

OPERATOR'S MANUAL

Operator's Manual

English

V O L V O

Operator's Manual

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V O L V O



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 not perform 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

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 as basic requirements, but national or local regulations that are more strict should be followed.

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!

Table of contents

Foreword	1
Identification numbers	6
Presentation	6
Compliance marking and directives	17
Communication equipment, installation	20
Safety components	21
Product plates	22
Information and safety decals	24
Instrument panels	33
Instrument panel, front	35
Display unit	42
Volvo Co-Pilot	64
Instrument panel, cab post	84
Instrument panel, rear	93
Control panel	94
Other controls	95
Controls	95
Cab	111
Operator comfort	113
Climate control system	120
Operating instructions	124
Safety rules when operating	128
Measures before operating	136
Starting engine	137
Hydraulic system, warming up	141
Mirrors	142
Gear shifting	146
Steering	150
Braking	153
Exhaust aftertreatment system	155
Stopping	167
Parking	168
Measures when getting stuck	170
Retrieving and towing	171
Transporting machine	174
Operating techniques	190
Eco driving	191
Whole-body vibrations	193
Working within dangerous areas	194
Attachments	198
Attachment brackets	200
Hydraulic function, 3rd and 4th	205
Pressure release	208
Buckets	209
Stone block handling	215
Pallet forks	216
Timber grapples	219
Lift arm, alternative lowering	222
Signalling diagram	223

Safety when servicing	225
Service position	226
Before service, read	228
Preparations before service	230
Fire prevention	232
Handling hazardous materials	237
Handling line, tubes and hoses	242
Maintenance	243
Lubrication	246
Maintenance service, every 10 hours	247
Maintenance service, every 50 hours	249
Maintenance service, every 250 hours	253
Maintenance service, every 500 hours	256
Maintenance service, every 1000 hours	261
Maintenance service, every 2000 hours	263
Maintenance service, every 4000 hours	264
Maintenance service, when required	265
Specifications	284
Recommended lubricants	284
Fuel system	292
Service capacities and change intervals	299
Engine	301
Electrical system	303
Transmission	314
Brake	316
Steering	317
Wheels	318
Cab	320
Noise and vibrations	322
Hydraulic system	323
Machine weights	327
Dimensions	328
Machine capacities	332
Combination table, interchangeable equipment	336
Pallet forks	337
Timber grapples	340
Service history	343
Alphabetical index	347

Identification numbers

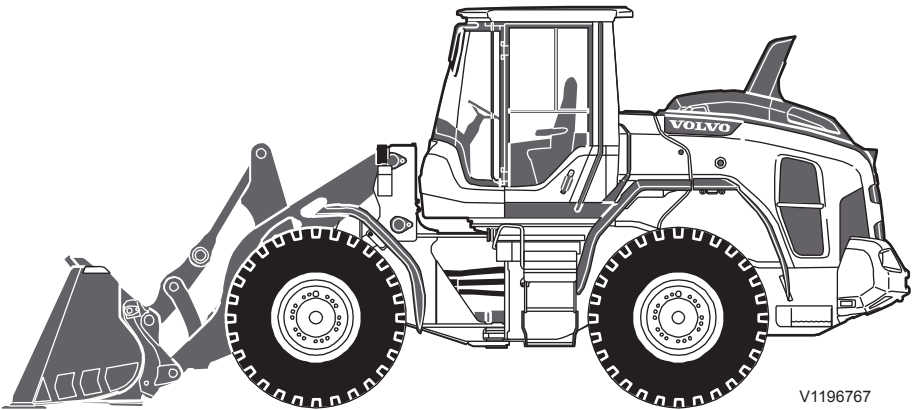
Identification numbers

Enter the identification number of the machine and the components below. The number should be stated when contacting the manufacturer and when ordering spare parts. The position of the plates is shown on page 22.

Manufacturer	Volvo Construction Equipment SE-631 85 Eskilstuna Sweden
Machine Product Identification Number (PIN)	
Engine	
Transmission	
Front axle	
Rear axle	
Boom	
Cab	

Please send any comments about the Operator's Manual to om@volvo.com.
The latest information is available in PROSIS.

Presentation



V1196767

Intended use

The basic machine is intended to be used under normal conditions, that is, outdoors, above ground, up to an elevation of 2000 metres (6562 ft)⁽¹⁾ above sea level, off-road, for earthmoving, and in an ambient temperature between -25 °C (-13 °F) and +45 °C (113 °F) with only the operator in the cab. Conditions that deviate from this are also described in the Operator's Manual. For use on public roads the machine must be adapted according to governing national legislation.

If it is used for other purposes or in potentially dangerous conditions, e.g., explosive and/or flammable environments or areas with dust containing asbestos, special safety regulations must be followed and the machine must be equipped for such use and handling. Contact the manufacturer/dealer for more information.

The machine is designed for a max. total weight (incl. equipment and attachments), see page 327. The max. weight applies when the machine is equipped for certain applications approved by Volvo. Safety is compromised if the maximum weight is exceeded. In addition, no manufacturer warranties are valid. However, always follow national regulations for operating on public roads.

Operating underground

The need for ventilation of the exhausts shall be checked before the machine is used in tunnels or other underground operations. Other legislation and rules may be applicable, such as national and labour laws.

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 machine is equipped with a straight six-cylinder, four-stroke, turbocharged diesel engine with direct injection and charge air cooler.

The exhaust system is certified as spark arrester according to test method described in EN 1834 -1, -2, -3 paragraph 6.4.2. or corresponding and the method found in BS6680:1985, appendix B paragraph B.3.8.

1. For machines with D6E engine: 1500 metres (4921 ft).

Only applicable for machines with engines D6J and D8J

The engines are equipped to meet the legal requirements for exhaust emissions according to US Tier 4 final, California Tier 4 final, or EU Stage V.

NOTE!

Machines with engines intended for USA and Canada may not be sold or used within the EU, and machines with engines for the EU market may not be sold or used within the USA and Canada, unless the engine is replaced by an engine valid for the applicable market. Which market the engine is designed for is shown on the exhaust decal (see page 22).

In order to reduce nitrogen oxides (NO_x), particulate matter (PM), hydrocarbons, and carbon monoxide, the engine features external, cooled exhaust gas recirculation (EGR) and an exhaust aftertreatment system (EATS).

AdBlue®/DEF information**NOTE!**

Only applicable for machines with engine D6J.

AdBlue®/DEF is needed to reduce emissions of nitrogen oxides (NO_x). AdBlue®/DEF is filled in a separate tank on the machine which is completely separated from the fuel tank. AdBlue®/DEF may not be filled in the diesel tank, and diesel may not be filled in the AdBlue®/DEF-tank.

For distribution of AdBlue®/DEF (only applies to market USA):

- Volvo Construction Equipment: 1-877-823-1111 (office hours)
- www.volvoce.com (outside of office hours)

For distribution of AdBlue®/DEF (all other markets), contact your local Volvo dealer for more information.

See page 265 for information about topping up AdBlue®/DEF.

Exhaust aftertreatment system

NOTE!

Only applicable for machines with engine D6J.

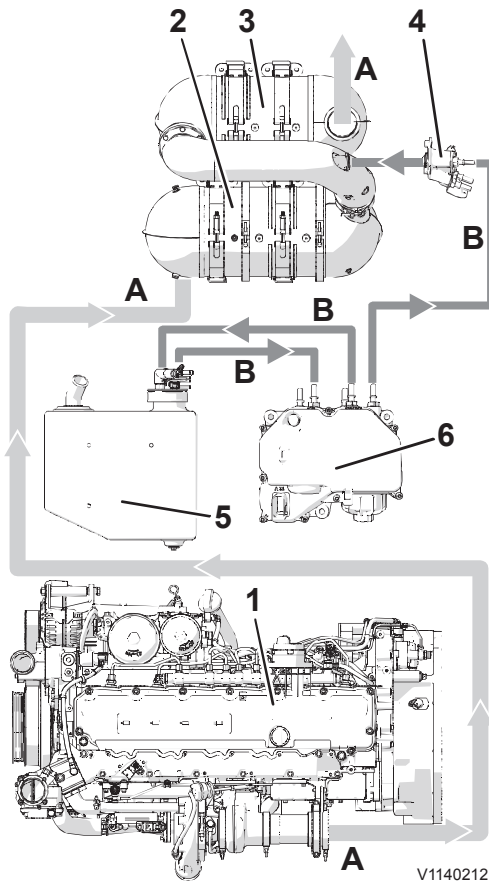
The engine features an exhaust aftertreatment system (EATS) that consists of a diesel particulate filter (DPF) which reduces PM, and a selective catalytic reduction system (SCR) which reduces the content of nitrogen oxide (NO_x). The catalysts (catalytic converters) for both the DPF and SCR are located in the machine's muffler. AdBlue®/DEF is injected in the exhaust flow to reduce NO_x .

In the muffler there is also a diesel oxidation catalyst (DOC) that supports the function in the diesel particulate filter and the selective catalytic reduction system.

The DPF traps particles from the engine's exhausts and, as it is filled with these particles, it needs to be regenerated so that the particles are removed. Regeneration is also needed to release soot and other substances that have collected in the selective catalytic reduction system and reduce its efficiency unless they are removed.

In order to ensure reduction of emissions, the aftertreatment system is monitored by the machine's electronic control system.

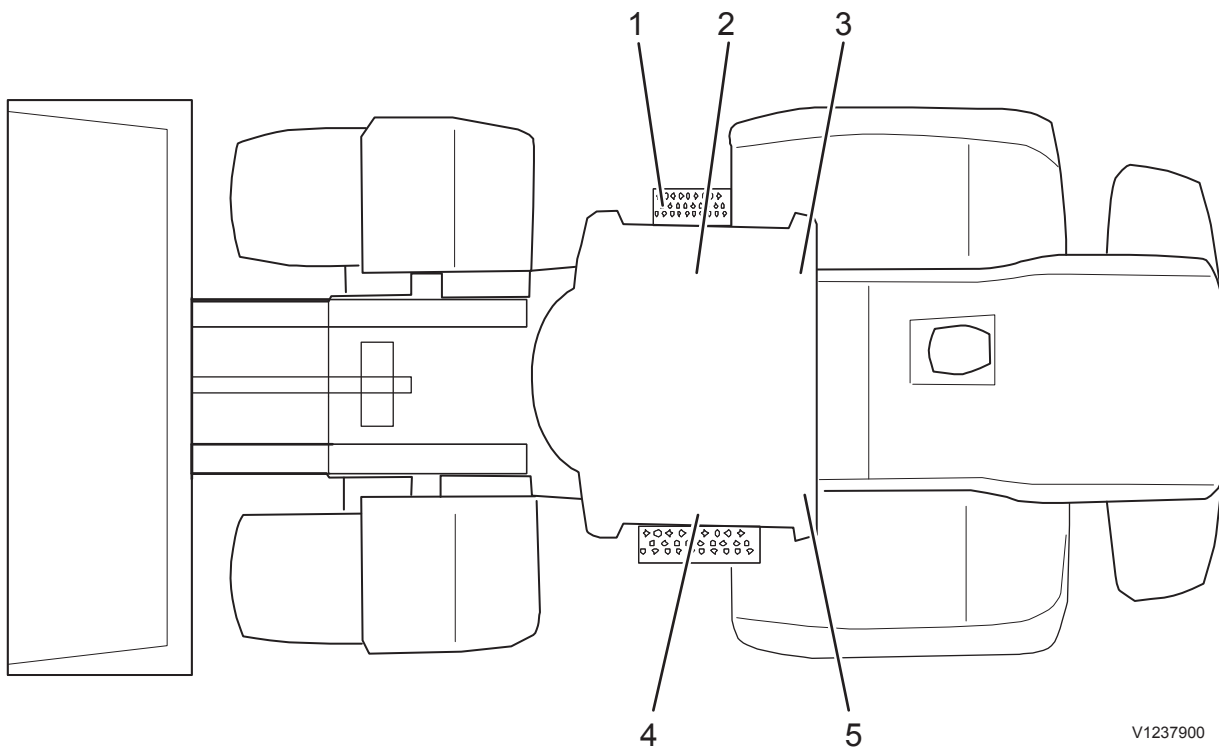
For more information, see page 155.



- A Exhausts
- B AdBlue®/DEF

- 1 Engine
- 2 Diesel particulate filter (DPF)
- 3 SCR catalytic converter
- 4 Injector for AdBlue®/DEF
- 5 AdBlue®/DEF tank
- 6 Pump for AdBlue®/DEF

Electrical system



V1237900

- 1 Batteries
- 2 Battery disconnect relay and battery disconnect switch
- 3 Voltage converter
- 4 Main fuses
- 5 Printed circuit board (PCB), fuses, relays

The electrical system consists of electrical and electro-mechanical components such as batteries, switches, solenoid valves, fuses and relays.

The voltage converter feeds the electric power outlet 12 V and the radio.

For more detailed information on the electrical system, see page 303.

Transmission

The transmission is electro-hydraulically controlled, where all gears are in constant mesh. Gear ranges are selected by application of different clutches. Between engine and transmission there is a hydraulic torque converter which steplessly controls the output torque. Front and rear axles have planetary gears in the wheel hubs, which reduce the strain on the drive shafts. The axles are of the type AWB (Axle Wet Brakes).

Lock-up

When active, the Lock-up function gives 100% power transmission from the engine to the transmission through mechanical locking in the torque converter. The direct power transmission contributes to reducing energy losses in applications such as load-carry and transport operation.

With maintained productivity, it reduce fuel consumption and reduce wear on the torque converter in several applications. In general, Lock-up should always be activated. For more

information on using Lock-up in different applications, see section "Operating techniques".

Brake system

The machine can be braked in three ways:

- the service brake
- the parking brake (should only be used as emergency brake when machine is moving)
- the auxiliary brake (engine brake), which increases the engine's resistance through increased load on the fan pump

If the machine is moving at 5 km/h or above, neutral gear is not activated when parking brake is applied. This is to reinforce braking power with engine braking when the parking brake is used as a supplementary brake.

Steering system

The machine is equipped with a load-sensing, hydraulic steering system as well as a secondary steering system. The steering system receives its hydraulic flow from a hydraulic pump that is driven by the transmission. The secondary steering pump, which is driven by an electric motor, is engaged when needed, e.g., if the engine suddenly stops, and is checked at each engine start. Comfort Drive Control (CDC) is also available as optional equipment.

Cab

The cab has a heating and ventilation system with defrosting for all windows. Air conditioning is available as an option.



Emergency exit

The cab has two emergency exits, the door and the right side window.

There is an emergency hammer located on the pillar behind the operator's seat on the right side.

FOPS and ROPS

The cab is approved as a protective cab according to the FOPS and ROPS standards, see page 320. FOPS is an abbreviation of Falling Object Protective Structure and ROPS is an abbreviation of Roll Over Protective Structure.

If any part of the cab's protective structure is affected by any remaining deformation or failures, the cab shall be inspected immediately and necessary actions shall be taken. Contact Volvo or a Volvo dealer for an inspection and action.

Never perform any unauthorized modifications to the cab, e.g., lowering the roof height, drilling, welding on brackets for fire extinguisher, radio aerial, or other equipment, without first, via a dealer, having discussed the modifications with personnel at Volvo Construction Equipment's Engineering Department. This department will decide whether the modification may cause the approval to become void.

Hydraulic system

The hydraulic system is load-sensing which means that the machine's hydraulic pumps adapt the oil flow in proportion to the hydraulic levers' position.

The main components for the machine's working hydraulic system are the hydraulic oil tank, hydraulic oil cooler, oil pump with variable displacement, central block, main control valve, and cylinders for lift and tilt function.

Other systems that can affect the working hydraulic system are the brake system, steering system, servo system, Boom Suspension System (BSS), as well as 3rd or 3rd/4th hydraulic function.

NOTE!

Do not use the working hydraulics at full speed until the hydraulic oil is warm. The hydraulic oil filter does not filter all of the oil when the oil temperature is below 15 °C (59 °F) at high flow. This can lead to unfiltered oil being pumped out in the system, which may result in noise and/or malfunctions. To warm up the hydraulic oil, see page 141.

Equipment

The machine can be provided with different types of optional equipment, depending on the requirements of different markets. Examples are Comfort Drive Control (CDC), BSS (Boom Suspension System), separate attachment locking, automatic engine shut-down, and automatic greasing system.

Modifications

Modifications of this machine and its components such as engine- and auxiliary system, including the use of unauthorized attachments, accessories, units, or parts, may affect the machine's integrity (condition), the machine's ability to function in the way for which it is designed and voids the compliance marking, type approval and certificates of the machine and engine- and auxiliary system. Persons or organizations performing unauthorized modifications assume all responsibility for consequences that arise due to modifications or can be attributed to modifications, including damages 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.

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.

Anti-theft system

(Optional equipment)

Installed theft protection makes it more difficult to steal the machine. Volvo CE can supply theft protection as optional

equipment. If your machine is not equipped with such an option, look into the possibility of having one installed by your dealer.

Logged machine data

The machine is equipped with software systems that register and store various types of information. The information can be transferred to Volvo to be used for product development purposes and when troubleshooting. Stored information includes, among others, travel speed, fuel consumption, and various temperatures. Volvo and qualified service technician will make use of this information.

CareTrack/Information Systems

Volvo Construction Equipment machines are equipped with CareTrack and/or one or more other systems which may gather and store information about the machine (the "**Information Systems**"), including but not limited to information relating to machine condition and performance, and information relating to the operation of the machine (together, the "**Machine Data**"). You agree not to interfere with the operation of the telematics device in any way.

CareTrack makes it easier to plan for service and reduces costly downtime. Productivity is improved by knowing if machines are being operated correctly and how much fuel is being consumed. CareTrack also allows the customer to restrict the operating area of the machine, by using virtual fences. This helps to eliminate unauthorized machine use and theft. For further information, contact a Volvo Construction Equipment dealer. The CareTrack system transmits data, in the same way a mobile phone does, with a maximum output rate of 10 W. The transmitter is always on and the operator cannot switch it off. Local precautions and restrictions applicable to mobile phones, for example safety distance, also apply to the CareTrack system.

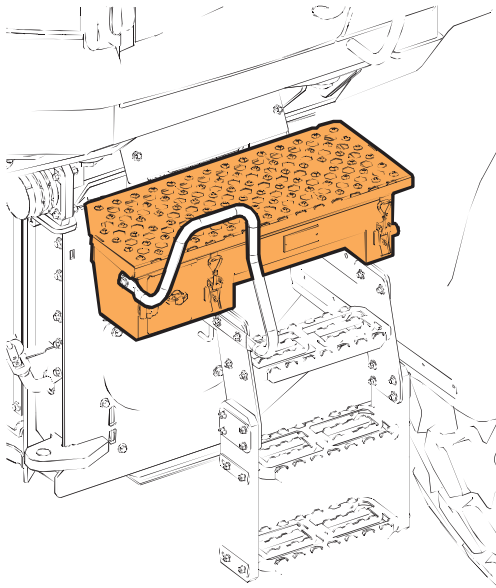
Volvo Construction Equipment may: (i) access the Information Systems at any time (including remote access); (ii) gather the Machine Data; (iii) store the Machine Data on Volvo Group systems; (iv) use the Machine Data in order to provide services to its customers, as well as for its own internal and other reasonable business purposes; and (v) share the Machine Data within the Volvo Group and with selected third parties.

Machine Data may include personal information about the operator, which may therefore be gathered, stored, used, shared or otherwise processed by Volvo Construction Equipment in accordance with its privacy notice (available at <https://www.volvogroup.com/en-en/privacy.html>). If you have any questions or concerns concerning the processing of your personal information by Volvo Construction Equipment, please contact Volvo's group privacy officer at gpo.office@volvo.com or by post: AB Volvo, Att: Group Privacy Office, Dept AA14100, VGHQ, SE-405 08 Göteborg, Sweden, or by phone at: +46 (0)31 66 00 00.

Tool kit

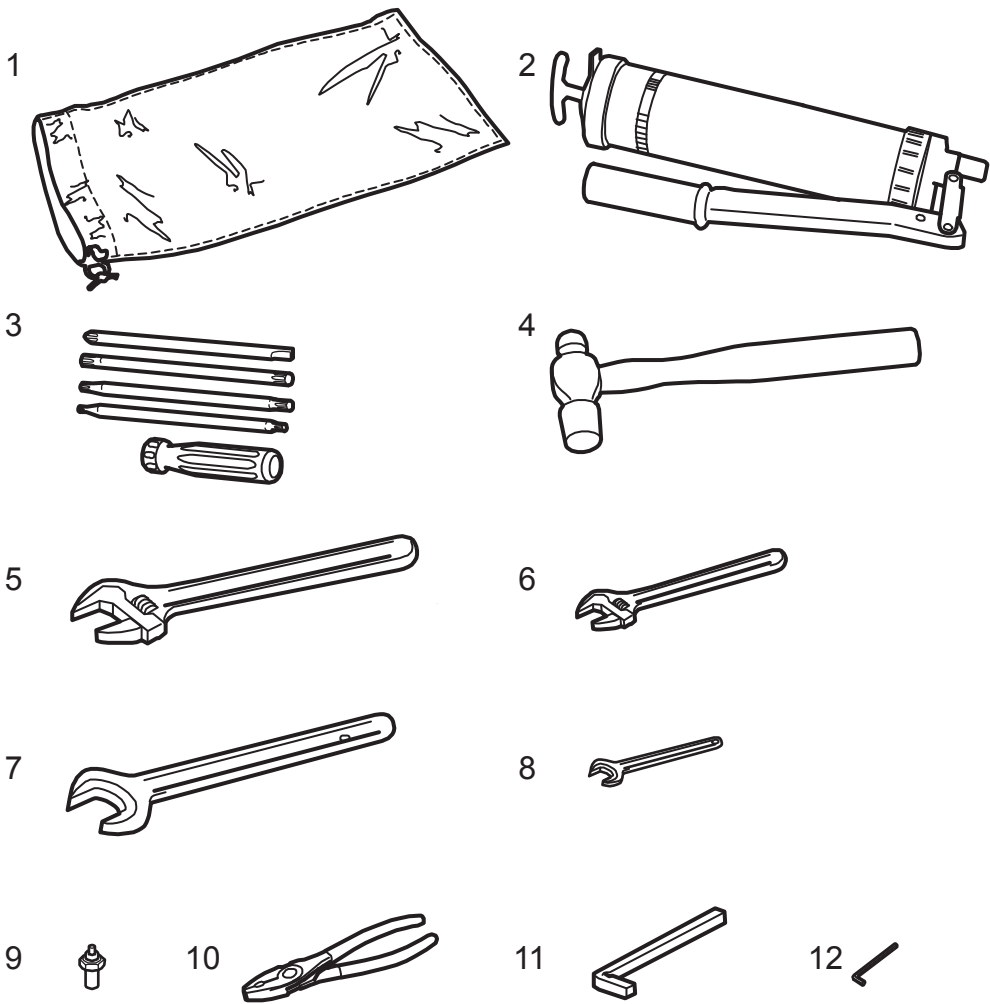
(Additional options)

The toolbox is located under the steps on the cab's left side.
A number of tools can be delivered with the machine.



Tool box

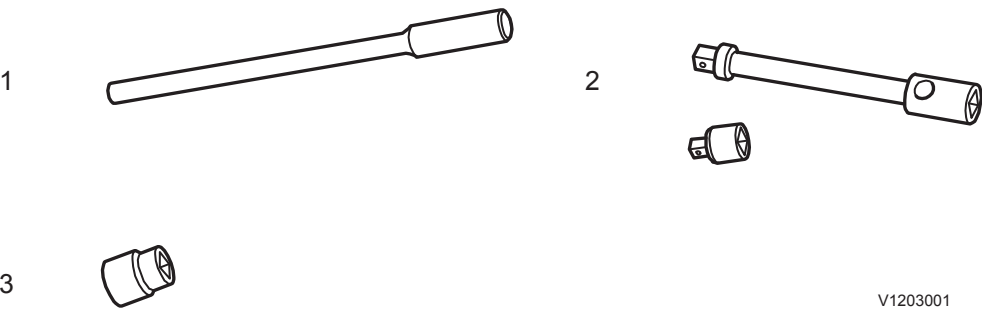
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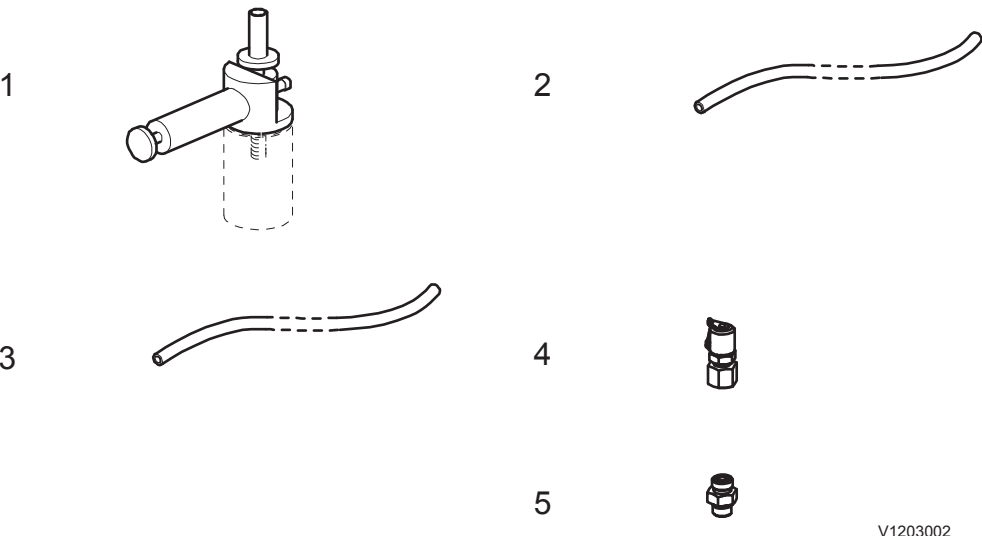
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Tool kit

1	Bag	2	Lubricating gun
3	Combination screwdriver	4	Ball peen hammer
5	Adjustable wrench, 34 mm	6	Adjustable wrench, 20 mm
7	Spanner	8	Spanner
9	Nipple	10	Plier
11	Key	12	Allen key



1	Handle	2	Extension
3	Socket wrench		



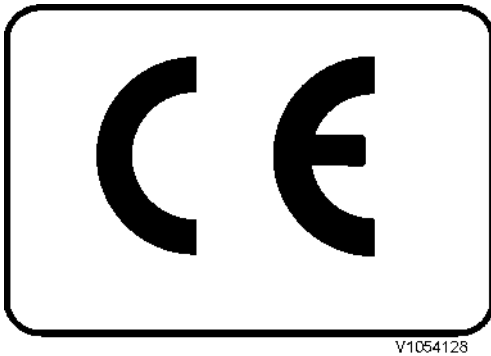
1	Vacuum pump	2	Hose
3	Hose	4	Testing nipple
5	Nipple		

Fire suppression system
(Optional equipment)

Fire Suppression System is a sprinkler system for the engine compartment.

The system meets the standards according to SBF 127 (Swedish rules for permanently installed sprinkler system and other fire protection equipment on forestry and construction machines).

See page 233 for more information.



Compliance marking and directives

When a machine is CE marked it means that, when initially delivered to the customer, the machine meets the requirements of applicable EU regulations.

Manufacturers are legally obliged to produce an EC Declaration of Conformity (DoC), which states that the machine conforms with the provisions of relevant directives. An EC Declaration of Conformity is therefore issued by Volvo Construction Equipment for each individual machine. The document is valuable and should be stored in a safe location for at least ten years. The document should always accompany the machine when it is sold.

Modifications made to the product after it was initially placed on the market may compromise the products CE marking and compliance to EU legislation. The person or organization performing modifications to the product after it was initially placed on the market is responsible for CE marking and compliance to EU legislation.

EU Machinery Directive, 2006/42/EC

The Machinery Directive is one of the main legislations governing the harmonization of essential health and safety requirements for machinery in the EU. It promotes harmonization through a combination of mandatory health and safety requirements and voluntary harmonized standards.

EU EMC Directive, 2014/30/EU

The EMC Directive limits electromagnetic emissions from equipment in order to ensure that, when used as intended, such equipment does not disturb radio and telecommunication, as well as other equipment. The directive also governs the immunity of such equipment to interference and seek to ensure that this equipment is not disturbed by radio emissions, when used as intended.

The machine's CE marking and the EC Declaration of Conformity also include the EMC directive.

If other electronic equipment is installed on this machine, the equipment must be CE marked and compliant to the EMC directive.

EU Outdoor Noise Directive, 2000/14/EC

The Outdoor Noise Directive (OND) regulates the noise emissions into the environment by outdoor equipment. Following this directive, manufacturers are legally obliged to produce an EC Declaration of Conformity, which states that the machine conforms with the provisions of this directive.

NOTE!

EU/EEA regulatory framework conditions may change over time. If the initial delivery of a CE compliant, hence CE marked, machine had originally been to a country outside EU/EEA and if that machine would be intended to be re-imported to EU/EEA countries at a later date, then that machine will have to comply with EU/EEA regulatory framework conditions which apply at the date of any re-entry to EU/EEA countries.

Declaration of Conformity

The following page shows a copy of the EC Declaration of Conformity (English version) for machine.

NOTE! The EC Declaration of Conformity only applies within the European Union (EU).

V O L V O

EC DECLARATION OF CONFORMITY FOR MACHINERY (IIA) (Original Document)

Volvo Construction Equipment hereby declares that the below specified product:

Manufacturer	: Volvo Construction Equipment AB
Address	: 631 85 ESKILSTUNA
Country	: Sweden
Category	: Earth Moving Machinery
Make	: Volvo
Type	: Wheel Loader
Model	: xxxx
Power [kW]	: xxxx
Representative sound pressure [dB(A)]	: xxxx
Guaranteed sound pressure [dB(A)]	: xxxx
PIN	: VCExxxxxxxxxxxx
In conjunction with:	
Type	: ---
Model	: ---
s/n	: ---
Initial placement within the EU (Y/N)	: Yes

in the state in which it was placed on the market, excluding components added and/or operations carried out subsequently, is in conformity with the relevant provisions of Essential Health and Safety requirements of:

Machinery Products (Safety)	: 2006/42/EC
Outdoor Noise	: 2000/14/EC
Electromagnetic Compatibility	: 2014/30/EC

including all amendments and annexes relating to machinery, and other applicable directives or regulations.

The following harmonized standards apply:

Earth Moving machinery - Safety Part 1	: EN 474-1:2006+A6:2019
Earth Moving machinery - Safety Part 3	: EN 474-3:2006+A1:2009
Technical file compiled by	: <i>Name and address of the person authorized to compile the technical file.</i>
Notified Body, 2000/14/EC, assessment procedure acc. to Annex VI	: <i>Identification number, name, and address of the notified body.</i>

This declaration includes attachments developed designed/approved, marked, and marketed by the above-mentioned manufacturer.

Signature

Signature

Name and title of the person authorized to represent the manufacturer.

Name and title of the person authorized to compile the technical file.

PLACE, DD.MM.YYYY

PLACE, DD.MM.YYYY

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 in accordance with EU directive 2014/30/EU governing electromagnetic interference. It is therefore very important that all non-approved electronic accessories, such as communication equipment, should be tested before installation and use, since they can cause interference to the electronic systems of the machine.

Guidelines

The following guidelines must be followed during installation:

- The antenna placement must be chosen to give good adaptation to the surroundings.
- The antenna cable must be of the coaxial type. Be careful to ensure that the cable is undamaged, that the sheath and braid are not split at the ends, the braid covers the connector ferrules and has good galvanic contact with them.
- The mating surface between the antenna mounting bracket and the bodywork must have clean metal surfaces, with all dirt and oxide removed. Protect the mating surfaces against corrosion after installation to maintain good galvanic contact.
- Remember to separate interfering and interfered cables physically. Interfering cables consist of the communication equipment's supply cables and antenna cable. Interfered cables are those which are connected to electronic devices in the machine. Install the cables as close as possible to earthed (grounded) sheet metal surfaces, since the sheet metal has a shielding effect.

Safety components

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 means that the components are intended to fulfil a safety function.

The following are considered as safety-classified machine parts/spare parts:

- Warning, safety and information decals
- Belt protection covers
- Fan protection covers
- Forward/rear view mirrors
- Forward/rear view camera
- Radar detection system
- Front windscreen
- Wiper blades and sun blinds
- Work lights, lamps and reflectors, including rotating warning beacon
- Switches and levers
- Fire suppression/extinguishing equipment
- Electric supply for engine block/cab heating
- Lowest entry footstep and attachments
- Frame joint lock
- Attachment lock indicators
- Emergency hammer in cab
- Gas springs
- Operator's seat, including armrests
- Seat belt
- Mudguards
- Rims
- Cab ventilation filters
- Horn/travel alarm
- Brake pads, parking brake

NOTE!

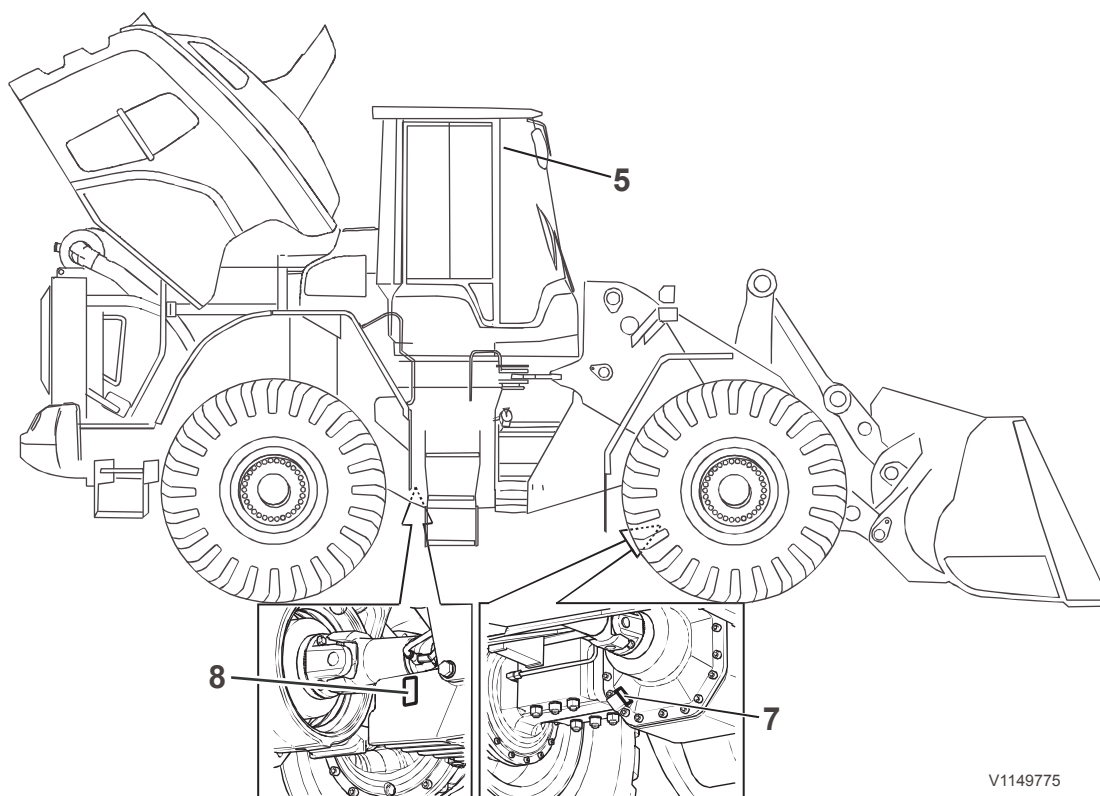
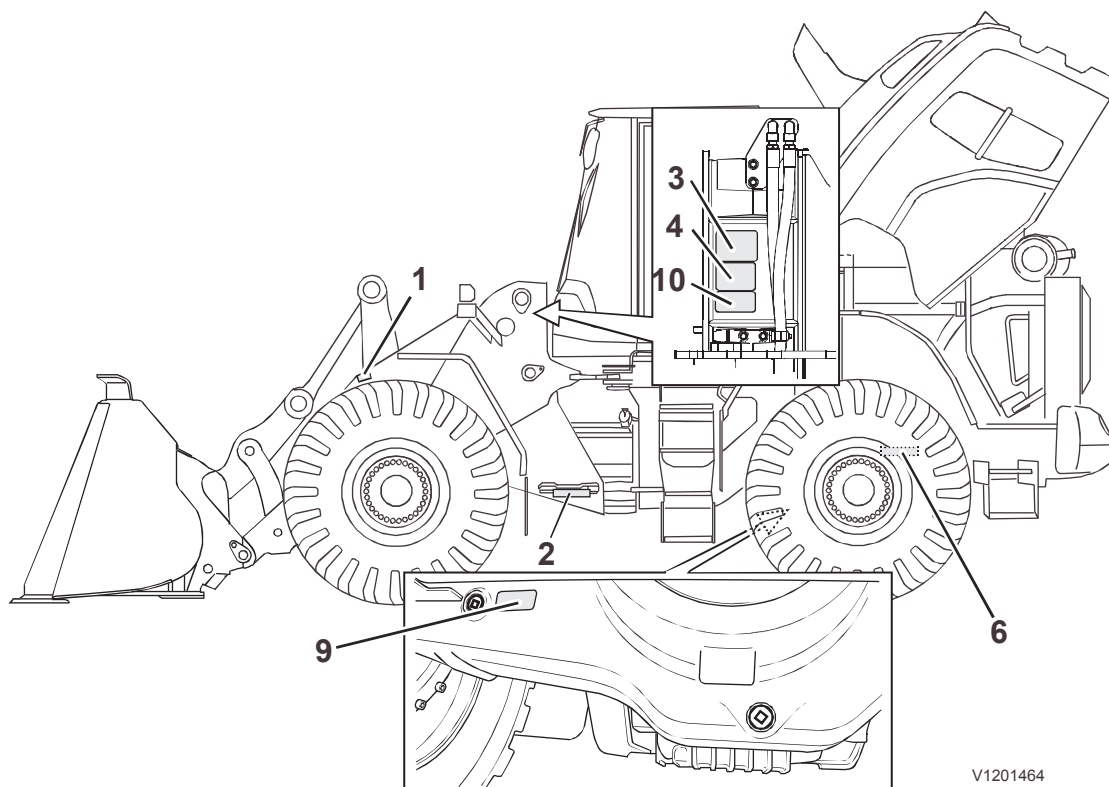
Safety-classified machine and spare parts shall be reinstalled, repaired, or replaced immediately if they have been removed or damaged.

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

Using the product plates listed below, it is possible to identify the machine and its components. State these numbers when ordering spare parts or when making enquiries.



1 Boom

The manufacturer's name and address, the boom's component number and serial number.

2 Primary marking

Machine's PIN (stamped in on left side).

3 Product plate

The manufacturer's name and address, machine's product number and serial number.

Machine weight¹⁾ (machine's most common configuration +10%), engine power, year of manufacture, year of delivery.

NOTE!

CE-marking for EU, EAC-marking for the Eurasian Customs Union (EACU), and without marking for other markets.

4 Additional plate to product plate (only applies to Brazil)

5 Cab

The manufacturer's name and address, product number, the machine's model designation, max. tested weight. ²⁾ (for which the cab is approved according to ROPS-test), cab serial number, ROPS/FOPS number, and ROPS/FOPS certificate number. (Plate located on inside of pillar in cab).

6 Engine + exhaust decal

The engine's type designation and component number.

7 Front axle

The manufacturer's name and address, and the front drive axle's component number.

8 Transmission

The manufacturer's name and address and the transmission's component number.

9 Rear axle

The manufacturer's name and address and the rear drive axle's component number.

10 Supplementary exhaust decal

The engine's type designation and component number (easier to access than ordinary exhaust decal, which may be concealed).

1) For relevant machine weight (depending on tires, equipment, and attachment combinations), see page 332.

2) For the machine's max. total weight, see page 327.

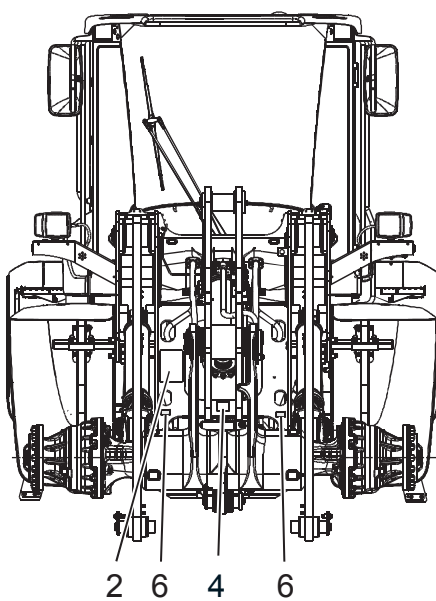
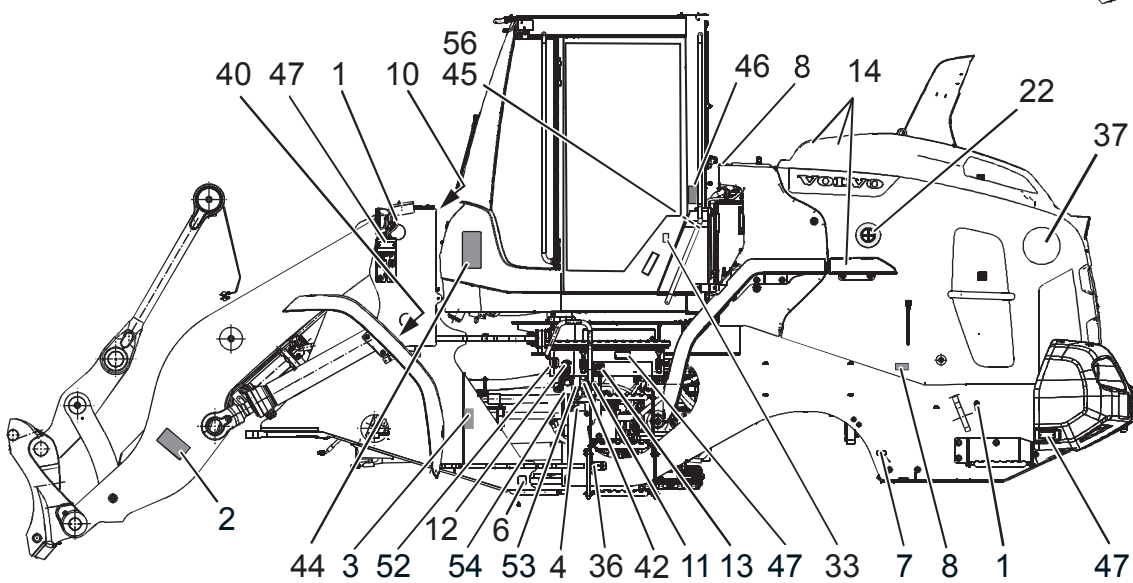
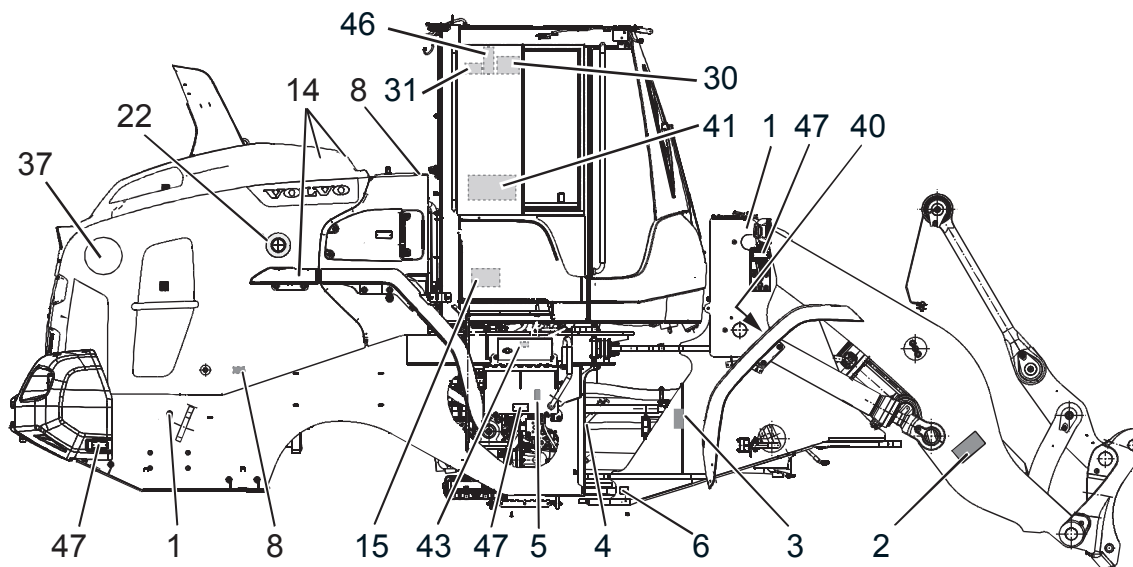
Information and safety decals

The operator shall be aware of and follow all information and safety plates/decals located on the machine. Not all plates/decals are found on all machines, since they are market-dependent and machine-dependent.

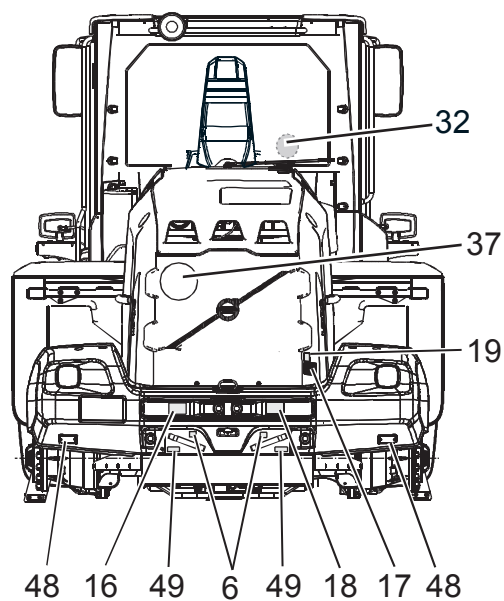
The decals/plates must be kept free from dirt, so that they can be read and understood. If they have been lost or are no longer legible, they must be replaced immediately. The part number (order number) is shown on each decal /plate and in the parts catalogue.

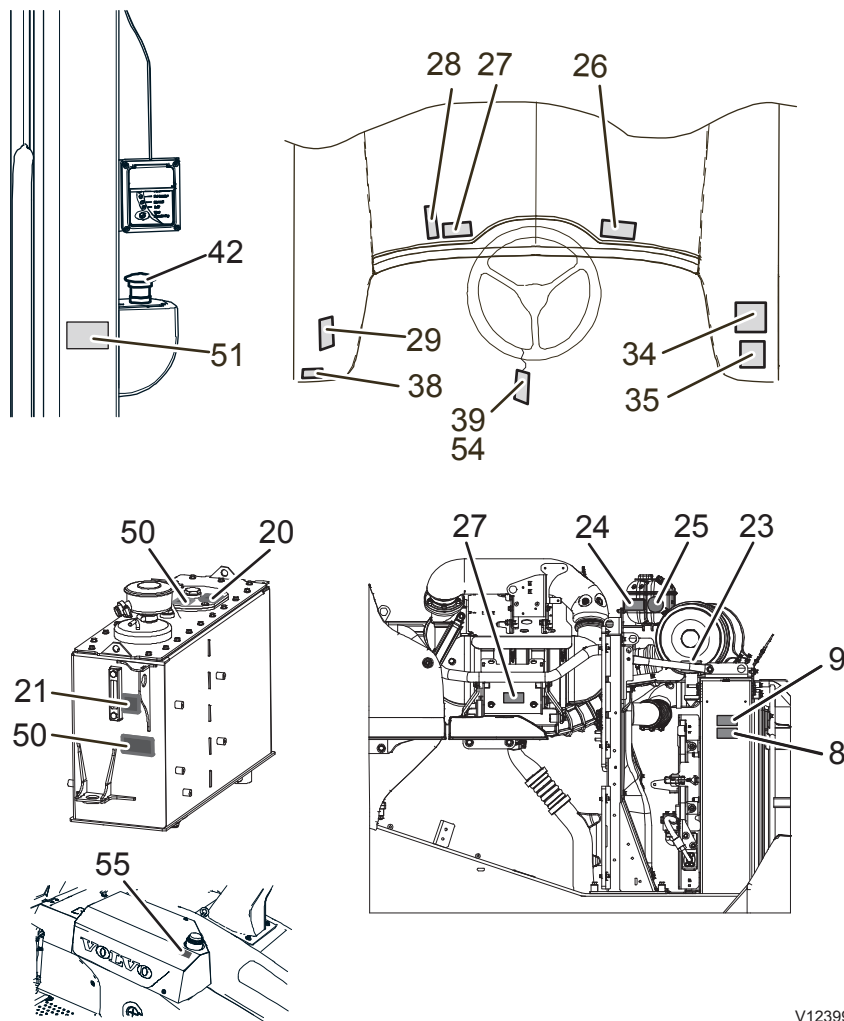
NOTE!

"WARNING" is written on the warning decals for North America.



V1239938





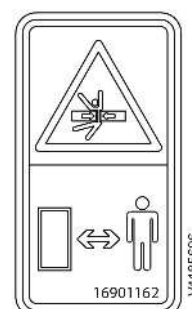
V1239946



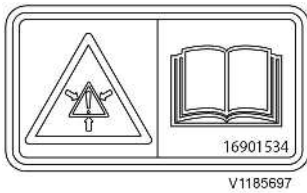
1 Lifting point when lifting
Spare part number: 4898495



2 WARNING! Crushing of whole body — Stay safe distance from raised loader lift arm and attachment
Spare part number in USA: 16949044
Spare part number, all other markets: 16901339



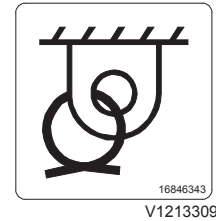
3 WARNING! Crushing of whole body — Stay safe distance from articulation area
Spare part number in USA: 16929620
Spare part number, all other markets: 16901162



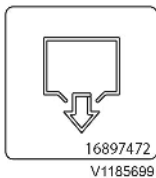
4 WARNING! Pressurized system
Spare part number in USA:
16902962
Spare part number, all other
markets: 16901534



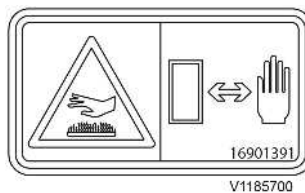
5 WARNING! Electrical shock/
electrocution - Read the operator's
manual
Spare part number in USA:
16929621
Spare part number, all other
markets: 16901361



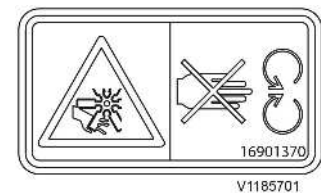
6 Attaching point for lashing
Spare part number: 16846343



7 Drain point
Spare part number: 16897472



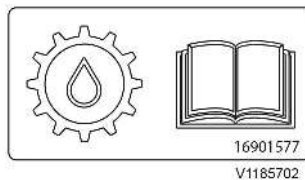
8 WARNING! Hot surface - Burns -
Keep hands safe distance from
hazard
Spare part number in USA:
16929623
Spare part number, all other
markets: 16901391



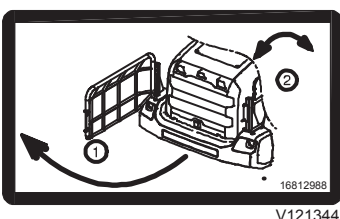
9 WARNING! Severing of fingers
or hand - Do not reach into area
when fan is rotating
Spare part number in USA:
16929622
Spare part number in China:
16925041
Spare part number, all other
markets: 16901370



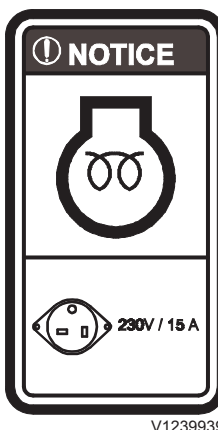
10 Sound power level outside the
machine
Not available as spare part



11 Transmission - read the
Operator's Manual
Spare part number: 16901577



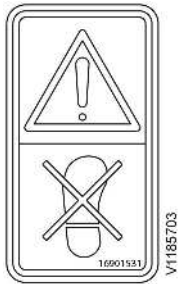
12 only in combination with
protective grill guard (optional
equipment)
Spare part number: 16812988



13 NOTICE Engine heater
Spare part number: 53015088
Spare part number (no text):
53015898



13 NOTICE Engine heater
Spare part number: 16949140
Spare part number (no text):
53015602

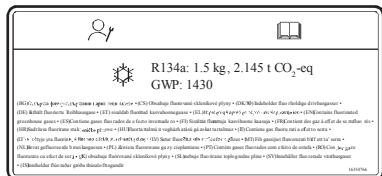


14 WARNING! Do not step on this surface

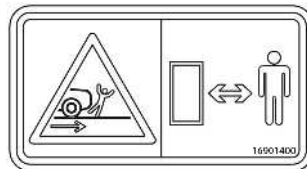
Spare part number in USA:
16929632

Spare part number in China:
16925043

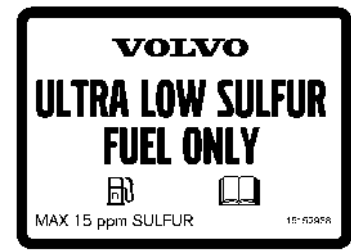
Spare part number, all other markets: 16901531



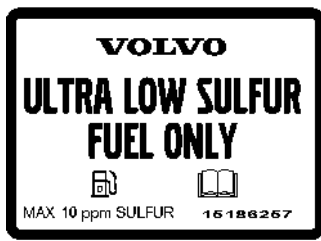
15 Global Warming Potential (GWP), CO₂-equivalent
Spare part number: 16354766



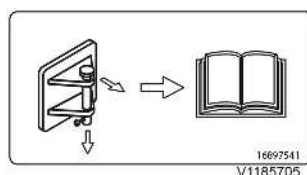
16 WARNING! Crushing hazard – Run-over – Stay safe distance from reversing machine
Spare part number in USA:
16929627
Spare part number, all other markets: 16901400



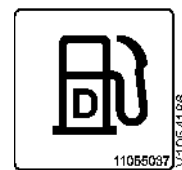
17 Fuel decal (only USA)
Max. 15 ppm SULPHUR
Spare part number: 15152938



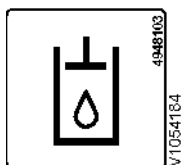
17 Fuel decal (only EU)
Max. 10 ppm SULPHUR
Spare part number: 15186257



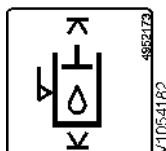
18 Maximum force on towing device – read the Operator's Manual
Spare part number: 16897541



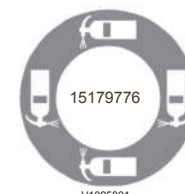
19 Fuel fill point
Spare part number: 11055037



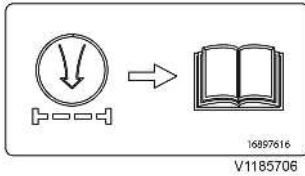
20 Hydraulic oil fill point
Spare part number: 4948103



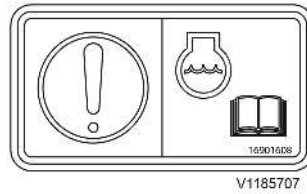
21 Hydraulic oil level
Spare part number: 4952173



22 Marking for holes intended for manual firefighting
Spare part number: 15179776



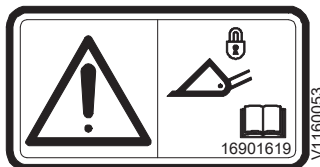
23 Air cleaner – read the Operator's Manual
Spare part number in: 16897616



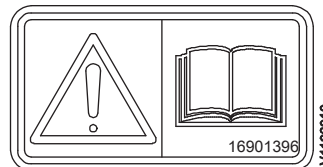
24 NOTICE! Use Volvo coolant only
- read the operator's manual
Spare part number in USA:
16902967
Spare part number, all other
markets: 16901608



25 WARNING! Hot coolant -
Burns
Spare part number in USA:
16948457
Spare part number, all other
markets: 16943076



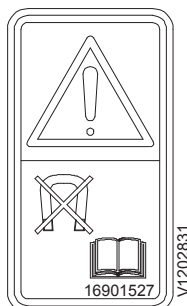
26 WARNING! Crushing hazard -
Check that the attachment is
locked - read the operator's
manual
Spare part number in USA:
11111506
Spare part number, all other
markets: 16901619



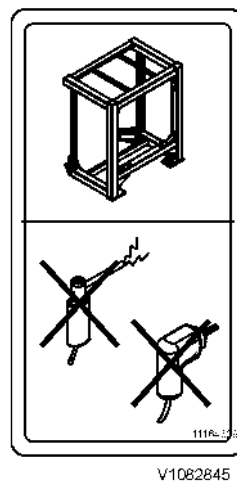
27 WARNING! First read the
Operator's Manual
Spare part number in USA:
16929624
Spare part number, all other
markets: 16901396



28 When operating on public
roads it is prohibited to have
Comfort Drive Control (CDC)
activated – use the steering
wheel.
Spare part number: 11445277



29 WARNING! Electromagnetic
fields - Working in areas exposed
to electromagnetic fields - read the
operator's manual
Spare part number in USA:
15011966
Spare part number in China:
16925120
Spare part number, all other
markets: 16901527



30 Welding and/or drilling forbidden
in the cab
Spare part number: 11164639



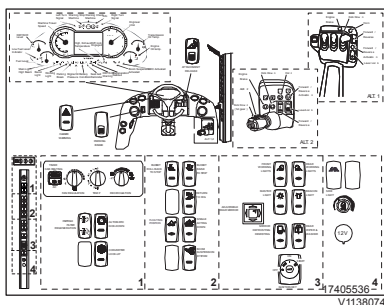
31 Emergency exit. Break glass
with emergency hammer in case
of emergency
Spare part number: 11116814



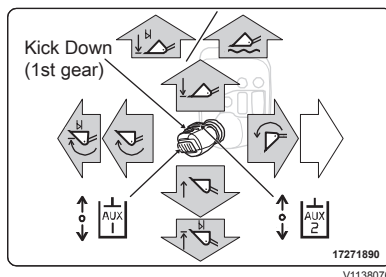
32 Sound pressure level in cab
Not available as spare part



33 WARNING! Remote-controlled door opening, risk of falling (optional equipment)
Spare part number in USA:
17309879
Spare part number, all other markets: 17273889



34 Overview of operating control in cab with electric servo lever
Spare part number (in English):
17405536



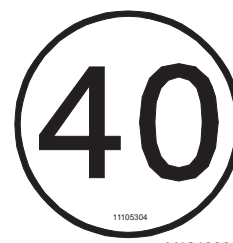
35 Functions for electric servo single lever
Spare part number: 17271890



36 Transmission oil level
Spare part number: 16851394



37 Speed limit 20 km/h (Germany only)
Spare part number: 11105305



37 Speed limit 40 km/h (Germany only)
Spare part number: 11105304



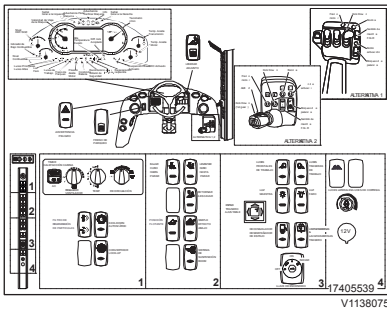
38 EMC-compliance Canada (only North America)
Spare part number: 12833278



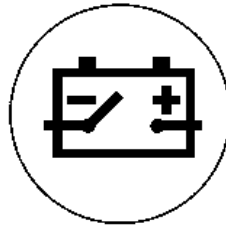
39 Disconnect steering frame lock before moving machine (USA Only)
Spare part number: 16930426



40 Fire extinguisher
Spare part number: 15126327

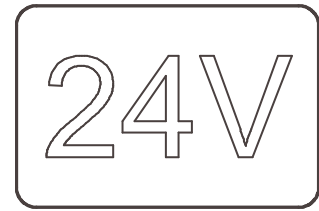


41 Overview of operating control in cab with electric servo lever
Spare part number (in Spanish): 17405539



V1192181

42 Emergency stop, engine
Spare part number: 11444288



V1239941

43 24V
Spare part number: 53489716

FILTER REPLACEMENT		
	PART NO	QTY.
AIR CLEANER		
MAIN FILTER (OUTER)	11110175	1
SAFETY FILTER (INNER)	15193224	1
ENGINE		
OIL FILTER	3831236	1
FUEL FILTER	20805349	1
WATER SEPARATOR	11110683	1
FUEL TANK BREATHING FILTER	11172907	1
TRANSMISSION		
OIL FILTER	11448509	1
HYDRAULIC TANK		
RETURN OIL FILTER	15139817	1
BREATHING FILTER	11707077	1
CAB		
PIRE FILTER	15052786	1
RECIRCULATION FILTER	11703980	1
AXLES		
BREATHING FILTER	11172907	2

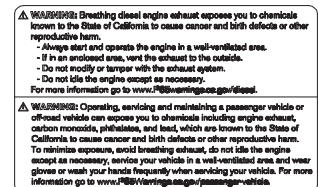
V1192925

44 Filter replacement
Spare part number (in English): 53000175
Spare part number (in Spanish): 53000652



V1240440

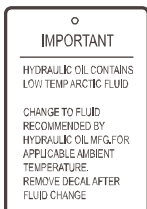
45 Fuse of different functions (on the inside of the cover)
Spare part number: 53921009



V1199743

46 WARNING! California P65
Spare part number: 16939540

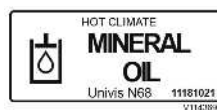
47 Side marking reflector
Spare part number: 43991231



V1240363

50 Hydraulic oil (cold climate)
Spare part number: 11141982

48 Reflector
Spare part number: 11883216



V1143891

50 Hydraulic oil (mineral)
Spare part number: 11181021

49 Reflector (Germany only)
Spare part number: 11883216

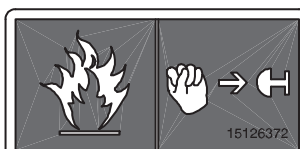


V1143692

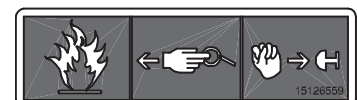
50 Hydraulic oil (synthetic)
Spare part number: 11181022



V1093357

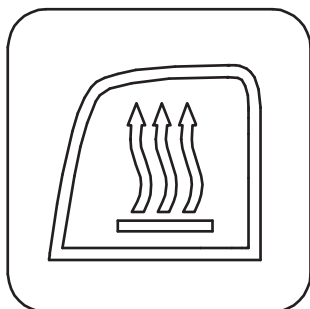


V1215115



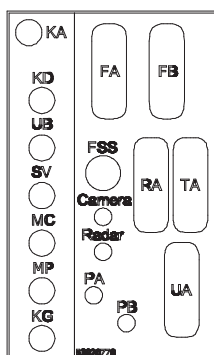
V1215114

50 Hydraulic oil (synthetic ester)
Spare part number: 11411924



V1239942

53 Interior heated window
Spare part number: 17421586



V1240377

56 Cab, electrical contacts
Spare part number: 53920778

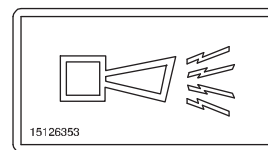
51 Inner activation button for Fire
Suppression System (FSS, optional
equipment)
Spare part number: 15126372



V1240375

54 Fire Suppression System (FSS,
optional equipment)
Spare part number: 11302287

52 Manual activation of Fire
Suppression System (FSS,
optional equipment)
Spare part number: 15126559



V1240376

55 Fire Suppression System
(FSS, optional equipment)
Spare part number: 15126353

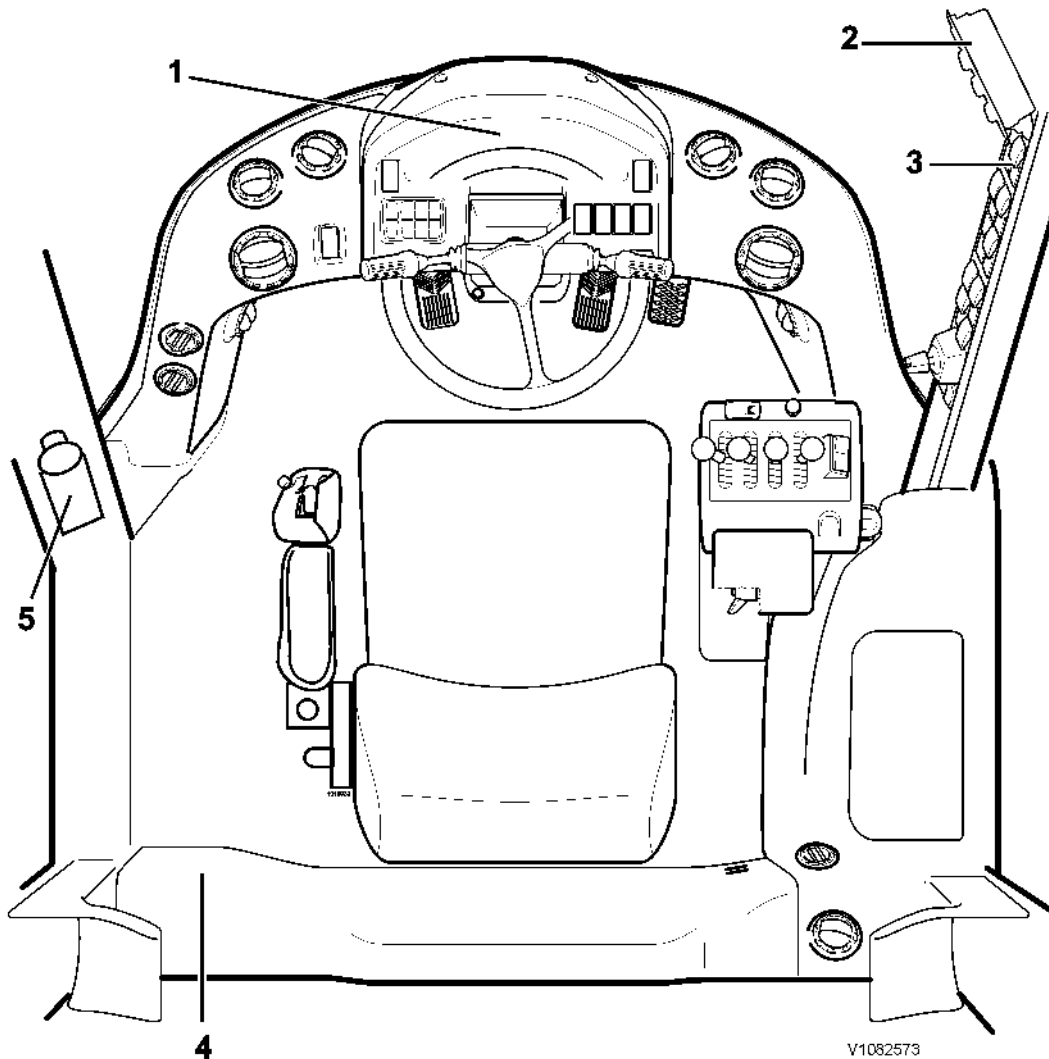
Instrument panels

WARNING

Risk of serious injury.

Operating the machine without sufficient skills and knowledge of the content in the Operator's Manual could lead to loss of machine control and could cause serious injuries including death.

Carefully read through the Operator's Manual and learn the warning signs, symbols and operating instructions before attempting to operate the machine.



V1082573

Always keep the manual in the cab so that it is easily available for quick reference.

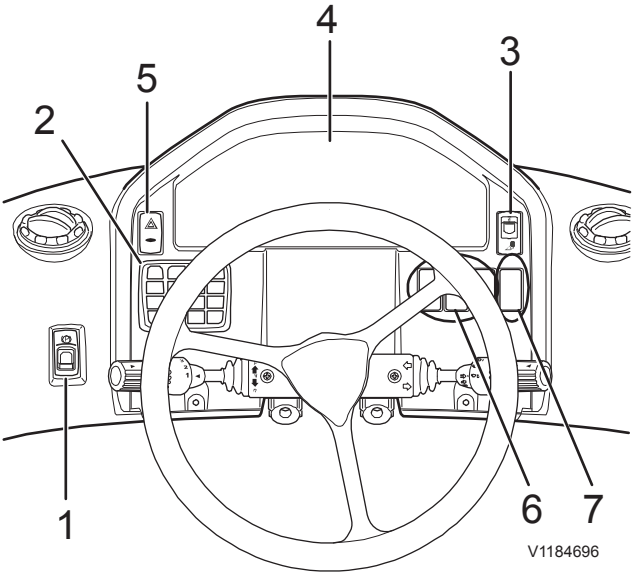
Instrument panels

1	Front panel (information display unit, switches, keypad)	See page 35
2	Overhead panel (climate control system)	See page 120
3	Cab post panel (switches, ignition, hand throttle control, and electric power socket 12 V)	See page 84

4	Rear panel (electric power socket 24 V, electrical distribution box with fuses and relays, socket for service tool)	See page <i>93</i>
5	Control panel for Fire Suppression System (optional equipment)	See page <i>94</i>

Instrument panel, front

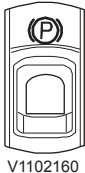
Front instrument panel



1	Parking brake
2	Keypad
3	Separate attachment lock (optional equipment)
4	Information display unit
5	Hazard flashers
6	Spare
7	Spare

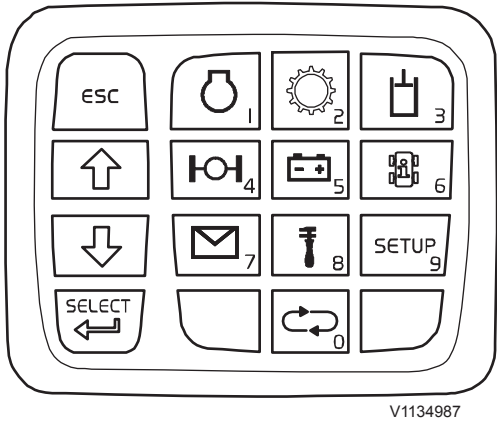
1 Parking brake

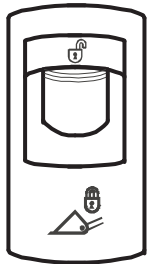
Parking brake's function, see page 95.



2 Keypad

Information about keypad, see page 46.





V1137732

3 Separate attachment lock (optional equipment)

NOTE!

The boom suspension system must be deactivated when checking the function of the attachment lock.

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.

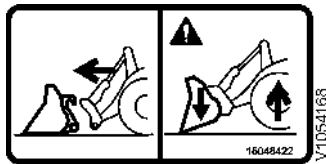
This equipment makes it possible for the operator to connect and disconnect attachments from the operator's seat, see page 200. Press the red button on the upper part of the switch to open the attachment lock.

Press the lower part of the switch to close the attachment lock.

NOTE!

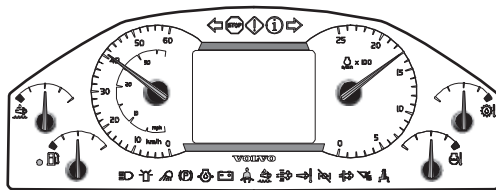
When the switch is on, it is possible to operate the tilt and lift functions simultaneously in order to align the attachment.

A warning message, "Attachment lock open", is shown on the display and an audible signal is heard. Connect and disconnect according to page 200.



16048422

V1054168



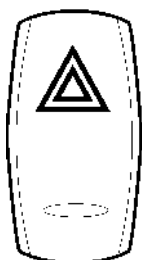
V1237589

4 Information display unit

By taking action in time, it is possible to prevent serious damage to the machine. Therefore, look now and then at the information display unit where the operator is provided with information if something happens that requires action. In order to be able to check the function of instruments and controls, the electric power must be on and the ignition switch in position 1 (running position). See explanation of symbols which appears later in the manual.

5 Flashing hazard lights

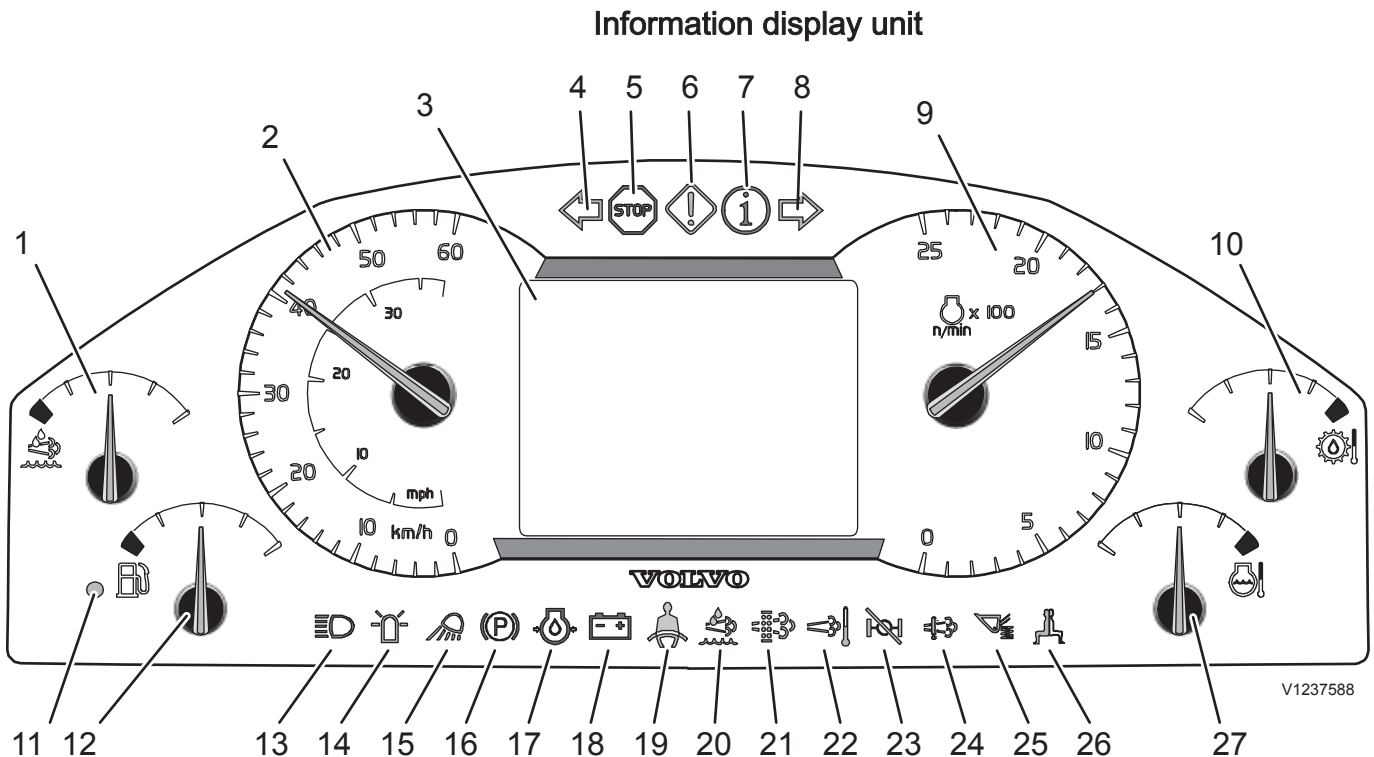
Switch, upper part pressed in = All direction indicators on the machine are activated and the light in the switch together with the control light for direction indicators. The hazard flashers can be used even if the ignition is not turned on.



V1070024

6 Spare

7 Spare

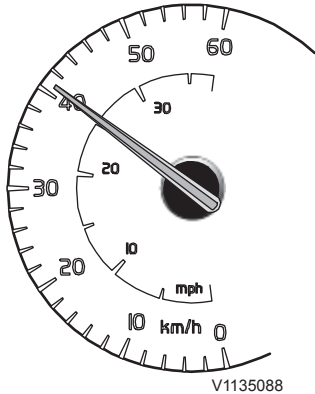


1	AdBlue®/DEF level (a)	14	Rotating beacon (amber)
2	Speedometer	15	Work lights (amber)
3	Display	16	Applied parking brake (red)
4	Direction indicator, left (green)	17	Low engine oil pressure (red)
5	Central warning (red)	18	Battery charging (red)
6	Central warning (amber)	19	Seatbelt not fastened (red)
7	Information symbol (blue)	20	AdBlue®/DEF, warning (amber) (a)
8	Direction indicator, right (green)	21	Regeneration needed (amber) (a)
9	Tachometer	22	High exhaust temperature, during regeneration (amber) (a)
10	Transmission oil temperature	23	Engaged differential lock (green)
11	Fuel level low (amber)	24	Engine Emission System Warning (amber)
12	Fuel level	25	Activated Boom Suspension System (green)
13	High beams (blue)	26	Activated Comfort Drive Control (green)
		27	Coolant temperature

a) Only applies to machines with D6J-engine.



V1240310



V1069831



V1137747



V1069824



V1069825



V1069832

1 AdBlue®/DEF level

When the gauge indicates empty, the warning light is turned on. If the level drops even more, a message is also shown on the display. The machine should be topped up with AdBlue®/DEF as soon as possible, see page 265 for topping up.

2 Speedometer

The speedometer shows the machine's current ground speed and is graded between 0 and up to 60 km/h (0 – 37.5 mph).

3 Display

In addition to alarm texts, the display also shows start sequence, operating information, and settings, see page 42.

4 Direction indicator, left (green)

The light flashes when the lever is moved forward, see page 95. Irregular flashing indicates a defective bulb, which should be replaced.

5 Central warning (red)

The light flashes in case of abnormal operating values or malfunctions. Alarm text is shown on the display unit. The buzzer will continue to sound until required action has been performed.

NOTE!

Move the machine to a safe location.

6 Central warning (amber)

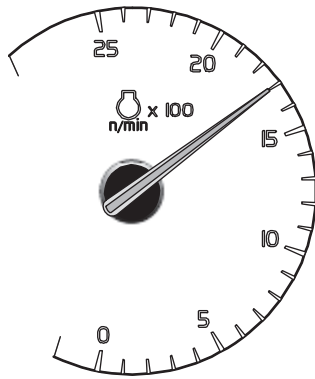
The light flashes when a function is engaged/disengaged or when a function needs to be kept under observation (e.g., clogged filter). Alarm text is shown on the display unit. The buzzer sounds four times.

7 Information symbol (blue)

Indicates deviation of some kind. Alarm text is shown for 7 seconds on the display unit. The buzzer sounds twice.

8 Direction indicator, right (green)

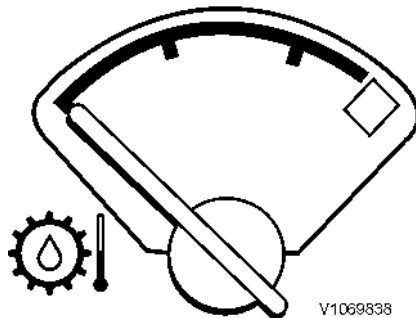
The light flashes when the lever is moved backward, see page 95. Irregular flashing indicates a defective bulb, which should be replaced.



V1237587

9 Tachometer

The tachometer shows the current engine speed (rpm). It is graded from 0 to 2,500 rpm (25 stands for 25 x 100 rpm, that is, 2,500 rpm).

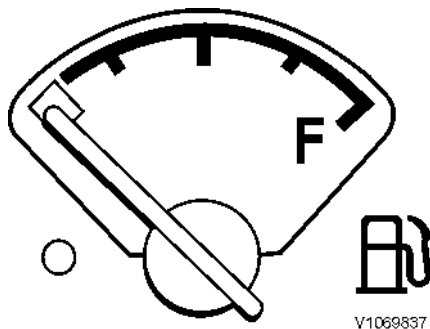


V1069838

10 Transmission oil temperature

The warning light is activated if the gauge needle enters the red field. As a protective action, the engine speed is limited at the same time.

Stop the machine and check for the cause. The buzzer sounds and an alarm text is shown on the display unit, if a directional gear is selected.



V1069837

11, 12 Fuel level

When the gauge indicates empty, the light to the left of the gauge turns on and a message is shown on the display. The machine should be refuelled as soon as possible to prevent air from entering the system. If the tank has been run dry, the fuel system must be bled, see page 267.



V1069826

13 High beams (blue)

The indicator light is on when the high beams are activated, see page 95.



V1069827

14 Rotating beacon (amber)

The light is on when the rotating beacon is activated. See page 130.



V1069828

15 Work lights (amber)

The indicator light is on when the work lights are activated, see page 131.



V1069829

16 Applied parking brake (red)

The light is on when the parking brake is applied. The buzzer sounds continuously and alarm text is shown on the display if a directional gear is engaged.

**17 Low engine oil pressure (red)****NOTICE**

Risk of machine damages

An instrument warning light and buzzer could indicate a serious malfunction.

Stop the machine immediately and investigate the cause of the signal.

The indicator light is on if the engine's oil pressure is too low.

**18 Battery charging (red)**

If the indicator light turns on during operation, the cause must be corrected, otherwise the batteries may be damaged.

19 Seatbelt not fastened (red)

- The control light is on when the seatbelt is not fastened.
- If a directional gear is selected, a red warning turns on ("STOP, fasten seatbelt").
- The buzzer sounds if the machine is operated without fastened seatbelt.

**20 AdBlue®/DEF, warning (amber)**

The indicator light is on with a fixed light at low level, poor quality, or incorrect metering of AdBlue®/DEF. The light starts to flash at a higher warning level.

**21 Regeneration needed (amber)**

The indicator light is on when the diesel particle filter is full and it is time to run a regeneration, see page 155.

**22 High exhaust temperature, during regeneration (amber)****! CAUTION**

Risk of thermal hazard.

The exhaust temperature is rising above the normal operation level during a regeneration.

Make sure that the machine is in a safe environment during regeneration.

The indicator light is on when regeneration of the diesel particle filter is in progress and indicates that the temperature of the exhausts from the outlet pipe is higher than normal. Do not turn off the engine as long as the light is on.

**23 Engaged differential lock (green)**

The light is on when the differential lock is engaged. The foot switch for the differential lock is located on the floor to the left of the steering column.

**24 Engine Emission System Warning (amber)**

The light is flashing or solid depending on the severity of the engine emission system malfunction. Contact a qualified service technician.

**25 Activated Boom Suspension System (green)**

The light is on with a fixed light when the Boom Suspension System is activated.



26 Activated Comfort Drive Control (green)

The light is on when Comfort Drive Control (CDC) is activated. It is possible to steer and shift gears from the armrest to the left of the operator's seat. When the speed exceeds 20 km/h (12.4 mph), the light starts to flash.

NOTE!

The standard gear selector should be in neutral position.

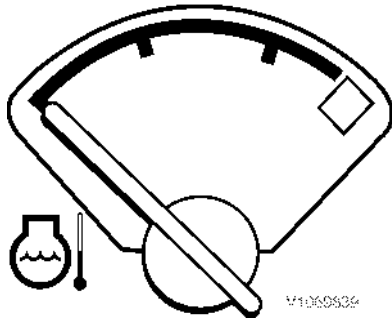
Other instructions, see page 150.

27 Coolant temperature

The warning light is activated if the gauge needle enters the red field. As a protective action, the engine speed is limited at the same time.

Run the engine at low idle for a few minutes. If the gauge continues to indicate within the red sector, stop the engine and investigate the cause.

The buzzer sounds and alarm text is shown on the display unit, if a directional gear is selected.



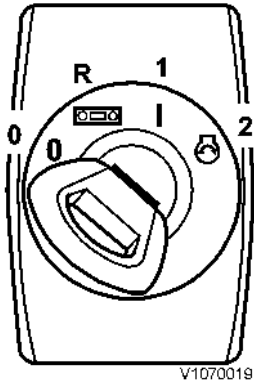
Display unit

The display shows current operating information, vehicle messages, and alarm texts. With the keypad on the front instrument panel the operator can also get information about the machine's status and make settings.

Machine hours are shown in 58. The machine hours are also shown for a short time after the ignition has been turned off.

When the ignition is turned to position 1, the electronics start and the control light test is run. All control lamps light up for two seconds, the pointers in the gauges then move to indicate the correct value for fuel level and temperature. Start display is shown on the information display unit with a rotating Volvo logo. This sequence takes a few seconds. Thereafter the electronics are ready for engine start and the start key can be turned to start position (position 2).

If the machine is equipped with anti-theft device, the display shows a request for the code to be entered, see page 52. After the correct code has been entered, the test program starts.



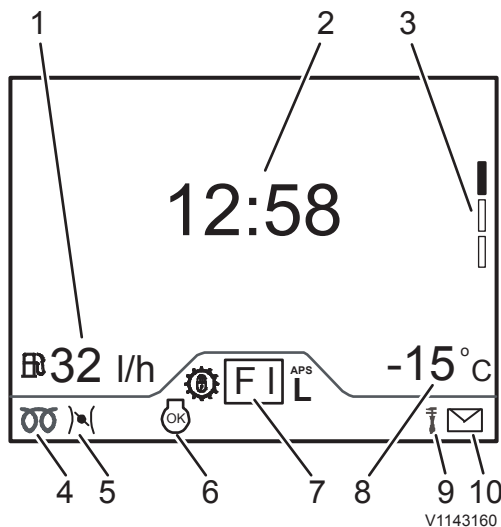
Operating Information display screen

When the engine is started and in normal operating mode, operating displays are shown on the display unit. There are three versions of operating displays; operating display 1, operating display 2, and operating display 3. When the machine is started, the operating display that was active when the electronics were shut down the last time is always shown. When the machine is started for the first time, operating display 1 is always shown. To alternate between operating displays, use the arrow keys.

Operating display 1

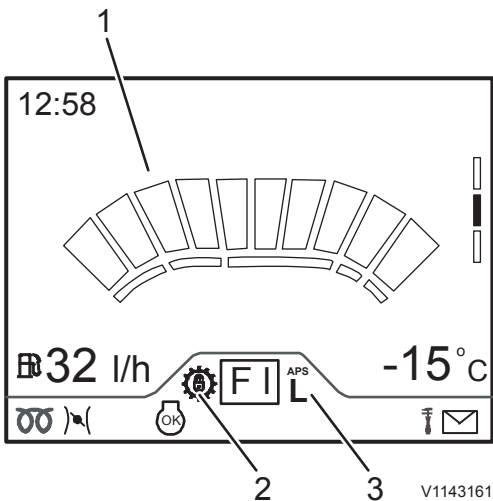
The symbols in operating display 1 show the following:

- 1 Fuel consumption in litres per hour (average consumption)
- 2 Digital clock
- 3 When operating display 1 is shown, it is possible to use the arrow down key on the keypad for the operating information display unit (see page 46) select operating display 2
- 4 Engine's preheating or afterheating is activated
- 5 Hand throttle is activated
- 6 Symbol shows when engine shutdown is permitted
- 7 Gear indication shows active gear
- 8 Ambient temperature
- 9 Information available for retrieval, use key with this symbol
- 10 Vehicle message available for retrieval, use key with this symbol

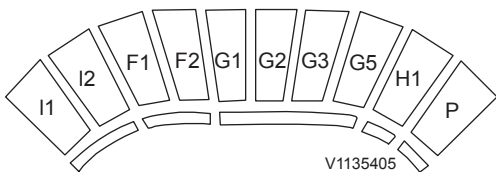


Operating display 1

If any information is missing or fails to appear, — — — will be shown.



Operating display 2



Operating display 2

Operating display 2 shows the same information as operating display 1. In addition, the following is shown:

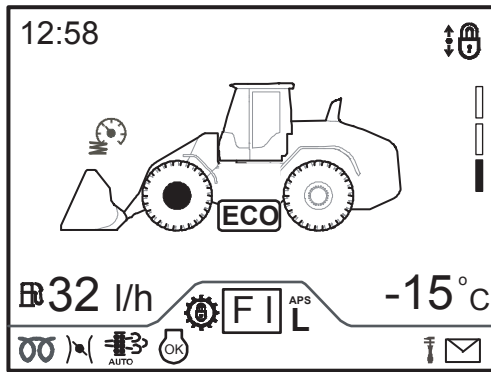
- 1 Throttle application (acceleration)
- 2 Lock-up (white symbol = function is activated, green symbol = function is engaged)
- 3 APS gearshifting program

When this operating display is active, select key with arrow up to switch to operating display 1 or key with arrow down to switch to operating display 3.

If any information is missing or fails to appear, --- will be shown.

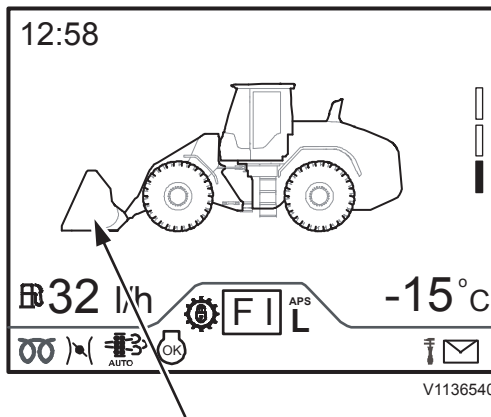
Explanation of previous figure (operating display 2)

Throttle application (acceleration)										
Segment	I1	I2	F1	F2	G1	G2	G3	G5	H1	P
Colour	Dark blue		Light blue		Green				Yellow	Orange
Operating interval	Low idle	High idle	ECO mode						Power mode	Power mode



V1143281

Operating display 3 (all functions shown here)



V1136540

Operating display 3

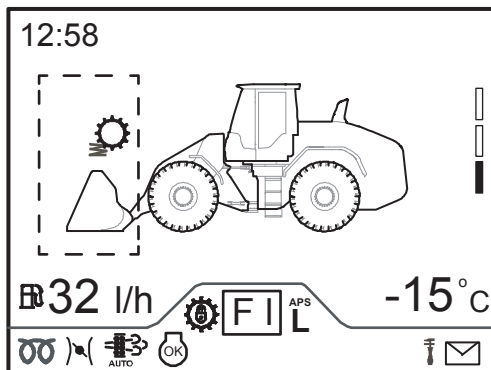
Operating display 3 shows a wheel loader. This figure shows, e.g., if transmission disengagement is activated. This enables the operator to get a quick overview of which functions are activated (white symbols) and which are engaged (green symbols).

- Activated function (white symbol): The function is activated to enable use by the machine (but is not engaged by the machine)
- Engaged function (green symbol): The function is activated and is being used by the machine (is engaged by the machine)

Attachment lock

There are two positions for the attachment lock:

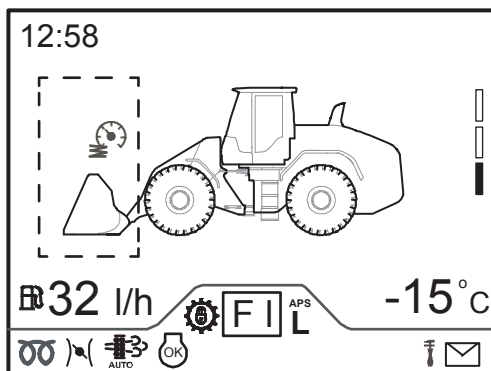
- Red bucket = attachment lock is open
- Neutral bucket = attachment lock is closed



V1136541

Gear-dependent Boom Suspension System (BSS)

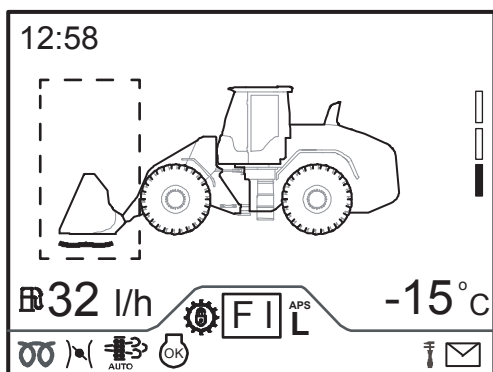
- White symbol = gear-dependent Boom Suspension System (BSS) is activated
- Green symbol = gear-dependent Boom Suspension System (BSS) is engaged



V1136542

Speed-dependent Boom Suspension System (BSS)

- White symbol = speed-dependent Boom Suspension System is activated
- Green symbol = speed-dependent Boom Suspension System is engaged

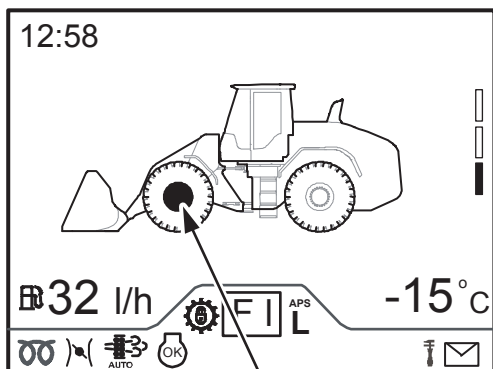


V1136543

Float mode

There are two positions for float mode:

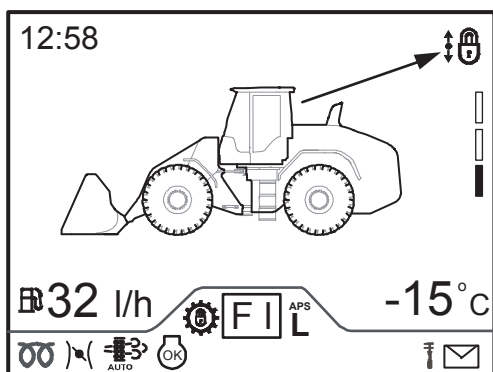
- White symbol = float mode is activated
- Green symbol = float mode is engaged



V1136565

Differential lock

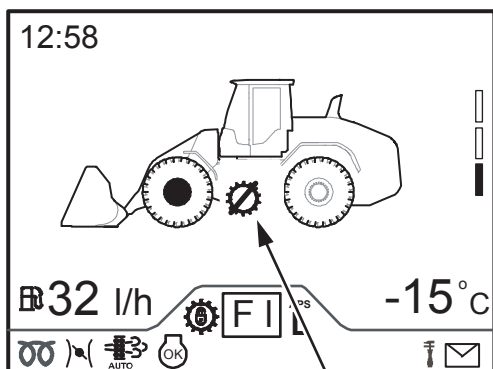
- Yellow-highlighted symbol = differential lock is activated



V1136566

Lever lockout

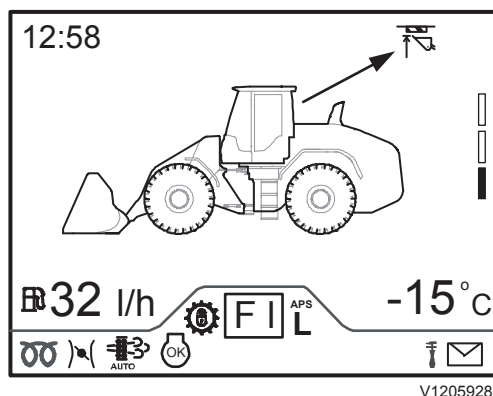
- White symbol = lever lockout is activated (and disengages the control levers' hydraulic function from accidental activation)



V1136567

Transmission disengagement

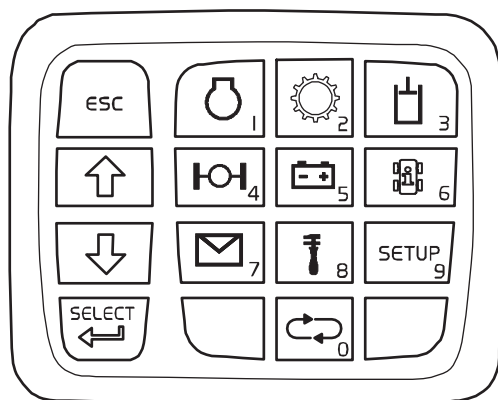
- White symbol = transmission disengagement is activated
- Green symbol = transmission disengagement is engaged



V1205928

Max. boom height

- White symbol = Max. boom height is activated



V1134987

Keypad

Keypad, information display unit

Using the keypad, the operator can access information about the machine's status and make settings.

The SELECT key is used to access a submenu or to make a selection, but is also used to obtain more information when an information message or check message is shown on the display unit.

The digit farthest down to the right on each key corresponds to the digit that should be entered when performing different settings, e.g., the date. On machines equipped with anti-theft device, the digits are used to enter the correct code.

Changing display screen is only possible if the speed is below 20 km/h (12.4 mph).

Alarm texts

The operator information is provided on the display unit in the form of alarm texts, which are divided into three classes: Warning, Check, and Information. For all classes, at machine speeds above 20 km/h (12.4 mph) the alarm text is shown for three seconds and then changes to previous display figure for three seconds.

Alternating showing of the two displays continues as long as the problem situation remains, or until the specified alarm has been shown a certain number of times.

Information

- The information symbol is shown.
- The buzzer sounds two times.
- Alarm text is shown for seven seconds and then changes to operating display.
- Check or contact a qualified service technician for information.

Engine

Display text	Action
Coolant output reduced Check radiator	1 Check if the radiator is clogged, see "Cooler and condenser, cleaning". 2 Check the coolant level, see "Coolant, checking level and refilling". 3 If the problem persists, contact an authorized dealer.
Abort with ESC Automatic Engine shutdown	No action required.

DPF change will soon be required	1 Contact an authorized dealer.
Delayed engine shutdown XX:XX Abort with ESC	No action required.
Delayed Engine Shutdown Abort with ESC Delayed Engine Shutdown Time remaining	No action required.
Regeneration not needed	No action required.

Transmission

Display text	Action
Gear selector not in neutral	1 Put gear selector in neutral to continue.
Machine speed too high for current gear	1 Reduce machine speed.
Transmission Declutch misuse	1 Change transmission disengagement to a lower level. 2 If the problem persists, turn off transmission disengagement.
Low transmission oil temperature Reduced performance	Engine's performance is limited.
Transmission oil temperature too low	While the engine is running with the gear lever in neutral, wait for the transmission oil temperature to rise before operating the machine. This can take 5-10 minutes.
Transmission calibration needed	1 Contact an authorized dealer.

Axle

Display text	Action
Low axle oil temperature Reduced performance	1 No action required, machine performance will be restored when temperature rises.

Steering system

Display text	Action
Lever carrier deactivated CDC activated	No action required.
Lever carrier not activated CDC activated	No action required.
Lever carrier activated	No action required.
Lever carrier deactivated	No action required.

Miscellaneous

Display text	Action
Low washer fluid level	1 Add washer fluid.
Be careful Radar Override	No action required.
CONTACT SERVICE GPS ECU Offline	1 Contact an authorized dealer.

Check

- The amber central warning symbol is shown.
- The buzzer sounds four times.

- Press SELECT to obtain more information on the malfunction.
- Alarm text is shown until confirmation is performed by pressing ESC.
- Repair or contact qualified service technician for information.

Engine

Display text	Action
Engine failure	1 Contact an authorized dealer.
Preheating failure	1 Contact an authorized dealer.
Cooling fan system failure	1 Contact an authorized dealer.
Cooling fan reversal failure	1 Contact an authorized dealer.
Fuel level sensor	1 Contact an authorized dealer.
Fuel level low	1 Check the fuel level, see "Fuel, filling". 2 If the problem persists, contact an authorized dealer.
Hand throttle failure	1 Contact an authorized dealer.
High temp. starter motor Wait 5 min. before start	1 Wait 5 minutes and try to start again. 2 If the problem persists, contact an authorized dealer.
High coolant temp. engine	1 Check if the radiator is clogged, see "Cooler and condenser, cleaning". 2 Check the coolant level, see "Coolant, checking level and refilling". 3 If the problem persists, contact an authorized dealer.
High engine oil temperature	1 Reduce the load on the engine. 2 Wait a couple of minutes and then check if the engine oil temperature has reached a normal level. 3 If the problem persists, contact an authorized dealer.
Injection system failure	1 Contact an authorized dealer.
Water in fuel Empty cup	1 Drain the water from the water separator, see "Water separator, draining". 2 If the problem persists, contact an authorized dealer.
Emission system failure	1 Contact an authorized dealer.
Turbo Hot Shutdown	1 Let the engine idle until the OK-symbol turns green in the display before turning it off, see "Stopping".
Possible fuel leakage	1 Contact an authorized dealer.
Fuel filter clogged	1 Contact an authorized dealer.
Air filter clogged Clean or replace	1 Clean the air cleaner primary filter, see "Air cleaner primary filter, cleaning". 2 If the problem persists, contact an authorized dealer.
High coolant temp. Reduced engine function	1 Check if the radiator is clogged, see "Cooler and condenser, cleaning". 2 Check the coolant level, see "Coolant, checking level and refilling". 3 If the problem persists, contact an authorized dealer.
Full engine power Temporarily restored	No action required.

Transmission

Display text	Action
Transmission oil filter Clogged	1 Work carefully 2 Contact an authorized dealer as soon as possible.
Gear sel. failure Check at next stop	1 Use directional gear selector on lever carrier. 2 Contact an authorized dealer as soon as possible.

Axles

Display text	Action
Front axle oil rising temperature	1 Reduce workload. 2 If the problem persists, contact an authorized dealer.
Rear axle oil rising temperature	1 Reduce workload. 2 If the problem persists, contact an authorized dealer.

Brakes

Display text	Action
Parking brake failure	1 Contact an authorized dealer.

Steering system

Display text	Action
Secondary steer failure	1 Check hydraulic system for leaks. 2 Contact an authorized dealer.
CDC failure	1 Use the steering wheel instead and continue working. 2 Contact an authorized dealer.

Hydraulics

Display text	Action
Check attachment lock and confirm ⁽¹⁾	1 Check attachment lock and confirm.

Miscellaneous

Display text	Action
ECU Network Reduced Communication ⁽²⁾	1 Work carefully 2 Contact an authorized dealer as soon as possible.
Parameter failure	1 Work carefully 2 Contact an authorized dealer as soon as possible.
Central lubrication failure	1 Check fuse FU43 2 Check the grease level and refill if needed, see page 280. 3 If the problem persists, contact an authorized dealer.
Next service, interval	1 Contact an authorized dealer.
'Limp Home' safety related failure	1 Stop the machine immediately, safely and in the nearest appropriate location. 2 Contact an authorized dealer.
Radar not functional	No action required.
Radar not functional due to lever lock engaged	No action required.

Warning

- The red central warning symbol is shown.
- The buzzer will sound until the required action has been performed.
- The alarm text will be shown until the required action has been performed.

1. Confirm with SELECT.

2. Reduced communication between ECUs. The machine can only be operated in first or second gear. Only operating information and alarms are available on the display unit.

- Repair or contact qualified service technician for information.

NOTE!

If the warnings below are shown, turn off the engine and then turn the start key to position 1 to check the subsequent alarm text. If the machine must be moved to a safe place before turning off the engine, press the ESC-button to hide the warning messages for 30 seconds.

Display text	Action
Stop vehicle	1 Stop the machine.
Stop vehicle Turn Off Engine	1 Stop the machine and turn off the engine.

These two warnings are always followed by an additional alarm text. Follow the instructions on the screen and repair or contact a qualified service technician. When a warning is shown, the engine should be turned off and the start key turned to position 1 in order to show the subsequent alarm text.

Engine

Display text	Action
High coolant temp. engine	1 Stop the machine and turn off the engine. 2 Check if the radiator is clogged, see "Cooler and condenser, cleaning". 3 Check the coolant level, see "Coolant, checking level and refilling". 4 If the problem persists, contact an authorized dealer.
High charge-air temp. engine	1 Stop the machine and turn off the engine. 2 Check if the charge air cooler is clogged, see "Cooler and condenser, cleaning". 3 If the problem persists, contact an authorized dealer.
High boost pressure	1 Stop the machine and turn off the engine. 2 Contact an authorized dealer.
Low engine oil pressure	1 Stop the machine and turn off the engine. 2 Contact an authorized dealer.
Coolant level low ⁽¹⁾	1 Stop the machine and turn off the engine. 2 Check the coolant level, see "Coolant, checking level and refilling". 3 If the problem persists, contact an authorized dealer.
Engine failure	1 Stop the machine and turn off the engine. 2 Contact an authorized dealer.
High fuel temperature	1 Stop the machine and turn off the engine. 2 Contact an authorized dealer.
High crankcase pressure	1 Stop the machine and turn off the engine. 2 Contact an authorized dealer.
High turbo temp.	1 Stop the machine and turn off the engine. 2 Contact an authorized dealer.
Engine overspeed	1 Stop the machine and turn off the engine. 2 If the problem persists, contact an authorized dealer.
Emission system failure	1 Stop the machine and turn off the engine. 2 Contact an authorized dealer.
Water in fuel	1 Stop the machine and turn off the engine. 2 Drain the water from the water separator, see "Water separator, draining" 3 If the problem persists, contact an authorized dealer.
Fuel injection system failure	1 Stop the machine and turn off the engine. 2 Contact an authorized dealer.
Turbocharger compressor outlet temperature	1 Stop the machine and turn off the engine. 2 Contact an authorized dealer.

1. The level is checked continuously during operation.

High exhaust system temperature (a)	1 Stop the machine and turn off the engine. 2 Contact an authorized dealer.
Park machine Service needed Derate active (a)	1 Park the machine in a non-heat-sensitive area. 2 Turn off the engine. 3 Contact an authorized dealer.

Electrical system

Display text	Action
Low system voltage	1 Stop the machine immediately, safely and in the nearest appropriate location. 2 Contact an authorized dealer.

Transmission

Display text	Action
High transmission oil temperature	1 Stop the machine immediately, safely and in the nearest appropriate location. 2 Let the machine idle until the temperature has reached a normal level. 3 If the alarm recurs after action, contact an authorized dealer.
Low transmission oil pressure	1 Stop the machine immediately, safely and in the nearest appropriate location. 2 Check the transmission oil level, topup the transmission oil if needed. 3 If the alarm recurs after action, contact an authorized dealer.
Transmission failure	1 Stop the machine immediately, safely and in the nearest appropriate location. 2 Contact an authorized dealer.
Direction change at too high speed	1 Reduce speed when changing direction.

Brakes

Display text	Action
Low brake pressure	1 Stop the machine immediately, safely and in the nearest appropriate location. 2 Contact an authorized dealer.
Applied parking brake	1 If the machine is stand still, release parking brake before engage gear. 2 If the machine is moving and the parking brake is used as emergency brake, after stopping, contact an authorized dealer.
Brake system failure	1 Stop the machine immediately, safely and in the nearest appropriate location. 2 Contact an authorized dealer.
Park brake NOT applied	1 Apply the parking brake before leaving the operator's seat. 2 If the fault persists, contact an authorized dealer.
Parking brake test Active	1 See page 153.

Axles

Display text	Action
High oil temperature front axle	1 Stop the machine immediately, safely and in the nearest appropriate location. 2 Contact an authorized dealer.

High oil temperature rear axle	1 Stop the machine immediately, safely and in the nearest appropriate location. 2 Contact an authorized dealer.
Diff. lock failure	1 Work carefully. 2 Contact an authorized dealer as soon as possible.

Steering system

Display text	Action
Low steer pressure	1 Stop the machine immediately, safely and in the nearest appropriate location. 2 Contact an authorized dealer.
CDC failure	1 Use the steering wheel instead and continue working. 2 Contact an authorized dealer.

Hydraulics

Display text	Action
Low hydraulic oil level ⁽¹⁾	1 Stop the machine immediately, safely and in the nearest appropriate location. 2 Check hydraulic oil level on the sight glass. 3 Check for leakage. 4 Fill with hydraulic oil. 5 If the alarm recurs after action, contact an authorized dealer.
High hydraulic oil temperature	1 Stop the machine immediately, safely and in the nearest appropriate location. 2 Wait until the temperature has reached a normal level. 3 If the fault persists, contact an authorized dealer.
Attachment lock open	1 Stop the machine immediately. 2 Check the attachment lock. See page 200.
Max. Boom Height Limitation Failure	1 Deactivate the function. Follow the instructions, see page 60. 2 If the fault persists, contact an authorized dealer.

Miscellaneous

Display text	Action
Reduce speed	1 Reduce speed.
Fasten seat belt	1 Fasten seat belt. 2 If the fault persists, contact an authorized workshop.
ECU network comm. interrupt	1 Stop the machine immediately, safely and in the nearest appropriate location. 2 Contact an authorized dealer.

Theft protection

(Optional equipment)

The anti-theft device prevents theft of the machine since:

- the engine does not start
- the gear selector does not work
- the parking brake cannot be released.

When starting the engine

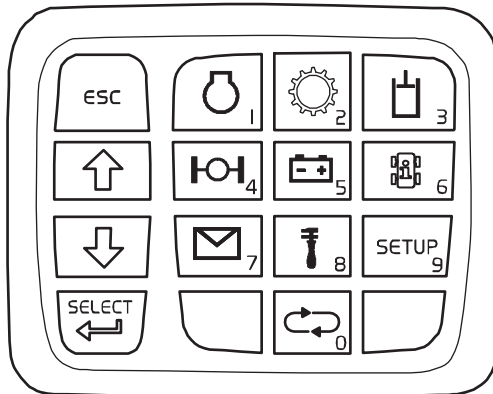
- 1 Turn the start key to position 1.

1. The level is checked continuously during operation.

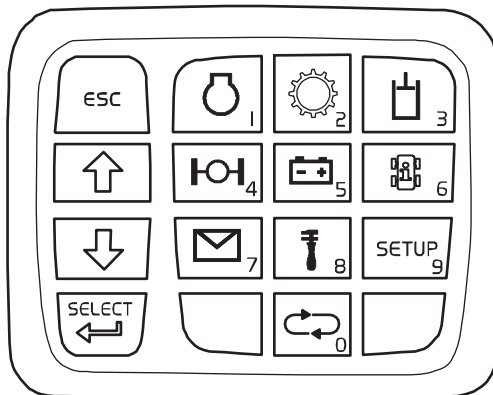


- Wait until the following display figure is shown on the display unit.
- Use the keypad to enter the four-digit PIN-code (for new machine set from factory).
 - When the correct code has been entered, the theft protection is deactivated and the engine can be started.
 - Use the ESC key to move the cursor to the left to change an incorrectly entered digit.
 - When the PIN-code has been entered, and any digit is incorrect, the system automatically returns to the position for the first digit. Enter the PIN-code again.

- The PIN-code can only be changed by a qualified service technician.
- The engine can be restarted within 15 minutes after it was turned off without having to enter the code (factory setting). The time for restart can be changed from 1 to 180 minutes only by a qualified service technician.



V1134987



V1134987

Keypad

- Engine 53
- Transmission 56
- Hydraulic system 57
- Axles / Brakes 58
- Electrical system 58
- Machine information 58
- Vehicle messages 63
- Service 59
- Setup 60
- Operational data 63

Settings and information menus

Press a key (0–9) on the keypad to reach the wanted menus. In each menu, information can be obtained about the machine's condition/status and/or settings can be made in submenus. Settings can be made when an arrow is pointing to the right.

Navigation in menus and submenus

- ESC-key: Press to go back (exit current menu or submenu)
- Arrow up/down-keys: Press to scroll up or down
- SELECT-key: Press to access a submenu or to make a selection.

Engine menu

For information on how to use the keypad and select the menus, see 53.

 ENGINE V1069651	
 Coolant temperature  XX °C High	Shows the coolant temperature.
  Low X.X bar	Shows the oil pressure.
Air filter   Normal  Clogged V1155637	Shows status of the engine's air filter. NOTE! A text message is shown if the air filter is clogged.
 Engine rpm XXX rpm n/min V1235668	Shows current engine speed.
 Working idle speed 'n/min' V1235668	Shows current setting for idle rpm during a break in the work (automatic engine shutdown to idle) (submenu available).
 Idle Speed Select n/min V1235668	The engine will run at the selected idle rpm during a break in the work (automatic engine shutdown to idle) when: - lever steering CDC (Comfort Drive Control) is affected - any operating control for the hydraulics is affected - gear is selected - throttle-up is activated The idle rpm during a break in the work (automatic engine shutdown to idle) should be adapted to how the machine is used and to how fast hydraulic response is desired. Higher idle rpm during a break in the work (automatic engine shutdown to idle) means faster response from the hydraulics, but also higher fuel consumption. Move with the arrow keys and press SELECT. - Off: The function is activated (engine's base idle rpm is selected) - 700 — 1,000 rpm: Idle rpm during a break in the work (automatic engine shutdown to idle) can be set from 700 up to 1,000 rpm (in steps of 50 rpm). To return to earlier menus, press ESC. NOTE! If lever steering CDC (Comfort Drive Control), operating controls for the hydraulics, gear, or throttle are not affected, the engine goes to base idle rpm after 5–6 seconds.
 Off	
 700 — 1,000	

Regeneration Action (a)  'Current selection' ▶	Shows current setting. Press SELECT to access a submenu where a new setting can be performed. NOTE! The menu can only be accessed within the interval 500 ±50 hours, 1000 ±50 hours, 1500 ±50 hours, etc.
---	--

a)Only applies to machines with D6J-engine.

 Stop	The setting for regeneration is performed in this submenu. Move with the arrow keys and press SELECT.
 Start	

Rev. cooling fan  'Current selection' ▶	The reversible fan function (optional equipment) is used to remove debris from the radiators by reversing the rotational direction of the cooling fan.
--	---

 Short	The menu selections will set how the reversing of the cooling fan is done. • Automatic reversing with short or long reversing period and intervals in between. • Manual reversing which starts a single reversing period. NOTE! There are systems in the machine with prioritized cooling needs that can prevent the fan from reversing (as well as hydraulic oil temp below approx. 20 °C (68 °F)): • Inlet air • AC-system • Auxiliary braking
 Long	
 Manual	
 OFF	

Rev. cooling fan  'Current selection' ▶	Shows current setting. The length between the reversing period in minutes is shown if automatic reversing is selected. Default settings: • Short: cooling fan reverse 30 seconds every 15 minutes. • Long: cooling fan reverse 30 seconds every 30 minutes. • Manual: cooling fan reverse 180 seconds. An authorized service technician can change the settings. Off is shown for manual reversing. Press SELECT to access a submenu where activation of manual reversing is done.
--	--

 Off	For manual reversing, select Reversing and the cooling fan performs one reversing period and then returns to normal rotational direction.
 Reversing	

 Delayed Eng. Shutdown	This function controls the after-cooling of the engine after the ignition has been turned off. It secures that the engine is running until it is sufficiently cooled and then shuts it down. The time required for the after-cooling is maximum 2 minutes, but it is also possible to manually set the time to shutdown in the interval 2–20 minutes. The remaining time from ignition key has been turned off to shutdown is shown in the display. It is possible to abort the after-cooling and shut down the engine directly by pressing ESC, via the battery disconnect switch or by using any emergency stop, but it is not recommended. A message will pop-up at restart if the engine has been shut down before the after-cooling is completed.
Activation/Deactivation  "Current selection"	The current selection is shown. Press SELECT to enter a sub menu where a new selection can be made. Auto means that the function is activated and must be selected to be able to set time. Off means that the function is deactivated and should normally <u>not</u> be selected because the engine will shut down directly when the ignition is turned off and no after-cooling will take place.
Set Time, 0 or 2-20 min   X min	The current selection is shown. Press SELECT to be able to adjust the time by using the arrow keys. 0 minutes means that the engine will shut down as soon as it is sufficiently cooled after the ignition has been turned off. In the span 2–20 minutes, the engine will shut down after the selected number of minutes has passed after the ignition was turned off.

Transmission menu

For information on how to use the keypad and select the menus, see 53.

 TRANSMISSION	
Oil temperature  XX °C	Shows the transmission's oil temperature.
Trans. diseng.  'Current selection'	Shows current selection for transmission disengagement. To make a new selection, press SELECT, use the arrow key to move to the desired selection, then press SELECT.

 OFF	Move with the arrow keys and press SELECT. There are five different positions for the transmission disengagement (OFF, 1, 2, 3, 4) that represent how hard the brake pedal has to be pressed down for the transmission to disengage.
 1	
 2	
 3	
 4	

Auto Lock-up Fwd  V1184186 'Current selection' ▶	Shows current selection for automatic lock-up forward. NOTE! F2–4 is the default setting and should normally be used. F1–4 is only available in certain applications. To make a new selection, press SELECT, use the arrow key to move to the desired selection, then press SELECT.
--	---

 F1–4	- F1–4: Lockup is allowed to automatically engage in gear F1, F2, F3 and F4. - F2–4: Lockup is allowed to automatically engage in gear F2, F3 and F4. - F3–4: Lockup is allowed to automatically engage in gear F3 and F4. - F4: Lockup is allowed to automatically engage in gear F4.
 F2–4	
 R3–4	
 R4	

Auto Lock-up Rev  V1184186 'Current selection' ▶	Shows current selection for automatic lock-up reverse. NOTE! R2–4 is the default setting and should normally be used. R1–4 is only available in certain applications. To make a new selection, press SELECT, use the arrow key to move to the desired selection, then press SELECT.
--	---

 R1–4	- R1–4: Lockup is allowed to automatically engage in gear R1, R2, R3 and R4. - R2–4: Lockup is allowed to automatically engage in gear R2, R3 and R4. - R3–4: Lockup is allowed to automatically engage in gear R3 and R4. - R4: Lockup is allowed to automatically engage in gear R4.
 R2–4	
 R3–4	
 R4	

For information on how to use the keypad and select the menus, see 53.

 HYDRAULIC SYSTEM V11551202	
 Oil temperature XX °C V1155032	Shows current hydraulic oil temperature.
 Oil level Low Normal V1155198	Shows current hydraulic oil level.

For information on how to use the keypad and select the menus, see 53.

 AXLES/BRAKES	
 Oil temp. Front axle XX °C	Shows oil temperature in the front axle.
 Oil temp. Rear axle XX °C	Shows oil temperature in the rear axle.

For information on how to use the keypad and select the menus, see 53.

ELECTRICAL SYSTEM	
 V1155956	Voltage  Low XX.X V High
Shows current battery voltage.	

For information on how to use the keypad and select the menus, see 53.

 MACHINE INFORMATION V11551202	
Model LXXX	Shows machine model.
Serial no. LXXXXXXXXXX	Shows serial number (manufacturing number).
Machine hrs XX h	Shows machine hours.
Time XX:XX	Shows current time.
Date YYYYMMDD	Shows current date.

Service menu

For information on how to use the keypad and select the menus, see 53.

 SERVICE V1069858	
 Next service V1069858	Shows current setting. Press SELECT to access a submenu with more information.
 Engine oil/filter V1069858	Press SELECT to access the following submenus.
Time remaining: XX h	Shows remaining operating hours to next engine oil/filter service. For other service intervals and maintenance steps see page 243.
Interval XXX h	Shows the engine oil/filter service interval in hours. For other service intervals and maintenance steps see page 243.
 Central lubrication V1069858	Press SELECT to access a submenu where the current setting is shown.
"Current selection"	Shows current setting. Press SELECT to access a submenu where the current setting is shown.

 Interval V1069858	
 Light	Move with the arrow keys and press SELECT.
 Normal	
 Heavy	

Setup menu

For information on how to use the keypad and select the menus, see 53.

 SETUP V1155205	
Personal Settings	Press SELECT to access the following submenus:
Smooth Control "Current selection"	Shows current selection. Press SELECT to access a submenu where a new setting can be performed.
 Off	Move with the arrow keys and press SELECT. This function controls the engine for a smoother performance and should be used in most applications. The function should normally be used ("On"). When grading on slippery surfaces, or in other applications that could require very quick adjustments of the engine speed, the function could be temporarily switched off.
 On	
Smart Control "Current selection"	Shows current selection. Press SELECT to access a submenu where a new setting can be performed.
 Off	Move with the arrow keys and press SELECT. This function ensures the correct torque in all applications and optimizes the harmony between the engine and the hydraulics. The function should normally be used ("On"). In situations when tractive force is highly prioritized over hydraulic capacity, the function could be temporarily switched off.
 On	
Rimpull Control "Current selection"	Shows current selection. Press SELECT to access a submenu where a new setting can be performed.

 OFF	Move with the arrow keys and press SELECT. With this function, the rimpull can be adjusted to avoid wheel spin and therefore reduce the wear of the tires. Proceed as follows for a suitable selection: 1 Select 60% (lowest rimpull) 2 Enter the material that should be loaded and give full engine speed when the machine has come to a stop. 3 Keep full engine speed and increase the rimpull step by step until the wheels are close to spinning. NOTE! 70–80% rimpull is suitable in most bucket handling loading cycles, but it could differ depending on ground conditions and the resistance in the material that should be loaded.
 90%	
 80%	
 70%	
 60%	

APS  "Current selection" ▶ V1176539	Shows current selection for automatic shifting (APS). Press SELECT to access a submenu where a new setting can be performed..
 Light	Move with the arrow keys and press SELECT.
 Medium	
 Heavy	
 Auto	

Lever Control  "Current selection" ▶ V1184183	Shows current selection. Press SELECT to access a submenu where a new setting can be performed.
 Active	Move with the arrow keys and press SELECT. Select the setting depending on how the lift and tilt function should react.
 Normal	
 Soft	

Aut. Tilt Settings  "Current selection" ▶ V1184184	Shows current selection. Press SELECT to access a submenu where a new setting can be performed.
--	--

 In	Move with the arrow keys and press SELECT.
 Out	
 Both	
Max. boom height  "Current selection" ▶ V1204054	Shows current selection. Press SELECT to access a submenu where a new setting can be performed.
 OFF	Move with the arrow keys and press SELECT. Lift the boom to desired height, press SELECT to save the boom upper limit. A confirmation message appears on the display and a short audible signal is heard. For more detailed instruction for setting, see page Max. boom height.
 ON	
 Set Upper Limit	
Set hydraulic priority (For L90H only)  "Current selection" ▶ V1236140	Shows current selection. Press SELECT to access a submenu where a new setting can be performed.
 0%	Move with the arrow keys and press SELECT to set priority between the 3rd/4th and lift/tilt. For more detailed instruction for setting, see page 107.
Default settings ▶	Press SELECT to access a submenu where a new setting can be performed.
 No	Move with the arrow keys and press SELECT. Select YES to recover all setting to default in Personal Setting.
 Yes	
Time / date ▶	Press SELECT to access a submenu where a new setting can be performed.
Set time ▶	Press SELECT to set time.
Set date ▶	Press SELECT to set date.
Time format ▶	Press SELECT to change time format.
Date format ▶	Press SELECT to change date format.
Language ▶	Press SELECT to change language.
Units ▶	Press SELECT to change units.
Display intensity ▶	Press SELECT to adjust the display's light intensity.

Backlight	▶ Press SELECT to adjust the keypad's lighting.
-----------	---

Operational data menu

For information on how to use the keypad and select the menus, see 53.

 V1135828	OPERATIONAL DATA	
Operating Time XX:XX		Shown in hours and minutes.
Distance XXXXX.X km / mile		Shown in kilometres / miles.
Cycles XXX		Shown in number of cycles.
Avg. consumption X.X l/h / gph		Shown in litres / gallons per hour. Average since last reset.
Total consumption XXX l / gal		Shown in litres / gallons.
Inst. consumption X.X l/h / gph		Shown in litres / gallons per hour. Present consumption.
Reset	▶	The following can be performed in this menu: Reset all Reset distance Reset cycle Reset fuel and time No reset

Vehicle messages menu

For information on how to use the keypad and select the menus, see 53.

 V1155958	VEHICLE MESSAGES	
 V1155958	Vehicle messages	Shows current machine messages.

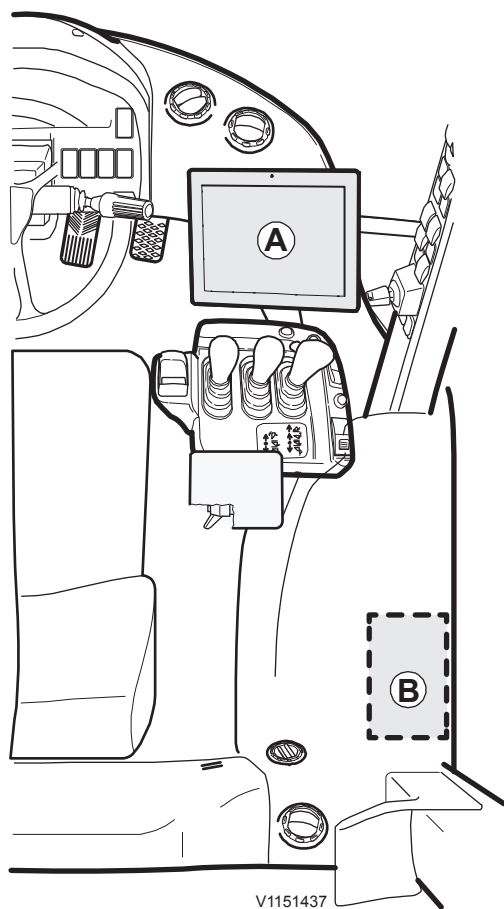
Volvo Co-Pilot

Volvo Co-Pilot

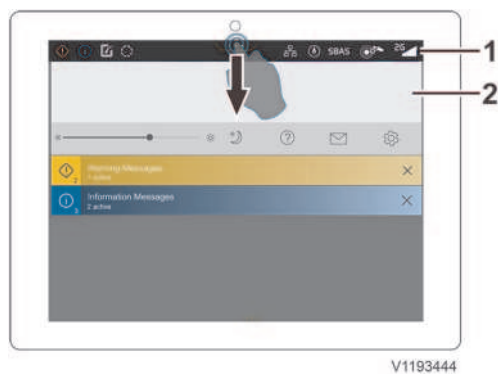
(Optional equipment)

Volvo Co-Pilot is the platform for on-board software applications. In the touch screen display, settings can be made in the action centre that is opened via swipe down from the status bar. The status bar indicates the current status for the Co-Pilot and the applications in use.

The following pages describe how to adjust the display and an overview of the connections on the back side, the status bar and action centre, and how to install a SIM card.

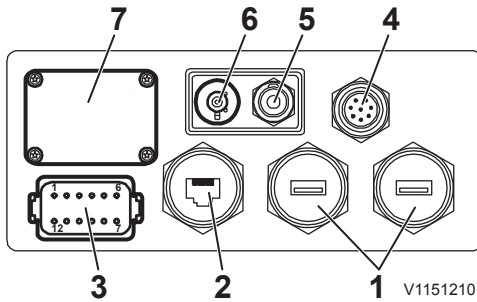


- A Display
- B Recommended location for printer



Volvo Co-Pilot

- 1 Status bar
- 2 Action centre



Connector, back of display unit

Connectors, overview

The following connectors are located on the back of the display unit:

- 1 **USB 2.0:** For connecting a printer, exporting to USB stick, and system updates
- 2 **Ethernet:** For system updates and local networks
- 3 **Connector, 12 pin:** For electric power and machine interface
- 4 **Audio in/out:** For future use
- 5 **Video in:** For camera signal
- 6 **External GSM:** 3G/4G/GSM antenna input.
- 7 **Cover for Mini SIM card:** Remove the cover to access the Mini SIM card.

NOTE!

The mobile modem is deactivated for certain markets.

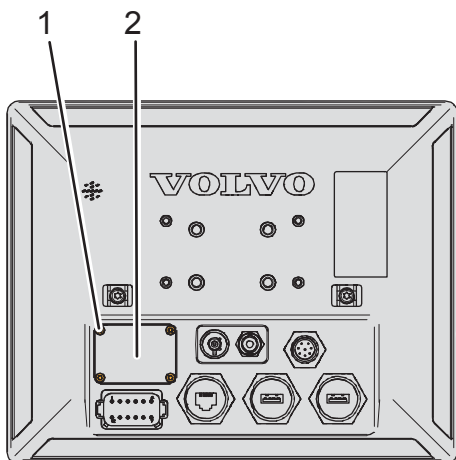
SIM card, installing

The following describes installing a SIM-card in Volvo Co-Pilot.

NOTE!

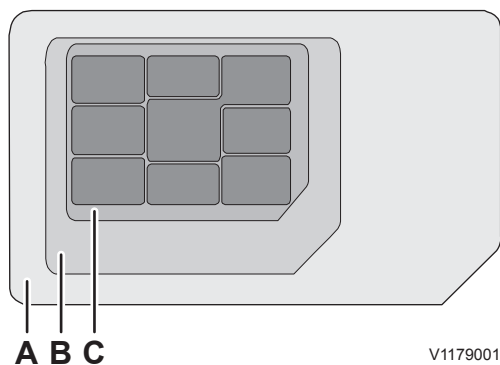
First, make sure that you have Mini SIM-card and a subscription with a network operator that is approved for Volvo Co-Pilot. If needed, check with your dealer.

- 1 Make sure the machine/vehicle is steady and that the engine is switched off.
- 2 Make sure the machine/vehicle is powered off.
- 3 Disconnect the leads on the back of Volvo Co-Pilot.
- 4 Loosen the screws and remove the cover (2) on the back of Volvo Co-Pilot.



V1171962

- 1 Attaching bolts
- 2 Cover plate



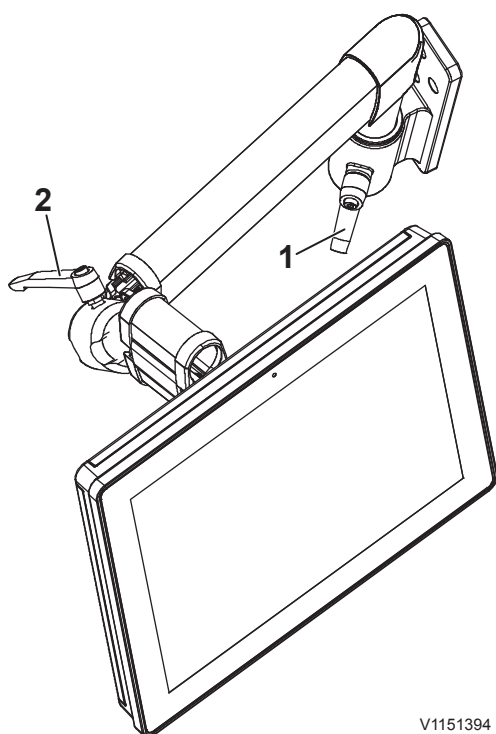
- A Mini SIM (2FF)
B Micro SIM
C Nano SIM

- 5 Install the Mini SIM-card.
- 6 Install the cover.
- 7 Reconnect the leads on the back of Volvo Co-Pilot.
- 8 Turn on the power.
- 9 Turn on the ignition.
- 10 If the SIM-card is protected by a PIN-code, wait until the message box for the PIN-code is shown and then enter the code in Volvo Co-Pilot.
- 11 Volvo Co-Pilot connects automatically to the Internet

Display, adjusting

NOTE!

Adjust the display according to the instructions below to make sure it cannot interfere with any controls.



Display, adjusting

- 1 Adjust the seat and the steering wheel for a safe and comfortable driving position, see the machine's Operator's Manual.
- 2 Adjust the armrest to a position for good operation of the machine, see the machine's Operator's Manual.
- 3 Adjust the display to the most suitable position and minimum reflections. Make sure there is a minimal distance of at least 40 mm (1.6 in) between the display and the levers and that you will be able to move the levers without interfering with the display when operating the machine.
 - Loosen the joint lock (1) to move the display forward or backwards and then tighten the joint lock securely.
 - Loosen the joint lock (2) to tilt the display up/down and sideways and then tighten the joint lock securely.
- 4 After tightening, check that the display will not be able to move to interfere with any controls when operating the machine.

Display, cleaning

NOTICE

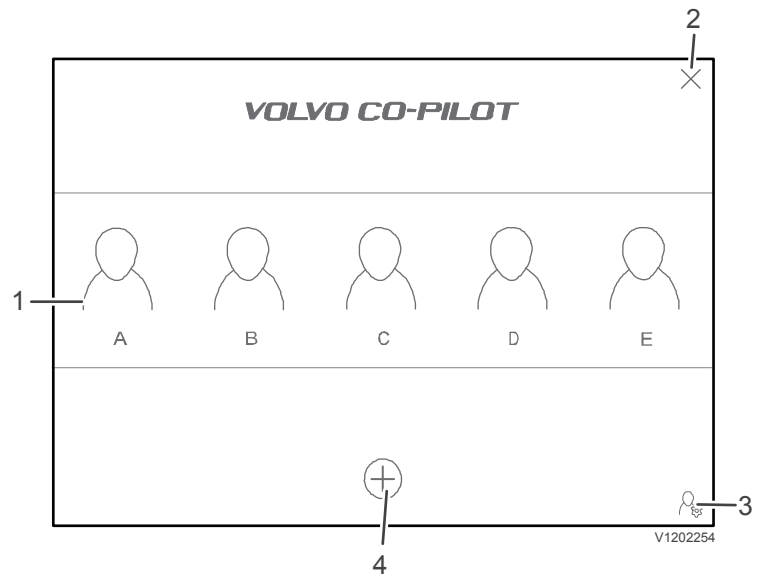
Risk of equipment damage.

Aggressive chemicals could cause defective pixels on the display. Clean the display with a mild cleaner only.

Clean the display and the casing using a soft cloth/rag and a cleaning agent approved for screens.

Co-Pilot login

When Volvo Co-Pilot starts for the first time after 12 hours, or if the last user has logged out, the login display is shown.

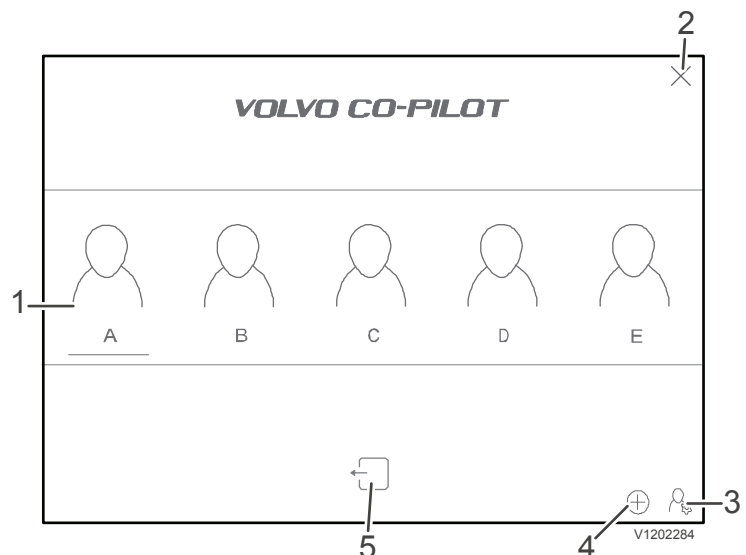


Login display

- 1 Active users
- 2 Closes login display
- 3 Shortcut to operator profiles in Setup
- 4 Shortcut to add user

- 1 The latest active user/operator profile. The latest to the left. Click on user for login.
- 2 If no user is logged in and the login display is closed, then the machine's chassis-ID will be logged in.
- 3 Shortcut to operator profile Setup. See page 79
- 4 Shortcut to add new operator profile and user. See page 79

When Volvo Co-Pilot starts for the first time after 12 hours and the last user is still logged in, then the following login display is shown.



Login display with logged-in user

- 1 Active users
- 2 Close login display
- 3 Shortcut to operator profiles in Setup
- 4 Shortcut to add user
- 5 Log-out

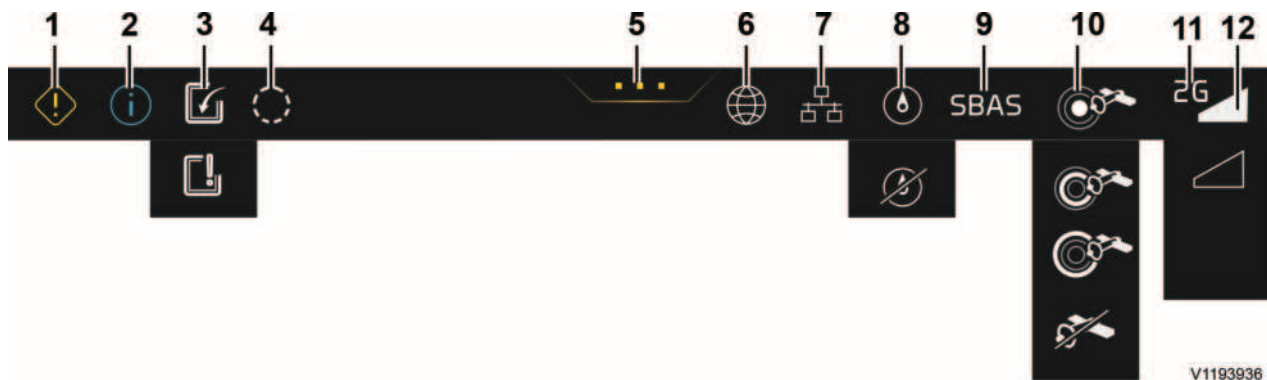
- 1 The latest active user/operator profile. The logged-in user is to the far left, highlighted with a line.
- 2 Close login display.
- 3 Shortcut to operator profile settings. See page 79

- 4 Shortcut to add new operator profile and user. See page 79
- 5 Click on the symbol and the user is logged out.

If Volvo Co-Pilot is started before 12 hours have elapsed and the user is logged in, the last used application is opened.

Status bar

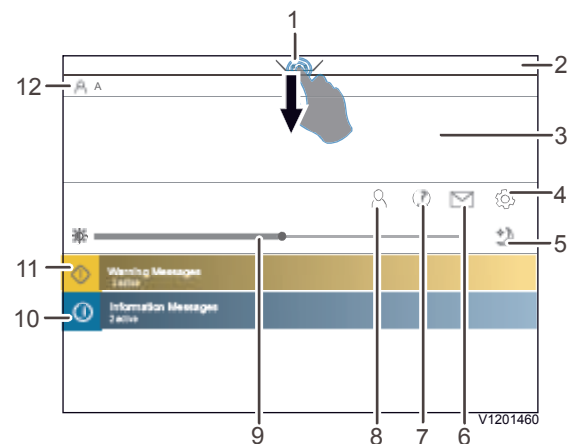
The status bar indicates the current status for the Co-Pilot, and the applications in use, according to the illustration and the table below. The status bar is shown and described with all possible functionality here. The functionality available depend on subscriptions, applications and its associated components, etc. What is shown depends on what is currently active or in progress and also with the coverage. If only one of the four left symbols is shown it will have position #1. If more are shown, the symbols expand to the right in given priority (1 to 4). For the six symbols to the right, expansion is done from right to left in given priority (12 to 6).



V1193936

1		Warning message active	Swipe down to access the action centre - active messages are found in the message centre. Read the message and perform the requested action.
2		Information message active	Swipe down to access the action centre - active messages are found in the message centre. Read the message and perform the requested action.
3		SEMS download	Software download is ongoing. The symbol indicates a temporary problem with the download.
4		Process ongoing	A process that the user has started is ongoing.
5		Action Centre access	Swipe down (from any position on the status bar) to open the action centre.
6		Internet connection	The symbol shows if an Internet connection is available.
7		Ethernet connection	Ethernet cable is connected. The symbol is only used for applications that uses ethernet as communication (IP cameras for example).
8		Machine direction	Machine direction is identified (or not identified as indicated by the symbol below in the illustration)
9		GNSS type	SBAS, L-BAND, RTK and NTRIP are different types of external corrections for better GPS positioning precision.
10		GNSS accuracy	The accuracy level of the external corrections for better GPS positioning precision. The illustration shows best accuracy at the top down to no GNSS in the bottom. Best accuracy cannot be reach without external corrections.
11		Cellular connection type	Is depending on connection type available.
12		Signal strength	Cellular connection signal strength. The illustration shows full strength and no connection below.

Action centre



1	Action centre access (swipe down/double click)	7	Help centre (Manuals)
2	Status field (not visible when action centre is open)	8	User profiles
3	Software application area (program area)	9	Light intensity (swipe to adjust)
4	Volvo Co-Pilot-settings	10	Information messages
5	Day mode / Night mode	11	Warning messages
6	Message centre	12	User field (with active user)

NOTE!

Messages are shown on the main screen and in the message centre. Tap the message to open it in the message centre. The number by the message symbol indicates the number of unread messages since the last start. The number drops as the messages are opened and closed. Closed messages are active until the necessary action has been taken by the driver or a qualified service technician.

System log files

To retrieve and create a log file in the event of an error in the system, press and hold "?" for a few seconds. (Help centre). It is also possible to add comments about the file.

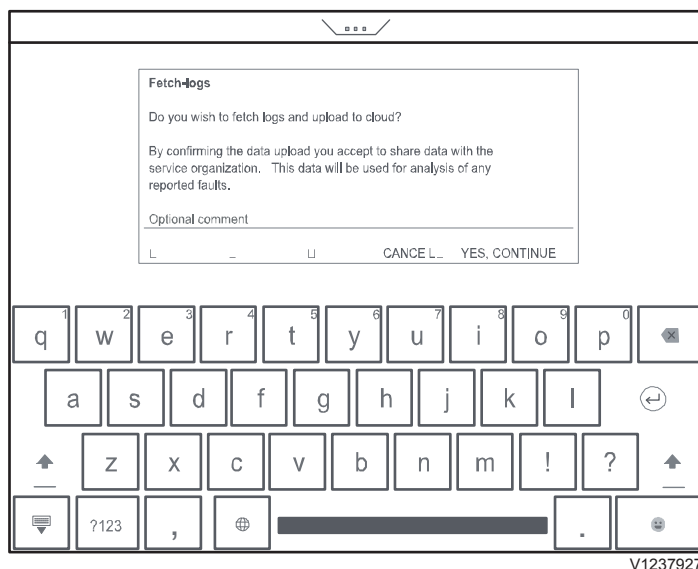
NOTE!

The function is only used in combination with technical support cases posted in CHAIN.

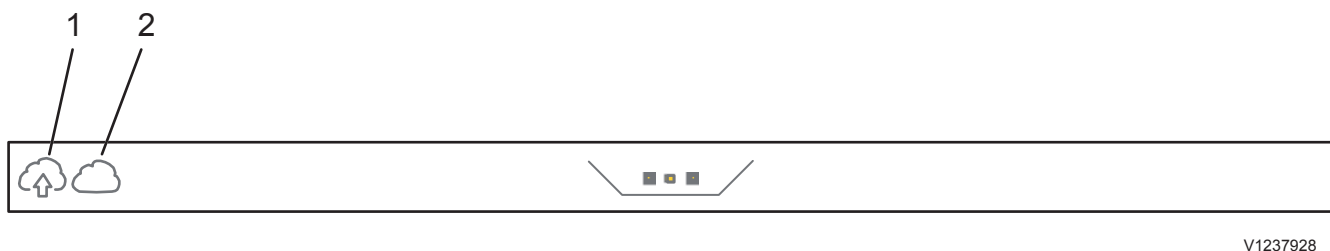
The data is not actively monitored or analysed but is processed through technical support.

NOTE!

This function requires an Internet connection.



Charging is displayed in the top left corner.
The text
"Cloud export completed, Transfer to cloud"
will appear on the screen.



- 1 Uploading to the cloud service
- 2 Cloud service active via the Internet

Rear vision system

(Optional equipment)

For forward-facing camera, see page 118.

The camera, located on the back of the machine, together with the Co-Pilot in the cab, helps to improve the operator field of vision to the rear of the machine when reversing.

The back-up camera is active when the ignition is in position 1 and the gear lever is in reverse position.

As an option there is also a radar detection system that detects an area behind the machine if reverse gear is engaged. If there is a risk of reversing in to something, the system warns for that which is detected within the alarm area. The detection area is shown in the back-up camera view on the Co-Pilot.

NOTE!

The radar detection system should be seen as an assisting device. Great care must still be taken when reversing the machine.

Maintenance

The only maintenance that is needed on the camera and monitor is cleaning:

- Clean the lens on the back-up camera as needed with a moist (water) cloth.

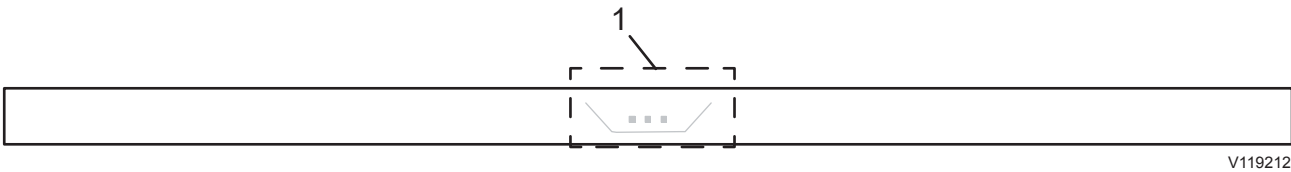
- Clean the screen of the monitor in the cab with a high-quality cleaning foam.

NOTICE

Risk of equipment damage.
Aggressive chemicals could cause defective pixels on the display.
Clean the display with a mild cleaner only.

Co-Pilot settings

Access to settings for Volvo Co-Pilot is found in the Action centre.
1 Open the Action centre via the screen's status bar.



Status bar
1 Action centre



1 Settings

- 2 The Action centre's menu bar appears.
3 Press on the symbol for settings 
4 Settings for Volvo Co-Pilot appear.

CO-PILOT SETTINGS			✕
SETTINGS LISTS			
	Connectivity		>
	Software update		>
	Backup		>
	Operator profiles		>
	Display		>
	Sound & notification		>
	Language & input		>
	Date & time		>
	About		>

V1236833

In the menu for Co-Pilot settings it is possible to choose between different submenus.

Co-Pilot settings, connectivity

NOTE!

Some functions and services are not available in all markets.

In the "Connectivity" menu, the settings to access the Internet or a local network can be made.

The connection status is also displayed.

NOTE!

Before using connection services, local or via cellular network, check the responsibility based on local laws and regulations.

A SIM card is required to use the cellular network.

To install a SIM card, see page *SIM card, installing*.

When a SIM card is installed, the Volvo Co-Pilot automatically connects to the internet.

NOTE!

In some rare cases it might be required to set the cellular network Access Point Name (APN) settings. See instruction below.

Connectivity

- Drag the  icon in the status bar downwards to open the **Action center**.
- Tap the  icon to open the **Co-Pilot settings**.
- Tap **Connectivity**.

1 Automatic

Tap "Automatic" to start an automatic connection to the Internet. See below.

2 Custom setup

Tap "Custom setup" to manually set up a connection to the Internet or a local network. See below.

3 External Ethernet modem

Tap "External Ethernet modem" to set up the connection to an external Teltonika 4G modem. See below.

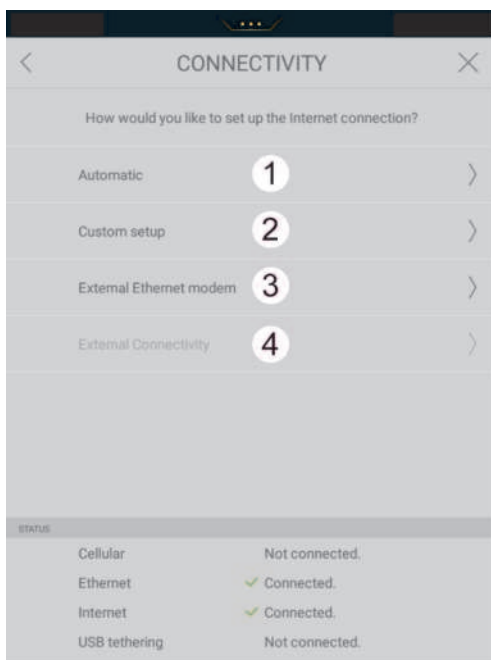
NOTE!

For information about installing an external modem, contact your dealer.

4 External connectivity

Tap "External connectivity" to setup a connection to an external device.

The screen in this menu depends on the user interface of the external USB device, refer to the instructions of the device.



V1229770

Connectivity

1. Automatic

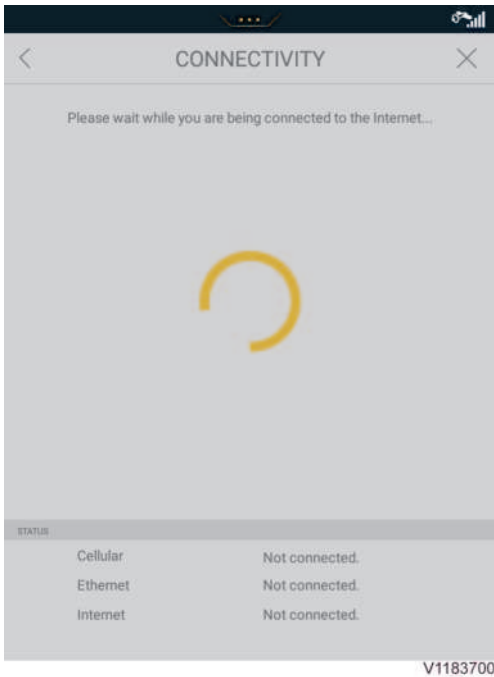
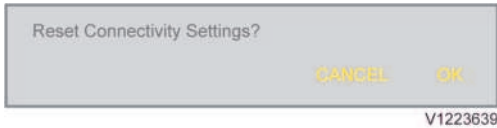
1. Tap "Automatic".
2. A pop-up message appears: "Reset Connectivity Settings?"
3. Tap "OK" to reset the settings.

NOTE!

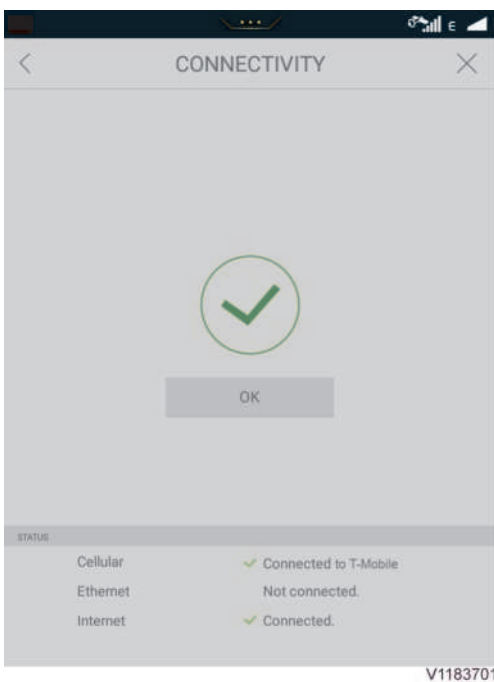
This pop-up message does not appear the first time after a fresh installation.

This automatically tries to connect the Volvo Co-Pilot to the internet.

4. This process can take up to 1 minute.



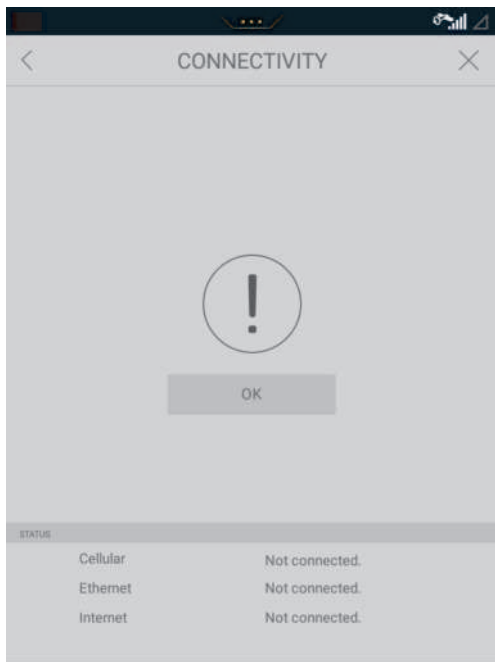
Connecting process



Successfully connected

If successfully connected:

The connection status will appear in the bottom of the page. Tap "OK".



Not connected

If not connected successfully:

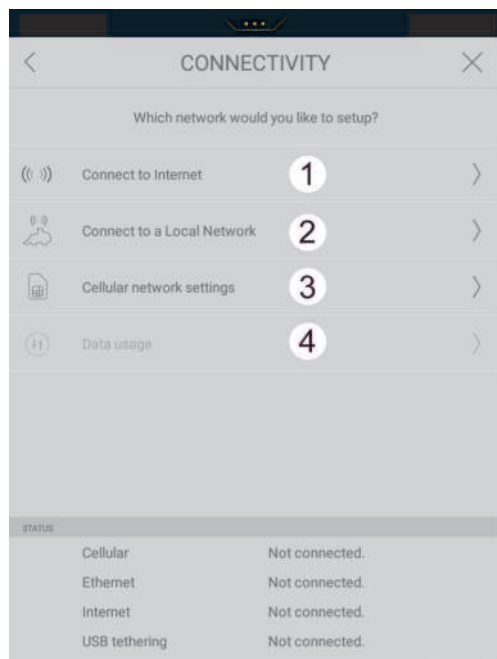
If the Volvo Co-Pilot is not able to connect to the internet, this view will appear.

Tap "OK" and follow the instructions below.

NOTE!

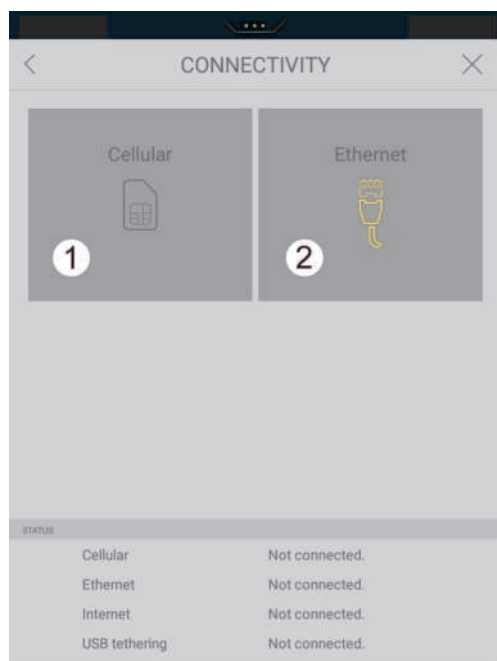
Reasons for a failed connection may be a poor mobile network connection, no data left on the subscription, mobile network operator requirements, etc.

Check the network performance, SIM card properties, mobile network operator requirements.



V1223641

Custom setup



V1223642

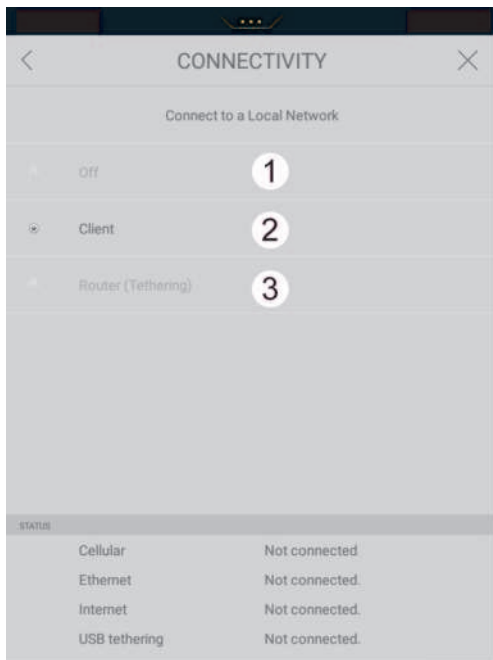
Connect to internet

2. Custom setup

- 1 **Connect to Internet**
See below.
- 2 **Connect to Local Network**
See below.
- 3 **Cellular network settings**
See below.
- 4 **Data usage**
Tap "Data usage" to check the data usage of your mobile connection and the different Apps.

1. Connect to internet

- 1 **Cellular**
Tap "Cellular" to connect to the Internet using a SIM card.
- 2 **Ethernet**
Tap "Ethernet" to connect to the internet using an Ethernet cable.
Make sure that "Client" is selected in the menu "Connect to local network".

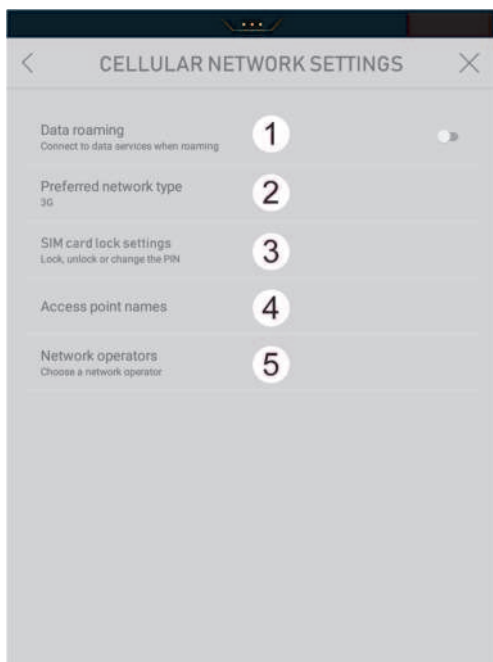


V1223644

Connect to local network

2. Connect to local network

- 1 **Off**
Connection to local network disabled.
- 2 **Client**
The Co-Pilot acts a client and receives the IP address from a connected device.
For example, when using an Android phone to connect to the internet using USB tethering. Or if the Co-Pilot is connected to the Internet via Ethernet cable.
- 3 **Router**
The Co-Pilot acts as a server and assigns an IP address to a connected device.
Used for the connection to the Trimble EC520 control unit, when no other external router is used.

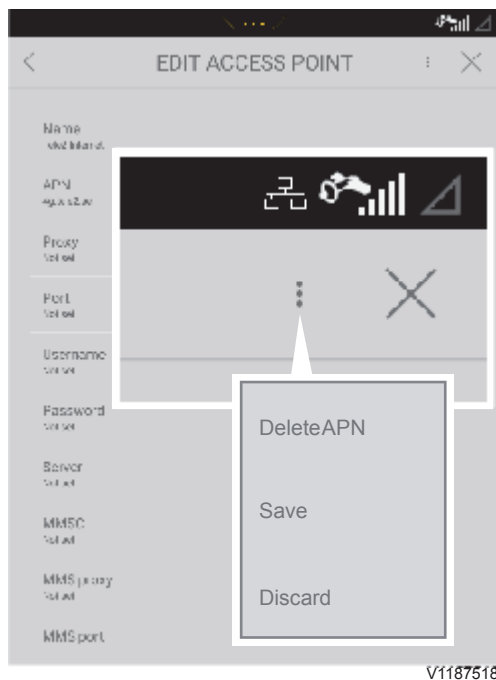


V1223643

Cellular network settings

3. Cellular network settings

- 1 **Data roaming**
Tap the switch to activate or deactivate "Data Roaming".
- 2 **Preferred network type**
Tap "Preferred network type " to select the network type.
- 3 **SIM card lock settings**
Tap "SIM card lock settings" to lock, unlock or change the PIN.
- 4 **Access Point Names**
Tap "Access Point Names" and change the access point settings accordingly to the mobile network operator requirements.
- 5 **Network operators**
Tap "Network operators" to choose a network operator.

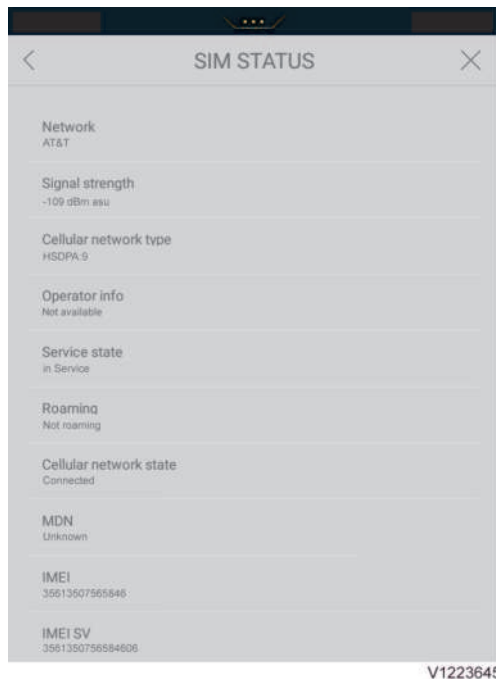


Access point

Access points

Tap on a field to edit it.

To save the changes, tap on the three dot icon and tap **Save**.



SIM status

Verifying the cellular network status

If a SIM card is installed, it is possible to check status of the cellular network.

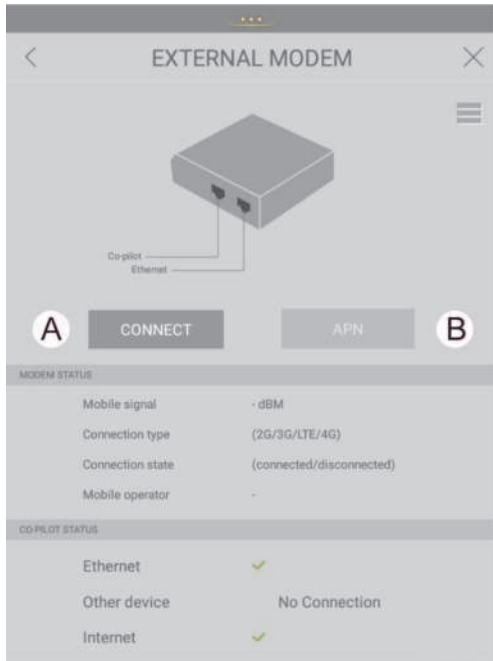
Go back to CO-PILOT **Settings** and tap **About** → **Status** → **SIM status**.

Verify that the network connection is established. Check that the **Cellular network state** is **Connected**.

Back on the main screen, network coverage status is displayed in the status bar.

For example **H** or **E**, depending on the available network technology.

3. External Ethernet modem



External modem

1. CONNECT

- Tap "Connect" to start the connection process.
- Long-pressing the Connect button will open a screen to override the default connect password.
- The progress is shown on the screen and the modem configuration is loaded.
- If needed enter the PIN and PUK from the inserted SIM card.
- If the modem validation is OK, the green check mark symbol is displayed for approx. 5s.

2. APN (Access Point Name)

NOTE!

For most providers the APN is automatically set and the modem will work without any additional setting. For a few providers the APN needs to be set manually.

- Tap "APN" and confirm the message.
- A scrollable list of available APN's appears. Choose an entry from the list and tap "Reconnect new APN".
- The Back button will reset APN to automatic mode selection.
- By long-pressing the "Reconnect new APN", the APN address can be set manually. It can be reset to default by tapping "Reset to default APN address".

Co-Pilot settings, software update

Volvo Co-Pilot software can be updated online via OtA (Over the Air)

- 1 Press **Software update** and then **OtA update**
- 2 The system checks if there are any updates
- 3 Follow the instructions

NOTE!

Software download and update will take place in several stages and with restarts.

NOTE!

Make sure that there is at least 500 MB mobile data left for each update.

When connected to the internet, the system automatically checks for new software updates daily.

If this does not happen, it can be requested manually using the **OtA update** menu.

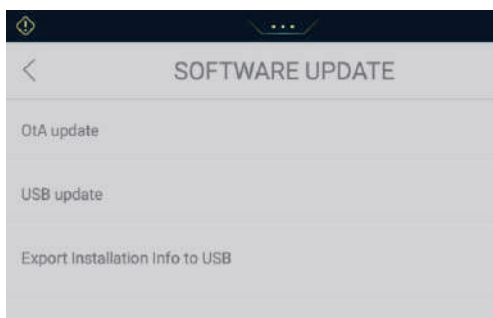
- The system in Volvo Co-Pilot gives information about the installed hardware, the machine software's version, and the Android application's version.
- The remote server checks if there is a new software version available. If a new version is found, a message is shown on the display and the operator can download and install the software.

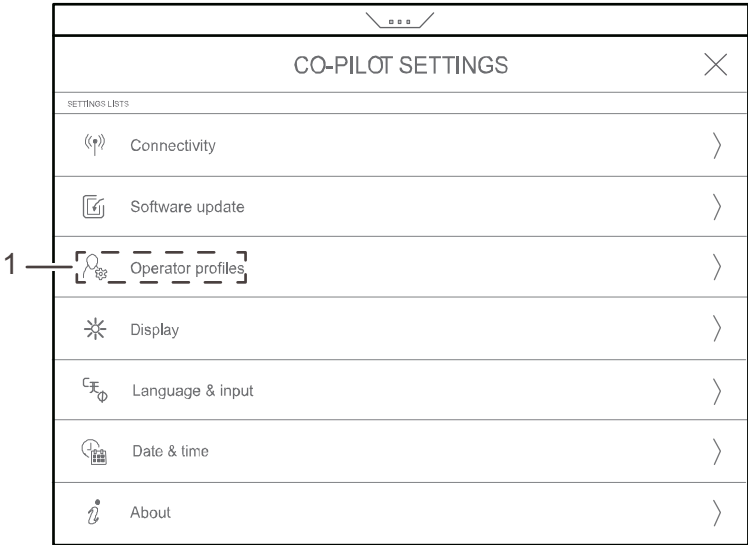
NOTE!

Software can also be updated using the service tool by an authorized service technician, who also can give advice on other apps and system updates.

Co-Pilot settings, operator profiles

Add, remove, and edit operator profiles.

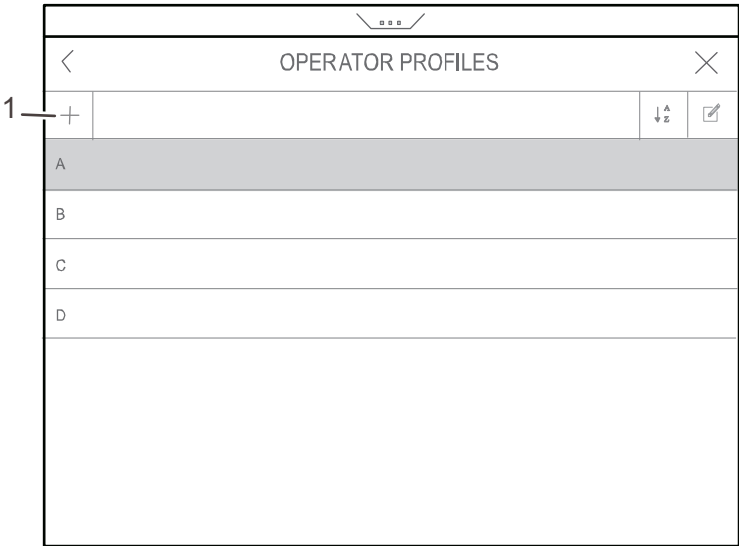




V1202053

1 Operator profiles

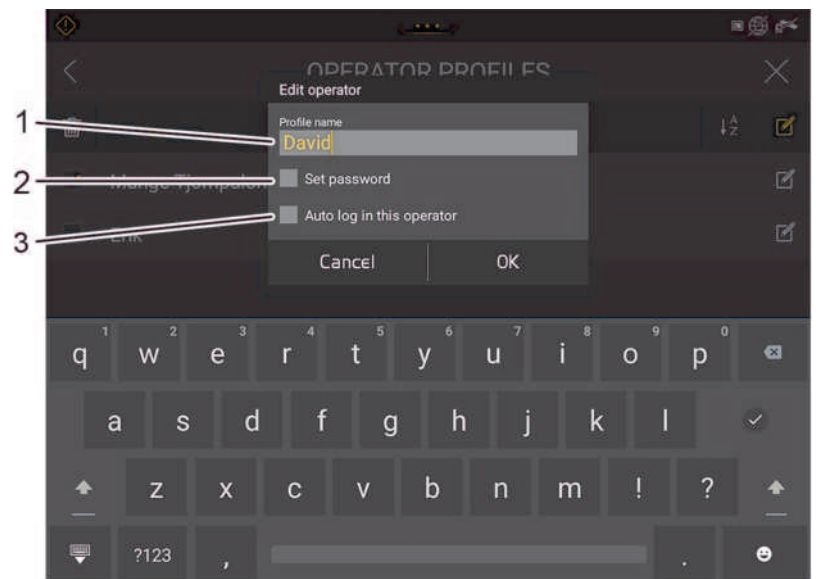
Adding an operator profile



V1202064

1 Add operator profiles

Press the plus key (+) to add a profile.



V1232113

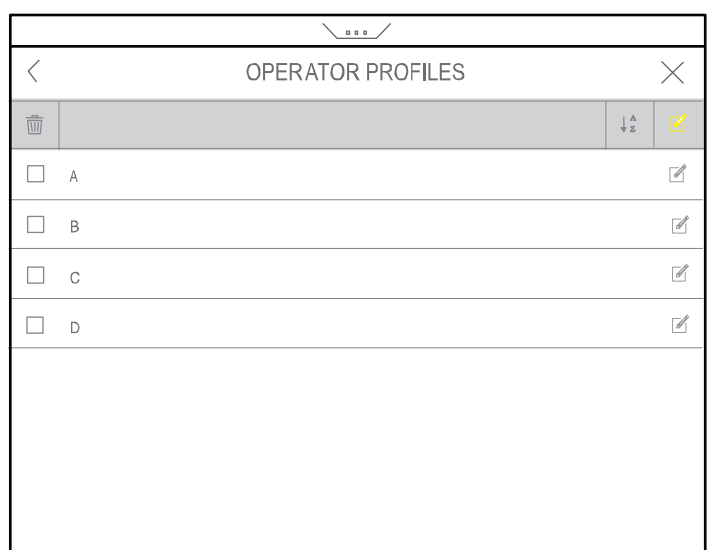
- 1 Edit the profile name
- 2 Set password, 6 digits
- 3 Auto log in

Password protection can now be added to the Co-Pilot operator profiles. By adding a password, your operator profile can be protected and only work being done by you will be attributed to it. Password protection can be added to already existing operator profiles as well as any new ones you create. The password must contain 6 digits and is by default disabled for any new operator profiles being created but it can easily be enabled by tapping the check box.

In the event of loss of your password, contact your authorized service technician for help with resetting your password.

Removing an operator profile

To remove an operator profile, highlight it and press the trash can.



V1202069

Co-Pilot settings, operator profile, data removal

To remove all operator-specific data, the operator profile should be deleted.

Co-Pilot settings, display

Adjust the screen's brightness manually or set using "Adaptive brightness"

Co-Pilot settings, language & input

Here it is possible to select language and type of keypad (keyboard).

Co-Pilot settings, date & time

Under this heading it is possible to set:

- Date
- Time zone
- "Automatic" can be set if a network is available
- Display format: 12-hour or 24-hour format

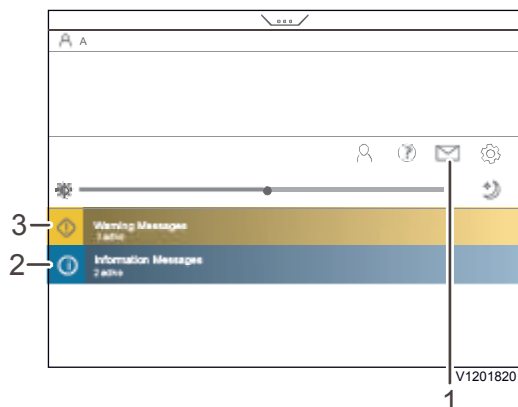
Co-Pilot settings, about tablet

The About screen contains:

- Software and firmware specifications
- Machine chassis ID and Volvo Co-Pilot serial number
- Network status
- Sensor information
- Software license information
- Version information for installed applications
- Access to the Information center

Messages

Messages are shown on the main screen and in the message centre. Regardless of where one clicks on a message, it is opened in the message centre. The number by the message symbols indicate the number of unread messages since the last start. The number is reduced with every opened and closed message.



Action centre

- 1 Message centre
- 2 Information messages
- 3 Warning messages

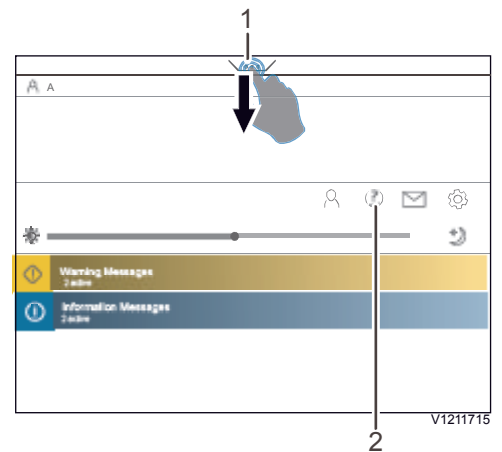
- Warning messages will be shown in yellow. They indicate malfunction of Volvo Co-Pilot or applications. Read the

message, take suitable action, and contact a qualified service technician.

- Information messages will be shown in blue. Information on Volvo Co-Pilot or applications is displayed. Read the message and take suitable action.

Help center

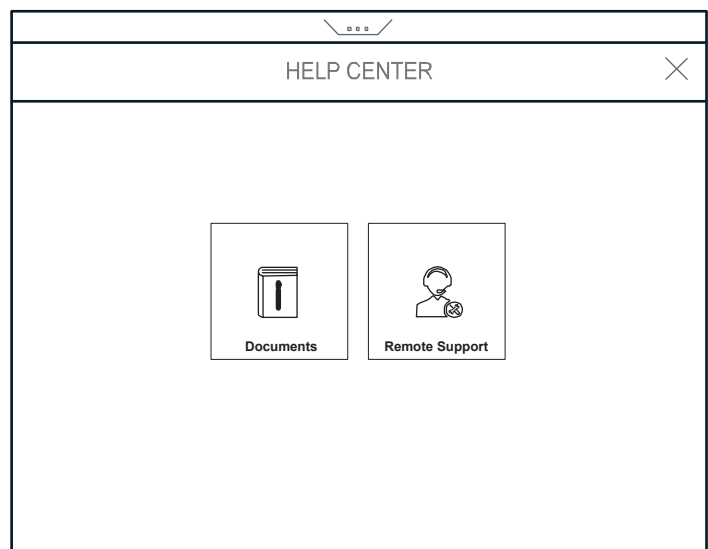
To access Help center open Action centre on the screen's Status bar click on .



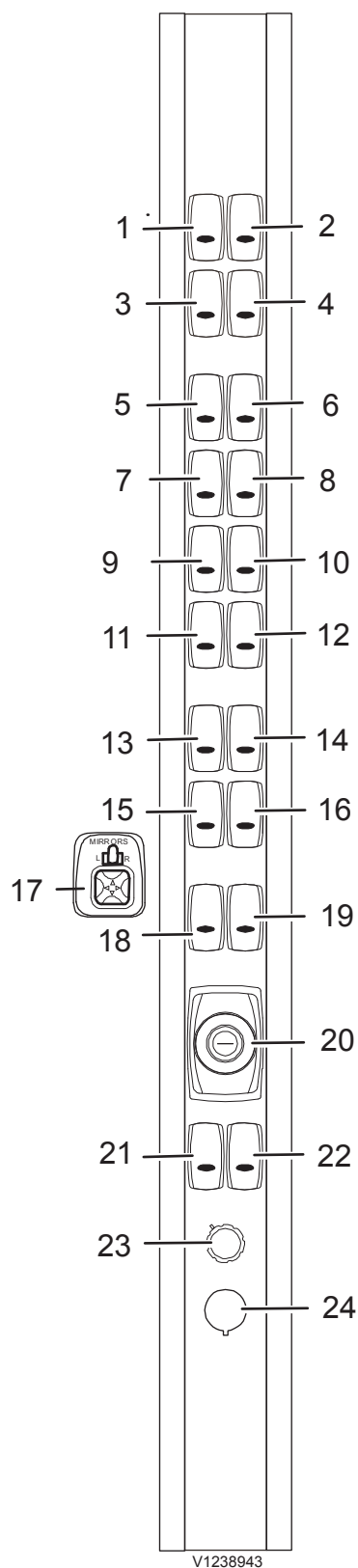
- 1 Action centre
- 2 Help center

Manuals

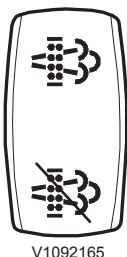
Digital Manuals are available in Volvo Co-Pilot Help center, which also contains tools for remote support (if applicable).



Instrument panel, cab post

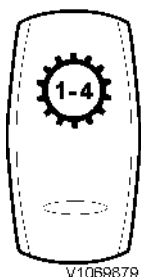


1	Regeneration
2	Fully automatic downshifting (1-4) FAPS
3	Spare
4	Lock-up (optional equipment)
5	Automatic tilt (bucket positioner)
6	Automatic lift (boom kick-out)
7	Engine reversible fan, manual switch (optional equipment)
8	Return-to-Dig (optional equipment)
9	Float mode
10	Single-acting lift function (optional equipment)
11	3rd hydraulic function, adjustable constant flow (optional equipment)
12	Function selector, Boom Suspension System (optional equipment)
13	Work lights, front
14	Work lights, rear
15	Headlights
16	Rotating beacon (optional equipment)
17	Electrically adjustable rear-view mirrors (optional equipment)
18	Electrically heated rear-view mirrors (optional equipment)
19	Wiper and washer, rear window
20	Ignition
21	Extended work lights / Entrance light (optional equipment)
22	Spare
23	Hand throttle (optional equipment)
24	12 V electric power socket (optional equipment)



1 Regeneration

When regeneration is needed, a message is shown on the information display unit to indicate that it is time to run a regeneration, see page 155.



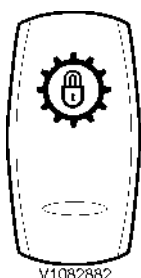
2 Fully automatic downshifting (1–4) FAPS

Switch, upper part pressed in = automatic downshifting to 1st gear when needed (manual downshifting using any of the kick-down buttons is still possible).

Switch, lower part pressed in (position 2–4) = downshifting to 1st gear takes place using any of the kick-down buttons.

NOTE!

When the switch is not activated, 1st gear can be activated automatically to reduce fuel consumption, see page 146 for more information.

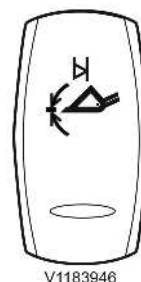


3 Spare

4 Lock-up (optional equipment)

Switch, upper part pressed in = function for Lock-up, direct-drive clutch in the torque converter, is activated. A control light in the front instrument panel is on when Lock-up is engaged, see page 35.

Switch, lower part pressed in = Lock-up (direct-drive clutch) deactivated.

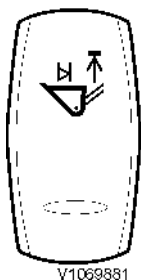


5 Automatic tilt (bucket positioner)

Switch, upper part pressed in (rocker return) = setting the tilt stop position, see page 103.

Switch in middle position = automatic tilt (bucket positioner) activated.

Switch, lower part pressed in = automatic tilt (bucket positioner) deactivated.



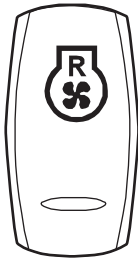
6 Automatic lift (boom kick-out)

Switch, upper part pressed in (rocker return) = setting the lift stop position, see page 103.

Switch in middle position = automatic lift (boom kick-out) activated.

Switch, lower part pressed in = automatic lift (boom kick-out) deactivated.

Further instructions, see page 103.



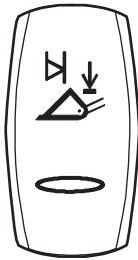
V1239596

7 Engine reversible fan, manual switch (optional equipment)

Switch, upper part pressed in less than 1 second (rocker return) = starts a single reversing period.

Switch, upper part pressed in more than 1 second (rocker return) = stops the reversing period.

Switch, lower part pressed in = green indication light is lit during reversing period.



V1074632

8 Return-to-Dig (automatic boom lowering) (optional equipment)

Switch, upper part pressed in (rocker return) = setting of lowering position, see page 103.

Switch in middle position = automatic Return-to-Dig activated.

Switch, lower part pressed in = automatic Return-to-Dig deactivated.



V1082306

9 Float mode

The function allows the bucket to follow any uneven or rough spots in the road and could be used to fine grade, clean hard surfaces and back-drag loose materials only by using the weight of the boom and the bucket.

Switch, upper part pressed in = float mode engaged when lift/lower lever has been moved to float mode.

Switch, lower part pressed in = float mode deactivated.



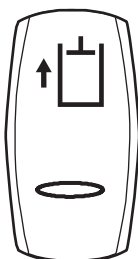
V1070006

10 Single-acting lift function (optional equipment)

The function has the same features as float mode - to follow uneven ground - but with this function, the bucket will not drop lower than the position it has when the function is activated. Normally, it should be used when working on softer surfaces.

Switch, upper part pressed in = single-acting lift function activated.

Switch, lower part pressed in = single-acting lift function deactivated.



V1148530

11 3rd hydraulic function, adjustable constant flow (optional equipment)

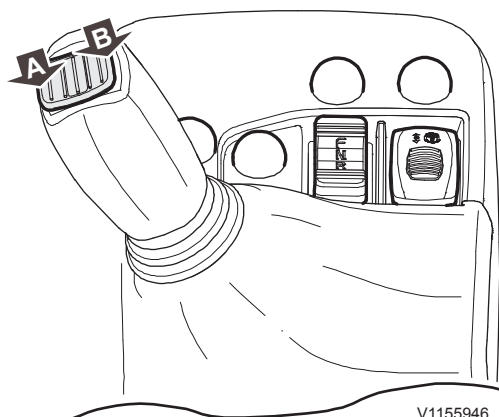
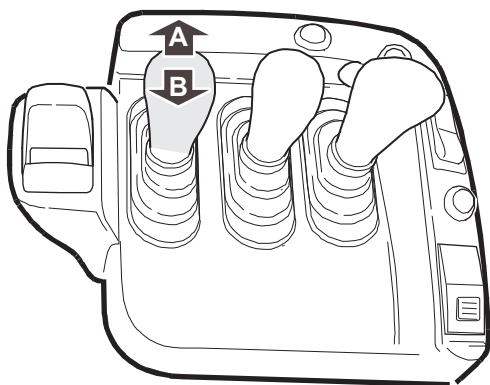
The function is primarily used for attachments with rotating parts, such as sweepers and snow blowers, when suitable rotational speed needs to be set by adjusting the flow for the 3rd hydraulic function.

Switch, upper part pressed in (rocker return) = setting of flow.

Switch in middle position = adjustable flow activated.

Switch, lower part pressed in = adjustable flow deactivated.

Setting of flow (for rotational direction and rotational speed)



Controls

V1155946

- 1 Adapt the engine speed to the work that is to be done.
- 2 Press in, and hold the upper part of the switch pressed in until a 'beep'-signal sounds.
- 3 Release the switch and select rotational direction (A or B) and move to a suitable stroke to adjust the rotational speed until the next 'beep'-signal is heard after 7 seconds (the flow settings are saved).

NOTE!

If the flow settings should be used directly (and keep the rotational speed), active the function immediately (see below).

Activate flow settings

NOTE!

The switch must be in middle position (activated).

Move the control to full stroke for at least 2 seconds to activate the flow settings. The control can then be released.

Stop the rotation by moving in the opposite direction (B or A) on the control, or by deactivating with the switch.

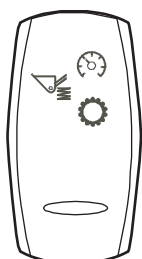
NOTE!

If the engine speed needs to be reduced, the rotational speed can still be kept higher by maintaining an increased stroke on the control.

NOTE!

The latest setting is saved and can be used until a new setting is made.

In order to connect the 3rd hydraulic function to the attachment, see page 205.



V1095905

12 Function selector, Boom suspension system (BSS) (optional equipment)

The switch has three positions. When the engine starts, the function reverts to the pre-selected position.

For settings of the Boom Suspension System in combination with different attachments, see the section "Operating techniques".

Switch, upper part pressed in = Speed-dependent Boom Suspension System (regardless of gear selector position).

- The control light for the Boom Suspension System is on, and the display unit under the menu hydraulics shows 'BSS – On' or 'BSS – Off', depending on if the system is engaged or disengaged (speed-dependent).
- The Boom Suspension System will be engaged if a certain speed is exceeded.
- Below a certain speed (approx. 5 km/h with forward gear engaged or approx. 2 km/h with neutral or reverse gear engaged), the function will be disengaged.

Switch in middle position = Gear-dependent Boom Suspension System.

- The control light for the Boom Suspension System is on, and the display unit under the menu hydraulics shows 'BSS – On' or 'BSS – Off', depending on if the system is engaged or disengaged (gear-dependent).
- The Boom Suspension System is engaged in gear positions 2, 3, and 4, and with engaged neutral, forward, or reverse gear.
- When kick-down is activated, the function will be disengaged.



Switch, lower part pressed in = deactivated Boom Suspension System.

13 Work lights, front

Switch, upper part pressed in = work lights by cab roof and lower work lights are on.

Switch in middle position = work lights or glare reduced lights (optional equipment) on front lamp arms active only.

Switch, lower part pressed in = work lights are off.

Control light on the front instrument panel indicates that the work lights are on.

Parking lights and license plate lights (optional equipment) are also on when work lights are on.



14 Work lights, rear

Switch, upper part pressed in = work lights by cab roof and lower work lights are on when reverse gear is engaged.

Switch in middle position = work lights by cab roof are on.

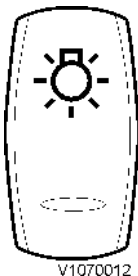
Switch, lower part pressed in = work lights are off.

Control light on the front instrument panel indicates that the work lights are on.

Parking lights and license plate lights (optional equipment) are also on when work lights are on.

NOTE!

Work lights must be off when travelling on public roads.



15 Headlights

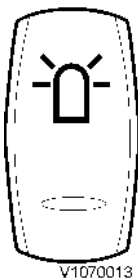
Switch, upper part pressed in = headlights, parking lights and license plate lights (optional equipment) are on.

Switch in middle position = parking lights and license plate lights (optional equipment) are on

Switch, lower part pressed in = headlights are off.

Switching between high/low beams, see page 95.

Control light on the front instrument panel indicates that the high beams are on.

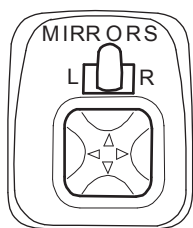


16 Rotating beacon (optional equipment)

Switch, upper part pressed in = rotating beacon is on, see also page 130.

Switch, lower part pressed in = rotating beacon is off.

Control light on the front instrument panel indicates that the rotating beacon is on.

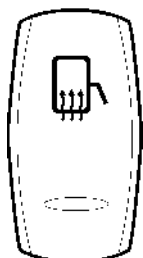


V1095074

17 Electrically adjustable rear-view mirrors (optional equipment)

Select the left or right rear-view mirror by moving the small button at the top.

Adjust the rear-view mirrors by moving the lower button in the direction of the arrows.

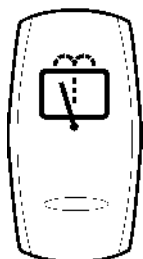


V1070015

18 Electrically heated rear-view mirrors (optional equipment)

Switch, upper part pressed in = electric heating activated.

Switch, lower part pressed in = electric heating deactivated.



V1070018

19 Wiper and washer, rear window

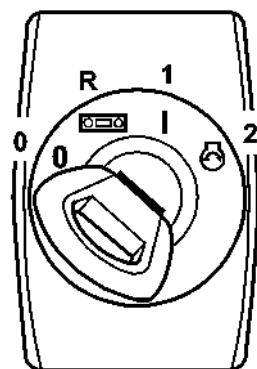
Switch, upper part pressed in (rocker switch) = washer is activated and the wiper makes a few strokes.

Switch in middle position = rear window wiper operates in intervals. The interval time is 7 sec.

With the reverse gear engaged, the rear window wiper runs continuously.

Switch, lower part pressed in = wiper and washer are off.

Washer fluid reservoir for front windshield and rear window, see page 272.

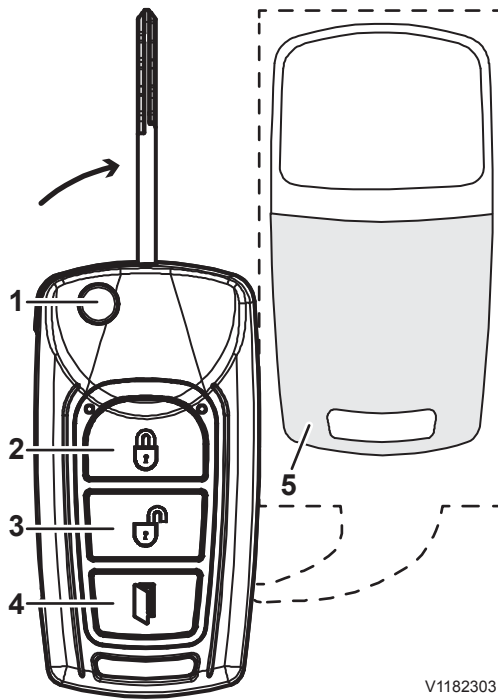


V1070019

20 Ignition

Ignition, positions

0	Off (engine turned off with key)
R	Radio position
1	Operating position
2	Start position



Start key with remote control (optional equipment)

- 1 Key, swings out/in
- 2 Lock door
- 3 Unlock door
- 4 Unlocking and door opening (press the button twice)
- 5 Battery cover

Remote-controlled lock function and door opener (optional equipment)

! WARNING

Risk of falling.

Opening the door without holding on to handholds could cause serious injury.

Open the door by remote control only if you are sure that no one can be hit by the door when it is opening.

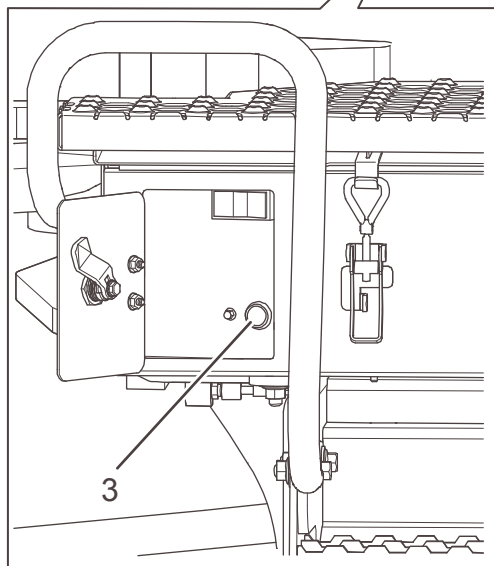
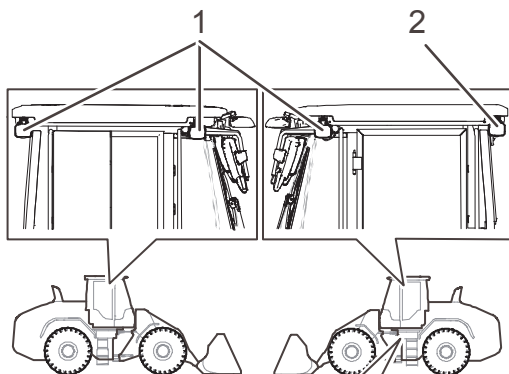
Remote control of locking and door opening is possible to perform with the start key at a distance of up to 30 metres from the machine. The battery disconnect switch must be ON.

NOTE!

If the door is not completely closed it can not be locked using the remote control.

Battery, replacement

Open the battery cover on the rear of the key to replace the battery (CR2032 3V).



- 1 Extended working lights
- 2 Extended working light / entrance light
- 3 Push button

21 Extended work lights / Entrance light (optional equipment)

Extended work lights located around the cab for better lighting of the machine and entrance light is for the cab steps.

Switch, lower part pressed in = extended working lights and entrance light are not available.

Switch in middle position = entrance light is available and turns on when

- button (3) is pressed.
- the door is opened.

Switch, upper part pressed in = parking lights and license plate lights (optional equipment) are on, and both extended working lights and entrance light are available.

Extended work lights turn on with the ignition in position 1.

Entrance light turns on when

- button (3) is pressed.
- the door is opened.

Entrance light turns off after three minutes or if machine moves.

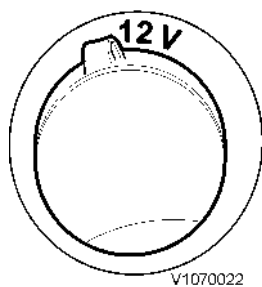


22 Spare

23 Hand throttle (optional equipment)

The throttle application is transmitted electrically.

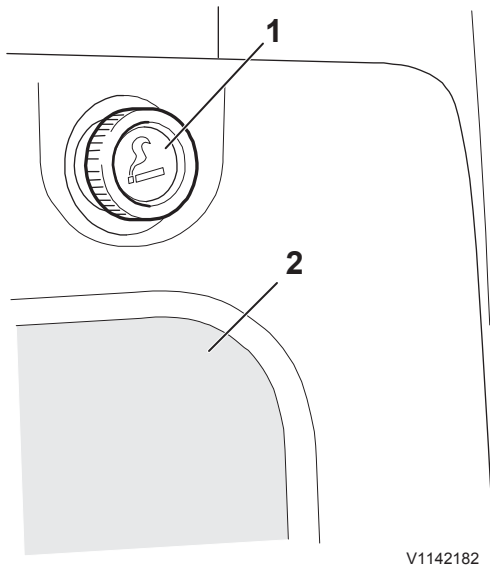
- Throttle application is changed by turning the control. Turning clockwise increases the speed.
- Depending on previous adjustment, the control may first have to be turned counter-clockwise and then clockwise in order to set the speed.
- Disengagement takes place when the brake pedal is used.
- At engine start the hand throttle is disengaged, regardless of previous setting.



24 12 V electric power socket (optional equipment)

For charging of, e.g., mobile telephone.

Instrument panel, rear



V1142182

- 1 Electric power socket, 24 V (e.g., for cigarette lighter)
- 2 Cover for electrical distribution box with fuses and relays

Fuse test

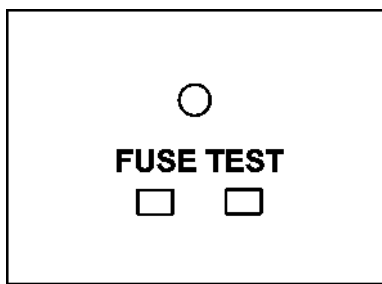
It is possible to test fuses.

On the circuit board (behind the cover for the electrical distribution box) there is the marking FUSE TEST.

To test whether a fuse has blown or not, hold it against the contact surface under the mark FUSE TEST.

If the fuse has not blown, the green light-emitting diode above the mark lights up.

For electrical system specifications, see page 303.



V1070245

Fuse test

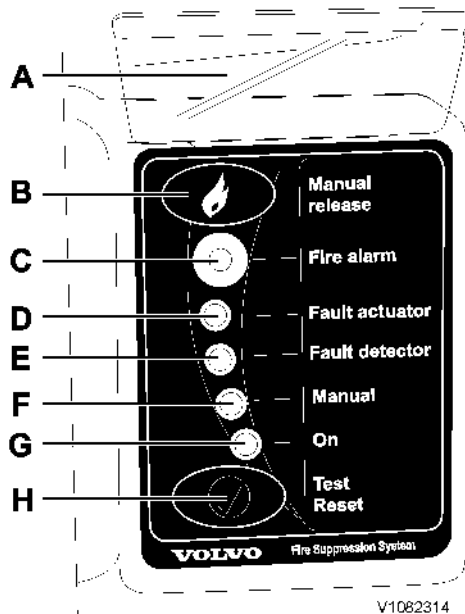
Control panel

Fire suppression system

(optional equipment)

NOTE!

When using button B on the control panel, the engine is not stopped. The machine can be moved during the time that fire extinguishing is in progress (the system is activated). Operator's choice depending on the situation.



- A Plastic cover
- B Manual release (activation)
- C Fire alarm
- D Fault actuator
- E Fault detector
- F Manual
- G On
- H Test/Reset

- A The seal is broken if the plastic cover (A) is raised.
- B Hold in the button for 1 second to activate the sprinkler system when fire is indicated. The engine is not stopped. Can be used when the machine has to be moved at the same time as the system is activated.
- C The light-emitting diode is red when fire is detected, and the siren and strobe light are activated at the same time. To activate the sprinkler system manually, hold in button (B) for 1 second.
- D The light-emitting diode is yellow when there is a malfunction of the activation function. If the light-emitting diode is on, contact a qualified service technician.
- E The light-emitting diode is yellow when there is a malfunction of the detector circuit. If the light-emitting diode is on, contact a qualified service technician.
- F The light-emitting diode is yellow when the system is in manual mode, that is, the parking brake is released.
- G The light-emitting diode is green when the machine is parked and when the system is in automatic mode. The system is supplied with electric power (the system is supplied with electricity even when the battery disconnect switch is off).
- H Test button: When the test button is pressed in, a function check of the system takes place. All light-emitting diodes, the siren, and strobe light are activated for approx. three seconds. Daily test is recommended.

Function check

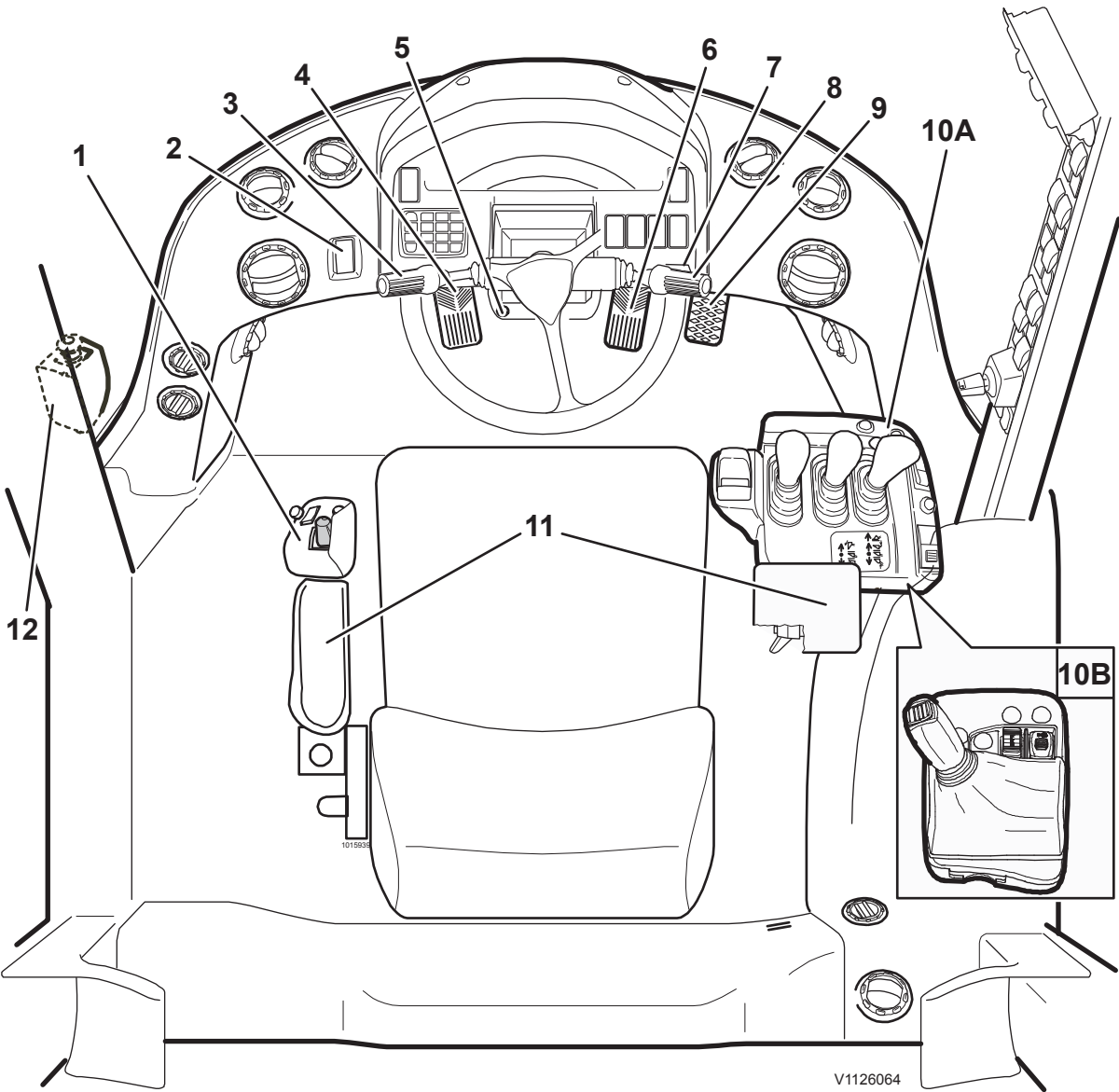
NOTE!

The plastic cover should not be raised.
Check daily that the system works.

- Press the test button (H) on the control panel.

In case of a malfunction indication, contact a qualified service technician.

Other controls
Controls



1	Comfort Drive Control, CDC (optional equipment)	8	Headlight high/low beam switch, windshield washer, direction indicators, windshield wiper
2	Parking brake	9	Accelerator pedal
3	Gear selector, horn	10A	Lever carrier, electric servo: working hydraulics, kick-down, engine brake, control lever lockout, forward/reverse, activation forward/reverse, horn
4	Brake pedal	10B	Single lever control (optional equipment): working hydraulics, kick-down, engine brake, control lever lockout, forward/reverse, activation forward/reverse, horn
5	Differential lock	11	Armrest, adjusting
6	Brake pedal	12	Emergency stop, engine (optional equipment)
7	Steering wheel adjustment		



V1070248

1 Comfort Drive Control, CDC (optional equipment)

- The equipment consists of a folding armrest where three operating functions are grouped: steering, forward/reverse and kick-down.
- The functions are activated by lowering the armrest and pressing in the activation button (gear selector must be in neutral position).
- A control light on the middle instrument panel is on when the system is activated.

Other instructions, see page 150.

2 Parking brake

- The control light is on when the parking brake is applied. If the parking brake is applied when a directional gear is selected, the red central warning light flashes, the buzzer sounds, and an alarm text is shown on the display.

- The catch on the switch prevents accidental release of the parking brake.

Applying

- Brake and stop the machine with the service brakes.
- Move the gear selector to neutral position.
- Press in the upper part of the switch. The machine must be at a complete standstill before applying the parking brake.

- The parking brake is applied automatically when the engine is turned off.

Releasing

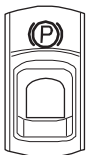
NOTE!

If the gear selector is moved to forward or reverse gear position before the parking brake is released, then the gear will still be in neutral position. The gear selector must first be moved to neutral position to enable selection of a gear.

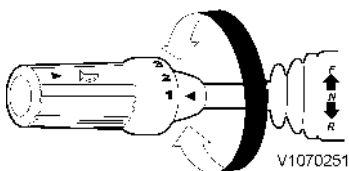
- Move the gear selector to neutral position.
- Press in the red catch and press in the lower part of the switch.

Releasing (if the parking brake has been applied automatically):

- Move the gear selector to neutral position.
- Press in the upper part of the switch.
- Press in the red catch and press in the lower part of the switch.



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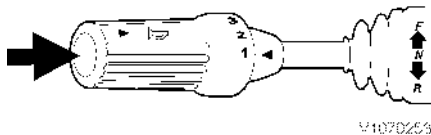
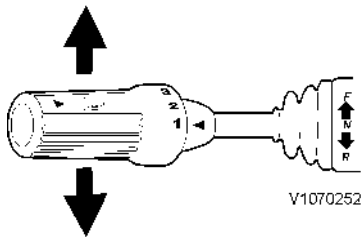
3 Gear selector

- Gears are shifted by turning the handle.

NOTE!

Never leave the machine with the gear selector in forward or reverse gear with the engine running.

For other instructions on gearshifting, see page 146.



Forward/Reverse

Lever in position F = Forward operation

Lever in position N = Neutral

Lever in position R = Reverse operation

NOTE!

When the parking brake is applied, no gear can be activated in forward or reverse. The parking brake must always be released in neutral position to enable gear selection. When the parking brake is activated, forward or reverse gear is shifted to neutral.

Horn

Button pressed in = Horn

4 Brake pedal

5 Differential lock

NOTICE

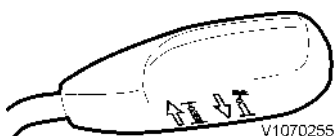
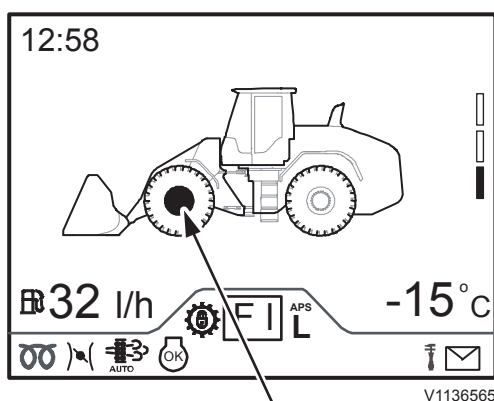
If the machine becomes stuck and one wheel is spinning, the wheel must be stopped before using the differential lock. Otherwise the drive shaft can be damaged.

IMPORTANT! The differential lock may only be used when operating on slippery ground.

NOTE!

The differential lock should only be engaged when the speed is below 10 km/h (6.2 mph). If the speed exceeds 10 km/h (6.2 mph) the differential lock is disengaged.

- When operating on firm ground, particularly when turning, the lock must be disengaged.
- If there is a risk of getting stuck or bogging down, engage the differential lock **before** the machine gets stuck.
- The differential lock only acts on the front axle.
- It is engaged by pressing down the foot-operated switch and it remains engaged for as long as the foot-operated switch is held down.
- The control light in the information panel is on when the diff. lock is engaged. This is also indicated in the operating information panel (operating display figure 3, see illustration to the left).



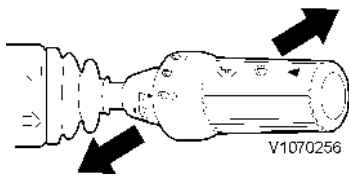
6 Brake pedal

7 Steering wheel adjustment

The control is located to the right under the steering wheel.

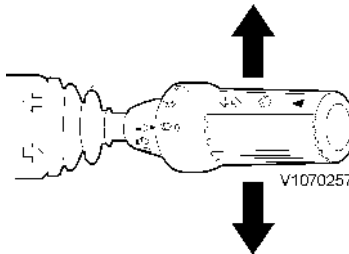
Control up = Adjustment of height

Control down = Adjustment of steering wheel angle



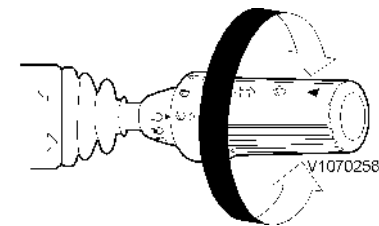
8 Light switch

Away from steering wheel = High beams
Neutral position = Low beams
Towards steering wheel = High beam flash



Direction indicator control

Lever forward = Left direction indicators
Lever backward = Right direction indicators

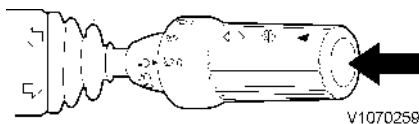


Windshield wiper

Position 0 = Neutral position
Position --- = Interval wiper*
Position I and II = Windshield wiper (two speeds)

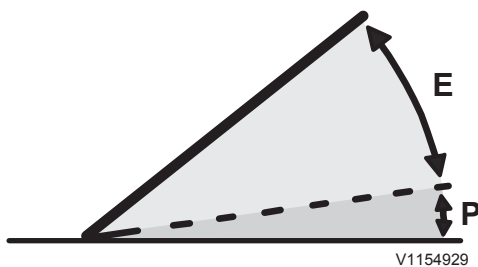
*) It is possible to change the time for the interval. The start key must be in position 1. First turn the control to the interval wiping position and let the wipers operate for a while. Then turn the control to position 0 and wait for the length of time you want the new interval to last, then turn the control to the interval position again. By default the interval is 7 seconds. The interval can be set between 5–25 seconds.

When the engine is turned off by turning the start key to position 0, the interval returns to the basic setting.



Windshield washer

Button pressed in = Windshield washer



Throttle application (acceleration)

E = Economical operating range

P = Power range

9 Accelerator pedal

Throttle application is transmitted electrically.

Use the accelerator pedal within the economical operating range (E) for lowest fuel consumption. The economical operating range is valid until the accelerator pedal encounters some resistance. When the accelerator pedal is pressed down more it enters the Power range.

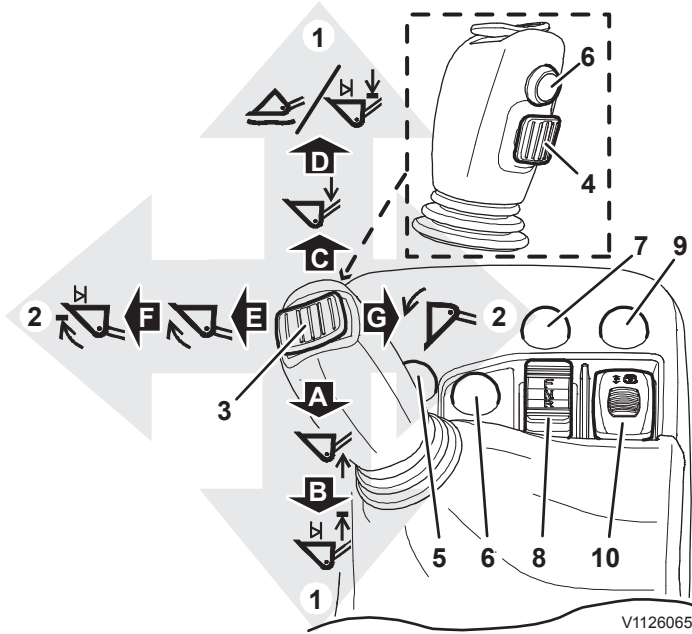
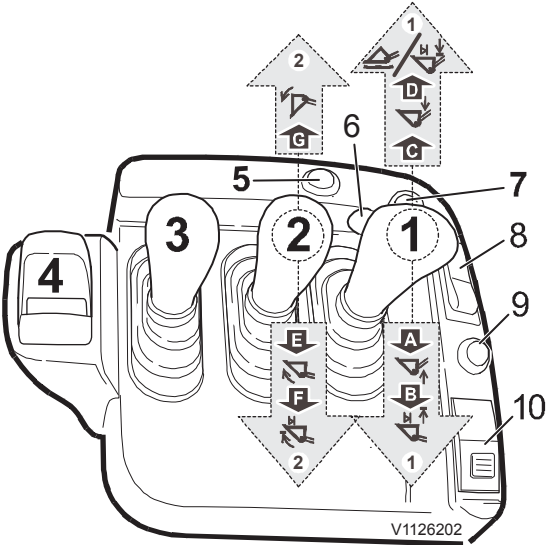
NOTE!

When the accelerator pedal is in Power range (P) and automatic shifting is in L, M, H, or AUT mode, the machine can downshift automatically to 1st gear even if "Fully automatic downshifting (FAPS)" is not selected, see page 146.

10A Lever carrier, electric servo

10B Single lever control (optional equipment)

When working in an area where there is risk of electromagnetic fields, EMF, see page 194.



1	Lift/lower
2	Tilt-back/forward
3	3rd hydraulic function (optional equipment)
4	4th hydraulic function (optional equipment)
5	Engine brake/downshifting
6	Kick-down
7	Horn
8	Directional gear F-N-R
9	Activation button
10	Lever lockout

Tilt-back/forward (2)	Lift/lower (1)
E Tilt-back	A Lift
F Automatic tilt (bucket positioner *)	B Automatic lift (boom kick-out *)
G Tilt forward	C Lower
	D Float mode *) / Return-to-Dig (automatic lift arm lowering *)

NOTICE

The automatic function has been changed so that the control lever no longer remains in its final position.

*) The function is activated when the lever is moved past a sensing position (an increased resistance at approx. 70% of full lever stroke) and then the lever can be released.

NOTE!

Return-to-Dig (automatic lift arm lowering) has priority over float mode. In order to enable engagement of float mode, the switch for Return-to-Dig (automatic lift arm lowering) must be in position 0.

For more information on boom kick-out and bucket positioner (automatic lift and automatic tilt), as well as for Return-to-Dig (automatic lift arm lowering), see page 103.

3rd hydraulic function (optional equipment) (3)

Double-acting hydraulic connections are used if the machine, e.g., is equipped with a log grapple.
May also be used for hydraulically powered rotating attachments.

4th hydraulic function (optional equipment) (4)

Double-acting hydraulic connections are used if the machine, e.g., is equipped with a log grapple.

Engine brake/downshifting (5)

Used to obtain immediate downshifting when operating downhill or to prevent undesired upshifting, see page 147.

Kick-down (6)

The function can be selected from the lever carrier, the single lever control, or Comfort Drive Control (optional equipment), see page 147.

Horn (7)

Directional gear F-N-R (8)

In order to use the function the activation button (9) must be pressed in first.

After activation, F/R is shown: in front of the selected directional gear on the information display unit's operating display figure.

Switch in forward position = Forward operation

Switch in middle position = Neutral

Switch in rear position = Reverse operation

New activation of the system requires new pressing of the activation button (9).

NOTE!

The standard gear selector (by the steering wheel) has priority over the directional gear on the lever carrier or single lever control and "takes over" control if it is used.

Activation button (9)

Activation of directional gear F-N-R on the lever carrier or single lever control takes place by pressing the activation button (9).

NOTE!

The standard gear selector by the steering wheel and the directional gear on the lever carrier or the single lever control must be in neutral position when activating. Comfort Drive Control must not be activated.

Control lever lockout (10)

Lever lockout must be used to prevent accidental activation of the control levers, e.g., during service or when operating on public roads.

Switch, front part pressed in = The control levers' hydraulic function is disabled, that is, lever lock is activated.

The switch features a catch to prevent accidental activation.

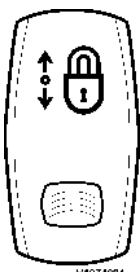
Amber central warning and text on the display unit show that the control lever lockout function is activated. When the lever lockout is activated, the RBB-function is disengaged.

NOTE!

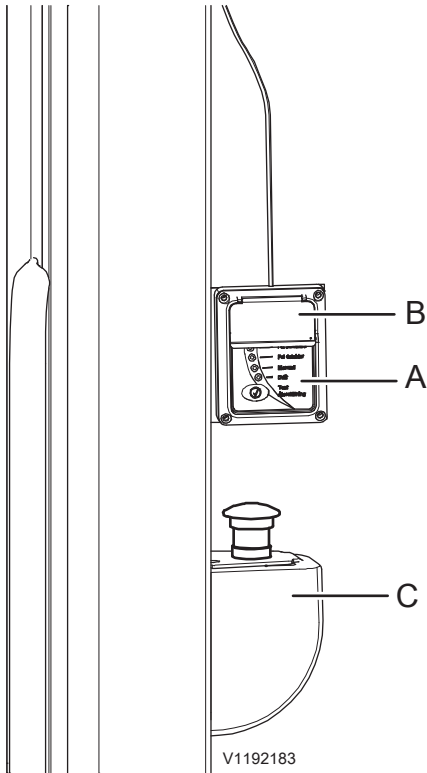
Activation of lever lockout disables the Collision Mitigation System (CMS).

11 Armrest, adjustment

The armrests should be adjusted for optimal operating position and comfort, see page 116.



Switch, control lever lockout



- A Control panel
- B Plastic cover
- C Emergency stop

12 Emergency stop, engine (optional equipment)

NOTE!

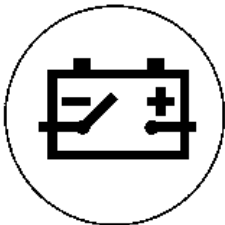
When the emergency stop is activated, the following steps 1–3 always take place. Step 4 only takes place if fire is detected.

The following occurs when the machine is operating, the parking brake is released, the system detects fire, and the emergency stop (C) is activated:

- 1 The engine is stopped automatically
- 2 The main electric power is turned off
- 3 The parking brake is applied
- 4 The sprinkler system is activated (only when fire is detected) (Fire Suppression System, optional equipment).

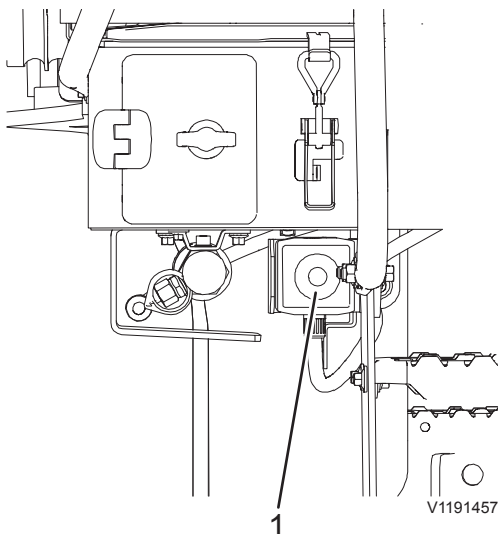
NOTE!

Flashing hazard lights can be activated to bring attention to the situation.

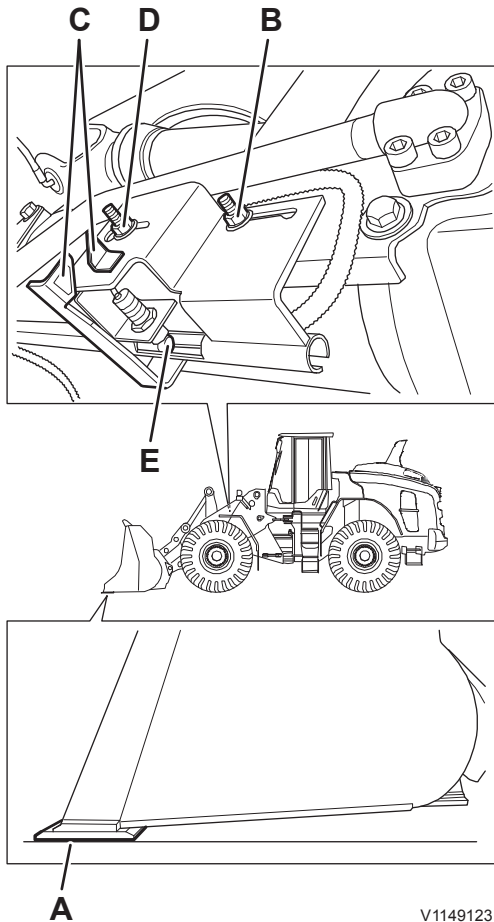


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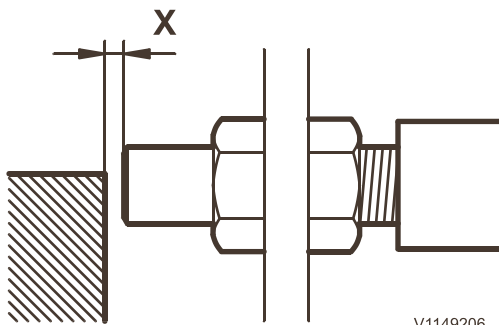
In case of fire, activate the emergency stop



- 1 External emergency stop (located by cab steps)



- A Edge saver, underside flat against ground
B Nut (for adjusting tilt position indicators)
C Tilt position indicators
D Nut (for adjusting sensor)
E Indicator pin



The distance (X) between the indicator pin and the sensor should be 3–5 mm.



Automatic tilt (bucket positioner)

Automatic tilt (bucket positioner)

Automatic tilt ensures that the attachment stops automatically in the set position when the attachment is tilted back (in) with the lever in locked position. This will result in shorter cycle times and reduces wear.

NOTE!

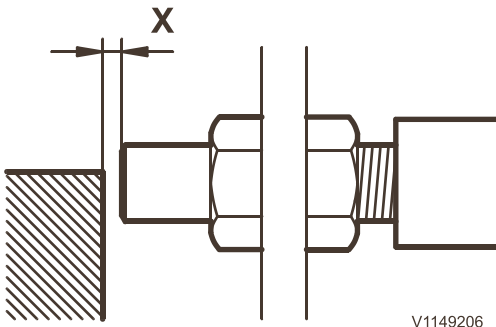
Automatic tilt can be used and set for various attachments. A bucket is used in the instructions below and the automatic tilt (bucket positioner) is set to deploy when the underside of the bucket's edge saver is parallel with the ground surface. This common setting means that the edge saver absorbs most of the wear, which minimizes wear on the rest of the bucket.

NOTE!

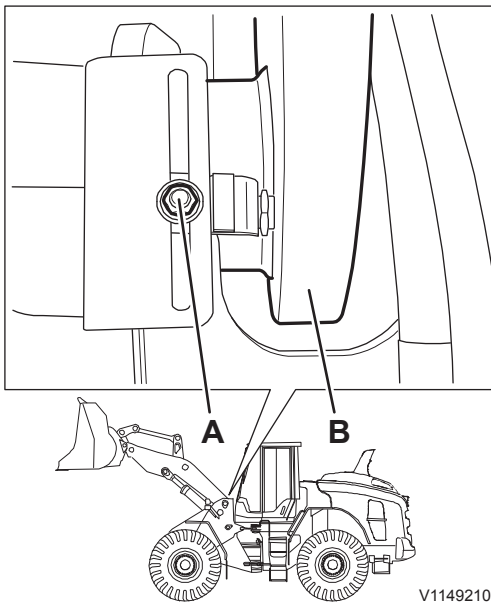
The tilt position indicators can be adjusted for one attachment and the sensor for another. If the tilt position indicators are adjusted, the sensor must always be adjusted afterwards since the sensor has been moved when the tilt position indicators were adjusted!

Adjusting

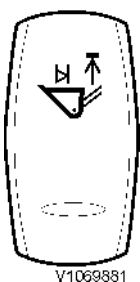
- 1 Position the bucket so that the underside of the edge saver is flat against the ground (see figure).
- 2 Turn off the engine, but leave the start key in running position.
- 3 Check that the distance between the sensor and the indicator pin is 3–5 mm. Otherwise, adjust by loosening one of the nuts and moving the sensor to correct distance with the other nut. Then tighten both nuts.
- 4 If the tilt position indicators need to be adjusted, loosen the nut and move to the desired position. Then tighten the nut.
- 5 Loosen the nut for adjusting the sensor and move the sensor to the exact position when the light-emitting diode on the back of the sensor is not lit (exactly when the sensor is in line with the end of the indicator pin). Then tighten the nut.
- 6 Activate automatic tilt (bucket positioner) with the switch.
- 7 Start the engine and lift the bucket so that the bucket can be tilted forward (out). Check the adjustment by first tilting the bucket forward a bit and then tilting back the bucket with the lever in locked position. Then the bucket should tilt back automatically and remain in the position that was set.
- 8 Lower the bucket against the ground (without tilting the bucket) and check that the edge saver's underside rests flat on the ground once again.



The distance (X) between the lift arm and the sensor should be 3–5 mm.



- A Nut
B Lift arm (boom)



Automatic lift (boom kick-out)

Automatic lift (boom kick-out)

Automatic lift (boom kick-out) ensures that the attachment stops automatically in the set position when the attachment is raised with the lever in locked position. This results in shorter cycle times and makes work easier.

Adjusting

- 1 Lift the attachment to the desired position.
- 2 Turn off the engine, but leave the start key in running position.
- 3 Check that the distance between the sensor and the lift arm (boom) is 3–5 mm. Otherwise, adjust by loosening one of the nuts and moving the sensor to correct distance with the other nut. Then tighten both nuts.
- 4 Loosen the nut for adjusting the sensor and move the sensor to the exact position when the light-emitting diode on the back of the sensor is not lit (exactly when the sensor is in line with the edge of the boom). Then tighten the nut.
- 5 Activate automatic lift (boom kick-out) with the switch.
- 6 Start the engine and lower the attachment slightly. Check the adjustment by raising the attachment with the lever in the rear lock position. Then the attachment should stop automatically in the set position.

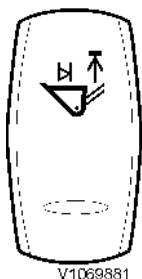
Lift and tilt function

NOTE!

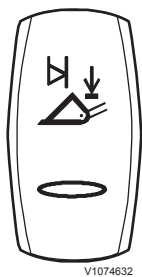
Only with electric servo levers.

The automatic functions have been changed so that the control lever no longer remains in its end-positions. Instead the levers must pass a sensing position for the automatic functions to engage.

The boom kickout and bucket positioner causes the attachment to automatically stop in predetermined positions. This will result in shorter cycle times and reduced wear. Follow the instructions below to adjust to the desired height when lifting or lowering, as well as the desired stop when tilt in and out.



Switch, boom kickout (automatic lift)



Switch, Return-to-Dig (automatic lift arm lowering)

During all adjustments, or when verifying functions, the machine should be at normal working temperature.

Adjustments take place from the operator's station with the engine running.

Operation

NOTE!

Automatic operation can be stopped by moving the control lever into the neutral position or by deactivating the switch for the respective function.

Adjusting lift height

Switch, upper part pressed in = setting of lift height

Switch in middle position = automatic lift (boom kick-out) activated

Switch, lower part pressed in = boom kickout (automatic lift) deactivated

- 1 Lift the attachment to the desired height.
- 2 Press in and hold the switch in the upper 'rocker-return' position until a short audible signal is heard from the instrument panel's buzzer (**after approx. 3 seconds**). The position has been saved.

Verifying boom kickout (automatic lift)

- 1 Raise the boom to desired lift height.
- 2 Press in and hold the switch in the upper 'rocker-return' position until a short audible signal is heard from the instrument panel's buzzer (**after approx. 3 seconds**).
- 3 Lower the attachment to the ground.
- 4 Move the lever fully rearwards and then release the lever, now automatic lift is engaged.
- 5 Check that the attachment stops smoothly in the selected position.
- 6 Deactivate boom kickout (automatic lift) with the switch.

Adjusting lowering position

Switch, upper part pressed in = setting of lowering position

Switch in middle position = automatic Return-to-Dig activated

Switch, lower part pressed in = automatic Return-to-Dig deactivated

- 1 Lower the attachment to the desired position.
- 2 Press in and hold the switch in the upper 'rocker-return' position until a short audible signal is heard from the instrument panel's buzzer (**after approx. 3 seconds**). The position has been saved.

Verifying Return-to-Dig (automatic lift arm lowering)

- 1 Lower the attachment to the desired position.
- 2 Press in and hold the switch in the upper 'rocker-return' position until a short audible signal is heard from the instrument panel's buzzer (**after approx. 3 seconds**).
- 3 Raise the boom above horizontal position.
- 4 Move the lever fully forward and then release the lever, now automatic lift arm lowering (Return-to-Dig) is engaged.
- 5 Check that the attachment stops smoothly in the selected position.
- 6 Deactivate automatic lift arm lowering (Return-to-Dig) with the switch.



Switch, float mode

Activating float mode

NOTE!

Return-to-Dig (automatic lift arm lowering) has priority over float mode. To activate float mode, automatic lift arm lowering must be deactivated.

NOTE!

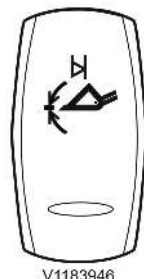
To activate the float mode function, the attachment must be moved to a flat position or moving towards a flat position, at a speed below 20 km/h (12.4 mph).

Switch, upper part pressed in = Float mode activated (and is engaged when the control lever for lift/lower has been moved to float position)

Switch, lower part pressed in = float mode function deactivated

Verifying float mode

- 1 Lower the attachment until it rests flat on the ground.
- 2 Activate float mode by pressing in the upper part of the switch.
- 3 Then move the lever fully forward and then release the lever, now float mode is engaged (which can be checked by the symbol for float mode on the display (in operating display 3) turning green).
- 4 Carefully tilt the attachment forward and check that the lift arms, not the machine, are raised.
- 5 Tilt back the attachment and check that the lift arms follow along down.
- 6 Deactivate float mode with the switch.



Switch, bucket positioner (automatic tilt)

Adjusting bucket positioner (automatic tilt)

Switch, upper part pressed in = setting of tilt position

Switch in middle position = automatic tilt (bucket positioner) activated

Switch, lower part pressed in = bucket positioner (automatic tilt) deactivated

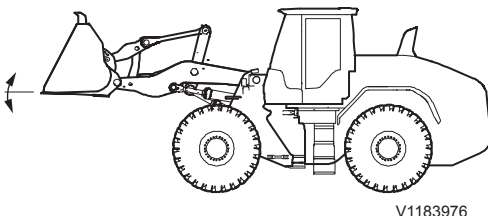
- 1 Tilt the attachment to the desired position.
- 2 Press in and hold the switch in the upper 'rocker-return' position until a short audible signal is heard from the instrument panel's buzzer (**after approx. 3 seconds**). The position has been saved.

Verifying bucket positioner (automatic tilt)

1. Tilt the attachment to the horizontal position.
As predefined, the auto tilt in and auto tilt out position will always be the same one, horizontal position is recommended when verifying.
2. Press in and hold the switch in the upper 'rocker-return' position until a short audible signal is heard from the instrument panel's buzzer (**after approx. 3 seconds**).
3. Set 'Aut. Tilt Settings' to 'Both' in information cluster which means both automatic tilt in and out are all selected, see page 60.

Automatic tilt out:

4. Fully tilt in the attachment.
5. Tilt out with full lever stroke and then release the lever, now automatic tilt out (bucket positioner) is engaged.





Switch, single-acting lift function

6. Check that the attachment stops smoothly in the selected position.

Automatic tilt in:

7. Fully tilt out the attachment.
8. Tilt in with full lever stroke and then release the lever, now automatic tilt in (bucket positioner) is engaged.
9. Check that the attachment stops smoothly in the selected position.

Activating single-acting lift function

Switch, upper part pressed in = single-acting lift function activated

Switch, lower part pressed in = single-acting lift function deactivated

Verifying single-acting lift function

- 1 Adjust the lift arms so that there is a gap between the attachment and the ground.
- 2 Activate single-acting lift function.
- 3 Carefully tilt the attachment forward and check that the lift arms, not the machine, are raised.
- 4 Tilt the attachment back to the starting position and check that the lift arms follow along down and that the gap between the attachment and ground is approximately the same as before.
- 5 Deactivate single-acting lift function with the switch.

Max. boom height

NOTE!

This function shall only be used in applications where it is allowed.

NOTE!

Only with electric servo levers.

This function limits the boom maximum lift height to a predetermined position. This is to facilitate work in environments where the physical conditions limits the lifting height.

The operator defines the limited lift height by positioning the boom at maximum height. This position is then saved by the operator in the front instrument panel.

Follow the instructions below to set the desired Max. boom height.

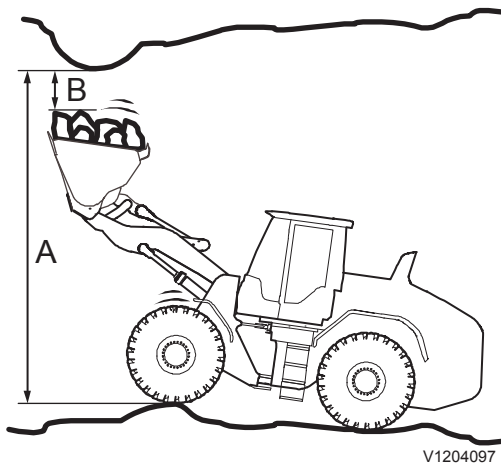
Setting

NOTE!

During the setting, the machine should be at normal working temperature.

The setting takes place from the cab with the engine running.

The setting is done on the display, see page 60.



Machine on the lowest working height.

- A Lowest working height
- B Margin to the lowest object

- 1 Place the machine where the lowest working height (A) is found.
- 2 Lift the boom to the desired maximum height for the attachment or load.
Make sure to have the attachment in the position that will provide the highest height when lifting (big influence for a side dump bucket for example).
The margin to the lowest object (B) have to be enough.

NOTE!

The margin to the lowest object have to be enough. The suspension in the tires and the boom reduces the distance between the load and the lowest object when driving the machine!

- 3 Press SETUP on the keypad.
Select Personal Settings.
Select Max. boom height.
Select Set Upper Limit.
A confirmation message appears on the display and a short audible signal is heard from the instrument panel's buzzer.

Boom upper limit set to current boom position

Activating/deactivating

- 1 Select ON, to activate the Max. boom height.
A symbol on the display indicates activated Max. boom height.

NOTE!

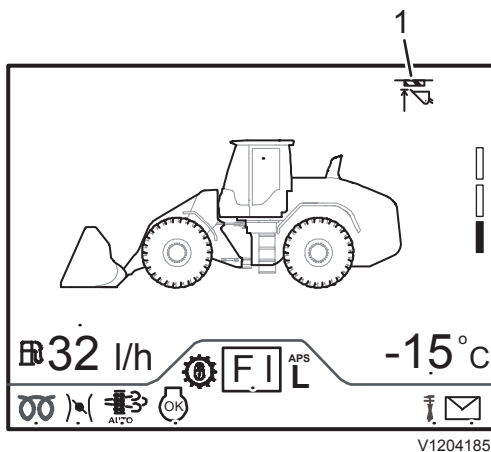
It is the operator's responsibility to ensure, the predetermined boom maximum lift height setting is as expected. It is especially important, when entering an area or a work site, where this function is intended to be used.

- 2 Select OFF, to deactivate the Max. boom height.
- 3 Select ON, to activate the latest stored Max. boom height.

NOTE!

If the boom height limitation function fails, a warning message appears on the display and the buzzer will sound, see page 49.

Max. Boom Height Limitation Failure



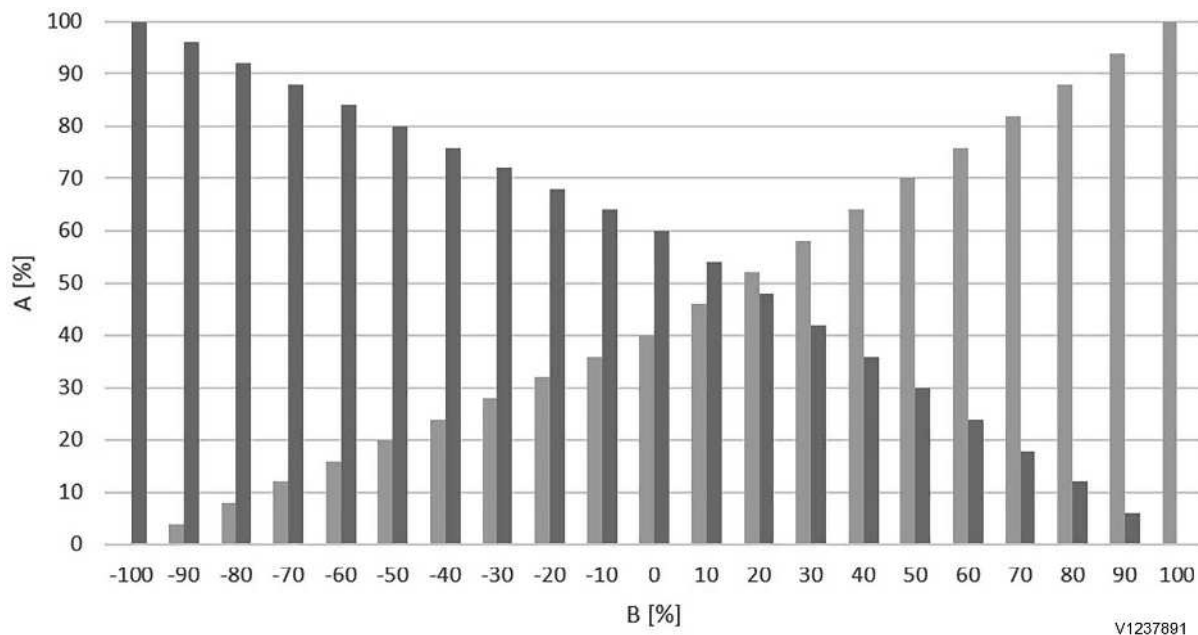
- 1 Activated Max. boom height

Set hydraulic priority

Applies to models: L90H

With the setting – Set hydraulic priority – it is possible to adjust the hydraulic priority between the 3rd/4th function and the lift/tilt function. By adjusting the hydraulic priority value, it is possible to customize the behavior of the 3rd/4th function to suit different attachments and different personal preferences.

The hydraulic priority setting is done on the display, see page 60.



A | Function priority / Flow priority
B | Hydraulic priority

Dark gray
Light gray

Lift/Tilt function
3rd/4th function

The percentage for the hydraulic priority (B) is stating the ratio of the distributed flow between the 3rd/4th function and the lift/tilt function.

The predefined setting for the hydraulic priority (B) is 0 %, this gives a ratio of 40 % of flow priority to the 3rd/4th function and 60 % to the lift/tilt function.

Hydraulic priority value set to positive:

- A higher flow is allowed for the 3rd/4th function, when using the lift/tilt function at the same time.
- The lift/tilt function will move slower and the 3rd/4th function will move faster, when using the functions at the same time.
- E. g., setting the hydraulic priority value (B) to +10 %, the function priority (A) is 46 % to the 3rd/4th function and, 54 % to the lift/tilt function.
- When the hydraulic priority value (B) is high enough i.e. more and more positive, the lift/tilt function will stop all movements, when the 3rd/4th function is used.

Hydraulic priority value set to negative:

- A lower flow will be allowed for the 3rd/4th function, when using the lift/tilt function at the same time.
- The 3rd/4th function will move slower and the lift/tilt function will move faster, when using the functions at the same time.
- E. g., setting the hydraulic priority value (B) to -10 %, the function priority (A) is 36 % to the 3rd/4th function and, 64 % to the lift/tilt function.
- When the hydraulic priority value (B) is low enough i.e. more and more negative, the 3rd/4th function will stop all movements, when the lift/tilt function is used.

Engine hood, maneuvering

WARNING

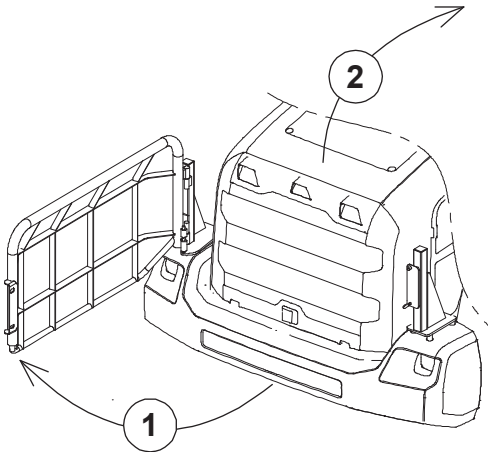
Risk of crushing.

Opening or closing the engine hood could cause crushing injuries. **Make sure that unauthorized persons stay clear from the working area.**

NOTE!

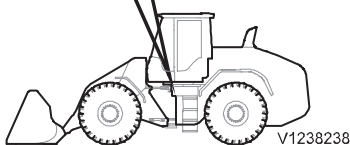
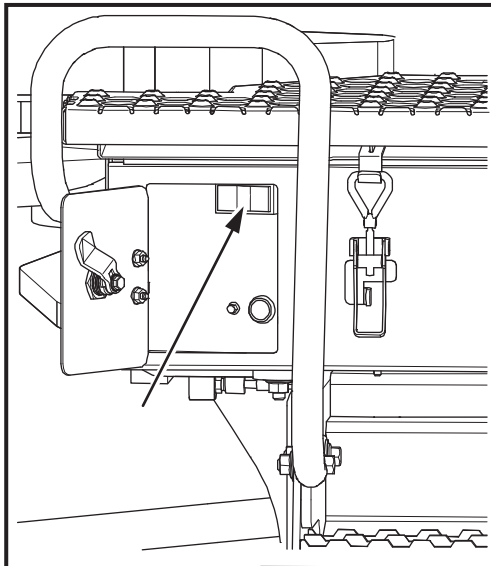
If the machine is equipped with a grill guard, it must be opened before the engine hood is opened, see figure.

- Release the lock and open the grill guard all the way (1). Make sure that the grill guard is locked in fully open position before opening the engine hood (2).
- Close the grill guard and secure it with the lock after closing the engine hood.



V1154712

Grill guard (optional equipment)



V1238238

Switch for operating engine hood

The machine's engine hood is operated electrically with a switch located inside the cover under the steps on the machine's left side.

- Press arrow up and hold in the switch until the engine hood is fully open.
- Press arrow down and hold in the switch until the engine hood is fully closed.

NOTE!

The engine hood may not be operated when the machine's engine is running. Risk of machine damage.

NOTE!

The machine may not be operated with a partly or fully open engine hood. Risk of machine damage.

NOTE!

The engine hood and rear fenders should be cleared of ice, snow, and mud before operating the engine hood. In heavy winds, pay attention to and be careful with the engine hood when it is open.

NOTE!

Make sure that no objects (forgotten tools and similar) are in the way of the engine hood's movement when it is opening or closing.

NOTE!

The engine hood must be closed during all regeneration of the engine's exhaust cleaning system.



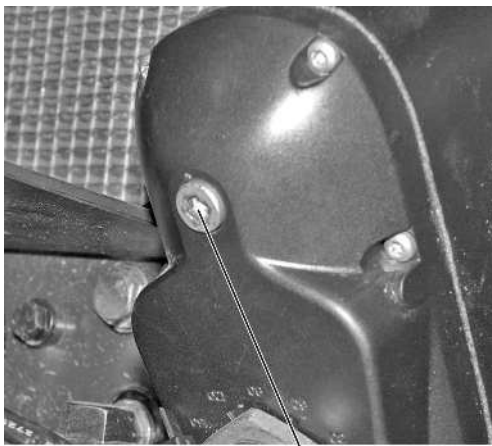
A **B**
A Fender
B Plate

V1149949

Secondary opening

Secondary opening of the engine hood is possible by turning with an Allen key (size 6 mm, 0.24 in) on the hood motor's shaft.

- 1 Remove the fender and plate.
- 2 Remove the protective bolt on the actuator that covers the hood motor's shaft.
- 3 Use an Allen key, size 6 mm (0.24 in), and turn with a ratchet handle or drill until the hood is open.



A
A Protective screw

V1149982

Cab

Rear vision system

For forward-facing camera, see page 118.

The camera, located on the back of the machine, together with the monitor in the cab, helps to give the operator good visibility to the rear when, e.g., reversing the machine, etc.

The back-up camera is active when the ignition is in position 1.

As an option there is also a radar detection system that detects an area behind the machine if reverse gear is engaged. If there is a risk of reversing in to something, the system warns for that which is detected within the alarm area. The alarm can be turned off temporarily by pressing key 5 on the monitor. The detection area is shown in the back-up camera view on the monitor.

NOTE!

The radar detection system should be seen as an assisting device. Great care must still be taken when reversing the machine.

The following explains the function of the buttons on the monitor:

1. Camera select

If the system only has one camera, the function is not applicable.

2. Setting of background lighting on LCD-screen

This button enables switching between the following position:

Automatic control — in this position the background lighting on the screen is controlled automatically between min. and max. light intensity, depending on the intensity of the surrounding light.

Day setting — setting of the light intensity for background lighting on the screen is adjusted by pressing the plus and minus buttons. The setting is saved.

Night setting — setting of the light intensity for background lighting on the screen is adjusted by pressing the plus and minus buttons. The setting is saved.

3. Contrast

Press the button once to enter contrast adjustment mode. Use the plus and minus buttons to adjust the contrast.

3. and 4. Colour saturation

To enter mode for setting colour saturation, press button 3 and 4 at the same time. Use the plus and minus buttons to adjust the image's colour saturation.

4. Light intensity

Press the button once to enter adjustment mode for light intensity. Use the plus and minus buttons to adjust the light intensity.

5. Alternative

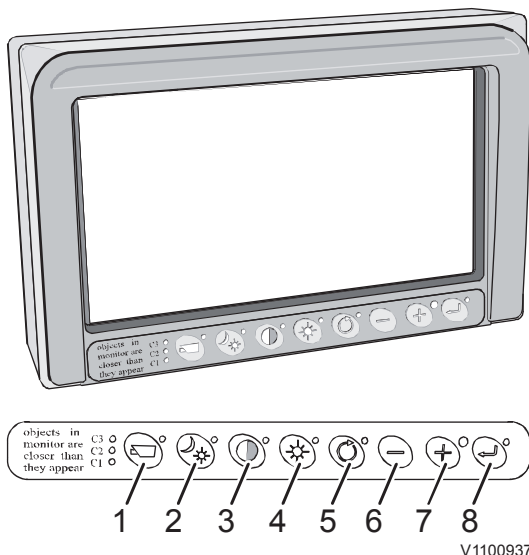
When button 5 "Alternative" is pressed, a picture (still image) is generated from the connected camera. It is possible to adjust the time for which the still image is to be shown. The alarm from the radar detection system is also turned off temporarily when the key is pressed in.

6. Select / setting – minus

7. Select / setting – plus

8. Enter

Enter can be used to temporarily turn off the alarm from the radar detection system.



Maintenance

The only maintenance that is needed on the camera and monitor is cleaning:

- Clean the lens on the back-up camera as needed with a moist (water) cloth.
- Clean the screen of the monitor in the cab with a high-quality cleaning foam.

NOTE!

Aggressive chemicals or abrasive cleaners may absolutely not be used on the screen.

NOTE!

Do not touch the screen with your fingers. Avoid pressing hard on the screen, the screen's pixels may be damaged.

Possible interference on the radar

- Railway rails or electrical wiring
- Large metal surfaces
- Lightning strike
- Open water surfaces with waves

Operator comfort

Operator seat

The operator's seat meets the standards according to EN ISO 7096:2000. In short this means that the seat is designed to minimise, in the best possible way, the whole body vibrations to which the operator is exposed while operating the machine. The size of the vibrations depends on different factors, many of which are not related to the machine design, such as ground conditions, speed, and operating techniques. Keep the following in mind:

- Adjust the seat according to the operator's weight and height.
- Keep the ground at the work site in good condition.
- Apply the correct operating techniques and speed in relation to existing conditions.

Correctly adjusted operator's seat increases operator comfort and safety. Incorrectly adjusted seat may lead to injuries. The adjustments that should be made are:

- A Backrest angle
- B Lumbar support
- C Inclination of and raising/lowering the seat cushion
- D Operator weight
- E Fore-aft (leg room)

(The controls for the different adjustments may vary depending on seat model.)

The mounting bracket for the operator's seat has several holes for attaching the seat. Thereby the operator's seat can be moved on the attaching bracket, thus providing additional adjustment possibilities fore-aft.

There are three positions in which the seat rails can be installed, the middle position is standard. If the machine is used by short operators (or an operator that is the only operator of the machine) the rails can be moved to the front holes to obtain good work position. For tall operators (or an operator that is the only operator of the machine) the rails can be moved to the rear holes.

The operator's seat should be moved by a qualified service technician.

If the operator's seat has to be replaced, then the new seat must be tested according to ISO 7096, which means that the seat manufacturer has designed and adapted the seat's vibration-damping properties to the machine type in which it is to be installed.

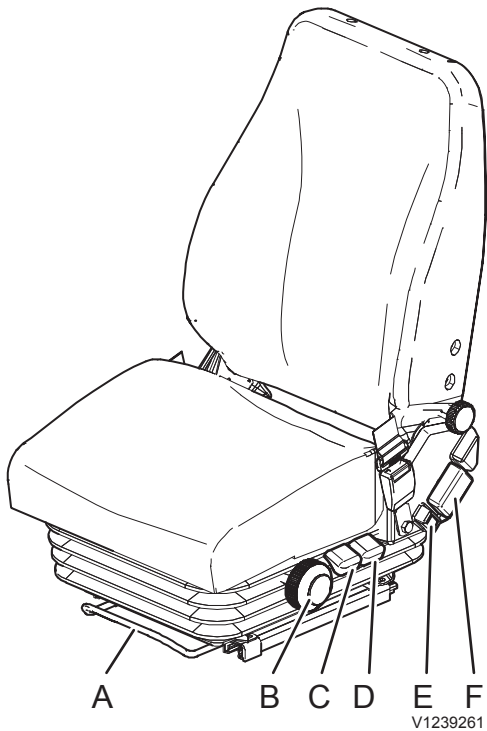
NOTE!

The seat shall be marked with vibration-damping class EM3. It is forbidden to change to a new seat that does not have the correct damping capacity.

NOTE!

Do not adjust the seat while the machine is moving.

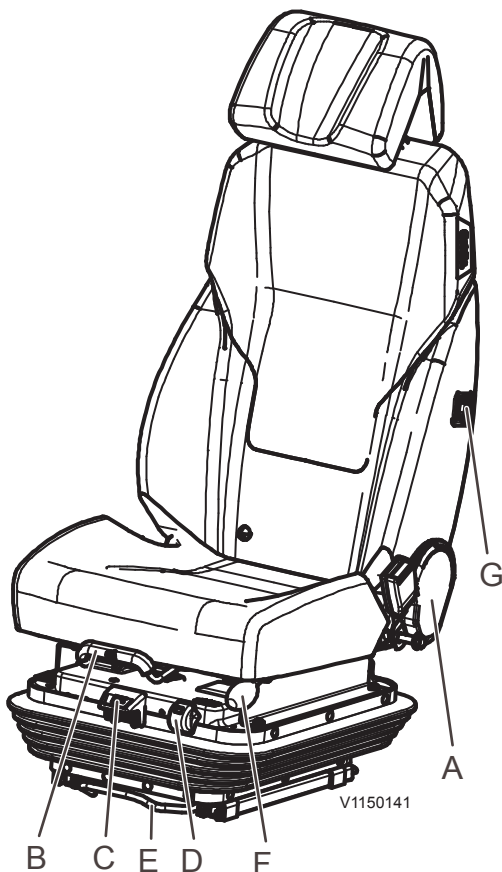
For specifications regarding operator's seat, see page 320

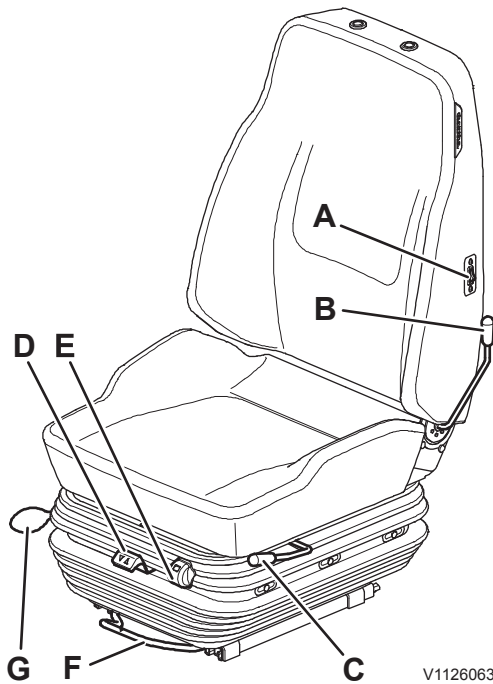
**Mechanical seat**

- A Fore-aft (leg room)**
Pull the bar upward and push the seat (fore/aft).
- B Weight adjustment**
By rotating the handle, the seat suspension can be adjusted according to the relevant operator weight.
- C Height and angle**
Pull up on the handles to raise and push down to lower the front of the seat.
- D Height and angle**
Pull up on the handles to raise and push down to lower the rear of the seat.
- E Seat heat**
- F Backrest angle**
Pull up on the handle and adjust to the desired angle.

Air-suspended seat (High backrest)**Air-suspended seat**

- A Backrest angle**
Pull up on the handle and adjust to the desired angle.
- B Angle**
Pull up on the handles to raise and push down to lower the front of the seat.
- C Height and suspension hardness (start key in position I)**
Pull up the handle to raise the seat and push down to lower. Green indicator shows that the setting of suspension hardness is correct.
- D Indicator for correct suspension**
Green indicator shows that the setting of suspension hardness is correct to minimize whole-body vibrations.
- E Fore-aft (leg room)**
Pull the bar upward and push the seat (fore/aft).
- F Adjusting lumbar support**
The lumbar support is adjusted manually with an air pump.
- G Seat heat**





Air-suspended seat (Heavy-duty) (optional equipment)

'Heavy-duty' means that the seat is designed for a heavier and bigger operator. The design is more robust and the seat is wider (537 mm compared to non-HD = ISRI 470 mm).

A Seat heat

B Backrest angle

Pull up on the handle and adjust the backrest to the desired angle.

C Seat angle

Pull up the handle and adjust the angle of the whole seat (seat cushion and backrest).

D Height and suspension hardness

Pull up the handle to raise the seat and push down to lower. Green indicator shows that the setting of suspension hardness is correct.

E Indicator for correct suspension

Green indicator shows that the setting of suspension hardness is correct to minimize whole-body vibrations.

F Fore-aft (leg room)

Lift the handle and adjust the seat fore-aft.

G Lumbar support

The lumbar support is adjusted manually with an air pump. The air pump together with valve is positioned on the right side of the seat.

Air-suspended seat (Heavy-duty, comfort seat) (optional equipment)

The seat is designed for premium comfort with, automatic weight adjustment, integrated climate system and fully adjustable seat cushion and suspension.

A Angle

Pull up on the handles to raise and push down to lower the front of the seat.

B Cushion depth adjustment

Pull the bar upward and move the cushion (fore/aft).

C Fore-aft (leg room)

Lift the handle and adjust the seat fore-aft.

D Height adjustment

Turn to adjust the height of seat and weight will be adjusted automatically.

E Seat heat

F Shock absorber adjustment

Adjust to suitable suspension hardness.

G Backrest adjustment

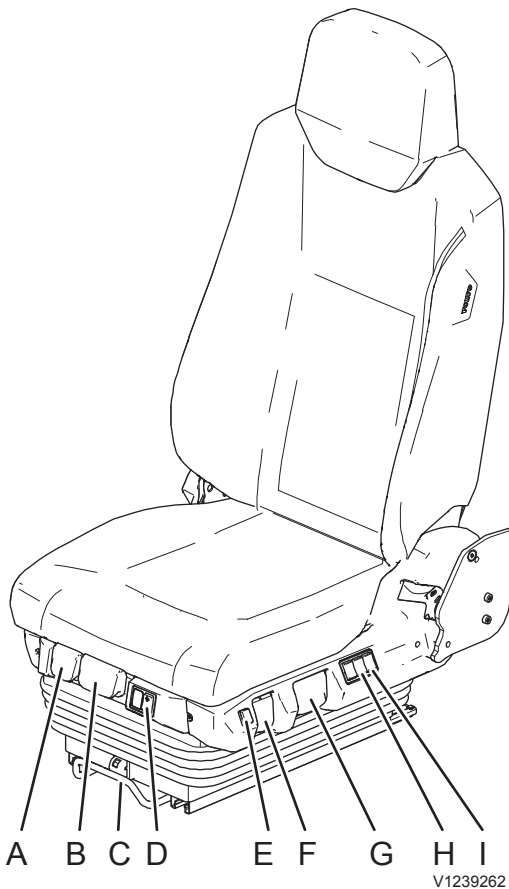
Pull up on the handle and adjust to desired angle.

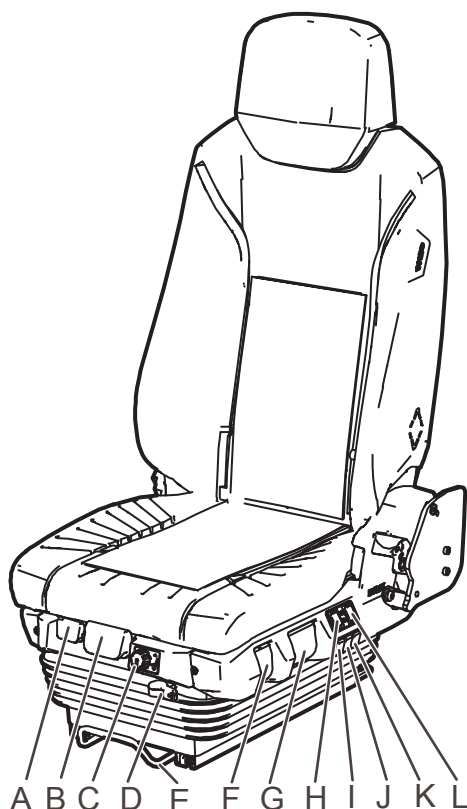
H Air lumbar support bottom

Adjust the lumbar on the bottom of backrest.

I Air lumbar support top

Adjust the lumbar on the middle of backrest and on the sides of the seat cushion.





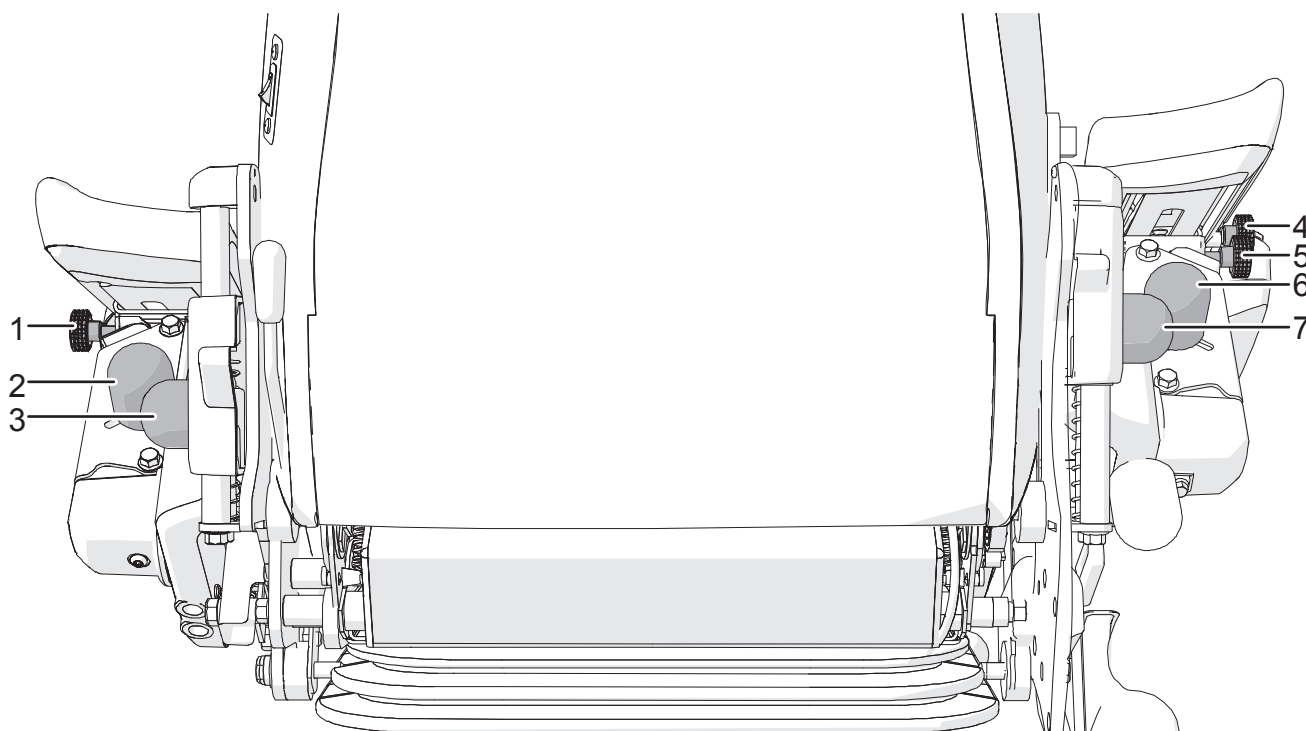
V1182258

Air-suspended seat (Heavy-duty, premium seat) (optional equipment)

- A Angle**
Pull up on the handles to raise and push down to lower the front of the seat.
- B Cushion depth adjustment**
Pull the bar upward and move the cushion (fore/aft).
- C Height adjustment**
Turn to adjust the height of seat and weight will be adjusted automatically.
- D Isolator locking device**
Switch on/off horizontal suspension.
- E Fore-aft (leg room)**
Lift the handle and adjust the seat fore-aft.
- F Shock absorber adjustment**
Adjust to suitable suspension hardness.
- G Backrest adjustment**
Pull up on the handle and adjust to desired angle.
- H Climate control Hot / Cold**
Turn on/off the climate control on seat.
- I Air lumbar support bottom**
Adjust the lumbar on the bottom of backrest.
- J Air lumbar support top**
Adjust the lumbar on the middle of backrest and on the sides of the seat cushion.
- K Side support**
Adjust the lumbar on both sides of backrest.
- L Ventilation adjustment control**
Adjust seat ventilation.

Armrest, adjusting

The armrests for the lever carrier and Comfort Drive Control (optional equipment), as well as the lever carrier, can be adjusted to give the operator an optimal and comfortable operating position.



V1192417

Adjusting arm rest for comfort drive control (CDC)

1 Fore-aft

Loosen the lock knob and adjust fore-aft to the desired position, then tighten the lock knob.

2 Sideways

Loosen the lock knob and adjust the armrest sideways to the desired position and then tighten the lock knob.

3 Height (vertical)

Loosen the lock knob and adjust the armrest vertically to the desired position and then tighten the lock knob.

Adjusting armrest and lever carrier

4 Lever carrier, height

Loosen the lock knob and adjust the lever carrier vertically to the desired position and then tighten the lock knob.

5 Armrest and lever carrier, fore-aft

Loosen the lock knob and adjust the armrest and lever carrier fore-aft to the desired position, then tighten the lock knob.

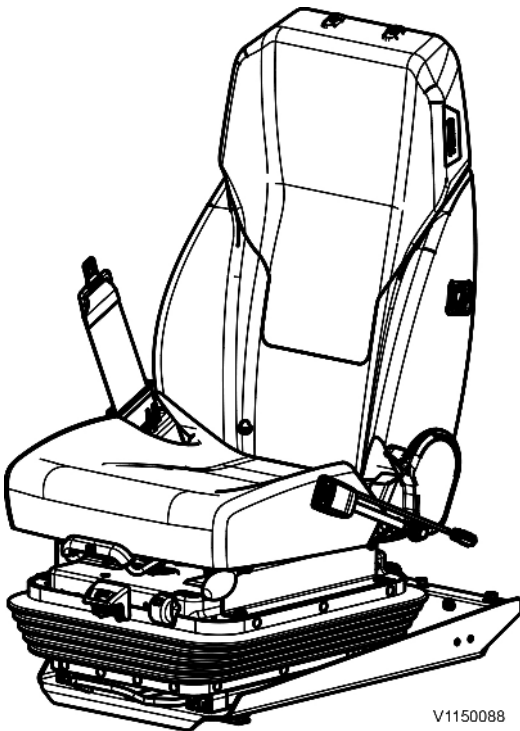
6 Armrest and lever carrier, sideways

Loosen the lock knob and adjust the armrest and lever carrier sideways to the desired position, then tighten the lock knob.

7 Armrest and lever carrier, angle

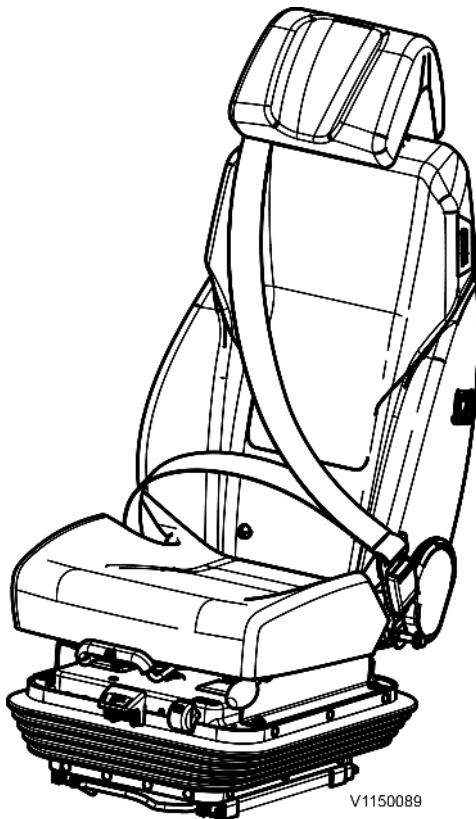
Loosen the lock knob and adjust the armrest's and lever carrier's angle to the desired position, then tighten the lock knob.

Seat belt



V1150088

Seat with lap-type seatbelt



Seat with three-point seatbelt

! WARNING

Risk of serious injury!

Unexpected machine movement can cause the operator to be ejected from the machine, causing serious injuries.

Operate the machine only while seated in the operator seat with the seat belt fastened.

The seatbelt is critical to operator safety. It must always be worn and fastened when the machine is used to prevent the operator from being ejected out of the cab or off the operator platform if the machine rolls over, tips over, or is involved in an accident. A fastened seatbelt also helps the operator to maintain control of the machine if it moves suddenly or in an unexpected way. Failure to use the seatbelt when the machine is used can lead to serious injuries or fatal accidents. The seatbelt is only intended for one adult. Make sure that the seatbelt is reeled-in when not in use.

! WARNING

Risk of serious injury or death.

A damaged seat belt could cause serious injury or death.

Check the seat belt and associated parts before start of machine operation.

Check the seatbelt and associated parts every day. Make sure that fasteners and installation parts are well-tightened. Replace the whole seatbelt immediately if there is any wear, the belt is worn, frayed, has loose stitching, if the belt is deformed, or if the seatbelt's reel does not work. Replace the seatbelt if the machine has been involved in an accident where the belt has been stretched, strained, or subjected to high forces. Check fasteners and installation parts. It is forbidden to change or modify the belt or its attachments and fasteners. Only use warm water when cleaning, do not use cleaning agents or detergents. Let the belt dry while it is pulled out, before reeling it in.

Volvo Construction Equipment recommends replacement of seatbelt units every 3rd year regardless of appearance.

NOTE!

Three-point seatbelt is optional equipment.

Forward camera

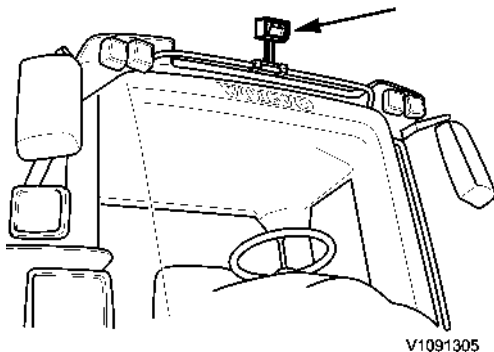
(Optional equipment)

When using large attachments and the biggest buckets from Volvo's range, it is recommended that the machine is equipped with a camera located up high, connected to the cab's ordinary screen, to give the operator better forward visibility.

The forward-facing camera's max. height above the cab roof is 250 mm (10 in) for better visibility over attachments or a big bucket. For best visibility forward, adjust the camera with high precision.

NOTE!

According to visibility measuring standard ISO 5006, visibility is measured with stationary machine, without load, and the bottom of the bucket pin located at least 250 mm (10 in) above ground level.



The forward-facing camera can normally replace the two forward-facing mirrors.

Contact a Volvo dealer to get a copy of the attachment catalogue where more information is available.

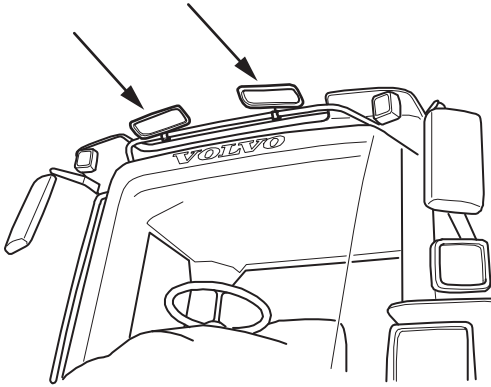
Forward mirrors

(Optional equipment)

When using certain large attachments and big buckets from Volvo's range, it is recommended that the machine is equipped with two extra front-mounted mirrors located up high to improve the operator's forward visibility. For best visibility forward, adjust the mirrors with high precision, see page 142.

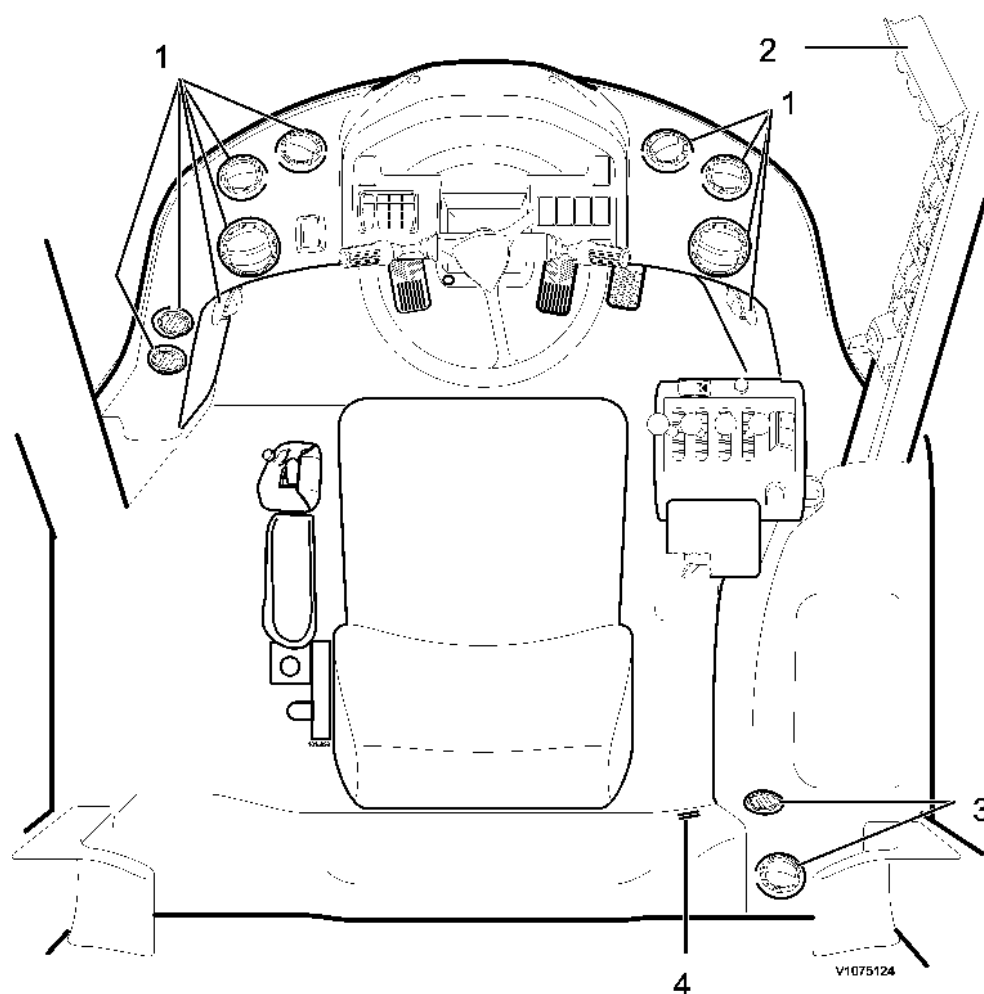
NOTE!

According to visibility measuring standard ISO 5006, visibility is measured with stationary machine, without load, and the bottom of the bucket pin located at least 250 mm (10 in) above ground level.



V1091306

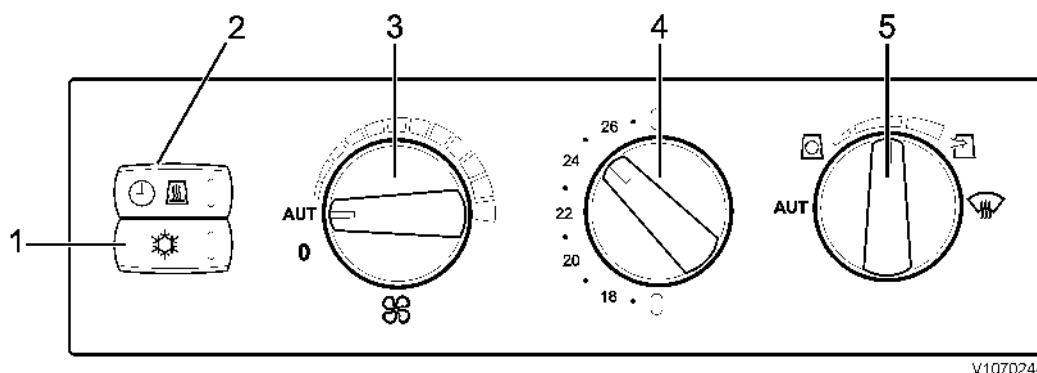
Climate control system



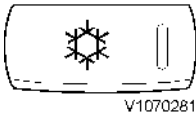
1	Air nozzles, front
2	Panel, climate control system
3	Air nozzles, rear
4	Temperature sensor for cab climate

NOTE!

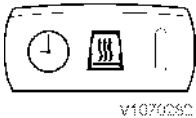
Make sure that the space in front of the temperature sensor is clear. Do not point an air nozzle directly at the temperature sensor.



1	Air conditioning (optional equipment)
2	Cab ventilation/interval heating (optional equipment)
3	Fan control



1 Air conditioning (optional equipment)



2 Cab ventilation/interval heating

4	Temperature control
5	Air distribution control

1 Air conditioning (optional equipment)

Press in the switch to turn on the air conditioning.

The control light in the switch shows that the function is active.

If the control light starts to flash, the air conditioning has been turned off. The cause may be clogged condenser and/or cooler, see page 256.

NOTE!

The switch is also installed on machines without this optional equipment, but then it does not have this function.

2 Cab ventilation/interval heating (interval heating is optional equipment)

Cab ventilation/interval heating takes place using the cab fan at the same time as the engine is turned off and the start key is in position 0.

Works even when the start key has been removed from the ignition.

The battery disconnect switch must be on.

Activation:

Press in switch (2) to activate the cab ventilation / interval heating.

Activation can take place max. 1 minute before, or max. 15 seconds after the start key is turned to position 0, thus turning off the engine.

The control light in the switch is on and shows that the function is active.

Warm outdoor climate, cab ventilation:

The cab is ventilated while the machine is parked.

Fan speed at position AUT is recommended.

The time is max. 2 hours.

Cold outdoor climate, interval heating (optional equipment):

The engine coolant is circulated and thereby provides the cab with heating.

The duration of the interval heating is as long as the temperature of the coolant is sufficiently high or up to 1 hour.

Fan speed at position AUT is recommended.

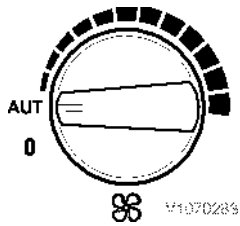
The interval heater strives for 20–26° C (depending on parameter setting in the machine) set temperature regardless of the temperature control's position.

Deactivation takes place:

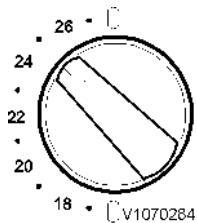
With switch (2).

When the time has elapsed.

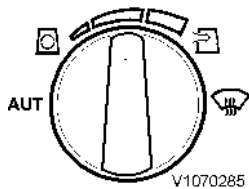
When the engine is started.



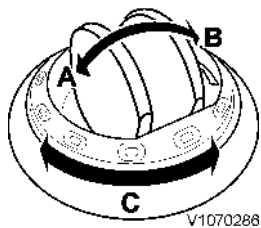
3 Fan control



4 Temperature control



5 Air distribution control



- A Open
B Closed
C Air direction

3 Fan control

Position 0 = fan turned off.

Position AUT = automatic control, stepless fan speed.

Marked area = manual setting, fixed positions for fan speed.

NOTE!

If the cab door is opened at the same time as the fan control is in position AUT, the fan speed will automatically be lowered in certain cases.

4 Temperature control

Position upward = max. heating, red marking.

Position left = selection of required temperature.

Position downward = max. cooling, blue marking.

5 Air distribution control

Position AUT = automatic control.

Position left, towards the symbol = maximum air recirculation.

Marked area = mixed, air recirculation – ambient air.

Position right, towards the upper symbol = maximum ambient air.

Position right = defroster, ventilation nozzles at the windows open and directed towards the windows.

Ventilation nozzles

Open the ventilation nozzles and adjust the direction of the air to obtain the best possible air distribution.

Climate control system, adjusting

The instructions below are basic recommendations. Each operator should experiment to achieve the best possible working environment in the cab, i.e. the right temperature without a draught.

For the best temperature control in the cab try to have as many nozzles open as possible.

Maximum recirculation set with the air distribution control

May be used as a setting for reducing the intake of malodorous air. This also reduces the accumulation of dust in the cab ventilation filters.

In case of mist on the windows, turn the control to Maximum ambient air. When needed, check and clean the cab's ventilation filter, see page 273.

This is how you adjust ...

... comfortable working temperature:

- All nozzles fully open.

- During warm outdoor climate – air conditioning switched on.
- Fan control in position AUT.
- Temperature control set to required temperature.
- Air distribution control in position AUT.

... demisting all windows:

- The front nozzles directed towards the windscreen.
- Floor nozzles under instrument panel closed.
- The rear nozzles directed at the rear window/side window.
- The air distribution control in defroster position, which provides:
 - Maximum ambient air.
 - Maximum heating.
 - Maximum cooling, if the machine is equipped with air conditioning.
 - Highest fan speed.

When the required effect has been reached and the air distribution control is turned back to the required position, the climate control system returns to selected temperature and selected fan speed. Open the floor nozzles.

To reduce the risk of mist, keep the windows clean. Only use ordinary window cleaner for cleaning.

Provide for good ventilation

Do not operate the machine for long periods without ventilation or with the cab fully closed without having the fan turned on.

Poorly ventilated air can cause tiredness (lack of oxygen).

Operating instructions

This section contains rules that must be followed for safe work with the machine. However, these rules are to be followed in conjunction with laws and 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 some extra care. During the running-in period it is important to check oil and fluid levels often.

Wheel bolts should be check-tightened after 8 hours operation, see page 279.

Engine protection - Software

The function informs the operator and limits the engine speed and torque as well as the machine's travel speed in order to prevent any engine damage. Engine shutdown does not take place until the speed has dropped to below 2 km/h (1.2 mph). This makes it possible to always be able to move the machine away from dangerous situations before engine shutdown takes place.

The function is monitored by the engine control module and, depending on which component is generating the alarm, any of the following functions can be activated:

- reduction of engine torque
- limiting engine speed
- engine shutdown

Delayed engine shutdown

This function controls the after-cooling of the engine after the ignition has been turned off. It secures that the engine is running until it is sufficiently cooled and then shuts it down.

The remaining time from ignition key has been turned off to engine shutdown is shown in the display.

To abort the engine shutdown during the delay, turn the ignition key to position I. This will return the machine to operating conditions.

It is possible to abort the after-cooling and shut down the engine directly by pressing ESC, via the battery disconnect switch or by using any emergency stop, but it is not recommended.

For settings of this function, see page 53.

Auto engine shutoff (optional equipment)

NOTE!

The function Delayed engine shutdown controls the after-cooling of the engine and has higher priority than Auto engine shutoff.

Engine shutdown takes place after a predetermined time. The time is set with Tech Tool.

The following conditions are required for engine shutdown:

- The machine is stationary
- The engine is idling

-
- The gear selector is in neutral position
 - The hand throttle is not activated

When the conditions have been met and there is one minute left of the predetermined time, a message is shown on the display unit.

Engine shutdown can then be interrupted by activating the accelerator pedal, hand throttle, or gear selector.

When automatic engine shutdown has taken place:

- The parking brake is applied
- The start key remains in position 1, running position

Any lights or other connected current-consuming devices remain connected.

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.

The following information applies to machines delivered to countries within the EU and may also apply to machines delivered to other countries outside the EU.

It is hard 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.

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. The load that is handled with these attachments may also restrict visibility.

To minimize risks caused by restricted visibility, the management shall establish rules and procedures for the work site. For example:

- Ensure that operators and job site workers have received thorough safety instructions.
- Conduct training for operators and staff on the site.
- Control the traffic patterns for the machine and other vehicles on the site. Avoid travelling in reverse if possible.
- Ensure the control of the machine's operating area and ensure the visibility is kept at a good level by planning the site for this, like arrange piles, roads, places to park and not to park machines, etc.
- Use a signal man to help the operator. Use signals according to the signal diagram, see page 223.
- Provide two-way communication equipment if necessary.
- Ensure that job site workers communicate with the operator before approaching the machine.
- Use warning signs.
- Restrictions for maximum permitted speed as well as for reversing the machine over long distances.

Visibility standards to meet EU's machine directive

- 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 stationary 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.
- ISO 14401 "Earthmoving machinery - Field of vision of surveillance and rear-view mirrors".
- ISO 16001 "Earthmoving machinery - Hazard detection systems and visual aids - Performance requirements and tests" (Earthmoving machinery - Visibility using cameras).

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.

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.
- Clean the cameras, if cameras are installed.
- Clean the radar sensor from snow, if radar detect system is installed.

NOTE!

When you don't have direct access to the cameras for cleaning, be sure to use an appropriate external ladder or an appropriate platform.

- 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.

Safety rules when operating

Fuel, filling



Risk of explosion!

The fumes in an empty fuel container are explosive. Severe personal injury or death could result.

Keep open flames and sparks away from fueling area.

Do not smoke.

Never cut or weld on fuel lines, tanks or containers.

Safety procedures during refuelling

- Turn off the engine and turn off all electrical switches and cab heaters.
- Do not refuel in enclosed areas.
- Ensure that the refuelling area is well ventilated.
- Do not refuel with the engine running.
- Allow the engine to cool before refuelling.
- Use handholds and steps provided to get to the fuel tank, if applicable.
- Use care when removing the fuel tank cap.
- To prevent static electricity sparks from igniting the fuel vapours, maintain good ground contact by keeping the fuel nozzle in constant contact with the fuel tank's filler neck.
- Do not mix gasoline or any other non-specified material with diesel fuel. Highly combustible vapours may result.
- Use the correct fuel grade for the operating season.
- Do not fill the fuel tank to full capacity.
- Clean up any spilled fuel immediately.
- Install and tighten the fuel tank's cap.

NOTE!

Should the fuel tank cap be lost, replace it only with a genuine manufacturer's approved cap. Using a non-approved cap without proper venting may result in pressurization of the fuel tank.

Operator's obligations

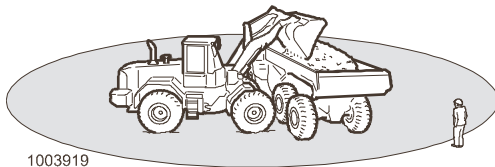


Risk of fatal accidents.

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 machine operator must operate the machine in such a way that the risk of accidents is minimized for the operator, other road users, and persons present on the work site.
- The machine operator must be thoroughly familiar with how to operate and maintain the machine, and it is recommended that operators receive the necessary training on the machine.
- The machine operator must follow the rules and recommendations given in the Operator's Manual, but also pay



1003919

The danger zone around operating machines is at least 7 m (275.5 in).

attention to any statutory and national regulations or specific requirements or risks that apply at the work site.

- The machine operator must be thoroughly rested and must never operate the machine under the influence of alcohol, medicine, or other drugs.
- The machine operator is responsible for the machine's load both when operating on public roads as well as when working on site.
 - There must be no risk of the load falling off while operating.
 - Refuse to take a load that is an obvious safety risk.
 - Respect the rated load capacity of the machine. Note the effect of varying distances to the centre of gravity and the effect of additional units.
- The machine operator must be in control of the machine's work area.
 - Prevent persons from walking or standing under raised lift arms, unless they have been secured or supported.
 - Prevent persons from entering or remaining in the danger zone, that is, the area around the machine and at least 7 m (275.5 in) beyond the attachment's maximal reach.
- The machine operator is responsible for the machine not being used to transport or lift persons, unless it is equipped and approved for this purpose. Contact a dealer for more information.

Accidents

WARNING

Risk of serious injury.

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

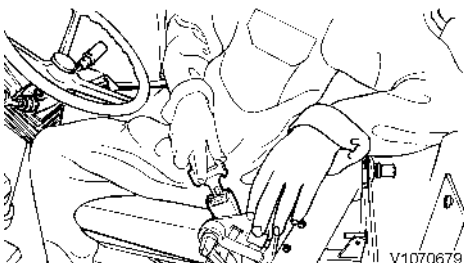
Only the operator, seated in the operator's seat, may be in the cab when operating. All other persons must keep at a safe distance from the machine.

In case of an accident:

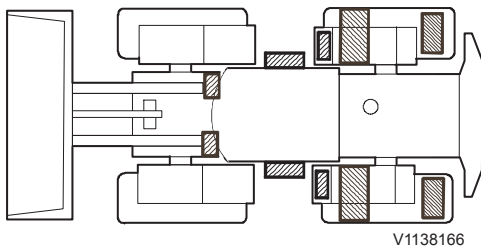
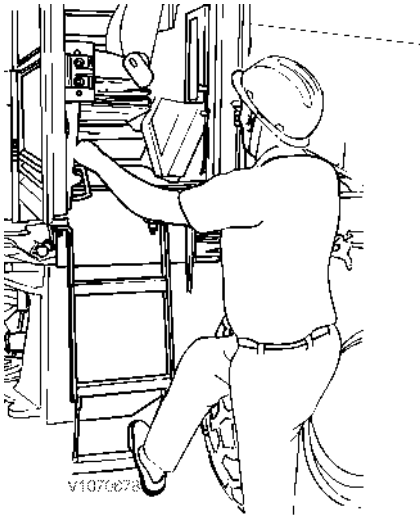
- Report accidents and incidents to the site management immediately.
- Leave the machine in position if possible.
- Take necessary action so as to reduce the effect of damage, especially personal injuries. Avoid action which may make an investigation more difficult.
- Take part in the emergency plan for the working site or other instructions about measures in case of accidents.
- Wait for further instructions from the site management.

Operator's safety

- Always use the seatbelt.
- Always sit in the operator's seat with the seatbelt fastened when starting the machine (engine) and when operating the machine.
- Check that the seatbelt is not damaged or worn, see page 117.



V1070679



(Principle diagram)
Stepping surfaces

- The machine must be operational, i.e., defects that can cause accidents must be repaired.
- Wear suitable clothing to enable safe handling. Wear a helmet outside of the cab.
- Mobile phone should not be used when operating the machine. Follow all national regulations for mobile phone use during operation!
- Any usage of radio transmitters with power levels beyond common mobile phone systems (typically 1-2 W) shall include a roof mounted antenna.
- Keep your hands away from areas where there is a risk of crushing, e.g., covers, door and windows.
- Use steps and handholds when entering or leaving the machine. Use the three-point stance, i.e., two hands and one foot, or two feet and one hand. Always face the machine – do not jump!
- The door must be closed during work, transport operation, and parking.
- The vibration (shaking) that occurs when operating may be harmful to the operator. Reduce this by:
 - adjusting the seat and tightening the seatbelt.
 - choosing the smoothest operating surface for the machine (level the surface if needed).
 - adapting the speed.
- The cab is the machine operator's protection and meets the requirements for Roll Over Protective Structures according to the test standard (ROPS). Therefore, hold on to the steering wheel if the machine rolls over – do not jump!
- The cab is also designed to meet the requirements for falling objects, the weight of which corresponds to stated test methods (FOPS).
- Only walk and stand on surfaces with slip protection.
- Do not enter or leave the machine during a thunderstorm.
 - If you are outside the machine, keep a good distance away from the machine until the thunderstorm has passed.
 - If you are in the cab, remain seated with the machine stationary until the thunderstorm passes. Do not touch any controls or anything made of metal.
- Check that the attachment is properly attached and locked.
- The cab has two emergency exits, the door and the right side window, see page 134.

Operating on public roads

NOTE!

Machines equipped with seat belt indicator beacon (optional equipment) must not be used on public roads. This beacon gives a green, flashing light.

- Road signs, barrier arrangements, and other safety devices that may be required when considering traffic speed, intensity, or other local conditions must be used.
- When moving a machine with a suspended load, special attention must be observed. When required, a signal man must be used.

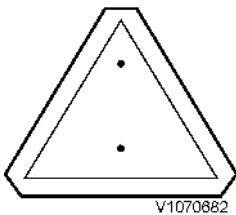
- Comfort Drive Control (CDC) must not be used if the machine is operated near persons, vehicles or other road users.
- Rotating beacon may be used:
 - on machine during road maintenance work, e.g., snow removal.
 - on attached or connected implement that is wider than the machine itself.
 - when the machine is an obstacle or danger to other traffic.
 - when working on or by the side of the road.
 - follow local rules and regulations.

Travelling on public roads

NOTE!

Machines equipped with seat belt indicator beacon (optional equipment) must not be used on public roads. This beacon gives a green, flashing light.

- As a machine operator you are considered to be a road user and therefore required to know and follow local regulations and national traffic regulations.
- It is important to remember that the machine, compared to other traffic, is a slow-moving and wide vehicle that may be an obstacle. Keep this in mind and pay attention to the traffic behind you. Facilitate overtaking.
- SMV (Slow-Moving Vehicle) plate or speed limit plate may be required depending on local laws and regulations. If so, it should be placed in a position at the rear on the machine where it is clearly seen, not inside the rear window or any other window. It should be located at a height of 0.6–1.8 m (23.6–70.9 in) above the ground measured from the bottom of the sign.
- The attachment should be empty, lowered to the transport position (30–40 cm (12–16 in) above ground) and fully tilted back.
- The front end of the material handling arm must be marked with a red flag.
- Lock the control levers with the control lever lockout.
- All work lights and any rotating beacon should be off.
- Hazard flashers may not be used except in emergency situations.
- Attachments and buckets that restrict visibility must not be used.
- Make sure that large attachments/buckets do not get in the way of the headlights. According to legislation, the machine's headlights must provide sufficient light and visibility in front of the machine.
- Additional tools such as buckets, shovels, and iron bars must be thoroughly secured with tensioning straps or chains.
- If a trailer is to be towed behind the machine, see page 171.
- The connecting device on the counterweight must not be used when recovering, towing, or when operating on roads. Follow national regulations.
- Comfort Drive Control (CDC) may not be used.



SMV-sign

NOTICE

Follow national and state regulations.

Safety rules in case of fire

If your own safety is not immediately compromised, take the following actions.

In case of fire on the work site

- 1 If possible, move the machine away from the hazardous area.
- 2 Lower the attachment to the ground.
- 3 Turn off the engine by turning the start key counter-clockwise or by pressing in the emergency stop (optional equipment) in the cab.
- 4 Leave the cab.
- 5 Turn off the electric power with the battery disconnect switch.
- 6 If possible, take active part in putting out the fire and call the fire department if needed.

In case of fire in the machine

If the machine is being operated:

- 1 If possible, park in a fireproof location.
- 2 Lower the attachment to the ground.
- 3 Turn off the engine by turning the start key counter-clockwise or by pressing in the emergency stop (optional equipment) in the cab.
- 4 Leave the cab.
- 5 If possible, turn off the electric power with the battery disconnect switch.
- 6 Try to put out the fire.
- 7 Call the fire department if needed.

In case of fire in machine with Fire Suppression System (optional equipment)

If the machine is operated (operator-dependent activation of sprinkler system):

- 1 If possible, park in a fireproof location.
- 2 Turn off the engine with the emergency stop (optional equipment) in the cab or by turning the start key counter-clockwise.

NOTE!

The sprinkler system is activated if fire is detected.

- 3 Leave the cab.

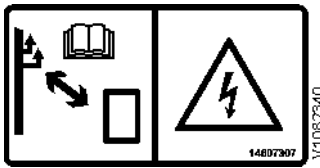
NOTE!

It is also possible to activate the sprinkler system with the manual activation button (outside the cab), see page 233.

- 4 If possible, turn off the main electric power with the battery disconnect switch located by the steps on the machine's right side.
- 5 Be ready with the handheld fire extinguisher since there may still be fire deep inside the machine that could flare up.
- 6 Call the fire department if needed.

NOTE!

If the machine is not operated or if the parking brake is applied, the sprinkler system is activated automatically.



Power lines, minimum clearance



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 could be powerful enough to destroy machine and attachments. Always contact the local authority before starting work near overhead power lines.

Operating the machine near overhead power lines requires special precautions.

- Consider all overhead power lines to be energised with electric power, even lines that are supposed to be without electric power.
- Contact with overhead power lines may cause a temporary power outage. The power may return automatically without any warning.
- There is a risk of electrocution if anyone touches both the machine and the ground at the same time.
- Always be aware of the very serious risk if the machine comes into contact with high voltage.
- Remember that the voltage in the power line determines the safety distance.
- Electrical flashovers may damage the machine and injure the operator at great distances from the power line.
- Always keep the minimum distance from overhead power lines.

Minimum distance from overhead power lines

Voltage of overhead power lines Volt (V)	Minimum distance	
	m	ft
up to 50,000	3	10
50,000 to 69,000	4	13
69,000 to 138,000	5	16.4
138,000 to 250,000	6	20
250,000 to 500,000	8	26
500,000 to 550,000	11	35
550,000 to 750,000	13	43
more than 750,000	14	46

Know the location and voltage of all overhead power lines on the work site before operating the machine.

Contact the local authority if there is any question about the power lines being energised or their voltage.

Keep the following in mind to ensure safety when operating:

- Know what to do if there is an electrical flashover that involves a person or machine.
- Operate the machine at slower than normal operation speed when working near power lines.
- Long-span power lines can sway and reduce the clearance.
- Be careful when travelling over uneven ground which could cause the machine to become unstable.

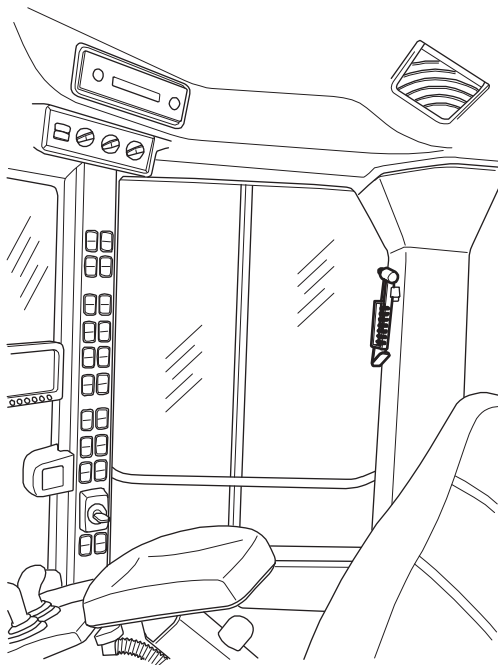
- Keep all persons away from the machine whenever it is close to power lines.
- Do not allow persons to touch the machine or its load before it is confirmed to be safe.
- When a machine is in contact with an overhead line, do not allow anyone to come near or touch the machine. Stay away from the machine and call for help.
- Never touch a person who is in contact with an energised power line.

If your machine comes into contact with overhead power lines:

- Stay in the operator seat while the machine is in contact with the power line.
- Warn personnel outside the machine to not touch any part of the machine and to stay away.
- Stay in the operator seat and lower any raised parts in contact with the overhead power lines, or drive the machine away from the overhead power lines if it is possible.
- If contact cannot be broken, stay in the operator seat until you know that the power is off.
- If you need to get out of the machine to call for help or because of fire, jump out as far as you can without touching any wires or the machine, stay upright, keep your feet together and hop to safety.

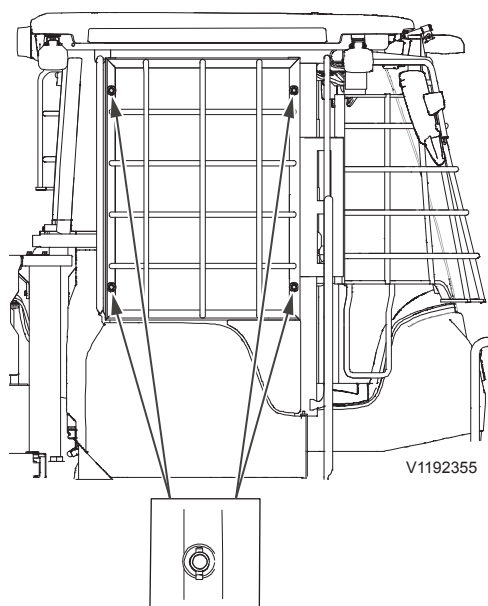
Failure to follow this instruction could result in electrocution or death!

Emergency exit



V1107270

Right side window from inside the cab



Pins to be removed

The cab has two emergency exits, the door and the right side window.

- 1 Break the window with the emergency hammer located on the cab pillar.
- 2 Press out the strip in the middle to exit the cab.

If the machine is equipped with "Side window protection"

- 1 Break the window as described above.
- 2 Remove the four pins that hold the window protection grill in place by holding on to the ring and pulling them out.
- 3 Press out the window protection grill.

Measures before operating



Risk of accidents.

Having the lever steering activated when operating on a public road could lead to accidents.

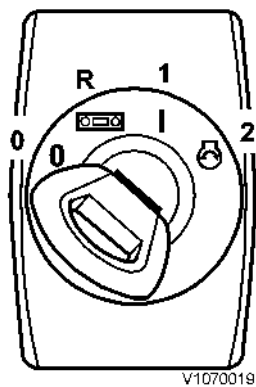
Do not use the lever steering when operating on a public road. Use the steering wheel.

- 1 Perform daily service, see page 247.
- 2 Clear the platform on the right side by the engine's air intake from snow and debris.
- 3 Check that the radiator is clean.
- 4 Check that the radiator casing and engine- and access covers are closed and secured.
- 5 Check that there are no persons near the machine, see page 128.
- 6 Close the door.
- 7 Fasten the seatbelt.
- 8 Check that there is sufficient fuel in the tank.
- 9 If the machine is cold, warm up the hydraulic system, see page 141.

After operating

- Fill the fuel tank, as this will counteract the formation of condensation water.
- Make sure that there is enough anti-freeze in the cooling system (see page 290) and in the washer fluid at temperatures below 0 °C (+32 °F).
- Remove the start key.

Starting engine

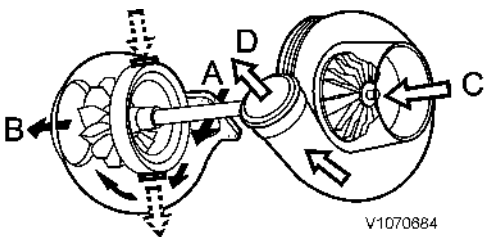


- 1 Place the gear selector in neutral.
- 2 Turn the key in the ignition to running position (1) so that a system test is run for about 4–5 seconds.
- 3 At the same time check that all lights turn on and that the gauges indicate readings.
- 4 Turn the ignition key to starting position (2). If the engine does not start, turn the key back to the "0" position, before making a new start attempt.
- 5 Check that all control and warning lights are off when the engine has started.
- 6 Let the engine idle for at least 30 seconds.
- 7 Check that the attachment is securely fastened to the machine by pressing it against the ground.
- 8 Sound the horn before releasing parking brake.
- 9 Release the parking brake.
- 10 Select gear position and increase the engine speed.

Turbocharger

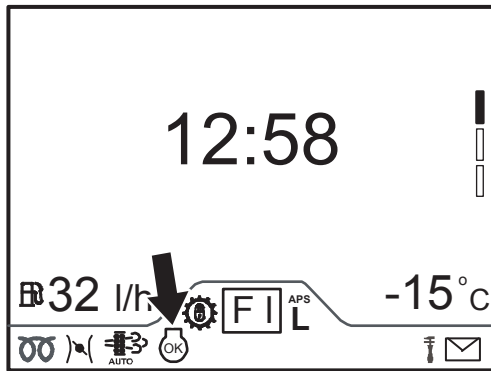
The turbocharger is lubricated by the engine's lubrication system.

Important for the function of the turbocharger is that:



A	Exhaust inlet
B	To exhaust system
C	Air inlet
D	Compressed air
 V1239019	Air
 V1239020	Lubrication oil
 V1239018	Exhaust

- lubrication is safeguarded by
 - not racing the engine immediately after it has been started.
 - letting the engine idle until **the OK-symbol turns green in the display** before turning it off.



V1142136

'OK' symbol

- engine oil is changed and oil filters are changed at prescribed intervals.
- the air cleaner is serviced regularly and the exhaust system and lubrication oil lines do not leak.

Change the turbocharger immediately if it generates noise or vibrations.

Work on the turbocharger should be performed by a qualified service technician.

Starting machine in cold weather (below 0 °C, 32 °F)

WARNING

Risk of explosion.

Spraying flammable starting aids into engine components could cause an explosion.

Never use starting aids while attempting to start the engine.

The preheating function is controlled by the machine's electronic system.

- 1 Turn the start key to running position (1).
- 2 If there is a need of preheating, the function will be activated automatically.
- 3 A symbol lights up on the front information display unit showing that preheating is engaged, see page 42.
- 4 When the symbol turns off, the engine can be started by turning the start key to starting position (2).
 - Let the engine run at low idle for at least 60 seconds.
 - Racing the engine immediately after it has been started may also jeopardise lubrication and cooling of the turbocharger, resulting in high risk of bearing seizure.

NOTE!

Do not use the working hydraulics at full speed until the hydraulic oil is warm. To warm up the hydraulic system, see page 141.

Starting with booster batteries

The following must be observed when 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.

WARNING

Risk of explosion.

Boost-start can cause flammable gas emission from the battery. Sparks near the battery can cause an explosion resulting in serious injury.

Avoid short-circuits, open flame or electrical spark. The machine being boost-started must not come in contact with the supplying machine.

WARNING

Risk of chemical burns.

Contact with battery acid causes serious chemical burns.

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

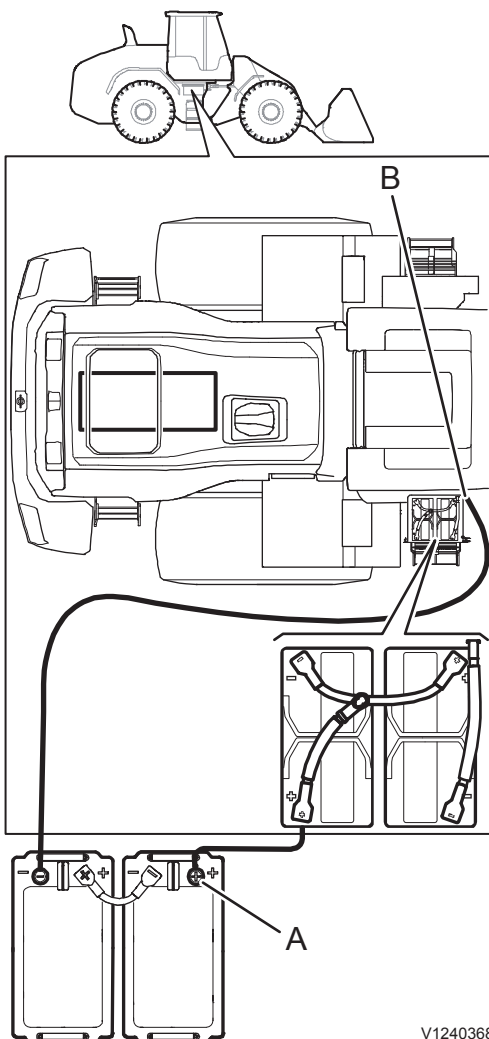
Check that the booster batteries or other power sources have the same voltage as the standard batteries.

- 1 Ensure that the machine is without electric power supply (voltage) by turning the battery disconnect switch to the OFF position.
- 2 Remove the bolts and the cover for the battery box.
- 3 Remove the terminal cap from the left battery's plus terminal.
- 4 Connect the plus side (A) first, from (+) on the booster battery to (+) on the machine's start battery.
- 5 Then connect minus side (B) from (-) on the booster battery to the ground point (bolt) at the battery box on the machine.
- 6 Turn the battery disconnect switch to the ON position.

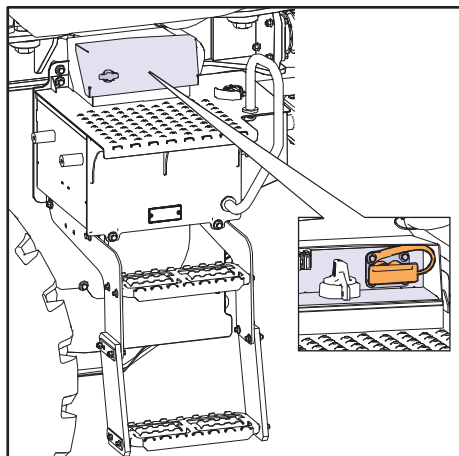
NOTE!

Install the cables 5-10 minutes before starting the engine.

- 7 Start the engine with the start key in the cab.
- 8 Leave the booster batteries connected 5-10 minutes after the engine has started.
- 9 First disconnect the minus side (B) starting with the ground point.
- 10 Then disconnect the plus side (A) starting with the machine's start battery.
- 11 Reinstall the terminal caps on the battery terminals.
- 12 Reinstall the cover for the battery box.



V1240368



V1240369

Jump-start connection

Jump-start connection

(Optional equipment)

The machine may be equipped with a jump-start connection (24 V) located on the machine's right-hand side.

- 1 Ensure that the machine is without electric power supply (voltage) by turning the battery disconnect switch to the OFF position.
- 2 Ensure that the supporting vehicle is without electric power supply (voltage).
- 3 Connect a suitable cable with a SAE J1283 connector to the jump-start connection on the machine.
- 4 Connect the other end of the cable to the supporting vehicle.
- 5 Start the engine on the supporting vehicle.
- 6 Turn the battery disconnect switch to the ON position on the machine.

NOTE!

Wait 5-10 minutes before starting the engine on the machine.

- 7 Start the engine on the machine with the start key in the cab.
- 8 Let both engines run for 5–10 minutes.
- 9 With both engines running, remove the SAE J1283 connector from the jump-start connection on the machine.
- 10 Remove the other end of the cable from the supporting vehicle.

Engine block heater

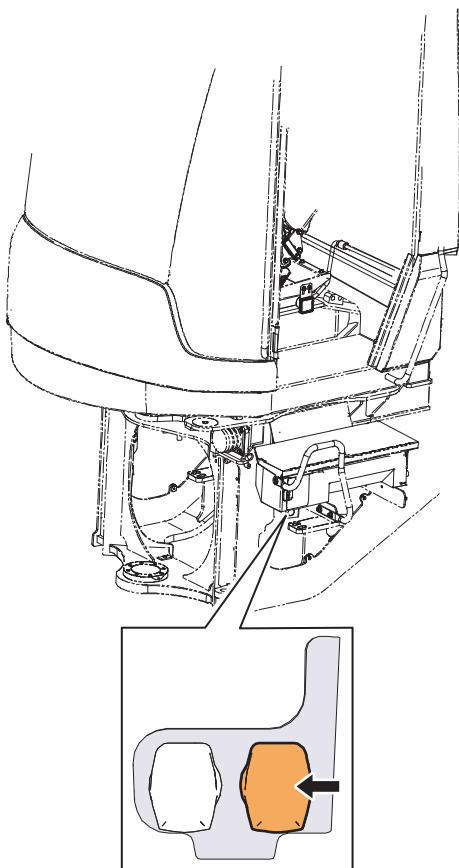
(Optional equipment)

This equipment is used to reduce the engine load that causes wear in the engine when it is started in areas with cold weather.

Recommended connection time for engine block heater				
°C	–20°C (–4°F)	–10°C (+14°F)	0°C (+32°F)	+10°C (+50°F)
Hours	3	2	1	1

NOTE!

For extra safety, use a ground fault interrupter (GFI) on the wall outlet and check for any damage on the connecting cable.



V1240403

Connection for engine block heater (located to the left of the steps)

Hydraulic system, warming up

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.

The oil is viscous when it is cold, therefore the machine's hydraulic functions can move slower than when the oil is warm.

If one or several machine functions are run against their end-positions without first warming up the system, this can cause unexpected movements, machine damage, and malfunctions.

NOTICE

Do not rush warming of the oil, since forced warming can damage the machine.

Warm up the hydraulic oil to operating temperature, 45–55 °C (113–131 °F). The temperature is checked on the display.

Warm-up can take place with or without attachment, but no load should be carried.

- 1 Check that there is no load in the bucket or on the attachment and that the frame joint lock is disconnected.
- 2 Turn the start key to position 1.
- 3 Press key 3 (hydraulics) on the keypad and check the temperature in the display.
- 4 Start the engine.

NOTE!

Use the hydraulics carefully if the oil is cold.

- 5 Tilt fully forward and lift the attachment to maximum lift height.
- 6 Tilt back fully and lower the attachment to the ground.
- 7 Turn the steering wheel alternately to left and right full lock.
- 8 Repeat steps 5–7 until the oil has reached operating temperature.

Mirrors

Front view mirrors

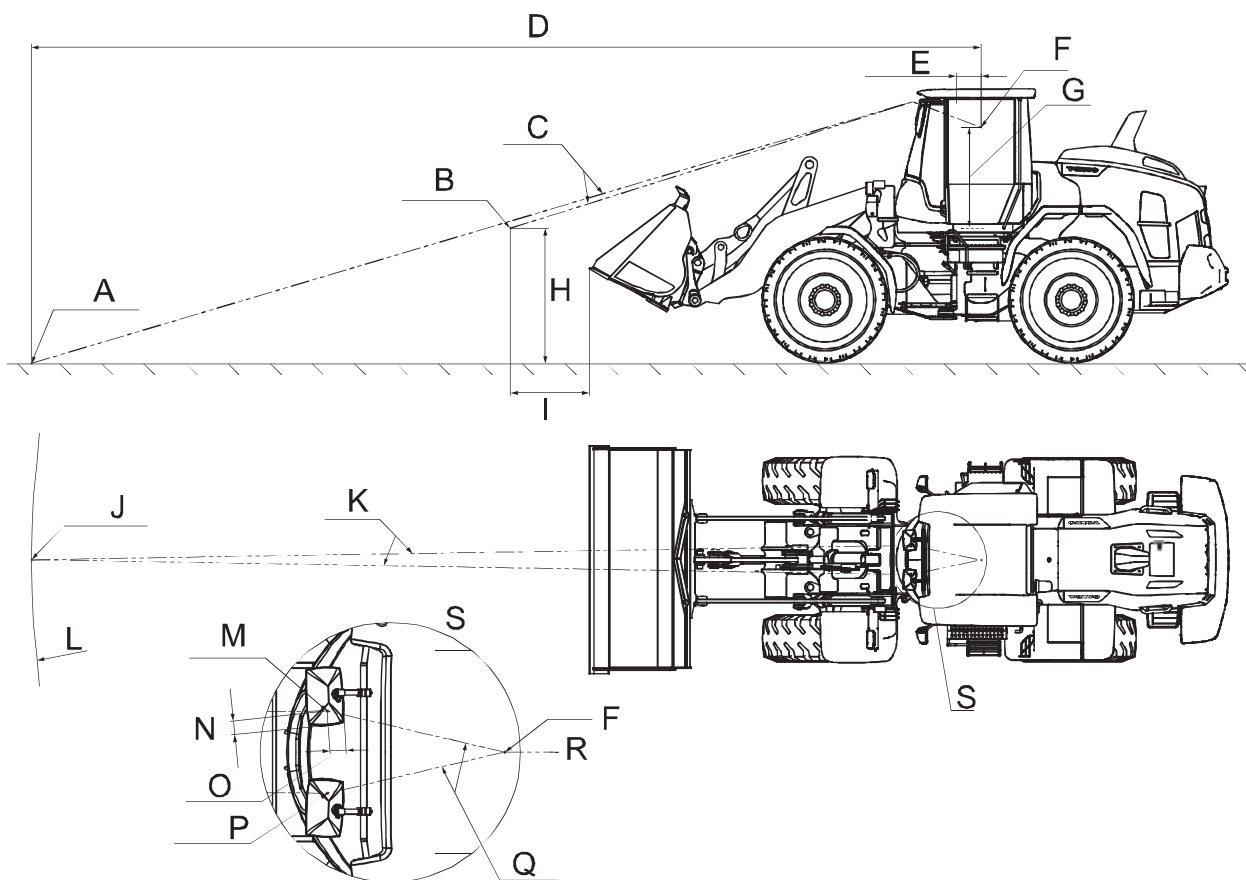
(Optional equipment)

Adjust the front mirrors as follows:

- 1 Locate a fixed object at point A
- 2 Position the bucket in the corresponding position
- 3 Check that the object in A can be seen from both mirrors.
- 4 If the object in A cannot be seen from both mirrors, adjust them until the object in A is visible in both mirrors.

NOTE!

Adjust the mirrors so that the object in point A is seen in the middle of the mirror and approx. 1/4 from the inner edge of the mirror. Point A must be visible in both mirrors. See detail S.



V1146802

- A Legal requirement
- B Legal requirement
- C Line of sight
- D Radius 12 m (39.4 ft)
- E 295 mm (11.6 in) behind cab pillar
- F Eye position
- G 1,19 m (3.9 ft) from floor
- H 1,5 m (4.93 ft)
- I 1,0 m (3.28 ft)
- J Point A from ground level
- K Line of sight
- L Radius 12 m (39.4 ft)
- M Point A in mirror
- N 1/4 of mirror width
- O 1/2 of mirror length
- P Point A in mirror

Q Line of sight
R Centre line, cab
S Front mirrors

Rear view mirrors, roof mounted

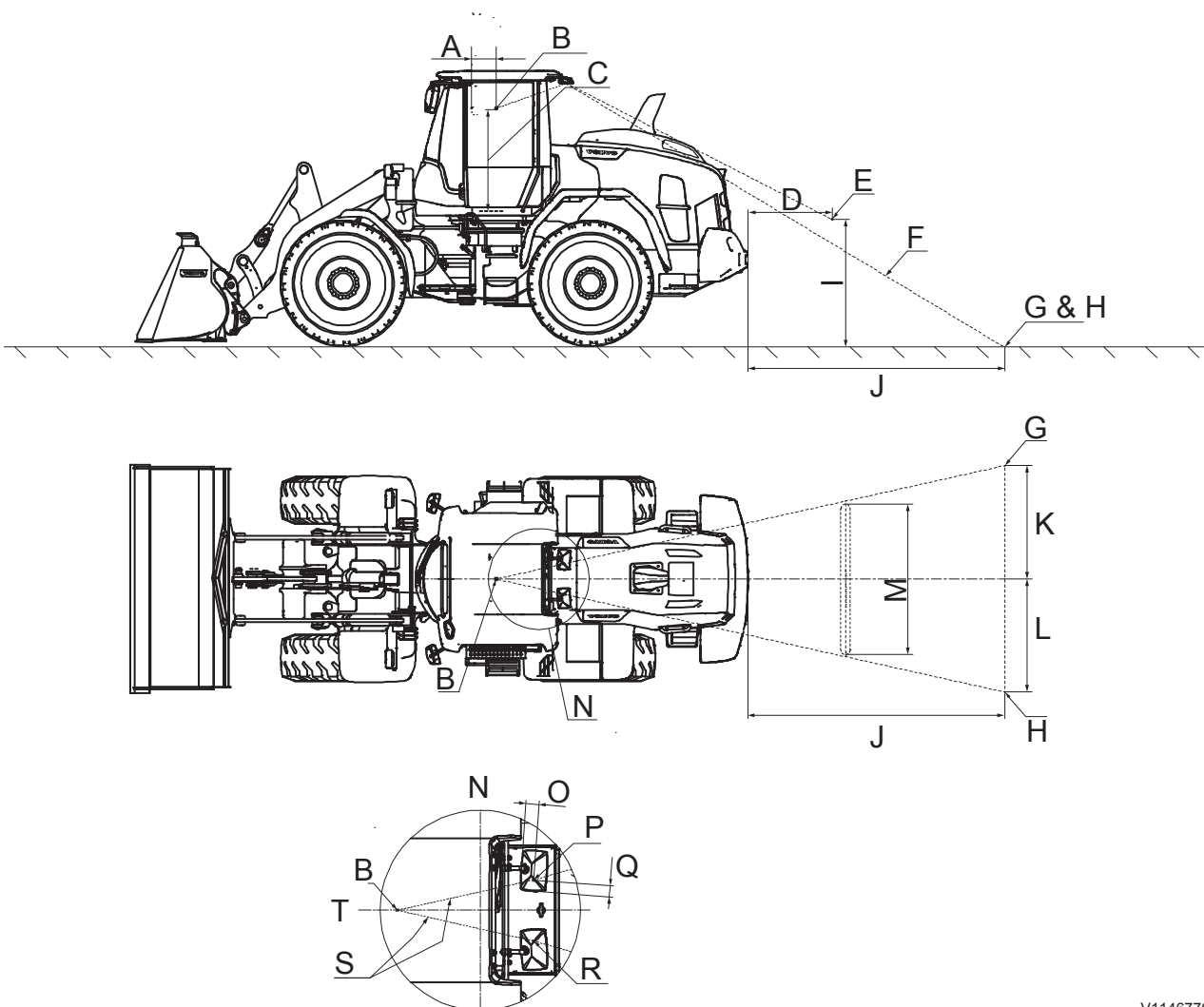
(Optional equipment)

Adjust the rear mirrors as follows:

- 1 Locate fixed objects at points G and H.
- 2 Check that the object in G can be seen from the right rear mirror.
- 3 If the object in G cannot be seen from the right rear mirror, adjust it until the object in G is visible in the right rear mirror.
- 4 Check that the object in H can be seen from the left rear mirror.
- 5 If the object in H cannot be seen from the left rear mirror, adjust it until the object in H is visible in the left rear mirror.

NOTE!

Adjust the right rear mirror so that the object in point G is seen in the middle of the mirror and approx. 1/4 from the inner edge of the mirror. Adjust the left rear mirror so that the object in point H is seen in the middle of the mirror and approx. 1/4 from the inner edge of the mirror. See detail N.



- A 295 mm (11.6 in) behind cab pillar
B Eye position rear mirrors
C 1,19 m (3.9 ft) from floor
D 1,0 m (3.28 ft)
E Legal reference point
F Visibility reference line

- G Right reference ground point
- H Left reference ground point
- I 1,2 m (3.93 ft)
- J 3,0 m (9.84 ft)
- K 1,1 m (3.61 ft)
- L 1,1 m (3.61 ft)
- M Real visibility width on "rectangular 1 m boundary" with rear-view mirror
- N Rear-view mirrors
- O 1/2 of mirror length
- P Point G in mirror
- Q 1/4 of mirror width
- R Point H in mirror
- S Line of sight
- T Centre line, cab

Rear view mirrors

Main rear view mirrors

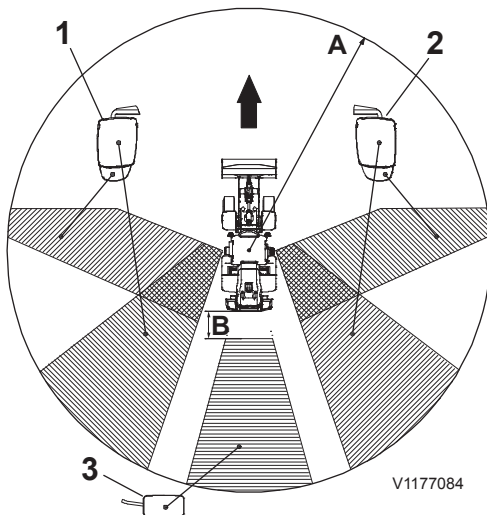
The mirrors are mounted inside and outside the cab and provide additional visibility around the machine.

The outside mounted mirrors are available in two types – mirrors on standard arm and mirrors on long arm.

Adjusting

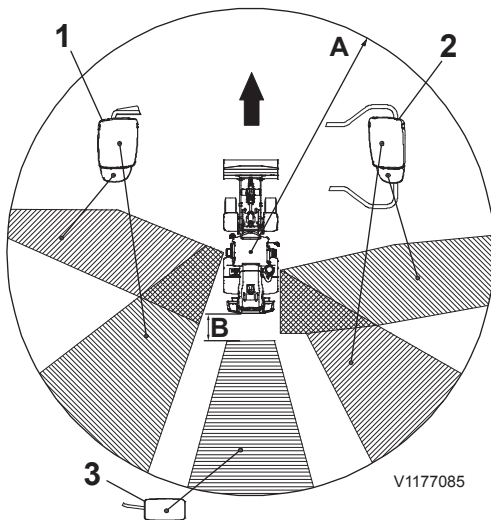
Adjust the mirrors to provide the best possible visibility as follows:

Adjust the left outside rear view mirror (1) and the right outside rear view mirror (2) to cover as much as possible of the visibility zones on both sides of the machine.



Visibility zones for mirrors on standard arms

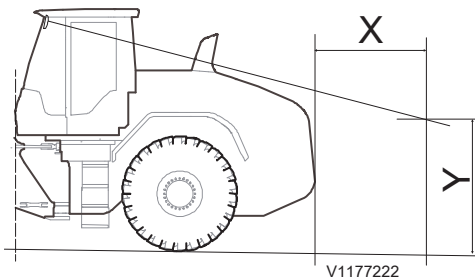
- A. 12 m (39.4 ft)
- B. 1,0 m (3.28 ft)
- 1. Left outside rear view mirror
- 2. Right outside rear view mirror
- 3. Inside rear view mirror



Adjust the inside mirror (3) to cover as much of the visibility zone to the rear of the machine. Make sure that it is possible to see any objects from 1,2 m (3.94 ft) vertical distance from the ground at 1,0 m (3.28 ft) distance from the rear side of the machine.

Visibility zones including right rear view mirror on long arm

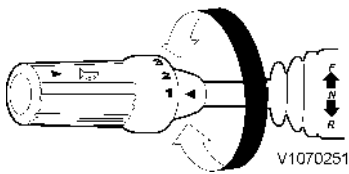
- A. 12 m (39.4 ft)
- B. 1,0 m (3.28 ft)
- 1. Left outside rear view mirror
- 2. Right outside rear view mirror on long arm
- 3. Inside rear view mirror



- X = 1,0 m (3.28 ft)
- Y = 1,2 m (3.94 ft)

NOTE!

Various equipment mounted on the outside of the machine can affect and reduce the visibility from the cab.



Gear shifting

- Select a suitable gear by turning the gear selector to the desired gear position and then select travel direction forward or reverse.

NOTE!

The transmission can drive the machine with a gear engaged, even at idle rpm, if the parking brake is not applied.

Directional gear

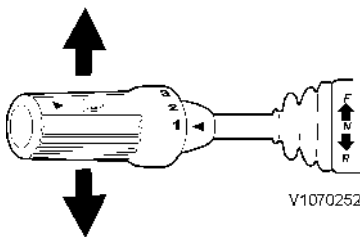
WARNING

Risk of runaway machine.

Leaving the transmission in neutral when driving downhill could lead to loss of machine control and fatal accidents.

Always have a forward gear engaged when driving downhill.

The power transmission can be damaged and you can lose control of the machine if the transmission is shifted to neutral when operating downhill.



WARNING

Risk of serious injury.

Uncontrolled machine movement could cause serious injury.

Never leave the machine with the gear selector in the forward or reverse position while the engine is running.

Lever in position N = Neutral

Lever in position F = Forward operation

Lever in position R = Reverse operation

When changing from forward to reverse or vice versa, the machine's speed and the engine rpm should be reduced as much as possible, especially if the machine is working on solid ground.

Shifting between forward and reverse may only take place in 1st and 2nd gear.

Automatic shifting (APS)

The APS-function is available on the display, see page 60.

The mode selector allows the machine operator to select different automatic shifting programs (modes) depending on the operating conditions.

Operating with APS

- Select gearshifting program (Auto-mode is recommended)
- Select directional gear.
- Accelerate, the machine starts in 2nd gear (basic gear).
- Upshifting and downshifting takes place between 2nd – 4th gear forward and reverse.
- When travel direction has been changed, the machine will start in 2nd gear.
- Downshifting to 1st gear, see "Fully automatic downshifting (1–4) FAPS", page 84 or "Kick-down function" on page 147.

Light-mode and Medium-mode

- Mode "Light" means that shifting will take place at low engine rpms and machine speed.
- Mode "Medium" means that shifting will take place at slightly higher engine rpms and machine speed.
- With the accelerator pressed down all the way, upshifting takes place according to mode "Heavy".
- Optimal use is obtained with less throttle application since the difference in upshifting rpms between the different modes (Light, Medium, and Heavy) becomes clear.
- Gives lower fuel consumption.

Heavy-mode

- The machine does not shift until higher engine and travel speeds have been reached.
- Preferably used in cases where the machine changes gears up and down (gear-hunting) when operating uphill or at high rolling resistance.

Auto-mode

- The machine chooses APS-program according to the operator's operating method.

Kick-down function

Kick-down is obtained, if the gear selector is in position 2, 3, or 4 and one of the kick-down buttons is pushed.

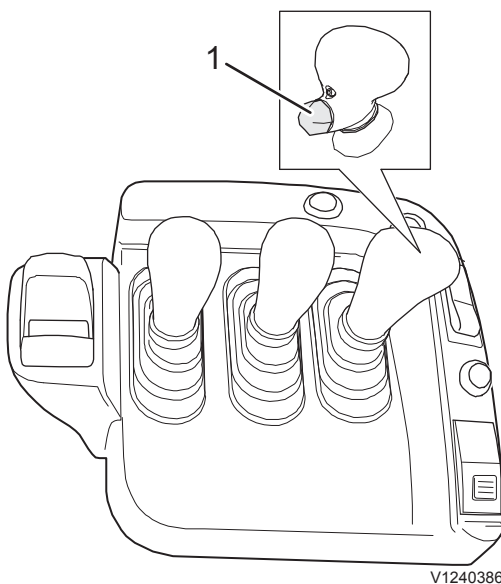
- When the kick-down button is pressed, 1st gear will be engaged if machine speed already is below 8 km/h (5 mph) or if the speed drops below 8 km/h (5 mph) within 8 seconds after the button was pressed.
- 1st gear remains engaged unless there is a new activation of the kick-down function or if the engine rpm is fulfilled in relation to the machine speed. The level for engine rpm is set with the APS-function on the display.
- If the travel direction changes, the machine will start in 2nd gear, if automatic shifting mode is selected.
- If the Boom Suspension System (BSS) is set to gear depending mode, it is deactivated automatically when downshifting to 1st gear and manual or FAPS is selected.

NOTE!

The machine will automatically downshift to 1st gear even in gears 2–4 (see "Fully automatic downshifting, FAPS" on page 84) in a situation when the machine needs 1st gear, for example, operating on steep uphill grades or with high rolling resistance when 2nd gear does not provide enough rimpull. However, this downshift only takes place with the accelerator pedal in Power mode, see "Accelerator pedal" on page 95.

NOTE!

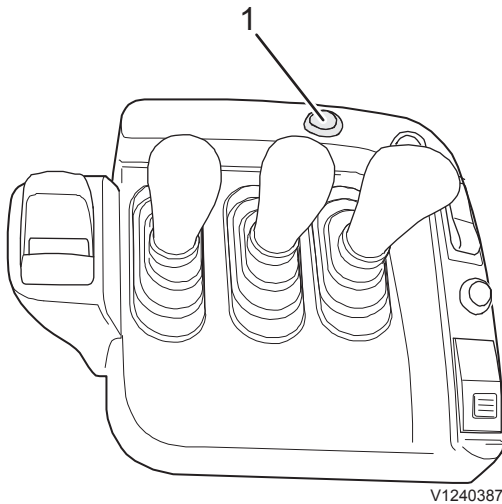
The kick-down function is also available on other levers than shown in the illustration here, see page 95, and if the machine is equipped with Comfort Drive Control (optional equipment), the kick-down function is also available on the armrest, see page 150.



1 Kick-down



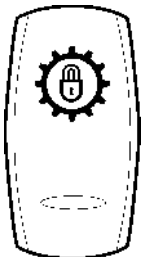
V1192880



1 Engine brake/downshifting



V1192881



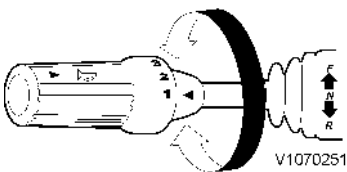
V1082882

Switch, Lock-up



V1082857

Control light, Lock-up



V1070251

Gear selector

Engine braking / downshifting

Using the button for engine brake/downshifting enables immediate downshifting in one or two steps or to prevent unwanted upshifting. In this way the warming up of the axle oil is reduced.

- One press of the button at higher speeds results in downshifting from 4th to 3rd gear.
- Another press of the button at a lower speed results in downshifting to 2nd gear.

NOTE!

If certain critical rpms and machine speeds are exceeded, upshifting takes place.

- Under these circumstances, lower the speed, or select a higher gear to reduce the engine speed.

NOTE!

The engine braking / downshifting function is also available on other levers than shown in the illustration here, see page 95.

Lock-up, gearshifting sequence

In order to enable direct-clutch in the torque converter (Lock-up), the function must be activated first.

- Switch, upper part pressed in = function for Lock-up, direct-drive clutch in the torque converter is activated. The control light in the middle instrument is on when the direct-drive clutch (Lock-up) is engaged, see page 42.
- Switch, lower part pressed in = Lock-up deactivated.

Gear selector, positions

Automatic Lock-up is available in 2nd, 3rd, and 4th gear. For some machines and applications it is also available in 1st gear, this will be shown as an option in the Transmission menu, see page 56. For all other machines Lock-up in 1st gear can only be activated when the gear selector is in position 1.

Tips for use

When dozing, for example, snow removal, Lock-up on gear 1 or 2 can be used for lower fuel consumption.

In Automatic mode the machine is programmed to read off the transport distance and, at a transport distance shorter than 15 metres, to select High mode which prevents activation of Lock-up in short cycle loading. However, it takes 4 work cycles before the machine has adapted the program (work mode).

For transport distances longer than 15 metres the machine immediately selects Medium mode, and for longer distances than 75 metres the machine selects Light mode for faster upshifting and activation of Lock-up.

Steering

NOTE!

In case the engine stops, stop the machine immediately and apply the parking brake.

The machine is frame-steered (articulated) and has a hydrostatic steering system.

Secondary steering

The machine is equipped with a secondary steering system. Follow national legislation and regulations.

NOTE!

In case of display text:

"WARNING - LOW STEERING OIL PRESSURE"

Stop the machine immediately and contact a qualified service technician.



V1092474

WARNING - LOW STEERING OIL PRESSURE

Comfort Drive Control, CDC (optional equipment)



Risk of serious injury.

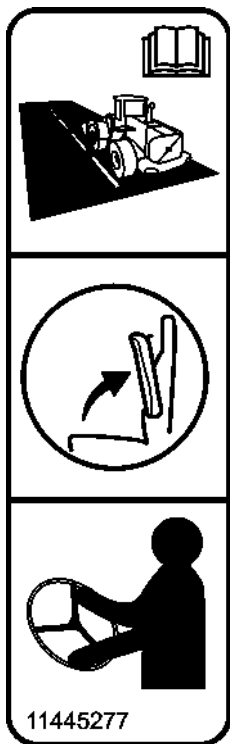
Unexpected behaviour of joystick steering could cause loss of machine control.

The steering wheel remains functional when joystick steering is in use. Immediately begin steering with the steering wheel if joystick steering does not respond as expected.

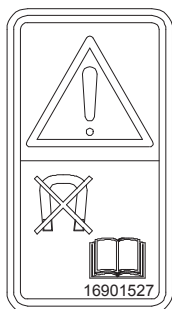
- Comfort Drive Control (CDC) must not be used when travelling on public roads, see page 131.

NOTICE

When working in areas with risk of electromagnetic fields, EMF, Comfort Drive Control (CDC) shall always be deactivated.



V1070689



V1202831

16901527

See page 194.

By changing between using lever steering and the steering wheel, the operator obtains a more varied movement pattern.

The system consists of a folding armrest where three functions are concentrated, i.e., steering, forward/reverse and kick-down function. The system is activated with the button on the armrest (see the next page). The armrest must be lowered in order to be able to activate the function.



V1074316

CDC is deactivated by raising the armrest or by moving the gear selector from neutral position.



V1069836

Control light, CDC



V1074316

CDC is deactivated by raising the armrest or by moving the gear selector from neutral position.

CDC is deactivated by raising the armrest.

The CDC function is also deactivated when the gear selector is moved from neutral position.

The control light on the instrument panel turns on when CDC is activated. The light flashes if the speed is over 20 km/h (12.4 mph).

The function of the steering wheel always remains functional and has priority over the CDC function. This means that if you attempt to steer to the right with the CDC and to the left with the steering wheel, the machine will steer in the direction the steering wheel movement.

NOTE!

Deactivate the CDC if the text "CDC failure" is shown on the display and bring the machine to a safe stop using the steering wheel.

NOTE!

When operating the machine with CDC, the recommended max. speed is 20 km/h (12.4 mph).

1 Activating (CDC)

In order to be able to use the steering, forward/reverse and kick-down functions from the armrest, the armrest must be lowered and the system activated with button 1.

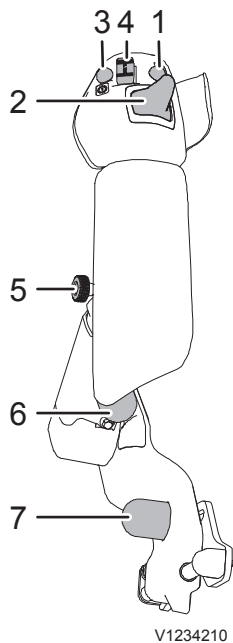
Before activation is possible, these actions must also be performed:

- The armrest must be lowered to its lowest position.

NOTE!

In certain positions the armrest must be moved to the right, in towards the seat in order to reach its lowest position.

- The directional gear selector on the armrest, the ordinary gear selector, and the F/N/R-control by the lever carrier must be in neutral position.
- The engine must be running, but the machine must be stationary.
- When the system is activated, a control light on the instrument panel is on.



V1234210

- 1 Activating CDC
- 2 Steering lever
- 3 Kick-down button
- 4 Directional gear selector
- 5 Adjustment of armrest, forward and backward
- 6 Adjustment of armrest, sideways
- 7 Adjustment of armrest, height (up and down)

NOTE!

CDC is deactivated by raising the armrest. CDC is also deactivated by moving the gear selector from neutral position.

2 Joystick (steering lever)

Very little physical effort is required to operate the joystick. The steering speed is proportional to the deflection (stroke) of the lever. The steering wheel's function always remains operational.

3 Kick-down button

With the kick-down button pressed in = The machine downshifts to 1st gear if the gear selector is in either of positions 2, 3 or 4. Other instructions, see page 147.

4 Directional gear selector

Switch, front part pressed down = Forward drive.

Switch, rear part pressed down = Reverse drive.

There is a neutral position between the forward and reverse positions.

NOTE!

The ordinary gear selector control always has priority, i.e., if the ordinary gear selector is actuated, the selection made from the armrest is cancelled.

5 Adjustment of armrest, forward and backward

Loosen the lock knob and adjust the armrest forward or backward to desired position, tighten the lock knob.

6 Adjustment of armrest, sideways

Loosen the lock knob and adjust the armrest sideways to desired position, tighten the lock knob.

7 Adjustment of armrest, height (up and down)

Loosen the lock knob and adjust the armrest's height to desired position, tighten the lock knob.

Braking

NOTICE

Risk of machine damage.

Using the transmission's disengagement function in transport operation could lead to machine damage.

Do not use the transmission's disengagement function in transport operation.

Brake smoothly. This is especially important when operating with a load and on slippery ground. If required during certain operations, automatic transmission disengagement can be obtained when braking. Activation of this function is performed on the display, see page 56.

Engine braking using the downshift button is advantageous, especially when operating downhill. In this way it is possible to reduce warming of the axle oil, see page 147.

Brake test

(Checking service brakes)

WARNING

Risk of accidents.

Performing the brake test in hazardous areas could lead to accidents.

Only perform the brake test in areas where it is no risk of accidents.

The brake test is performed using computer software, which measures the machine's average retardation. The test can be run by the machine operator from the display unit.

NOTE!

The brake test must be done in a place where there is no risk of injuries to personnel or damage to equipment. The ground must be clean and have good friction (dry asphalt or similar). The machine must not be loaded.

- 1 Press and hold in key 8 (service) on the keypad for approximately 4 seconds. A message will appear when you enter service mode.
- 2 Engage gear position F and accelerate when the text "Accelerate above 20 km/h" is shown on the information display, brake maximally when the text "Brake to standstill" is shown on the information display.
The retardation value is shown on the information display.
- 3 If the wheels lock and slide on the ground surface, the test has to be repeated.
- 4 The three most recent test values are saved in "Brake test log".

Minimum retardation value for brake test: 5 m/s² (0.51 g)

NOTE!

The value according to specifications is to be considered as an absolute minimum value. In case reduced brake function is suspected, contact a qualified service technician.

Parking brake function, checking



Risk of crushing!

Unexpected machine movement could lead to serious injury.

Never perform parking brake test when persons are located in the danger zone.

Check the function according to the following:

- 1 Make sure that the gear selector is in neutral position.
- 2 Turn on the ignition and apply the parking brake. Make sure that the transmission disengagement function is not activated, see page 56 for more information.
- 3 Hold in the key for service on the keypad to access the menus for service.
Activate APS-settings Service. Press ESC on the keypad to see the rpm in the display.

NOTE!

Before software version BL24, the APS setting is set in the Transmission menu (2). After software version BL24, the APS setting is set in the Setup menu (9), in Personal Settings.

- 4 Start the engine and select gear F1. The following message should be shown in the display:

Parking brake test

Active

- 5 Press down the accelerator pedal slowly to 1200 rpm. The machine should not move.
- 6 If the machine moves, contact a qualified service technician.

Exhaust aftertreatment system

Regeneration

NOTE!

Only applicable for machines with engine D6J.



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.

The purpose of regeneration is to increase the temperature in the aftertreatment system so that any trapped substances, for example soot, are combusted to allow the system to regain its full capacity. There are two types of regeneration: passive and parked regeneration. Most of the regeneration is passive and does not involve any operator interaction.

Passive regeneration

A passive regeneration is what takes place during normal operation. When the engine is running, the heated exhaust heats EATS. A passive regeneration does not involve any operator interaction. It takes place continuously and does not have any start or stop. However, regeneration effectiveness is increased by the temperature of the exhaust.

NOTE!

Idle engine a lot or running machine with very low load can cause problems to run passive regeneration.

No information is shown to the operator on the instrument panel until there is a need for a parked regeneration.

Service regeneration

If the parked regeneration is not performed within 625 hours since the last parked regeneration, the engine performance is significantly reduced and a service regeneration has to be performed. Service regeneration is the same as parked regeneration, but has to be performed by a service technician with Tech Tool.

Parked regeneration

If the passive regeneration is not sufficient to reduce the soot load, or if too long time has passed since the last parked regeneration, a parked regeneration is requested. A parked regeneration must be performed every 500 ± 50 hours in order to ensure complete removal of the soot load. This will be performed at the engine oil change interval (before changing the engine oil) in the machine service program.

NOTE!

If the regeneration is not performed within 625 hours since the last parked regeneration, a service regeneration with Tech Tool will be required. At the service interval 500 ± 50 hours, 1000 ± 50 hours, 1500 ± 50 hours etc it is possible to start a parked regeneration from the machine display (the menu is not visible outside these intervals).



V1083542

HEST-light (High Exhaust Temperature) (shown when a parked regeneration is in progress)

Parked regeneration requires operator interaction. No work can be performed with the machine during a parked regeneration which takes approximately 45 minutes to run.

A parked regeneration requires that:

- The engine is running (during the entire parked regeneration)
- The engine has reached sufficient working temperature
- The machine is parked in a fireproof area
- The parking brake is applied (during the entire parked regeneration)

The HEST (High Exhaust Temperature) light is on, see symbol, to indicate that a parked regeneration is in progress and that the exhaust temperature is high. Do not turn off the engine when the HEST-light is on!

NOTE!

The machine must be in an area that is not heat-sensitive when the HEST-light is on.

The engine speed will be changed to a predefined value and cannot be affected by the operator. The reason for this is that the engine speed and load levels must remain constant. It is not recommended to interrupt or cancel an ongoing parked regeneration other than in emergency situations. For example, if the parking brake is released, the regeneration will be interrupted immediately and will have to be restarted to be run successfully. If the regeneration is not performed as requested for some reason, eventually the engine protection function, in the form of derate, is activated.

Start a parked regeneration

NOTE!

First make sure that following conditions are fulfilled:

- The engine is running (during the entire parked regeneration)
- The engine has reached sufficient working temperature
- The SCR system must be active (defrosted)*
- The machine is parked in a fireproof area
- The parking brake is applied (during the entire parked regeneration)

*) When operating under cold conditions it can take up to 70 minutes before the SCR system is defrosted.

During normal operation, when the machine requests a parked regeneration, it can be started using the regeneration switch, see page 84. At the service interval 500 ± 50 hours, 1000 ± 50 hours, 1500 ± 50 hours etc it is possible to start a parked regeneration from the machine display (the menu is not visible outside these intervals), see page 53.

Cancel a parked regeneration

A parked regeneration can be cancelled by pressing the lower end of the regeneration switch, see page 84.

NOTE!

Only cancel a parked regeneration in case of an emergency.

A message will appear in the display when regeneration is cancelled, see messages in the table further down.

Regeneration is cancelled automatically when:

- a malfunction occurs
- the engine is turned off
- the parking brake is released.

Possible consequences if the regeneration is not performed:

- engine derate.
- higher fuel consumption.
- shorter lifetime of diesel particulate filter.
- damage to the aftertreatment system.

Alarms that require specific action			
Text on display	Display indication	Alarm level	Action
Regeneration cancelled	Warning, amber   V1135633	- buzzer sounds - amber central warning on	1 Restart regeneration when possible.
REDUCE ENGINE SPEED Parked regeneration needed	  V1128635	- buzzer sounds - amber central warning on	1 Reduce engine speed. 2 Park the machine in a non-heat sensitive area. 3 Apply the parking brake. 4 Start regeneration.
PARK SOON Parked regeneration needed	Warning, amber   V1128635	- buzzer sounds - amber central warning on	1 Park the machine in a non-heat-sensitive area. 2 Apply the parking brake. 3 Start regeneration. NOTE! Regeneration is cancelled if the parking brake is released or the engine is turned off. NOTE! The idle rpm will be increased during the entire regeneration process.
START REGENERATION Parked regeneration possible	Warning, amber   V1128635	- buzzer sounds - amber central warning on	1 Park the machine in a non-heat-sensitive area. 2 Apply the parking brake. 3 Start regeneration. NOTE! Regeneration is cancelled if the parking brake is released or the engine is turned off. NOTE! The idle rpm will be increased during the entire regeneration process.
KEEP MACHINE PARKED Regeneration ongoing	Warning, amber   V1128635	- buzzer sounds - amber central warning on	1 Keep the machine parked.

PARK MACHINE Parked regeneration required	Warning, amber   V1128635	- buzzer sounds - amber central warning on - engine derate is activated (but is restored after a completed regeneration)	1 Park the machine in a non-heat-sensitive area. 2 Start regeneration when possible. NOTE! Regeneration is cancelled if the parking brake is released or the engine is turned off. NOTE! The idle rpm will be increased during the entire regeneration process.
Regeneration cancelled	Warning, amber   V1135633	- buzzer sounds - amber central warning on - engine derate is activated (but is restored after a completed regeneration)	1 Restart regeneration when possible.
PARK SAFELY Service regeneration needed Derate active	Warning, red   V1128638	- buzzer sounds - red central warning on - engine performance is significantly reduced (but is restored after a completed regeneration)	1 Park the machine in a non-heat-sensitive area. 2 Turn off the engine. 3 Contact an authorized dealer.
PARK MACHINE Service needed Derate active	Warning, red   V1128638	- buzzer sounds - red central warning on - engine performance is significantly reduced	1 Park the machine in a non-heat-sensitive area. 2 Turn off the engine. 3 Contact an authorized dealer.

The alarms in the table below can be shown in connection with the alarms in the table above.

APPLY PARKING BRAKE Regeneration needed	Warning, amber   V1128635	- buzzer sounds - amber central warning on	1 Park the machine in a non-heat-sensitive area. 2 Apply the parking brake. 3 Start regeneration.
Regeneration not needed	information, blue   V1088268	- buzzer sounds - blue central warning on	1 No action required.

CONTINUE OPERATION Low temperature Regeneration pending	Warning, amber   V1128635	- buzzer sounds - amber central warning on	1 Continue operation to warm up.
SERVICE NEEDED Regeneration not possible System failure	Warning, amber   V1128635	- buzzer sounds - amber central warning on	1 Contact an authorized dealer.

Emission compliance

NOTE!

Only applicable for machines with engine D6J.

The aftertreatment system is monitored by diagnostic systems in the control units to ensure reduced emissions. If the system does not meet the emission requirements, it should not be possible to use the machine for work as usual. This takes place by a reduction of engine power (derate).

Engine power is reduced if:

- The level in the AdBlue®/DEF tank is too low
- AdBlue®/DEF is of low quality
- There is a problem/malfunction with the aftertreatment system

There are two levels of engine power reduction (derate) that are activated after a certain time depending on the type of problem, as well as if the malfunction reoccurs or not.

Restoring engine function

If the engine is restarted (key off, key on) with an active engine derate, it can achieve full engine power for 10 minutes twice for derate level 1. This can be used if a limp home mode is encountered and the machine has to be moved. This will not extend the time for activation of derate level 2. As soon as derate level 2 is reached it will not be possible to use restored operation.

During restored operation, full engine speed and torque is available for 10 minutes. After that the engine will return to its previous reduction level within one minute. If the engine is shut down in this state and the cycle time for restored operation has not ran out, it will be saved to be used when the engine is restarted.

Exhaust aftertreatment system, alarms requiring special actions

NOTE!

The display text will show "AdBlue®" in machines for the European market and the Chinese market, and "DEF" in machines for the US market.

AdBlue®/DEF level monitoring		
Display figure	Alarm level	Action
—	- solid symbol	1 Turn off the engine. 2 Fill AdBlue®/DEF in the AdBlue®/DEF tank.
Refill AdBlue  V1126376 AdBlue empty Derate active Full derate in -- min ^(a)	- buzzer sounds 4 times - amber central warning on - flashing symbol - torque reduction	1 Turn off the engine. 2 Fill AdBlue®/DEF in the AdBlue®/DEF tank.
Park safely  V1126376 AdBlue empty Full derate soon	- buzzer sounds continuously - red central warning on - flashing symbol - torque reduction	1 Turn off the engine. 2 Fill AdBlue®/DEF in the AdBlue®/DEF tank.
Refill AdBlue  V1126376 AdBlue empty Full derate active	- buzzer sounds continuously - red central warning on - flashing symbol - forced idle or torque and speed reduction (depending on market)	1 Turn off the engine. 2 Fill AdBlue®/DEF in the AdBlue®/DEF tank.

a) Countdown only visible for the Chinese market

AdBlue®/DEF quality monitoring		
Display figure	Alarm level	Action
Replace AdBlue  V1126376 Wrong AdBlue quality Derate soon Derate in -- h^(a)	- buzzer sounds 4 times - amber central warning on - solid symbol	1 Contact an authorized dealer.
Replace AdBlue  V1126376 Wrong AdBlue quality Derate active Full derate in -- h^(b)	- buzzer sounds 4 times - amber central warning on - flashing symbol - torque reduction	1 Contact an authorized dealer.
Park safely  V1126376 Wrong AdBlue quality Full derate soon	- buzzer sounds - red central warning on - flashing symbol - torque reduction	1 Contact an authorized dealer.
Replace AdBlue  V1126376 Wrong AdBlue quality Full derate active	- buzzer sounds - red central warning on - flashing symbol - forced idle or torque and speed reduction (depending on market)	1 Contact an authorized dealer.

a) Countdown only visible for the Chinese market

b) Countdown only visible for the Chinese market

SCR-system failure monitoring		
Display figure	Alarm level	Action
Check SCR-system  V1201756 SCR-system failure Derate in -- h ^(a)	- buzzer sounds 4 times - amber central warning on - solid symbol	1 Contact an authorized dealer.
Check SCR-system  V1201756 SCR-system failure Derate active Full derate in -- h ^(b)	- buzzer sounds 4 times - amber central warning on - flashing symbol - torque reduction	1 Contact an authorized dealer.
Park safely  V1201756 SCR-system failure Full derate soon	- buzzer sounds - red central warning on - flashing symbol - torque reduction	1 Contact an authorized dealer.
Check SCR-system  V1201756 SCR-system failure Full derate active	- buzzer sounds - red central warning on - flashing symbol - forced idle or torque and speed reduction (depending on market)	1 Contact an authorized dealer.

a) Countdown only visible for the Chinese market

b) Countdown only visible for the Chinese market

Valid for European and US market only:

DPF-system failure monitoring		
Display figure	Alarm level	Action
CHECK DPF SYSTEM  V1201756 DPF-system deactivated	- buzzer sounds 4 times - amber central warning on - solid symbol	Contact an authorized dealer.
CHECK DPF SYSTEM  V1201756 DPF-system missing	- buzzer sounds 4 times - amber central warning on - solid symbol	Contact an authorized dealer.
CHECK DPF SYSTEM  V1201756 DPF-system failure	- buzzer sounds 4 times - amber central warning on - solid symbol	Contact an authorized dealer.

Valid for Chinese market only:

Removal of particulate aftertreatment monitoring		
Display figure	Alarm level	Action

CHECK DPF SYSTEM  V1201756 DPF system deactivated Derate in -- h	- buzzer sounds 4 times - amber central warning on - solid symbol	Contact an authorized dealer.
CHECK DPF SYSTEM  V1201756 DPF system deactivated Derate active Full derate in -- h	- buzzer sounds 4 times - amber central warning on - flashing symbol - torque reduction	Contact an authorized dealer.
Park safely  V1201756 DPF system deactivated Full derate soon	- buzzer sounds - red central warning on - flashing symbol - torque reduction	Contact an authorized dealer.
CHECK DPF SYSTEM  V1201756 DPF system deactivated Full derate active	- buzzer sounds - red central warning on - flashing symbol - torque and speed reduction	Contact an authorized dealer.

Loss of function in particulate aftertreatment system monitoring

Display figure	Alarm level	Action
CHECK DPF SYSTEM  V1201756 DPF system missing Derate in -- h	- buzzer sounds 4 times - amber central warning on - solid symbol	Contact an authorized dealer.
CHECK DPF SYSTEM  V1201756 DPF system missing Derate active Full derate in - - h	- buzzer sounds 4 times - amber central warning on - flashing symbol - torque reduction	Contact an authorized dealer.
Park safely  V1201756 DPF system missing Full derate soon	- buzzer sounds - red central warning on - flashing symbol - torque reduction	Contact an authorized dealer.
CHECK DPF SYSTEM  V1201756 DPF system missing Full derate active	- buzzer sounds - red central warning on - flashing symbol - torque and speed reduction	Contact an authorized dealer.

Failures of PCD system monitoring

Display figure	Alarm level	Action
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CHECK DPF SYSTEM  V1201756 DPF system failure Derate in -- h	- buzzer sounds 4 times - amber central warning on - solid symbol	Contact an authorized dealer.
CHECK DPF SYSTEM  V1201756 DPF system failure Derate active Full derate in -- h	- buzzer sounds 4 times - amber central warning on - flashing symbol - torque reduction	Contact an authorized dealer.
Park safely  V1201756 DPF system failure Full derate soon	- buzzer sounds - red central warning on - flashing symbol - torque reduction	Contact an authorized dealer.
CHECK DPF SYSTEM  V1201756 DPF system failure Full derate active	- buzzer sounds - red central warning on - flashing symbol - torque and speed reduction	Contact an authorized dealer.

Stopping

NOTICE

Do not turn off the battery disconnect switch when the engine is running. The electrical system may be damaged.

- 1 Lower the engine speed.
- 2 Stop the machine with the service brake. When the machine has come to a complete stop, move the gear selector to neutral position.
- 3 Lower the attachment to the ground.

NOTE!

Lower the boom immediately, max. 5 minutes after the engine has stopped. If more than 5 minutes have passed the engine shall be restarted. If this fails, contact service personnel or cordon of the area and post a guard.

- 4 Apply the parking brake.

NOTE!

Do not turn off the engine until the symbol 'OK' is shown on the display (see figure).

- 5 Turn the start key counter-clockwise when the symbol indicating that engine shutdown is permitted turns on, then the control lights turn off and the engine turns off.

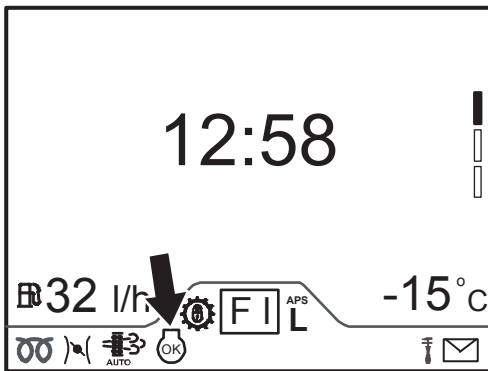
NOTE!

Only applicable for machines with engine D6J: It is important to not turn off the engine during a regeneration. This generates unnecessary heat stress on the components of EATS. Wait until the HEST light has been turned off.

NOTE!

The time it takes for the symbol showing that engine shutdown is permitted to be activated depends on how hard the engine has been loaded.

If the operator has to leave the cab with the engine running, care has to be taken so that the steering wheel is not turned inadvertently as the operator leaves the cab. This applies particularly if the steering wheel is provided with a knob.



V1142136

Symbol shows when engine shutdown is permitted



V1083542

HEST (High exhaust temperature) light, regeneration in progress (only applicable for machines with engine D6J)



V1070728



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!



V1070891

Parking

- 1 If possible, place the machine on level ground. If this is not possible, block the wheels to prevent the machine from starting to roll. Lower the attachment to the ground.
- 2 Check that all switches and controls are in the "Off" position or in neutral.
- 3 Apply the parking brake after the machine has come to a complete standstill.
- 4 Remove the keys.

NOTE!

To avoid reduced battery life due to sulfation during extended parking periods, the batteries must be kept well charged. Due to battery self-discharge, both batteries voltage levels need to be at least 12,65 V to support a parking period of up to 30 days. If batteries are being kept at low voltage levels, this could lead to reduced battery life.

- 5 Make sure that there is enough anti-freeze in the cooling system (see page 290) and in the washer fluid at temperatures below 0 °C when the machine is parked.
- 6 It is recommended that the AdBlue®/DEF-tank is completely filled.
- 7 Lock all covers, windows and the door.

Keep in mind that the risk of theft and break-in can be minimized by:

- removing the start key when the machine is left unattended.
- locking doors and covers after the end of the work shift.
- avoiding parking the machine in places with a high risk of theft, break-ins, and vandalism.
- removing all valuable items from the cab, e.g., mobile telephone, computer, radio, and bags.

It is easier to identify stolen machines if the PIN-number or registration number is etched into the window glass.

Long-term parking (parking for longer time than three months)

NOTICE

If the machine is not going to be used every day, all cylinders should be protected against corrosion.

- The temperature may not be below -25 °C or above +70 °C.
- Check that the batteries are fully charged.
- Take actions for parking and storage according to the above.
- Wash the machine and touch up any damaged paint to prevent rust.
- Use rust-protection agents on exposed parts, grease the machine thoroughly, and use grease on unpainted parts (lift cylinders and tilt cylinders, etc.).
- Top up the fuel tank and hydraulic oil tank to their max. markings.

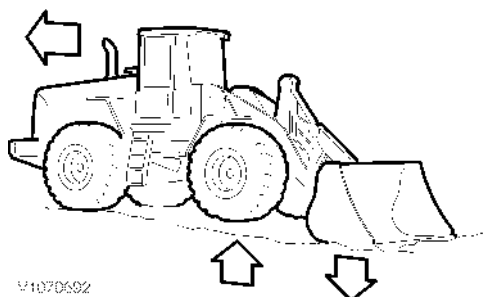
- Cover the exhaust pipe (when parking outdoors).
- Make sure that the machine is without electric power supply (voltage) by turning the battery disconnect switch to the OFF position.
- Check the tire pressure and protect the tires from intense sunlight.

After long-term parking

- Check all oil levels and fluid levels
- Check tension of all belts
- Check air pressure
- Check air cleaner
- Turn the battery disconnect switch to the ON position
- Check that the AdBlue®/DEF pump unit, full flow filter is replaced if the machine is parked for longer than four months. Contact a qualified service technician.

NOTE!

If protective compounds (rust-protection agents, etc.) have been used on the machine when preparing it for long-term parking, follow the manufacturer's instructions for safety precautions and methods for removing.



Measures when getting stuck

If the machine has got stuck, it is usually best to reverse out. If you cannot reverse or drive forward, try the following:

- 1 Engage the differential lock with the foot switch.
- 2 Select a low gear (1st or 2nd).
- 3 Reverse and steer the machine fully to the left and then to the right alternately (like a duck's waddle).

If only the front wheels have got stuck proceed in either of the following ways:

- 1 Lift the front wheels, supporting the machine on the bottom of a flat bucket and reverse.
- 2 Steer to the right or to the left, press the bucket against the ground, lift up the front wheels and steer the other way, raise the bucket slightly and reverse.
- 3 Lift up the front wheels using the bucket. Manually fill the holes under the wheels with branches, pieces of wood or similar and reverse.
- 4 If the machine needs to be recovered, see page 171.

You must never engage the differential lock when one of the wheels is slipping. Lower the engine speed until the wheel has stopped. Then engage the differential lock.

Retrieving and towing

WARNING

Risk of fatal accidents by runaway machine.

Loss of braking function and steering function could cause serious injury or death by runaway machine.

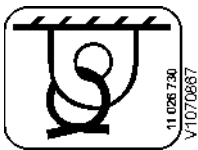
If the engine cannot be started, towing must only be performed in an emergency situation by trained personnel and only the shortest possible distance with very low speed. If possible, transport the machine on a trailer.

NOTE!

The connecting device (tow hitch) on the counterweight or the eyes on the rear frame located inside of the rear wheels must not be used when recovering or towing.

NOTE!

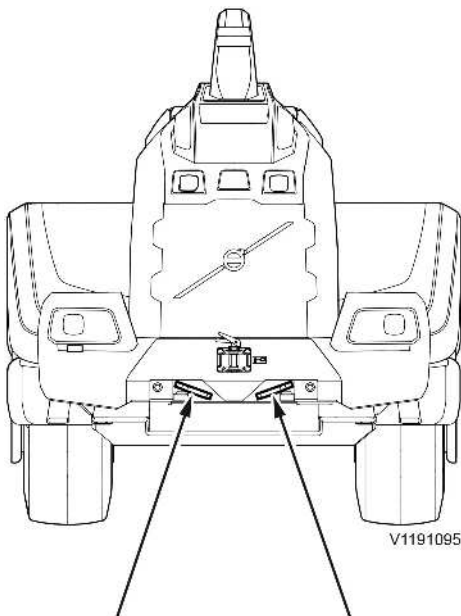
Inspect the attaching points on the machine for deformation. If an attaching point is deformed, please contact your local Volvo dealer for further support.



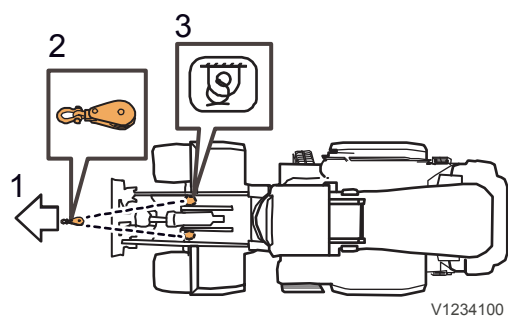
Attaching point for lashing

Recovering

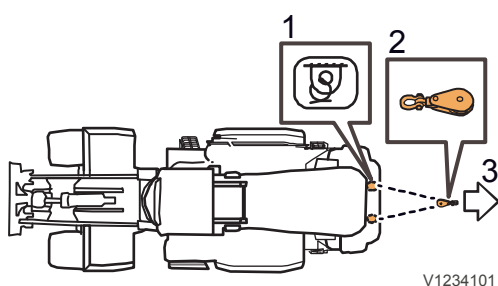
- If possible, the engine should be running so that brakes and steering work.
- If the engine cannot be started, or it is not possible to build up enough pressure to release the parking brake for some other reason, the parking brake can be released mechanically. Contact a qualified service technician.
- When recovering backwards, use the eyes under the counterweight, which are intended for lashing the machine.
- When recovering forwards, use the retrieval lugs by the front axle attachment intended for lashing the machine.
- Connect to both retrieval lugs to avoid shear loads as much as possible.
- Snatch blocks must be used.
- The towing line must be a minimum of 3 meter (10 ft) from the snatch block to each retrieval lug, which means a minimum of 6 meters (20 ft) in total.
- Max 10° towing angle from the center line of the machine are permitted.



Eyes under counterweight when recovering, towing, and lashing



- 1 Maximum pull force
- 2 Snatch block
- 3 Retrieval lugs (attaching points)



- 1 Retrieval lugs (attaching points)
- 2 Snatch block
- 3 Maximum pull force

Maximum pull force when recovering or towing		
NOTE! The stated value is for both retrieval lugs, the maximum pull force for one retrieval lug is half of the value in the column.		
	Front	Rear
L60H	215 kN (48333 lbf)	232 kN (52155 lbf)
L70H	245 kN (55078 lbf)	232 kN (52155 lbf)
L90H	280 kN (62946 lbf)	232 kN (52155 lbf)

Towing

- The engine must be running on the machine that is being towed.
- There must be an operator in the machine being towed to brake and steer the machine.
- The towing vehicle or machine must weigh at least as much as the machine in tow, and must have adequate engine power and braking capacity to tow the vehicle in question.
- Do not tow longer distances than absolutely necessary, otherwise the transmission may be damaged.
- Connect in a corresponding way as when recovering.
- If the engine cannot be started, or it is not possible to build up enough pressure to release the parking brake for some other reason, the parking brake can be released mechanically. Contact a qualified service technician.

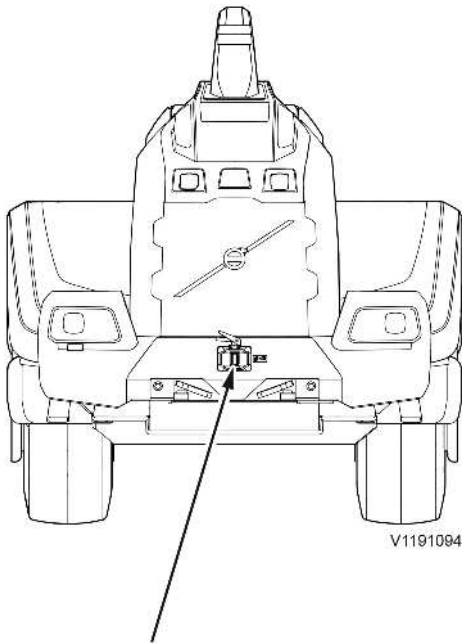
Follow national regulations where required.

NOTE!

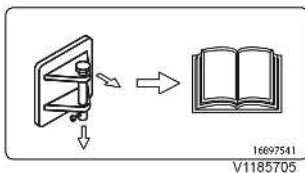
It is not possible to start the engine by towing.

Trailer hitch on counterweight

The machine counterweight is equipped with a bolt pattern interface for mounting a trailer hitch (optional equipment).



Trailer hitch on counterweight



Trailer hitch forces

NOTE!

The trailer hitch interface on the counterweight (or any mounted trailer hitch) must not be used when recovering the machine.

The maximum load on the counterweight's trailer hitch interface must not exceed a horizontal force of 110 kN (24728 lbf) and a vertical force of 10 kN (2248 lbf).

If towing a trailer without a service brake system, the total weight of the machine and trailer with load must not exceed the maximum allowed machine weight, see page 327.

If towing a trailer with a service brake system, higher trailer weights are allowed under certain conditions. Contact your dealer for further information.

The trailer hitch may only be used temporarily to transport necessary maintenance supplies needed by the machine on the work site (attachments, tools, fuel, oils, etc.).

NOTE!

Make sure that any attached trailer hitch is suitable for the purpose of use and fulfill all applicable regulations.

When using a trailer hitch, make sure that the trailer connection is securely locked.

When towing, follow national regulations.

Parking brake, mechanical release

Contact a qualified service technician if the parking brake has to be released mechanically.

Transporting machine

Actions before transporting machine

NOTE!

Before loading the machine for transport, deactivate the transmission disengagement, see page 84.

WARNING

Risk of overturning.

A machine can cause serious or fatal injuries if it rolls over while being driven onto the platform of a transport vehicle.

Make sure that the transport vehicle is braked with the wheels blocked. Secure the driving ramps steadily so that the machine cannot roll over or sway.

NOTE!

To avoid air being forced into the exhaust stack during transport, resulting in damage to the turbocharger, the exhaust stack must be covered with suitable protection (not plastic).

NOTE!

When the machine is secured (lashed) the tire pressure in all tires should be between 400 and 500 kPa (4–5 bar) so that the machine moves as little as possible.

On another vehicle

- The frame joint must be locked if the machine is lifted up onto another vehicle.
 - Use intended attaching points for lifting.
 - Lock the frame joint.
- If the machine is driven up on to another vehicle, the frame joint must not be locked. The frame joint must be locked first when the machine has been driven up on the trailer.
- Tie down (lash) the machine according to the following pages.

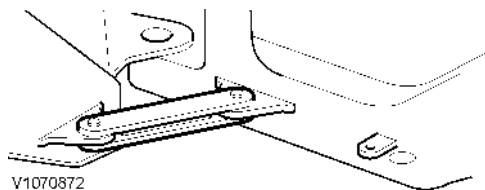
Over ramp

- First check that the ramp is wide enough and has the required strength and that it will not be displaced.

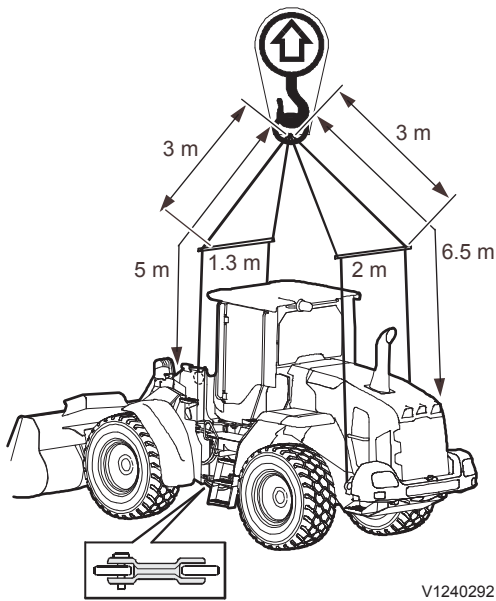
In an elevator or other confined space

- 1 Reverse the machine in.
- 2 Apply the parking brake and stop the engine before starting the elevator.

Otherwise, follow the national rules and regulations.



Frame joint lock



L60H, L70H and L90H

Lifting the machine

NOTE!

The rear fender (mudguard) shall be removed when lifting the machine.

NOTE!

Inspect the lifting attachment points on the machine for deformation. If a lifting attachment point is deformed, please contact your local Volvo dealer for further support.

- Lift the machine using the intended lifting attachment points (see figure). The frame joint must be locked before lifting.

The machine's maximum total weight is as follows:

L60H	16400 kg (36156 lb)
L70H	18500 kg (40785 lb)
L90H	19000 kg (41888 lb)

Securing the machine on a transport carrier

See the following conditions for securing a machine that has been loaded on a transport carrier, as well as instructions and values for each machine in the following tables.

Conditions for securing the machine

The instructions on the following pages are only valid if the following conditions have been fulfilled:

Acceleration requirements

- The machine is subjected to a max. acceleration of; 0.8 g forward, 0.5 g backward, 0.5 g sideways, and 0.2 g upward.⁽¹⁾
- The accelerations forward, rearward and sideways are acting individually and are combined with 1 g downward.⁽¹⁾
- The upward acceleration is not combined with other accelerations.

The machine

- The machine (with or without attachment) is manufactured by Volvo Construction Equipment.
- The machine's weight is max. 16400 kg (36155 lb) for L60H, 18500 kg (40785 lb) for L70H, 19000 kg (41888 lb) for L90H.
- The tire pressure in all tires of the machine should be 400–500 kPa (4–5 bar)
- The machine has new or normally worn rubber wheels or wood-fitted rims of pine or birch. If the wood-fitted rims comprise of birch wood, a rubber friction pad must be placed between the wood surface of the rim and the platform to achieve a friction level of 0.5, else the friction level is assumed to be 0.2 only.
- The lashing points on the machine have a LC/MSL of at least 10000 daN.

Loading and securing on transport carrier

- The machine is loaded with the front or rear forward and is positioned laterally centred (± 5 cm) with the support of at least half of the width of the tires.
- The parking brake is applied and in working order and able to keep the machine stationary on inclines up to 14°.
- The frame joint is locked.
- The machine is loaded and secured in such a way that no parts such as painted surfaces and tires are damaged.

Transport carrier

- The machine is loaded on a vehicle with a platform of wood, plywood, grooved aluminium or unpainted or painted steel. The rubber tires must be clean and free from frost, ice and snow to achieve a friction level of 0.5, else the friction level is assumed to be 0.2 only.
- The lateral distance between the lashing attachments on the vehicle is at least 2500 mm (99 in).
- The lashing attachments on the vehicle have at least the same breaking load as the lashings.

Tie-downs (lashings)

- The chain lashings have a minimum breaking load (MBL) of either at least 12 or 20 ton. The maximum securing load (MSL/LC/SWL) is at least 50 % of the MBL.
- The lashings are tensioned to at least 400 daN during the entire transport.

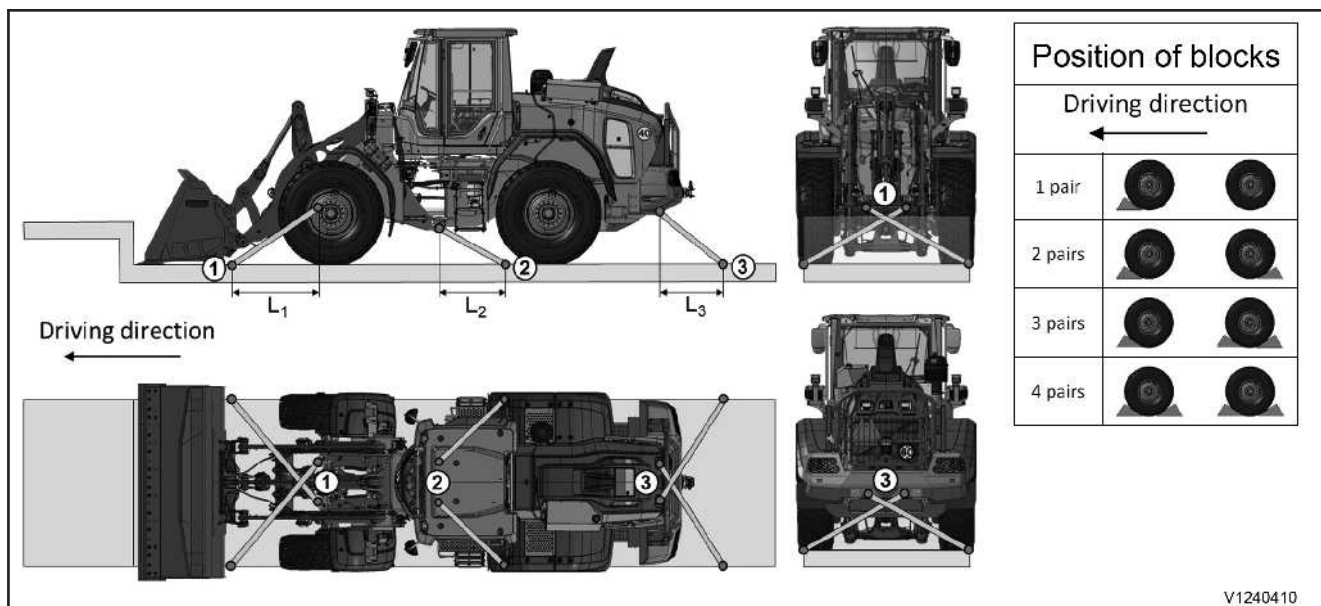
1. The acceleration data fulfil the basic requirements in almost all road regulations and standards. However, in some countries national rules and guidelines may require alternative or additional blocking and/or lashing.

- The chain lashings are placed symmetrically, in pairs and are fixed to the designated lashing points on the machine. Only one lashing shall be attached to each lashing point on the vehicle as well as on the machine.
- Lashing (1) is always directed forward while lashings (2) and (3) are always directed rearward.
- It should not be possible for the lashing hooks to come loose if the lashings become slack.

If blocks or blocking is used the following conditions shall be met:

- When using blocks, these must be firmly attached, have an angle of inclination of 37° (3:4:5), at least 250 mm (9.8 in) in height and placed in pairs; 1, 2 or 3-4 pairs according to the table indicating the position of blocks.
- If rubber wheels or wood-fitted rims are supported by wheel grooves, these may be considered to be equivalent of blocks.
- Blocking of the bucket, lifting unit, rear of the machine or the wheel pairs turned in driving direction up to at least the wheel radius against goose-neck or corresponding in forward direction prevents forward movements.
- Blocking with adequate height acting on the inside or outside of all four wheels prevents sideways movements.

Cargo securing certificate L60H, loaded with the front facing forward



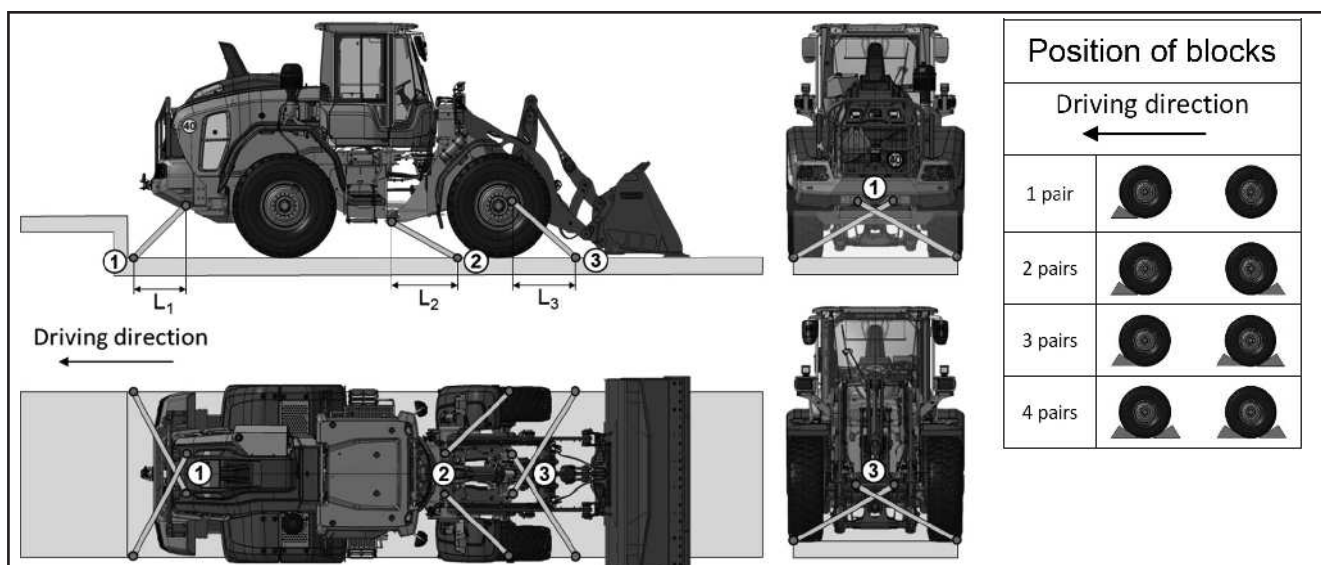
$L_1 - L_3$ are the distances from the lashing points of the machine to the lashing points of the trailer.

Values and instructions in the following table are only valid if the conditions described earlier in the section under the heading "Conditions for securing cargo" are fulfilled.

Lashings' permitted distance interval in metres (1 m = 39.4 in)							
Friction surfaces	Blocks or blocking	Chain min. class 8 Ø10 mm MBL 12 ton, LC 60 kN (6 ton)			Chain min. class 8 Ø13 mm MBL 20 ton, LC 100 kN (10 ton)		
		L_1 (crossed)	L_2 (straight)	L_3 (crossed)	L_1 (crossed)	L_2 (straight)	L_3 (crossed)
Rubber, pine, birch with rubber (dry or wet): $\mu = 0.5$	No blocks	0.9–2.5	0.5–1.4	1.1–2.5	0.5–2.5	Not required	1.2–2.5
	1 pair	0.9–2.5	Not required	0.9–2.5	0.5–2.5	Not required	0.5–2.5
	2 pairs	0.5–2.5	Not required	0.9–2.5	0.5–2.5	Not required	0.5–2.5
	3 pairs	0.5–2.5	Not required	0.5–2.5	0.5–2.5	Not required	0.5–2.5
	4 pairs						
	Blocking forward	0.9–2.5	Not required	0.5–2.5	0.5–2.5	Not required	0.5–2.5
	Blocking sideways	0.9–2.5	0.5–1.4	1.1–2.5	0.5–2.5	Not required	1.2–2.5
	Blocking forward and sideways	0.9–2.5	Not required	0.5–2.5	0.5–2.5	Not required	0.5–2.5

Frost, ice, snow, dirt, birch without rubber: $\mu = 0.2$	No blocks	1.5–2.5	0.6–1.4	1.5–2.5	0.8–2.5	Not required	1.6–2.5
	1 pair	1.5–2.5	0.3–1.4	0.7–2.5	0.8–2.5	Not required	0.7–2.5
	2 pairs	0.5–1.5	Not required	1.4–2.5	0.5–2.5	Not required	0.7–2.5
	3 pairs	0.5–2.0	Not required	0.5–2.0	0.5–2.5	Not required	0.5–2.5
	4 pairs						
	Blocking forward	1.5–2.5	Not required	0.5–1.5	0.8–2.5	Not required	0.5–2.5
	Blocking sideways	1.5–2.5	0.6–1.4	1.5–2.5	0.8–2.5	Not required	1.6–2.5
	Blocking forward and sideways	1.5–2.5	Not required	0.5–2.5	0.8–2.5	Not required	0.5–2.5

Cargo securing certificate L60H, loaded with the front facing backward



V1240411

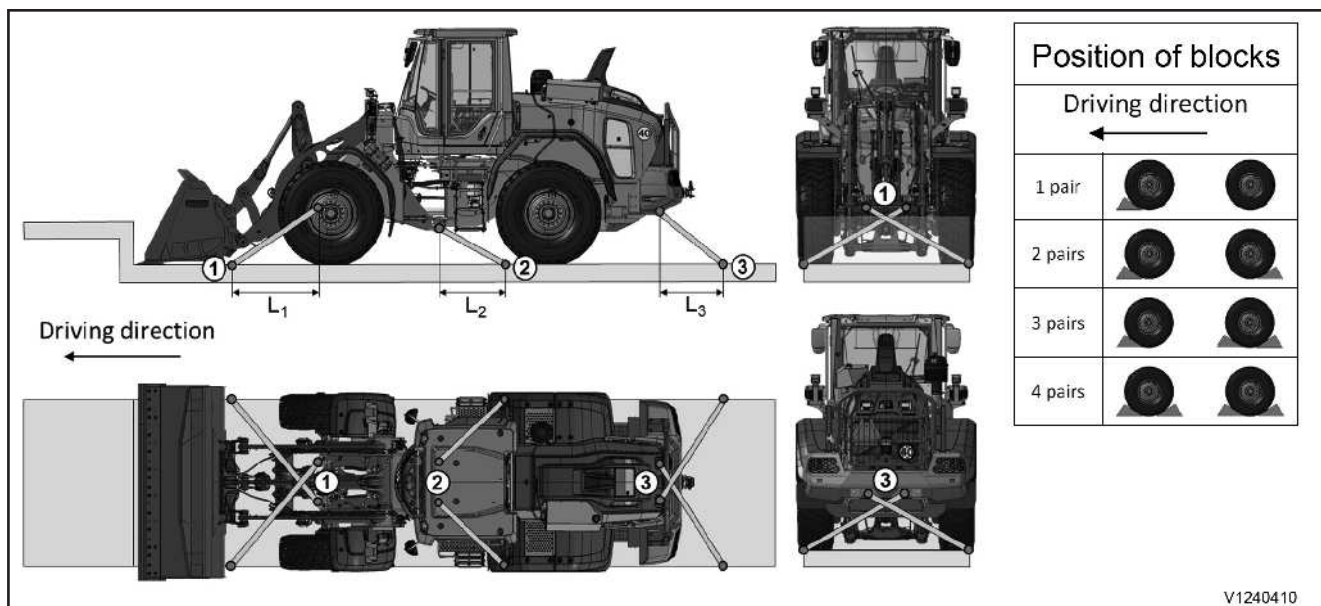
$L_1 - L_3$ are the distances from the lashing points of the machine to the lashing points of the trailer.

Values and instructions in the following table are only valid if the conditions described earlier in the section under the heading "Conditions for securing cargo" are fulfilled.

Lashings' permitted distance interval in metres (1 m = 39.4 in)							
Friction surfaces	Blocks or blocking	Chain min. class 8 Ø10 mm MBL 12 ton, LC 60 kN (6 ton)			Chain min. class 8 Ø13 mm MBL 20 ton, LC 100 kN (10 ton)		
		L_1 (crossed)	L_2 (straight)	L_3 (crossed)	L_1 (crossed)	L_2 (straight)	L_3 (crossed)
Rubber, pine, birch with rubber (dry or wet): $\mu = 0.5$	No blocks	0.9–2.5	0.5–1.4	1.3–2.5	0.5–2.5	Not required	1.3–2.5
	1 pair	0.9–2.5	Not required	0.9–2.5	0.5–2.5	Not required	0.5–2.5
	2 pairs	0.5–2.5	Not required	0.9–2.5	0.5–2.5	Not required	0.5–2.5
	3 pairs	0.5–2.5	Not required	0.5–2.5	0.5–2.5	Not required	0.5–2.5
	4 pairs	0.5–2.5	Not required	0.5–2.5	0.5–2.5	Not required	0.5–2.5
	Blocking forward	0.9–2.5	Not required	0.5–2.5	0.5–2.5	Not required	0.5–2.5
	Blocking sideways	0.9–2.5	0.5–1.4	1.3–2.5	0.5–2.5	Not required	1.3–2.5
	Blocking forward and sideways	0.9–2.5	Not required	0.5–2.5	0.5–2.5	Not required	0.5–2.5

Frost, ice, snow, dirt, birch without rubber: $\mu = 0.2$	No blocks	1.4–2.5	0.7–1.4	1.4–2.5	0.7–2.5	Not required	1.7–2.5
	1 pair	1.4–2.5	0.3–1.4	0.7–2.5	0.7–2.5	Not required	0.8–2.5
	2 pairs	0.5–1.5	Not required	1.4–2.5	0.5–2.5	Not required	0.8–2.5
	3 pairs	0.5–2.0	Not required	0.5–2.0	0.5–2.5	Not required	0.5–2.5
	4 pairs						
	Blocking forward	1.4–2.5	Not required	0.5–1.5	0.7–2.5	Not required	0.5–2.5
	Blocking sideways	1.4–2.5	0.7–1.4	1.4–2.5	0.7–2.5	Not required	1.7–2.5
	Blocking forward and sideways	1.4–2.5	Not required	0.5–2.5	0.7–2.5	Not required	0.5–2.5

Cargo securing certificate L70H, loaded with the front facing forward



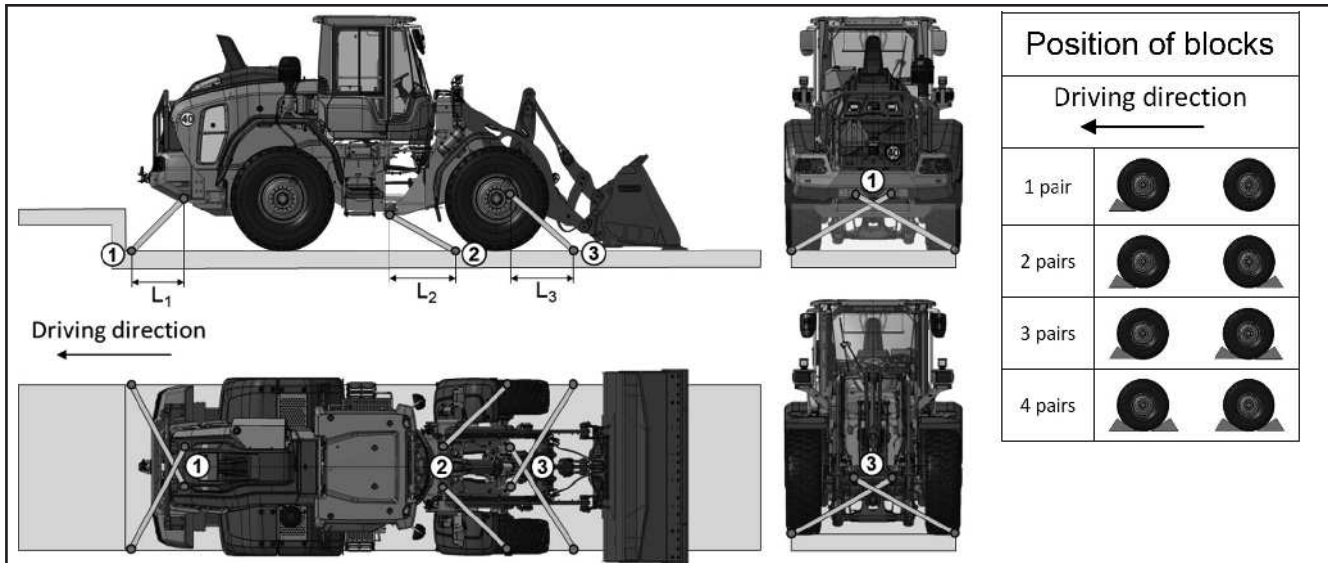
$L_1 - L_3$ are the distances from the lashing points of the machine to the lashing points of the trailer.

Values and instructions in the following table are only valid if the conditions described earlier in the section under the heading "Conditions for securing cargo" are fulfilled.

Lashings' permitted distance interval in metres (1 m = 39.4 in)							
Friction surfaces	Blocks or blocking	Chain min. class 8 Ø10 mm MBL 12 ton, LC 60 kN (6 ton)			Chain min. class 8 Ø13 mm MBL 20 ton, LC 100 kN (10 ton)		
		L_1 (crossed)	L_2 (straight)	L_3 (crossed)	L_1 (crossed)	L_2 (straight)	L_3 (crossed)
Rubber, pine, birch with rubber (dry or wet): $\mu = 0.5$	No blocks	1.1–2.5	0.6–1.4	1.4–2.5	0.6–2.5	Not required	1.5–2.5
	1 pair	1.1–2.5	Not required	1.0–2.5	0.6–2.5	Not required	0.6–2.5
	2 pairs	0.5–2.5	Not required	1.0–2.5	0.5–2.5	Not required	0.6–2.5
	3 pairs	0.5–2.5	Not required	0.5–2.5	0.5–2.5	Not required	0.5–2.5
	4 pairs						
	Blocking forward	1.1–2.5	Not required	0.5–2.5	0.6–2.5	Not required	0.5–2.5
	Blocking sideways	1.1–2.5	0.6–1.4	1.4–2.5	0.6–2.5	Not required	1.5–2.5
	Blocking forward and sideways	1.1–2.5	Not required	0.5–2.5	0.6–2.5	Not required	0.5–2.5

Frost, ice, snow, dirt, birch without rubber: $\mu = 0.2$	No blocks	1.7–2.5	0.8–1.4	1.7–2.5	0.9–2.5	0.4–1.4	0.9–2.5
	1 pair	1.7–2.5	0.3–1.4	0.9–2.5	0.9–2.5	Not required	0.8–2.5
	2 pairs	0.5–2.5	0.3–1.4	0.9–2.5	0.5–2.5	Not required	0.8–2.5
	3 pairs	0.5–1.5	Not required	0.5–1.5	0.5–2.5	Not required	0.5–2.5
	4 pairs						
	Blocking forward	1.7–2.5	0.3–1.4	0.5–2.5	0.9–2.5	Not required	0.5–2.5
	Blocking sideways	1.7–2.5	0.8–1.4	1.7–2.5	0.9–2.5	0.4–1.4	0.9–2.5
	Blocking forward and sideways	1.7–2.5	Not required	0.5–2.5	0.9–2.5	Not required	0.5–2.5

Cargo securing certificate L70H, loaded with the front facing backward



V1240411

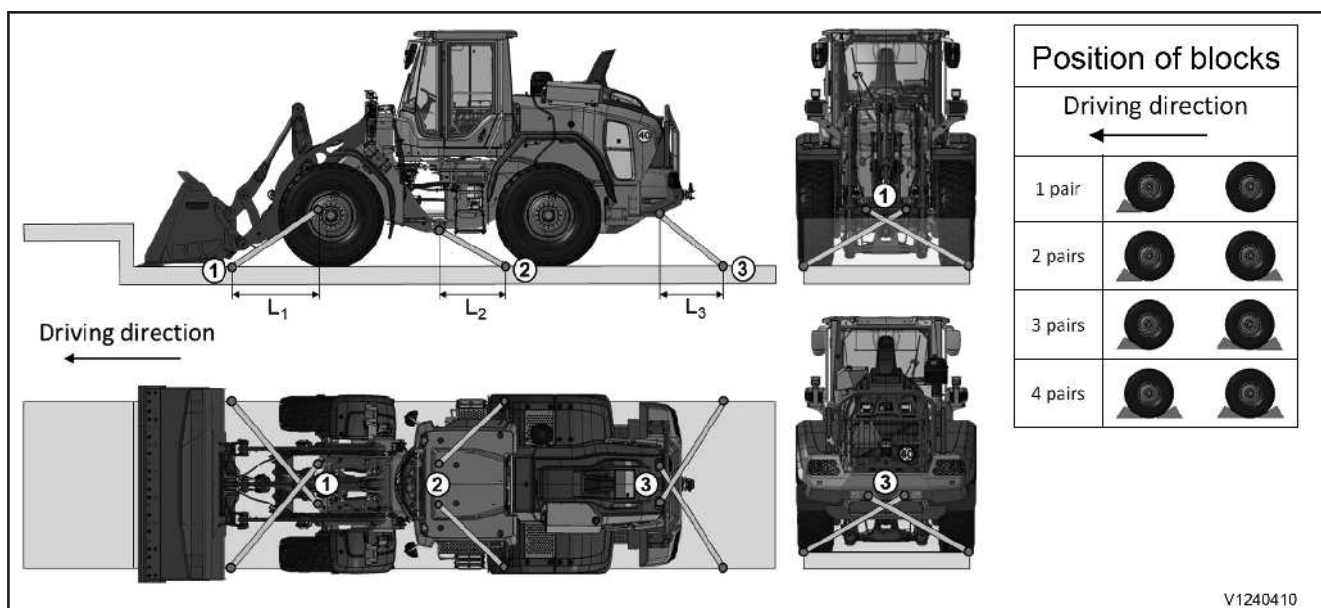
$L_1 - L_3$ are the distances from the lashing points of the machine to the lashing points of the trailer.

Values and instructions in the following table are only valid if the conditions described earlier in the section under the heading "Conditions for securing cargo" are fulfilled.

Lashings' permitted distance interval in metres (1 m = 39.4 in)							
Friction surfaces	Blocks or blocking	Chain min. class 8 Ø10 mm MBL 12 ton, LC 60 kN (6 ton)			Chain min. class 8 Ø13 mm MBL 20 ton, LC 100 kN (10 ton)		
		L_1 (crossed)	L_2 (straight)	L_3 (crossed)	L_1 (crossed)	L_2 (straight)	L_3 (crossed)
Rubber, pine, birch with rubber (dry or wet): $\mu = 0.5$	No blocks	1.0–2.5	0.6–1.4	1.4–2.5	0.6–2.5	Not required	1.5–2.5
	1 pair	1.0–2.5	Not required	1.1–2.5	0.6–2.5	Not required	0.6–2.5
	2 pairs	0.5–2.5	Not required	1.1–2.5	0.5–2.5	Not required	0.6–2.5
	3 pairs	0.5–2.5	Not required	0.5–2.5	0.5–2.5	Not required	0.5–2.5
	4 pairs						
	Blocking forward	1.0–2.5	Not required	0.5–2.5	0.6–2.5	Not required	0.5–2.5
	Blocking sideways	1.0–2.5	0.6–1.4	1.4–2.5	0.6–2.5	Not required	1.5–2.5
	Blocking forward and sideways	1.0–2.5	Not required	0.5–2.5	0.6–2.5	Not required	0.5–2.5

Frost, ice, snow, dirt, birch without rubber: $\mu = 0.2$	No blocks	1.7–2.5	0.8–1.4	1.8–2.5	0.8–2.5	0.4–1.4	0.9–2.5
	1 pair	1.7–2.5	0.3–1.4	0.9–2.5	0.8–2.5	Not required	0.9–2.5
	2 pairs	0.5–2.5	0.3–1.4	0.9–2.5	0.5–2.5	Not required	0.9–2.5
	3 pairs	0.5–1.5	Not required	0.5–1.5	0.5–2.5	Not required	0.5–2.5
	4 pairs						
	Blocking forward	1.7–2.5	0.3–1.4	0.5–2.5	0.8–2.5	Not required	0.5–2.5
	Blocking sideways	1.7–2.5	0.8–1.4	1.8–2.5	0.8–2.5	0.4–1.4	0.9–2.5
	Blocking forward and sideways	1.7–2.5	Not required	0.5–2.5	0.8–2.5	Not required	0.5–2.5

Cargo securing certificate L90H, loaded with the front facing forward



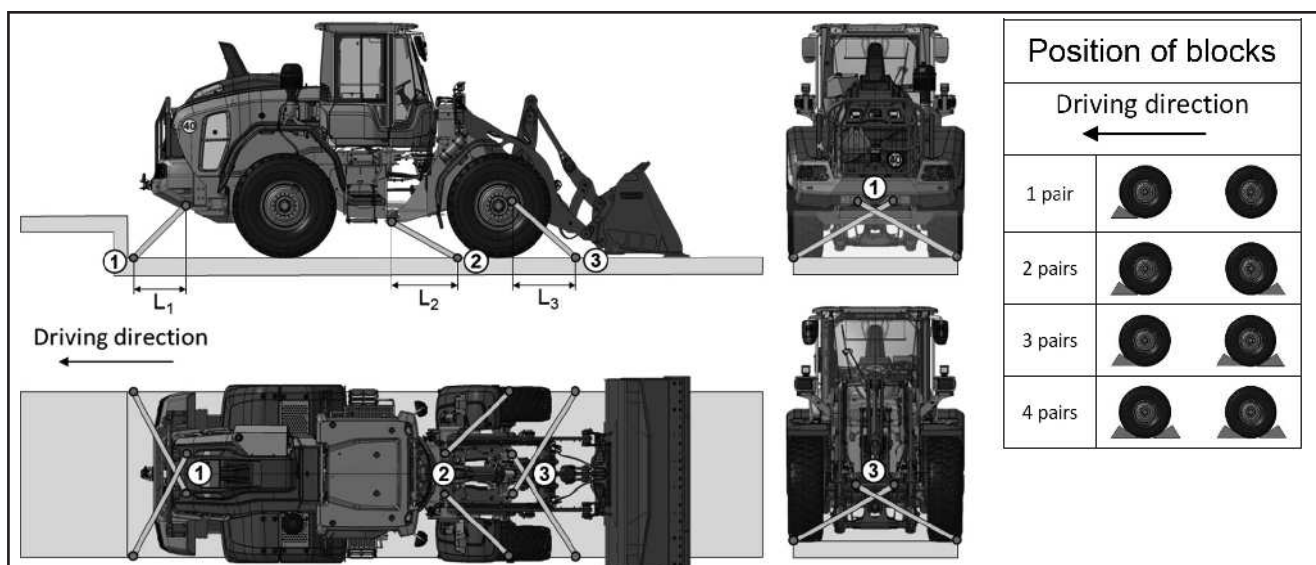
$L_1 - L_3$ are the distances from the lashing points of the machine to the lashing points of the trailer.

Values and instructions in the following table are only valid if the conditions described earlier in the section under the heading "Conditions for securing cargo" are fulfilled.

Lashings' permitted distance interval in metres (1 m = 39.4 in)							
Friction surfaces	Blocks or blocking	Chain min. class 8 Ø10 mm MBL 12 ton, LC 60 kN (6 ton)			Chain min. class 8 Ø13 mm MBL 20 ton, LC 100 kN (10 ton)		
		L_1 (crossed)	L_2 (straight)	L_3 (crossed)	L_1 (crossed)	L_2 (straight)	L_3 (crossed)
Rubber, pine, birch with rubber (dry or wet): $\mu = 0.5$	No blocks	1.1–2.5	0.6–1.3	1.5–2.5	0.6–2.5	Not required	1.5–2.5
	1 pair	1.1–2.5	Not required	1.1–2.5	0.6–2.5	Not required	0.6–2.5
	2 pairs	0.5–2.5	Not required	1.1–2.5	0.5–2.5	Not required	0.6–2.5
	3 pairs	0.5–2.5	Not required	0.5–2.5	0.5–2.5	Not required	0.5–2.5
	4 pairs						
	Blocking forward	1.1–2.5	Not required	0.5–2.5	0.6–2.5	Not required	0.5–2.5
	Blocking sideways	1.1–2.5	0.6–1.3	1.5–2.5	0.6–2.5	Not required	1.5–2.5
	Blocking forward and sideways	1.1–2.5	Not required	0.5–2.5	0.6–2.5	Not required	0.5–2.5

Frost, ice, snow, dirt, birch without rubber: $\mu = 0.2$	No blocks	Non-approved cargo securing alternative			0.9–2.5	0.4–1.3	0.9–2.5
	1 pair	1.8–2.5	0.3–1.3	0.9–2.5	0.9–2.5	Not required	0.8–2.5
	2 pairs	0.5–2.5	0.3–1.3	0.9–2.5	0.5–2.5	Not required	0.8–2.5
	3 pairs	0.5–1.5	Not required	0.5–1.4	0.5–2.5	Not required	0.5–2.5
	4 pairs						
	Blocking forward	1.8–2.5	0.3–1.3	0.9–2.5	0.9–2.5	Not required	0.5–2.5
	Blocking sideways	Non-approved cargo securing alternative			0.9–2.5	0.4–1.3	0.9–2.5
	Blocking forward and sideways	1.8–2.5	Not required	0.5–2.5	0.9–2.5	Not required	0.5–2.5

Cargo securing certificate L90H, loaded with the front facing backward



V1240411

$L_1 - L_3$ are the distances from the lashing points of the machine to the lashing points of the trailer.

Values and instructions in the following table are only valid if the conditions described earlier in the section under the heading "Conditions for securing cargo" are fulfilled.

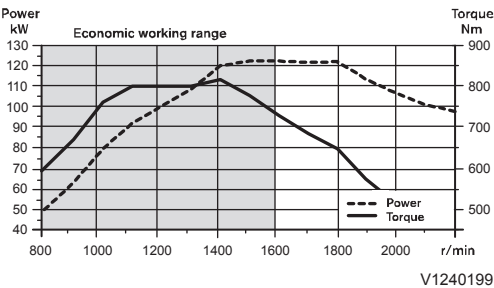
Lashings' permitted distance interval in metres (1 m = 39.4 in)							
Friction surfaces	Blocks or blocking	Chain min. class 8 Ø10 mm MBL 12 ton, LC 60 kN (6 ton)			Chain min. class 8 Ø13 mm MBL 20 ton, LC 100 kN (10 ton)		
		L_1 (crossed)	L_2 (straight)	L_3 (crossed)	L_1 (crossed)	L_2 (straight)	L_3 (crossed)
Rubber, pine, birch with rubber (dry or wet): $\mu = 0.5$	No blocks	1.1–2.5	0.6–1.3	1.5–2.5	0.6–2.5	Not required	1.6–2.5
	1 pair	1.1–2.5	Not required	1.1–2.5	0.6–2.5	Not required	0.6–2.5
	2 pairs	0.5–2.5	Not required	1.1–2.5	0.5–2.5	Not required	0.6–2.5
	3 pairs	0.5–2.5	Not required	0.5–2.5	0.5–2.5	Not required	0.5–2.5
	4 pairs						
	Blocking forward	1.1–2.5	Not required	0.5–2.5	0.6–2.5	Not required	0.5–2.5
	Blocking sideways	1.1–2.5	0.6–1.3	1.5–2.5	0.6–2.5	Not required	1.6–2.5
	Blocking forward and sideways	1.1–2.5	Not required	0.5–2.5	0.6–2.5	Not required	0.5–2.5

Frost, ice, snow, dirt, birch without rubber: $\mu = 0.2$	No blocks	Non-approved cargo securing alternative			0.9–2.5	0.4–1.3	1.0–2.5
	1 pair	1.8–2.5	0.3–1.3	1.0–2.5	0.9–2.5	Not required	0.9–2.5
	2 pairs	0.5–2.5	0.3–1.3	1.0–2.5	0.5–2.5	Not required	0.9–2.5
	3 pairs	0.5–1.5	Not required	0.5–1.4	0.5–2.5	Not required	0.5–2.5
	4 pairs						
	Blocking forward	1.8–2.5	0.3–1.3	0.5–2.5	0.9–2.5	Not required	0.5–2.5
	Blocking sideways	Non-approved cargo securing alternative			0.9–2.5	0.4–1.3	1.0–2.5
	Blocking forward and sideways	1.8–2.5	Not required	0.5–2.5	0.9–2.5	Not required	0.5–2.5

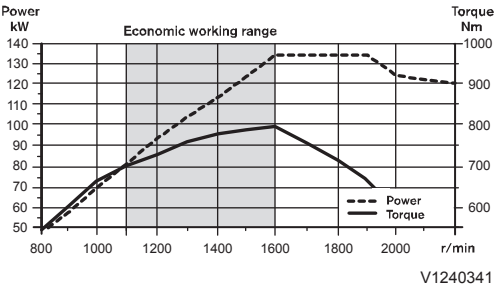
Operating techniques

The following pages contain advice and instructions on how to operate the machine and examples of how the most common attachments are used. It is important that the correct operating techniques are used to carry out the work in a safe and efficient way.

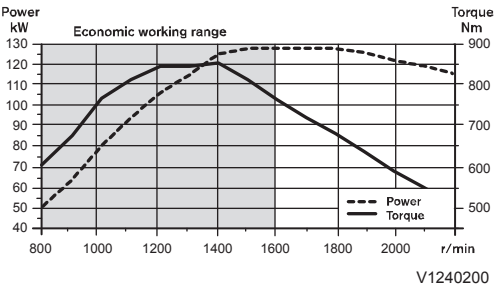
Eco driving



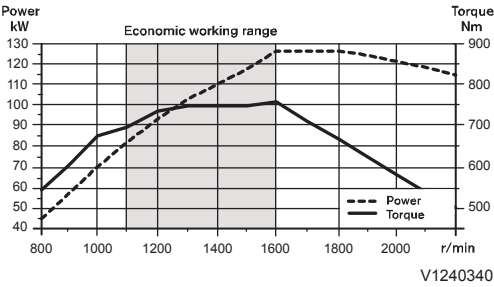
L60H with D6J engine



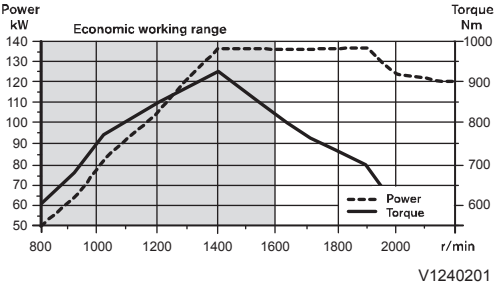
L60H with D6E engine



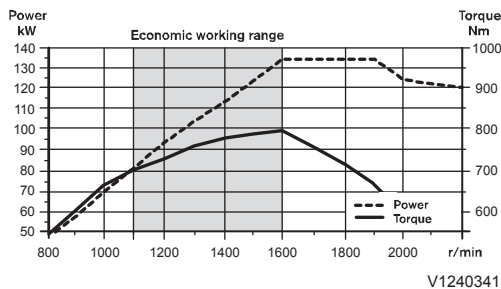
L70H with D6J engine



L70H with D6E engine



L90H with D6J engine



L90H with D6E engine

To use the system in the best way and to achieve low fuel consumption, the engine should be run at low rpms during all handling operations. Exceptions are:

- when filling the bucket, the rpm should be adapted to the material's hardness.
- during the acceleration phase in longer work cycles (e.g., load and carry). When transport speed is reached, you can ease off on the throttle.

Lift speed and power are sufficient already at low engine speed, which will result in a lower fuel consumption, lower sound level, and higher comfort with maintained high productivity.

A fuel-saving way of operating also means less wear on the machine and less impact on the environment. Always strive to:

■ **Stay within the economical rpm range**

See tables on the left. A high engine rpm rarely means higher productivity, but often higher fuel consumption. When filling the bucket, the rpm should be adapted to the material's hardness and during the acceleration phase in longer work cycles (e.g., load-carry) high throttle can be used until transport speed is reached.

■ **Selecting gearshifting program according to operating conditions**

Follow recommendations for gearshifting program, see page 146.

■ **Adapt machine operation to the application**

Follow the recommendations for the applications described in the section.

■ **Select attachment according to the application**

Using attachments adapted to the application means higher productivity, lower fuel consumption and less machine wear - at the same time. Follow the recommendations in the section.

■ **Maintain correct inflation pressure in tires**

On page 318 there are recommendations for air pressure in tires. Correct air pressure in the tires reduces fuel consumption and machine wear.

■ **No unnecessary idling**

However, follow the recommendations for stopping the machine, see page 167, to ensure lubrication of the turbo.

■ **Plan the work site**

Evaluate and plan your work area and its layout based on the machines that are going to work there, to make work more organized and effective. Keep the ground surface even and free from large stones and other potential obstacles.

■ **Cooperate**

Cooperate with other operators to enable as effective work as possible with the machines.

■ **Operate within the economical range**

See page 95 for using the accelerator pedal in an economical way.

Contact your dealer for more information and for the possibility of participating in a Volvo course for the area.

Whole-body vibrations

Whole-body vibrations generated by construction machines are influenced by a number of factors, such as work methods, ground conditions, and machine speed, etc.

The operator can affect the actual vibration levels to a great extent, since it is the operator who controls the machine's speed, work method, and haul route. Therefore, the result can be a range of different vibration levels for the same type of machine. For cab specifications, see page 320.

Guidelines for reducing vibration levels for earthmoving machines

- Use the proper type and size of machine, with tires, optional equipment and attachments for the application.
- Keep the ground and haul roads in good condition.
 - Remove any large rocks or obstacles.
 - Fill any ditches and holes.
 - Provide equipment and schedule time to maintain ground conditions.
- Adjust speed and haul route to minimize vibration levels.
 - Drive around obstacles and rough ground conditions.
 - Reduce the speed, if it is necessary to travel across uneven ground.
- Maintain machines according to the manufacturer's recommendations.
 - Tire pressure
 - Brake and steering systems.
 - Operating controls, hydraulic system, and linkage.
- Make sure that the operator's seat is maintained and correctly adjusted.
 - Adjust the seat and its suspension according to the operator's weight and height.
 - Check and maintain the seat suspension and adjustment mechanisms.
 - Use the seatbelt and adjust it correctly.
- Steer, brake, accelerate, shift gears, and operate the attachments smoothly.
- Minimize vibrations for long work cycles or long-distance travel.
 - Use Boom Suspension System if the machine is equipped with such a system.
 - If the machine is not equipped with a Boom Suspension System, reduce speed to prevent bouncing and rocking.
 - Transport the machine when there are long distances between work sites.

Backpain, suspected of originating from whole-body vibrations, may be caused by other risk factors. The following guidelines can be effective in minimizing risks of backpain:

- Adjust the seat and operating controls so that good posture is obtained.
- Adjust the mirrors to minimize twisting of the body.
- Plan for and take breaks in order to avoid long periods of sitting still in one position.
- Do not jump down from the machine.
- Minimize repeated handling and lifting of objects.

Working within dangerous areas

- Do not operate too close to the edge of a dock, ramp, etc.
- Operate slowly in tight spaces and check that there is enough room for machine and load.
- Operating under ground requires special equipment, e.g., certified engine within the EU and EEA countries. Talk to your dealer.
- Use the machine's lights when working in poor light conditions, e.g., indoors and in tunnels.
- The machine must be specially equipped when operating and working in a contaminated environment or health hazardous area. Talk to your dealer. Also check the local regulations before you enter the area with the machine.

Electrical magnetic field (EMF)

Working in areas exposed to electromagnetic fields, EMF

NOTICE

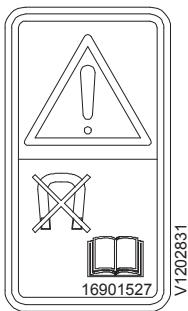
When working in areas with risk of electromagnetic fields, EMF, Comfort Drive Control (CDC) shall always be deactivated.

- The site management (employer) has an obligation to know if there are areas where there are powerful electromagnetic fields and to inform the machine operator about these.
- The operator should seek information if the work site may be exposed to powerful electromagnetic fields.
- Electromagnetic fields, EMF, may affect the machine, if it is equipped with electric servo lever control and Comfort Drive Control (CDC). For Comfort Drive Control (CDC), see page 150.

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



Working on slopes

WARNING

Risk of injury or death.

Machine could become unstable while operating on slopes or steep grades resulting in loss of control, tipover or rollover.

Operate machine up or down slope. Avoid turning and operating across the slope. Exercise extreme caution when working on a steep grade.

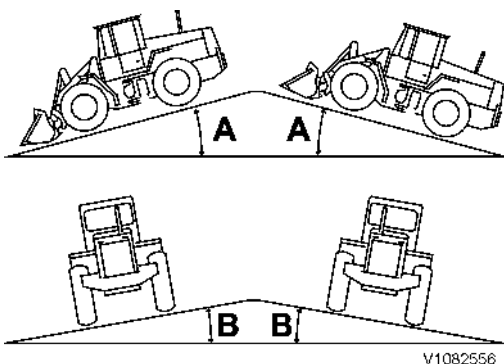
- When working on a slope or grade, pay attention to the current weather and ground conditions in order to not jeopardize safety.
- Be careful when opening the door since it may be difficult to control with the machine leaning at an angle. When closing the door, make sure that it closes completely.
- Operate slowly when approaching or running down a grade.
- Do not operate faster down a grade than the machine can run up the grade.
- Do not change travel direction when operating on a slope, and do not operate across a slope.
- If the machine slides, lower the bucket to the ground immediately. The machine may roll over if it becomes unbalanced. Do not turn with a load in the bucket if the machine does not stand completely stable. If absolutely necessary, pile up earth material on the slope so that the machine can be parked on a level and stable surface.
- If the engine stops when the machine is on a slope, lower the attachment to the ground.

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.

Maximum permitted angle

See the figure to the left to see how each angle (A and B) affect the machine.



Maximum permitted angle

- A Machine affected in fore-aft direction
- B Machine affected sideways

Machine affected in fore-aft direction (angle A)		Machine affected sideways (angle B)	
Continuously	Temporarily	Continuously	Temporarily
A = 15°	A = 25°	B = 10°	B = 20°

Working in water and on boggy ground

NOTICE

Pay attention to the permissible water depth in order to avoid damage to the machine.

In normal operation, the water may not reach over the bottom edge of seals for hubs, propeller shafts and rear axle oscillation bearing.

In temporary use, like crossing a body of water with the machine, the water level may not reach higher than the wheel hub's centre. Avoid using the hydraulic functions in these water level conditions.

Pay attention if the water is turbid or cloudy, there may be hidden obstacles or dangerous deep hollows in the bottom. Avoid operating in the area if you are not certain that it is safe to do so.

- After working in water, the grease points that have been under water must be greased to force out any water.
- Check that no water has penetrated the transmission or axles.

Working where there is risk of landslip

Always check the 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.

- Do not operate too close to the edge of a steep slope or road bank. Take care when working in a place where the machine may tip.
- Take care when working on river banks or in other similar places where the ground is soft. There is a risk that the machine, because of its own weight and own vibrations, may sink and this could lead to accidents.
- Keep in mind that the ground conditions may have changed after heavy rain. Therefore, be careful when restarting work. This is particularly important when working near the edge of ditches, road verges or similar, as the ground may easily give way after it has been raining.

Working in cold weather



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 start, see page 137.

The windows should be free from ice and snow before starting to use the machine. Acceptable visibility is always a 'must have' condition, see page 126.

- Watch out for slippery parts on the machine. Only step on slip-protected areas.
- Use an ice scraper to remove ice from the windows. If needed, use a scraper with a long handle or a ladder.



Risk of frostbite.

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

Use personal protective equipment when handling cold objects.

Attachments

Volvo Construction Equipment			
SE-631 85 ESKILSTUNA, SWEDEN			
	Model	No	
	Supplier	No	
	Serial	No	
	Made in		
	Manuf. year/month		/
	Adapter	Kit	No
	Point	Kit	No
	Segment	Kit	No
	Bolt on edge	Kit	No
	Cutting edge	Part	No
	Weight, Wear parts excl.	Kg/lb	/
	Capacity, Wear parts excl.	m³/yd³	/
	Capacity, Wear parts incl.	m³/yd³	/
	Max working pressure	MPa/psi	/

VOLVO

175801 V1184025

Product plate that must be on the bucket for it to be CE-marked (applies within the EU) and EACmarked (applies within the EACU).

Volvo Construction Equipment			
SE-631 85 ESKILSTUNA, SWEDEN			
	Model/Type No		
	Supplier No		
	Serial No		
	Made In		
	Manufacturing Year		
	Mass (Kg/Lb)		/
	Working Oil Flow (l/min / g/min)		/
	Max. Working Pressure (MPa/Psi)		/

VOLVO

14702975 V1184187

Product plate that must be on the hydraulically driven attachments for it to be CE-marked (applies within the EU) and EACmarked (applies within the EACU).

Volvo Construction Equipment			
SE-631 85 ESKILSTUNA, SWEDEN			
	Model	No	
	Supplier	No	
	Serial	No	
	Made in		
	Weight	Kg/lb	/
	Capacity	m³/ft³	/
	Manuf. year/month		/
	Max working pressure	MPa/psi	/

VOLVO

1745245 V1184024

Product plate that must be on the quick coupler and grapple for it to be CE-marked (applies within the EU) and EACmarked (applies within the EACU).

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.

The machine has either a pin-on attachment or a hydraulically operated attachment bracket, which allows rapid changes of attachments. Using the correct attachment for a particular job is a deciding factor when it comes to the capacity of the machine. The permitted load will be limited to the lowest workload capacity of the combination machine - attachment.

Follow instructions in the Operator's Manual.

According to EU's machine directive there shall be a CE-marking on the machine's product plate (see figures) as well as a "Declaration of conformity". This marking also covers attachments designed by Volvo and adapted for Volvo wheel loaders since they are an integrated part of the machine and adapted to the machine. For the Eurasian Customs Union (EACU), there are similar requirements for EAC-marking of machines and attachments (see figures).

Attachments in the category **"interchangeable equipment"**¹⁾ (attachments that can be changed by operator) designed by Volvo are CE-marked and adapted for Volvo wheel loaders and are supplied with a "Declaration of Conformity" as well as instructions.

The machine owner is responsible for the attachments being within the recommended limits for the carrying machine, and approved for installation on the machine. The machine owner is responsible for the safety of the combination machine – attachment.

For more detailed information about selecting attachments, contact a Volvo dealer to get a copy of the attachment catalogue.

The machine is prepared for different attachments. In order to connect these hydraulically to the machine, the hydraulics must first be depressurized, see page 208.

The machine's stability may vary depending on the attachments and the density of the material.

1) **"Interchangeable equipment"** (attachments that can be changed by operator) means that the attachment requires the combination hydraulic attachment lock and together with hydraulic attachments, for example, a log grapple, a 3rd hydraulic function is needed, and in some cases also a 4th hydraulic function.

Transporting attachments with another vehicle

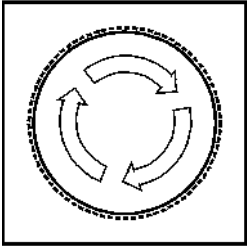
Follow the tie-down/lashing instructions according to standard SS-EN 12195-1, as well as local transport rules.

Rotating attachments

Hydraulically powered, rotating attachments

NOTE!

Read the safety rules before installing and using hydraulically powered, rotating attachments.



V1070017

For location of the emergency stop, see page 84.

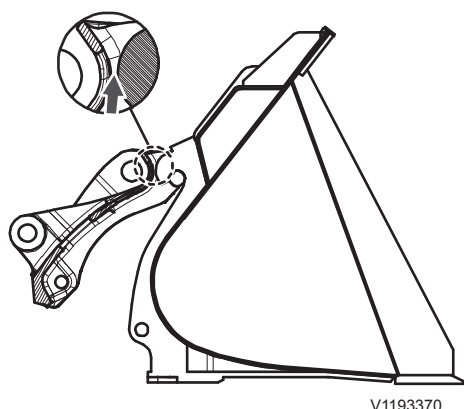
If the machine is used with hydraulically powered, rotating working parts, e.g., brush, bush clearer, sand spreader, the following general safety rules must be followed:

- The fitting of such attachment for the first time must only be done by a trained person.
- Read, understand and follow the instructions supplied with the attachment.
- Always stop (turn off the hydraulic supply) the rotating/moving part of the attachment before you leave the cab.
- When servicing or maintaining the attachment or in case of the working parts having come to a standstill while operating, the hydraulic hoses to the attachment must be disconnected in order to prevent accidental engagement of the hydraulic power, which might result in an accident.

Check that the attachment in question is CE-marked, if the attachment is not made by Volvo.

Make sure that your dealer writes in such an attachment into the "Declaration of Conformity" for your machine as being an approved attachment.

Attachment brackets



WARNING

Risk of crushing.

Falling attachment could result in severe injury or death.

Always complete every coupling process by making sure that the attachment, attachment bracket, locking pins, hydraulic hoses and the connections are undamaged and securely fastened.

NOTICE

When changing to another attachment, the holes for the lock pins in the new attachment should be cleaned and lubricated.

NOTE!

Make sure that the indicator areas on the attachment bracket are cleaned from any material that could reduce the indicator visibility.

Connecting

If the attachment requires optional hydraulics (3rd and 4th hydraulic function), see page 205.

- 1 Release the lock pins by pressing the switch.

NOTE!

A warning message, "Attachment lock open", is shown on the display and an acoustic signal will sound.

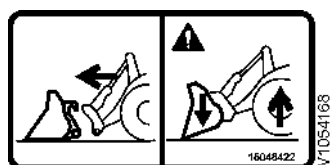
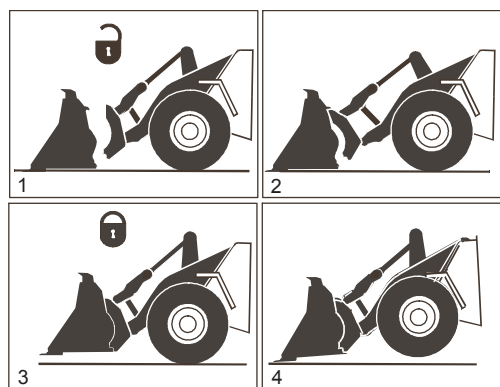
- 2 Tilt the attachment bracket forward approx. 15° and align the attachment bracket's upper mounting points with the upper mounting points on the attachment. Lift the attachment from the ground and then tilt back to level position.
- 3 Lock the attachment with the switch.

NOTE!

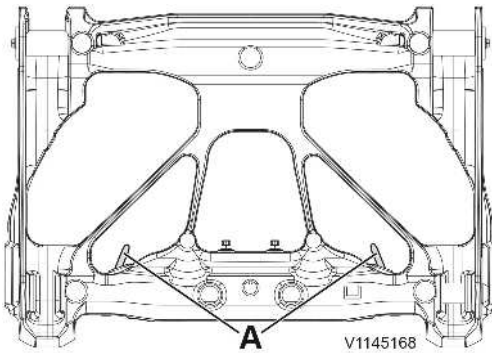
On machines with Boom Suspension System and single-acting lift function, these functions must be deactivated with the switches in order to be able to perform the check that the attachment is securely locked.



Attachment lock

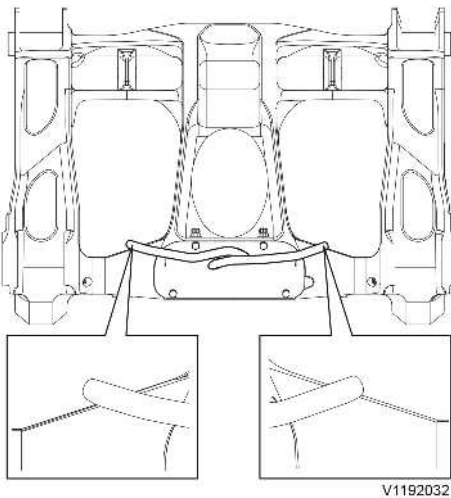


- 4 Check that the attachment is locked correctly by pressing the front edge of the attachment against the ground. If it is locked, the machine's front end will start to lift up. Confirm locking of the attachment by pressing in ESC on the keypad.



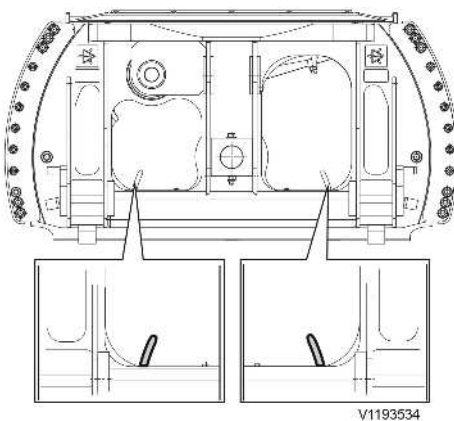
Old solution

A. Locked



New solution

Locked



Side tilting attachment bracket

Locked

- 5 Check the indicator. Lift the attachment enough to see that the indicators are in position as shown in the figure.

WARNING

Risk of crushing.

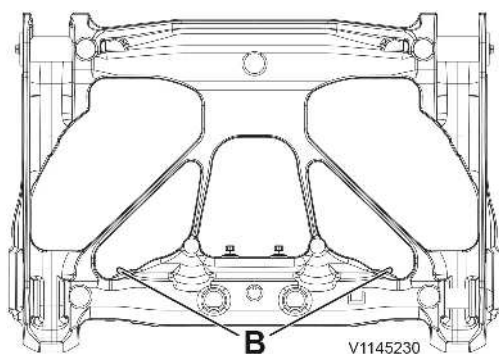
An unsecured attachment could fall and cause serious injury or death.

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

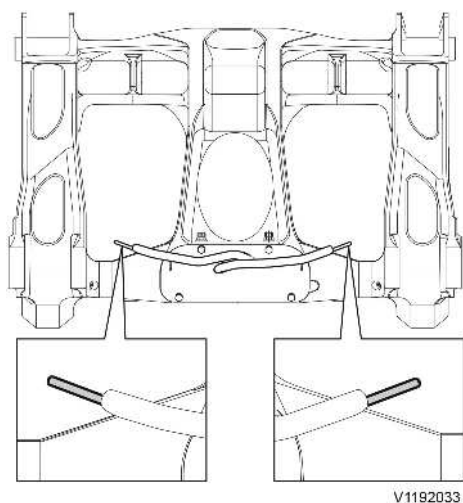
If you are uncertain if the attachment is securely locked, you must visually check that the lock pins of the attachment bracket are in the locked position.

NOTE!

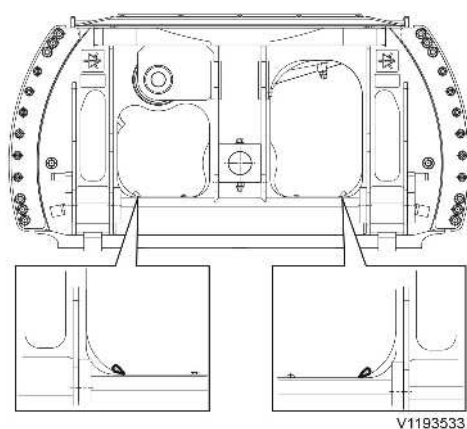
Make sure that the indicator areas on the attachment bracket are cleaned from any material that could reduce the indicator function and visibility.



Old solution
B. Unlocked



New solution
Unlocked



Side tilting attachment bracket
Unlocked

Disconnecting

- 1 The attachment should be in a level position on the ground.
- 2 Release the lock pins by pressing the switch.

NOTE!

A warning message, "Attachment lock open", is shown on the display and an acoustic signal will sound.

- 3 Lower the lift arms so that they disengage from the attachment.
- 4 Reverse away from the attachment.
- 5 Check the indicator, see figure.

CAUTION

Risk of crushing.

Pressing the switch for the attachment lock could cause the attachment to fall off and cause personal injuries.

Press the switch for the attachment lock only when changing attachments.

Attachments intended to be used with the attachment bracket (quick coupler)

NOTE!

- 1 Not all attachments are available in all markets and applicable to all models.
- 2 The permitted load will be limited to the lowest workload capacity of the combination machine - attachment. For that reason, it is important to choose the correct type and size of attachment.

Bucket

Volvo offer an extensive range of buckets including:

- General Purpose bucket
- Rock bucket
- Rehandling bucket
- Sand bucket
- Flat floor bucket
- Side dump bucket
- High-Tip bucket
- Light Material bucket
- Refuse bucket
- Grading bucket

For choosing buckets, contact your Volvo dealer to obtain attachment recommendations.

For correct operating with buckets, please refer to **Operating techniques** —> **Buckets**.

For specification of buckets, please refer to **Specifications** —> **Machine capacities**.

Forks

For work in material handling yards, warehouses or harbors, Volvo provides different types of fork frames, fork tines and tailor-made solutions to work with your Volvo wheel loader:

- Pallet forks
- Lumber forks
- Side shift forks
- Combi forks
- Stone block forks
- Rake

For choosing fork frame and tines, contact your Volvo dealer to obtain attachment recommendations.

For correct operating with pallet forks, please refer to **Operating techniques** —> **Pallet forks**.

For correct operating with stone block forks, please refer to **Operating techniques** —> **Stone block handling**.

For specification of forks, please refer to **Specifications** —> **Pallet forks**.



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Grapples

Volvo offer an extensive range of grapples including:

- Unloading grapples
- Sorting grapples
- General purpose grapples

For choosing grapples, contact your Volvo dealer to obtain attachment recommendations.

For correct operating with timber grapples, please refer to

Operating techniques —> Timber grapples.

For specification of timber grapples, please refer to **Specifications —> Timber grapples.**



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Material handling arm

The material handling arm is used to pick, carry or load a large variety of materials and equipment.

For choosing a material handling arm, contact your Volvo dealer to obtain attachment recommendations.

For detailed information, see Operator's manual appendix for material handling arm.

Attachments for special applications

To further extend the versatility of Volvo wheel loaders, Volvo also provide attachments made by other manufacturers to suit our products, including but not limited to:

- Diagonal snow blade
- Folding snow plow
- Sweeper
- Pick-up Sweeper

Detailed specifications and other information can be obtained from the respective manufacturer or local distributor.

Hydraulic function, 3rd and 4th

(Optional equipment)

WARNING

Risk of accidents.

Using an attachment with hydraulic hoses that are too short could cause accidents.

Always check the function before the machine is put to work. Check that hydraulic hoses and connections to the attachment are routed freely and are long enough for the whole range of movement. Use extension hoses if necessary.

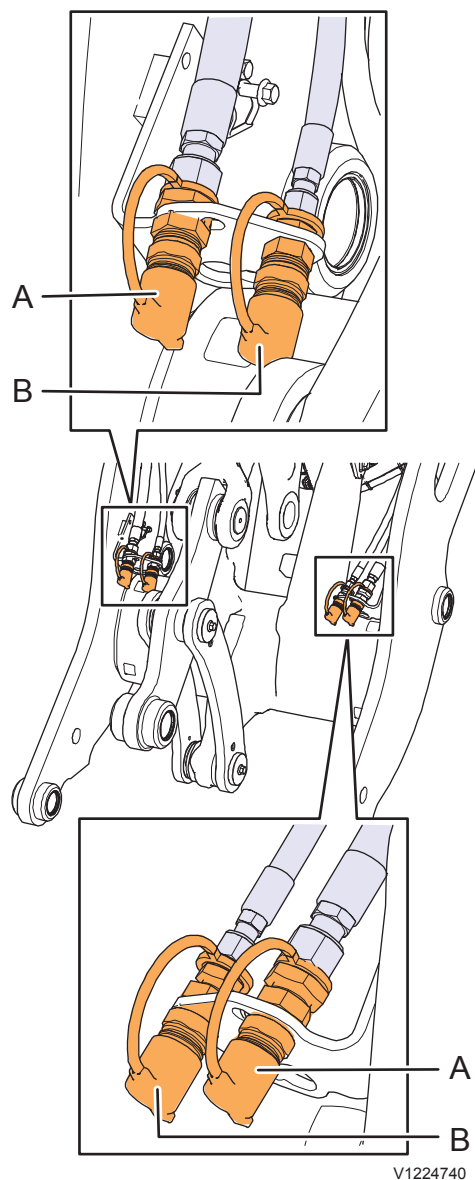
NOTICE

When connecting or disconnecting hydraulic couplings, ensure that the couplings and the surrounding area are clean.

Make sure that the hydraulic oil in the attachment, which is to be connected, is not contaminated with foreign particles, water etc. and that the hydraulic oil is of the same quality as the machine's hydraulic oil.

Third party attachments as well as older Volvo attachments may be dimensioned for lower pressures than the machine's pressure, and thus they may not be used.

When connecting rotating attachment, see also page 198.



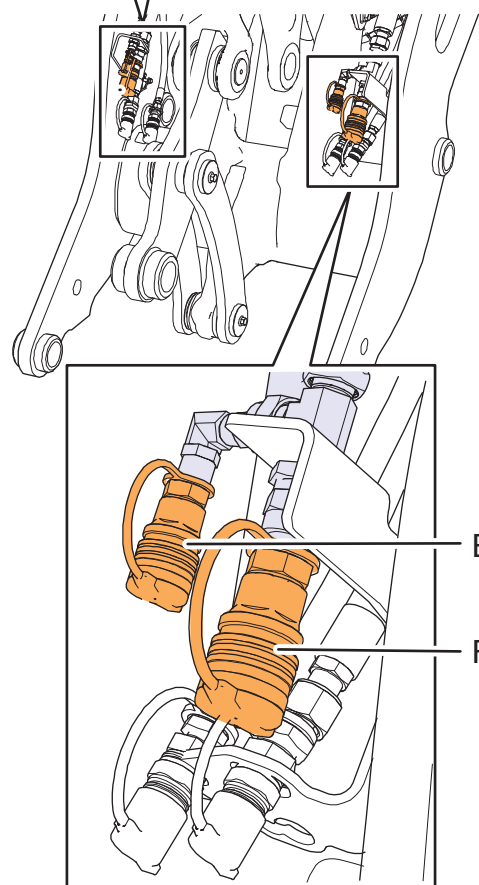
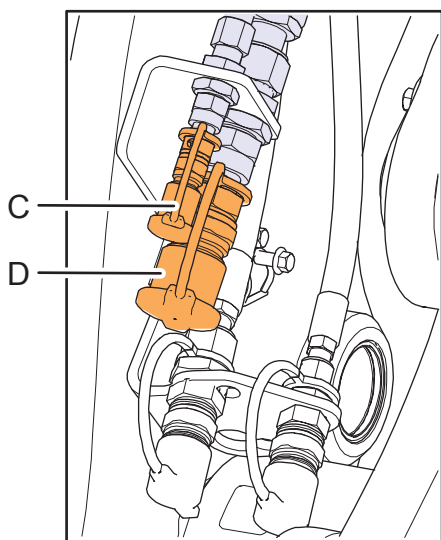
- A Connection, 3rd hydraulic function
B Connection, 4th hydraulic function

Connecting

- 1 See page 200 and follow the steps when connecting.
- 2 Place the attachment level on the ground.
- 3 Depressurize the hydraulic system, see page 208.
- 4 Clean the hydraulic couplings thoroughly, both on the machine and on the attachment.
- 5 Connect the attachment's hydraulic hoses to the machine.

NOTE!

Always check the control functions for the attachment before starting to work!



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- C LS-signal (heavy duty)
- D Pressure (heavy duty)
- E Drain (heavy duty)
- F Return (heavy duty)

6 Heavy duty hydraulics (optional equipment for L70)

The connections C, D, E and F are for heavy duty hydraulics, such as rotating attachments and for low travel speed when a higher oil flow is needed. This option gives the possibility to operate high demanding hydraulic attachments equipped with load-sensing (LS) valves, such as grass mowers, brush cutters and small snow blowers.

- C – LS-signal, activates the machine's hydraulic pump.
- D – Pressure, main pressure from the machine's hydraulic pump.
- E – Drain, drain oil from the attachment's hydraulic motor.
- F – Return, return oil from attachment's hydraulic motor.

NOTE!

Always check the control functions for the attachment before starting to work!

Disconnecting

- 1 Place the attachment level on the ground.
- 2 Depressurize the hydraulic system, see page 208.
- 3 Disconnect the attachment's hydraulic hoses from the machine.
- 4 Make sure that the attachment cannot fall over after disconnecting.
- 5 See page 200 and follow the steps to disconnect the attachment from the machine.

Pressure release

Residual pressure in the hoses makes it very difficult to disconnect or connect the quick-couplings.

This is facilitated by releasing the pressure in the hydraulic system when, i.e., you want to disconnect a hydraulic hose:

- 1 Turn off the engine.
- 2 Ignition in position 1.
- 3 Move the control levers for the relevant function back and forth, and hold the levers in their end-positions for three seconds.
- 4 Disconnect or connect the quick-couplings. This must be done just after releasing the pressure, otherwise the pressure will increase again, or decrease, depending on the temperature.

The attachment should always rest on the ground when releasing the pressure.

Depressurizing disconnected attachment

High pressure in a hydraulic attachment can be released by loosening the hose from the hydraulic pipe and then tightening it again. Keep an eye on the attachment.

Collect the surplus oil.

Buckets

When the machine is used with a bucket, a working load of 50 % of the tipping load for a fully steered machine is permissible. Depending on application and/or machine size the manufacturer often recommends a utilisation lower than 50%.

For information about weight, volume, load, edge savers, etc., contact your dealer to obtain the attachment catalogue.

Bucket teeth, changing, see page 277.



WARNING

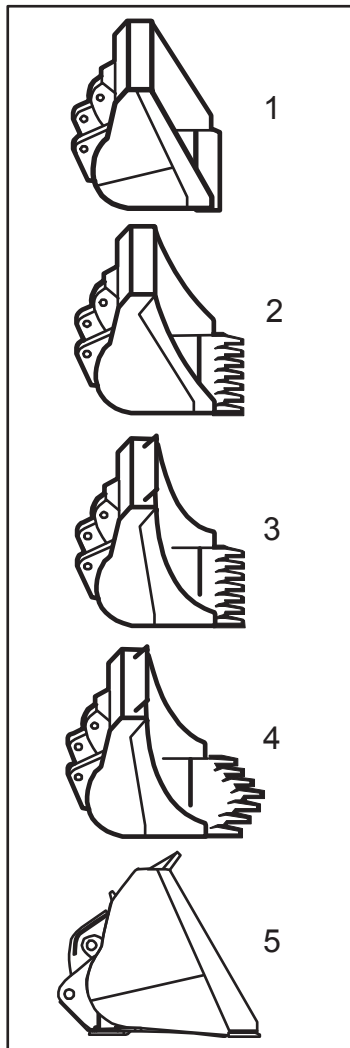
Risk of fatal accidents.

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!

Excavating or surface stripping must not be carried out at high speed, if the bucket is tilted more than 15°, and a fully tilted bucket must be avoided.



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The five most common types of buckets:

- 1 Straight bucket without teeth
(Loose material, sand, soil, artificial fertilizer)
- 2 Straight bucket with teeth
(Hard material, gravel, mud, digging work)
- 3 Straight rock bucket with teeth
(Hard materials, stone, gravel with highly abrasive wear)
- 4 Spade-nose bucket with teeth
(Hard and rocky material, hard gravel and blasted rock)
- 5 Bucket for stockpile loading
(Loose sand, gravel, and crushed materials)

Choosing bucket

- The choice of bucket is dependent on the condition of the material (hard/loose), its density (heavy/light) and on the tipping load of the machine.
- A too large bucket relative to the density of the material and the tipping load of the machine will give the impression that the machine is weak and unstable and will not increase the productivity.

For choosing buckets, contact your dealer to obtain the attachment catalogue.

NOTICE

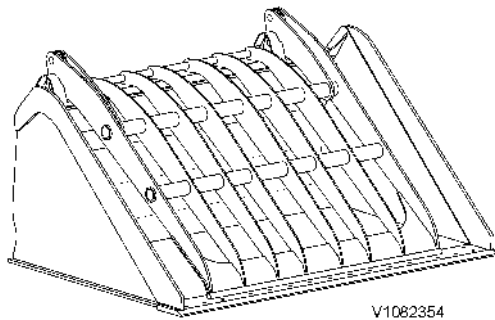
Check the bolt torques after the first four hours of operation, according to the table below.

Tightening torque for edge savers and segments with bolted joints (bolt grade 10.9)	
Size	Tightening torques
M16	275 ± 45 Nm
M20	540 ± 90 Nm
M24	900 ± 140 Nm
1 1/4"	2160 ± 345 Nm

Working with buckets

To obtain efficient and safe operation it is important to bear the following points in mind:

- Select the correct bucket.
- Level the ground at the work site as far as possible and make sure the ground is firm.
- Avoid wheel spin by adapting the engine speed and by transferring as much weight onto the front wheels as possible. This is achieved by slightly raising the bucket after it has begun to enter the material.
- Work with a straight machine against the material to obtain the best penetration. Also contributes to reduced tire wear.



Bucket with clamping arm (optional equipment)

This bucket is the best for loading bulky materials, e.g., waste, tree branches, etc. The clamping arm is used to hold the bulky material in the bucket or to pick up materials in tight spaces.

NOTE!

For connecting and disconnecting hydraulic hoses for 3rd hydraulic function, see page 205. Always check the attachment's control functions before starting to work!

- The clamping arm is operated with the control lever (3), see page 95.
- Check the hydraulic lines at regular intervals for leaks and visible damage.
- Grease the bearings for the clamping arm and cylinder every 250 hours and every 50 hours in aggressive/corrosive conditions. For grease quality, see page 284.
- Always depressurize the hydraulic system before starting maintenance or repair work, and before disconnecting the attachment.
- Work on the hydraulic system may only be done by authorized personnel.

High-tip bucket (optional equipment)

The high-tip bucket is a combination of carrier and bucket. When tipping, the carrier acts as an extension of the boom, which gives great tipping height. When loading and transporting the bucket is tilted back between the carrier, and the bucket is in almost the same position as a standard bucket, and thus there are barely any disadvantages with regards to breakout force, lifting force, and tipping load.

NOTE!

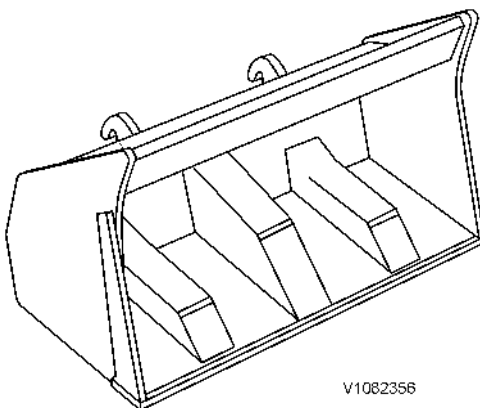
For connecting and disconnecting hydraulic hoses for 3rd hydraulic function, see page 205. Always check the attachment's control functions before starting to work!

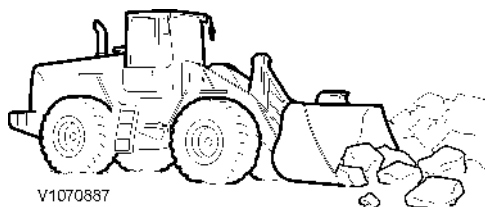
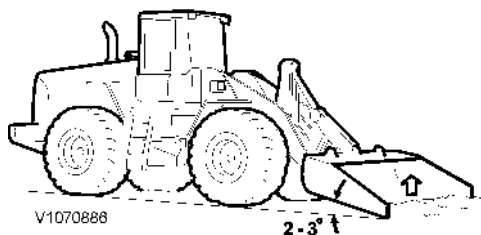
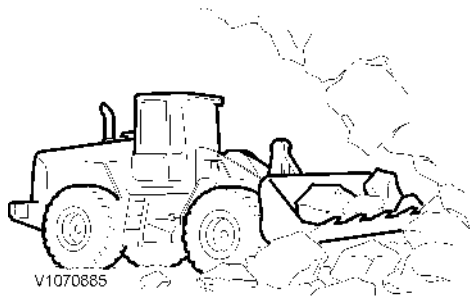
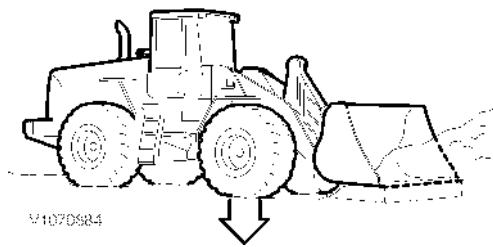
- The bucket cylinder is activated in "tilt function" with the control lever (3), see page 95.
- For loading, transporting, and lifting the bucket should be tilted back completely.
- Only empty the bucket when the desired lifting height has been reached.

NOTE!

Avoid tipping the high-tip bucket with the standard tipping function, or if that is the case, use low tipping speed, so that the bucket remains completely tilted back on the carrier.

- Avoid tipping the high-tip bucket forward or back against the end-stops with full force in order to prevent damage to the bucket and cylinders.
- Clean the carrier arms from dirt at regular intervals.
- Check the hydraulic lines at regular intervals for leaks and visible damage, replace if needed.
- Check the dampers (buffers) on the tilt-back stops at regular intervals, replace if needed.
- Grease the bucket support and the cylinder bearings every 250 hours and every 50 hours in aggressive/corrosive conditions. For grease quality, see page 284.
- Always depressurize the hydraulic system before starting maintenance or repair work.
- Work on the hydraulic system may only be done by authorized personnel.





Gravel and stockpile loading (short cycle loading)

- 1 Adjust the bucket so that it is level and lower it to the ground just in front of the gravel pile.
- 2 Enter the material in 2nd gear + kick-down. When the machine has nearly come to a standstill because the maximum tractive effort of the machine has been reached, begin to raise the bucket while at the same time tilt backward with short control lever movements.

If possible avoid tilting the bucket forward when filling it. Exaggerated lever movements causes wheel spin. Never move into the material at a high speed.

Suitable bucket:	Straight with or without teeth
Suitable gear:	Gear selector in position 2 or 4
APS settings ^(a)	Medium or Automatic
Boom Suspension System:	Gear-dependent position

a)For selecting APS settings see page 60.

WARNING

Risk of crushing.

Falling load could cause serious injury.

Always ensure that components are secured and supported with properly rated equipment.

Excavating

- When excavating and surface stripping, start by angling down the bucket 2–3°.
- Operate in 1st gear and at low engine rpm, gradually increase engine rpm at the same time as you lift the bucket slightly.
- If the ground conditions are poor and the wheels tend to spin, use the differential lock.

NOTE!

You must never engage the differential lock when one of the wheels is spinning. Let up the accelerator until the wheel stops.

Suitable bucket:	Straight with or without teeth (or levelling bucket)
Suitable gear:	Gear selector in position 1

Rock loading (short cycle loading)

- Correct engine speed is of great importance – too high engine rpms cause wheel spin.
- Run straight into the material to avoid shear stresses that can damage the lift arm system.
- The edge of the bucket must find its way under and between the stones, which means that you must watch the bucket carefully as it enters the material.
- If a stone has become wedged, try a new angle of approach, but avoid exerting pressure on the corner of the bucket.
- Avoid driving up into the material, as there is then a great risk of damage to the tyres by the sharp blasted pieces of rock. Also remove stones that have fallen out of the bucket.

Suitable bucket:	Spadenose bucket
Suitable gear:	Gear selector in position 2
APS settings ^(a)	Medium or Automatic
Boom Suspension System:	Gear-dependent position

a)For selecting APS settings see page 60.

Transporting load (load – carry)

- The bucket should be fully tilted back and held in carry position 30–40 cm (12–16 in) above the ground.
- Keep the transport road smooth and free from stones and other objects. An overfull bucket always spills material.
- Even out the road on the way back if necessary.
- Adapt the speed to governing regulations and operating conditions.

Max. speed under normal conditions:

Approx. 15–20 km/h (9.3–12.4 mph)

Suitable gear:

Gear selector in position 4

APS settings^(a)

Light (*Light*) or Automatic

Boom Suspension System:

Gear-dependent position

a) For selecting APS settings see page 60.

When operating where gear-shift hunting arises, select the H mode as the machine then must reach a higher travelling speed before upshifting takes place.

Example: Operating on long grades during load/carry work. Before operating on long grades, activate the switch "Engine brake/downshifting" (see page 147) to prevent 'gear-hunting'.

NOTE!

Remember that the stability of a heavily loaded machine changes when it is steered.

Dumping load



WARNING

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.

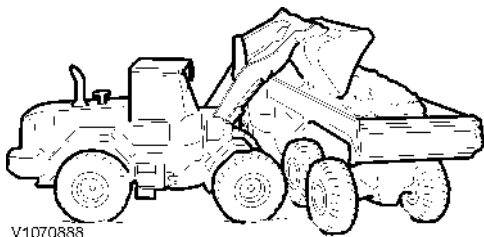
- If you are working on a grade, try to dump the load uphill. This affects the stability of the machine in a positive way.
- Keep the bucket as close as possible to the dump body or hopper to achieve smooth dumping and better control of load placement.
- When loading rock, try to fill the first bucket with as fine material as possible in order to soften the impact of subsequent larger material.

Positioning of transport vehicle

- Positioning of the hauler (transport vehicle) is of great importance for efficient loading operation.
- The operator should indicate where the transport vehicle is to stand, by "pointing" with the bucket. Having done so, the operator is responsible for that place being safe.

Levelling

- The bucket should lie flat against the ground. To be able to fill any hollows you should have material in and in front of the bucket when operating forwards.
- To finish off the levelling operation, keep the edge of the bucket slightly downward and reverse while pressing the bucket lightly against the ground.
- If a dozer blade, snow plough or sweeper etc. is used, it may advantageous to have the single-acting lift function engaged. This allows the attachment to follow any unevenness in the



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ground by "floating". This means that steering ability and traction power is maintained. The attachment returns to preset position, see page 84.

Suitable bucket:	Straight without teeth (or levelling bucket)
Suitable gear:	Gear selector in position 1 or 2
Fully automatic downshifting:	Deactivated
Boom Suspension System:	Not activated

Stone block handling

Stone block handling

Applies to models: L90H

Working with stone fork

Always carry the stone blocks as low as possible and fully tilted rearward.

Operate with as small, careful control lever movements as possible, particularly when unloading and loading a vehicle.

Always handle the blocks with the centre of gravity as close to the machine as possible.

Never use the stone fork for prizing loose large blocks or moving them with the aid of just one fork tine. In stead use a breaker tine, which is intended for this purpose.

To achieve the best possible stability, aim at placing the machine as straight as possible when handling blocks.

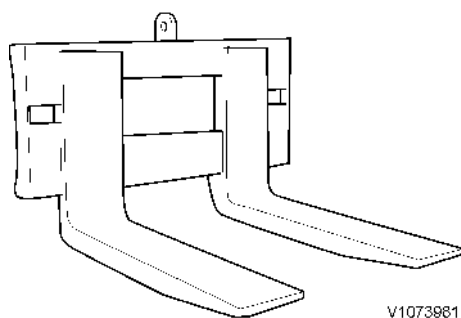
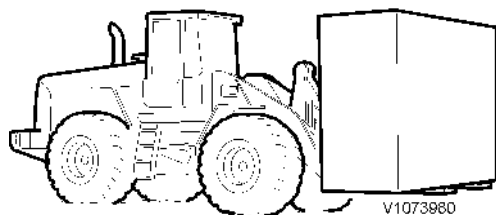
For increased stability, it is important to maintain the recommended tyre pressure.

When operating downhill with a heavy load it may be better to reverse the machine.

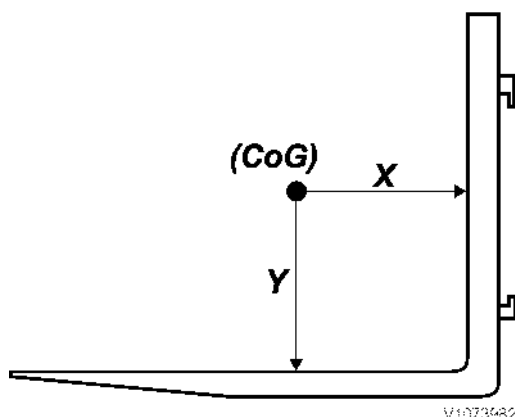
When using the machine with a stone fork, the maximum permissible load is 80% of the tipping load on firm and level ground.

Maximum work load is based on the following (ISO 14397-1)

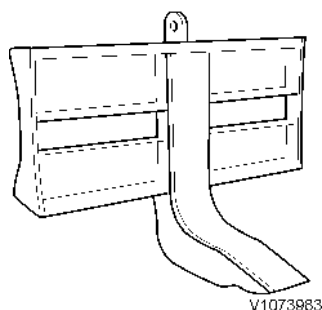
- Maximum speed is less than 2 km/h (1.2 mph)
- Straight machine
- The load is fully tilted rearward
- The load lifted to max. reach
- Centre of gravity of the load X = 900 mm, Y = 800 mm.
- Max. permitted use is 80% of the tipping load on firm and level ground.



Stone fork



Centre of gravity of load



Breaker tine

Suitable gear:

Mode selector:

Boom Suspension System:

Lockup:

Gear selector in position 2

L position

Gear-dependent position

Not activated

Pallet forks

NOTICE

Only pallet forks approved for the machine by Volvo may be used.

When the machine is used with pallet forks, the max. permitted work load is 60% of the tipping load with fully turned machine on uneven ground surface, and 80% with a hard and smooth ground surface. Depending on application and/or machine size, the manufacturer often recommends a lower utilization. For information about weight, volume, load, etc., contact your dealer to obtain the attachment catalogue.

Pallet forks are only to be used for intended purpose: Therefore, may not be used as a crowbar for prying loose tree stumps, large stones or similar.

Must not be overloaded or subjected to shear loads.

Must not be used as lifting equipment together with chains or slings for lifting objects.

NOTICE

In order to avoid damage to the pallet forks it is recommended that single-acting lifting function is activated particularly when operating rearwards and if the points of the tines come into contact with the ground. It is particularly important in the case of uneven ground conditions.

Pallet forks and fork brackets must be dimensioned to withstand loads which the lifting capacity of the machine permits.

Pallet forks and fork brackets must be kept free from dirt and rust and be well greased for best possible function.

Pallet forks and fork brackets may not be combined with work basket or work platform for lifting persons.

The fork arms are dimensioned according to ISO 2330 and are classified together with the machine according to governing standards.

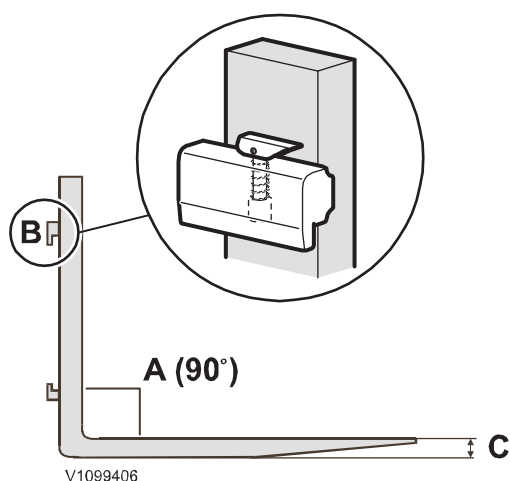
NOTICE

Make sure that the stops that prevent the fork arms from sliding off the fork frame are properly located. This is particularly important when the fork arms are moved sideways manually. Make sure that the fork arms are locked against the fork retainer, so that the fork arms are prevented from moving sideways.

NOTE!

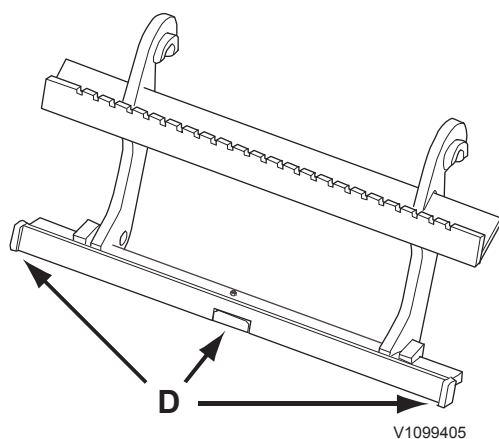
The supports must be lowered before the pallet fork is removed from the machine.

(Only applies to pallet forks with hydraulically adjustable forks)



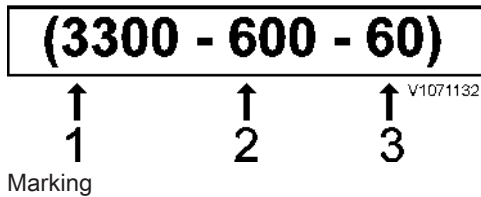
Checking fork tines

- A Angle
- B Attaching lugs
- C Thickness



Fork frame

- D Stop



Marking

1 Max. load per tine (kg) *)

2 Distance to centre of gravity in mm for maximum load

3 Thickness of fork tine at delivery

*) Must not be confused with rated operating load for the respective loader model.

- Check the pallet forks regularly for wear. It is especially important to check the heel of the fork tine.
- Check that stops (D) for the fork arms are properly located.
- Check that the fork arms are locked against the fork frame.
- The fork tine should not be used any more if:
 - the fork tine has been worn down to 90% of its original thickness
 - the angle between fork tine and shank has become greater than 93°.
 - the attaching lugs are worn or cracked.
- Cracks or wear must not be made good by welding.

Adjusting fork tines' position sideways

- 1 Place the fork tines just above ground level and tilt max. 15° forward.
- 2 Open the fork tines' lock and move the fork tines sideways to desired position.
- 3 Close the fork tines' lock so that the fork tines cannot move sideways.

NOTE!

Do not place the fork tines in the middle of the fork frame. Risk of the fork tines unhooking from the fork frame.

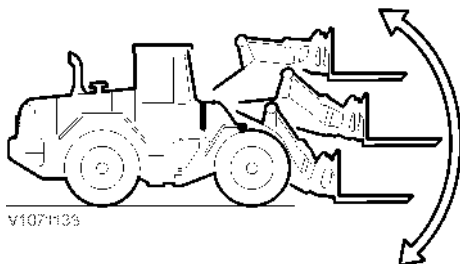
Fork tine extensions

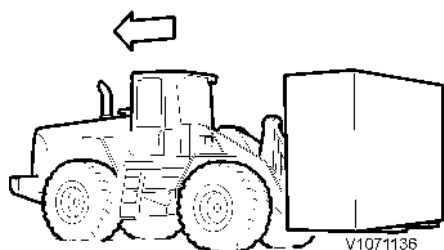
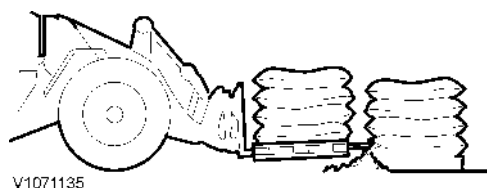
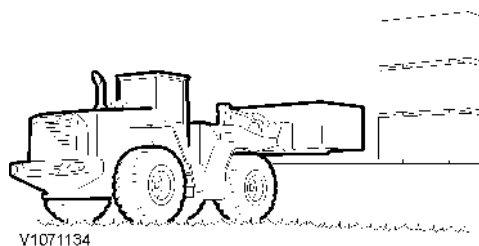
Fork tine extensions are used when handling light material with low density and it is marked with maximum load.

Working with pallet forks

The most important points for work with pallet forks are:

- The operator should have suitable training.
- The operator is responsible for that permissible load values are not exceeded.
- The fork makes a semi-circular movement when it is raised. Therefore, start raising the fork a little bit away from the place where the load is to be placed.
- The fork must not be raised other than when stacking or unloading pallets.
- When operating without a load in the fork, the tines should be held low and tilted upward.
- When stacking material, the fork tines should be kept horizontal.
- Choose the most suitable travel path with the smoothest surface or, when required, rectify by levelling off the ground.
- The machine's speed should be adapted to the ground conditions.
- For increased stability, when working with pallet forks, it is important that the tyre pressure is correct according to recommendations.
- With a wide load it may be advantageous to move the fork arms out on the fork frame to obtain increased stability of the load. Also make sure that the load is centred sideways with regard to the centre of gravity.
- When operating downhill with a heavy load it may be better to reverse the machine.





NOTE!

For heavy jobs that require high breakout force, e.g., breaking out tree stumps and carrying marble blocks – use attachments approved by Volvo.

Suitable gear:	Gear selector in position 4
APS settings ^(a) :	Light (Light) or Automatic
Boom Suspension System:	Speed-dependent position or not activated
Single-acting lift function	Activated

a) For selecting APS settings, see page 60.

Picking up a load

- Choose fork tines with a correct length so that they do not protrude outside the load. Previously deposited pallet or goods may be damaged as the penetrating force of the fork tines is very great.
- Place the load as close to the vertical shank of the fork as possible.
- Lift the load with the least possible inclination of the pallet fork.
- There may be deviations from the complete parallel movement (see the Specifications) and this may affect the use of the fork.

Operating with a load

- Hold the load low (30–40 cm (12–16 in)) above the ground for best possible stability and visibility.
- If the load obscures the vision, reverse the machine to the place where the load is to be unloaded.
- Adapt the speed to governing regulations and operating conditions.
- When handling high loads, use a special load support.

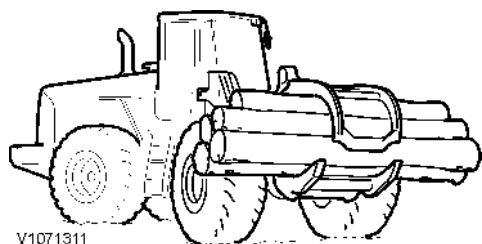
Approval and legal provisions

The permissible rated operating load capacity according to CEN standard EN 474-3 is given as a percentage of the tipping load. The percentage values, which must not be exceeded, are as follows:

Uneven ground:	60 % of tipping load
Firm and even ground:	80 % of tipping load

It must be possible to control and handle the load hydraulically in all likely positions at the same time as all other hydraulic circles are actuated. The maximum permissible load capacity is determined either by the stability of the machine or its hydraulic capacity whichever is less.

In countries outside the EU/EEA other regulations may apply. Therefore, always check which local rules apply.



Timber grapples

When the machine is used with a log grapple, the max. permitted work load is 80% of the tipping load with fully turned machine.

NOTE!

Only log grapples approved by Volvo may be used, see page 340 for more information.

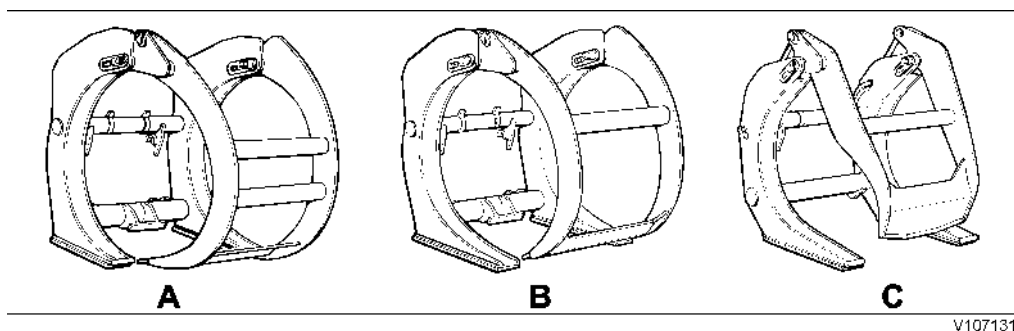
NOTE!

For connecting and disconnecting hydraulic hoses for 3rd hydraulic function, see page 205. Always check the attachment's control functions before starting to work!

- The clamping arm is operated with control lever (3) and the counterhold (optional equipment) control lever (4), see page 95.
- Check the hydraulic lines' hoses at regular intervals for leaks and visible damage.
- Grease the bearings for clamping arm and cylinder every 250 hours. For grease quality, see page 284.
- Always depressurize the hydraulic system before starting maintenance or repair work, and before disconnecting the attachment.
- Work on the hydraulic system may only be done by authorized personnel.

There are five types of log grapples:

- A **Unloading grapple** has short tines which makes it easier to fill the grapple when unloading transport vehicles.
- B **Sorting grapple** has relatively long tines which makes it easier to fill the grapple from a stack and sorting table.
- C **Universal grapple** has a smaller grapple area than the sorting grapple and can be used for handling whole trees sorting or picking up individual trees.

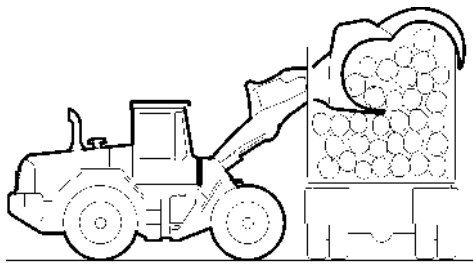


CEN-standard EN 474-3 applies within the EU, which means that nominal work load is expressed as a percentage (85%) of the tipping load. According to this, Volvo has chosen to adapt its internal standard for stating the capacity of log grapples.

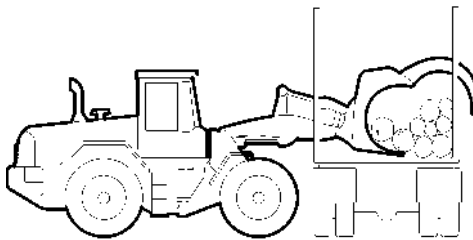
The recommended maximum loads apply for combinations of log grapples and wheel loaders that are equipped with approved counterweights for log handling.

Any equipment added to the attachment reduces the rated operating load.

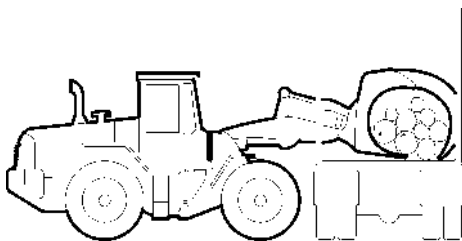
In countries outside the EU and EEA other safety requirements may apply, therefore, always observe local regulations.



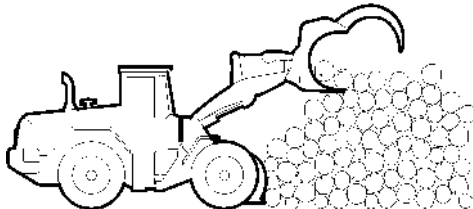
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Working with timber grapples

Unloading vehicle

Operate very carefully when filling the grapple to avoid damaging stakes and their attachments on the vehicle.

- 1 Approach the vehicle which is to be unloaded with a raised and fully open grapple.
- 2 Tilt the grapple forward and lay it down over the load.

Close the clamping arm and begin to tilt slightly upward. Then repeat alternate closing and upward tilting of the grapple until it is full.

NOTE!

Operate carefully when unloading a vehicle, especially when there are only a few logs left. If the grapple should grip around the far edge of the platform this could lead to damage.

Loading vehicle with log grapples

- 1 Make sure that each log lies correctly in the grapple to avoid "crows nest".
- 2 Approach the vehicle to be loaded while at the same time raising the attachment so that the logs clear the stakes.
- 3 Lower the grapple until it is level on the bunks or the platform and deposit the bundle against the stakes on the far side.
- 4 Open the clamping arm fully and carefully reverse out.

Stacking

For machines with Boom Suspension System it is recommended that speed-dependent function should be selected. The precision increases and the risk of "crows nest" reduces.

- 1 Keep the grapple as near the stack as possible to prevent logs falling down.
 - 2 Tilt the grapple slightly forward.
 - 3 Carefully open the clamping arm fully so that the logs start to roll out of the grapple.
 - 4 Then open the clamping arm completely and reverse carefully while lowering the grapple and holding back falling logs.
- The grapple's counterhold can be used as heel kick-out and therefore you do not have to tilt the grapple forward. The machine's lifting height is used better and it is possible to build higher stacks. The heel kick-out can also be used as a counterhold when handling single logs.

Basic rule: Make sure that the logs leave the grapple without falling.

Suitable gear:

APS settings^(a)

Boom Suspension System:

Gear selector in position 4

Light (*Light*) or Automatic

Speed-dependent position

a) For selecting APS settings, see page 60.

Picking up from a stack

Low stack:

- 1 Keep the grapple tines flat against the ground with the grapple fully open.
- 2 Enter the grapple into the stack and close the clamping arm as far as possible.

- 3 Carefully reverse while closing the grapple further.

High stack:

- 1 Begin as high as possible and tilt the grapple tines slightly forward with the grapple fully open.
- 2 When the grapple is well into the stack, close it.
- 3 Follow through with the grapple so as to avoid logs falling down under the grapple tines.

If logs fall between the grapple tines, carefully lower the load to the ground, reverse and try to pick up the load again. Make sure not to damage the logs.

A heel/kick-out makes it possible to stack the logs higher and to keep the ground in front of the wheels of the machine clear of logs.

Operating with tree-length logs

- Pay special attention that the centre of gravity of the logs is correctly positioned to maintain a satisfactory lateral side stability.
- Make use of a signal man when operating where visibility is limited, see page 223.



Risk of crushing.

Swinging objects could cause serious injury.

Always ensure no persons are in the danger zone before lifting or moving objects.

Lift arm, alternative lowering

Boom, emergency lowering



Risk of crushing.

- **Never enter under a raised lift arm.**
- **Always lower the lift arm before leaving the cab.**
- **Never operate the machine when you suspect hydraulic damage or lift arm damage. Contact a qualified service technician.**

Emergency lowering

If the machine's engine has stopped with the boom in raised position, the boom can be lowered with the remaining pressure in the hydraulic system.

NOTE!

Lower the boom immediately, max. 5 minutes after the engine has stopped. If more than 5 minutes have passed the engine shall be restarted. If this fails, contact a qualified service technician or cordon of the area and post a guard.

- 1 The ignition must be in running position (1) before lowering the boom.
- 2 When the boom has been lowered, all hydraulic hoses on the boom shall be depressurized with the control levers, see page 205.

Signalling diagram

If the operator's visibility is restricted, e.g., due to a big load, use a signal man.

The faster lifting, lowering, or movement that is required, the livelier the signal man's movements should be. If two or several operators use the same signal man, determine ahead of time how the lift is to be done and how signals shall be given to each operator.



START

Arms extended horizontally with palms facing forward



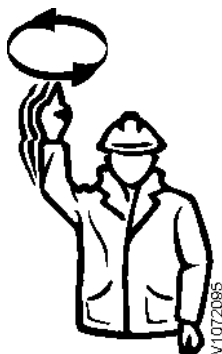
STOP

Right arm pointing up with palm facing forward



END

Hands held together at chest height



RAISE

Right arm pointing up with palm facing forward and hand moving slowly in a circle



LOWER

Right arm pointing down with palm facing forward and hand moving slowly in a circle



VERTICAL DISTANCE

Hands indicate relevant distance



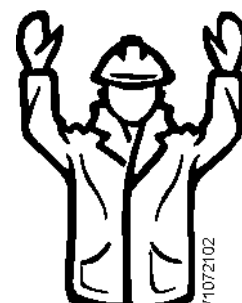
MOVE FORWARD

Both arms bent with palms facing up and underarms moving slowly and repeatedly up towards the body



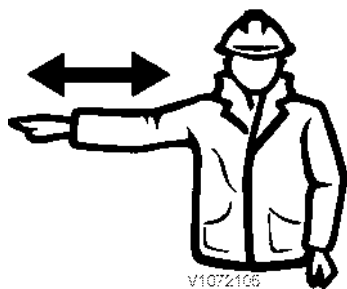
MOVE BACK

Both arms bent with palms facing down and underarms moving slowly and repeatedly down away from the body

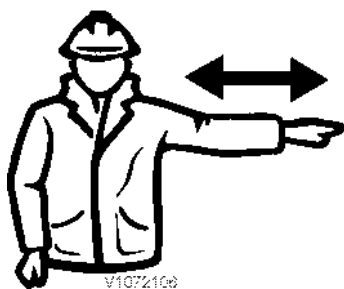


DANGER (EMERGENCY STOP)

Both arms up with palms facing forward

**OPERATE IN INDICATED DIRECTION**

Arm extended horizontally with palm facing down and small movements back and forth slowly to the right

**OPERATE IN INDICATED DIRECTION**

Arm extended horizontally with palm facing down and small movements back and forth slowly to the left

**HORIZONTAL DISTANCE**

Hands indicate relevant distance



Safety when servicing

This section deals with the safety rules that must be followed when checking and servicing the machine. Volvo will not accept any responsibility if any tools, lifting devices, or work methods other than those described in this publication are used.

Other safety rules, information and warning texts are given in each section.

NOTE!

Lifting and supporting of the machine may only be performed by trained personnel.

WARNING

Risk of burns!

Hot machine parts could cause burns.

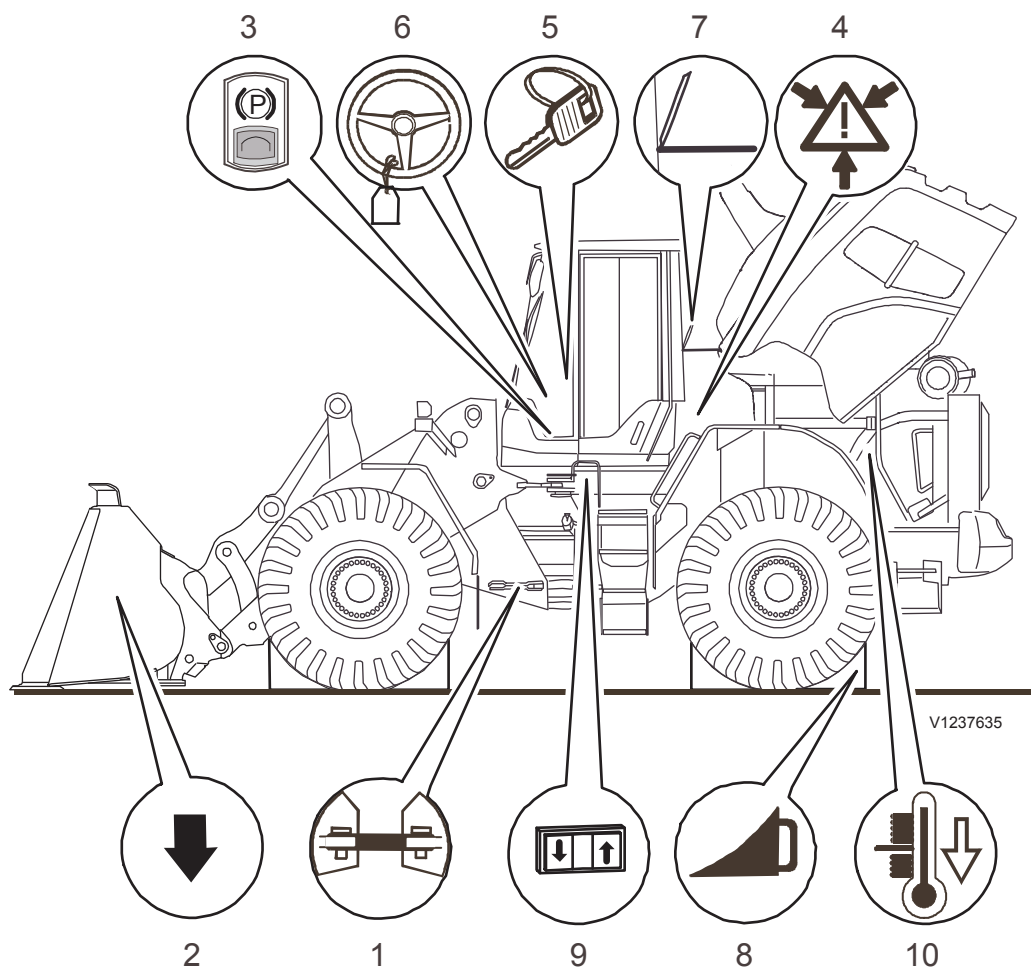
Allow hot machine parts to cool before performing adjustments or service. Wear personal protective equipment.

Service position

Service position

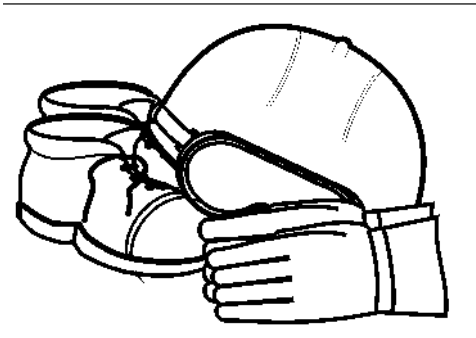
BEFORE you begin service work, the machine must be placed on level ground and prepared as shown below. The machine must be clean.

AFTER you have finished service, all protective plates must be reinstalled, the engine hood and all covers are to be closed and locked.

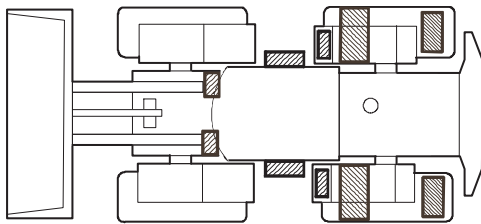


1	Connect the frame joint lock.	6	Fasten a yellow-black warning tag to the steering wheel (in the USA a red flag can be used instead).
2	Lower the attachment and let it rest on the ground.	7	Raise the plate.
3	Apply the parking brake and turn off the engine.	8	Block the wheels, e.g., with wedges.

4  WARNING Risk of high pressure injection. Discharging hydraulic oil will cause serious injury when injected into the skin. The hydraulic oil is under high pressure. Depressurise the hydraulic system before starting work on it. To depressurize; turn the start key to ignition position (1). Pressurized lines and pressure tanks shall be depressurized carefully so that the high pressure is released without risk. See page 208.	9 Open the engine hood. NOTE! Turn the battery disconnect switch to the OFF position to make the machine fully powerless. For e.g. replacing the starter motor, alternator, pre heater, and for engine or cab removing. See 230.
5 Remove the start key.	10 Let the machine cool down.  WARNING Risk of burns! Hot liquids and machine parts can cause burns. Allow the machine to cool before beginning any service.



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Slip protection, placement (principle illustration)

Before service, read

Prevent personal injuries

- Read the instructions in the Operator's Manual before starting any work on the machine. It is also important to read and follow the information and instructions found on plates and decals.
- Do not wear loose-fitting clothing or jewellery that may get caught and cause injuries.
- Always wear a hard hat, protective safety glasses, work gloves, protective work shoes, breathing protection, and hearing protection when required by the job.
- Make sure that ventilation is adequate if the engine is going to be started indoors.
- Do not stand in front of or behind the machine while the engine is running.
- Turn off the engine before you remove any protective covers or open the engine hood.
- There remains an accumulated pressure in the system, even when the engine has been turned off. If a system is opened without first being depressurized, high-pressure fluid may jet out.
- Use a piece of paper or cardboard when checking for leaks, never use your hand.
- Make sure that stepping surfaces, handholds and slip protected surfaces are free from oil, diesel fuel, dirt and ice.
- Only step on machine parts that are provided with slip-protection (see principle illustration).
- It is important that correct tools and equipment are used. Faulty tools or defective equipment must be repaired or replaced.
- If service work has to be done under an attachment, make sure that it is secured before starting any work. Apply the lever lockout and the parking brake.

Prevent machine damage

- Use equipment with adequate lifting capacity when lifting or supporting the machine or parts of the machine.
- Volvo will not accept any responsibility if other lifting devices, tools, work methods, lubricants, and parts than those described in this Operator's Manual are used.
- Make sure that no tools or other objects that can cause damage have been forgotten in or on the machine.
- Release the pressure in the hydraulic system before starting the service work.
- Machines used in contaminated conditions or health-hazardous areas must be equipped for such operations. Also, special safety rules apply when servicing such machines.
- When installing two-way radio, mobile telephone or similar equipment, the installation must be carried out according to the manufacturer's instructions in order to eliminate interference with the electronic system and components intended for the machine's function, see page 20.
- Actions to be taken in connection with electric welding, see page 230.
- Make sure that all belly plates, guards, covers, and hoods on the machine are in place before starting the engine and using the machine.
- Use the three-point method (two feet and one hand) when cleaning or scraping the windows, rear-view mirrors, and cameras.

Prevent environmental impact

Be aware of the environment when performing service and maintenance. Oil and other liquids harmful 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. The machine shall be cleaned in a facility with an oil separator or equivalent equipment.

NOTE!

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

- When draining, oils and liquids must be collected in suitable containers and actions must be taken to avoid spills.
- Used filters must be drained of all liquid before they are handled as waste. When changing asbestos filter, the used asbestos filter shall be placed in the tight-sealing plastic bag that is supplied with each asbestos filter package. Do not shake out the asbestos filter, just place it carefully in the supplied plastic bag. Seal the plastic bag and make sure that it is deposited in a suitable location for asbestos waste.
- Batteries contain substances dangerous to the environment and health. Therefore used batteries must be handled as environmentally hazardous waste.
- Consumables, e.g. used rags, gloves, and bottles may also be contaminated with oils and liquids that are hazardous to the environment. In such cases they must be treated as environmentally hazardous waste.

Preparations before service

Battery, disconnecting and connecting

Disconnecting

- 1 Place machine in the service position. Refer to page 226.

- 2 **NOTICE**

Risk of machine damage.

Incorrect handling of the electrical system can lead to machine damage.

Make sure that the machine is without electric power supply (voltage) by turning the ignition to position 0, the information display unit should also be off.

- 3 Make sure that the machine is without electric power supply (voltage) by turning the battery disconnect switch to the OFF position.

Connecting

- 1 **NOTICE**

Risk of machine damage.

Incorrect handling of the electrical system can lead to machine damage.

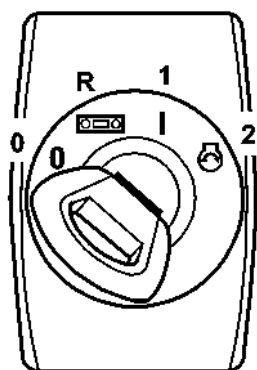
Ensure the ignition switch is in the "0" position before work is started.

- 2 Turn the battery disconnect switch to the ON position.

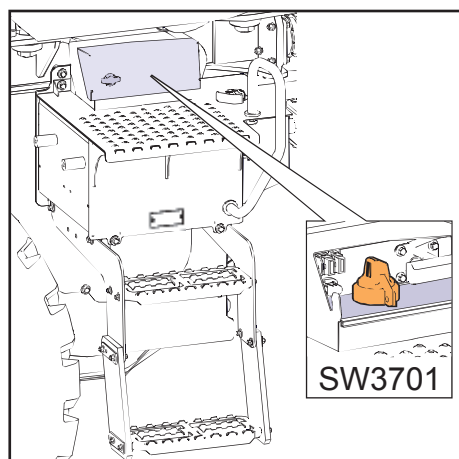
- 3 Restore the machine from service position.

Electric battery disconnecter relay

The ignition switch shall be used daily when turning off the machine. When the ignition switch is turned to position 0, the electric battery disconnecter relay cuts off the machine's main electric power. Voltage may remain for some time to shut down various systems in a controlled way. However, a few minor power consumers are always supplied with voltage, e.g., the radio memory.



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Battery disconnect switch

The battery disconnect switch should be used to prevent unintended machine powering during service and repair of the electrical system, during transport and for long term parking. Do not confuse the battery disconnect switch with the electric battery disconnecter relay or emergency switch. The battery disconnect switch disconnects all electric power (even minor power consumers, e.g., the radio memory, and can be locked in the OFF position using a pad lock.

The battery disconnect switch is located by the stairs on the machine's right side.

Welding

NOTE!

Welding on the machine may only be performed by a qualified welder.

WARNING

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.

NOTICE

A fire extinguisher should be easily accessible during all welding work.

NOTICE

Before starting any electric welding, disconnect the battery connections. All connections to the control units (ECU) should be disconnected. Connect the welding unit's ground cable as close as possible to the welding point.

NOTE!

Welding on the cab is not permitted, it affects the cab's approval for FOPS and ROPS .

- 1 Turn off the electric power with the battery disconnect switch.
- 2 Disconnect the batteries, start with the minus terminal and then the plus terminal.
- 3 Unplug the electronic units. For more information, contact a qualified service technician.
- 4 Connect the welding equipment's ground connection as close to the welding point as possible and make sure that the current does not pass across a bearing.
- 5 Provide for good ventilation.
- 6 Remove all paint from an area at least 10 cm (4 in) around the welding point.
- 7 After welding is finished, disconnect the ground cable.
- 8 Plug in the electronic units.
- 9 Connect the batteries.
- 10 Turn on the electric power with the battery disconnect switch.

See also page 232.

Fire prevention



Risk of fire.

Operating in environments with flammable or other explosive particulates in the air could increase the risk of fire.

Use special equipment and proper ventilation when operating in hazardous environments.

There is always a risk of fire. Find out which type fire extinguisher that is used at your place of work and how it is used. A fire extinguisher is optional equipment and is available from your dealer. If the machine is equipped with a fire extinguisher, it should be located on the back part of the front fender.

If the machine is equipped with a portable fire extinguisher it should be of the type ABE (ABC in North America). The designation ABE means that it can be used to put out fires in both solid organic materials and fluids, and that the fire suppressing agent does not conduct electricity. Efficiency class I means that the fire extinguisher must operate effectively for at least 8 seconds, efficiency class II at least 11 seconds, efficiency class III at least 15 seconds.

In general, a portable fire extinguisher ABE I corresponds to an effective content of 4 kg (8.8 lbs) (EN-class 13A89BC), standard EN 3-1995 part 1, 2, 4, and 5.

Fire prevention

- Smoking or open flames are forbidden near a machine when filling with fuel or when the fuel system has been opened and has contact with the surrounding air.
- Diesel fuel is flammable and must not be used for cleaning. Instead use car care products intended for cleaning or degreasing. Also keep in mind that certain solvents may cause skin rash, damage the paint finish, and constitute a fire hazard.
- Keep the place clean where service work is to be done. Oil and water can make floors and steps slippery. This may also be dangerous in connection with using electrical equipment or electrically powered tools. Oily or greasy clothes are a serious fire hazard.
- Check daily that the machine and equipment are free from dust and oil. This reduces the risk of fire and also makes it easier to detect loose or damaged parts.

NOTE!

Be very careful when using a high-pressure washer for cleaning since electrical components and cable insulation may be damaged at relatively low pressure and temperature. Protect electrical components and cables in an appropriate way.

- Be extra thorough when cleaning a machine that is operated in fire-hazardous environments, e.g., sawmill and landfill sites. The risk of spontaneous combustion can be further reduced by, for example, installing insulation on the muffler.
- The fire extinguisher must be maintained so that it works when it is needed.
- Check that fuel lines, hydraulic hoses, brake hoses, and electrical cables have not been damaged by chafing or are not at risk of being damaged in that way due to incorrect installation or clamping.

- All power cables on the machine are protected with corrugated hoses (black). Short cable between batteries is without corrugated hose and is red. Unfused cables are routed as follows:
 - between batteries
 - between battery and battery disconnect switch
 - between battery disconnect switch and battery disconnect relay
 - between battery disconnect relay and starter motor
 - between starter motor and fuse box
 - between battery disconnect relay and jump-start connection

Electrical cables must not rest directly against oil or fuel lines.

- Do not weld or grind on components which are filled with flammable liquids, e.g. tanks and hydraulic pipes. Work carefully when doing these jobs close to such places. A fire extinguisher should be kept nearby.

Actions in case of fire

If conditions allow and it is possible without risking your own safety, take the following actions at the slightest sign of fire:

- 1 Stop the machine if it is moving.
- 2 Lower the attachments to the ground.
- 3 Move the lever lockout to locked position.
- 4 Remove the start key.
- 5 Leave the cab.
- 6 Call the fire department.
- 7 If possible try to put out the fire. Otherwise move away from the machine and the danger area.

Actions after a fire

When handling a machine that has been damaged by fire or has been exposed to intense heat, the following protective actions must be taken:

- Use thick rubber gloves and wear protective goggles.
- Never touch burnt components with your bare hands to avoid contact with melted polymers. First wash thoroughly with plenty of lime water (a solution of calcium hydroxide, i.e., slaked lime in water).
- Handling heated fluor rubber, see page 237.

Fire suppression system

(Optional equipment)

Fire Suppression System is a sprinkler system for the engine compartment. The system is recommended for machines operating in fire-hazardous conditions.

The system meets the standards according to SBF 127 (Swedish rules for permanently installed sprinkler system and other fire protection equipment on forestry and construction machines).

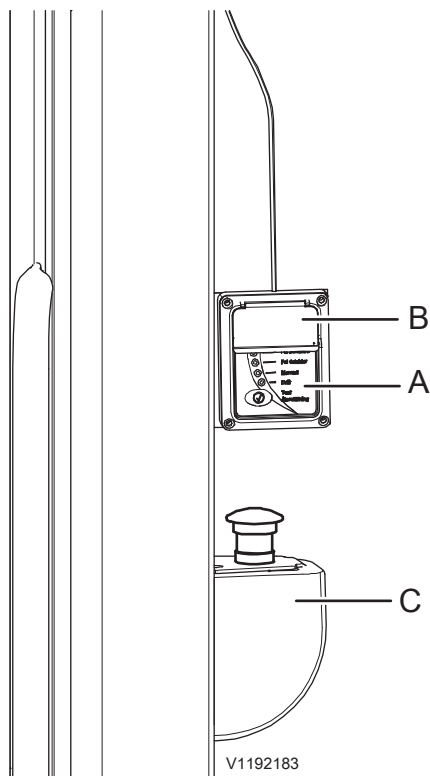
Automatic mode

In automatic mode only the green light-emitting diode is activated ("On") on the control panel, see page 94.

The sprinkler system is activated automatically in two modes:

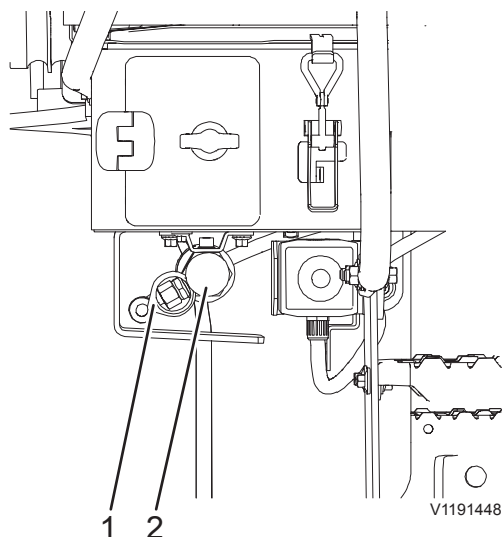
- when the machine is not operated (e.g., when parked) with the engine off and the key removed, or
- when the parking brake is applied with the engine running.

In case of high temperatures, a detector circuit detects fire and the sprinkler system is activated automatically. After the system has



Cab's front left pillar

- A Control panel
- B Plastic cover
- C Emergency stop (stops the engine, cuts off electric power, and activates the sprinkler system if fire is indicated)



- 1 Tamper seal
- 2 Button to activate the fire suppression system outside the cab (located by cab steps)

been activated, there is enough extinguishing agent for approx. 20 seconds of operation. Then the extinguishing agent container is empty.

Manual mode

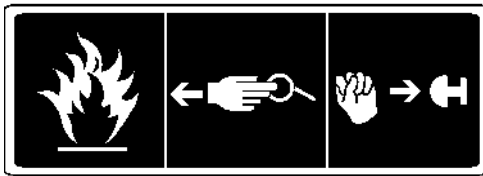
In manual mode both the green light-emitting diode ("On") and yellow light-emitting diode ("Manual") are activated, see page 94.

The sprinkler system is in manual mode (the operator activates the system) when the machine is operated and the parking brake is released.

When the machine is operated and fire is detected, an alarm is triggered and shown using a red light on the control panel (A) and the siren/strobe light are activated. Then the system shall be activated manually with the emergency stop (C), via the control panel (A), or by removing the tamper seal (1) and pressing in the manual activation button (2). For further information, see page 95.

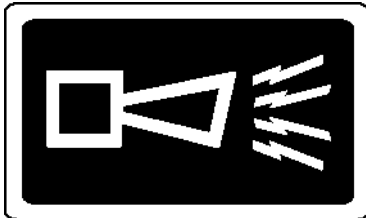
For the control panel's functions, see page 94.

NOTE! Plastic cover (B) shall only be raised when the control panel is used. The tamper seal is restored during service and maintenance.



V1082251

Manual activation of the sprinkler system with the manual release (activation) button



V1082252

Decal for siren (located by siren/strobe light)



V1082253

Decal for handheld fire extinguisher (located by each handheld fire extinguisher)



V1203124

Decal for fire extinguishing agent (located on container for fire extinguishing agent)

For safety rules in case of fire, see page 131.

The manual release (activation) button (located by cab steps) can be used in all modes to activate the sprinkler system, even when the machine is not operated and if the machine's electric power supply is turned off.

- 1 Pull out the yellow tamper seal (1).
- 2 Press in the red button (2).

Siren/strobe light

Siren/strobe light are activated

- when fire is detected
- when the sprinkler system is activated using the control panel
- when the system is activated with manual release (activation) button
- when the test button on the control panel is pressed in.

Siren/strobe light remain activated until the test button on the control panel is pressed in. If there is still a fire indication, the siren/strobe light are activated again. Contact a qualified service technician.

Location for handheld fire extinguisher (optional equipment)

There is space provided for two handheld fire extinguishers, one on each front fender. These are a supplement to the permanent sprinkler system and have the primary purpose of protecting the surrounding areas and for any damping-down operations. According to Swedish standard SBF127, two fire extinguishers of 6 kg (13 lbs) each are required for work in a fire-hazardous environment.

To use the handheld fire extinguishers:

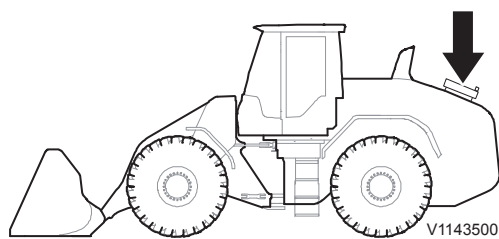
- 1 Hold the fire extinguisher upright, pull out and remove the safety pin.
- 2 Point the nozzle at the base of the flames, from a distance of at least 1 m (39.4 in).
- 3 Press the trigger.

Fire extinguishing agent

The fire extinguishing agent is a water-based powder ("wet chem") that is easy to wash off after the system has been activated.

At activation of the sprinkler system, there is enough fire extinguishing agent for approx. 20 seconds of operation.

The fire extinguishing agent is protected against freezing down to -30 °C.



Container with fire extinguishing agent

! WARNING

Chemical hazard.

Contact with the extinguishing agent which contains glycol could cause personal injuries.

Use personal protective equipment and avoid contact.

In case of contact with the eyes, rinse with water. In case of skin contact, wash with soap and rinse with water. Always consult a doctor after contact with the extinguishing agent.

After activation of the sprinkler system

After activation of the sprinkler system, contact a qualified service technician.

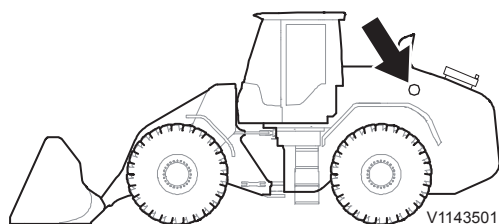
Firefighting if the hood cannot be opened – also applies to standard machine

If the engine hood cannot be opened in case of a fire, it is possible to fight the fire manually through two holes (diameter 55 mm (2.2 in)) on the side of the hood. Through the marked holes the engine compartment can be accessed for firefighting with, e.g., a handheld fire extinguisher.



V1094256

Marking for holes intended for manual firefighting



The holes are located on the side covers

Handling hazardous materials

Heated paint



Risk of chemical injury.

Heated rubber and plastics produce toxic components that could damage exposed skin and eyes and respiratory tract.

Never heat or ignite plastics or rubber on the machine.

When 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 cutting with a torch. In addition to the health hazard, the weld will be of inferior quality and strength, which may cause future failure of the weld.

Methods and precautionary measures when removing paint

- **Blasting**
 - use breathing protection and protective goggles
- **Paint remover or other chemicals**
 - use a portable air extractor, breathing protection, and protective gloves
- **Grinding machine**
 - use a portable air extractor, breathing protection, protective gloves and protective goggles

Never burn discarded painted parts. They should be disposed of by a licensed waste handling 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 approved breathing protection.

Heated fluor rubber



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 that has been damaged by fire or has been exposed to intense heat, the following protective actions must be taken:

- Use thick gloves made of rubber and wear protective goggles.
- Discard gloves, rags, etc., that have been in contact with heated fluor rubber after first washing them in lime water (a solution of calcium hydroxide, i.e., slaked lime in water). These are handled as hazardous waste.
- The area around a part which has been very hot and which may be made of fluor 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 fluor rubber.

- The hydrofluoric acid may remain on the machine parts for several years after a fire.
- If there is swelling, redness, or a stinging feeling and one suspects that the cause may be contact with heated fluor rubber, contact a doctor immediately. Symptoms may not appear until after several hours without any previous warning.
- The acid cannot be rinsed or washed off the skin. Contact a doctor and treat with Hydrofluoric Acid Burn Jelly or similar.

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 (since these give off explosive gases), welding, grinding, and open flames.
- Make sure that metal objects, e.g., tools, rings, and watch straps do not come into contact with the battery terminals.
- Make sure that the battery terminals' caps always are installed.
- Do not tilt a battery in any direction. Battery electrolyte may leak out. (Does not apply to maintenance-free batteries)
- Do not connect a discharged battery in series with a fully charged battery since this results in a risk of explosion.
- When removing a battery, disconnect the ground cable first and when installing, connect the ground cable last to reduce the risk of sparks.
- Discarded batteries must be handled according to governing national regulations.

Charging batteries, see page 269.

Starting with booster batteries, see page 137.

Dust of crystalline silicon dioxide (silica dust)



Risk of hazardous inhalation.

Working in environments containing dangerous dust can lead to serious health problems.

Wear personal protective equipment when working in dusty environments.

Crystalline silicon dioxide is a basic component of sand and granite. Many activities at construction and mining sites, such as trenching, sawing and drilling, generate dust containing crystalline silicon dioxide. This dust can cause silicosis (miner's lung).

The employer or work site management should provide the operator with information about the presence of crystalline silica on the work site along with specific work instructions, safety actions, as well as necessary personal protective equipment.

Also check local and national regulations on silica and silicosis.

Asbestos dust

- It is important that the cab is kept free from dust/asbestos dust as much as possible:
 - Enter and leave the machine in a place away from the asbestos-contaminated area.
 - Keep clothes and shoes clean from dust.
 - Clean and vacuum the cab often and use personal protective equipment, e.g., breathing protection intended for asbestos-contaminated areas.
 - Make sure that the cab door and windows are kept closed while operating.
- The cab should be ventilated through its ventilation system, which also provides overpressure in the cab.
- Keeping in mind the health risk and the environment, used filters must be placed in the tight-sealing plastic bag that is supplied together with a new filter. Then the bag should be left at a site especially intended for asbestos waste. Asbestos filters shall be changed by a qualified service technician.

Refrigerant

Environmental precautions

The air conditioning system of the machine is filled with R134a refrigerant at the factory. R134a refrigerant is a fluorinated greenhouse gas and contributes to global warming.

Do not release refrigerant into the environment. See page 321 for the amount of R134a refrigerant in your machine and its global warming potential.

Safety precautions

Work on the air conditioning system must only be performed by a qualified service technician. Do not attempt to perform work on the air conditioning system.

Wear safety goggles, chemical resistant gloves (e.g., neoprene or butyl rubber) and appropriate personal protective equipment to protect bare skin when there is a risk of contact with refrigerant.

Actions in case of exposure

Eye contact: Rinse with warm water and apply a light bandage. Seek medical attention immediately.

Limited skin contact: Rinse with warm water and apply a light bandage. Seek medical attention immediately.

Extensive skin contact: Rinse with warm water and carefully heat the area with warm water or warm clothing. Seek medical attention immediately.

Inhalation: Leave the area and find fresh air. Seek medical attention immediately.

End of life product dismantling

Core Values

Along with quality and safety, caring for the environment is one of Volvo's core values. This means that Volvo Construction Equipment works with an overall perspective of the products that extends throughout their entire lifecycle. This includes engineering and design, material selection, manufacturing processes, use, and recycling.

Producer responsibility

In most countries there is a producer responsibility for products that is applicable to components such as batteries, tyres and others. There are special regulations for these components. Contact an authorised dealer for more information.

Machine content

Thoroughly planned recycling of the machine is the foundation for ending the life cycle and for being able to recycle materials for use in new Volvo Construction Equipment products. According to calculations, Volvo Construction Equipment machines are up to 96% recyclable by weight. Refer to the Environmental Declaration for the machine or contact an authorised dealer for specific information regarding recyclable materials by weight for your machine.

Proper recycling and disposal

Proper safety and environmental precautions must be followed when dismantling the machine or machine components.

- Use proper tools and personal protective equipment.
- Place machine in a suitable service position. See page 226.
- Release all stored pressure and disconnect the battery.
- Follow instructions for specialised components.
- Carefully drain all fluids and lines into appropriate containers.
- Recycle machine parts and components in accordance with applicable laws and regulations. Refer to the Environmental Declaration or contact an authorised dealer for specific information regarding recyclable materials by weight for your machine.
- Dispose of waste fluids, batteries, filters, filter ash and non-recyclable material in accordance with applicable laws and regulations.
- Dispose of air conditioning systems in accordance with applicable laws and regulations.

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

Maintenance

The scheduled maintenance must be performed as specified in order to maintain the machine for maximum reliability, performance and safety.

Some of the scheduled maintenance items can be performed by the operator and some must be performed by a qualified service technician.

Service programme

The Service Programme is a checklist of all scheduled maintenance intervals for a specific range of models under normal operating conditions. The Service Programme is available from an authorized dealer.

Volvo Construction Equipment continually strives to improve efficiency and serviceability through product design changes. These changes are not always added to Operator's Manuals for products that have already been delivered. **Always refer to the Service Programme for the most accurate maintenance service intervals.**

For any factory warranty to be valid, the machine must be maintained according to the Service Programme. The completed Service Programmes must be kept on file and provided to Volvo Construction Equipment upon request.

Service history

The service history is a record that the machine has been properly maintained.

Fill in the service history after each scheduled maintenance service is complete, see page 343.

Maintenance to be performed by the operator

The following chapters contains the scheduled maintenance instructions for the machine which the operator may perform:

- Maintenance service, every 10 hours
- Maintenance service, every 50 hours
- Maintenance service, every 500 hours
- Maintenance service, every 1000 hours
- Maintenance service, every 2000 hours
- Maintenance service, every 4000 hours
- Maintenance service, when required

Maintenance to be performed by a qualified service technician

The maintenance steps that are to be performed by a qualified service technician are listed below.

EVERY 250 HOURS

After completed daily and 50 service

Change the oil-bath air cleaner's oil (optional equipment)

EVERY 500 HOURS

After completed daily, 50 and 250 hour service

Exhaust aftertreatment system regeneration status, checking (only applies to machines with D6J-engine)

Change engine oil and oil filters

- The interval varies depending on oil grade and the fuel's sulphur content, see page 284 .

EVERY 500 HOURS**After completed daily, 50 and 250 hour service**

Change the fuel filters (prefilter and main filter) (every 500 hours or when message is shown on the information display)

- The interval varies depending on oil grade and the fuel's sulphur content, see page 284.

Change the filter for the central lubrication system (optional equipment)

EVERY 1000 HOURS**After completed daily, 50, 250 and 500 hour service**

Change the engine oil and filter

- Only applies to machines with Volvo High Performance engine oil filter and approved oil according to 284.

- Or at least every 12 month

Change the fuel filters

- Only applies to machines with Volvo High Performance fuel filter and approved fuel according to 284.

Change the cab ventilation's prefilter (does not apply when extra prefilter of cyclone type is installed)

- Change the filter more often if needed.

Change the cab ventilation's extra prefilter (cyclone type) (optional equipment)

Service and maintenance of Fire Suppression System (optional equipment) (every 1000 hours or every 6 months) (optional equipment)

Check battery cables and connections

Check the brake pressure

Check the service brake for brake disc wear

Check the parking brake for wear

Draining hydraulic tank sediment

Change the cab ventilation's main filter, carbon filter (optional equipment)

Change the cab ventilation's main filter, asbestos filter (optional equipment)

Software update, checking

Reading MATRIS and Tech Tool

Checking engine belt condition

EVERY 2000 HOURS**After completed daily, 50, 250, 500 and 1000 hour service**

Change the engine air cleaner primary filter (every 2000 hours, at least once a year, or when message is shown on the information display)

Change axle oil (in front and rear axles)

- Change oil for the first time in front and rear axles at 1000 hours

- (applicable to L70H/L90H)

Change breather filter for the hydraulic system and the transmission

Change the hydraulic system's return oil filter and clean the magnetic rod.

Change the cab ventilation's filter, main filter (change more often if needed)

Change the front and rear axle breather filters

Change the fuel system's breather filter

Check the coolant's freezing point (every 2000 hours or at least once a year)

Check and adjust valve clearance

Clean the oil-bath air cleaner's insert (every 2000 hours or when message is shown on the information display) (optional equipment)

Check accumulator for the Boom Suspension System (BSS) (optional equipment)

EVERY 4000 HOURS After completed daily, 50, 250, 500, 1000 and 2000 hour service
Change the engine air cleaner secondary filter (every 4000 hours, after three changes of primary filter, or at least every other year)
Change the air filter for AdBlue®/DEF-tank (only applies to machines with D6J-engine)
Change the transmission oil filter – The interval depends on the oil grade, see page 284 .
Change transmission oil and clean suction strainer – The interval depends on the oil grade, see page 284.
Change the hydraulic oil in the hydraulic tank – The interval varies depending on oil grade, see page 284.
Change axles oil cooling filters (optional equipment for L70H and L90H)
Check the hydraulic oil pressure
Check the engine hood: framework, hinges, and the engine hood's opening device
EVERY 6000 HOURS After completed daily, 50, 250, 500, 1000 and 2000 hour service
Change coolant (every 6000 hours or at least every fourth year)
Change the pump unit filter for AdBlue®/DEF (only applies to machines with D6J-engine)
EVERY 8000 HOURS After completed daily, 50, 250, 500, 1000, 2000 and 4000 hour service
Replace the diesel particulate filter, DPF – Or if information message, DPF change will soon be required, is shown (only applies to machines with D6J-engine)
IF NEEDED
Check the condition of the fire extinguishers (optional equipment) according to requirements for fire extinguishers
Insert light bulbs
Grease the operator's seat



Lubrication

Lubrication

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

The greasing of bearings has two main purposes:

- Add grease to the bearing to reduce friction between the pin and bushing.
- Replace old grease that may contain dirt particles. The grease in the space inside the outer seal collects dirt and prevents dirt and water from penetrating into the bearing.

NOTICE

Wipe off grease nipples and grease gun before greasing, so that dirt and sand are not introduced through the grease nipples into the bearings.

Grease the bearing until new clean grease is forced out through the outer seal. For recommended grease, see page 284.

Between 10–15 strokes with a normal handheld grease gun is required to grease a bearing in the boom.

Maintenance service, every 10 hours

Test-run and check

Performed daily.

Safety decals

- 1 Check that all safety decals are in place, are legible, and are not damaged, see page 24.

External check

- 1 Check that the machine does not have any external damage or defective/loose parts. Especially tires, hoses, and pipes.
- 2 Check that there are no visible leaks.
- 3 Clean/scrape windows and rear-view mirrors.
- 4 Check that the work lights and headlights are clean and intact.
- 5 Check that the back-up camera is clean and intact.
- 6 Check that the frame joint lock has been disconnected.
- 7 Check that engine hood, underbody skid plates, and protective plates are closed.
- 8 Check all reflectors.
- 9 Check that the wheels are not blocked.
- 10 Check that the battery disconnect switch is on.

Lights, instruments, and controls

- 1 Adjust the steering wheel and the operator's seat. For adjusting the operator's seat, see page 113.
- 2 Turn the ignition to position 1 (operating position) and check that all control lights turn on and that the gauges indicate readings.
- 3 Check that there is sufficient fuel and AdBlue®/DEF in the tanks.
- 4 Check the function of all lights.
- 5 Check that the seatbelt can be buckled up and is not damaged. Fasten the seatbelt.
- 6 Check that there are no persons near the machine, see page 128.
- 7 Start the engine.
- 8 Check that all control and warning lights are off. When the parking brake is applied, the warning light for parking brake will be on.
- 9 Check that the horn works.

Brake system (service brake)

- 1 Let the engine idle until the pressure has built up.
- 2 Check that no warnings about the brake system are displayed.

- 3 Release the parking brake and press down the brake pedal all the way. Check that the machine does not activate an alarm.
- 4 Move off carefully and test-brake. The brakes should be applied smoothly and not generate any noise.

Steering system

- 1 Turn to steering lock both to the right and left.
- 2 Check that the steering is free from clearance and noise.

Reverse alarm/Rear view camera

- 1 Move the gear selector to reverse position.
- 2 Check that the reverse alarm, the rear view camera, and the radar detect system works.
- 3 Turn off the engine.

Actions after operating

Fill the fuel tank, as this will counteract the formation of condensation water.

NOTE!

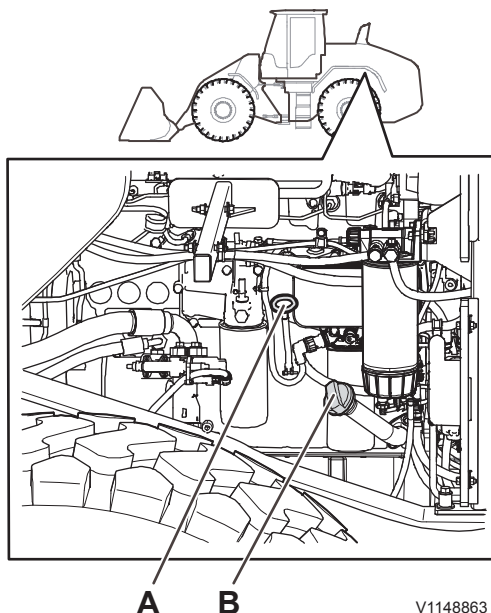
Contact a qualified service technician if there is a problem with any of the items above.

Maintenance service, every 50 hours

Engine oil level, checking

Check the oil level every 50 hours or when message is shown on the display, see page 49.

■ The level should be within the marks on the oil dipstick.



- A Oil dipstick
- B Filler pipe

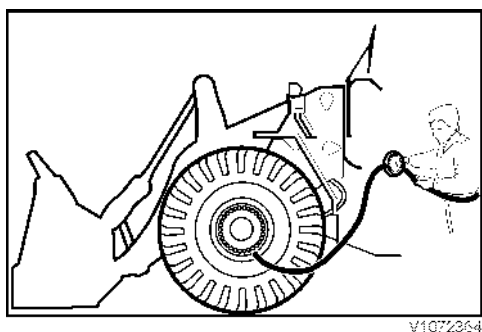
Tyres, checking air pressure

! WARNING

Risk of explosion.

Inflating a tyre could cause it to explode. An exploding tyre could lead to lethal injuries.

Use a self-attaching air chuck with a hose long enough to enable the tyre to be inflated without standing in front of the rim and as far away as possible. Make sure no one stands in front of, or passes, the rim during inflation.



Recommended air pressures should normally be followed, see page 318. Special ground conditions may require adjustment of the air pressure. Follow the tire supplier's instructions and do not exceed the maximum permitted air pressures.

The tyre pressure may have been raised before the machine was delivered from the factory. Therefore, check and adjust the tyre pressure according to recommendations, before putting the machine to work for the first time.

WARNING

Risk of explosion.

Attempts to repair or weld a rim with an inflated tyre fitted could cause the rim to split or the tyre to explode. An exploding tyre could lead to lethal injuries.

Repair work on tyres and rims must be carried out by a qualified service technician.

The instructions stated below apply to an inflated tyre where the pressure needs to be increased. If the tyre has lost all pressure, a trained service engineer should be called in.

- When checking the air pressure, the tyre should be cold and the machine be without a load.
- Ask all other persons to leave the danger area (in front of the rim).
- Stand by the tyre's tread. Tyre installed on a split rim may explode and cause injuries or, in the worst case, death.
- Use a long air hose (with a self-attaching air chuck) which allows you to stand outside the danger area.
- Tyres on stored wheels (spare wheels) should be kept in a lying down position and only be inflated sufficiently to keep the rim parts in position.
- Do not re-inflate a tyre, if the machine has been operated with a tyre pressure that has been below 80% of the lowest recommended tyre pressure according to the specifications, or if the tyre and/or rim are obviously damaged or are suspected of being damaged.

Tyres, checking wear

Check:

- that there is enough tread on the tyre.
- the tread, so the cord is not visible.
- the sides of the tyres, so that there are no deep cuts in to the cord.

Oil bath air cleaner, checking

(optional equipment)

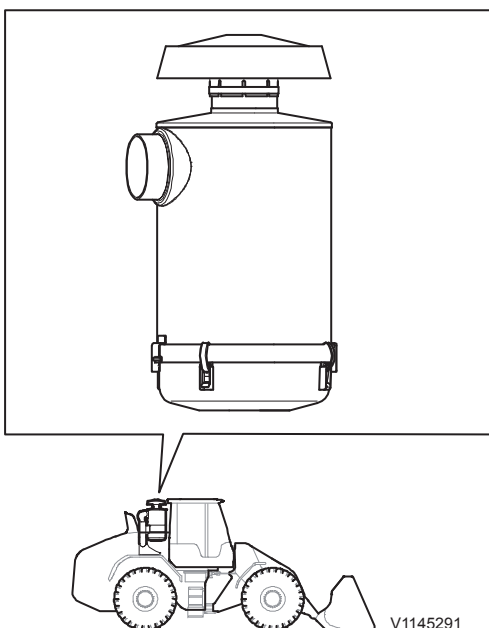
NOTE!

The oil-bath air cleaner may only be used together with the standard filter.

The oil-bath air cleaner is installed in series with the standard filter. The cleaning capacity of the oil-bath air cleaner is between 90-95%, which practically means that the standard filter will work as a secondary filter.

Check the oil in the bowl every 50 hours (more often when needed).

- 1 Place the machine in service position, see page 226.
- 2 Wait 5 minutes so that the oil runs down into the oil reservoir.
- 3 Loosen the oil reservoir with the lower filter insert and remove it.
- 4 Check the oil's quality. The oil should be changed if it contains sludge and is thick. Contact a qualified service technician.
- 5 Check the underside of the filter insert. The oil should be changed if there are sludge deposits. Contact a qualified service technician.

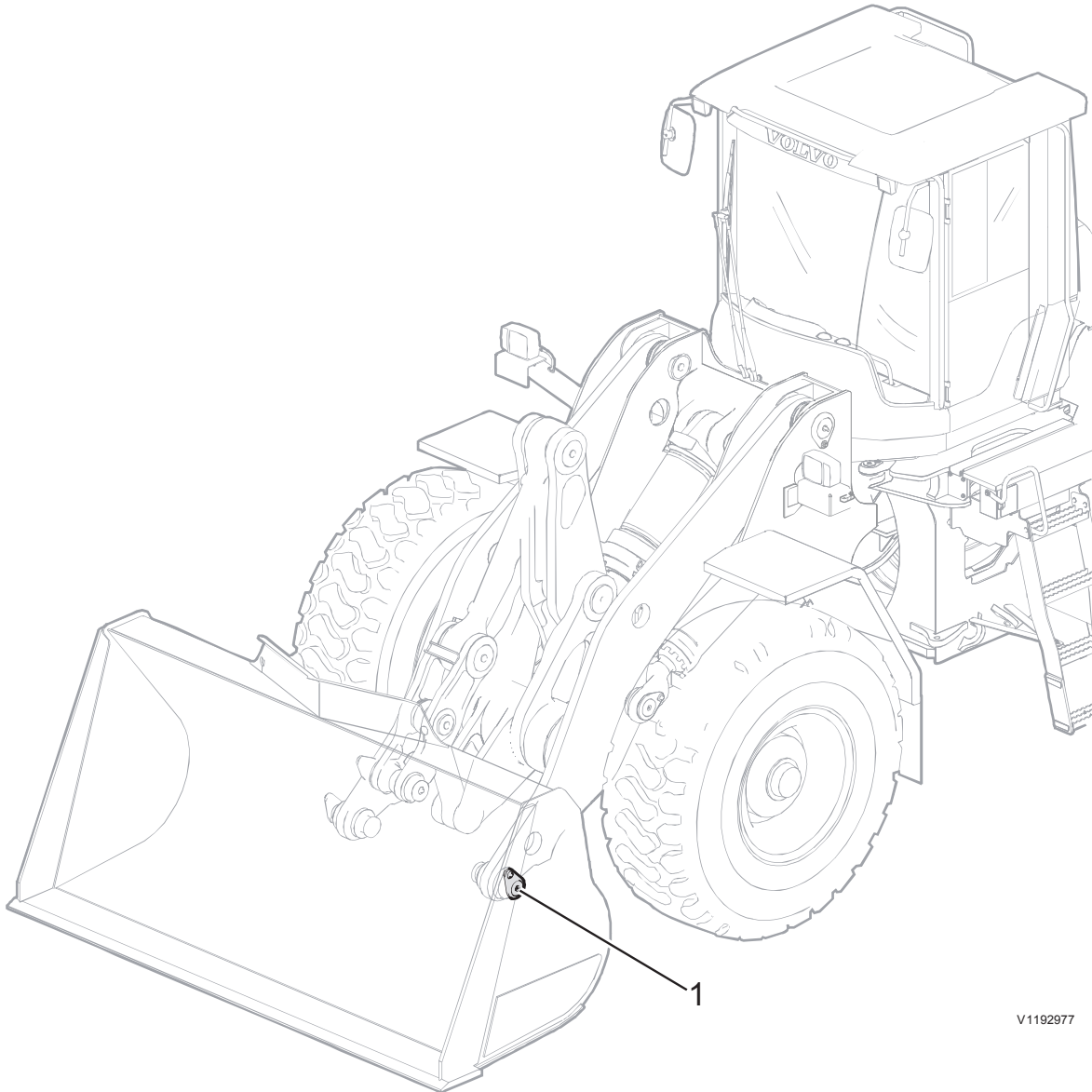


6 Reinstall the oil reservoir.

Lubrication

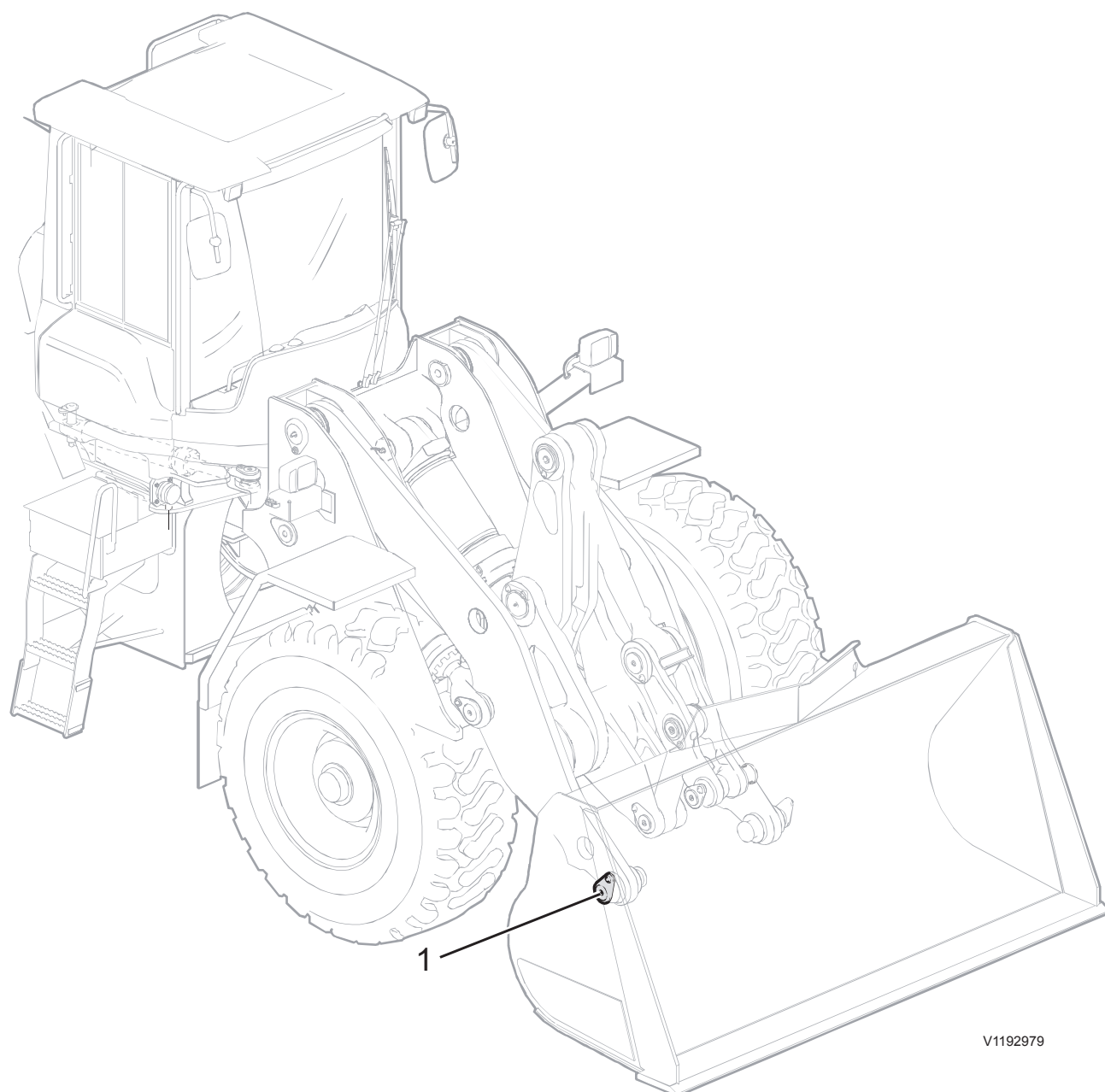
Boom, greasing

Grease daily during difficult operating conditions.



V1192977

Grease points, left side



V1192979

Grease points, right side

Maintenance service, every 250 hours

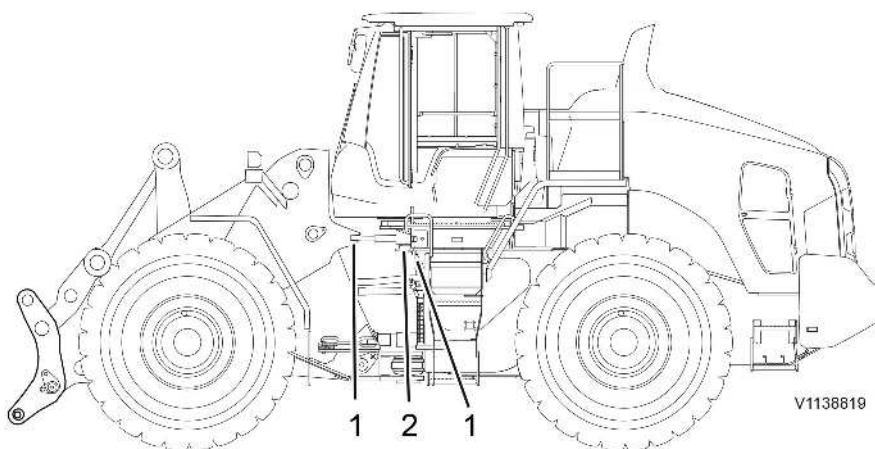
Greasing

Upper frame joint bearing, steering cylinders, attachment bracket, and attachment

NOTE!

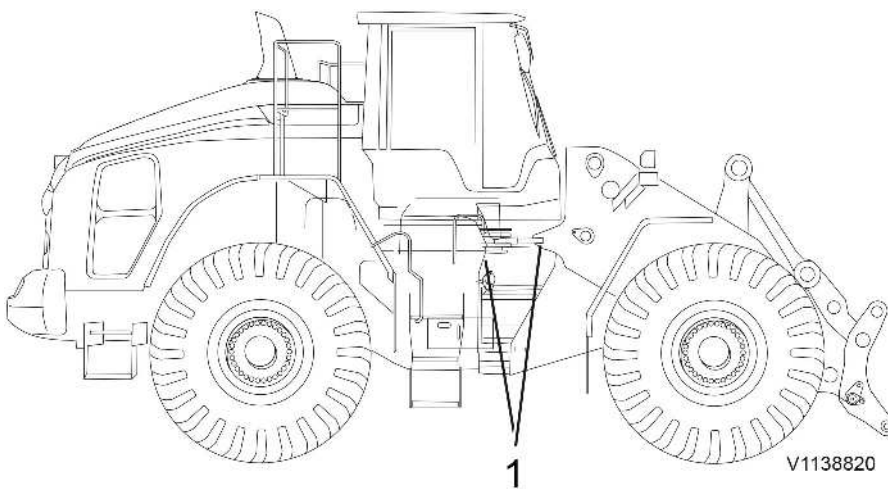
In aggressive/corrosive conditions, greasing should take place every 50 hours.

Grease the upper frame joint bearing and the steering cylinder's front and rear bearings on the machine's left side.



- 1 Steering cylinder's grease points
- 2 Frame joint, upper bearing

Grease the steering cylinder's front and rear bearings on the machine's right side.

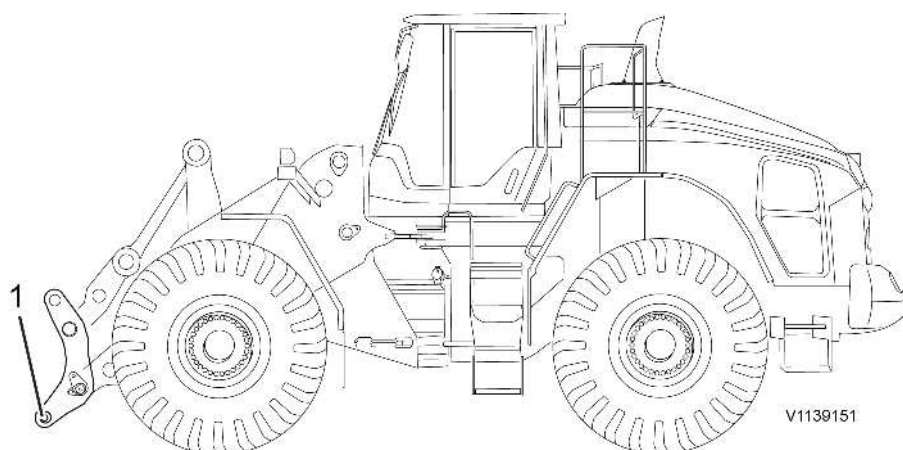


- 1 Steering cylinder's grease points

Grease the attachment bracket, left and right side. Also grease the greased bearings on associated attachments.

NOTE!

In tough operating conditions, grease daily.

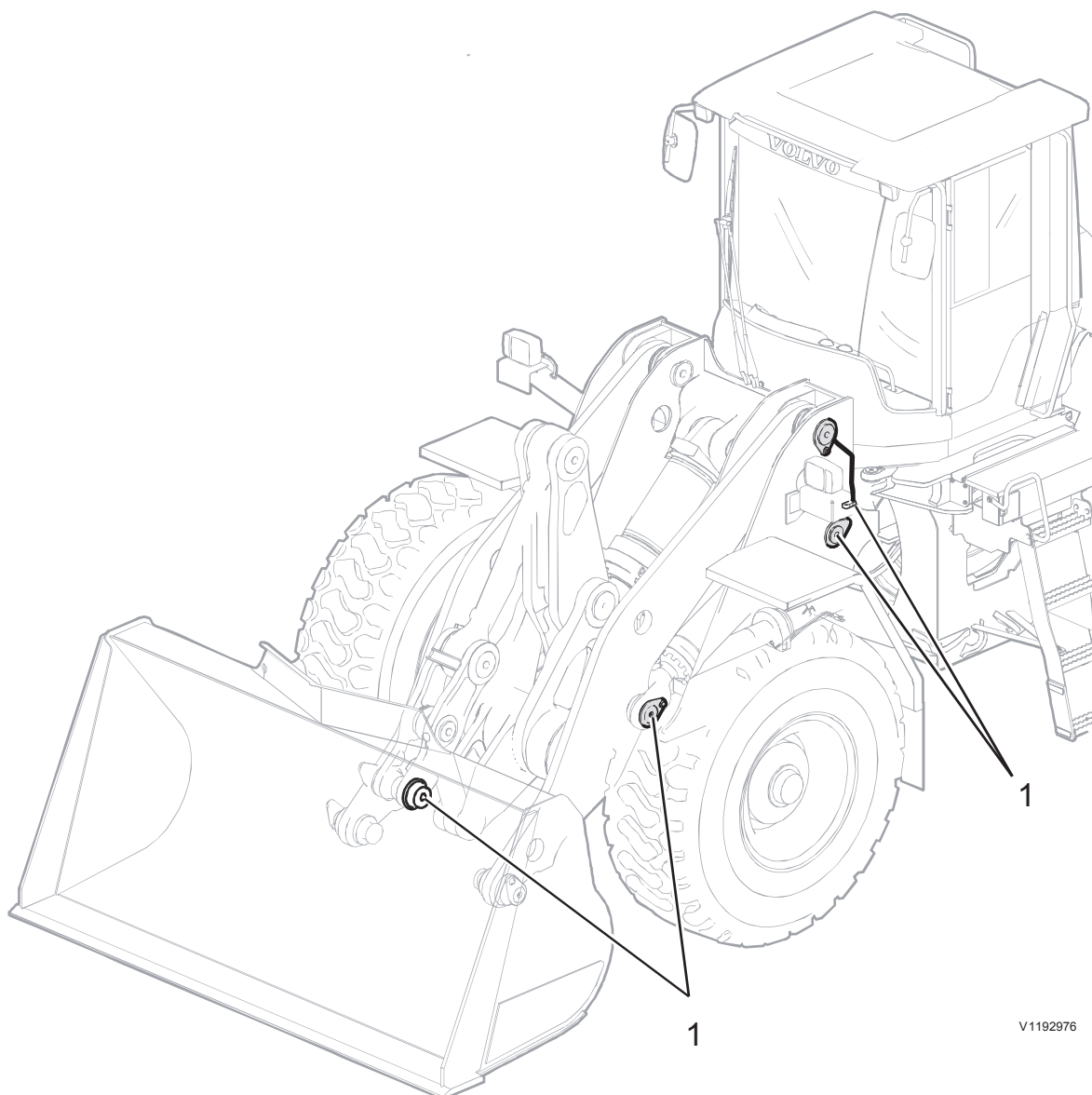


1 Attachment bracket's grease points

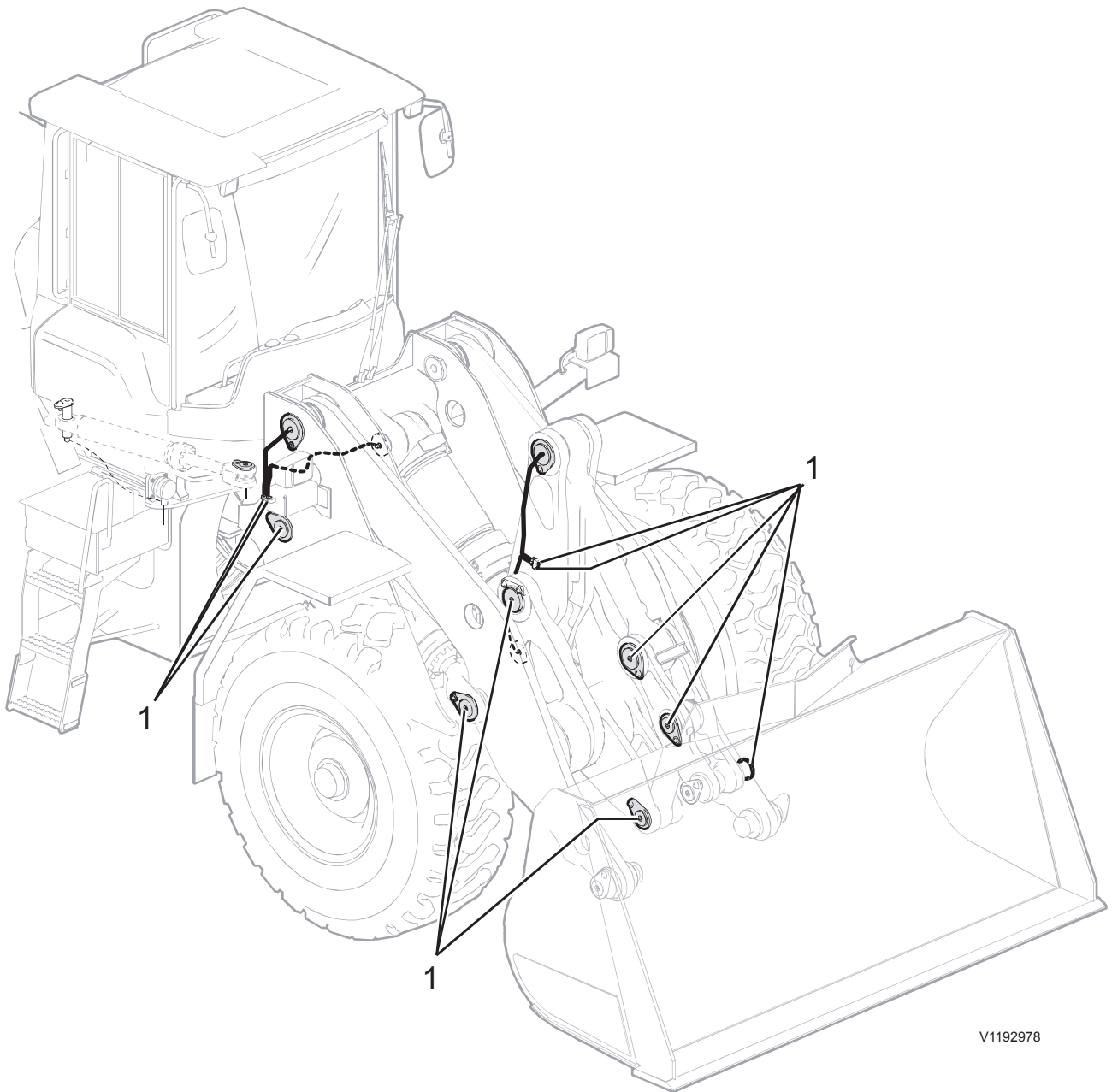
Greasing

Boom

Grease daily in aggressive/corrosive conditions.



Grease points, left side



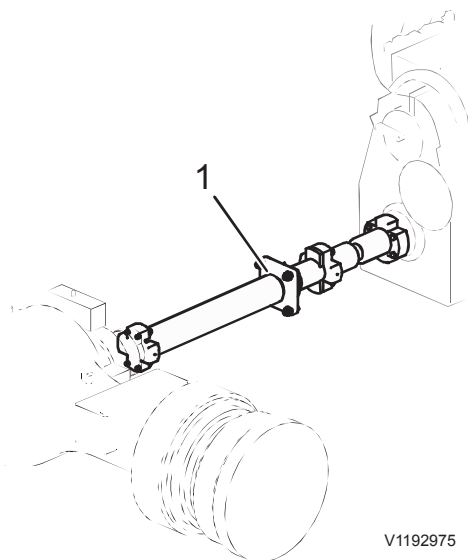
V1192978

Grease points, right side

Maintenance service, every 500 hours

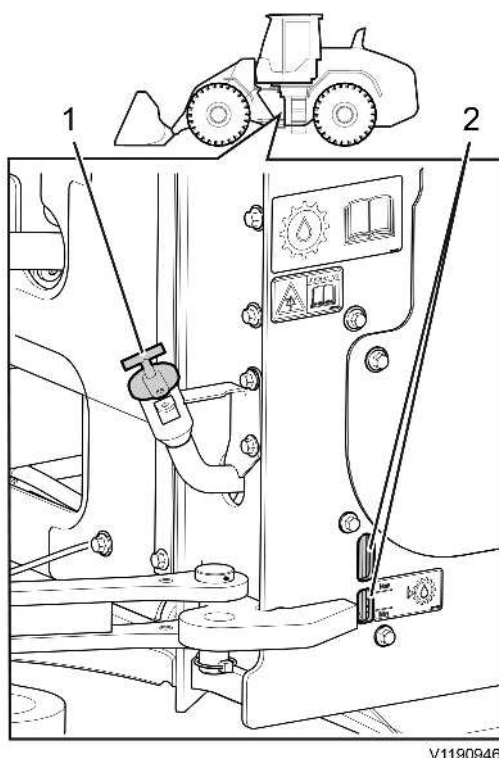
Greasing

Support bearings



Grease points

- 1 Support bearing



- 1 Filler pipe
- 2 Level glass

Transmission oil level, checking

Check the oil level every 500 hours.

When checking, the machine should stand on level ground, with the gear selector in neutral position and applied parking brake. With the machine at operating temperature and the engine running at low idle, the transmission oil level should be between the markings Min and Max in the **lower** part of the glass.

Fill with oil through the filler pipe.

Oil grade, see page 284.

Handle and take care of filters, oils, and liquids in an environmentally safe way. See page 228.

Cooler and condenser, cleaning

Clean the radiator, condenser, and hydraulic oil cooler every 500 hours.

NOTE!

The radiator should be cleaned at regular intervals in order to ensure cooling of the engine. When operating under especially dusty conditions, the radiator should be checked daily. If the machine is equipped with a reversible cooling fan, intervals can be set to temporarily reverse the fan's rotational direction in order to blow the radiator clean, see page 53.

NOTE!

Always clean the condenser and hydraulic oil cooler at the same time the radiator is cleaned, see below.

WARNING

Risk of crushing and cutting.

Rotating parts could cause serious injury.

Shut down the machine before cleaning the machine or any component of the machine.

WARNING

Risk of serious injury.

Compressed air, water jets or steam may cause damage to unprotected skin and eyes.

Always wear personal protective gloves, goggles and clothing when using compressed air, water jets or steam.

WARNING

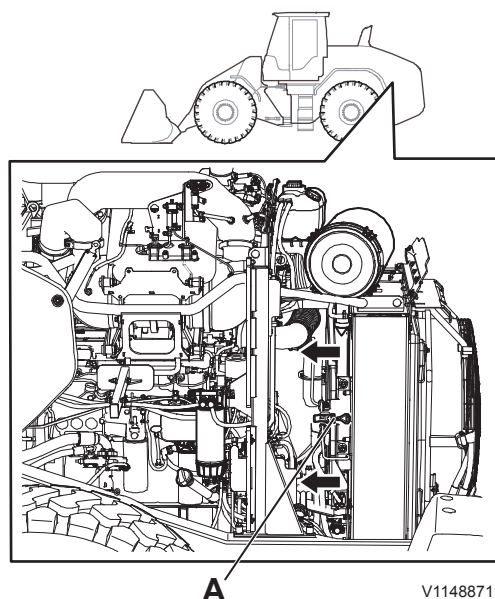
Risk of hazardous inhalation.

Dangerous dust can lead to serious health problems.

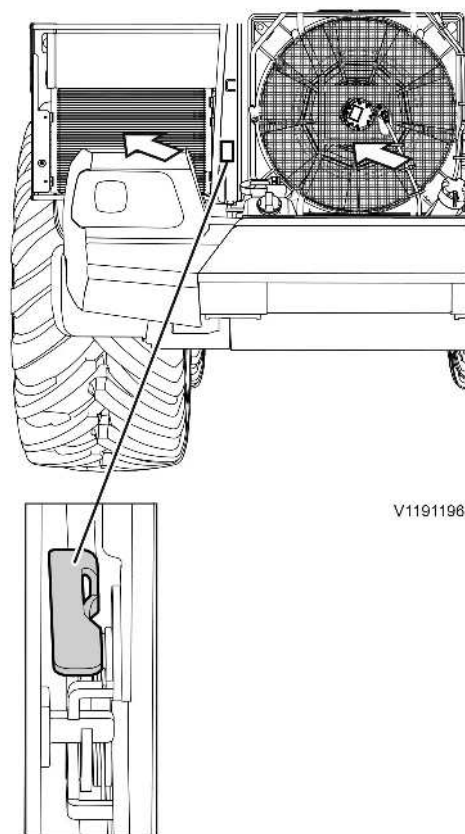
Always wear personal protective equipment, including filter mask, eye protection and appropriate gloves when handling and cleaning the engine compartment, coolers and air filters.

NOTE!

The condenser as well as the radiator core and hydraulic oil cooler core may be damaged if handled carelessly. Keep a distance of at least 50 cm (20 in) when cleaning with a high-pressure washer.



A Lock

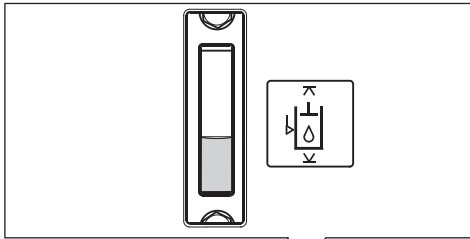


Earlier solution

- 1 Place the machine in service position, see page 226.
- 2 Open the lock device, swing out the frame with the condenser and the hydraulic oil cooler, towards the engine.
- 3 Use compressed air or water to blow clean the radiator, condenser, and hydraulic oil cooler in the direction of the arrows.
- 4 Blow off loose dirt that ends up on the machine and wipe clean with a rag when needed.
- 5 Swing back the frame with the condenser and hydraulic oil cooler after cleaning and restore the locks.
- 6 Restore the machine from service position.

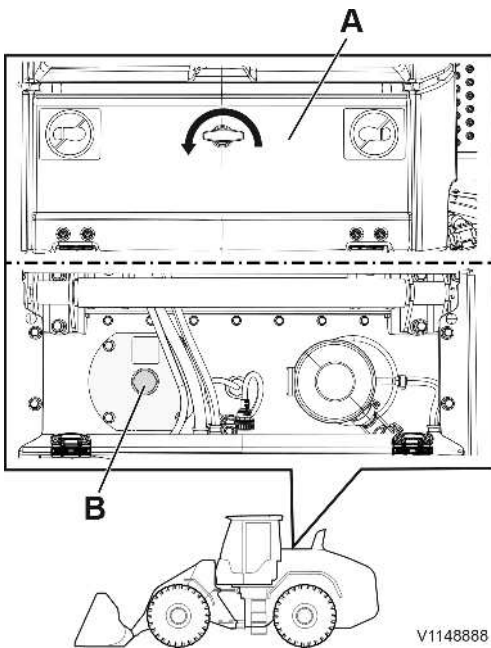
Later solution

- 1 Place the machine in service position, see page 226.
- 2 Release the catch and pull out the coolers.
- 3 Open the fan grill. Blow clean the coolers with compressed air. Blow in the arrows' direction.
- 4 Install the fan grill. Push back the coolers and secure them.
- 5 Restore the machine from service position.



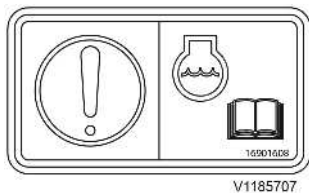
Hydraulic oil level

V1137036



- A Cover
- B Cap

V1148888



Hydraulic oil, checking level and refilling

The oil level should be between Max. and Min. on the sight glass (located on the left side of the machine).

NOTE!

The oil level should be checked when the lift arms are in their lowest position and with the attachment flat on the ground.

Fill from the top of the hydraulic oil tank. Open the cover (A) and remove the cap (B) to fill oil.

NOTICE

It is very important to keep the hydraulic system free from any contaminants, as these can cause abnormal wear and may lead to expensive downtime. Greatest possible cleanliness should be maintained during all handling of hydraulic components and hydraulic oil.

NOTICE

Risk of machine damage.

Using biodegradable oil that contains mineral oil could damage the machine hydraulic components.

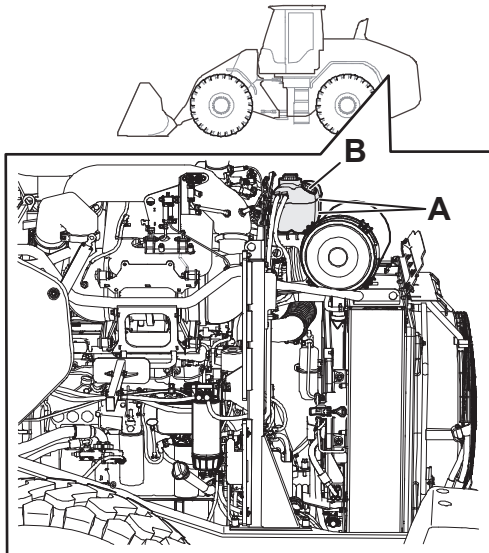
If the machine is filled with biodegradable oil, this oil must also be used when filling and changing. The mineral oil content in bio oil must not exceed 2%. If changing from mineral oil to bio oil, contact a qualified service technician.

- 1 Fill with oil to correct level.
- 2 Start the engine and operate the lift and tilt cylinders to their end-positions.
- 3 Top up with oil when required.

Check that there are no leaks.

Take care of filters, oils and liquids in an environmentally safe way. See page 228.

Coolant, checking level and refilling



- A MIN and MAX markings
B Cap for topping up

The cooling system is filled with Volvo Coolant, which is in accordance with the highest requirements regarding anti-freeze, anti-corrosion and anti-cavitation properties. To avoid damage to the engine, it is very important that Volvo Coolant is used when topping up or when changing coolant.

A decal by the fill point shows that the system is filled with Volvo Coolant (see figure).

! WARNING

Risk of scalding and severe burns to unprotected skin. High-pressurised hot coolant may rush out of expansion tank and cause severe burns. Before removing the expansion tank pressure cap:

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

Check the coolant level every 500 hours or when message is shown on the display, see page 46.

The level should be between MIN and MAX markings on the expansion tank when the engine is cold.

Filling

NOTICE

Risk of machine damage.

Mixing different coolants and corrosion preventives could damage the engine.

Use only Volvo Coolant VCS-2 when filling the coolant system.

NOTICE

Never fill a hot engine with cold coolant, as this may cause the cylinder block or the cylinder head to crack. Failure to change coolant will cause clogging of the cooling system and the risk of engine damage.

NOTE!

For coolant specifications, see page 290.

- 1 Place the machine in service position, see page 226.
- 2 Open the cap on the expansion tank carefully and remove it.
- 3 Fill coolant to the MAX marking on the expansion tank and install the cap.
- 4 Restore the machine from service position.

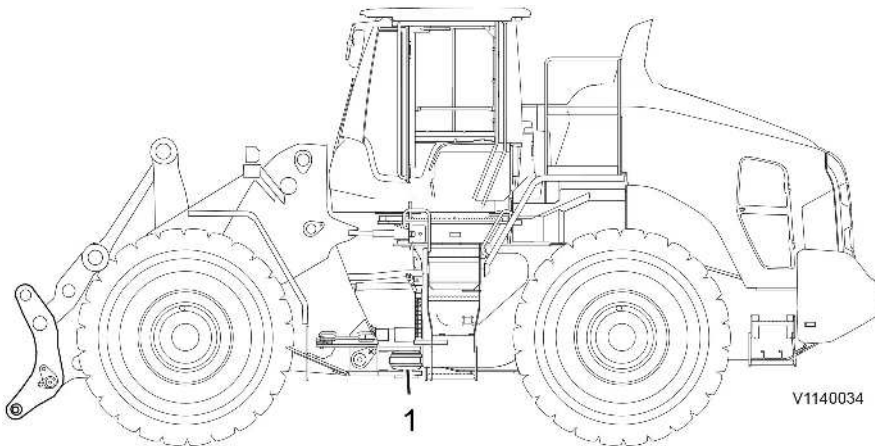
Maintenance service, every 1000 hours

Greasing

Frame joint bearing, lower

NOTE!

In aggressive/corrosive conditions, greasing should take place more often.



1 Frame joint, lower bearing

Brake test

(Checking service brakes)

WARNING

Risk of accidents.

Performing the brake test in hazardous areas could lead to accidents.

Only perform the brake test in areas where it is no risk of accidents.

The brake test is performed using computer software, which measures the machine's average retardation. The test can be run by the machine operator from the display unit.

NOTE!

The brake test must be done in a place where there is no risk of injuries to personnel or damage to equipment. The ground must be clean and have good friction (dry asphalt or similar). The machine must not be loaded.

- 1 Press and hold in key 8 (service) on the keypad for approximately 4 seconds. A message will appear when you enter service mode.
- 2 Engage gear position F and accelerate when the text "Accelerate above 20 km/h" is shown on the information display, brake maximally when the text "Brake to standstill" is shown on the information display. The retardation value is shown on the information display.
- 3 If the wheels lock and slide on the ground surface, the test has to be repeated.
- 4 The three most recent test values are saved in "Brake test log".

Minimum retardation value for brake test: 5 m/s² (0.51 g)

NOTE!

The value according to specifications is to be considered as an absolute minimum value. In case reduced brake function is suspected, contact a qualified service technician.

Parking brake function, checking



Risk of crushing!

Unexpected machine movement could lead to serious injury.

Never perform parking brake test when persons are located in the danger zone.

Check the function according to the following:

- 1 Make sure that the gear selector is in neutral position.
- 2 Turn on the ignition and apply the parking brake. Make sure that the transmission disengagement function is not activated, see page 56 for more information.
- 3 Hold in the key for service on the keypad to access the menus for service.

Activate APS-settings Service. Press ESC on the keypad to see the rpm in the display.

NOTE!

Before software version BL24, the APS setting is set in the Transmission menu (2). After software version BL24, the APS setting is set in the Setup menu (9), in Personal Settings.

- 4 Start the engine and select gear F1. The following message should be shown in the display:

Parking brake test Active
--

- 5 Press down the accelerator pedal slowly to 1200 rpm. The machine should not move.
- 6 If the machine moves, contact a qualified service technician.

Maintenance service, every 2000 hours

Greasing

Grease hinges on covers/hatches and cab
- Grease more often if needed

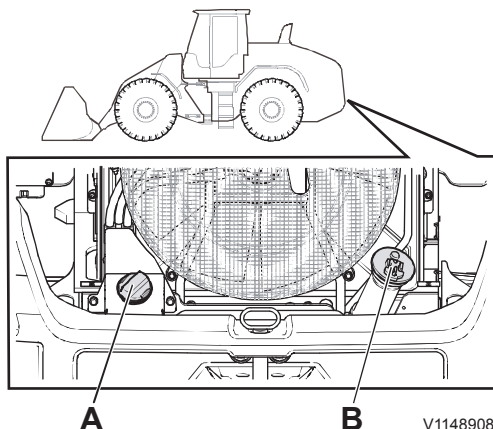
Maintenance service, every 4000 hours

Seat belt, checking

Check the seat belt, see page 117.

Maintenance service, when required

Fuel, filling



- A AdBlue®/DEF tank cap (only applicable for machines with engine D6J)
B Fuel tank cap

! WARNING

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

NOTICE

Risk of machine damage.
Refueling of any other fluid but diesel in the fuel tank could cause machine damage.
Do not start the engine if you have filled other than pure diesel in the diesel tank.

NOTICE

Risk of fuel tank contamination.
Accidental filling of AdBlue®/DEF in to the fuel tank causes fuel tank contamination.
Only use AdBlue®/DEF filling equipment that has a valve that opens only on machines equipped with a magnetic ring in the AdBlue®/DEF filler neck to avoid fuel tank contamination.

Fuel tank capacity: approx. 234 litres (61.8 US gal).
Fuel quality, see page 292.

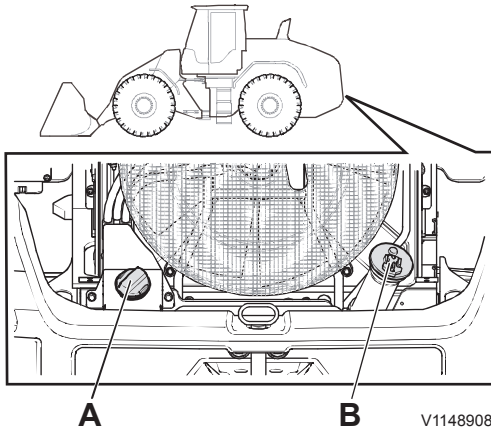
! WARNING

Risk of fire.
Burning fuel can cause fatal injuries.
Stop the engine before filling fuel.

If the fuel level is low, an alarm indication is displayed, see page 47. Fill with fuel, ensuring that no air enters the system.

- Clean carefully around the fuel tank cap before removing it.
- Avoid spills when filling. Diesel-soaked dust and dirt are fire hazards!
- In the winter, keep the fuel tank full to prevent condensation from forming in the tank.
- AdBlue®/DEF must not be mixed into the diesel tank and diesel must not be mixed into the AdBlue®/DEF-tank (only applicable for machines with D6J-engine).

Please contact your local Volvo dealer for more information.



- A AdBlue®/DEF tank cap (only applicable for machines with engine D6J)
B Fuel tank cap

AdBlue®/DEF, filling

NOTE!

Only applicable for machines with engine D6J.

WARNING

Risk of serious injury.

Rotating parts could cause serious cutting or crushing injury.

Never open the engine hood when the engine is running.

NOTICE

Risk of machine damage.

Refilling fluids with anything other than what is specified in this manual could cause permanent damage to the catalyst system. Only refill fluids with those specified in this procedure.

NOTICE

Risk of fuel tank contamination.

Accidental filling of AdBlue®/DEF in to the fuel tank causes fuel tank contamination.

Only use AdBlue®/DEF filling equipment that has a valve that opens only on machines equipped with a magnetic ring in the AdBlue®/DEF filler neck to avoid fuel tank contamination.

NOTICE

Risk of machine damage.

AdBlue®/DEF is highly corrosive. If the tank is overfilled, AdBlue®/DEF may leak out through the air vent pipe. If the tank is overfilled and the fluid in it freezes, the tank and hoses can be permanently damaged.

Do not overfill the tank. Always stop filling when the fluid level reaches the filling port or when an automatic filling nozzle shuts off.

NOTICE

Risk of machine damage.

A clogged AdBlue®/DEF filter can lead to difficulties filling the tank.

Filling AdBlue®/DEF in the tank with a damaged filter or without a filter in place can contaminate the AdBlue®/DEF fluid and seriously damage the aftertreatment system.

The filter might need to be removed, cleaned and put back in place before filling. Never damage the filter or fill AdBlue®/DEF without the filter in place. Turn to your local Volvo dealer for support.

NOTE!

Do not fill with any fluid other than that specified in ISO 22241-1. We recommend that you do not reuse drained AdBlue®/DEF due to the risk of contamination.

AdBlue®/DEF tank capacity, see page 299.

AdBlue®/DEF quality, see page 297.

If the AdBlue®/DEF level is low, an alarm indication is displayed, see page 47. Fill the AdBlue®/DEF tank with AdBlue®/DEF.

NOTE!

After filling AdBlue®/DEF during cold weather conditions, the system needs to reach a normal operating temperature before the level is increased on the level gauge in the display.

NOTE!

AdBlue®/DEF filling equipment must be designed for a maximum filling rate of 40 litres/minute, and adjustable to a rate below 40 litres/minute. If filling problems occur and remain after the filling filter has been cleaned, please refer to the manual for the filling equipment and take the necessary action.

NOTE!

Wipe clean the spill cup after filling AdBlue®/DEF.

- AdBlue®/DEF is not classified as a hazardous substance but should still be handled with care. It is highly corrosive.
- If it comes into contact with the skin, rinse well with water.
- If it comes into contact with the eyes, rinse thoroughly for several minutes. Consult a doctor if necessary.
- If inhaled, breathe fresh air and contact a doctor if necessary.
- If swallowed, drink water and contact a doctor.
- Do not allow AdBlue®/DEF to come into contact with other chemicals.
- AdBlue®/DEF is not combustible. If AdBlue®/DEF is exposed to high temperatures it will decompose into ammonia and carbon dioxide.
- AdBlue®/DEF must not be mixed into the diesel tank and diesel must not be mixed into the AdBlue®/DEF tank.

For distribution of AdBlue®/DEF (only valid for US market):

- Volvo CE Customer Support: 1-877-823-1111 (business hours)
- www.volvoce.com (outside business hours)

For distribution of AdBlue®/DEF (all other markets), please contact your local Volvo dealer for more information.

Water separator, draining

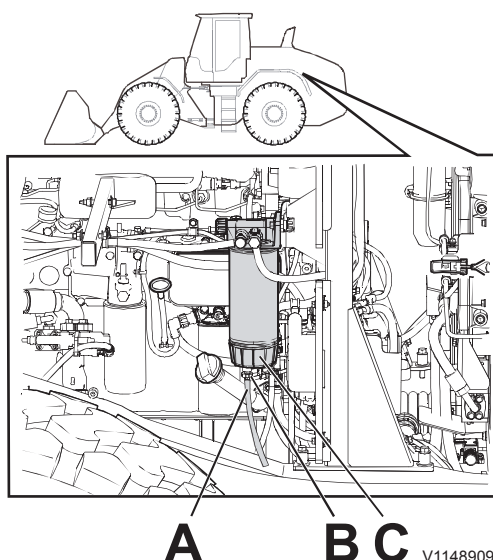
Drain the water trap when a message is shown in the display, see page 46.

NOTE!

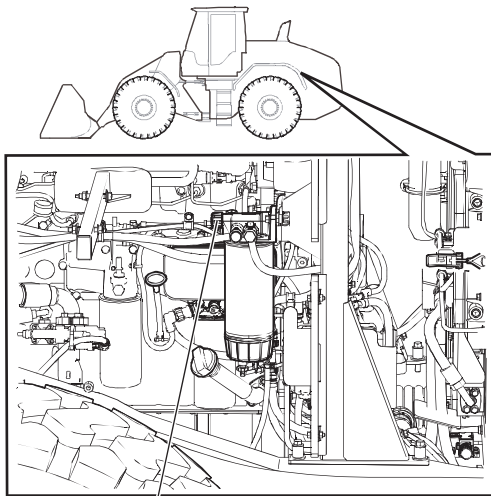
Do not use the hand pump to drain the water trap!

- 1 Place the end of the hose in a container.
- 2 Loosen the drain nipple until air bubbles become visible in the water trap.
- 3 Drain until clean fuel runs from the hose and until all water is gone.
- 4 Tighten the drain nipple after draining is completed.

Take care of filters, oils and liquids in an environmentally safe way. See page 228.



- A Hose
- B Drain nipple
- C Water trap

**A**

A Hand pump

V1148914

Fuel system, bleeding

Collect fuel spills using a container or a plastic hose.

Manual bleeding of the fuel system may be necessary if:

- Service work has been carried out on the fuel system.
- The engine has been run dry of fuel.

NOTE!

Air bleeding may not be performed using the starter motor.

- 1 Make sure that there is sufficient fuel in the fuel tank.
- 2 Open the engine hood, see page 108
- 3 Press down and turn the handle counter-clockwise so that it ends up in pumping position.

NOTE!

Make sure that the hand pump is not subjected to bending stresses.

- 4 Pump approx. 200–300 strokes with the hand pump until a resistance is felt and a 'clicking' sound is heard from the valve in the fuel filter bracket.
- 5 Lock the hand pump by pressing down and turning it clockwise to stop.
- 6 Start the engine. Pump with the hand pump again if the engine does not start after 30 seconds.
- 7 When the engine has started, check to make sure that there are no fuel leaks.
- 8 Let the engine idle for 5 minutes before the rpm is increased to vent out any remaining air.

NOTE!

The hand pump may not be used when the engine is running.

Take care of filters, oils and liquids in an environmentally safe way. See page 228.

Air cleaner primary filter, cleaning

! WARNING

Risk of hazardous inhalation.

Dangerous dust can lead to serious health problems.

Always wear personal protective equipment, including filter mask, eye protection and appropriate gloves when handling and cleaning the engine compartment, coolers and air filters.

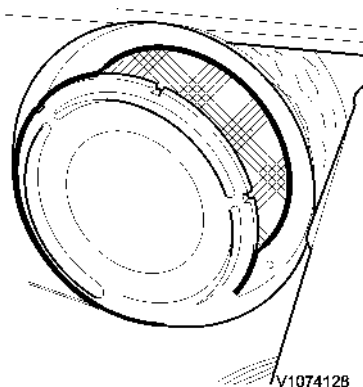
If the status is 'clogged', the air cleaner elements are plugged and need to be cleaned or replaced.

NOTE!

Document each time the filter is cleaned. The filter must be replaced by a qualified technician if it is damaged and/or after the fifth cleaning.

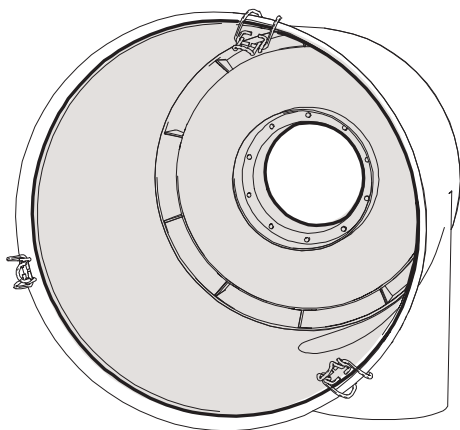
NOTE!

The secondary filter should not be removed or cleaned! It acts as a protective filter in case the primary filter is damaged and should be replaced by a qualified service technician at the specified service interval.



Primary filter

V1074128



Area to be cleaned

NOTICE

Risk of machine damage!

Dust could enter the air intake system if the secondary filter comes off.

If the secondary filter comes off, clean the air cleaner housing thoroughly and make sure no dust enters the air intake system before reinstalling the secondary filter.

- Do not use compressed air.
- Vacuum cleaning is recommended, because it minimizes the risk that dust enters the air intake system.
- A wet cloth may be used but be careful not to push any dust into the air intake system.

Poorly filtered air can cause damage and unnecessary wear to the engine. The air cleaner prevents dust and other impurities from entering the engine. Therefore, it is very important that the air cleaner is checked regularly and maintained correctly.

- Use breathing protection when cleaning.
- The air cleaner housing must be cleaned thoroughly every time the primary filter is cleaned.
- Check all hose and pipe connections from the air cleaner to the engine induction manifold are tight. Ensure all hose clamps are secure.
- If the alarm text remains after cleaning, contact a qualified service technician.

Under any circumstances, never run the engine without a filter or with a damaged filter.

Mechanical cleaning

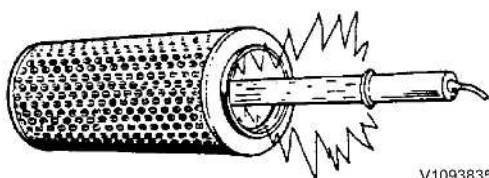
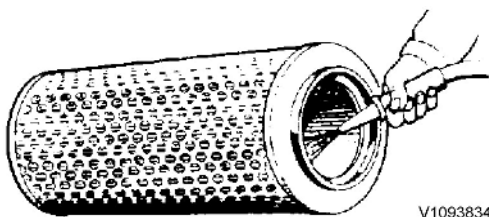
NOTE!

Do not strike the filter against a hard object.

- 1 Carefully tap the end of the filter against a soft and clean surface.

Cleaning with compressed air

- 1 Use clean and dry compressed air with a maximum pressure of 500 kPa (5 bar) (72.5 psi). Do not hold the nozzle closer than 3 – 5 cm (1 – 2 in).
- 2 Blow the filter clean from the inside.



Checking filter

- 1 Check the filter with a light.
- 2 If there is tear, scratch, crack or other damage, the filter must be discarded.

Batteries, charging

WARNING

Risk of serious injury.

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

Switch off charge current before connecting and 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.

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.

- Check the battery terminal connections and make sure that they are tightened and free from corrosion and dirt.
- Batteries must be charged using a battery charger.
- Always charge both batteries in the machine.
- The charge current should be 10% of the capacity, e.g., 225 Ah the maximum charge current is set to 22 A. For 170 Ah, the charge current is 17 A.

NOTE!

The charging voltage must be the same as the battery voltage (12 V or 24 V).

Connecting charger

NOTE!

The charging voltage must be the same as the battery voltage (12 V or 24 V).

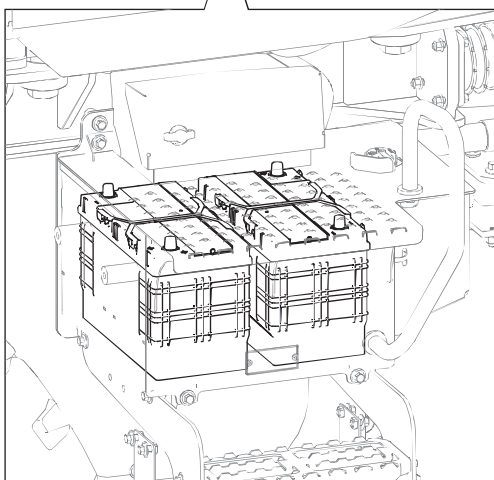
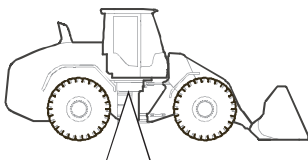
- 1 Turn off the voltage feed, see 230.
- 2 Disconnect the minus (negative) cable first then the plus (positive) cable from the batteries.
- 3 Remove the cable between the batteries.
- 4 Install the charger's clamps, plus on the plus (positive) terminal and minus on the minus (negative) terminal.
- 5 Make sure that the battery charger is set to the correct voltage.
- 6 Start the charger.

NOTE!

Always charge both batteries in the machine otherwise there is a risk that the batteries will be unbalanced (potential difference between the batteries). If the batteries have been charged so they are unbalanced, this means that when they are charged (through the alternator) the fully charged battery will be overcharged while the other battery will be undercharged. In the long term this could lead to reduced battery life.

Disconnecting charger

- 1 Turn off the charger.
- 2 Remove the charger's clamps.
- 3 Connect the cables between the batteries.
- 4 Connect the plus (positive) cable first and then the minus (negative) cable to the batteries.



V1238961

Batteries

- 5 Turn on the voltage feed, see 230.
- 6 Start the machine.

Fuses and relays

Most fuses and relays are located behind the rear cab wall, behind the operator's seat, and can be reached by opening the plastic cover. A decal on the inside of the cover shows which current consuming device is connected to each relay and fuse. For detailed information about fuses and relays, see page 303. If a problem should occur in one of the relays, this can temporarily be overcome, by replacing the defective relay with one that has a less important function. Check thoroughly that the relays are identical.

NOTICE

Risk of fire.

An inappropriate fuse could result in damage or fire on the circuit board.

Never install a fuse with a higher amperage than what is stated on the decal.

If the same fuse blows repeatedly, the cause must be investigated.

Light bulb, replacing

To replace a light bulb, contact a qualified service technician.

For specifications of the machine's lights, see page 303.

NOTICE

Risk of environmental hazard.

Light bulbs could contain hazardous chemicals and cause an environmental hazard.

Follow local environmental guidelines when disposing light bulbs. Do not put lights bulbs in general trash.

WARNING

Risk of toxic hazard.

Contact with chemicals contained in light bulbs could cause exposure to hazardous chemicals.

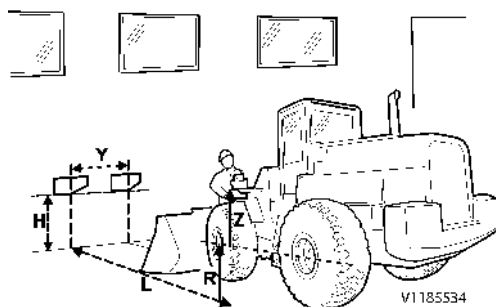
Always wear personal protective equipment when handling light bulbs.

Headlights, adjusting

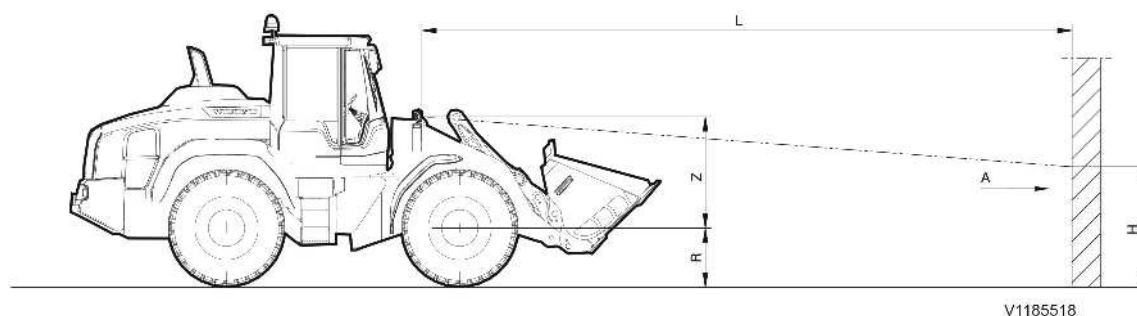
The headlight adjustment is very important to avoid blinding on-coming traffic. The headlights are of the asymmetrical type, which means that one has to take extra care when adjusting.

Place the machine, which should be without load, on level ground at right angles to a wall or similar.

Adjust the light-dark boundary (H) with low beams on at the distance (L) from the headlights. Check the distance (Y) between the light beams with the high beams turned on. The distance should be the same as between the headlights on the machine.



Adjustment measurements

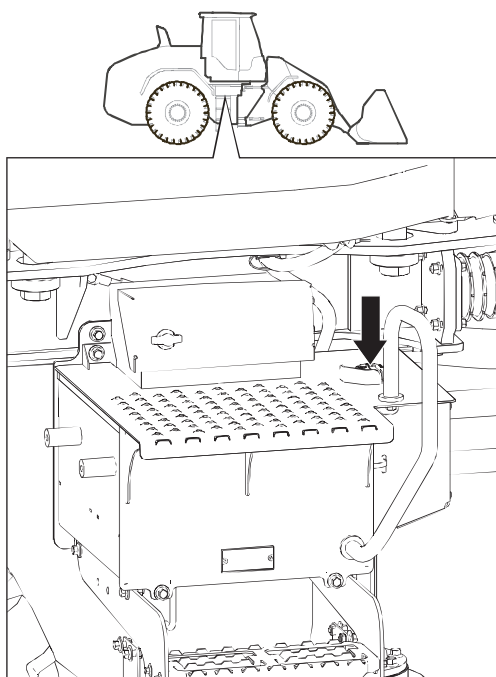


side view

L = 5,000 mm (197 in), distance from head light to wall or screen
R = Measured distance from the floor/the ground to the centre of the front wheel
Z = According to table, measured from centre of front wheel to centre of headlights⁽¹⁾
H = 0.85 multiplied by (Z+R), upper light - dark boundary when low beams is switched on
Y = According to the table, distance between centres of headlight

Model	Z (mm)	Y (mm)
L60H	1475	1890
L70H	1480	1945
L90H	1480	1945

1. Measured with halogen lights, for LED lights use the same figures.

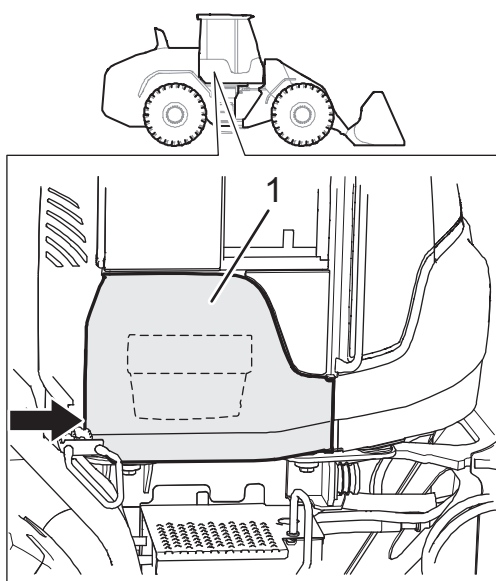


V1238942

Washer fluid reservoir, fill point

Washer fluid, checking level and refilling

- The washer fluid level is checked continuously during operation and an alarm is shown on the display if the level is too low.
- Make sure that there is sufficient anti-freeze in the washer fluid when there is a risk of frost.
- Top up when necessary.
- The reservoir has a volume of 5 litres (1.3 US gal) and an alarm will be shown when approx. 0.6 litres (0.2 US gal) remain in the reservoir.



V1141222

1 Side cover

Cab ventilation filters, cleaning

The cab ventilation filters consist of prefilter and main filter. The machine is often used in dusty conditions and therefore it is delivered with filters that meet efficiency class F8 according to EN 779:2002. The filters reduce the risk of silicosis and reduce particles such as quartz in fine fractions, pollen, bacteria, and mould spores. The recommendation is that the fan should always be on to bring clean air into the cab. Contact your dealer for more information.

Clogging of the filters is entirely dependent on the machine's working environment, but the filters should be checked once a week.

WARNING

Risk of hazardous inhalation.

Dangerous dust can lead to serious health problems.

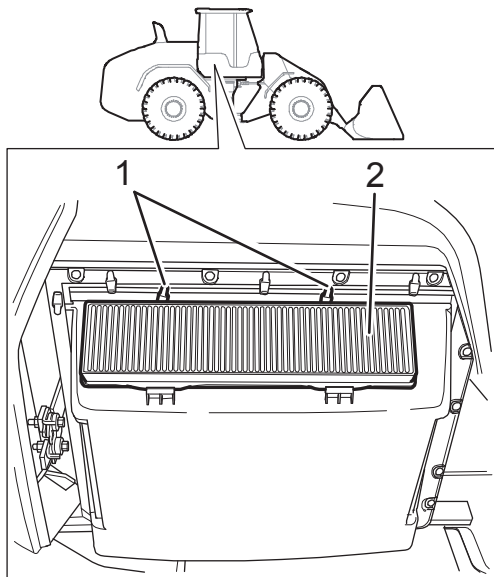
Always wear personal protective equipment, including filter mask, eye protection and appropriate gloves when handling and cleaning the engine compartment, coolers and air filters.

NOTE!

The cab filters are only intended to separate particles (dust) from the air. Any dangerous gases are not trapped by the filters.

NOTE!

Only the prefilter can be cleaned! The main filter is replaced by a qualified service technician.



- 1 Fasteners
- 2 Prefilter

Cleaning

- 1 Use breathing protection.
- 2 Pull the catch (see arrow) and open the side cover.
- 3 Move aside the fasteners that hold the prefilter in place and remove the prefilter.
- 4 Shake the filter carefully without damaging it. Do not use compressed air or vacuum-cleaning.
- 5 The filter can be cleaned using water by submerging it in a suitable container.

Carbon filter (optional equipment)

The carbon filter (green frame) is a main filter intended for use in conditions where odours from organic and sulphuric gases may need to be reduced. The filter meets the same particle efficiency class as the standard main filter.

Asbestos filter (optional equipment)

NOTE!

The change interval for the asbestos filter is every 1,000 hours, but it can be increased or decreased depending on how dusty the work conditions are.

NOTE!

Filter changes are to be done by a qualified service technician, and asbestos filters must always be handled with extra care. When changing asbestos filter, the used asbestos filter shall be placed in the tight-sealing plastic bag that is supplied with each asbestos filter package. Never shake the asbestos filter, place it carefully in the supplied plastic bag. Then the plastic bag shall be sealed and deposited with at a suitable location for asbestos waste.

The asbestos filter (red frame) is a main filter especially intended for use in conditions where there may be asbestos dust. Of course, the filter is effective against all other kinds of dust when the operator needs highly filtered air in the cab.

The filter meets the requirements according to EN 1822:1, filter class H13. Pay attention to any national regulations issued for work in the relevant environment.

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.

NOTE!

The inside of the cab may not be cleaned with running water or other high-pressure fluid.

NOTICE

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

NOTE!

Daily clean the areas on the machine where dust, chips, and similar may collect in order to minimize the risk of fire, see page 275.

Recommendations for cleaning the machine:

- Place the machine in a place intended for cleaning.
- Follow the instructions supplied with the car care product.
- The water temperature must not exceed 60 °C (140 °F).
- If high-pressure washer is used, keep a distance of at least 20–30 cm (8–12 in) between the nozzle and the machine. Too high pressure and too short distance may cause damage. Protect electrical wiring in an appropriate way.
- Do not use high-pressure washer on electrical components.

NOTICE

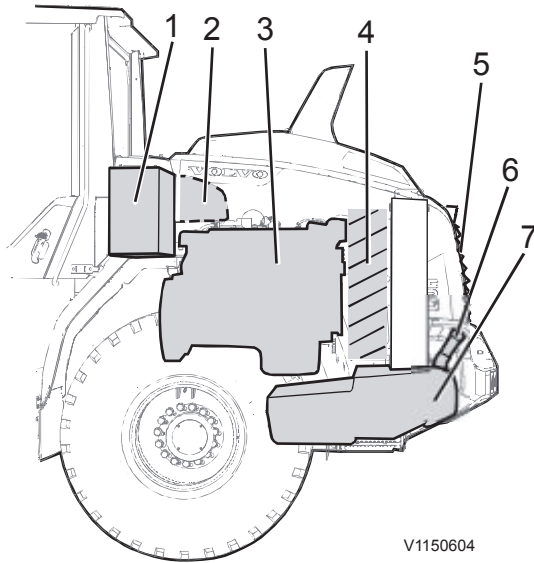
If you are using a high-pressure wash, take care so that the decals do not loosen.

- 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.
- If a decal is tattered or illegible it must be replaced immediately, see page 24 for more information.

Paint finish maintenance

Machines used in corrosive conditions are more prone to rusting than others. As a preventive measure it is recommended that the paint finish should be maintained every sixth months. If there is any doubt whether the conditions are corrosive or not, contact your dealer.

- At first clean the machine.
- Apply Dinol 77B (or corresponding transparent waxy anti-rust agent) at a thickness of 70–80 µm.
- A protective layer of underseal Dinol 447 (or corresponding) may be applied under the mudguards where mechanical wear is expected.



Areas that need to be checked and cleaned:

- 1 The top of the hydraulic tank
- 2 Air intake, engine (air-cooled alternator)
- 3 Under the engine hood, accumulation on the engine's valve cover and other surfaces, especially hot surfaces such as the muffler, turbo, exhaust pipe, exhaust manifold, preheating coil, and alternator. See figure of the engine compartment.
Also check and clean by the starter motor, oil fill point, oil filters, and fuel filter
- 4 The space between engine and radiator
- 5 Inside radiator casing
- 6 Fuel fill point
- 7 The top of the fuel tank and surrounding areas

Cleaning engine compartment

Machines operating in dusty, fire-hazardous environments, e.g., log handling, woodchip handling, grain handling, and animal feed industries, require daily inspection and cleaning of the engine compartment and surrounding areas.

When operating in other conditions, checking and cleaning is required at least once a week.

WARNING

Risk of hazardous inhalation.

Dangerous dust can lead to serious health problems.

Always wear personal protective equipment, including filter mask, eye protection and appropriate gloves when handling and cleaning the engine compartment, coolers and air filters.

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.

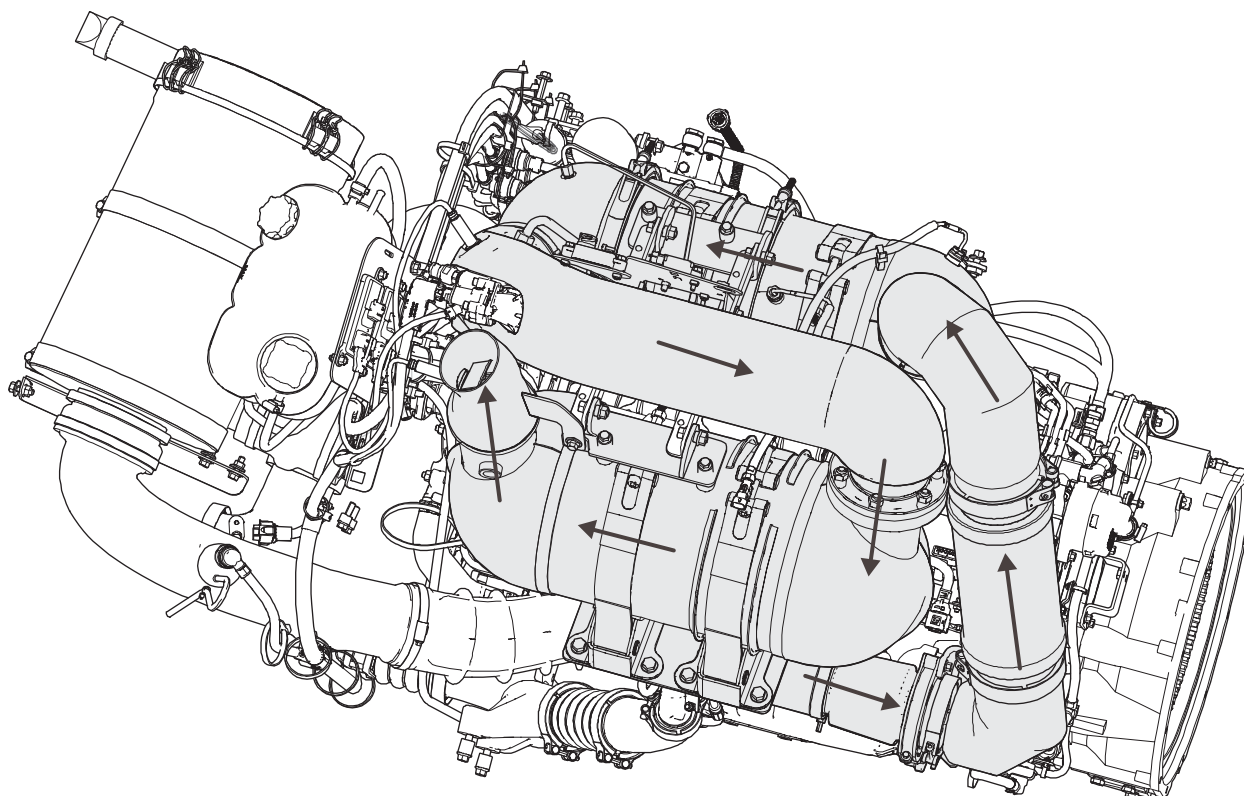
For opening/closing the engine hood, see page 108.

NOTE!

Avoid spraying water into the exhaust system.

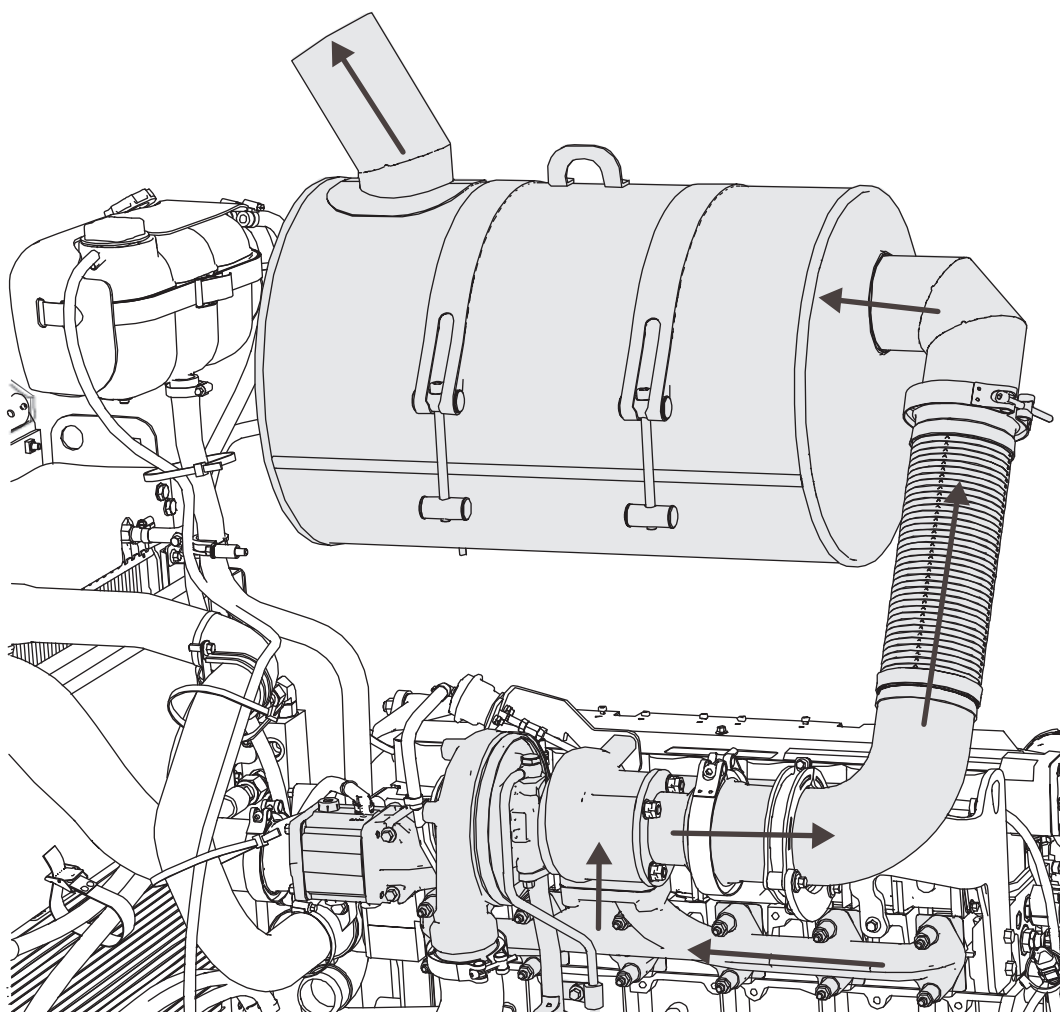
- It is suitable to clean the machine at the end of the work shift before it is parked.
- Use personal protective equipment such as protective goggles, gloves, and protective breathing equipment.
- Start with the highest areas on the machine and finish with the lowest on top of the fuel tank and areas near the fuel tank.
- Loose material is removed with, e.g., compressed air.
- After cleaning, check and repair any leaks. Close all covers and hoods.

Hot surfaces in the engine compartment



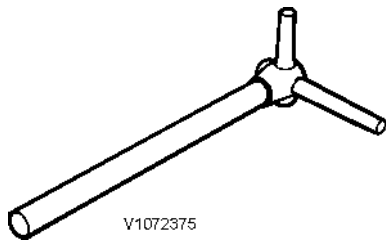
V1150605

Engine D6J

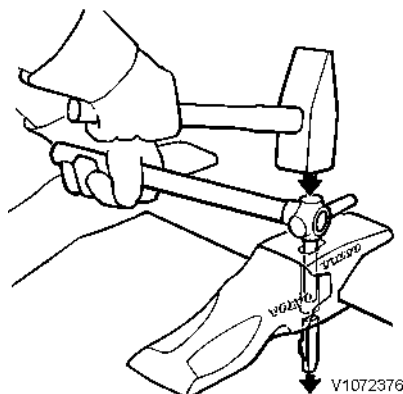


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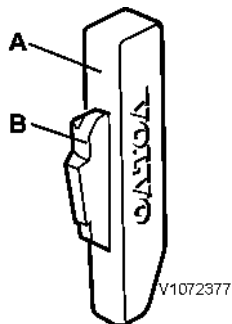
Engine D6E



Special tool

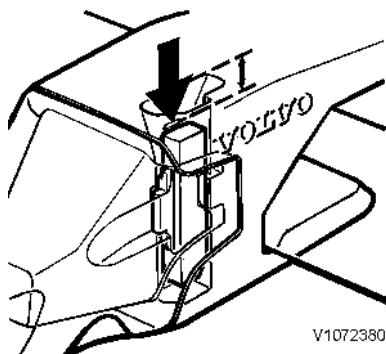


Drive out the lock device



Lock device

- A Steel pin
- B Lock retainer



The lock device should be just below the line marking.

Bucket teeth, replacing

The following information is valid for Volvo Tooth System.

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

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.**

Removing tooth

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

Installing tooth

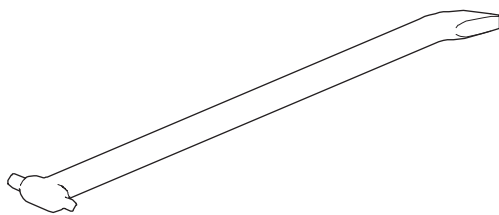
- 1 Clean the front part of the tooth adapter and the hole for the lock device.
- 2 Install the tooth so that the guide lugs fit in the tooth adapter's recesses.
- 3 Replace the lock retainer (B) with a new one.
- 4 Install the lock device so that the chamfered part points down and the lock retainer points forward.
- 5 Drive down the lock device with a hammer until it is level with the upper part of the tooth adapter.
- 6 Drive down the lock device further with a hammer and the special tool or another suitable drift until the upper part is just below the line marking in the hole.

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

Bucket teeth, replacing

The following information is valid for Volvo Tooth System (new generation).

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

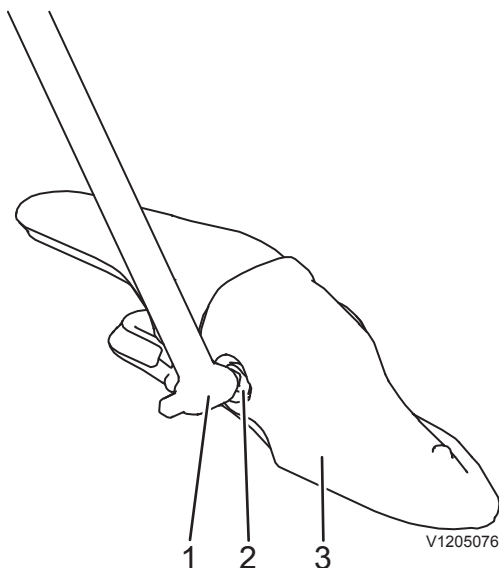


V1205123

Special tool

Removing tooth

- 1 Lower the bucket to the ground and angle it slightly upward.
- 2 Clean the square hole in the pin.
- 3 Install the tool in the pin and turn it 90 degrees either way to unlock it.
- 4 Turn the tool back and forth, with an outwards motion, until the pin is removed. Use the pry bar end of the tool if the pin gets stuck.
- 5 Remove the tooth.

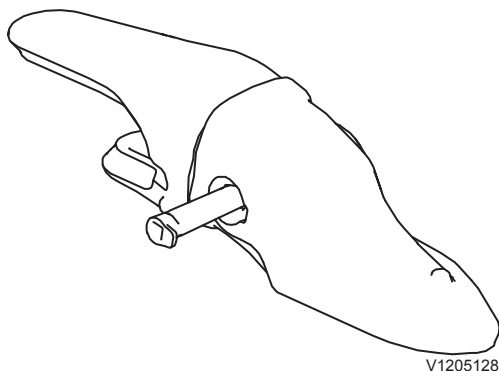


V1205076

- 1 Special tool
- 2 Pin
- 3 Tooth

Installing tooth

- 1 If changing the position of a tooth, check that the retainer is not bent or damaged.
- 2 Check that the pin is not bent or damaged.
- 3 Clean the front part of the adapter and the holes for the pin.
- 4 Place the tooth on the adapter.
- 5 Place the pin in the tooth. Check that the pin flange is aligned with the tooth.
- 6 Install the tool in the pin and turn it back and forth, with an inwards motion, until the pin is installed. A click sound will occur.
- 7 Check that the tooth is secured to the adapter.



V1205128

Tooth with pin

Wheel bolts, checking tightening

After having changed a tyre or if the wheel has been removed and installed for any other reason, the wheel bolts must be check-tightened after eight hours of operation.

For tightening torque, see page 319.

Central lubrication system

(Optional equipment)

The machine may be equipped with an automatic greasing system which automatically greases many points according to a preselected lubrication cycle. The automatic greasing system should be inspected regularly and should be co-ordinated with other regular maintenance and control.

Checking and setting of lubrication cycles takes place with the keypad and the display, see page 46.

Check the following regularly:

- that there is sufficient grease in the reservoir. Top up when needed, see page 280.

NOTE!

Too low lubricant level constitutes a great risk of air entering the system (the most common cause of operating problems).

- that the system functions. Run the system test that is described later on in the section.
- that the grease reservoir is undamaged.
- that the connections do not leak.
- that the dust caps on the quick-couplings are installed and undamaged.
- that the lubrication lines are undamaged and well secured.
- that all lubrication points are lubricated (that lubricant is forced out at bearings and joints).

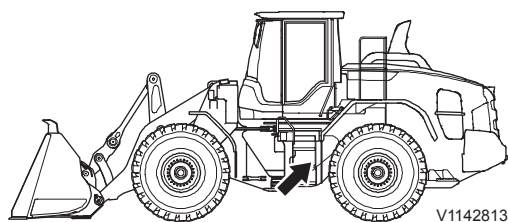
NOTE!

Remember to lubricate by hand the lubrication points which are not included in the automatic greasing system. See the ordinary lubrication chart.

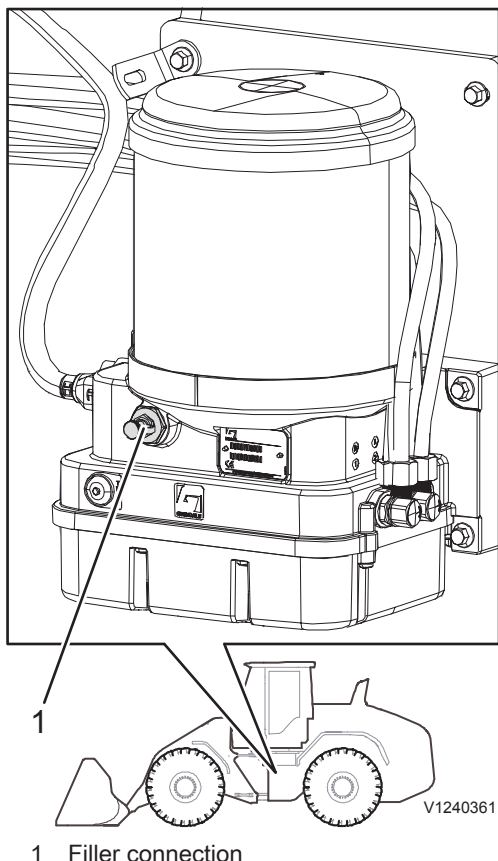
Lubrication points, central lubrication

NOTE!

The central lubrication includes all of the machine's grease points except hinges, universal joints, and splined joints for propeller shafts.



Position of grease reservoir



Filling lubricant

Lubricant must be topped up before the level falls below the minimum marking on the reservoir.

NOTE!

Let the level drop completely to the bottom every other time grease is filled so that old grease is not at the top of the reservoir.

On the pump unit there is a filler connection (grease nipple) to which a hand pump or an industrial pump is connected when filling.

NOTE!

If an industrial pump is used, the filter between connection and pump must be cleaned regularly. A partly blocked filter can easily burst, with a consequent great risk of small particles entering the lubrication system. This may in turn lead to a breakdown in the lubrication system.

For information on type of grease, see lubricant recommendations on page 291.

Proceed as follows:

- 1 Remove the protective cap. Carefully clean the filler connection and the connection on the filler hose.
- 2 Fill the filler hose completely full with grease before beginning to fill. this will prevent air from entering the system.
- 3 Connect the connection on the filler connection.
- 4 Fill with lubricant to the maximum level on the reservoir. *) If it is difficult to pump in the grease, either the filter behind the filler connection is blocked or there may be dirt in the filler nipple itself. Clean the filter, if required replace the nipple and try again.
- 5 Reinstall the protective cap.
- 6 Keep the grease pump in a dust-free place, so that it will not be exposed to dirt.

*) If the reservoir is filled above the maximum level, the surplus lubricant will be drained through the ventilation hole on the left side of the reservoir. Any air under the plate in the reservoir is also drained through the ventilation hole.

Change of lubrication interval

If the preselected lubrication interval is not suitable for the operating and load conditions to which the machine is subjected, the interval can be changed using the keypad and display, see page 46.

- 1 Turn the ignition key to position 1 (operating position).
- 2 Select "Service" with the keypad.
- 3 Select "Central lubrication" with the arrow keys and press SELECT.
- 4 Select "Interval" with the arrow keys and press SELECT.
- 5 Select the lubrication interval you want to change to with the arrow keys and press SELECT.

- 6 **Wait 45 seconds** before turning the start key to 0 (selected interval in display may go back to earlier interval, but the change will be in effect after 45 seconds).

NOTE!

If the start key is turned to position 0 within 45 seconds after the lubrication interval has been changed, then the latest selection of lubrication interval will be erased. Therefore, wait for at least 45 seconds after the setting has been made, before turning the start key to position 0.

- 7 Turn the start key to position 0 and wait until the display shuts down.
- 8 Turn the start key to position 1 (running position) and check that the correct lubrication interval is shown in the display.

To change lubrication interval again, the start key must be turned to position 0 and when the display shuts down, the start key can once again be turned to position 1 and new lubrication interval can be selected.

System test

In order to check the function of the greasing system, or to initiate an extra lubrication cycle after, e.g., the machine has been washed, a system test can be run. The test button, which is used to begin a system test, is positioned at the front on the pump.

A test cycle can only be run when the pump is between two ordinary lubrication cycles (not during an ongoing lubrication cycle).

Single test lubrication cycle

The pump only runs **one lubrication cycle**. Can be used after washing to get extra lubrication.

- 1 Turn the start key to position 1 (operating position).
- 2 Press in the test button for 2–6 sec.
- 3 The lubrication cycle starts.
- 4 The test cycle ends automatically.

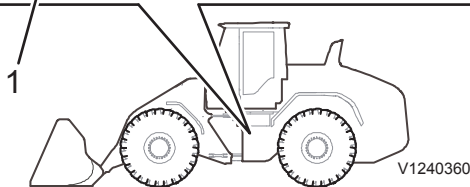
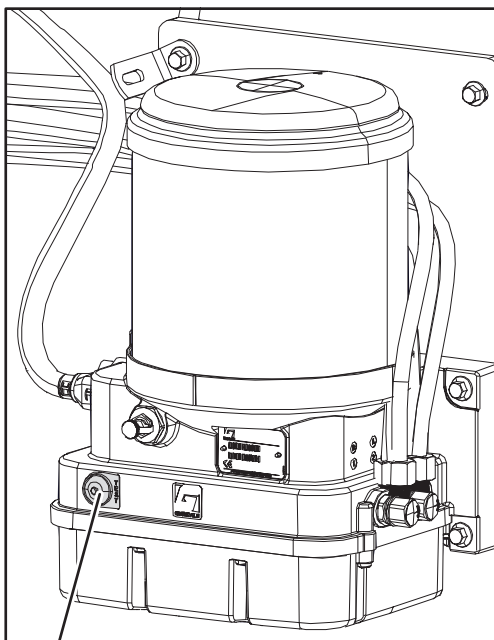
If the test lubrication cycle has been used to obtain an additional lubrication cycle after a wash, the test button should be pressed once more to lubricate the other main line.

Continuous test lubrication cycle

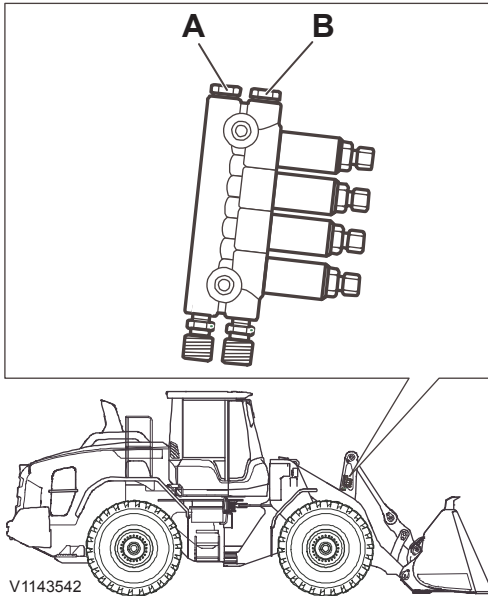
The pump runs **an unlimited number of lubrication cycles**, i.e., it continuously pumps out grease alternating between **both** main lines. **This is used for bleeding air from the system.**

- 1 Turn the start key to position 1 (operating position).
- 2 Press the test button for more than 6 sec.
- 3 The lubrication cycle starts.
- 4 End the test cycle by turning the ignition key to position 0.

The test cycle does not end automatically.



1 Test button



V1143542

Principle illustration

- A Plug
- B Plug

Central lubrication system, bleeding

- 1 Make sure that the grease reservoir is filled to the max. mark.
- 2 Remove the plug for one of the main lines in the metering block located farthest away from the pump unit (see figure).
- 3 Turn the start key to position 1 (operating position).
- 4 Start a **continuous lubrication test cycle**, see page 282.
- 5 Bleeding is finished in the relevant main line when air-free grease comes out from that main line.
- 6 Turn the start key to position 0 and install the plug for the relevant main line.
- 7 Follow steps 2–6 in order to bleed the other main line.
- 8 Run a single lubrication test cycle twice in a row to check that the system works, see page 282.

Cleaning

Normally water cannot penetrate into the system. However, during a high-pressure wash the risk increases and the pump unit should be protected, as water, which has entered the system, does not disappear by itself, but could instead cause operating problems. After high-pressure washing, a **Continuous test lubrication cycle** should be run, see page 282) to obtain extra lubrication.

Specifications Recommended lubricants

Recommended lubricants

Valid for option / configuration	
Option	Configuration
Engine	D6J US Tier 4 final
Engine	D6J EU Stage V
Engine	D6J Korea Stage V

For any questions or more information about oils, lubricants and extreme outdoor temperatures, please contact your dealer.

NOTE!

Keep in mind the type of engine fitted on the machine and follow the instructions relevant for that engine.

NOTE!

It is very important that instructions concerning the oil grade are followed, otherwise oil deposits may clog the diesel particulate filter.

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Volvo Engine Oil VDS-4.5 Other approved VDS-4.5 oil	<table><tr><td>°C</td><td>-30</td><td>-20</td><td>-10</td><td>0</td><td>+10</td><td>+20</td><td>+30</td><td>+40</td></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></tr><tr><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></td><td></td><td></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></tr><tr><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></td><td></td><td></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></tr><tr><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></td><td></td><td></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></tr><tr><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></td><td></td><td></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></tr><tr><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></td><td></td><td></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></tr><tr><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></td><td></td><td></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></tr><tr><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></td><td></td><td></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></tr><tr><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></td><td></td><td></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></tr><tr><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></td><td></td><td></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></tr><tr><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></td><td></td><td></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></tr><tr><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></td><td></td><td></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></tr><tr><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></td><td></td><td></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></tr><tr><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></td><td></td><td></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></tr><tr><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></td><td></td><td></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></tr><tr><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></td><td></td><td></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></tr><tr><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></td><td></td><td></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></tr><tr><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></td><td></td><td></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></tr><tr><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></td><td></td><td></td><td></td><td></td><td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V1177225

*) VDS-4 and VDS-4.5 approved oils only. Other oils can be used up to +30° C.

Engine			
Oil grade	Change intervals (Sulphur content in the fuel)		
	<15 ppm		> 15 ppm not permitted.
	Volvo High Performance engine oil filter	Volvo Performance engine oil filter	
Volvo Engine Oil VDS-4.5	every 1000 hours or at least every 12 month	every 500 hours	
Other approved VDS-4.5 oil ^(a)			
Other approved VDS-4.5 oil	every 500 hours	every 500 hours	
Volvo Engine Oil VDS-4			
Other approved VDS-4 oil			
ACEA E9 or API CJ-4 or API CK-4	every 250 hours	every 250 hours	

a) Approved for 1000 hours according to Volvo engine oil VDS 4.5 standard.

286 Specifications Recommended lubricants

	Oil grade	Service interval		Recommended viscosity at various ambient temperatures																																																			
		First (hours)	Every (hours)																																																				
AXLES With axle oil cooler every 4000h only.	Volvo Wet Brake Oil Volvo 97304 WB102	1000	2000	<table><tr><td>°C</td><td>-30</td><td>-20</td><td>-10</td><td>0</td><td>+10</td><td>+20</td><td>+30</td><td>+40</td><td>+50</td></tr><tr><td>°F</td><td>-22</td><td>-4</td><td>+14</td><td>+32</td><td>+50</td><td>+68</td><td>+86</td><td>+104</td><td>+122</td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td colspan="8">WB102</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> V1095848	°C	-30	-20	-10	0	+10	+20	+30	+40	+50	°F	-22	-4	+14	+32	+50	+68	+86	+104	+122												WB102																			
	°C		-30		-20	-10	0	+10	+20	+30	+40	+50																																											
	°F		-22		-4	+14	+32	+50	+68	+86	+104	+122																																											
	WB102																																																						
Volvo Wet Brake Oil Volvo 97303 WB101	1000																																																						
Other oil approved against Volvo Standard 1273,03 (97303, WB101)																																																							
REAR AXLE BEARING (if applicable)	Volvo Wet Brake Oil Volvo 97304 WB102	—	4000																																																				
	Volvo Wet Brake Oil Volvo 97303 WB101																																																						
	Other oil approved against Volvo Standard 1273,03 (97303, WB101)																																																						
	TRANSMISSIO N	Volvo Automatic Transmission Fluid Volvo 97342 AT102	—	4000		<table><tr><td>°C</td><td>-30</td><td>-20</td><td>-10</td><td>0</td><td>+10</td><td>+20</td><td>+30</td><td>+40</td><td>+50</td></tr><tr><td>°F</td><td>-22</td><td>-4</td><td>+14</td><td>+32</td><td>+50</td><td>+68</td><td>+86</td><td>+104</td><td>+122</td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td colspan="8">Volvo Automatic Transmission Fluid AT102</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> V1095847	°C	-30	-20	-10	0	+10	+20	+30	+40	+50	°F	-22	-4	+14	+32	+50	+68	+86	+104	+122												Volvo Automatic Transmission Fluid AT102																	
°C		-30		-20			-10	0	+10	+20	+30	+40	+50																																										
°F		-22		-4			+14	+32	+50	+68	+86	+104	+122																																										
	Volvo Automatic Transmission Fluid AT102																																																						
Volvo Automatic Transmission Fluid Volvo 97341 AT101	2000																																																						
Other transmission oil approved against Volvo Standard 1273,41 (97341, AT101)																																																							

V1095848

V1095847

HYDRAULIC SYSTEM	Volvo Hydraulic Oil Volvo 98610 Biodegradable 46	—	8000	V109420 8
	Volvo Hydraulic Oil Volvo 98608 Super 46	—	4000	
	Volvo Hydraulic Oil Volvo 98608 Super 68	—		
HYDRAULIC CAB TILT UNIT (if applicable)	See HYDRAULIC SYSTEM	—	When required	
COOLING SYSTEM	Volvo Coolant Ready Mixed For more information, see: 290	—	6000 or max 4 years	

Recommended lubricants

Valid for option / configuration	
Option	Configuration
Engine, D6J, High Sulphur Fuel Conversion kit	Installed
Engine	D6E Stage IIIA

For any questions or more information about oils, lubricants and extreme outdoor temperatures, please contact your dealer.

NOTE!

Keep in mind the type of engine fitted on the machine and follow the instructions relevant for that engine.

NOTE!

It is very important that instructions concerning the oil grade are followed, otherwise oil deposits may clog the diesel particulate filter.

288 Specifications Recommended lubricants

Engine	
Oil grade	Recommended viscosity at various ambient temperatures
Volvo Engine Oil VDS-4.5 10W-30 Volvo Engine Oil VDS-4.5 15W-40 Other approved VDS-4.5 oil	°C -30 -20 -10 0 +10 +20 +30 +40 °F -22 -4 +14 +32 +50 +68 +86 +104 V1177225
Volvo Engine Oil VDS-4 10W-30 Volvo Engine Oil VDS-4 15W-40 Other approved VDS-4 oil	
Volvo Engine Oil VDS-3 10W-40 Volvo Engine Oil VDS-3 15W-40 Other approved VDS-3 oil	
API CI-4 or ACEA E7 API CJ-4 or API CK-4 or ACEA E9	

*) VDS-4 or VDS-4.5 approved oils only. Other oils can be used up to +30° C.

Engine	
Oil grade	Change intervals (Sulphur content in the fuel)
	<15 ppm 15 - 500 ppm 500 - 3000 ppm 3000 - 5000 ppm >5000 ppm
Volvo Engine Oil VDS-4.5 10W-30 Volvo Engine Oil VDS-4.5 15W-40 Other approved VDS-4.5 oil	every 500 hours every 250 hours every 125 hours
Volvo Engine Oil VDS-4 10W-30 Volvo Engine Oil VDS-4 15W-40 Other approved VDS-4 oil	
Volvo Engine Oil VDS-3 10W-40 Volvo Engine Oil VDS-3 15W-40 Other approved VDS-3 oil	
API CI-4 or ACEA E7 API CJ-4 or API CK-4 or ACEA E9	every 250 hours every 125 hours every 75 hours

	Oil grade	Service interval		Recommended viscosity at various ambient temperatures																																																																																																					
		First (hours)	Every (hours)																																																																																																						
AXLES With axle oil cooler every 4000h only.	Volvo Wet Brake Oil 97304 WB102	1000	2000	<table><tr><td>°C</td><td>-30</td><td>-20</td><td>-10</td><td>0</td><td>+10</td><td>+20</td><td>+30</td><td>+40</td><td>+50</td></tr><tr><td>°F</td><td>-22</td><td>-4</td><td>+14</td><td>+32</td><td>+50</td><td>+68</td><td>+86</td><td>+104</td><td>+122</td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td colspan="8">WB102</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><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></td><td></td><td></td><td></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><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr></table> V1095848	°C	-30	-20	-10	0	+10	+20	+30	+40	+50	°F	-22	-4	+14	+32	+50	+68	+86	+104	+122																						WB102																																																											
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REAR AXLE BEARING (if applicable)	Volvo Wet Brake Oil 97304 WB102	—	4000																																																																																																						
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TRANSMISSION	Volvo Automatic Transmission Fluid 97342 AT102	—	4000		<table><tr><td>°C</td><td>-30</td><td>-20</td><td>-10</td><td>0</td><td>+10</td><td>+20</td><td>+30</td><td>+40</td><td>+50</td></tr><tr><td>°F</td><td>-22</td><td>-4</td><td>+14</td><td>+32</td><td>+50</td><td>+68</td><td>+86</td><td>+104</td><td>+122</td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td colspan="8">Volvo Automatic Transmission Fluid AT102</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><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></td><td></td><td></td><td></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><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr></table> V1095847	°C	-30	-20	-10	0	+10	+20	+30	+40	+50	°F	-22	-4	+14	+32	+50	+68	+86	+104	+122																						Volvo Automatic Transmission Fluid AT102																																																										
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HYDRAULIC SYSTEM	Volvo Hydraulic Oil 98610 Biodegradable 46(a)	—	8000	<table><tr><td>°C</td><td>-30</td><td>-20</td><td>-10</td><td>0</td><td>+10</td><td>+20</td><td>+30</td><td>+40</td><td>+50</td></tr><tr><td>°F</td><td>-22</td><td>-4</td><td>+14</td><td>+32</td><td>+50</td><td>+68</td><td>+86</td><td>+104</td><td>+122</td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td></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></td><td></td><td></td><td></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><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></td><td></td><td></td><td></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><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr></table> V1094208	°C	-30	-20	-10	0	+10	+20	+30	+40	+50	°F	-22	-4	+14	+32	+50	+68	+86	+104	+122																																																																																	
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Volvo Hydraulic Oil 98608 Super 46	—	4000																																																																																																							
Volvo Hydraulic Oil 98608 Super 68																																																																																																									

290 Specifications Recommended lubricants

HYDRAULIC CAB TILT UNIT (if applicable)	See HYDRAULIC SYSTEM	—	When required	
COOLING SYSTEM	Volvo Coolant Ready Mixed For more information, see: <i>290</i>	—	6000 or max 4 years	

a) Only valid with factory filled Volvo Hydraulic Oil 98610 Biodegradable 46 under the pre-requisit of oil sample analysis at regular intervals.

Coolant

Only use Volvo Coolant VCS or Volvo Coolant VCS-2 when topping up or changing coolant.

NOTE!

To avoid damage to engine and cooling system, Volvo Coolant VCS and Volvo Coolant VCS-2 must never be mixed with other brands of coolant or additives.

The Volvo Coolant VCS-2 is orange.

The Volvo Coolant VCS is yellow.

Volvo Coolant VCS and Volvo Coolant VCS-2 can be mixed, the color of the coolant will then become orange.

When using concentrated Volvo Coolant VCS or Volvo Coolant VCS-2 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.

Table. Volvo Coolant VCS

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%

Table. Volvo Coolant VCS-2

Freeze protection down to	Mixed-in amount of concentrated coolant
-25 °C (-13 °F)	40%
-37 °C (-35 °F)	50%
-45 °C (-49 °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	< 300 ppm
Total hardness	< 120 ppm or 7° dH
Chloride	< 40 ppm
Sulphate	< 100 ppm
pH value	6.5 – 8.5
Silica	< 20 ppm
Iron	< 0.10 ppm
Manganese	< 0.05 ppm
Electrical conductivity	< 400 µS/cm
Organic material, COD-Mn	< 8 ppm

If there is any doubt about the water quality use ready-mixed Volvo Coolant VCS or Volvo Coolant VCS-2, which contains 40% concentrated coolant.

Do not mix with any other ready-mixed coolants since this may result in engine damage.

Grease

Volvo Super Grease Lithium EP2.

Or corresponding grease on lithium base with EP additives and consistency NLGI class 2.

If the machine is provided with automatic greasing system, other recommended lubricants apply.

Automatic central lubrication

Recommended lubricants

The following requirements apply to grease to be used in the central greasing system:

- the grease may **not** contain graphite or PTFE (teflon)
- use is permitted of grease containing max. 5% molybdenum disulphide (MoS_2)
- the following NLGI-class is recommended at operating temperature between:

Operating temperature range	NLGI-class
-20 °C (-4 °F) to +70 °C (158 °F)	2
<-20 °C (-4 °F) to 0 °C (32 °F)	0 / 1
<-20 °C (-4 °F) to +70 °C (158 °F)	synthetic 2
<-20 °C (-4 °F) to 0 °C (32 °F)	synthetic 0 / 1

Fuel system

Fuel recommendation for EU-certified engines (“J”-engines with exhaust gas recirculation, EGR and exhaust aftertreatment) from model year 2011.

Diesel engines for model year 2011 and later are only designed to operate with sulphur-free fuel with a maximum sulphur content of 10 ppm. The use of fuels other than sulphur-free fuel will reduce the efficiency and service life of the engine, permanently damage the advanced emission control systems, reduce fuel economy and possibly prevent the engine from running at all. Manufacturer warranties may be voided by using improper or incorrect fuel. It is essential to use the correct fuel in order to ensure good fuel economy, performance and engine life. Market fuels complying with the CEN diesel fuel standard EN 590:2013 or with the European Fuel Quality Directive 98/70/EC should be used. Fuel variants like HVO (Hydrotreated vegetable oil), GTL (Gas-to-liquids), CTL (Coal To Liquids), BTL (Biomass-to-liquids) and Swedish Environmental Class 1 (Mk1) diesel fuels may also be used, if complying with the aforementioned standard or directive. It is important that the fuel is not contaminated with dust or water, since this may damage the engine's fuel system and increase engine wear.

Fuel recommendation for US-certified engines (“J”-engines with exhaust gas recirculation, EGR and exhaust aftertreatment) from model year 2011.

Diesel engines for model year 2011 and later are only designed to operate with Ultra Low Sulphur Diesel (ULSD) fuel, with a maximum sulphur content of 15 ppm. The use of fuels other than ULSD will reduce the efficiency and durability of the engine, permanently damage the advanced emission control systems, reduce fuel economy and possibly prevent the engine from running at all. Manufacturer warranties may be voided by using improper or incorrect fuel, and the use of fuels other than ULSD-fuel in diesel-powered machines is illegal and punishable by civil penalties. It is essential to use the correct fuel in order to ensure good fuel economy, performance and engine life. ASTM D 975 Number 2D ULSD should be used when climate conditions permit. ASTM D 975 Number 1D ULSD may be used in cold weather conditions. Blends of ASTM D 975 Number 1D and Number 2D ULSD fuels may be used to suit various climate conditions. It is important that the fuel is not contaminated with dust or water, since this may damage the engine's fuel system and increase engine wear.

Fuel recommendation for China-certified engines (“J”-engines with exhaust gas recirculation, EGR and exhaust aftertreatment)

Diesel engines for model year 2022 and later are only designed to operate with sulphur-free fuel with a maximum sulphur content of 15 ppm. The use of fuels other than sulphur-free fuel will reduce the efficiency and service life of the engine, permanently damage the advanced emission control systems, reduce fuel economy and possibly prevent the engine from running at all. Manufacturer warranties may be voided by using improper or incorrect fuel. It is essential to use the correct fuel in order to ensure good fuel economy, performance and engine life. Market fuels complying with the China diesel fuel standard GB19147-2016/XG1-2018

should be used. Fuel variants like HVO (Hydrotreated vegetable oil), GTL (Gas-to-liquids), CTL (Coal-to-liquids) and BTL (Biomass-to-liquids) may also be used, if complying with the aforementioned standard or the EU standard EN 15940. It is important that the fuel is not contaminated with dust or water, since this may damage the engine's fuel system and increase engine wear.

Fuel recommendation for Korea-certified engines (“J”-engines with exhaust gas recirculation, EGR and exhaust aftertreatment)

Diesel engines for model year 2022 and later are only designed to operate with sulphur-free fuel with a maximum sulphur content of 10 ppm. The use of fuels other than sulphur-free fuel will reduce the efficiency and service life of the engine, permanently damage the advanced emission control systems, reduce fuel economy and possibly prevent the engine from running at all. Manufacturer warranties may be voided by using improper or incorrect fuel. It is essential to use the correct fuel in order to ensure good fuel economy, performance and engine life. Market fuels complying with the Korean Standard KS M 2610, the CEN diesel fuel standard EN 590:2013 (with nationally adapted temperature requirements), with JIS KK 2204 or with ASTM D 975 No. 1D and 2D should be used. Fuel variants like HVO (Hydrotreated vegetable oil), GTL (Gas-to-liquids), CTL (Coal-to-liquids) and BTL (Biomass-to-liquids) may also be used, provided that they meet the requirements of the afore mentioned standards. It is important that the fuel is not contaminated with dust or water, since this may damage the engine's fuel system and increase engine wear.

Fuel recommendation for engines without exhaust aftertreatment. (“E”- or “F”- engines)

This diesel engine is designed to operate with commercially available diesel fuels. It is recommended to use fuel that fulfils national or international standards for diesel fuel. Fuel with low sulphur content (below 1,000 ppm) is preferable since it reduces wear as well as environmental impact. Selection of correct fuel is essential for good economy, performance, and engine life. It is important that the fuel is not contaminated with dust or water since this may damage the engine's fuel system and increase engine wear.

NOTE!

Warranties may be voided by using improper or incorrect fuel.

NOTE!

Volvo do not approve usage of fuel additives.

Alternative fuels

This statement is only valid for Volvo branded engines.

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 fuels complying with the CEN diesel fuel standard EN 590:2013 or with the European Fuel Quality Directive 98/70/EC are approved for use in all Volvo Construction Equipment diesel engines with no changes to maintenance intervals. Paraffinic diesel fuels complying with the CEN standard EN 15940 may be used in all machines operating outside the European Union and for EU-certified engines up to the emission level Stage IV. These fuels may also be used for the EU-certified D11, D13 and D16 engines meeting the emission level Stage V.

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 EN16709(B20) or 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 EU Stage V	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 II / US Tier 2 * EU Stage IIIA / US Tier 3 * US Tier 4 final, special North America arrangement **	D9–D16	Up to B20
EU Stage IIIB / US Tier 4 interim EU Stage IV / US Tier 4 final	D11–D16	Up to B10

Engine emission designation	Engine size	Acceptable blend
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)	D4–D16	Up to B20
EU Stage V	D4–D16	Up to B7
* 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. ** With additional restrictions and special operating conditions, equipment used in North America may operate on B20 diesel.		

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.

Every 10 hours
- 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
- Change the engine oil and filter - Replace the fuel filter(s)
Every year, regardless of operating hours
- 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 aftertreatment 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 engine performance

Biodiesel B100 has about 8% lower energy density compared to regular diesel fuel. Blends equal or lower than B20 have a small impact on engine performance.

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.

However, the use of biodiesel up to a maximum of 20% (B20) in and of itself, will not affect the manufacturer's mechanical warranty as to engine or emissions system, provided the bio fuel used in the blend conforms to the applicable standards and the additional steps outlined herein are followed.

AdBlue®/DEF

NOTE!

Not applicable for machines with D6E engine.

NOTICE

Risk of machine damage.

In the short term, use of the wrong fluid can lead to reduced engine power. In the long term, it can lead to damage to the SCR-system and the catalyst. Reusing AdBlue®/DEF can lead to contamination. Damages caused by the use of incorrect fluids will not be covered by the warranty.

Always use fluid specified in ISO 22241-1. Do not reuse drained AdBlue®/DEF.

For reducing nitrogen oxides (NO_x) the engine is equipped with a selective catalytic reduction (SCR) system. A diesel exhaust fluid is needed for the process to work. The fluid is called AdBlue® in Europe and Asia, but in North America it is called Diesel Exhaust Fluid (DEF). When needed, the SCR system warms up the AdBlue®/DEF-tank and lines.

The fluid is filled in a separate tank, which is completely separated from the fuel tank. AdBlue®/DEF may not be mixed in the fuel tank and fuel may not be mixed in the AdBlue®/DEF-tank.

AdBlue®/DEF consists of urea crystals (32.5%) and distilled water (67.5%). It is transparent, clear, and has a slight odour of ammonia. The fluid is not considered to be hazardous, but should still be handled with care. It is very corrosive, especially with copper and aluminium. For this reason, avoid spilling the fluid on electric cables and components. Always wipe up any spilled AdBlue®/DEF.

AdBlue®/DEF is not a combustible product. When exposed to high temperatures it will convert to ammonia and carbon dioxide. The fluid should not come into contact with other chemicals or be mixed with other chemicals.

AdBlue®/DEF is sensitive to both high and low temperatures. It should not be exposed to direct sunlight for any extended period of time. If the machine is not in use, AdBlue®/DEF starts to freeze at -11 °C (12 °F). The fluid volume in the tank increases when frozen, this is why it is important to follow the recommended fill volume.

AdBlue®/DEF does not break down or degrade when it freezes. The SCR-system will thaw the fluid so that it regains its concentration with maintained quality. The machine will work normally during the time that the fluid melts.

At AdBlue®/DEF temperatures above 20 °C (68 °F) the fluid starts to degrade. Then the fluid gives off ammonia, which is aggressive to materials such as rubber. At temperatures above 75–80 °C (167–176 °F), ammonia production increases. However, high temperatures are permitted for a short time.

AdBlue®/DEF should be stored in a cool, dry, and ventilated place. The fluid may not be stored in direct sunlight. The recommended storage temperature for AdBlue®/DEF is between -11 °C (12 °F) and 25 °C (77 °F). Under these conditions, storage life is approx. two years. Long-term storage of AdBlue®/DEF at a temperature above 25 °C (77 °F) can reduce the lifetime of the fluid. A short time exposure to higher temperatures has no impact on the quality.

NOTE!

If the machine is to be parked for an extended period of time (several months) in ambient temperatures above 40 °C (104 °F) the tank must be drained. This to prevent the fluid from having the wrong quality when starting the machine or that precipitates have a negative impact on the component parts.

NOTE!

If the tank has been drained completely it should be rinsed out with new AdBlue®/DEF before new fluid is filled. Never reuse old fluid. If distilled water or ordinary water is used when rinsing there is a risk that the system will generate an alarm due to wrong quality of AdBlue®/DEF.

NOTE!

Water of any kind should not be used when cleaning AdBlue®/DEF system or AdBlue®/DEF components since there is a risk that even a small amount of water remains in the system after cleaning. The only exceptions allowed are operations described in the service information made by Volvo.

AdBlue®/DEF is available in plastic container, barrel, IBC, or bulk.

For information on ordering AdBlue®/DEF (only applies to USA-market):

- Volvo Construction Equipment: 1-877-823-1111 (office hours)
- www.volvoce.com (outside of office hours)

For information on ordering AdBlue®/DEF (other markets), contact your local Volvo dealer.

Actions in case of contact with AdBlue®/DEF:

- In case of skin contact, rinse thoroughly with water. The fluid may cause irritation of the skin.
- In case of eye contact, rinse thoroughly for several minutes. If needed, contact a doctor for advice.
- In case of inhalation, breathe fresh air and contact a doctor if needed.
- If swallowed, drink water and contact a doctor.

Service capacities and change intervals

L60H

Capacities	When changing	Total
Engine oil, incl. filter	approx. 20 litres (5.3 US gal)	
Transmission incl. filter	21 litres (5.5 US gal)	
Front axle	25 litres (6.6 US gal)	
Rear axle	25 litres (6.6 US gal)	
Hydraulic system		142 litres (37.5 US gal)
Hydraulic oil tank	88 litres (23.2 US gal)	
Fuel tank		222 litres (58.6 US gal)
AdBlue®/DEF tank		20 litres (5.3 US gallons)
Cooling system	approx. 30 litres (7.9 US gal)	
Oil-bath air cleaner (optional equipment)		approx. 5.5 litres (1.5 US gal)

L70H/L90H

Capacities	When changing	Total
Engine oil, incl. filter	approx. 20 litres (5.3 US gal)	
Transmission incl. filter	21 litres (5.5 US gal)	
Front axle	35 litres (9.2 US gal)	
Rear axle	28 litres (7.4 US gal)	
Rear axle heavy duty (optional equipment) (PID:56155)	36 litres (9.5 US gal)	
Hydraulic system		142 litres (37.5 US gal)
Hydraulic oil tank	88 litres (23.2 US gal)	
Fuel tank		222 litres (58.6 US gal)
AdBlue®/DEF tank		20 litres (5.3 US gallons)
Cooling system	approx. 30 litres (7.9 US gal)	
Oil-bath air cleaner (optional equipment)		approx. 5.5 litres (1.5 US gal)

Change intervals

Oil and fluid changes	Hours
Oil-bath air cleaner (Optional equipment)	250
Engine oil	500 ^(a)
Transmission oil, at the same time clean suction strainer	4000
Front and rear axle oil	First 1000 ^(b) 2000 ^(c)
Hydraulic oil, tank	4000 ^(d)
Coolant	6000 ^(e)

300 Specifications Service capacities and change intervals

- a) The interval varies depending on oil grade and the fuel's sulphur content, see page 284.
 b) If axle oil cooling (optional equipment) is installed, the interval is 4000 hours only.
 c) If axle oil cooling (optional equipment) is installed, the interval is 4000 hours only.
 d) The interval varies depending on oil grade and the fuel's sulphur content, see page 284.
 e) Change coolant every 6000 hours or every fourth year. See also page 290.

Filter change	Hours
Engine, oil filters	500 ^(a)
	1000 ^(b) - Only applies to machines with Volvo High Performance engine oil filter and approved oil according to 284.
Engine, air cleaner primary filter	2000 ^(c)
Engine, air cleaner secondary filter	4000 ^(d)
Fuel filters	500 ^(e)
	1000 - Only applies to machines with Volvo High Performance fuel filter and approved fuel according to 284.
Fuel system, breather filter	2000
Oil-bath air cleaner, cleaning filter insert (Optional equipment)	2000 ^(f)
Diesel particulate filter	8000 ^(g)
AdBlue®/DEF tank, breather filter	4000 ^(h)
AdBlue®/DEF pump unit filter	6000 ^{(i)(j)}
Transmission, oil filter	4000
Axle oil cooling filter (Optional equipment)	4000
Drive axles, breather filter	2000
Cab, ventilation main filter	2000
Cab, ventilation prefilter	1000
Cab, carbon filter (Optional equipment)	1000
Cab, asbestos filter (Optional equipment)	1000
Cab, extra prefilter cyclone type (Optional equipment)	1000
Hydraulic tank, return oil filter	2000
Hydraulic tank, breather filter	2000
Automatic lubrication system filter (Optional equipment)	500

- a) The interval varies depending on oil grade and the fuel's sulphur content, see page 292.
 b) Or at least once a year.
 c) Or at signal or at least once a year.
 d) Or every third time primary filter is replaced or once every two years.
 e) The interval varies depending on oil grade and the fuel's sulphur content, see page 284.
 f) Or at signal.
 g) Only applies to machines with D6J-engine.
 h) Only applies to machines with D6J-engine.
 i) Only applies to machines with D6J-engine.
 j) Or when warning for high back pressure occurs.

Engine

L60H

Designation	Volvo D6J	Volvo D6E
Max. power at 1800 rpm (30 r/s) ISO 9249, SAE J1349 net	122 kW (166 hp)	122 kW (166 hp)
Max. torque at 1400 rpm (23.3 r/s) ISO 9249, SAE J1349 net	820 Nm (605 lbf ft)	720 Nm (531 lbf ft)
Economic operating range	800–1600 rpm (13.3–26.6 r/s)	1100–1600 rpm (18.3–26.6 r/s)
Number of cylinders	6	6
Cylinder capacity	5.7 litres (1.5 US gal)	5.7 litres (1.5 US gal)
Idle speed, low	700 ±50 rpm	700 ±50 rpm
Idle speed, high	2350 ±25 rpm	2370 ±25 rpm
Air cleaner	Air cleaning in 3 steps Cyclone cleaner – primary filter – secondary filter	Air cleaning in 3 steps Cyclone cleaner – primary filter – secondary filter

L70H

Designation	Volvo D6J	Volvo D6E
Max. power at 1800 rpm (30 r/s) ISO 9249, SAE J1349 net	127 kW (172.9 hp)	126 kW (171.6 hp)
Max. torque at 1400 rpm (23.3 r/s) ISO 9249, SAE J1349 net	850 Nm (627 lbf ft)	750 Nm (553 lbf ft)
Economic operating range	800–1600 rpm (13.3–26.6 r/s)	1100–1600 rpm (18.3–26.6 r/s)
Number of cylinders	6	6
Cylinder capacity	5.7 litres (1.5 US gal)	5.7 litres (1.5 US gal)
Idle speed, low	700 ±50 rpm	700 ±50 rpm
Idle speed, high	2350 ±25 rpm	2360 ±25 rpm
Air cleaner	Air cleaning in 3 steps Cyclone cleaner – primary filter – secondary filter	Air cleaning in 3 steps Cyclone cleaner – primary filter – secondary filter

L90H

Designation	Volvo D6J	Volvo D6E
Max. power at 1900 rpm (31.7 r/s) ISO 9249, SAE J1349 net	137 kW (186.3 hp)	134 kW (181.7 hp)
Max. torque at 1400 rpm (23.3 r/s) ISO 9249, SAE J1349 net	934 Nm (689 lbf ft)	777 Nm (573 lbf ft)
Economic operating range	800–1600 rpm (13.3–26.6 r/s)	1100–1600 rpm (18.3–26.6 r/s)
Number of cylinders	6	6
Cylinder capacity	5.7 litres (1.5 US gal)	5.7 litres (1.5 US gal)
Idle speed, low	700 ±50 rpm	700 ±50 rpm
Idle speed, high	2350 ±25 rpm	2360 ±25 rpm
Air cleaner	Air cleaning in 3 steps Cyclone cleaner – primary filter – secondary filter	Air cleaning in 3 steps Cyclone cleaner – primary filter – secondary filter

Carbon dioxide emissions

NOTE!

Only applicable to engine(s) equipped to meet the legal requirements for exhaust emissions according to EU Stage V.

The table below shows the value of the carbon dioxide (CO₂) emission determined from EU-type approval testing of parent engine(s) in the warm part of the Non Road Transient Test Cycle (NRTC).

	Test cycle NRTC
Parent engine	With B7 fuel
D6J, CO ₂ (g/kWh)	724,0 (L60H/L70H) 794,0 (L90H)

Electrical system

System voltage	24 V
Batteries	2 (connected in series)
Battery voltage	2 x 12 V
Battery capacity	2 x 110 Ah / 105 Ah / 95 Ah (depending on production plant)

LED lights	Watt
Headlights, low beams	25
Headlights, high beams	40
Parking lights, front	0,8
Direction indicators, front	7
Parking lights, rear	0,4
Brake lights	1,4
Reversing lights, rear	8,4
Direction indicators, rear	1,4
Position light	1,2
Work lights	22
License plate light	1

Halogen lights	Watt	Socket
Headlights, low beams	70	PX 26D (H7)
Headlights, high beams	70	PK 22S (H3)
Parking lights, front	4	BA 9s
Direction indicators, front	21	BA 15s
Parking lights, rear	10	BA 15s
Brake lights	21	BA 15s
Direction indicators, rear	21	BA 15s
Cab interior light	10 21	BA 15s
Work lights	70	PK 22s (H3)

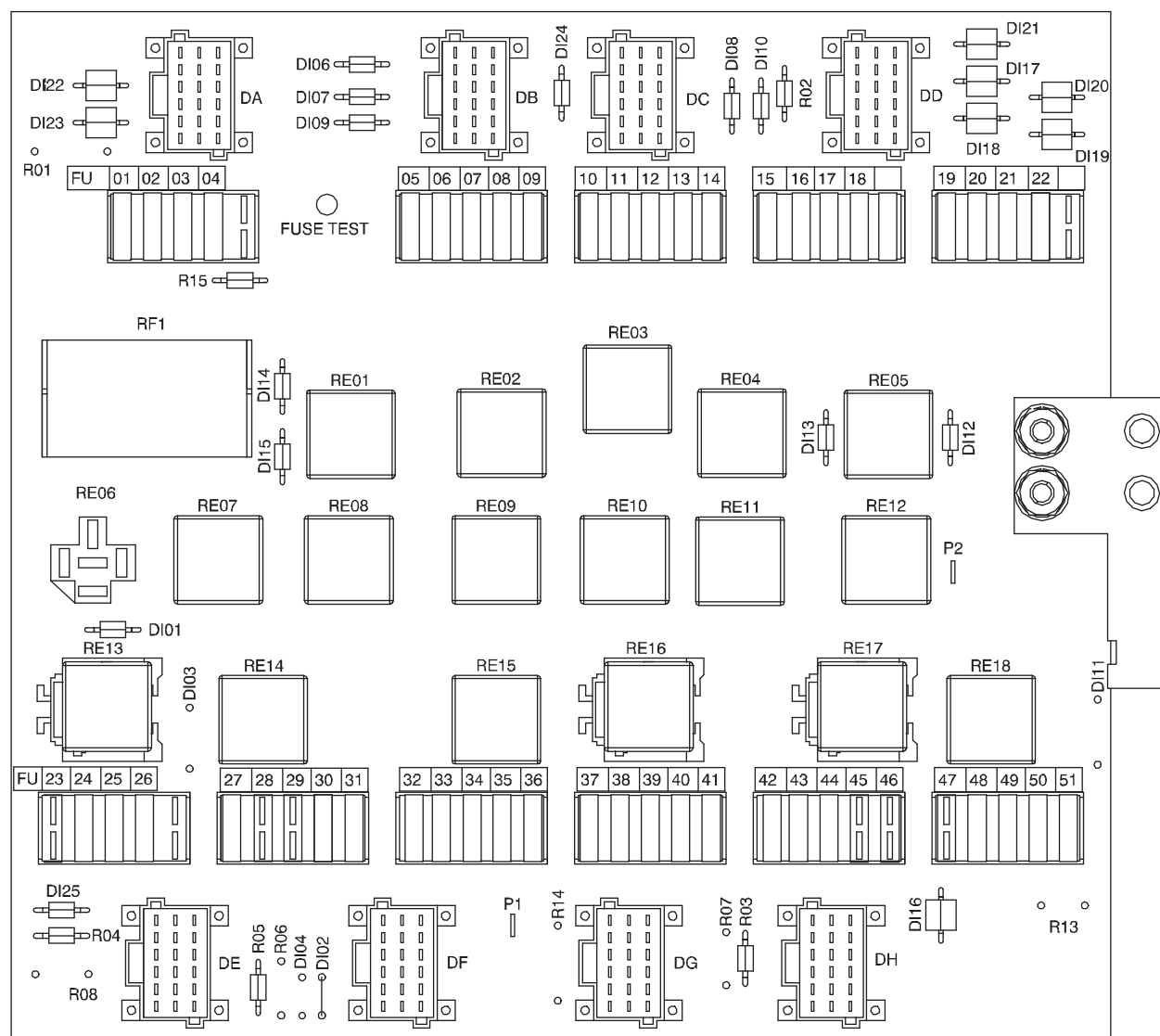
Fuses and relays

Fuses

Fuses on circuit board:

NOTE!

Fuses can be tested on the circuit board. See FUSE TEST located between FU04 and FU05.



V1182601

Designation	Rated current	Description
FU01	5 A	RE10 (Brake lights)
FU02	15 A	HMICU Instrument cluster
FU03	15 A	RE07 (Work lights cab, front)
FU04	5 A	RE14 (CCM, AC compressor, Cab fan, Pause heater)
FU05	5 A	Parking light, front left Parking light, right rear Position light, left
FU06	5 A	Parking light, front right Parking light, left rear Position light, right License plate light
FU07	5 A	Low beam, left
FU08	5 A	Low beam, right
FU09	10 A	RE02 (Back-up light, Back-up warning, Back-up work light, rear)
FU10	5 A	High beam, right
FU11	5 A	High beam, left
FU12	5 A	–
FU13	15 A	RE03 (Work lights, front and work light, attachment)

FU14	–	–
FU15	15 A	RE04 (Work lights, cab rear)
FU16	15 A	RE11 (Work lights, rear)
FU17	10 A	Ignition operated battery disconnect RE13 (Voltage feed to ECUs, Gear selector steering column, Pre-magnetisation alternator, RE2502 (Engine and aftertreatment))
FU18	10 A	Power socket 24 V On board diagnostic connector
FU19	15 A	Headlights FU05 FU06
FU20	–	–
FU21	10 A	Entrance light Warning beacon Interior light Extended work lights Door position
FU22	–	–
FU23	–	–
FU24	25 A	HMICU GPMECU3 FU23 FU30 FU31
FU25	20 A	GPMECU1
FU26	20 A	GPMECU2 CDC
FU27	20 A	CCM Cab fan AC compressor RE8712 (Pause heater)
FU28	–	–
FU29	5 A	Controlled shutdown
FU30	5 A	RE2502 (Engine and aftertreatment) ACM
FU31	5 A	Gear selector steering column Pre-magnetisation alternator
FU32	10 A	Single-acting lift RE08 (Boom Suspension System)
FU33	10 A	Regeneration
FU34	10 A	Windshield wiper and washer, front RE15 (Windshield wiper, front) Headlight flasher
FU35	10 A	Windshield wiper and washer, rear RE09 (Windshield wiper, rear) Sensor for washer fluid level
FU36	5 A	RE3610 (Power supply 15) P1/2
FU37	5 A	Direction indicators
FU38	5 A	Work lights, front Work lights, rear RE2301 (Electrically heated fuel filter) RE3507 (Extended work lights)

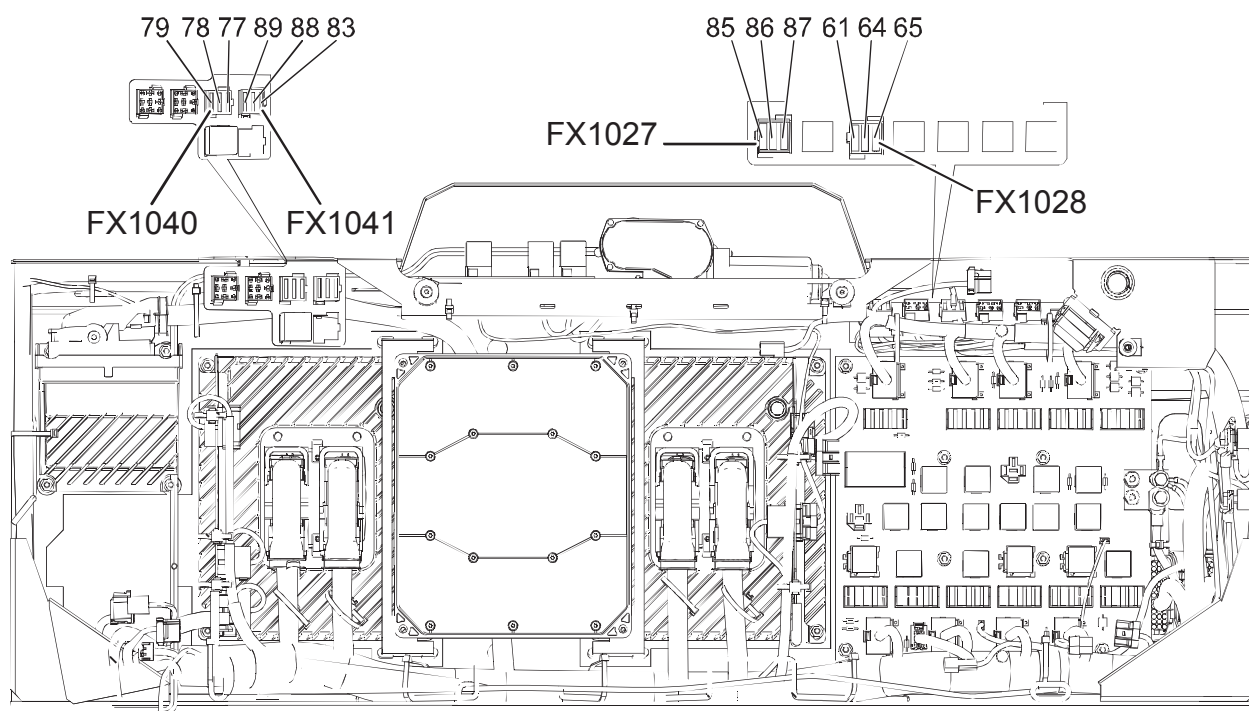
306 Specifications Electrical system

FU39	10 A	Kick-down (CDC) Electrically controlled/heated rear view mirrors Horn
FU40	10 A	Proximity Detection System
FU41	15 A	Seat heat Seat compressor
FU42	5 A	Lock-up Boom Suspension System (BSS) Fully automatic downshifting (FAPS) Differential lock CDC armrest position CDC activation Direction gear (CDC) Activation F/N/R (lever carrier) Engine brake Direction gear (lever carrier) Kick-down (lever carrier)
FU43	10 A	Central lubrication
FU44	5 A	Float position Automatic tilt Automatic lift Return-to-dig Lever lock Adjustable constant flow 3rd hydraulic function Reversible cooling fan (optional equipment)
FU45	5 A	Seat belt indicator light Seat presence Seat belt
FU46	–	–
FU47	–	–
FU48	5 A	Parking brake
FU49	5 A	Secondary steering
FU50	5 A	CAN bus, interface Rear view camera Front view camera Reverse warning system
FU51	5 A	Ignition-dependent voltage feed to ECUs On board diagnostic connector Delayed shutdown

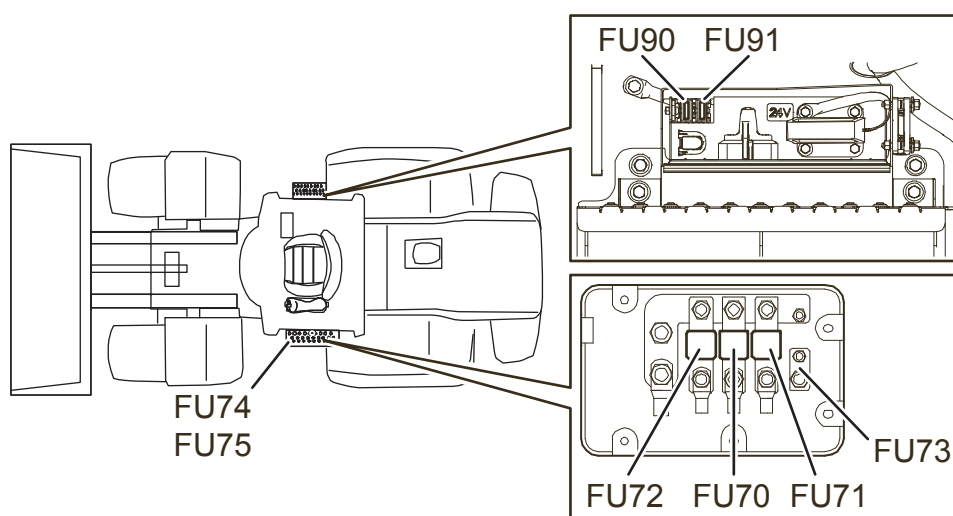
Other fuses:

NOTE!

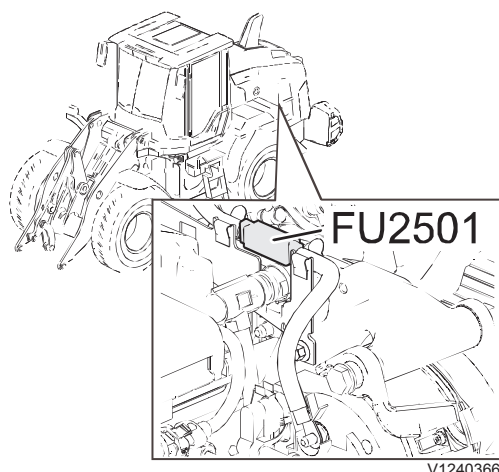
Pull the seat ahead maximally and fold it forward for easier removal of the rear cab wall and to access the fuses outside of the circuit board.



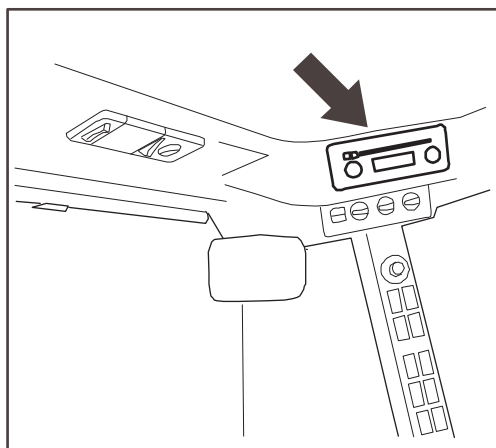
V1182598



V1239092



Designation	Rated current	Description
FU61	15 A	RE2301 (Electrically heated fuel filter)
FU64	10 A	Electric door opener
FU65	5 A	Volvo Co-Pilot Tire pressure monitoring system (TPMS)
FU70	125 A	Secondary steering
FU71	125 A	Alternator
FU72	125 A	Power to cab
FU73	-	—
FU74	10 A	Entrance light Fire Supression System (FSS) Electric door Voltage converter CAN bus, interface Hazard flasher W-ECU
FU75	30 A	Hood motor Alternator Ignition switch Proximity Detection System switch Proximity Detection System
FU77	30 A	ACM
FU78	30 A	ECM FU83 FU88
FU79	-	—
FU83	15 A	NO _x sensors Exhaust gas recirculation (EGR) valve
FU85	15 A	Cab cyclone filter
FU86	5 A	Volvo Co-Pilot
FU87	-	—
FU88	10 A	Preheating Exhaust gas recirculation (EGR) valve
FU89	-	—
FU90	10 A	Battery check
FU91	10 A	Battery check
FU2501	150 A	Preheating



V1138281

Fuse for radio

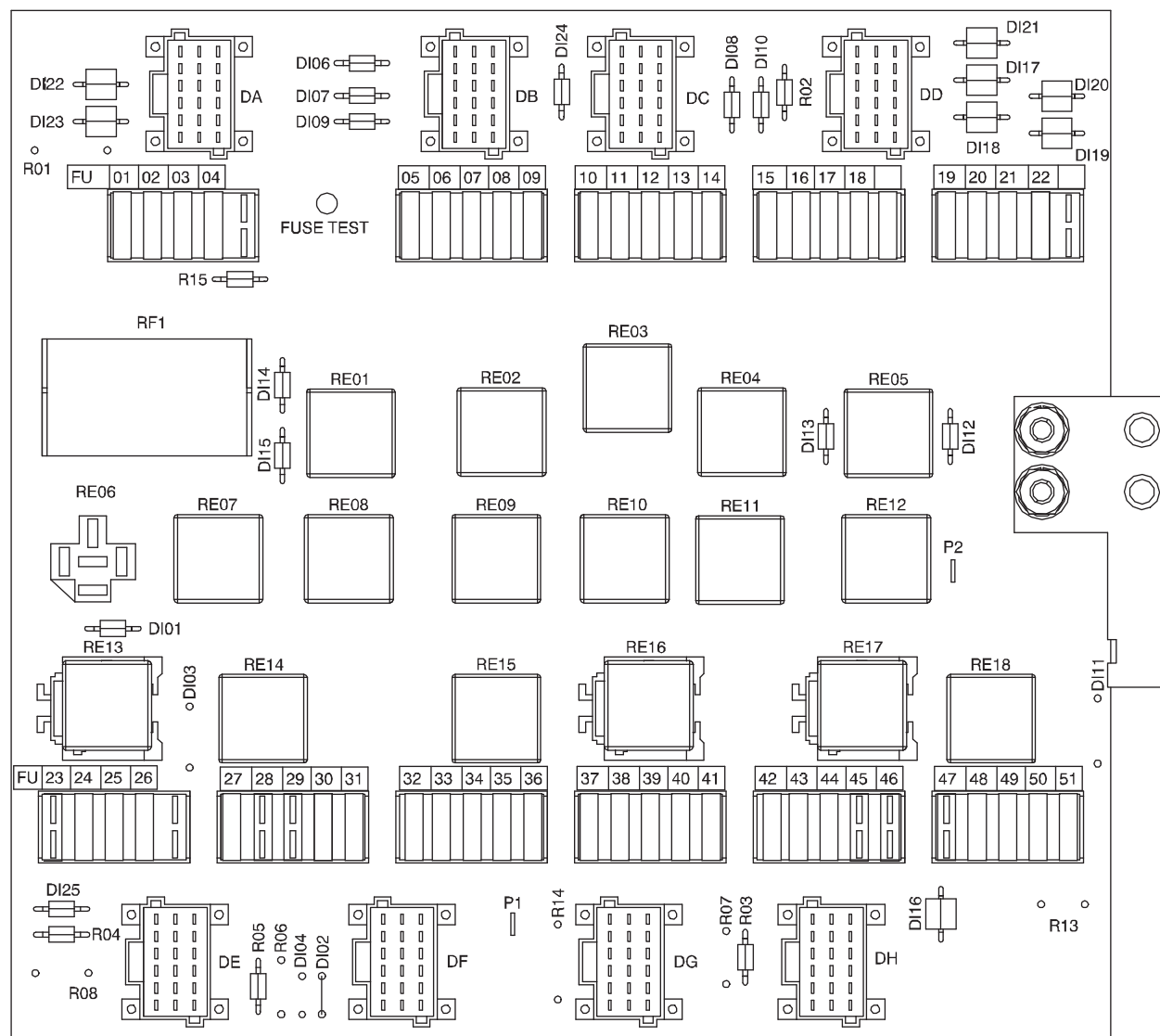
The radio must be removed first, in order to access the fuse (10 A) for the radio. Use the two handles found in the glove compartment and insert them into the intended holes on the radio. When a clicking sound is heard the radio can be pulled out of its position with the handles. The fuse is located on the back of the radio.

Fuse for subwoofer

The fuse for the subwoofer is located under the seat on the back of the subwoofer.

Relays

Relays on circuit board:

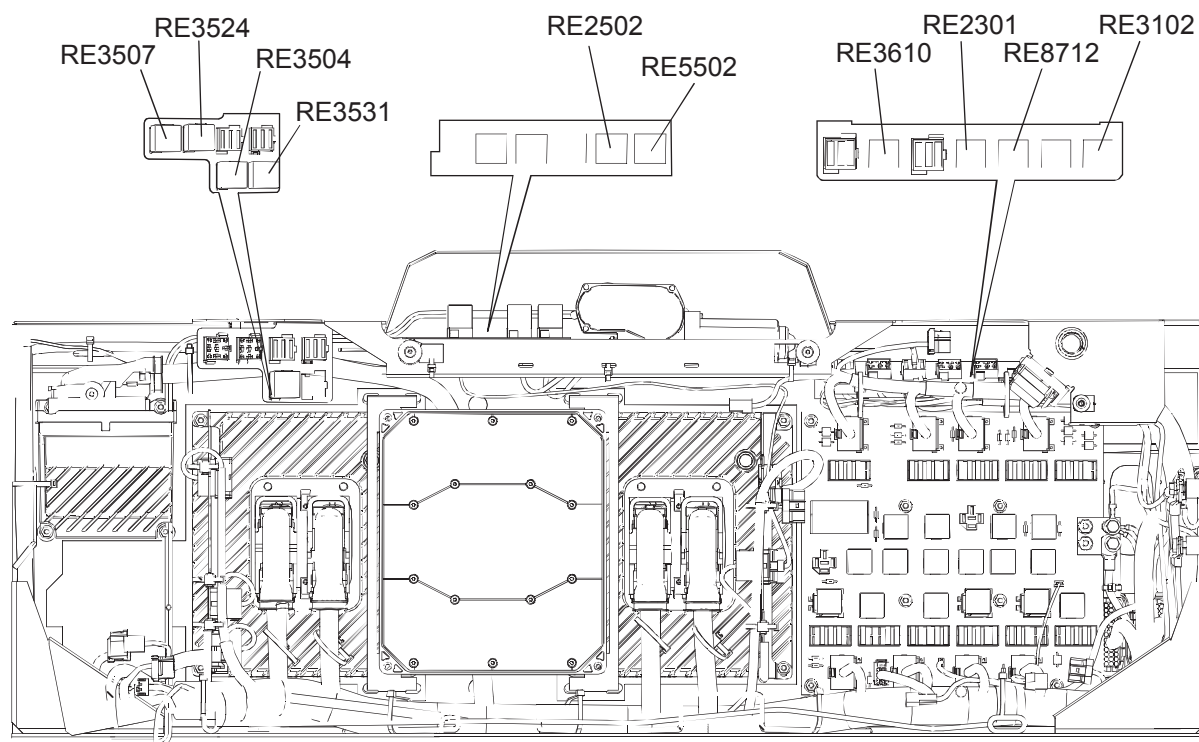


V1182601

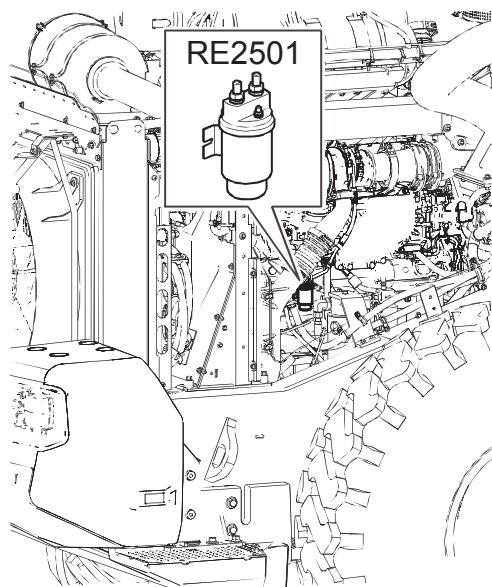
Designation	Description
RE01	–
RE02	Back-up light Back-up warning Back-up work light, rear
RE03	Work lights, front and work light, attachment
RE04	Work lights, cab rear
RE05	–
RE06	–
RE07	Work lights, cab front
RE08	Boom Suspension System (BSS) Single acting lift
RE09	Windshield wiper, rear
RE10	Brake lights
RE11	Work lights, rear
RE12	Delayed shutdown

RE13	Voltage feed to ECUs Gear selector steering column Pre-magnetisation alternator RE2502 (Engine and aftertreatment)
RE14	Voltage feed to CCM AC compressor Cab fan Pause heater
RE15	Windshield wiper, front
RE16	Ignition dependent voltage feed (15A-feed)
RE17	Ignition dependent voltage feed (15B-feed)
RE18	Ignition dependent voltage feed (15EA-feed)
RF1	Flasher relay

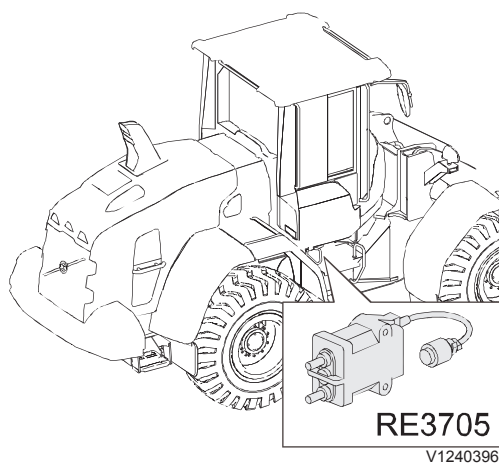
Other relays:



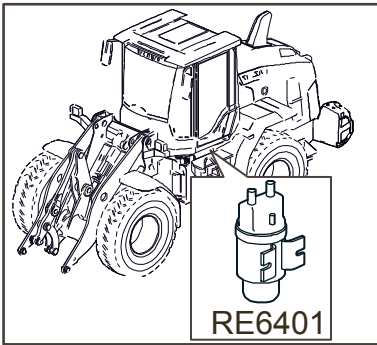
V1239093



V1239094



V1240396



V1239095

Designation	Description
RE2301	Electrically heated fuel filter
RE2501	Preheating
RE2502	Engine and aftertreatment
RE3102	Ignition operated battery disconnect
RE3504	Interior light
RE3507	Extended work lights
RE3524	Entrance light
RE3531	Seat belt indicator light
RE3610	Power supply 15
RE3705	Battery disconnect
RE5502	Parking brake
RE6401	Secondary steering
RE8712	Pause heater

Transmission

L60H

Hydraulic transmission			
Make		Volvo	
Type		Full power shift transmission	
Designation		Standard: HTE125x Lock up: HTL125x	
Torque converter		Single stage	
Torque multiplication		2,50:1 (no lock-up) 2,59:1 (lock-up)	
Number of gears		4 forward, 4 reverse	
Gearshifting system		Electro-hydraulic with APS (Automatic Power Shift)	
		No lock-up	Lock-up
Values Max. speed (tires 20,5R25L3)	1st	7 km/h (4.3 mph)	7 km/h (4.3 mph)
	2nd	14 km/h (8.7 mph)	14 km/h (8.7 mph)
	3rd	27 km/h (16.8 mph)	28 km/h (17.4 mph)
	4th	44 km/h (27.3 mph) (limited by ECU)	48 km/h (29.8 mph) (limited by ECU)

L70H

Hydraulic transmission			
Make		Volvo	
Type		Full power shift transmission	
Designation		Standard: HTE125x Lock up: HTL125x	
Torque converter		Single stage	
Torque multiplication		2,50:1 (no lock-up) 2,59:1 (lock-up)	
Number of gears		4 forward, 4 reverse	
Gearshifting system		Electro-hydraulic with APS (Automatic Power Shift)	
		No lock-up	Lock-up
Values Max. speed (tires 20,5R25L3)	1st	7 km/h (4.3 mph)	7 km/h (4.3 mph)
	2nd	14 km/h (8.7 mph)	14 km/h (8.7 mph)
	3rd	27 km/h (16.8 mph)	28 km/h (17.4 mph)
	4th	44 km/h (27.3 mph) (limited by ECU)	48 km/h (29.8 mph) (limited by ECU)

L90H

Hydraulic transmission			
Make		Volvo	
Type		Full power shift transmission	
Designation		Standard: HTE125x Lock up: HTL125x	
Torque converter		Single stage	
Torque multiplication		2,50:1 (no lock-up) 2,59:1 (lock-up)	
Number of gears		4 forward, 4 reverse	

Gearshifting system		Electro-hydraulic with APS (Automatic Power Shift)	
		No lock-up	Lock-up
Values Max. speed (tires 20,5R25L3)	1st	6.0 km/h (3.7 mph)	6 km/h (3.7 mph)
	2nd	13 km/h (8.0 mph)	13 km/h (8.0 mph)
	3rd	25 km/h (15.5 mph)	26 km/h (16.2 mph)
	4th	44 km/h (27.3 mph) (limited by ECU)	48 km/h (29.8 mph) (limited by ECU)

Axles

L60H

Type	Fully floating drive shafts with planetary gear hub reductions
Front axle, make	Volvo
Designation	AWB 15
Rear axle, make	Volvo
Designation	AWB 15
Differential lock	On front axle
Operation, differential lock	Electro-hydraulic

L70H

Type	Fully floating drive shafts with planetary gear hub reductions
Front axle, make	Volvo
Designation	AWB 25
Rear axle, make	Volvo
Designation	AWB 20
Differential lock	On front axle
Operation, differential lock	Electro-hydraulic

L90H

Type	Fully floating drive shafts with planetary gear hub reductions
Front axle, make	Volvo
Designation	AWB 25
Rear axle, make	Volvo
Designation	AWB 20, AWB 25
Differential lock	On front axle
Operation, differential lock	Electro-hydraulic

Brake

Brake system

L60H

Service brakes	
Service brakes, type	Dual circuit, all-hydraulic, wet disc brake
Number of discs per wheel front/rear	1/1
Accumulator volume	3 x 0.5 litre (0.13 gal)
Service brakes, disc thickness, new	9.5 mm (0.37 in)
Service brakes, disc thickness, minimum	7.2 mm (0.28 in)

Parking brake	
Type	Electrically operated hydraulic disc brake
Parking brake, disc thickness, new	12.4–13.0 mm (0.40– 0.51 in)
Parking brake, disc thickness, minimum	10 mm (0.39 in)

L70H

Service brakes		
Service brakes, type	Dual circuit, all-hydraulic, wet disc brake	
Number of discs per wheel front/rear	1/1	
Accumulator volume	2 x 0.5 litre (0.13 gal) + 1 x 1.0 litre (0.26 gal)	
	Front axle	Rear axle
Service brakes, disc thickness, new	10.5 mm (0.41 in)	9.5 mm (0.37 in)
Service brakes, disc thickness, minimum	8.2 mm (0.32 in)	7.2 mm (0.28 in)

Parking brake	
Type	Electrically operated hydraulic disc brake
Parking brake, disc thickness, new	12.4–13.0 mm (0.40– 0.51 in)
Parking brake, disc thickness, minimum	10 mm (0.39 in)

L90H

Service brakes		
Service brakes, type	Dual circuit, all-hydraulic, wet disc brake	
Number of discs per wheel front/rear	1/1	
Accumulator volume	2 x 0.5 litre (0.13 gal) + 1 x 1.0 litre (0.26 gal)	
	Front axle	Rear axle
Service brakes, disc thickness, new	10.5 mm (0.41 in)	9.5 mm (0.37 in)
Service brakes, disc thickness, minimum	8.2 mm (0.32 in)	7.2 mm (0.28 in)

Parking brake	
Type	Electrically operated hydraulic disc brake
Parking brake, disc thickness, new	12.4–13.0 mm (0.40– 0.51 in)
Parking brake, disc thickness, minimum	10 mm (0.39 in)

Steering

Steering system

L60H

Type	Load-sensing, hydrostatic
Number of steering wheel revolutions, total	4.0 revolutions
Steering angle	$\pm 40^\circ$
Steering pump	Common with the working hydraulics

L70H

Type	Load-sensing, hydrostatic
Number of steering wheel revolutions, total	4.0 revolutions
Steering angle	$\pm 40^\circ$
Steering pump	Common with the working hydraulics

L90H

Type	Load-sensing, hydrostatic
Number of steering wheel revolutions, total	4.0 revolutions
Steering angle	$\pm 40^\circ$
Steering pump	Common with the working hydraulics

Wheels

Tyre sizes and pressures

The following tables include approved tyre dimensions for the machine. If other tyre dimensions than those are deemed to be necessary, then those tyres need to be specified and approved in writing by the manufacturer. Tyre pressure table should be seen as a recommendation for normal bucket use. For other application contact your local tyre supplier for recommendations. Higher pressure will increase machine stability. Lower pressure will increase traction and comfort. Instructions for checking air pressure, see page 249.

NOTE!

Avoid mixing tyres of different circumferences and with different type designations on the same axle. This may result in unnecessary wear of the drivetrain and also change the machine's characteristics. For more information refer to SB 770 WLO 3 or contact an authorized dealer.

NOTE!

Operating on-road at high speeds normally requires a higher air pressure in the tyres to reduce heat build-up in the tyres as well as to reduce the fuel consumption.

NOTE!

During transports where the machine is tied down (lashed) the air pressure in the tyres should be between 350 and 450 kPa (51 and 65 psi). Do not exceed the maximum inflation pressure stated by the tyre manufacturer.

- Air pressure recommendations are based on the work load (rated load) for each handling case.
- In case of heavier loads, especially during log handling or load/carry operations, higher air pressure is required in the tyres. Contact the tyre manufacturer's dealer for information about which air pressure is correct for the load that is to be handled and for the transport distance in question.
- If L4 or L5 tyres are used for load/carry operations, then the transport distances must be considered. Radial tyres are preferred for load/carry operations since there is less heat build-up in this type of tyre.

L60H				
Tyre	Tyre pressure			
	Front		Rear	
	kPa	psi	kPa	psi
20,5R25	325	47	200	29
17,5R25	450	65	300	44
600/65R25	300	44	200	29
620/70 R26 ^(a)	220	32	160	23
620/75 R26 ^(a)	220	32	160	23
750/65 R26 ^(a)	160	23	120	17

a) For agriculture applications only

L70H				
Tyre	Tyre pressure			
	Front		Rear	
	kPa	psi	kPa	psi
20,5R25	350	51	200	29
600/65R25	325	47	200	29
620/70 R26 (a)	270	39	200	29
620/75 R26 (a)	270	39	200	29
750/65 R26 (a)	200	29	150	22

a) For agriculture applications only

L90H				
Tyre	Tyre pressure			
	Front		Rear	
	kPa	psi	kPa	psi
20,5R25	400	58	275	40
650/65R25	350	51	250	36
620/70 R26 (a)	280	40	230	33
620/75 R26 (a)	310	45	230	33
750/65 R26 (a)	220	32	160	23

a) For agriculture applications only

Wheel nuts, tightening torque

Wheel nuts, tightening torque	600 ±50 Nm (443 ±37 lbf ft)
-------------------------------	-----------------------------

Cab

General

The cab is mounted on rubber pads, is insulated, and has a flat floor with rubber mat.

Tested and approved as protective cab and meets standards according to ISO 3471: 2008 (ROPS), ISO 3449: 2008 (FOPS level II) as well as ISO 6055-1997 (protective roof for high-lift rider trucks).

Max tested mass: 19500 kg (42990 lbs)

The cab is equipped with Personal Protective Equipment (PPE) attachment points fulfilling ISO 14567:1999 (Personal protective equipment for protection against falls from a height) as well as WorkSafeBC OHS Regulation Part 11.

The attachment points (2 pcs.) are on both front corners of the cab next to the mirrors.

Cab interior fittings and upholstery

Fire retardant (fire resistant) measured according to ISO 3795-1989

Number of emergency exits

2 (door and right side window)

Heating and ventilation

The basic version of the loader is provided with a heating and ventilation system with defrosting for all windows and the best possible air distribution (10 air vents). Air conditioning is available as optional extra.

Operator's seat

This machine is equipped with an operator's seat that meets the vibration-damping criteria for EN ISO 7096.

Air-suspended seat (Heavy-duty, premium/comfort-seat) (optional equipment)

Height adjustment	70 mm (3 in)
Fore-aft adjustment	180 mm (7 in)
Adjustment of backrest, (adjustable backrest angle) F/R	12/40°
Weight	150 kg (330 lb)
Upholstery	Fire-resistant
Seatbelt with roller	Yes

Air-suspended seat (Heavy-duty) (optional equipment)

Height adjustment	60 mm (2 in)
Fore-aft adjustment	160 mm (6 in)
Adjustment of backrest, (adjustable backrest angle) F/R	66/72°
Weight	125 kg (275 lb)
Upholstery	Fire-resistant
Seatbelt with roller	Yes

Air-suspended seat (High backrest)

Height adjustment	100 mm (4 in)
Fore-aft adjustment	205mm (8 in)
Adjustment of backrest, (adjustable backrest angle) F/R	12/28°
Weight	130 kg (286 lb)
Upholstery	Fire-resistant
Seatbelt with roller	Yes

Air-suspended seat		
Height adjustment		60 mm (2 in)
Fore-aft adjustment		160 mm (6 in)
Adjustment of backrest, (adjustable backrest angle) F/R		66/72°
Weight		125 kg (275 lb)
Upholstery		Fire-resistant
Seatbelt with roller		Yes

Mechanical Seat		
Height adjustment		95 mm (4 in)
Fore-aft adjustment		180 mm (7 in)
Adjustment of backrest, (adjustable backrest angle) F/R		12/28°
Weight		130 kg (286 lb)
Upholstery		Fire-resistant
Seatbelt with roller		Yes

Refrigerant

Type	Quantity	GWP ^(a)
R134a	1,5 kg (3.31 lb)	2145 CO ₂ -eq

a) Global warming potential (GWP) is a measure of how much heat a gas traps in the atmosphere relative to that of carbon dioxide (CO₂). GWP is calculated in terms of the 100-year warming potential of 1 kg of a greenhouse gas relative to 1 kg of CO₂.

Noise and vibrations

Noise and vibrations

Hand-arm vibrations

Emission of hand-arm vibrations during real operating conditions at its intended use is less than 2.5 m/s² RMS (root mean square) acceleration according to ISO 8041.

Whole-body vibrations

Emission of whole-body vibrations generated during real operating conditions when the machine is used as intended is according to the table below.

Typical operating conditions	Vibration emissions, value $a_{w,eqx}$ (m/s ² RMS)	Vibration emissions, value $a_{w,eqy}$ (m/s ² RMS)	Vibration emissions, value $a_{w,eqz}$ (m/s ² RMS)
Load-and-carry handling	0.6	0.6	0.5
Mining application	0,8	0.7	0,8
Transport operation	0.5	0.7	0.5
V-shaped load-and-carry handling	0.7	0.6	0.5

The following vibration directions are defined:

x = longitudinal

y = lateral

z = vertical

NOTE!

These whole-body vibration emission values were determined at particular operating and ground conditions and are therefore not representative for all the various conditions according to the intended use of the machine and should not alone be used to determine the whole-body vibration exposure to the operator using the machine. For this purpose the information in ISO/TR 25398 is recommended.

To ensure that the generated whole-body vibration emissions during machine use is kept to a minimum, see page 193.

Sound information

Measured average sound pressure level (L_{pA}) at operator's station (Measured value with standard deviation <2 dB(A), according to ISO 6396)	67 dB (A)
Measured average exterior sound power level (L_{WA}) emitted from the machine with standard deviation <1 dB(A).	103 dB(A)
Limit exterior sound power level (L_{WA}) for the machine. (Measured according to ISO 6395. Sound certified according to Noise Body document GN No. 07–003.)	105 dB(A)

Hydraulic system

Type	Load-sensing, (closed centre)
Hydraulic oil pump, type	Axial piston pump, variable displacement
Pump 1	
Does not apply to this machine type	
Pump 2	
Function	Working hydraulics, steering system, brake system and servo system
Pump 3	
Function	Cooling fan motor and brake system

Function times, specifications

Applies to models: L60H

All times applies to a warmed-up machine to operating temperature.

End-position damping must be turned off, this is done with Tech Tool parameter P1KJN set to 0.

Valid for standard boom, long boom, and super long boom	
Lifting (+): - SAE loaded standard bucket with approx. 3200 kg (7040 lbs). - From: Fully tilted-in bucket at ground level. - To: Mechanical stop for the lifting cylinders at the top position. - Engine running at high idle.	4.8-5.8 s
Lifting (+): - Empty standard bucket. - From: Bucket flat on the ground. - To: Mechanical stop for the lifting cylinders at the top position. - Engine running at high idle.	4.5-5.5 s
Lowering (-): - Empty standard bucket. - From: Mechanical stop for the lifting cylinders at the top position. - To: Bucket flat on the ground. - Engine running at low idle.	2.4-3.0 s
Tilt in (+): - Empty standard bucket. - From: Fully tilted-out bucket, boom parallel with the ground. - To: Fully tilted-in bucket (full cylinder stroke). - Engine running at high idle.	2.5-3.0 s
Tilt out (-): - Empty standard bucket. - From: Fully tilted-in bucket, boom parallel with the ground. - To: Fully tilted-out bucket (full cylinder stroke). - Engine running at high idle.	1.8-2.2 s

Function times, specifications

Applies to models: L70H

All times applies to a warmed-up machine to operating temperature.

End-position damping must be turned off, this is done with Tech Tool parameter P1KJN set to 0.

Valid for standard boom, long boom, and super long boom	
Lifting (+): - SAE loaded standard bucket with approx. 3700 kg (8140 lbs). - From: Fully tilted-in bucket at ground level. - To: Mechanical stop for the lifting cylinders at the top position. - Engine running at high idle.	4.8-5.8 s
Lifting (+): - Empty standard bucket. - From: Bucket flat on the ground. - To: Mechanical stop for the lifting cylinders at the top position. - Engine running at high idle.	4.5-5.5 s
Lowering (-): - Empty standard bucket. - From: Mechanical stop for the lifting cylinders at the top position. - To: Bucket flat on the ground. - Engine running at low idle.	2.3-2.8 s
Tilt in (+): - Empty standard bucket. - From: Fully tilted-out bucket, boom parallel with the ground. - To: Fully tilted-in bucket (full cylinder stroke). - Engine running at high idle.	3.3-4.0 s
Tilt out (-): - Empty standard bucket. - From: Fully tilted-in bucket, boom parallel with the ground. - To: Fully tilted-out bucket (full cylinder stroke). - Engine running at high idle.	1.9-2.3 s

Function times, specifications

Applies to models: L90H

All times applies to a warmed-up machine to operating temperature.

End-position damping must be turned off, this is done with Tech Tool parameter P1KJN set to 0.

Valid for standard boom, long boom, and super long boom	
Lifting (+): - SAE loaded standard bucket with approx. 4500 kg (9900 lbs). - From: Fully tilted-in bucket at ground level. - To: Mechanical stop for the lifting cylinders at the top position. - Engine running at high idle.	4.8-5.8 s
Lifting (+): - Empty standard bucket. - From: Bucket flat on the ground. - To: Mechanical stop for the lifting cylinders at the top position. - Engine running at high idle.	4.5-5.5 s
Lowering (-): - Empty standard bucket. - From: Mechanical stop for the lifting cylinders at the top position. - To: Bucket flat on the ground. - Engine running at low idle.	2.5-3.1 s
Tilt in (+): - Empty standard bucket. - From: Fully tilted-out bucket, boom parallel with the ground. - To: Fully tilted-in bucket (full cylinder stroke). - Engine running at high idle.	3.0-3.7 s
Tilt out (-): - Empty standard bucket. - From: Fully tilted-in bucket, boom parallel with the ground. - To: Fully tilted-out bucket (full cylinder stroke). - Engine running at high idle.	2.5-3.1 s

Machine weights

L60H

Operating weight The operating weight is the machine's most common configuration + 10%. The machine's most common configuration includes: - Bucket (pin-on) 2.1 m³ (2.7 yd³) - Tires 20.5 R25 L3 - Standard boom - Operator and all fluids	13600 kg (29983 lb)
Max. machine weight Max. machine weight (incl. equipment and attachment) ⁽¹⁾	16400 kg (36156 lb)

L70H

Operating weight The operating weight is the machine's most common configuration + 10%. The machine's most common configuration includes: - Bucket (pin-on) 2.3 m³ (3.0 yd³) - Tires 20.5 R25 L3 - Standard boom - Operator and all fluids	15500 kg (34172 lb)
Max. machine weight Max. machine weight (incl. equipment and attachment) ⁽¹⁾	18500 kg (40785 lb)

L90H

Operating weight The operating weight is the machine's most common configuration + 10%. The machine's most common configuration includes: - Bucket (pin-on) 2.7 m³ (3.5 yd³) - Tires 20.5 R25 L3 - Standard boom - Operator and all fluids	17300 kg (38140 lb)
Max. machine weight Max. machine weight (incl. equipment and attachment) ⁽¹⁾	19000 kg (41888 lb)

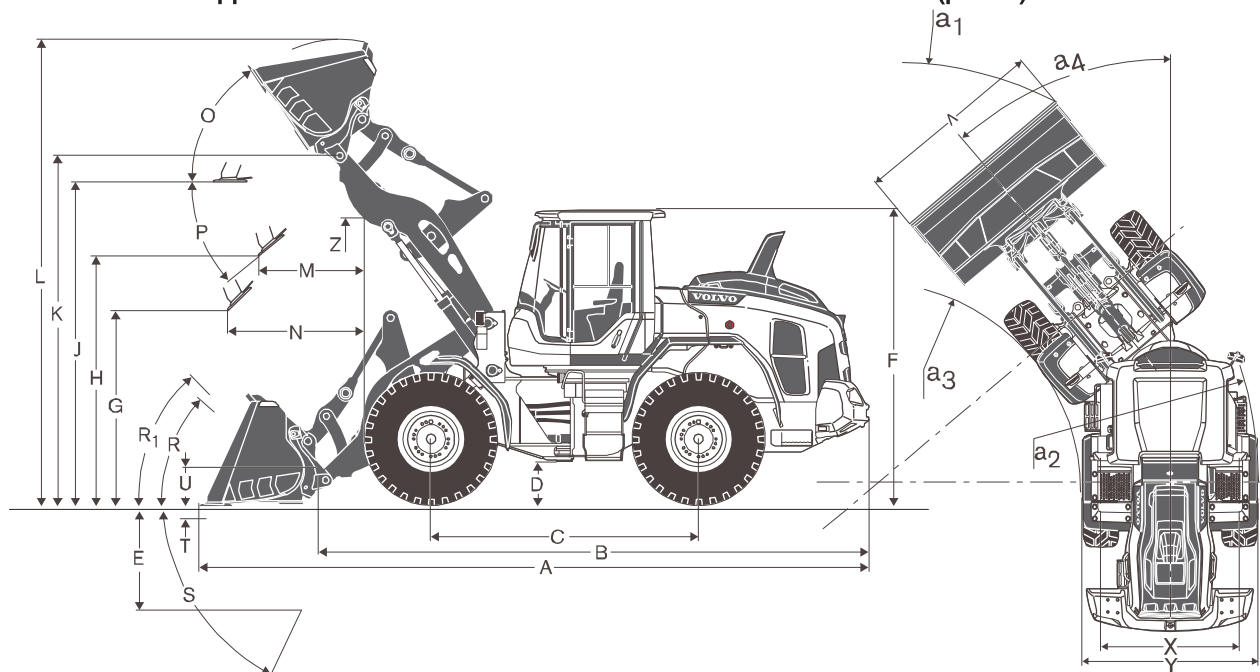
1. The machine is designed for a maximum machine weight acc. to the table. The max. weight applies when the machine is equipped for certain applications approved by Volvo. Safety will be jeopardized if the max. weight is exceeded. In addition, no manufacturer warranties are valid. However, always pay attention to national regulations for travelling on public roads.

Dimensions

L60H

Specifications and dimensions comply in applicable parts with ISO 7131:1997, SAE J732 JUN92, ISO 7546: 1983, SAE J742 FEB85, SAE J818 MAY87, ISO 14397:2002 Part 1 & 2.

The information applies to a machine with tires 20.5R25 L3 and 3.5 m³ bucket (pin-on).



V1196768

Standard boom		Standard boom		Long boom	
A	(a)	P ^(b)	45°	B	6552 mm (258 in)
B	6038 mm (238 in)	R	43°	J	4150 mm (163 in)
C	3000 mm (118 in)	R ₁ ^(c)	47°	K	4380 mm (172 in)
D	439 mm (17 in)	S	78°	O	58°
E	(a)	T	110 mm (4.3 in)	P _{ma} x	44°
F	3270 mm (129 in)	U	399 mm (16 in)	R	41°
G	2133 mm (84 in)	V	(a)	S	78°
H	(a)	X ^(d)	1904 mm (75 in)	T	79 mm (3 in)
J	3563 mm (140 in)	Y ^(d)	2433 mm (96 in)	U	537 mm (21 in)
K	3862 mm (152 in)	Z	3204 mm (126 in)	Z	3594 mm (141 in)
L	(a)	a2	5338 mm (210 in)		
M	(a)	a3	2905 mm (114 in)		
N	(a)	a4	±40°		
O	57°				

a) See table on page 332

b) P-max.

c) Carry position SAE

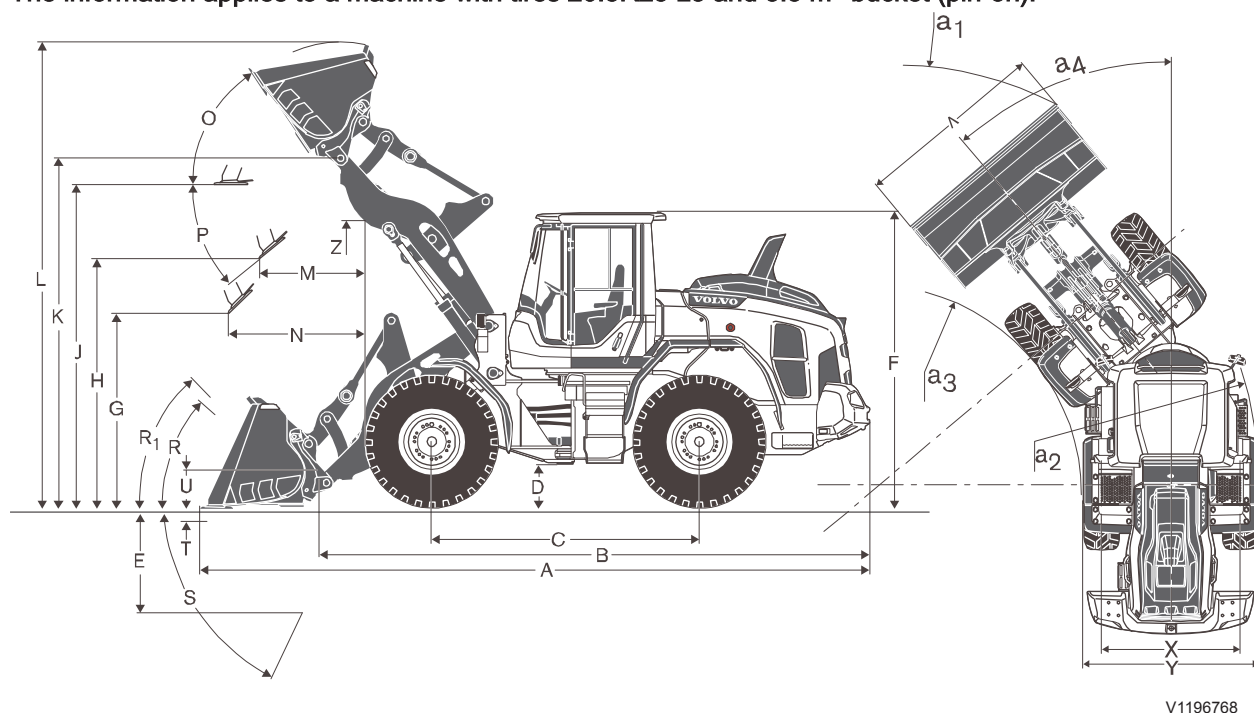
d) Dimensions vary depending on tire equipment

The difference between standard boom and long boom is shown here with the same size bucket.
Note that the version with long boom is intended to be used in materials with a lower density.

L70H

Specifications and dimensions comply in applicable parts with ISO 7131:1997, SAE J732 JUN92, ISO 7546: 1983, SAE J742 FEB85, SAE J818 MAY87, ISO 14397:2002 Part 1 & 2.

The information applies to a machine with tires 20.5R25 L3 and 3.5 m³ bucket (pin-on).



V1196768

Standard boom		Standard boom		Long boom	
A	(a)	P ^(b)	46°	B	6557 mm (258 in)
B	6077 mm (239 in)	R	43°	J	4105 mm (162 in)
C	3000 mm (118 in)	R ₁ ^(c)	45°	K	4390 mm (173 in)
D	448 mm (18 in)	S	69°	R	43°
E	(a)	T	106 mm (4 in)	S	73°
F	3280 mm (129 in)	U	381 mm (15 in)	T	107 mm (4 in)
G	2134 mm (84 in)	V	(a)	U	498 (20 in)
H	(a)	χ ^(d)	1934 mm (76 in)	Z	3495 mm (138 in)
J	3580 mm (141 in)	γ ^(d)	2463 mm (97 in)		
K	3872 mm (152 in)	Z	3162 mm (124 in)		
L	(a)	a2	5353 mm (211 in)		
M	(a)	a3	2890 mm (114 in)		
N	(a)	a4	±40°		
O	58°				

a) See table on page 332

b) P-max.

c) Carry position SAE

d) Dimensions vary depending on tire equipment

The difference between standard boom and long boom is shown here with the same size bucket.

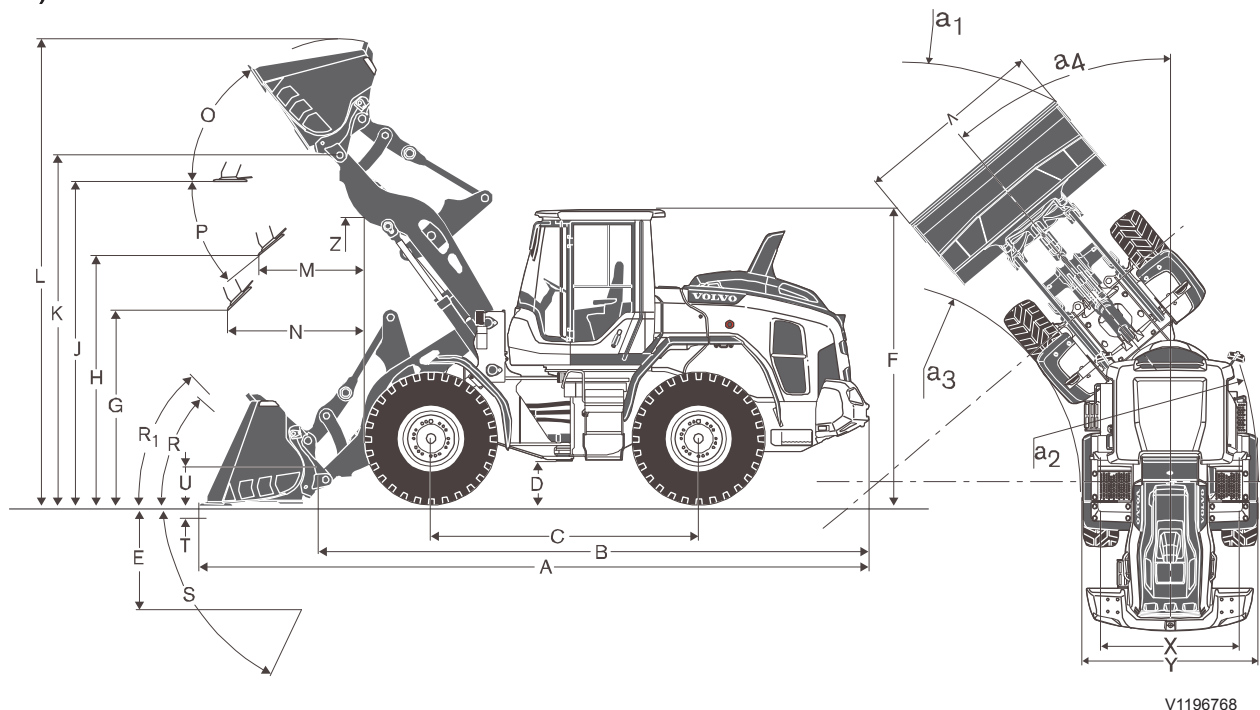
Note that the version with long boom is intended to be used in materials with a lower density.

L90H

Specifications and dimensions comply in applicable parts with ISO 7131:1997, SAE J732 JUN92, ISO 7546: 1983, SAE J742 FEB85, SAE J818 MAY87, ISO 14397:2002 Part 1 & 2.

The information regarding Standard Boom and Long Boom applies to a machine with tires 20.5R25 L3 and 3.5 m³ bucket (pin-on).

The information regarding Super Long Boom applies to a machine with tires 20.5R25 L3 and 2.5 m³ bucket (pin-on).



V1196768

Standard boom		Standard boom		Long boom	
A	(a)	P ^(b)	45°	B	6593 mm (260 in)
B	6164 mm (243 in)	R	44°	J	4085 mm (161 in)
C	3050 mm (120 in)	R ₁ ^(c)	47°	K	4390 mm (173 in)
D	447 mm (18 in)	S	67°	R	46.1°
E	(a)	T	111 mm (4 in)	S	65.7°
F	3279 mm (129 in)	U	410 mm (16 in)	T	108 mm (4 in)
G	2132 mm (84 in)	V	(a)	U	503 mm (20 in)
H	(a)	X ^(d)	1960 mm (77 in)	Z	3652 mm (144 in)
J	3654 mm (144 in)	Y ^(d)	2489 mm (98 in)		
K	3966 mm (156 in)	Z	3283 mm (129 in)		
L	(a)	a2	5434 mm (214 in)		
M	(a)	a3	2945 mm (116 in)		
N	(a)	a4	±40°		
O	56°				

a) See table on page 332

b) P-max.

c) Carry position SAE

d) Dimensions vary depending on tire equipment

The difference between standard boom and long boom is shown here with the same size bucket. Note that the version with long boom is intended to be used in materials with a lower density.

Super Long Boom					
A	8544 mm (336 in)	L	6243 mm (246 in)	V	2750 mm (108 in)
B	7191 mm (283 in)	M	1000 mm (39 in)	X	1960 mm (77 in)
C	3050 mm (120 in)	N	2561 mm (101 in)	Y	2489 mm (98 in)
D	441 mm (17 in)	O	61.6°	Z	3648 mm (144 in)
E	1139 mm (45 in)	P	43.8°	a1	13093 mm (515 in)
F	3272 mm (129 in)	R	50.0°	a2	5434 mm (214 in)
G	2132 mm (84 in)	R1	58.2°	a3	2945 mm (116 in)
H	3911 mm (154 in)	S	59.8°	a4	40.0°
J	4678 mm (184 in)	T	181 mm (7 in)		
K	4986 mm (196 in)	U	713 mm (28 in)		

Machine capacities

Calculated with additional protective guarding.

L60H

Machine's max. weight, see page 327. Current machine weight depends on your equipment, see table (last row).
Respect the maximum allowed load of attachment or the maximum allowed load of machine.

BR 20,5R25 VJT L3		GENERAL PURPOSE						GRADING	LIGHT MATERIAL		Long Boom
		1.8 m ³ STE H T	1.9 m ³ STE H BOE	2.1 m ³ STE P BOE	2.1 m ³ STE H BOE	2.3 m ³ STE P BOE	2.3 m ³ STE H BOE	1.7 m ³ GRB H BOE	3.1 m ³ LM H	5 m ³ LM H	
Volume, heaped ISO/SAE	m3	1,8	1,9	2,1	2,1	2,3	2,3	1,7	3,1	5	0
Volume at 110% fill factor	m3	2	2,1	2,3	2,3	2,5	2,5	1,9	3,4	5,5	0
Static tipping load, straight	kg	9020	8860	9270	8760	9190	8650	7750	8460	8470	-1820
at 35° turn	kg	8080	7930	8320	7830	8240	7730	6930	7550	7520	-1680
at full turn	kg	7800	7650	8040	7560	7960	7460	6690	7280	7250	-1640
Breakout force	kN	84,9	80,2	82,9	76,1	79	72,8	60,2	61,7	53,8	8
A	mm	7410	7340	7300	7400	7370	7470	7650	7680	7910	520
E	mm	1190	1140	1110	1200	1160	1260	1400	1480	1700	50
H	mm	2750	2800	2820	2760	2780	2720	2510	2580	2430	550
L	mm	5110	5110	5120	5170	5190	5240	4530	5280	5480	510
M	mm	1070	1050	1020	1090	1060	1140	1130	1320	1500	20
N	mm	1580	1590	1570	1610	1590	1630	1490	1630	1670	450
V	mm	2500	2500	2500	2500	2500	2500	2500	2550	2650	0
a1 clearance circle	mm	11800	11760	11760	11800	11800	11840	12140	12010	12240	480
Operating weight	kg	12260	12320	12120	12360	12160	12400	12260	12450	12740	230

L70H

Machine's max. weight, see page 327. Current machine weight depends on your equipment, see table (last row).
Respect the maximum allowed load of attachment or the maximum allowed load of machine.

BR 20,5R25 VJT L3		GENERAL PURPOSE						GRADING	LIGHT MATERIAL		Long Boom
		2.1 m ³ STE H BOE	2.3 m ³ STE H T	2.3 m ³ STE P BOE	2.3 m ³ STE H BOE	2.4 m ³ STE P BOE	2.4 m ³ STE H BOE	2.2 m ³ GRB H BOE	3.4 m ³ LM H	6.4 m ³ LM H	
Volume, heaped ISO/SAE	m ³	2,1	2,3	2,3	2,3	2,4	2,4	2,2	3,4	6,4	0
Volume at 110% fill factor	m ³	2,3	2,5	2,5	2,5	2,6	2,6	2,4	3,7	7	0
Static tipping load, straight	kg	9750	9640	10280	9680	10240	9640	7930	9270	8840	-1870
at 35° turn	kg	8720	8620	9220	8650	9180	8610	7050	8260	7810	-1720
at full turn	kg	8420	8310	8910	8340	8870	8310	6790	7960	7500	-1670
Breakout force	kN	90,3	87	97,2	88,2	93,5	85,1	62,8	71,8	53,9	-1,7
A	mm	7480	7610	7400	7510	7450	7570	7960	7780	8330	470
E	mm	1180	1290	1100	1210	1150	1260	1670	1470	1970	30
H	mm	2760	2670	2810	2730	2780	2700	2350	2530	2150	480
L	mm	5220	5280	5190	5250	5250	5320	4720	5450	5780	470
M	mm	1140	1200	1070	1160	1110	1190	1350	1340	1730	-40
N	mm	1650	1660	1610	1660	1630	1670	1570	1680	1730	400
V	mm	2550	2550	2650	2650	2550	2550	2650	2650	2750	0
a1 clearance circle	mm	11850	11930	11910	11960	11850	11900	12480	12140	12600	430
Operating weight	kg	13960	14020	13750	14010	13770	14020	14260	14210	14750	260

L90H

Machine's max. weight, see page 327. Current machine weight depends on your equipment, see table (last row). Respect the maximum allowed load of attachment or the maximum allowed load of machine.

BR 20,5R25 VJT L3		GENERAL PURPOSE						GRADING	LIGHT MATERIAL	
		2.3 m ³ STE H BOE	2.5 m ³ STE H T	2.5 m ³ STE P BOE	2.5 m ³ STE H BOE	2.6 m ³ STE P BOE	2.8 m ³ STE P BOE	2.8 m ³ GRB H BOE	4.1 m ³ LM H	7 m ³ LM H
Volume, heaped ISO/SAE	m3	2,3	2,5	2,5	2,5	2,6	2,8	2,8	4,1	7
Volume at 110% fill factor	m3	2,5	2,8	2,8	2,8	2,9	3,1	3,1	4,5	7,7
Static tipping load, straight	kg	11410	11330	11940	11320	11820	11910	9260	10820	10530
at 35° turn	kg	10120	10030	10620	10030	10500	10580	8190	9550	9250
at full turn	kg	9730	9650	10220	9650	10110	10190	7870	9180	8870
Breakout force	kN	134,9	129,9	141,3	127,1	133,8	135,6	92,2	100,7	87
A	mm	7600	7850	7550	7690	7630	7610	8170	8050	8350
E	mm	1200	1410	1150	1280	1220	1200	1760	1600	1860
H	mm	2890	2730	2920	2830	2870	2880	2400	2610	2410
L	mm	5450	5510	5440	5530	5520	5500	4900	5630	5840
M	mm	1010	1170	960	1070	1020	1000	1210	1350	1560
N	mm	1670	1720	1650	1700	1670	1660	1520	1710	1710
V	mm	2650	2650	2650	2500	2500	2750	2880	2750	3000
a1 clearance circle	mm	12140	12290	12130	12060	12040	12250	12980	12500	12920
Operating weight	kg	15560	15630	15380	15600	15390	15360	15700	15850	16280

Long Boom and Super Long Boom (SLB is an optional equipment)

BR 20,5R25 VJT L3	Unit of measurement	Long Boom	Super Long Boom (optional equipment)
Static tipping load, straight	kg (lb)	-1800	-4228 (-9321)
at 35° turn	kg (lb)	-1650	-3860 (-8510)
at full turn	kg (lb)	-1600	-3752 (-8272)
Breakout force	kN	1.7	-10
A	mm (in)	410	1043 (41)
E	mm (in)	-10	20 (0.8)
H	mm (in)	430	961 (38)
L	mm (in)	420	945 (37)
M	mm (in)	-50	68 (2.7)
N	mm (in)	360	932 (37)
V	mm (in)	0	0
a1 clearance circle	mm (in)	340	915 (36)
at 35° turn	kg (lb)	290	508 (1120)

The difference between standard boom and long boom is shown here with the same size bucket.
Note that the version with long boom is intended to be used in materials with a lower density.

Combination table, interchangeable equipment

Combination table, interchangeable equipment

The table shows attachments of the category **"interchangeable equipment"** (attachments that can be changed by the operator) and for which machines these attachments are approved.

Attachment, type	Attachment, model	Model/ Type number	Page	Machine model	Historic authorization
Bucket with clamping arm	REF H TB CA 5.2 m ³ 3000 mm	83364	210	L90H	L90G
High-tipping light material bucket	HIT H BOE 7.0 m ³ 3000 mm ^{**})	82041	210	L90H	L90F/G
High-tipping light material bucket	HIT H BOE 4.5 m ³ 3000 mm, side-mounted cylinders	85441	210	L90H	–
High-tipping light material bucket	HIT H BOE 3.8 m ³ 2750 mm, side-mounted cylinders	85443	210	L90H	–
Pallet forks, sideshift version	Sideshift pallet forks 1500 mm FFPSS	83772	217	L60H, L70H, L90H	L60G, L70G, L90G
Pallet forks, sideshift version	Sideshift pallet forks 2000 mm FFPSS	83773	217	L60H, L70H, L90H	L60G, L70G, L90G
Pallet forks, combi forks	Combi forks 1.1 m ² COF	83774	217	L60H, L70H	L60G, L70G
Pallet forks, combi forks	Combi forks 1.6 m ² COF	83775	217	L90H	L90G
Log grapple, unloading	UNLGR H 1.8 m ² 1634 mm	80834	219	L90H	L90F/G
Log grapple, unloading	UNLGR H 2.4 m ² 1634 mm	80831	219	L90H	L90F/G
Log grapple, sorting	UNLGR H 1.3 m ² 1620 mm	82194	219	L60H	L60G
Log grapple, sorting	UNLGR H 1.5 m ² 1599 mm	80153	219	L70H	L70G
Log grapple, sorting	UNLGR H 1.8 m ² 1634 mm	80835	219	L90H	L90F/G
Log grapple, sorting	UNLGR H 2.4 m ² 1634 mm	80832	219	L90H	L90F/G
Log grapple, General Purpose	UNLGR H 0.7 m ² 1610 mm	82192	219	L60H	L60G
Log grapple, General Purpose	UNLGR H 0.9 m ² 1600 mm	82028	219	L70H	L70G
Log grapple, General Purpose	UNLGR H 1.3 m ² 1200 mm	82340	219	L90H	L90F/G
Log grapple, General Purpose	UNLGR H 1.3 m ² 1635 mm	82339	219	L90H	L90F/G

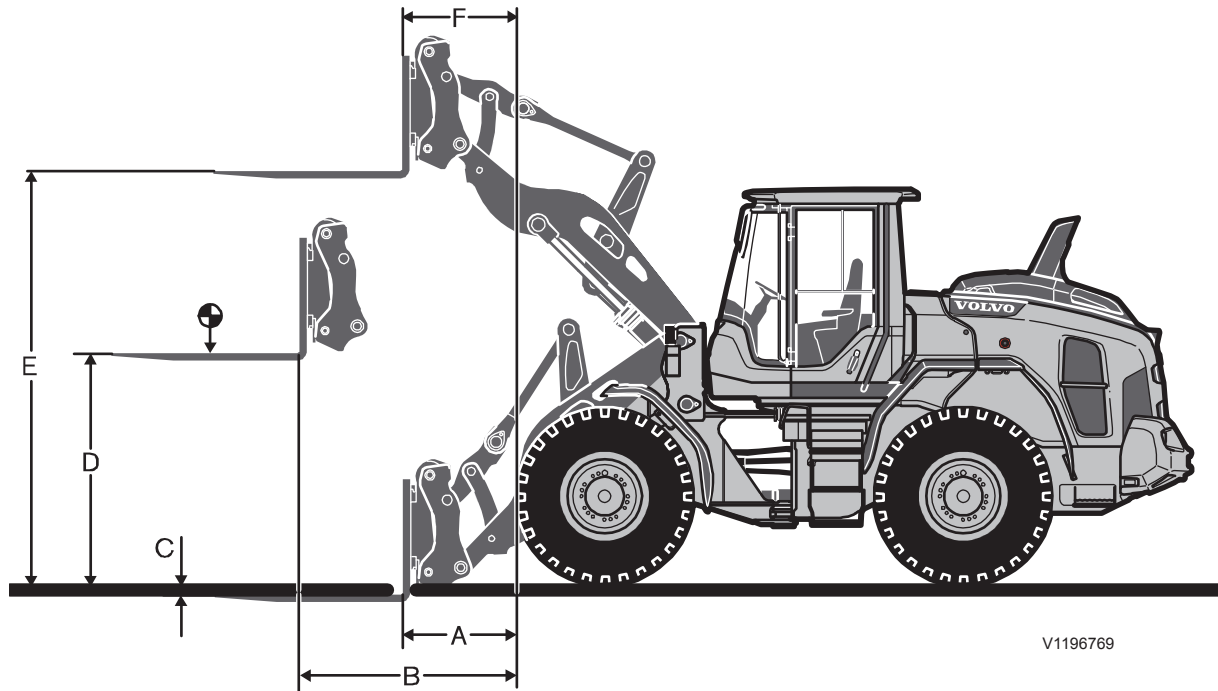
*) **"interchangeable equipment"** (attachments that can be changed by operator) means that the attachment **requires** the combination hydraulic attachment lock ("hook-on") and quick-couplings for optional hydraulics (3rd and 4th hydraulic function).

**) Requires installation of two optional highly placed, front-mounted mirrors (optional equipment).

Pallet forks

L60H

Pallet fork (with attachment bracket)	
Attachment	Hook-on
Order no.	83768
Tires	20.5R25 L3



V1196769

A	794 mm (31.3 in)	C	34 mm (1.3 in)	E	3640 mm (143.3 in)
B	1563 mm (61.5 in)	D	1759 mm (69.3 in)	F	697mm (27.4 in)

Load table for pallet forks

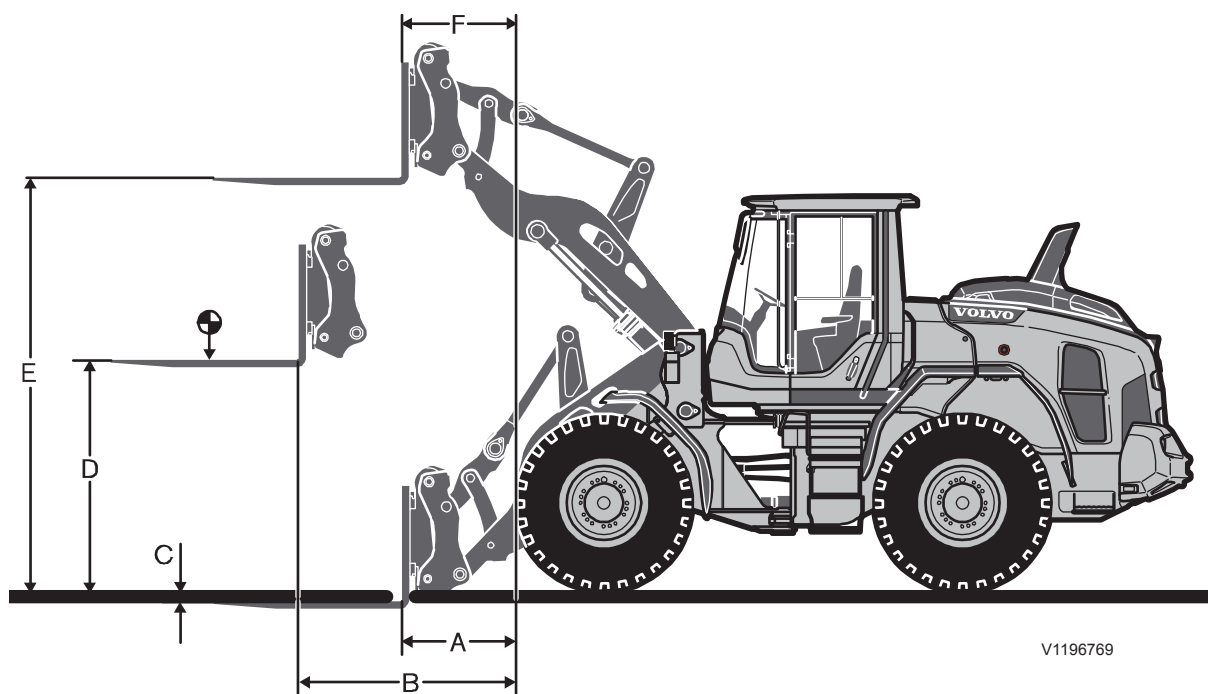
		Rated operating load capacity (rated work load) at different load centre distances					
Ground	Tires	500 mm (19.7 in)	600 mm (23.6 in)	700 mm (27.6 in)	800 mm (31.5 in)	900 mm (35.4 in)	1200 mm (47.2 in)
Rough terrain	20.5R25	3,540 kg (7,810 lb)	3,410 kg (7,540 lb)	3,300 kg (7,280 lb)	3,190 kg (7,050 lb)	3,090 kg (6,820 lb)	2,820 kg (6,230 lb)
Even and hard	20.5R25	4,720 kg (10,410 lb)	4,550 kg (10,050 lb)	4,400 kg (9,710 lb)	4,260 kg (9,400 lb)	4,120 kg (9,100 lb)	3,650 kg (8,040 lb)*

The maximum permitted load according to the table is reduced if the attachments are supplemented with optional equipment. For more information, contact your dealer who has access to the attachment catalogue.

*) Is limited by the attachment. (max. load per arm, 3,650 kg (8,040 lb) at 600 mm (23.6 in) TP-distance).

L70H

Pallet fork (with attachment bracket)	
Attachment	Hook-on
Order no.	83768
Tires	20.5R25 L3



A	837 mm (33.0 in)	C	17mm (0.7 in)	E	3668 mm (144.4 in)
B	1612 mm (63.5 in)	D	1791 mm (70.5 in)	F	763 mm (30.0 in)

Load table for pallet forks

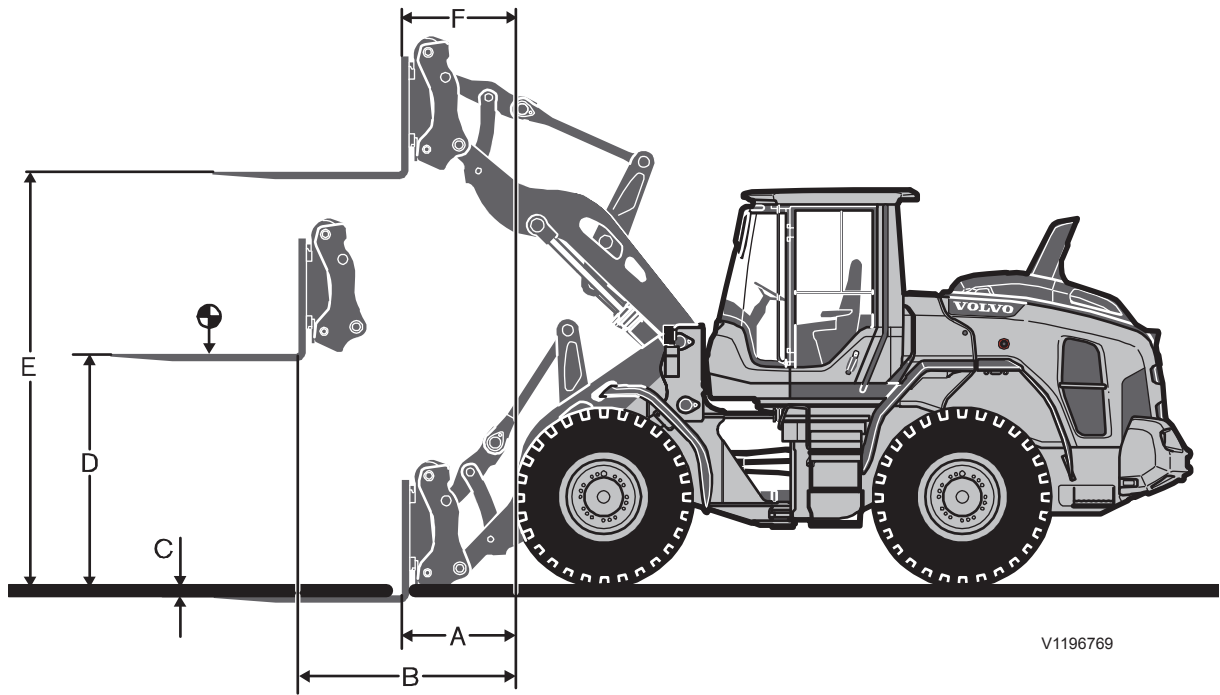
		Rated operating load capacity (rated work load) at different load centre distances					
Ground	Tires	500 mm (19.7 in)	600 mm (23.6 in)	700 mm (27.6 in)	800 mm (31.5 in)	900 mm (35.4 in)	1200 mm (47.2 in)
Rough terrain	20.5R25	3,900 kg (8,610 lb)	3,770 kg (8,320 lb)	3,650 kg (8,040 lb)	3,530 kg (7,790 lb)	3,420 kg (7,540 lb)	3,130 kg (6,900 lb)
Even and hard	20.5R25	5,210 kg (11,490 lb)	5,030 kg (11,090 lb)	4,860 kg (10,730 lb)	4,710 kg (10,380 lb)	4,560 kg (10,060 lb)	3,950 kg (8,040 lb)*

The maximum permitted load according to the table is reduced if the attachments are supplemented with optional equipment. For more information, contact your dealer who has access to the attachment catalogue.

*) Is limited by the attachment. (max. load per arm, 3950 kg (8040 lb) at 600 mm (23.6 in) TP-distance).

L90H

Pallet fork (with attachment bracket)	
Attachment	Hook-on
Order no.	83768
Tires	20.5R25 L3



V1196769

A	928 mm (36.5 in)	C	49 mm (1.9 in)	E	3720 mm (146.5 in)
B	1675 mm (65.9 in)	D	1747 mm (68.8 in)	F	731 mm (28.8 in)

Load table for pallet forks

		Rated operating load capacity (rated work load) at different load centre distances					
Ground	Tires	500 mm (19.7 in)	600 mm (23.6 in)	700 mm (27.6 in)	800 mm (31.5 in)	900 mm (35.4 in)	1200 mm (47.2 in)
Rough terrain	20.5R25	4,510 kg (9,950 lb)	4,360 kg (9,620 lb)	4,220 kg (9,300 lb)	4,080 kg (9,010 lb)	3,960 kg (8,730 lb)	3,620 kg (8,000 lb)
Even and hard	20.5R25	6,020 kg (13,270 lb)	5,810 kg (12,820 lb)	5,620 kg (12,410 lb)	5,450 kg (12,010 lb)	5,280 kg (11,650 lb)	4,300 kg (9,480 lb)*

The maximum permitted load according to the table is reduced if the attachments are supplemented with optional equipment. For more information, contact your dealer who has access to the attachment catalogue.

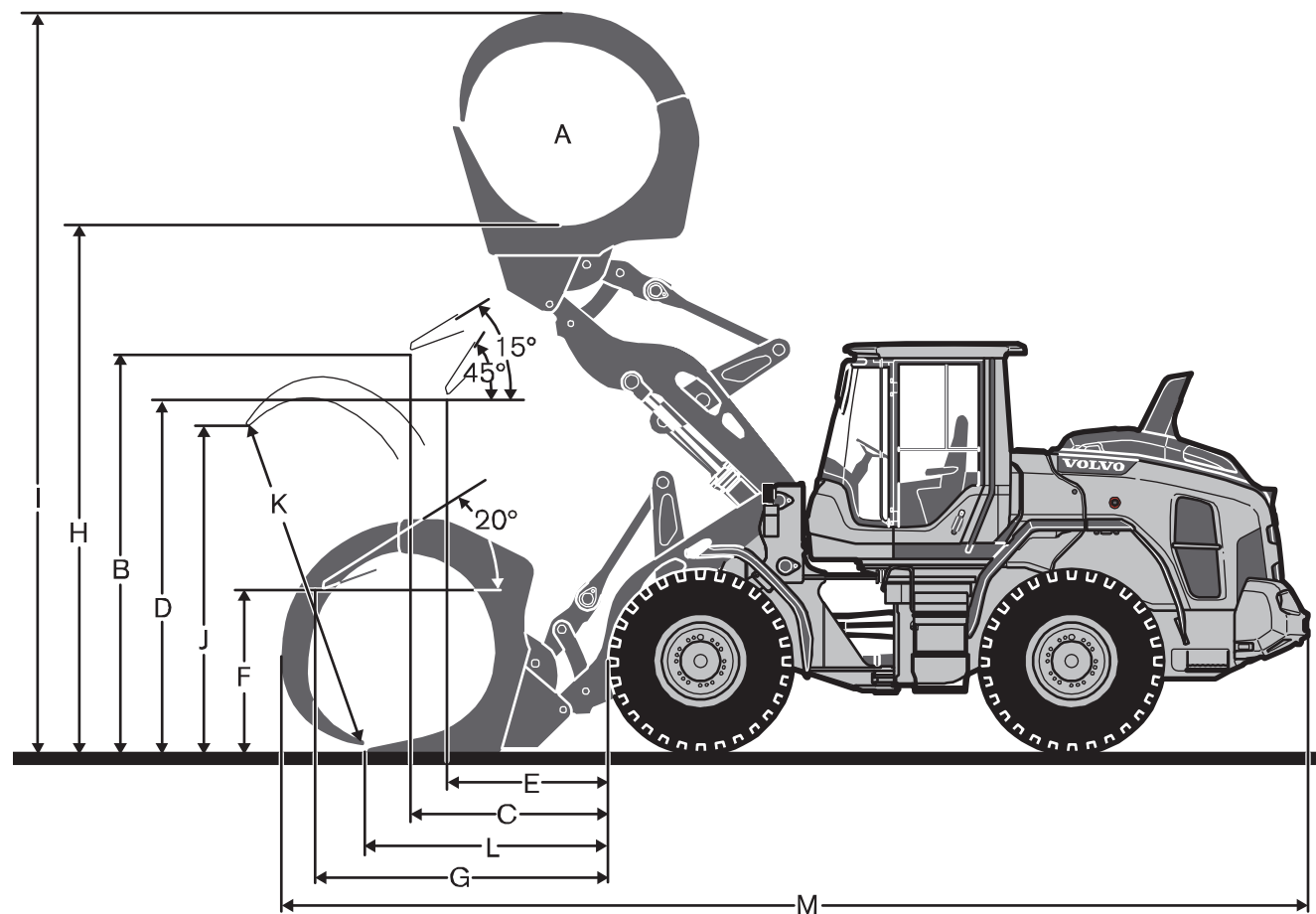
*) Is limited by the attachment. (max. load per arm, 4300 kg (9480 lb) at 600 mm (23.6 in) TP-distance).

Timber grapples

Timber grapples

L60H

Log grapple (for attachment bracket)	
Attachment	Hook-on
Tires	20,5 R25 L3
A	1.3 m ² (2015.0 in ²)

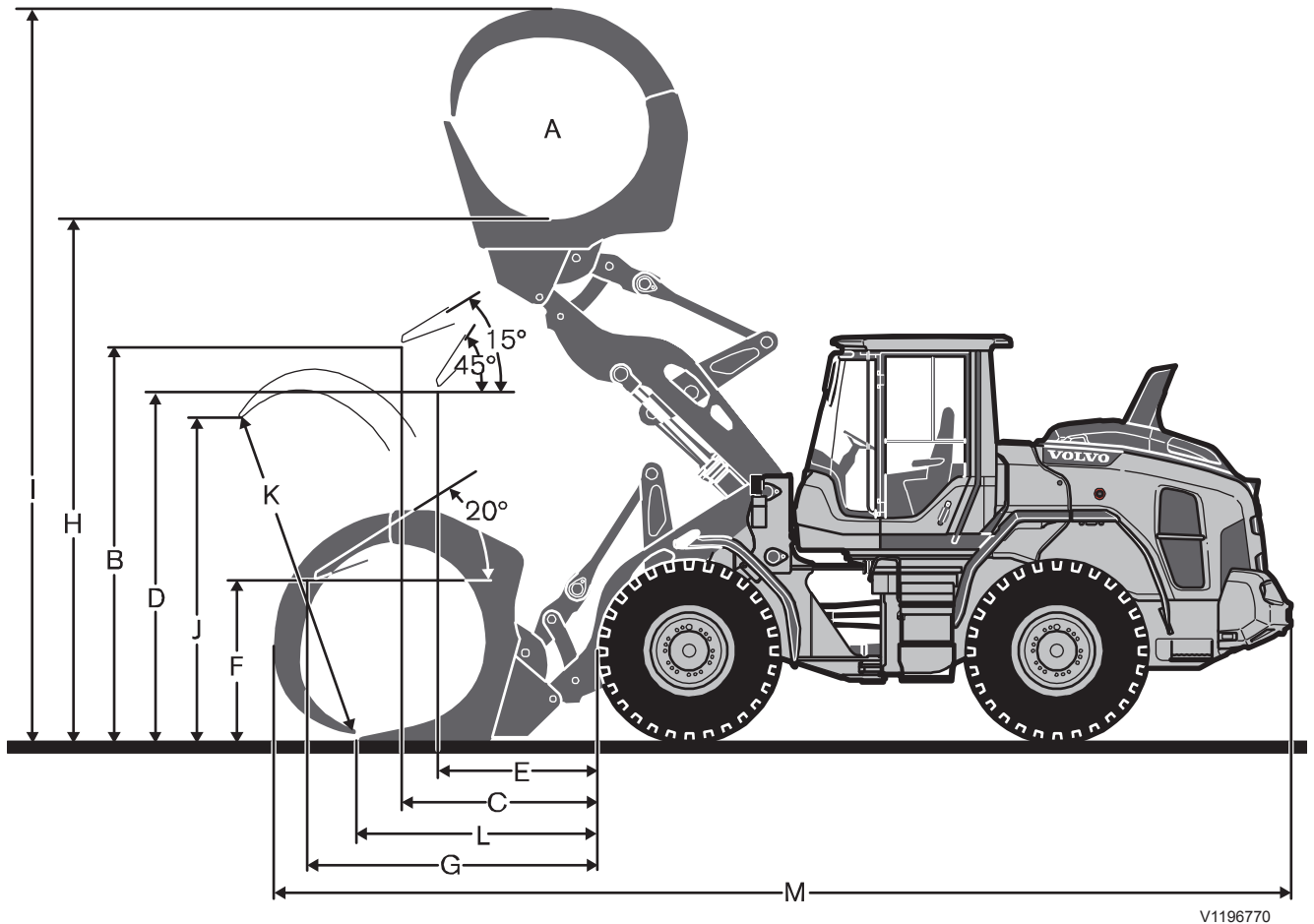


V1196770

B	3410 mm (134.3 in)	F	1530 mm (60.2 in)	J	2000 mm (78.7 in)
C	1480 mm (58.3 in)	G	2350 mm (92.5 in)	K	2080 mm (81.9 in)
D	2930 mm (115.4 in)	H	4330 mm (170.5 in)	L	1710 mm (67.3 in)
E	1170 mm (46.1 in)	I	5880 mm (231.5 in)	M	7890 mm (310.6 in)

L70H

Log grapple (for attachment bracket)	
Attachment	Hook-on
Tires	20,5 R25 L3
A	1.5 m ² (2325.0 in ²)

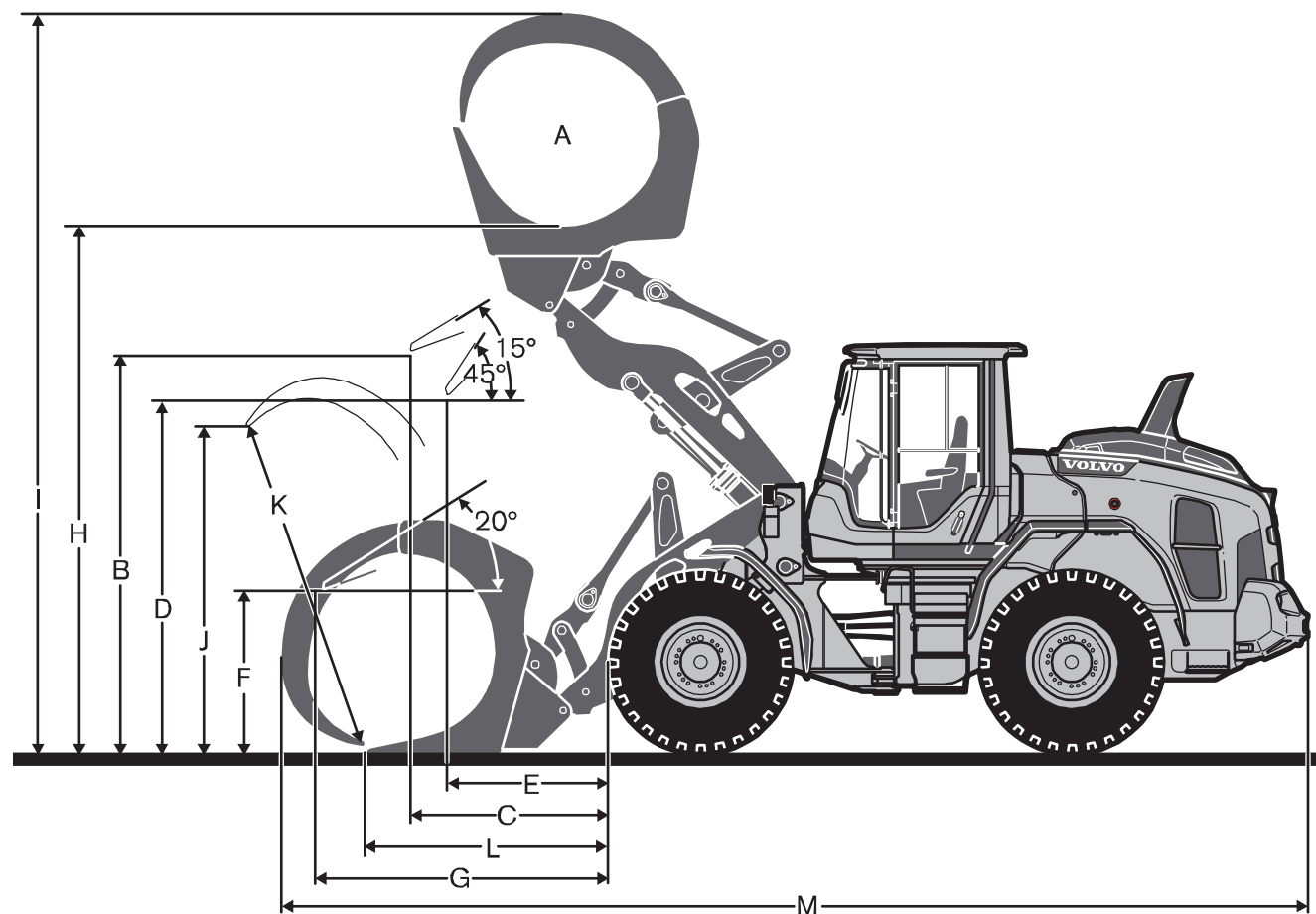


V1196770

B	3390 mm (133.5 in)	F	1510 mm (59.4 in)	J	2140 mm (84.3 in)
C	1590 mm (62.6 in)	G	2440 mm (96.1 in)	K	2370 mm (93.3 in)
D	2870 mm (113.0 in)	H	4380 mm (172.4 in)	L	1790 mm (70.5 in)
E	1 260 mm (49.6 in)	I	6030 mm (237.4 in)	M	7990 mm (314.6 in)

L90H

Log grapple (for attachment bracket)	
Attachment	Hook-on
Tires	20,5 R25 L3
A	2.4 m ² (3720.0 in ²)



V1196770

B	3420 mm (134.6 in)	F	1440 mm (56.7 in)	J	2790 mm (109.8 in)
C	1820 mm (71.7 in)	G	2760 mm (108.7 in)	K	2990 mm (117.7 in)
D	2800 mm (110.2 in)	H	4540 mm (178. in)	L	2150 mm (84.6 in)
E	1430 mm (56.3 in)	I	6590 mm (259. in)	M	8460 mm (333. in)

Service history

Service 50 hours		Type of service ☐ Service and maintenance	Signature and stamp
Date	Hours		
Service 250 hours		Type of service ☐ Service and maintenance	Signature and stamp
Date	Hours		
Service 500 hours		Type of service ☐ First 500 hours ☐ Service and maintenance	Signature and stamp
Date	Hours		
Service 1000 hours		Type of service ☐ First 1000 hours ☐ Service and maintenance	Signature and stamp
Date	Hours		
Service 1500 hours		Type of service ☐ Service and maintenance	Signature and stamp
Date	Hours		
Service 2000 hours		Type of service ☐ First 2000 hours ☐ Service and maintenance	Signature and stamp
Date	Hours		
Service 2500 hours		Type of service ☐ Service and maintenance	Signature and stamp
Date	Hours		
Service 3000 hours		Type of service ☐ Service and maintenance	Signature and stamp
Date	Hours		
Service 3500 hours		Type of service ☐ Service and maintenance	Signature and stamp
Date	Hours		

Service 4000 hours		Type of service	Signature and stamp
Date	Hours	☐ Service and maintenance	
Service 4500 hours		Type of service	Signature and stamp
Date	Hours	☐ Service and maintenance	
Service 5000 hours		Type of service	Signature and stamp
Date	Hours	☐ Service and maintenance	
Service 5500 hours		Type of service	Signature and stamp
Date	Hours	☐ Service and maintenance	
Service 6000 hours		Type of service	Signature and stamp
Date	Hours	☐ Service and maintenance	
Service 6500 hours		Type of service	Signature and stamp
Date	Hours	☐ Service and maintenance	
Service 7000 hours		Type of service	Signature and stamp
Date	Hours	☐ Service and maintenance	
Service 7500 hours		Type of service	Signature and stamp
Date	Hours	☐ Service and maintenance	
Service 8000 hours		Type of service	Signature and stamp
Date	Hours	☐ Service and maintenance	
Service 8500 hours		Type of service	Signature and stamp
Date	Hours	☐ Service and maintenance	

Service 9000 hours		Type of service ☐ Service and maintenance	Signature and stamp
Date	Hours		
Service 9500 hours		Type of service ☐ Service and maintenance	Signature and stamp
Date	Hours		
Service 10000 hours		Type of service ☐ Service and maintenance	Signature and stamp
Date	Hours		
Service 10500 hours		Type of service ☐ Service and maintenance	Signature and stamp
Date	Hours		
Service 11000 hours		Type of service ☐ Service and maintenance	Signature and stamp
Date	Hours		
Service 11500 hours		Type of service ☐ Service and maintenance	Signature and stamp
Date	Hours		
Service 12000 hours		Type of service ☐ Service and maintenance	Signature and stamp
Date	Hours		



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Alphabetical index

A

Accidents.....	129
Action centre.....	69
AdBlue®/DEF.....	297
AdBlue®/DEF information.....	8
AdBlue®/DEF, filling.....	266
Air cleaner primary filter, cleaning.....	268
Alarm texts.....	46
Alternative fuels.....	293
Anti-theft system.....	12
Armrest, adjusting.....	116
Attachment brackets.....	200
Attachments.....	198
Attachments intended to be used with the attachment bracket (quick coupler).....	203
Auto engine shutoff (optional equipment).....	124
Automatic central lubrication.....	291
Automatic lift (boom kick-out).....	103
Automatic shifting (APS).....	146
Automatic tilt (bucket positioner).....	102
Axles.....	315
Axles / Brakes menu.....	58

B

Batteries, charging.....	270
Battery, disconnecting and connecting.....	230
Before service, read.....	228
Boom, emergency lowering.....	222
Brake.....	316
Brake system.....	11, 316
Brake test.....	153, 261
Braking.....	153
Bucket teeth, replacing.....	278, 279
Buckets.....	209

C

Cab.....	11, 111, 320
Cab ventilation filters, cleaning.....	273
Carbon dioxide emissions.....	302
CareTrack/Information Systems.....	13
Central lubrication system.....	280
Central lubrication system, bleeding.....	283
Change intervals.....	299
Change of lubrication interval.....	281
Check.....	47
Cleaning.....	283
Cleaning engine compartment.....	276
Cleaning machine.....	274
Climate control system.....	120
Climate control system, adjusting.....	122
Combination table, interchangeable equipment.....	336
Comfort Drive Control, CDC (optional equipment).....	150
Communication equipment, installation.....	20
Compliance marking and directives.....	17
Connectors, overview.....	65
Control panel.....	94
Controls.....	95
Coolant.....	290
Coolant, checking level and refilling.....	259
Cooler and condenser, cleaning.....	257
Co-Pilot login.....	66
Co-Pilot settings.....	71
Co-Pilot settings, about tablet.....	82
Co-Pilot settings, connectivity.....	73
Co-Pilot settings, date & time.....	82
Co-Pilot settings, display.....	82
Co-Pilot settings, language & input.....	82
Co-Pilot settings, operator profile, data removal.....	82
Co-Pilot settings, operator profiles.....	79
Co-Pilot settings, software update.....	79

D

Delayed engine shutdown.....	124
------------------------------	-----

Dimensions.....	328
Display unit.....	42
Display, adjusting.....	66
Display, cleaning.....	66

E

Eco driving.....	191
Electrical magnetic field (EMF).....	194
Electrical system.....	10, 303
Electrical system menu.....	58
Emergency exit.....	134
Emission compliance.....	161
End of life product dismantling.....	241
Engine.....	7, 301
Engine block heater.....	140
Engine braking / downshifting.....	148
Engine hood, maneuvering.....	109
Engine menu.....	53
Engine oil level, checking.....	249
Engine protection - Software.....	124
Environmental requirements.....	7
Equipment.....	12
Exhaust aftertreatment system.....	9, 155
Exhaust aftertreatment system, alarms requiring special actions.....	162

F

Filling lubricant.....	281
Fire prevention.....	232
Fire suppression system.....	16, 94, 233
FOPS and ROPS.....	11
Forward camera.....	118
Forward mirrors.....	119
Front instrument panel.....	35
Fuel system.....	292
Fuel system, bleeding.....	268
Fuel, filling.....	128, 265
Function times, specifications.....	324, 325, 326
Fuses and relays.....	271, 303

G

Gear shifting.....	146
Grease.....	291
Greasing.....	253, 254, 256, 261, 263

H

Handling hazardous materials.....	237
Handling line, tubes and hoses.....	242
Headlights, adjusting.....	271
Help center.....	83
Hydraulic function, 3rd and 4th.....	205
Hydraulic oil, checking level and refilling.....	259
Hydraulic system.....	11, 323
Hydraulic system, warming up.....	141
Hydraulics menu.....	58

I

Identification numbers.....	6
Information and safety decals.....	24
Instrument panel, cab post.....	84
Instrument panel, front.....	35
Instrument panel, rear.....	93
Intended use.....	7

K

Keypad, information display unit.....	46
Kick-down function.....	147

L

Lift and tilt function.....	103
Lift arm, alternative lowering.....	222
Light bulb, replacing.....	271
Lock-up.....	10
Lock-up, gearshifting sequence.....	148
Logged machine data.....	13
Lubrication.....	246, 251
Lubrication points, central lubrication.....	280

M		
Machine capacities.....	332	
Machine information menu.....	58	
Machine weights.....	327	
Maintenance.....	243	
Maintenance service, every 10 hours.....	247	
Maintenance service, every 1000 hours.....	261	
Maintenance service, every 2000 hours.....	263	
Maintenance service, every 250 hours.....	253	
Maintenance service, every 4000 hours.....	264	
Maintenance service, every 50 hours.....	249	
Maintenance service, every 500 hours.....	256	
Maintenance service, when required.....	265	
Manuals.....	83	
Max. boom height.....	106	
Measures before operating.....	136	
Measures when getting stuck.....	170	
Messages.....	82	
Mirrors.....	142	
Modifications.....	12	
N		
Noise and vibrations.....	322	
O		
Oil bath air cleaner, checking.....	250	
Operating Information display screen.....	42	
Operating on public roads.....	130	
Operational data menu.....	63	
Operator comfort.....	113	
Operator seat.....	113	
Operator's safety.....	129	
Operator's obligations.....	128	
P		
Paint finish maintenance.....	275	
Pallet forks.....	216, 337	
Parking.....	168	
Parking brake function, checking.....	154, 262	
Parking brake, mechanical release.....	173	
Power lines, minimum clearance.....	133	
Preparations before service.....	230	
Pressure release.....	208	
Product plates.....	22	
R		
Rear vision system.....	70, 111	
Recommended lubricants.....	284, 287	
Refrigerant.....	240, 321	
Regeneration.....	155	
Retrieving and towing.....	171	
Rotating attachments.....	199	
Running-in instructions.....	124	
S		
Safety components.....	21	
Safety rules in case of fire.....	131	
Safety rules when operating.....	128	
Seat belt.....	117	
Seat belt, checking.....	264	
Secondary steering.....	150	
Service capacities and change intervals.....	299	
Service history.....	343	
Service menu.....	59	
Service position.....	226	
Set hydraulic priority.....	107	
Settings and information menus.....	53	
Setup menu.....	60	
Signalling diagram.....	223	
SIM card, installing.....	65	
Starting engine.....	137	
Starting with booster batteries.....	138	
Status bar.....	68	
Steering.....	150, 317	
Steering system.....	11, 317	
Stone block handling.....	215	
Stopping.....	167	
		System test..... 282
T		
Test-run and check.....	247	
Theft protection.....	52	
Timber grapples.....	219, 340	
Tool kit.....	14	
Transmission.....	10, 314	
Transmission menu.....	56	
Transmission oil level, checking.....	256	
Transporting machine.....	174	
Travelling on public roads.....	131	
Tyre sizes and pressures.....	318	
Tyres, checking air pressure.....	249	
Tyres, checking wear.....	250	
U		
Underground cables and pipes.....	194	
V		
Vehicle messages menu.....	63	
Visibility.....	126	
Volvo Co-Pilot.....	64	
W		
Warning.....	49	
Washer fluid, checking level and refilling.....	273	
Water separator, draining.....	267	
Welding.....	231	
Wheel bolts, checking tightening.....	279	
Wheel nuts, tightening torque.....	319	
Wheels.....	318	
Whole-body vibrations.....	193	
Working in cold weather.....	196	
Working in water and on boggy ground.....	196	
Working on slopes.....	195	
Working where there is risk of landslide.....	196	
Working with buckets.....	210	
Working with pallet forks.....	217	
Working with timber grapples.....	220	
Working within dangerous areas.....	194	



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