 3565	* 1617	* 3565	* 777	* 1713	* 777	* 1713	*				483	* 1066	* 483	* 1066	* 2.89 (8-9)		

ISO 10567



P = 210 bar
P = 3045 psi

VOLVO - EC20E

15710705

V1197899

L = length of dipper arm

* = Limited by machine's hydraulic lifting capacity rather than tipping load.

222 Specifications
Lifting capacities

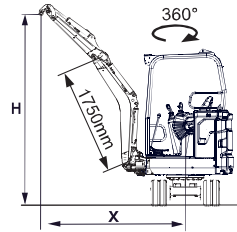
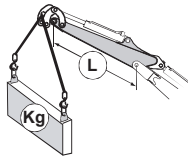
Lifting capacities, EC20E, Canopy, North America only

X m (ft-in)	H m (ft-in)	1 (3-3.5)				2 (6-7)				3 (9-10)				Max1 (X)			
		Min		Max		Min		Max		Min		Max		Min		Max	
		Kg	Lbs	Kg	Lbs	Kg	Lbs	Kg	Lbs	Kg	Lbs	Kg	Lbs	Kg	Lbs	m (ft-in)	
L = 0.95m (37.4 in)	3.0 (9-10)					296	653	398 *	877 *					294	647	400 *	881 *
	2.0 (6-7)					299	659	400 *	882 *	218	481	330	728	224	493	337 *	743
	1.0 (3-3.5)					390	860	576 *	1270 *	213	470	324	714	172	380	265	584
	0 (0)	503	1109	794 *	1750 *	344	758	548	1208	199	439	308	681	168	370	262	577
	-1.0 (-3-3.5)	515	1135	860	1896	339	747	542	1195	194	428	303	668	218	481	340	750
L = 1.15m (45.3 in)	-2.0 (-6-7)	530	1168	879	1938	351	774	555	1224					304	671	477	1051
	3.0 (9-10)													233	514	340 *	749 *
	2.0 (6-7)									225	496	333 *	734 *	188	415	286	630
	1.0 (3-3.5)					372	820	580	1279	215	474	326	719	150	330	233	513
	0 (0)	490	1080	809 *	1784 *	345	761	551	1215	197	434	307	677	144	318	228	503
L = 0.95m (37.4 in)	-1.0 (-3-3.5)	960	2116	1125	2480	326	719	529	1166	188	414	288	657	177	391	280	618
	-2.0 (-6-7)	982	2165	1617 *	3565 *	333	734	537	1184					226	498	355	783
	3.0 (9-10)					398 *	877 *	398 *	877 *					400 *	881 *	400	881 *
	2.0 (6-7)					400 *	882 *	400 *	882 *	396 *	873 *	396 *	873 *	404 *	891 *	404	891 *
	1.0 (3-3.5)					774 *	1706 *	774 *	1706 *	474 *	1045 *	474 *	1045 *	429	945 *	429	945 *
L = 1.15m (45.3 in)	0 (0)	794 *	1750 *	794 *	1750 *	984 *	2125 *	984 *	2125 *	540 *	1190 *	540 *	1190 *	465	1026 *	465	1026 *
	-1.0 (-3-3.5)	1450	3197 *	1450 *	3197 *	942 *	2077 *	942 *	2077 *	527 *	1162 *	527 *	1162 *	511 *	1127 *	511 *	1127 *
	-2.0 (-6-7)	912	2011 *	912 *	2011 *	631 *	1391 *	631 *	1391 *					520 *	1146 *	520 *	1146 *
	3.0 (9-10)													340 *	749 *	340	749 *
	2.0 (6-7)									350 *	772 *	350 *	772 *	353 *	778 *	353	778 *
L = 0.95m (37.4 in)	1.0 (3-3.5)					647 *	1426 *	647 *	1426 *	426 *	939 *	426 *	939 *	377 *	832 *	377	832 *
	0 (0)	809 *	1784 *	809 *	1784 *	928 *	2046 *	928 *	2046 *	519 *	1144 *	519 *	1144 *	412 *	907 *	412	907 *
	-1.0 (-3-3.5)	1374 *	3029 *	1374 *	3029 *	952 *	2099 *	952 *	2099 *	533 *	1175 *	533 *	1175 *	457 *	1008 *	457 *	1008 *
	-2.0 (-6-7)	1617 *	3585 *	1617 *	3585 *	777 *	1713 *	777 *	1713 *					483 *	1066 *	483 *	1066 *

ISO 10567



VOLVO - EC20E



P = 210 bar
P = 3045 psi

15710709 P02

V1197900

L = length of dipper arm

* = Limited by machine's hydraulic lifting capacity rather than tipping load.

Specifications
Lifting capacities 223

Lifting capacities, EC20E, Cab, with safety valves on dipper arm and boom, without safety valve on dozer blade

ISO 10567

H (m)	1.0		1.5		2.0		2.5		3.0		3.5		Max		Xmax
	L		F		L		F		L		F		L		
	mini	Max	mini	Max	mini	Max	mini	Max	mini	Max	mini	Max	mini	Max	
3,5															
3								316	398 *	398 *				314	400 *
2,5								319	364 *	364 *				241	360
2															
1,5						417	576 *	576 *	302	455	475 *	235	352	365	
1						390	608	641	288	440	460	222	338	351	
0,5						371	595	519	277	428	447	216	331	344	
0				543	794 *	794 *	362	577	609	270	420	439	211	327	339
-0,5				546	910	983	361	576	608	267	418	436	210	326	338
-1				554	919	993	366	580	613	271	421	440			
-1,5				569	912 *	912 *	377	594	627						
-2															
3,5															
3														250	340 *
2,5														203	306
2															
1,5															
1							399	618	647 *	307	397 *	397 *	231	349	362
0,5							372	589	522	276	428	447	214	330	342
0							529	809 *	809 *	357	572	604	265	416	435
-0,5	756 *	756 *	756 *	528	890	963	352	566	598	260	411	429	204	319	331
-1	1032	1125 *	1125 *	534	897	970	353	567	599	260	411	429	205	320	333
-1,5	1054	1617 *	1617 *	545	911	985	360	575	608	267	418	436			
-2															

VOLVO - EC20E 15711151 P02

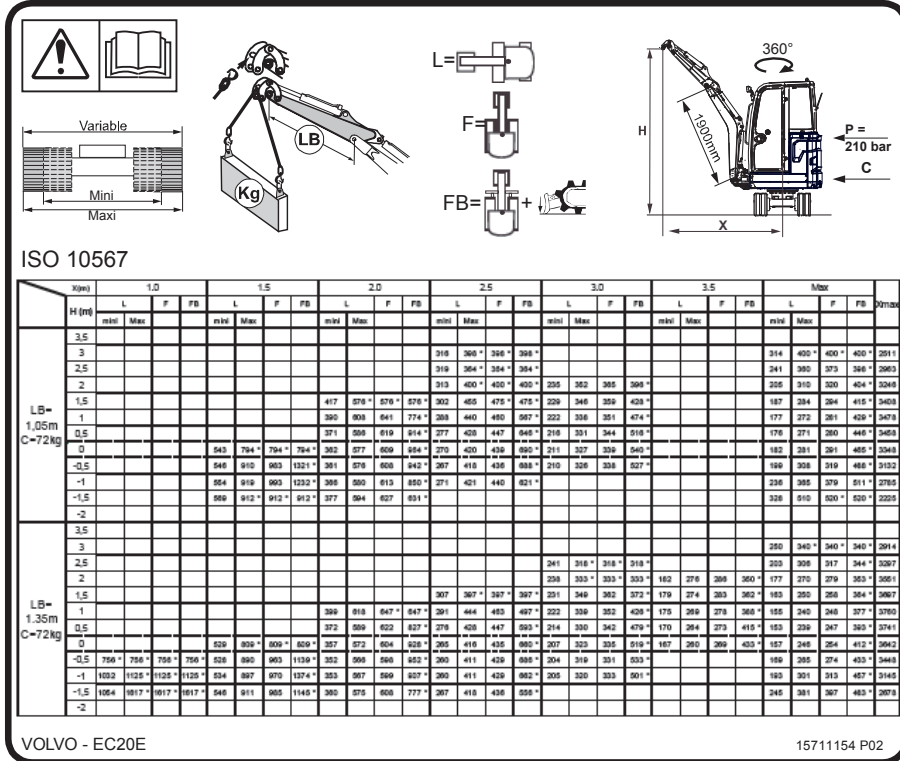
V1197667

C = additional counterweight, LB = length of dipper arm

* = Limited by machine's hydraulic lifting capacity rather than tipping load.

224 Specifications
Lifting capacities

Lifting capacities, EC20E, Cab, with safety valves on dipper arm, boom and dozer blade



C = additional counterweight, LB = length of dipper arm
* = Limited by machine's hydraulic lifting capacity rather than tipping load.

Specifications
Lifting capacities 225

Lifting capacities, EC20E, Canopy, with safety valves on dipper arm and boom, without safety valve on dozer blade

H (m)	1.0		1.5		2.0		2.5		3.0		3.5		Max			Xmax							
	L		F		L		F		L		F		L		F								
	mini	Max	mini	Max	mini	Max	mini	Max	mini	Max	mini	Max	mini	Max	F								
3.5																							
3								296	398 *	398 *					294	400 *	400 *	2511					
2.5								299	394 *	364 *					224	337	348	2963					
2								293	400 *	405 *	218	330	340		190	299	298	3246					
1.5							390	576 *	576 *	281	427	444	213	324	334		172	263	273	3408			
1							363	569	598	268	412	428	206	316	326		163	253	260	3478			
0.5							344	548	576	256	399	415	199	309	318		162	252	259	3458			
0				503	794 *	794 *	336	539	566	248	392	407	195	304	314		168	262	270	3348			
-0.5				507	851	916	334	537	565	247	389	405	194	303	313		184	287	296	3132			
-1				515	860	926	339	542	570	250	393	408					218	340	352	2785			
-1.5				530	879	912 *	351	555	584								304	477	498	2225			
-2																							
3.5																							
3																	233	340 *	340 *	2914			
2.5																	188	286	295	3297			
2																	163	251	259	3557			
1.5																	150	233	239	3697			
1																	142	223	229	3780			
0.5							372	580	610	270	416	432	206	317	327	181	250	257	142	223	229	3780	
0							345	551	579	265	399	415	197	307	318	156	245	252	140	222	228	3741	
-0.5	756 *	756 *	756 *	490	809 *	809 *	330	534	561	245	388	404	190	300	310	153	241	249	144	226	235	3642	
-1	960	1125 *	1125 *	495	838	902	326	529	556	240	382	398	188	298	308				177	290	299	3140	
-1.5	982	1617 *	1617 *	507	852	917	333	537	565	246	389	405							226	355	368	2678	
-2																							

VOLVO - EC20E 15711162 P02

V1197669

C = additional counterweight, LB = length of dipper arm
* = Limited by machine's hydraulic lifting capacity rather than tipping load.

226 Specifications Lifting capacities

Lifting capacities, EC20E, Canopy, with safety valves on dipper arm, boom and dozer blade

ISO 10567

H (m)	1.0		1.5		2.0		2.5		3.0		3.5		Max		Reach (H+H)				
	L		F		L		F		L		F		L						
	min	Max	min	Max	min	Max	min	Max	min	Max	min	Max	min	Max					
3.5															204	403*	400*	2511	
3															224	337	348	2693	
2.5																			
2																			
1.5																			
1																			
0.5																			
0																			
-0.5																			
-1																			
-1.5																			
-2																			
3.5															233	340*	340*	3914	
3															188	288	285	344*	3297
2.5																			
2																			
1.5																			
1																			
0.5																			
0																			
-0.5																			
-1																			
-1.5																			
-2																			

VOLVO - EC20E

15711167 P02

V1197670

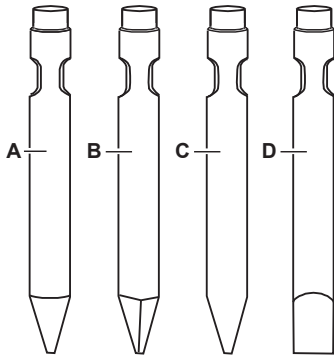
C = additional counterweight, LB = length of dipper arm
 * = Limited by machine's hydraulic lifting capacity rather than tipping load.

Hammer

HB02TLN	
Operating weight (a)	129 kg (284.4 lb)
Breaker weight (b)	114 kg (251.3 lb)
Overall length	967 mm (38.07 in)
Tool diameter	57 mm (2.24 in)
Flow rate	19–38 l/min (5–10 US gal/min)
Operating pressure	9–12 MPa
Impact rate	450–1000 bpm

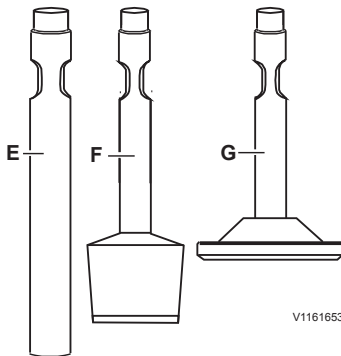
a)incl. bracket pins & tool

b)incl. tool but without breaker bracket



Hammer tools

- A Moil point
- B Pyramid moil
- C Chisel parallel
- D Chisel transversal
- E Blunt
- F Spade
- G Compacting plate



V1161653

228 Specifications
Service history

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	

Specifications
Service history 229

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

Service 2750 hours		Type of service	Signature and stamp
Date	Hours	<input type="checkbox"/> Service and maintenance	

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

Service 3250 hours		Type of service	Signature and stamp
Date	Hours	<input type="checkbox"/> Service and maintenance	

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

Service 3750 hours		Type of service	Signature and stamp
Date	Hours	<input type="checkbox"/> Service and maintenance	

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

Service 4250 hours		Type of service	Signature and stamp
Date	Hours	<input type="checkbox"/> Service and maintenance	

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

230 Specifications
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	

Specifications
Service history 231

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
232 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.....	140
Accidents.....	69
Alternative fuels.....	186
Alternator.....	169
Anti-theft device.....	12
Arrival Inspection.....	148
Attachment brackets.....	109
Attachment quick coupler.....	112
Attachments.....	106
Attachments, alternative lowering.....	83
Attachments, connecting and disconnecting.....	108
Audio system.....	62

B

Batteries, charging.....	168
Bearings, greasing.....	160
Before service, read.....	137
Buckets.....	115

C

Cab.....	10, 195
CareTrack.....	12
CE-marking, EMC-directive.....	15
Change intervals.....	190
Cleaning engine compartment.....	172
Cleaning machine.....	170
Communication equipment, installation.....	18
Connecting to an attachment bracket.....	122
Connecting to an attachment quick coupler, hydraulic.....	123
Connecting with pivot pins.....	120
Controls.....	45
Coolant.....	182
Coolant level, checking.....	157

D

Delivery Inspection.....	148
Delivery Instructions.....	148
Demolition work.....	105
Digging forces.....	206
Dimensions.....	201
Disconnecting from an attachment quick coupler, hydraulic.....	124
Disconnecting with pivot pins.....	122
Display unit.....	34
Door.....	61

E

Eco driving.....	92
Electrical system.....	9, 192
Emergency exit.....	62
Engine.....	9, 191

Engine oil.....	181
Engine oil level, checking.....	158
Entering, leaving and climbing the machine.....	140
Environmental requirements.....	9
Equipment.....	11
EU conformity certificate.....	17

F

Fire extinguisher, location.....	61
Fire prevention.....	141
Front windscreen rails.....	173
Fuel system.....	184
Fuel, filling.....	166

G

Ground pressure.....	200
----------------------	-----

H

Hammer.....	119, 227
Handling hazardous materials.....	144
Handling line, tubes and hoses.....	147
High voltage overhead power line.....	96
Hose rupture valves.....	125
Hydraulic attachment bracket.....	112
Hydraulic oil.....	183
Hydraulic oil level, checking.....	158
Hydraulic system.....	11, 197

I

Information and warning decals.....	21
Instrument panel, left.....	31
Instrument panel, right.....	38
Intended use.....	9

L

Leaving cab.....	140
Lifting capacities.....	207
Lifting machine.....	85
Lifting objects.....	127
Long-term parking.....	80
Lubrication and service chart.....	151

M

Machine view.....	14
Machine weights.....	199
Maintenance service, every 10 hours... ..	157
Maintenance service, every 1000 hours... ..	165
Maintenance service, every 250 hours... ..	161
Maintenance service, every 50 hours... ..	160
Maintenance service, every 500 hours... ..	163
Maintenance service, when required... ..	166
Maintenance under special environmental conditions.....	177
Measures before operating.....	73
Modifications.....	11

O

Offset boom.....	116
------------------	-----

Alphabetical index

234

Operating on public roads.....	71	U	
Operator comfort.....	56	Underground cables and pipes.....	99
Operator obligations.....	68	USA federal clean air act.....	27
Operator safety.....	70	V	
Operator seat.....	56	Visibility.....	64
Operator's manual, storage.....	61	W	
Operator's seat, adjusting.....	57	Warming up.....	77
P		Washer reservoir.....	172
Paint finish maintenance.....	171	Water separator, checking and draining	159
Parking.....	79	Welding.....	169
Pressure release.....	114	When using rubber tracks.....	126
Primary air filter, cleaning and replacing	163	Whole-body vibrations.....	93
Product plates.....	20	Windows.....	60
R		Working in cold weather.....	104
Radiator and coolers, cleaning.....	163	Working in water and on boggy ground	101
Recommended intervals for critical		Working on slopes.....	100
parts.....	176	Working ranges.....	204
Recommended lubricants.....	179	Working where there is risk of landslide.	102
Retrieving and towing.....	82	Working with buckets.....	115
ROPS.....	54	Working with hammer.....	119
ROPS Cab (Roll Over Protective		Working within dangerous areas.....	96
Structure).....	54		
Rules for digging.....	95		
Running-in instructions.....	64		
S			
Safety components.....	19		
Safety rules when operating.....	68		
Seat belt.....	59		
Secondary air filter, replacing.....	165		
Service capacities and change intervals	190		
Service history.....	148, 228		
Service points.....	149		
Service position.....	136		
Service Programme.....	148		
Signalling diagram.....	132		
Slewing system.....	12, 198		
Special hydraulics.....	118		
Starting engine.....	74		
Starting with booster batteries.....	76		
Stopping.....	78		
Symbol key.....	151		
T			
Tool kit.....	13		
Touch-up painting.....	171		
Towing.....	82		
Track unit, checking tension.....	161		
Tracks.....	126		
Transmission.....	198		
Transporting machine.....	85		
Travel system.....	12		



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Alphabetical index

236
