



# **BOMAG**

**FAYAT GROUP**

## **Operating instructions Maintenance instructions**

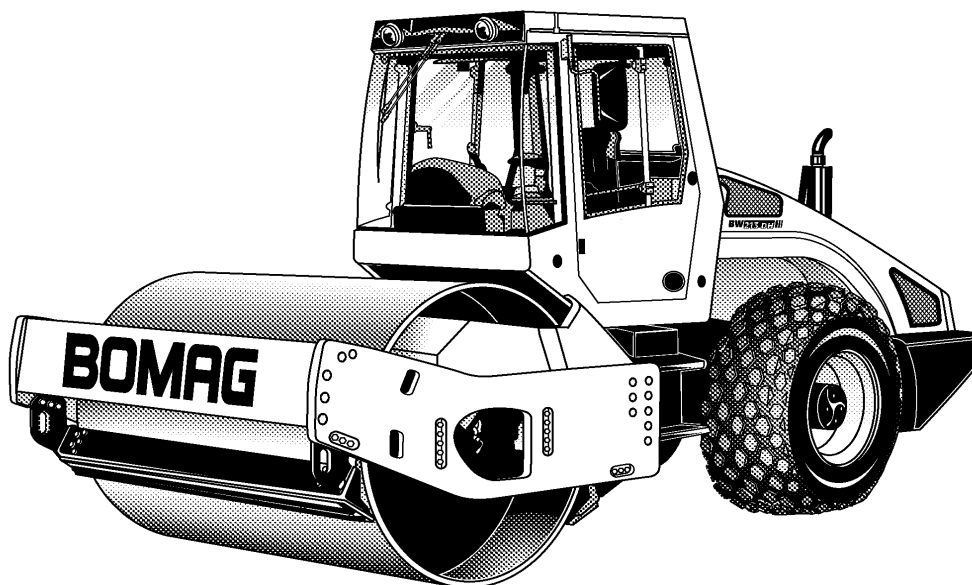
*Original operating instructions*

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**BW 213 D-4**

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S/N 101 583 08 1960>



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**Single drum roller**

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If the machine is equipped with a battery :

**CALIFORNIA**  
Proposition 65 Warning

Battery posts, terminals and related accessories contain lead and lead compounds, chemicals known to the State of California to cause cancer and birth defects or other reproductive harm.  
**Wash hands after handling.**

If the machine is equipped with a diesel engine :

**CALIFORNIA**  
Proposition 65 Warning

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



## Foreword

**These BOMAG machines are products from the wide product range of BOMAG machines for earth and asphalt construction, refuse compaction and stabilizing/recycling.**

**BOMAG's vast experience in connection with state-of-the-art production and testing methods, such as lifetime tests of all important components and highest quality demands guarantee maximum reliability of your machine.**

This manual comprises:

- Safety regulations
- Operating instructions
- maintenance instructions
- Trouble shooting

Using these instructions will

- help you to become familiar with the machine.
- avoid malfunctions caused by unprofessional operation.

Compliance with the maintenance instructions will

- enhance the reliability of the machine on construction sites,
- prolong the lifetime of the machine,
- reduce repair costs and downtimes.

BOMAG will not assume liability for the function of the machine

- if it is handled in a way not complying with the usual modes of use,
- if it is used for purposes other than those mentioned in these instructions.

No warranty claims can be lodged in case of damage resulting from

- operating errors,
- insufficient maintenance and
- wrong fuels and lubricants.

### **Please note!**

This manual was written for operators and maintenance personnel on construction sites.

Always keep this manual close at hand, e.g. in the tool compartment of the machine or in a specially

provided container. These operating and maintenance instructions are part of the machine.

You should only operate the machine after you have been instructed and in compliance with these instructions.

Strictly observe the safety regulations.

Please observe also the guidelines of the Civil Engineering Liability Association "Safety Rules for the Operation of Road Rollers and Soil Compactors" and all relevant accident prevention regulations.

**For your own personal safety you should only use original spare parts from BOMAG.**

**For your machine BOMAG offers service kits to make maintenance easier.**

**In the course of technical development we reserve the right for technical modifications without prior notification.**

These operating and maintenance instructions are also available in other languages.

Apart from that, the spare parts catalogue is available from your BOMAG dealer against the serial number of your machine.

Your BOMAG dealer will also supply you with information about the correct use of our machines in soil and asphalt construction.

The above notes do not constitute an extension of the warranty and liability conditions specified in the general terms of business of BOMAG.

We wish you successful work with your BOMAG machine.

BOMAG GmbH

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## Foreword

### Please fill in

.....

Machine type (Fig. 1)

.....

Serial-number (Fig. 1 and 2)

.....

Engine type (Fig. 3)

.....

Engine number (Fig. 3)

### **i** Note

Supplement the above data together with the commissioning protocol.

During commissioning our organisation will instruct you in the operation and maintenance of the machine.

Please observe strictly the safety regulations and all notes on risks and dangers!

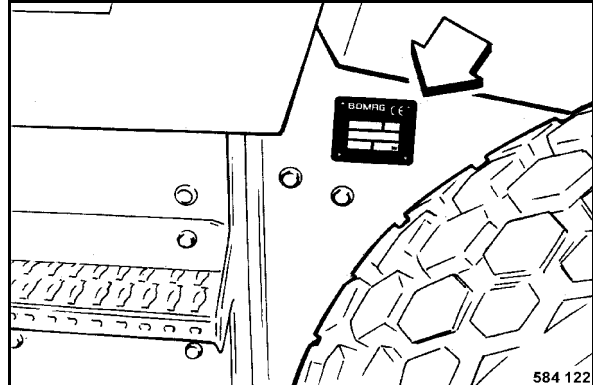


Fig. 1

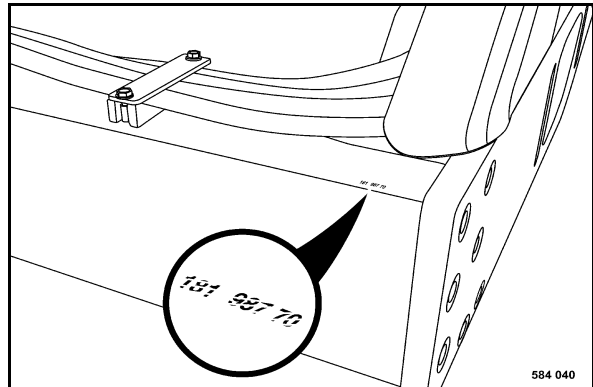


Fig. 2

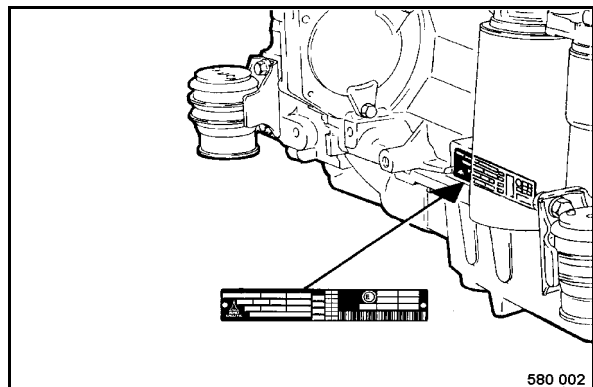


Fig. 3



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## 1 Technical Data

**Technical Data**

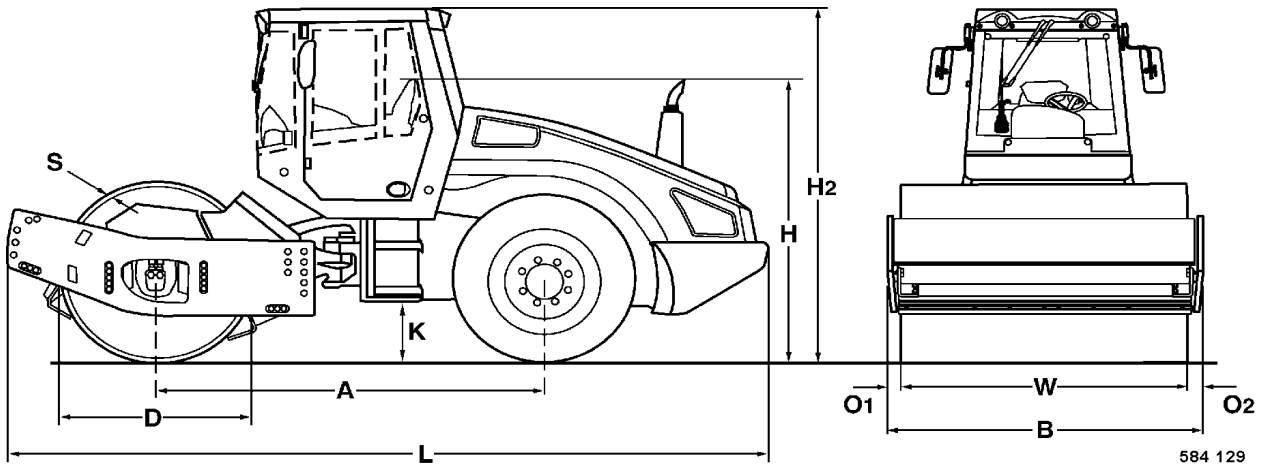


Fig. 4

<b>BW 213 D-4</b>	<b>A</b>	<b>B</b>	<b>D</b>	<b>H</b>	<b>H2</b>	<b>K</b>	<b>L</b>	<b>O1</b>	<b>O2</b>	<b>S</b>	<b>W</b>
Dimensions in mm	2960	2270	1500	2268	2985	490	5808	70	70	35	2130

\*

**BW 213 D-4**

**Weights**

Operating weight (CECE) with ROPS-cabin	kg	12525
Axle load, drum (CECE)	kg	7225
Rear axle load (CECE)	kg	5300
Static linear load	kg/cm	33.9
Max. operating weight	kg	14600

**Travel characteristics**

Travel speed (1)	km/h	0 – 6
Travel speed (2)	km/h	0 – 7
Travel speed (3)	km/h	0 – 8
Travel speed (4)	km/h	0 – 11
Max. gradability without/with vibration (soil dependent)	%	45/43

**Drive**

Engine manufacturer		Deutz
Type		TCD 2013 L04
Cooling		Water
Number of cylinders		4
Rated power DIN ISO 3046	kW	99
Rated power SAE J 1995	hp	133
Rated speed	rpm	2200
Fuel		Diesel
Electrical equipment	V	12
Drive system		hydrostatic
Permissible ambient temperature	°C	-20 ... +50



## Technical Data

\*

### BW 213 D-4

#### Brakes

Service brake  
Parking brake

hydrostatic  
hydro-mechanical

#### Steering

Type of steering  
Steering operation  
Steering/oscillation angle  
Inner track radius

Oscill.-articul.  
hydrostatic  
± ° 35/12  
mm 3494

#### Vibration

Vibrating drum  
Drive system  
Frequency (1/2)  
Amplitude (1/2)  
Centrifugal force

1  
hydrostatic  
Hz 30/36  
mm 1.90/0.96  
kN 275/202

#### Tires

Tire size  
Air pressure, nominal value  
Air pressure, span

23.1-26/12PR  
bar 1.4  
bar 0.8 - 1.4

#### Filling capacities

Motor  
Fuel  
Hydraulic oil  
Coolant

l approx. 15,5  
l approx. 340  
l approx. 160  
l approx. 16

\* The right for technical modifications remains reserved



## Technical Data

The following noise and vibration data acc. to

- EC Machine Regulation edition 2006/42/EC
- the noise regulation 2000/14/EG, noise protection guideline 2003/10/EC
- Vibration Protection Regulation 2002/44/EC

were determined during conditions typical for this type of equipment and by application of harmonized standards.

During operation these values may vary because of the existing operating conditions.

### Noise value

**sound pressure level at the work place of the operator (with cabin):**

$L_{pA} = 73$  dB(A), determined acc. to ISO 11204 and EN 500

**Guaranteed sound power level:**

$L_{WA} = 103$  dB(A), determined acc. to ISO 3744 and EN 500

### Vibration value

**Vibration of the entire body (driver's seat)**

The weighted effective acceleration value determined according to ISO 7096 is  $\leq 0.5$  m/s<sup>2</sup>.

**Hand-arm vibration values**

The weighted effective acceleration value determined according to ISO 5349 is  $\leq 2.5$  m/s<sup>2</sup>.



## 2 Safety regulations



## Safety regulations

### General

**This BOMAG machine has been built in compliance with the latest technical standard and complies with the applicable regulations and technical rules. However, dangers for persons and property may arise from this machine, if:**

- it is used for purposes other than the ones it is intended for,
- it is operated by untrained personnel,
- it is changed or converted in an unprofessional way,
- the safety instructions are not observed.

**Each person involved in the operation, maintenance and repair of the machine must therefore read and comply with these safety regulations. If necessary, this must be confirmed by obtaining the signature of the customer.**

Furthermore, the following obviously also applies:

- applicable accident prevention instructions,
- generally accepted safety and road traffic regulations,
- country specific safety regulations. It is the duty of the operator to be acquainted with these instructions and to apply these accordingly. This applies also for local regulations concerning different types of handling work. Should the recommendations in these instructions be different from the regulations valid in your country, you must comply with the safety regulations valid in your country.

### Intended use

This machine must only be used for:

- medium to heavy compaction work in earth construction (road sub-bases)
- probably compaction of bituminous material, e.g. road surface layers.

### Unintended use

Dangers may arise from the machine when it is used for purposes other than the one it is intended for.

Any danger caused by intended use is the sole responsibility of the customer or driver/operator, the manufacturer cannot be made liable.

Examples for unintended use are:

- work with vibration on hard concrete, cured bitumen layers or extremely frozen ground
- driving on unstable subbases or too small contact area (danger of tipping over)
- using the machine for towing
- use to pull down walls or demolish buildings

Transporting persons, except the machine driver, is prohibited.

Starting and operation of the machine in explosive environments and in underground mining is prohibited.

### Remaining dangers, remaining risks

Despite careful work and compliance with standards and regulations it cannot be ruled out that further dangers may arise when working with and handling the machine.

Both the machine as well as all other system components comply with the currently valid safety regulations. Nevertheless, remaining risks cannot be ruled out completely, even when using the machine for the purpose it is intended for and following all information given in the operating instructions.

A remaining risk can also not be excluded beyond the actual danger zone of the machine. Persons remaining in this area must pay particular attention to the machine, so that they can react immediately in case of a possible malfunction, an incident or failure etc.

All persons remaining in the area of the machine must be informed about the dangers that arise from the operation of the machine.

### Regular safety inspections

Have the machine inspected by an expert (capable person) as required for the condition the machine is working under, but at least once every year.

### Who is allowed to operate the machine?

Only trained, instructed and authorized persons of at least 18 years of age are permitted to drive and operate this machine. For operation of the machine the responsibilities must be clearly specified and complied with.



## Safety regulations

Persons under the influence of alcohol, medicine or drugs are not allowed to operate, service or repair the machine.

Maintenance and repair work requires specific knowledge and must therefore only be performed by trained specialists.

### Changes and conversions to the machine

Unauthorized changes to the machine are prohibited for safety reasons.

Original parts and accessories have been specially designed for this machine.

We wish to make explicitly clear that we have not tested or approved any parts or accessories not supplied by us.

The installation and/or use of such products may have an adverse effect on the active and/or passive safety.

The manufacturer explicitly excludes any liability for damage caused by the use of non-original parts or accessories.

### Damage, deficiencies, misuse of safety installations

Machines which are not safe to operate or in traffic must be immediately taken out of service and shall not be used, until these deficiencies have been properly rectified.

Safety installations and switches must neither be removed nor must they be made ineffective.

### Notes on safety in the operating and maintenance instructions:

#### **Danger**

Paragraphs marked like this highlight possible dangers for persons.

#### **Caution**

Paragraphs marked like this highlight possible dangers for machines or parts of the machine.

#### **Note**

Paragraphs marked like this contain technical information for the optimal economical use of the machine.

#### **Environment**

Paragraphs marked like this point out practices for safe and environmental disposal of fuels and lubricants as well as replacement parts.

**Observe the regulations for the protection of the environment.**

### Loading the machine

Use only strong and stable loading ramps. The ramp inclination must be lower than the gradability of the machine.

Secure the machine against turning over or slipping off.

Secure the machine on the transport vehicle against rolling off, slipping and turning over.

Persons are highly endangered if

- they step or stand under loads being lifted
- they remain in the drive range of the machine during a demonstration or during loading.

The machine must not swing about when lifted off the ground.

Use only safe lifting gear of sufficient load bearing capacity.

Attach the lifting gear only to the specified lifting points.

### Towing the machine

You should generally use a tow bar.

Max. towing speed 1 km/h (1.6 mph), max. towing distance 500 m (1640 ft.).

Before releasing the multi-disc brakes secure the machine properly against unintended rolling.

### Checking the Roll Over Protective Structure (ROPS)

#### **Note**

On machines with cab the ROPS is an integral part of the cab.



## Safety regulations

The frame of the machine must not be warped, bent or cracked in the area of the ROPS fastening. The ROPS must not show any rust, damage, hair-line cracks or open fractures.

The actual weight of the machine must not exceed the testing weight of the ROPS.

The ROPS must not rattle about when driving. This indicates that it is not properly fastened. All bolted connections must comply with the specifications and should be absolutely tight (observe the tightening torques). Screw and nuts must not be damaged, bent or deformed.

With the cab assembled check also the state of the cabin mounts (rubber elements and screws).

No accessories may be welded or bolted on and no additional holes must be drilled without the consent of the manufacturer, since this will impair the strength of the unit.

The ROPS must therefore also not be straightened or repaired if it is damaged.

A defect ROPS must generally be replaced with an original spare part in close coordination with the manufacturer.

### Starting the machine

#### Before starting

Operation of the machine is only permitted when sitting in the operator's seat.

Use only machines which have been properly serviced at regular intervals.

Become acquainted with the equipment, the control elements, the working mode of the machine and the area you will be working in.

Use your personal protective outfit (hard hat, safety boots etc.).

Check before mounting the machine if:

- there are persons or obstructions beside or under the machine
- the machine is free of any oily and combustible material
- all handrails, steps and platforms are free of grease, oils, fuels, dirt, snow and ice
- the engine compartment hood is closed and locked

To climb onto the machine use steps and handrails.

Check before starting, whether:

- the machine shows any obvious defects
- all protective devices are properly secured in their place
- steering, brakes, control elements, lighting and warning horn are in order
- the seat is correctly adjusted
- the mirrors (if available) are clean and correctly adjusted.

Do not start the machine if any gauges, control lights or controls are defective.

Do not take any loose objects with you or fasten them to the machine.

On machines with ROPS you should always wear your seat belt!

#### Starting

Start and operate the machine only from the operator's seat

For starting set all control levers to "neutral position".

Do not use any starting aids such as Start Pilot or ether.

After starting check all gauges.

#### Starting with jump leads

Connect plus with plus and minus with minus (ground cable) - always connect the ground cable last and disconnect it first! Wrong connections may cause severe damage in the electric system.

Never start the engine by bridging the electrical connections on the starter, because the machine would probably start to move immediately.

#### Starting in closed rooms

Exhaust gases are toxic! Always ensure an adequate supply of fresh air when starting in closed rooms!

### Driving the machine

#### Persons in the danger area

If a machine has turned over and the cabin door is jammed, the right hand cabin window can be used as an escape door.

Before taking up work, also after breaks, you should always convince yourself that the danger



## Safety regulations

zone is free of persons or obstructions, especially when driving in reverse.

Give warning signals, if necessary. Stop work immediately if persons remain in the danger zone, despite the warning.

Do not step or stand in the articulation area of the machine when the engine is running. Danger of squashing!

### Driving

Always wear the seat belt when driving.

Do not drive on bases with insufficient load bearing capacity.

Do not drive on ice and snow.

In events of emergency and in case of danger actuate the emergency stop switch immediately. Do not use the emergency stop switch as service brake.

Restart the machine only after the danger that caused the actuation of the emergency stop switch has been eliminated.

If the machine has contacted high-voltage power lines:

- do not leave the operator's stand,
- warn others from coming close to or touching the machine,
- if possible drive the machine out of the danger zone,
- have the power switched off.

Operate the machine only from the operator's stand.

Keep the cabin doors closed.

Do not adjust the driver's seat while driving.

Do not climb onto or off the machine while the machine is driving.

Change the travel direction only at standstill.

Do not use the machine to transport persons.

In case of unusual noises and development of smoke perform trouble shooting and have the fault corrected.

Always keep a sufficient distance to excavation walls and embankments and do not use working methods that could impair the stability of the machine.

Do not work with vibration on hard concrete, cured bitumen layers or extremely frozen ground.

Always keep a sufficient distance when passing through subways, under bridges, tunnels, electric power lines etc.

### Driving on inclinations and slopes

Do not drive on gradients exceeding the maximum gradability of the machine.

On slopes drive extremely careful and always directly up or down the slope. Change to a lower gear before starting to drive.

Wet and loose soils considerably reduce the ground adhesion of the machine on inclinations and slopes. Higher risk of accident!

### Inclination

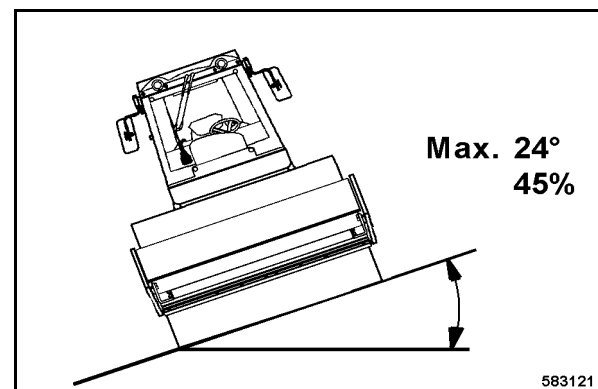


Fig. 5

The tipping angle was measured in static condition on level, hard ground with the machine stopped, no steering and without vibration.

With loose soil, acceleration/deceleration, running vibration, steering or attached accessories the tipping angle may be considerably lower.

Driving across slopes should therefore be strictly avoided, because of the high risk of tipping over and the related risk of severe or even fatal accidents.

You should therefore always drive straight up or down a slope.

### Behaviour in traffic

Match the speed to the working conditions. Do not make extreme steering movements when driving with high speed, danger of tipping over!

Always give way to loaded transport vehicles.

Switch the lights on if the visibility is poor.

Keep away from edges and embankments.



## Safety regulations

### Checking the effect of vibration

When compacting with vibration you must check the effect on nearby buildings and underground supply lines (gas, water, sewage, electric power), if necessary stop compaction work with vibration.

Do not activate the vibration on hard (frozen, concrete) ground. Danger of bearing damage!

### Parking the machine

Park the machine on horizontal, level, firm ground.

Before leaving the machine:

- Straighten the articulated joint to provide easier access to the machine.
- return the control lever to neutral position
- apply the parking brake
- shut the engine down, pull the ignition key off
- close the cabin
- secure the machine against unintended use.

Do not jump off the machine, but use hand grips and access steps.

Mark machines, which could be in the way, with a clearly visible sign.

### Parking on slopes and inclinations

Secure the machine against rolling, place metal chocks in front of and behind the wheels. The wheel chocks must be provided by the operating company.

### Refuelling

Do not inhale any fuel fumes.

Refuel only with the engine shut down.

Do not refuel in closed rooms.

No open fire, do not smoke.

Monitor the entire refuelling process.

Do not spill any fuel. Catch running out fuel, do not let it seep into the ground.

Wipe off spilled fuel. Keep dirt and water away from the fuel.

A leaking fuel tank can cause an explosion. Ensure tight fit of the fuel tank cover, if necessary replace immediately.

### Fire protection measures

Familiarise yourself with the location and the operation of fire fighting equipment. Observe all fire reporting and fire fighting possibilities.

### Maintenance work

Comply with the maintenance work described in the operating and maintenance instructions, including the information concerning the replacement of parts.

Support the engine hood for all maintenance and repair work in the engine compartment.

Maintenance work must only be performed by qualified and authorized persons.

For overhead maintenance and assembly work use the access steps and working platforms provided or other secure means. Do not use machine parts as access steps.

Keep unauthorized persons away from the machine.

Do not perform maintenance work while the machine is driving or the engine is running.

Park the machine on horizontal, level, firm ground.

Pull the key out of the ignition switch.

Secure the articulated joint with the articulation lock.

### Work on hydraulic lines

Relieve hydraulic pressures before working on hydraulic lines. Hydraulic oil escaping under pressure can penetrate the skin and cause severe injury. When being injured by hydraulic oil consult a medical doctor immediately, as otherwise this may cause severe infections.

Do not step in front of or behind the drums/wheels when performing adjustment work in the hydraulic system.

Do not change the setting of pressure relief valves. Drain the hydraulic oil at operating temperature – danger of scalding!

Catch running out hydraulic oil and dispose of environmentally.

Always catch and dispose of hydraulic oils separately.

Do not start the engine after draining the hydraulic oil.



## Safety regulations

Once all work is completed (with the system still depressurized!) check all connections and fittings for leaks.

### Changing hydraulic hoses

Hydraulic hoses must be visually inspected at regular intervals.

Hydraulic hoses must be immediately replaced if:

- the outer layer is damaged down to the inlay (e.g. chafing, cuts, cracks)
- the outer layer is brittle (formation of cracks in the hose material)
- the hose shows deformations in pressurized and depressurized condition, which do not comply with the genuine shape of the hydraulic hose
- the hose shows deformations in bends, e.g. squeezing, buckling, layer separation, formation of blisters
- parts of the hose are leaking.
- hoses are not correctly installed.
- the hydraulic hose has separated from the fitting
- the fitting shows corrosion that impairs both function and strength.
- hoses are mixed up by mistake.
- fittings are damaged or deformed, whereby the function and strength of the hose/hose connection is impaired.

Only genuine BOMAG replacement hydraulic hoses ensure that the correct hose type (pressure range) is used at the right location.

### Working on the engine

Shut the engine down before opening the engine hood.

Do not work on the fuel system while the engine is running - danger to life due to high pressures!

- Wait another minute after the engine has stopped.
- Keep out of the danger zone during the initial test run.
- In case of leaks return to the workshop immediately.
- Make sure that the engine cannot be started unintentionally during service and repair work.

Drain the engine oil at operating temperature – danger of scalding!

Wipe off spilled oil, catch running out oil and dispose of environmentally.

Store used filters and other oil contaminated materials in a separate, specially marked container and dispose of environmentally.

Do not leave any tools or other objects, that could cause damage, in the engine compartment.

The settings for idle speed and highest speed must not be changed, since this would affect the exhaust gas values and cause damage to engine and power train.

Turbo chargers work with high speeds and high temperatures. Keep hands, tools and materials away from the intake and outlet openings of the turbo charger and do not touch any hot surfaces.

Check and change coolant only when the engine is cold.

Catch coolant and dispose of environmentally.

### Working on electric parts of the machine

Before starting to work on electric parts of the machine disconnect the battery and cover it with insulating material.

Do not use fuses with higher ampere ratings and do not repair fuses with a piece of wire. Fire hazard!

Disconnect the battery before starting welding work on the machine.

### Working on the battery

When working on the battery do not smoke, do not use open fire!

Do not let acid come in contact with hands or clothes! When injured by acid flush off with clear water and seek medical advice.

Metal objects (e.g. tools, rings, watch straps) must not come in contact with the battery poles – danger of short circuit and burning!

When recharging serviceable batteries remove all plugs, to avoid the accumulation of explosive gases.

Observe the applicable instructions when starting with an auxiliary battery.

Dispose of old batteries according to regulations. Switch off the charging current before removing the charging clamps.



## Safety regulations

Ensure sufficient ventilation, especially if the battery is to be charged in a closed room.

### Working on the fuel system

Do not inhale any fuel fumes.

Avoid open fire, do not smoke, do not spill any fuel.

Catch running out fuel, do not let it seep into the ground and dispose off environmentally.

### Working on wheels and tires

Explosion-like bursting of tires or parts of tires and rims can cause most severe or even deadly injuries.

Assemble the tires only if are sufficiently experienced and with the right tools at hand. If necessary have the tires assembled in a qualified workshop.

Always ensure the correct tire pressure and do not exceed the specified maximum pressure.

Check tires and wheels every day for specified pressure, cuts, bulges, damaged rims, missing wheel studs or nuts. Do not drive with damaged tires or wheels.

Ant-sticking emulsions for tires must only consist of water and anti-sticking agent, in a concentration in accordance with the specifications of the manufacturer of the anti-sticking agent. Observe applicable environmental regulations.

### Working on the air conditioning

Faults on the air conditioning should only be remedied by professional personnel.

According to the regulation for pressure reservoirs all pressure reservoirs must be repeatedly inspected by a specialist.

In connection with this inspection the drier/collector unit must be visually examined twice every year. During these inspections special attention must be paid to corrosion and mechanical damage.

Do not perform welding work in the vicinity of the air conditioning. Danger of explosion!

Do not clean the condenser in the air conditioning system with a hot water jet. Danger of explosion!

Do not release refrigerant into the atmosphere, but dispose of environmentally.

### Cleaning work

Do not perform cleaning work while the motor is running.

Do not use gasoline or other easily inflammable substances for cleaning.

When cleaning with steam cleaning equipment do not subject electrical parts and insulation material to the direct jet of water, or cover it beforehand.

- Do not guide the water jet into the exhaust and into the air filter.

### After maintenance work

After all maintenance work is completed reinstall all guards and safety installations.

### Repair

Mark a defective machine by attaching a warning tag to the steering wheel.

Repair work must only be performed by qualified and authorized persons. Use our repair instructions for this work.

Exhaust gases are highly dangerous! Always ensure an adequate supply of fresh air when starting in closed rooms!

Do not work on the fuel system while the engine is running - danger to life!

The system is under high pressure! Keep away from leakages in the high pressure system, because fuel squirting out may cause severe injury. After shutting down the engine wait for another minute, until the pressure has dropped to a permissible level. In case of leakages you should contact the Service Department of the engine manufacturer and refrain from starting the engine.

### Test

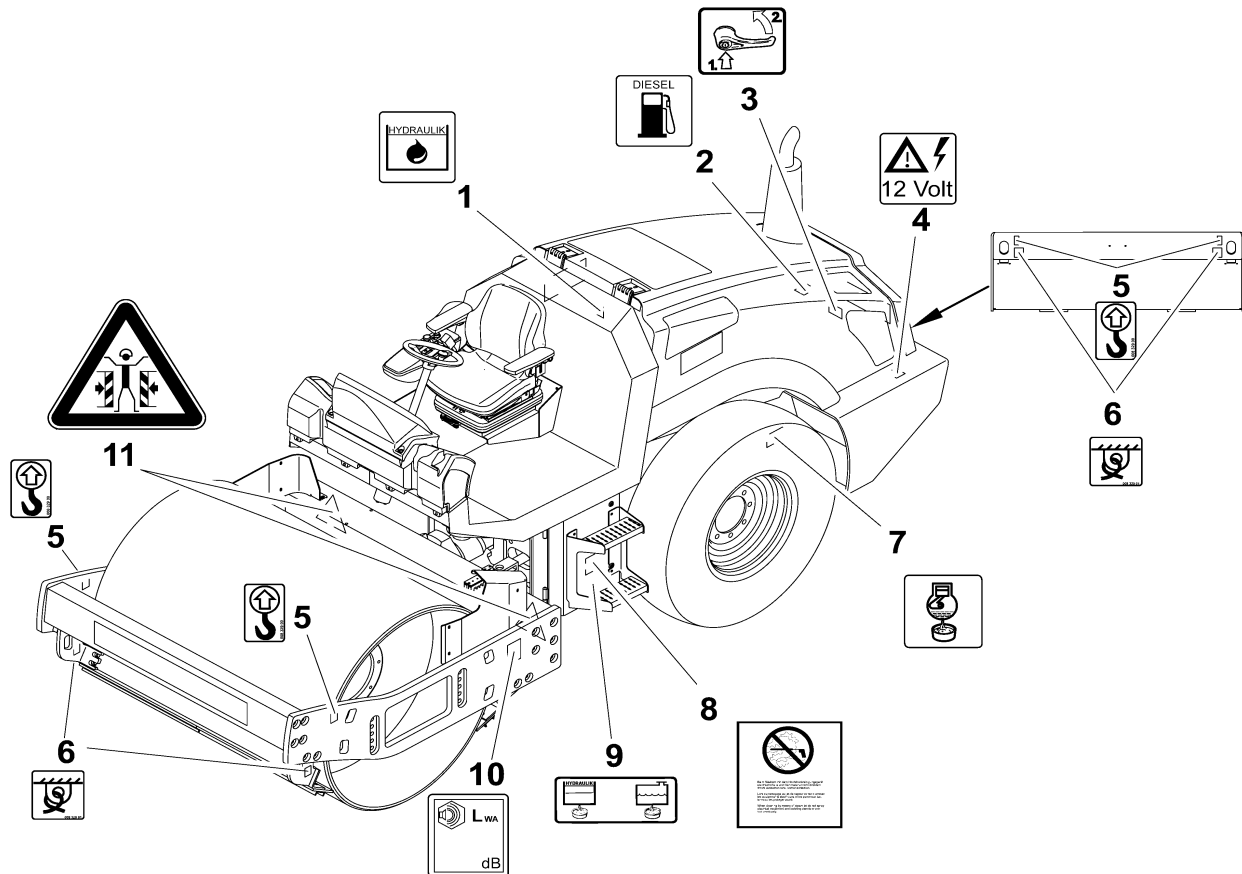
The safety of compaction equipment must be checked by a specialist as required in dependence on the application and the operating conditions, however at least once every year.

### Information and safety stickers/decals on the machine

Keep stickers/decals complete (see spare parts catalogue) and fully legible and observe their meaning.

Replace damaged or illegible stickers/decals immediately.

## Safety regulations



583062

Fig. 6

### Stickers and decals

- 1 Information sticker "Hydraulic oil"
- 2 Information sticker "Diesel"
- 3 Operation sticker "Hood handle"
- 4 Information sticker "Vehicle voltage 12 V"
- 5 Information sticker "Lifting point"
- 6 Information sticker "Lashing points"
- 7 Information sticker "Engine oil drain port"
- 8 Prohibition sticker "High pressure cleaner"
- 9 Information sticker "Hydraulic oil and coolant drains"
- 10 Information sticker "Guaranteed sound capacity level"
- 11 Warning sticker "Danger of crushing"

Safety regulations

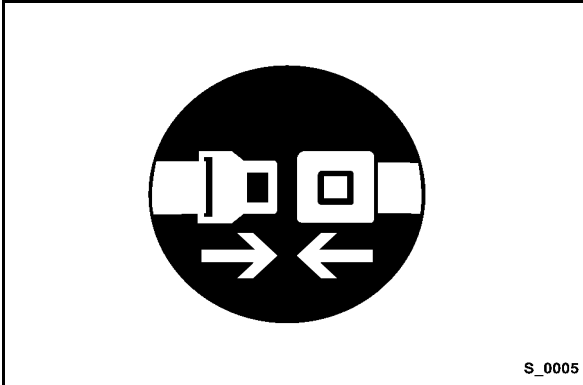


Fig. 7

Instruction sticker - Always wear your seat belt

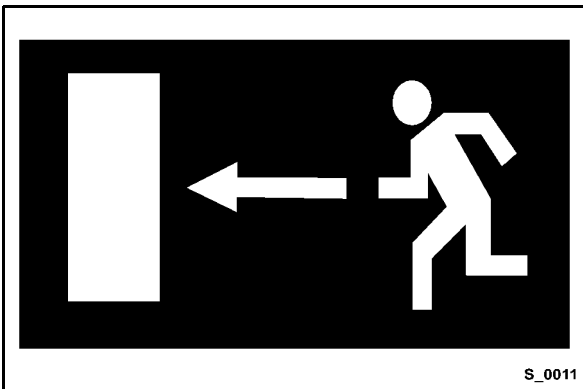


Fig. 8

Information sticker "Emergency exit"

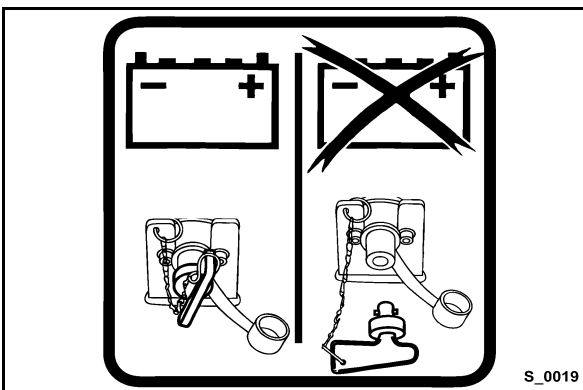


Fig. 9

Information sticker - Main battery switch\*

\* Optional equipment

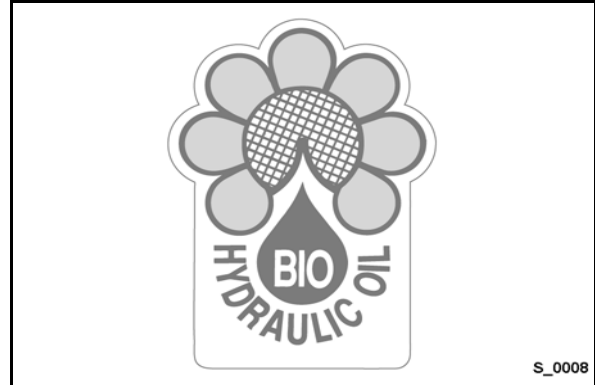


Fig. 10

Information sticker "Bio Hydraulic Oil"\*\*



Fig. 11

Information sticker "Panolin 46"\*\*\*

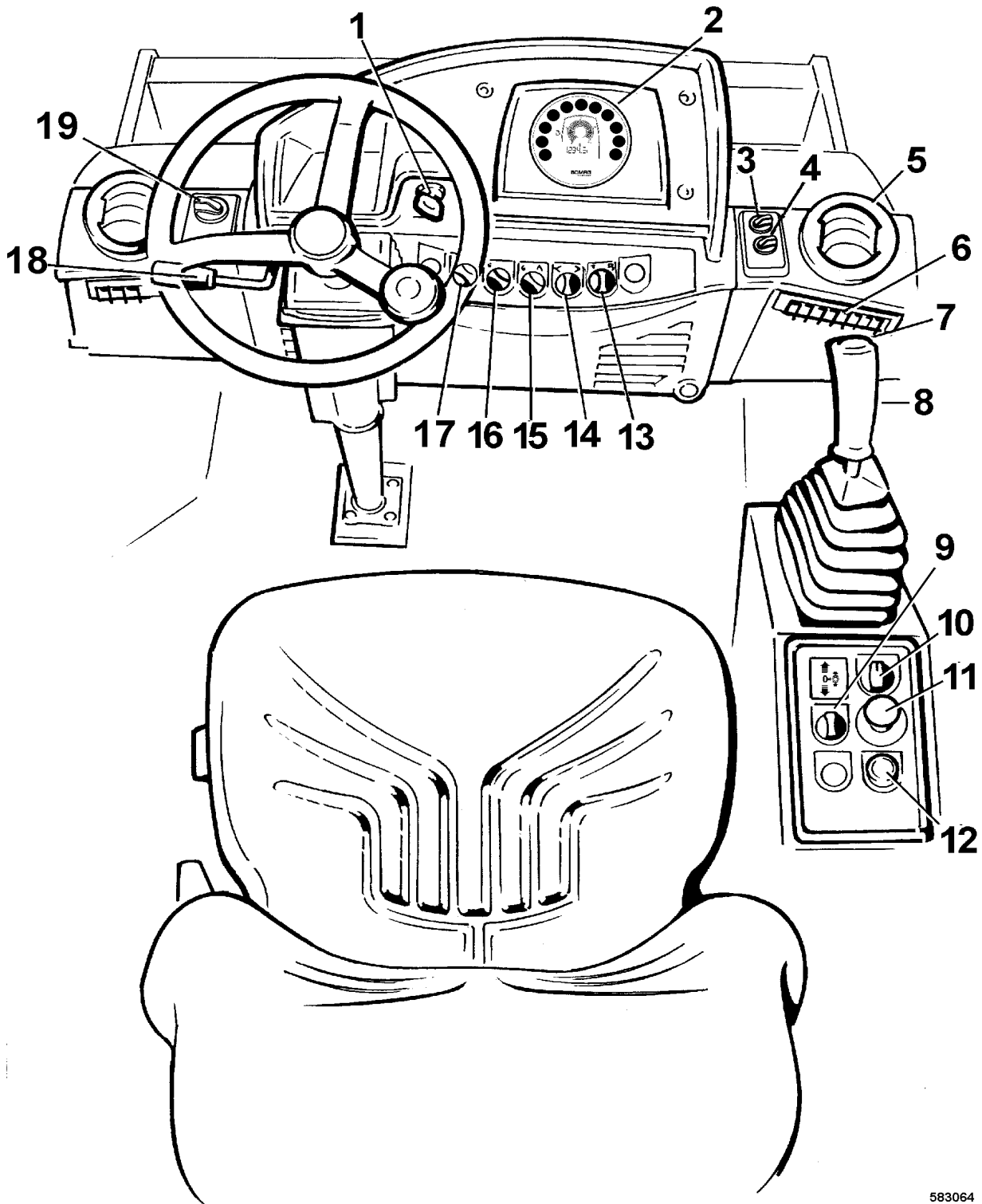
\*\* Optional equipment

\*\*\* Optional equipment



### 3 Indicators and Controls

Indicators and Controls



583064

Fig. 12





## Indicators and Controls

- |  |   |
|--|---|
| 1 Start switch                                     | 11 Emergency stop push button                       |
| 2 Instrument cluster                               | 12 Push button for warning horn                     |
| 3 Rotary switch for cabin fan*                     | 13 Rotary momentary contact switch for engine speed |
| 4 Rotary switch for air conditioning system*       | 14 Rotary switch for direction indicators*          |
| 5 Vent for heating and ventilation, driver         | 15 Rotary switch for hazard light system*           |
| 6 Vent for heating and ventilation, footwell       | 16 Rotary switch for lighting*                      |
| 7 Push button vibration                            | 17 Rotary switch for working head lights*           |
| 8 Travel lever                                     | 18 Steering wheel adjustment lever                  |
| 9 Rotary switch for vibration, amplitude selection | 19 Rotary switch for cabin heater*                  |
| 10 Rotary switch for travel ranges                 |   |
| * Optional equipment                               |   |

## Indicators and Controls

### 3.1 General notes

If you are not yet familiar with the control and display elements on this machine you should read this section thoroughly before starting any operation on the machine. Here all functions are described in detail.

The section "Operation" contains only brief descriptions of the individual control steps.

### 3.2 Description of indicators and control elements

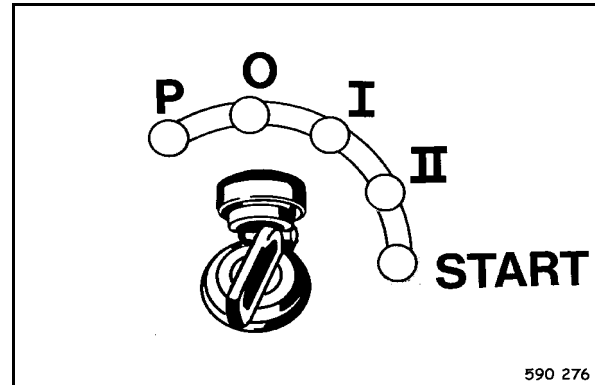


Fig. 13

#### No. 1 = Start switch

Position "P", "0" = Ignition off, key can be pulled out

Position "I", "II" = Ignition on, all control and warning lights in the instrument cluster light up for 3 seconds (test function). The oil pressure warning light flashes, charge control light and parking brake warning light stay on. The preheating control light lights up in case of low temperatures.

#### **i** Note

*The engine can only be started if both travel levers are in "neutral".*

*The starter switch is designed with a re-start lock. For a new starting attempt the ignition key must first be turned back to position "0".*

Position "START" = Turn further against spring pressure, the engine starts, turn the ignition key back to position "I" once the engine has started.

#### **⚠** Caution

**Run the engine warm for a short while before starting work. Do not rev up a cold engine to high idle speed/full load speed.**

## Indicators and Controls

**Do not shut down the engine all of a sudden from full load speed, but let it idle for about 2 minutes.**

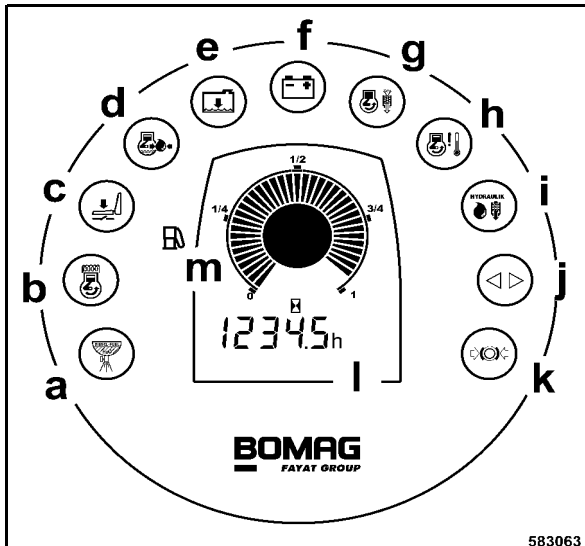


Fig. 14

### No. 2 = Instrument cluster

#### **i** Note

With the ignition switch in position "I" all control and warning lights are switched on for a moment.

- a** yellow = Water in fuel warning light  
Lights when the water content in the fuel pre-cleaner reaches the sensor contacts. Warning buzzer sounds. The engine is shut down after 2 seconds.  
Clean the water separator.
- b** yellow = Preheating control light  
Lights when temperatures are low (pre-heating for starting)
- c** yellow = Driver's seat warning light  
Lights when the driver's seat is not occupied. If the machine is travelling the warning buzzer will sound, engine is shut down after 4 seconds. To continue travelling occupy the driver's seat and shift the travel lever through the braking position.
- d** red = Engine oil pressure warning light  
Flashes when the engine oil pressure is too low, the warning buzzer sounds, the engine is shut down after

10 seconds.

Check engine oil level, repair the engine if necessary.

- e** red = Coolant level warning light  
Flashes if the coolant level is too low, the warning buzzer sounds, the engine is shut down after 10 seconds. Check coolant level. Check cooling system for leaks, repair if necessary.
- f** yellow = Charge control light  
Lights when the battery is not being charged.  
Check V-belt, if necessary repair the generator.
- g** yellow = Air filter warning light  
Lights when the combustion air filter cartridge is contaminated, the warning buzzer sounds.  
Clean or replace, as necessary.
- h** red = Warning light engine overheating  
Flashes if the engine overheats, the warning buzzer sounds, the engine is shut down after approx. 2 minutes.  
Clean engine oil cooler, repair the engine is necessary.
- i** yellow = Hydraulic oil filter warning light  
Lights when the hydraulic oil filter is contaminated, the warning buzzer sounds, the engine is shut down after 2 minutes.  
Check hydraulic system, replace hydraulic oil filter.
- j** green = Indicator control light
- k** red = Parking brake warning light  
Lights when the parking brake is applied
- l** = Operating hour meter  
Counts the operating hours while the engine is running.  
All maintenance work must be performed according to the indicated operating hours.
- m** = Fuel level gauge

## Indicators and Controls

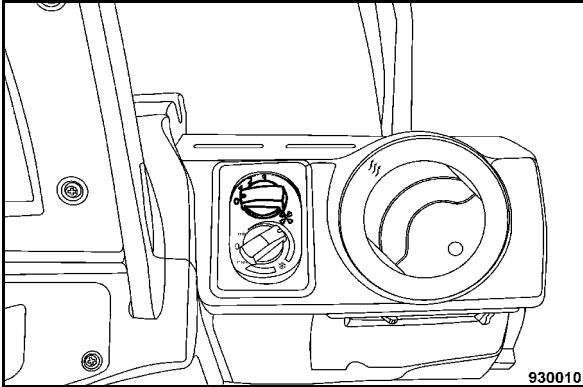


Fig. 15

### No. 3 = Rotary switch for cabin fan

Position 0 = Cabin fan switched off.

Position 1, 2 and

3 = Fan stages of different strengths

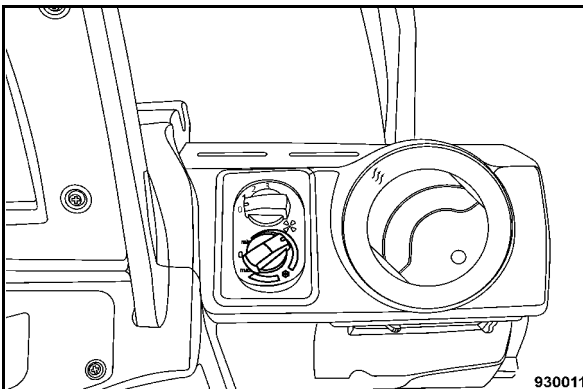


Fig. 16

### No. 4 = Rotary switch for air conditioning system\*

#### **i** Note

Only switch the air conditioning system on when the rotary switch for the cabin fan in position 1, 2 or 3.

Position 0 = Air conditioning switched off.

\* Optional equipment

Position min. and max. = Air conditioning control segment

No. 5 = Vents for air conditioning, heating and ventilation, driver

No. 6 = Vents for air conditioning, heating and ventilation, footwell\*\*

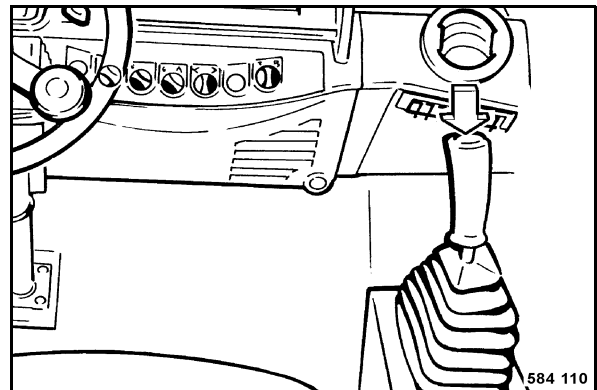


Fig. 17

### No. 7 = Push button vibration

. = Switching the vibration on

press again = Switching the vibration off

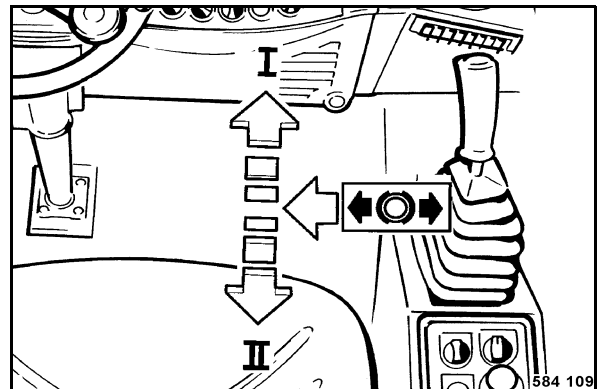


Fig. 18

### No. 8 = Travel lever

Position "middle" = Braking position service brake

Position "middle, right" = Parking brake, to start the engine

Position "I" = Forward travel

Position "II" = Backwards travel

\*\* Optional equipment

## Indicators and Controls

### **i** Note

If the engine speed drops under load when driving on steep gradients, take the travel lever slightly back towards neutral. This relieves the hydraulic system and reduces the load on the diesel engine.

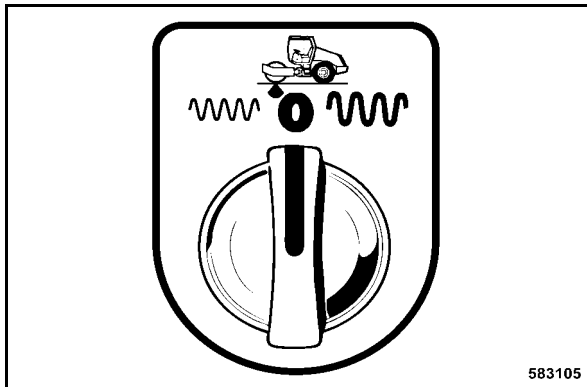


Fig. 19

### **No. 9 = Rotary switch for vibration, amplitude selection**

- Position left = low amplitude, high frequency
- Position "middle" = Vibration off
- Position right = high amplitude, low frequency

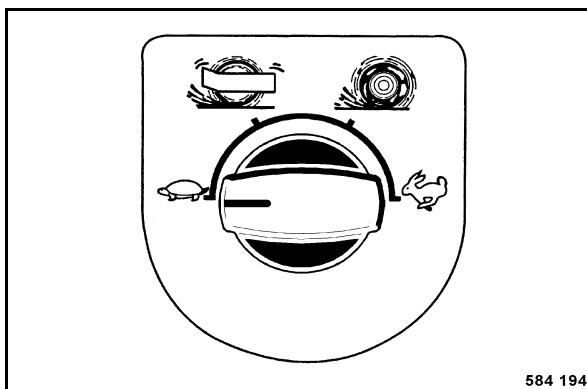


Fig. 20

### **No. 10 = Rotary switch for speed ranges without ASC**

- Position "turtle" = Working speed range on level ground
- Position "Drum" = if the drum starts to slip
- Position "Wheels" = if the wheels are slipping

- Position "rabbit" = Transport speed range, e.g. to drive to the work location

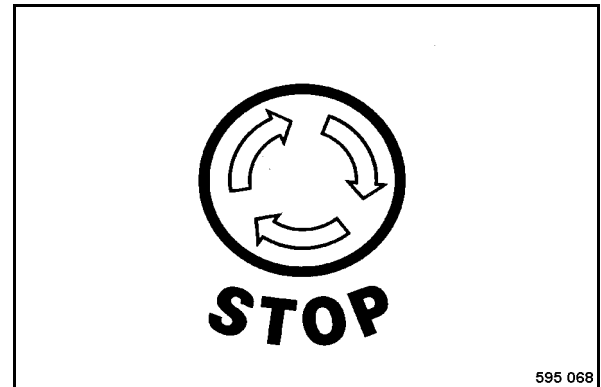


Fig. 21

### **No. 11 = Emergency stop switch**

The engine will be shut down and the brake will close.

### **⚠ Danger**

#### **Danger of accident!**

**Operate only in emergency situations during operation, do not use as a service brake.**

**The machine should only be started again after the danger, that caused the actuation of the emergency stop switch, has been removed.**

- operate = push the button completely down, it will automatically lock in end position.
- unlock = turn the button clockwise and release it.
- to drive = move the travel lever first to braking position, then start the engine and choose the travel direction.

For safety reasons the travel system of the machine will only be enabled after the travel lever has been shifted back to braking position.

Indicators and Controls

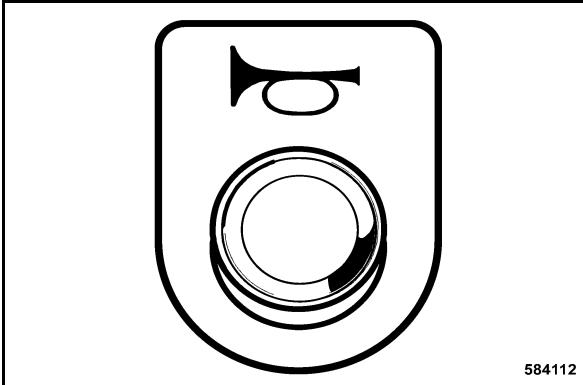


Fig. 22

No. 12 = Push button for warning horn

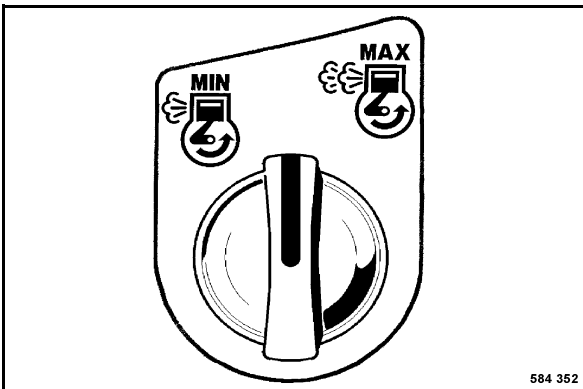


Fig. 23

No. 13 = Rotary momentary contact switch for engine speed

Electric engine speed adjustment

Momentary con-

tact position left = Idle speed position

**i Note**

Normal position for engine start.

Momentary con-

tact position

right

= Full throttle position, operating position for driving and vibration

**⚠ Caution**

Always drive and vibrate with max. engine speed! Control the travel speed with the travel lever.

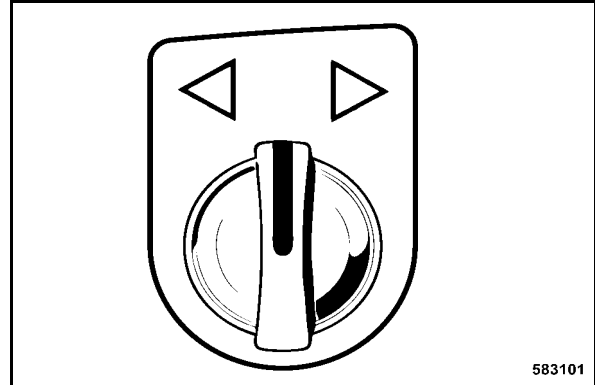


Fig. 24

No. 14 = Rotary switch for direction indicators\*

Position "mid-

dle"

= Direction indicators disabled

Position "left or

right"

= Front and rear direction indicators on the corresponding side are flashing. Indicator control light in instrument cluster flashes.

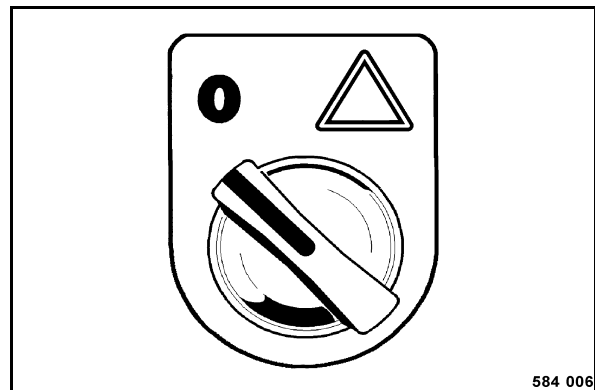


Fig. 25

No. 15 = Rotary switch for hazard light system\*\*

Position "left"

= Hazard light system switched off

Position "right"

= Hazard light system switched on. All flashing lamps and the flashing control light in the instrument cluster are flashing.

\* Optional equipment

\*\* Optional equipment

Indicators and Controls

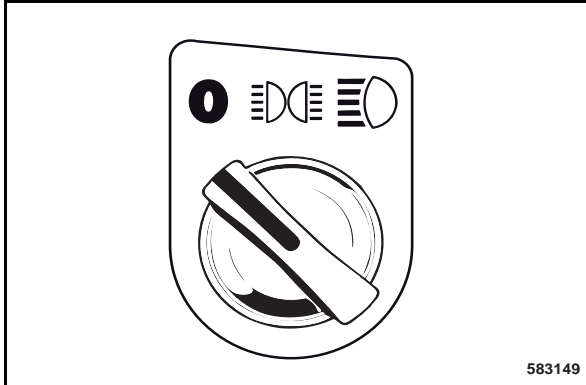


Fig. 26

**No. 16 = Rotary switch for lighting \***

- Position Left = Light off
- Position "middle" = Sidelights on, with ignition switch in position "I" or "P"
- Position Right = Travel light on with ignition switch in position "I"

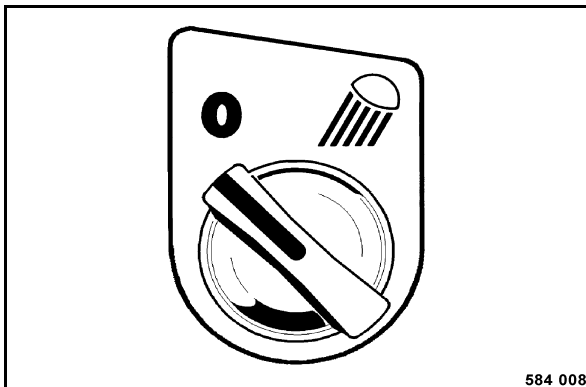


Fig. 27

**No. 17 = Rotary switch for working lights \*\***

- Position "left" = Light off
- Position "right" = Working lights on, with ignition switch in position "I".

\* Optional equipment  
\*\* Optional equipment

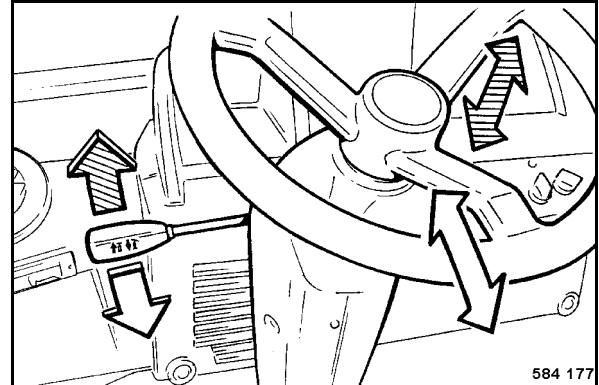


Fig. 28

**No. 18 = Lever, steering wheel adjustment \*\*\***

**⚠ Danger**

**Danger of accident!**

**Do not adjust the steering wheel while driving.**

- pull up = adjust height of steering wheel
- press down = adjust inclination of steering wheel

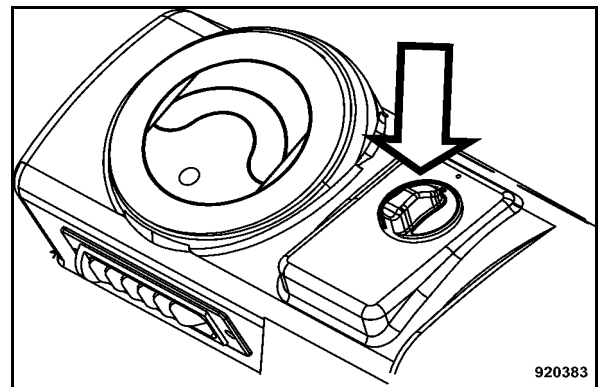


Fig. 29

**No. 19 = Rotary switch for cabin heater**

- Position "0" = Cabin heater switched off
- Position red range = Temperature selection for cabin heating

\*\*\* Optional equipment

## Indicators and Controls

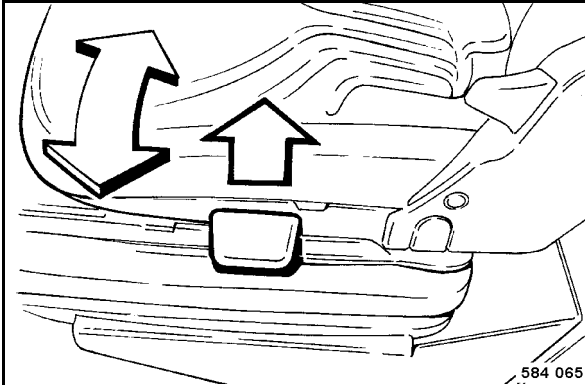


Fig. 30

**No. 20 = Lever, swivelling of driver's seat\***

### **⚠ Danger**

**Danger of accident!**

**Always lock the driver's seat in one of the locking positions while driving.**

**Do not swivel the driver's seat while driving.**

turn = Stop the machine and apply the parking brake. Pull the lever up and swivel the driver's seat to the desired position.

### **i Note**

*Swivelling angle max. 20° to either side.*

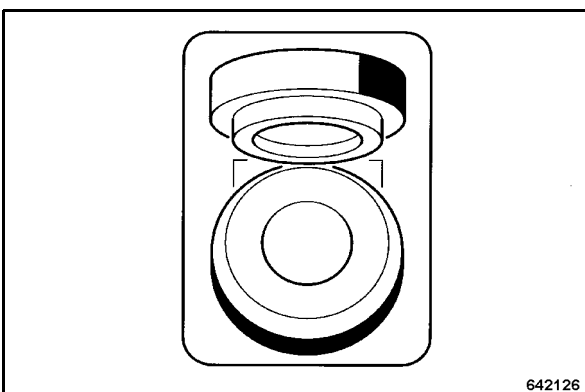


Fig. 31

**No. 21 = 2-pole socket**

Current only with the ignition switch in position "I" or when the engine is running.

\* Optional equipment

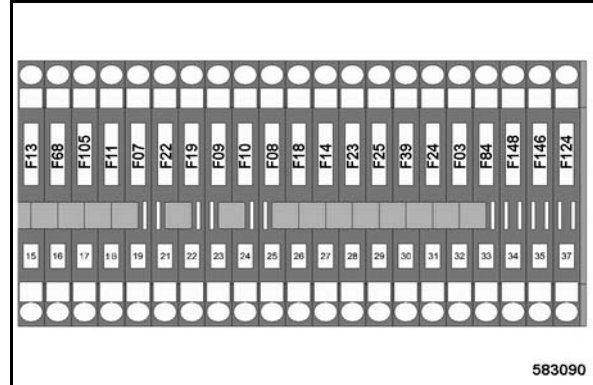


Fig. 32

**No. 22 = Fuses in electric junction box**

### **⚠ Danger**

**Fire hazard!**

**Do not use fuses with higher ampere ratings and do not bridge fuses.**

- (15) 30A = (F13) Start switch
- (16) 5A = (F68) Electronic immobilizer
- (17) 20A = (F105) Engine speed
- (18) 15A = (F11) Front head lights\*\*
- (19) 15A = (F07) Hazard light
- (21) 15A = (F22) Working headlights, rear
- (22) 15A = (F19) Working headlights, rear
- (23) 15A = (F09) Parking and tail light, left\*
- (24) 15A = (F10) Parking and tail light, right\*
- (25) 15A = (F08) Direction indicators\*
- (26) 10A = (F18) Pre-fuse for working head lights
- (27) 15A = (F14) Engine solenoid
- (28) 10A = (F23) Warning horn
- (29) 10A = (F25) solenoid valve for driving and braking
- (30) 15A = (F39) Main fuse for cabin
- (31) 10A = (F24) Instruments
- (32) 15A = (F03) Vibration
- (33) 10A = (F148) Control MESX, potential 15\*
- (34) 10A = (F84) control, contact 54
- (35) 15A = (F146) Control MESX, potential 30\*
- (37) 25A = (F124) Fuel pre-heating\*

\*\* Optional equipment



Indicators and Controls

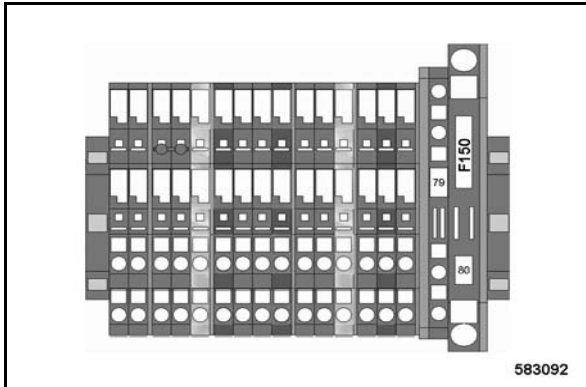


Fig. 33

(80) 5A = (F150) GPS Receiver\*

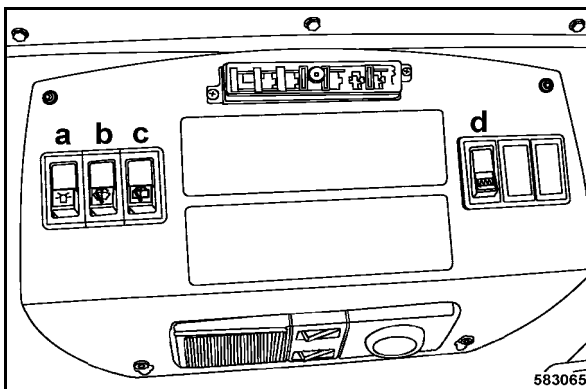


Fig. 34

**No. 23 = Toggle switch, cabin**

**a = toggle switch for flashing beacon**

**b = toggle switch for front windscreen wiper/washer**

- up = windscreen wiper moves to end position and stops.
- down = Switches on front windscreen wiping.
- Push button = Front windscreen is sprayed during wiping.

**c = toggle switch for rear windscreen wiper/washer**

- up = windscreen wiper moves to end position and stops.
- down = Switches on wiping of rear windscreen.
- Push button = Rear windscreen is sprayed during wiping.

**d = toggle switch for rear windscreen heating**

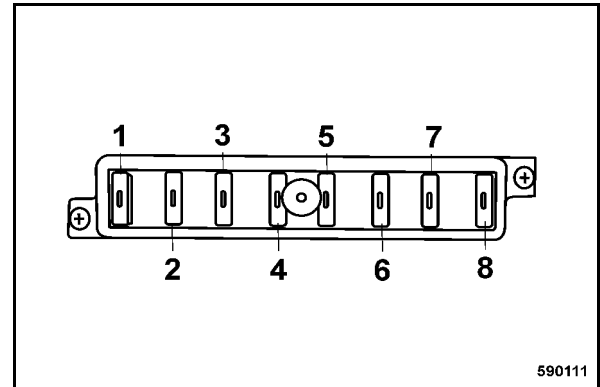


Fig. 35

**⚠ Danger**  
**Fire hazard!**

**Do not use fuses with higher ampere ratings and do not bridge fuses.**

- (1) 15A = (F43) Wiper/washer, rear
- (2) 15A = (F44) Wiper/washer, front
- (3) 10A = (F130) Night light
- (4) 25A = (F31) Cabin ventilator
- (5) 10A = (F41) Flashing beacon
- (6) 15A = (F144) Cab socket
- (7) 15A = (F143) Rear windscreen heating
- (8) 10A = (F42) Cab lights

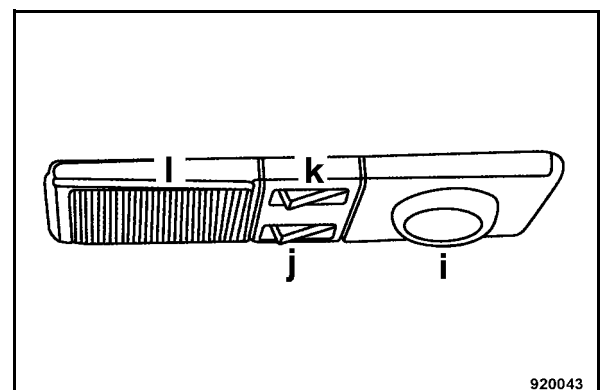


Fig. 36

**No. 24 = Cabin light**

## Indicators and Controls

i = reading and dashboard light

j = toggle switch for reading and dashboard light

k = toggle switch for cabin light

l = cabin light

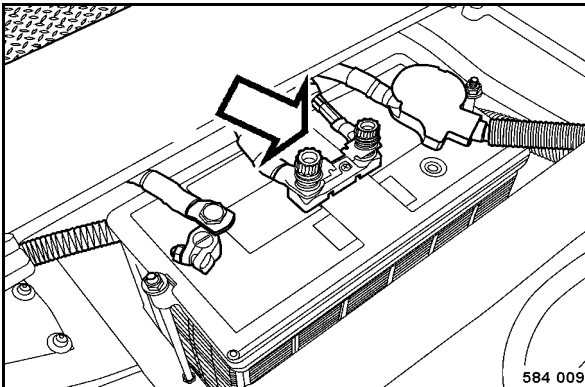


Fig. 37

**No. 25 = Main fuse for battery**

125A = (F00)

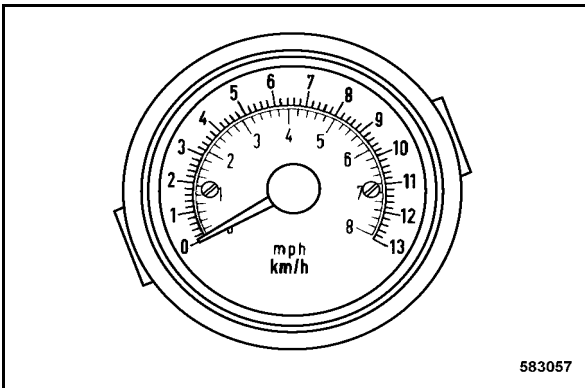


Fig. 38

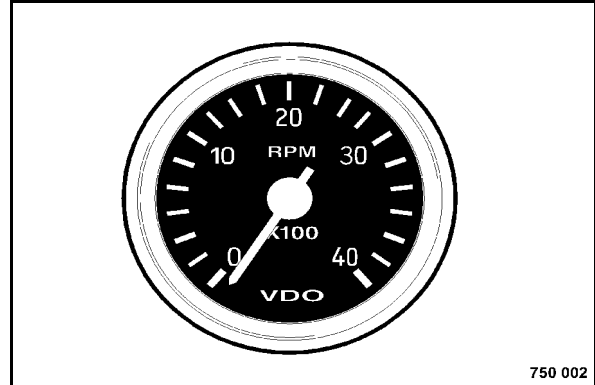
**No. 26 = Speedometer\***

Shows the travel speed of the machine.

outer scale = km/h

inner scale = mph

\* Optional equipment



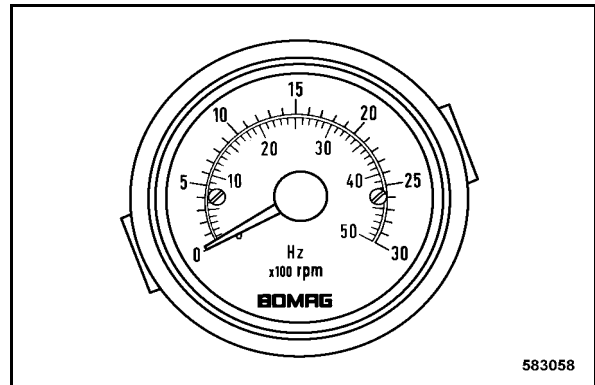
750 002

Fig. 39

**No. 27 = Tachometer for diesel engine\*\***

shows the rotational speed of the diesel engine.

Scale value x 100 = revolutions per minute



583058

Fig. 40

**No. 28 = Vibration frequency display\*\*\***

Shows the vibration frequency.

outer scale = Frequency in  $\text{min}^{-1} \times 100$

inner scale = Frequency in Hz

\*\* Optional equipment

\*\*\* Optional equipment

Indicators and Controls

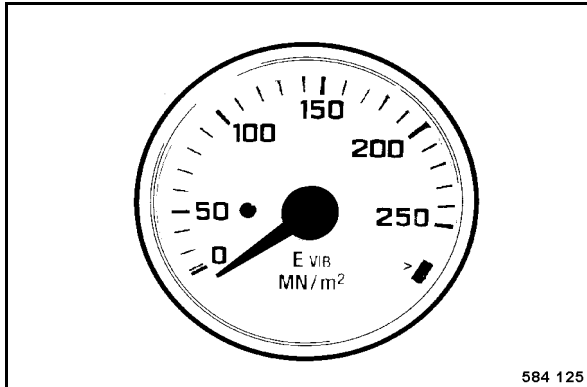


Fig. 41

**No. 29 = E<sub>VIB</sub>display\***

is a compaction measuring unit for continuous display of the load bearing characteristics (MN/m<sup>2</sup>) during the compacting pass.

**E<sub>VIB</sub> value**

- Increase = higher load bearing capacity
- Constant = end of compaction

**i Note**

Modular upgrading to BTM plus / BTM prof and/or BCM 05 possible.

\* Optional equipment

## Indicators and Controls

### 3.3 Display and control elements

#### BTM\*

\* Optional equipment

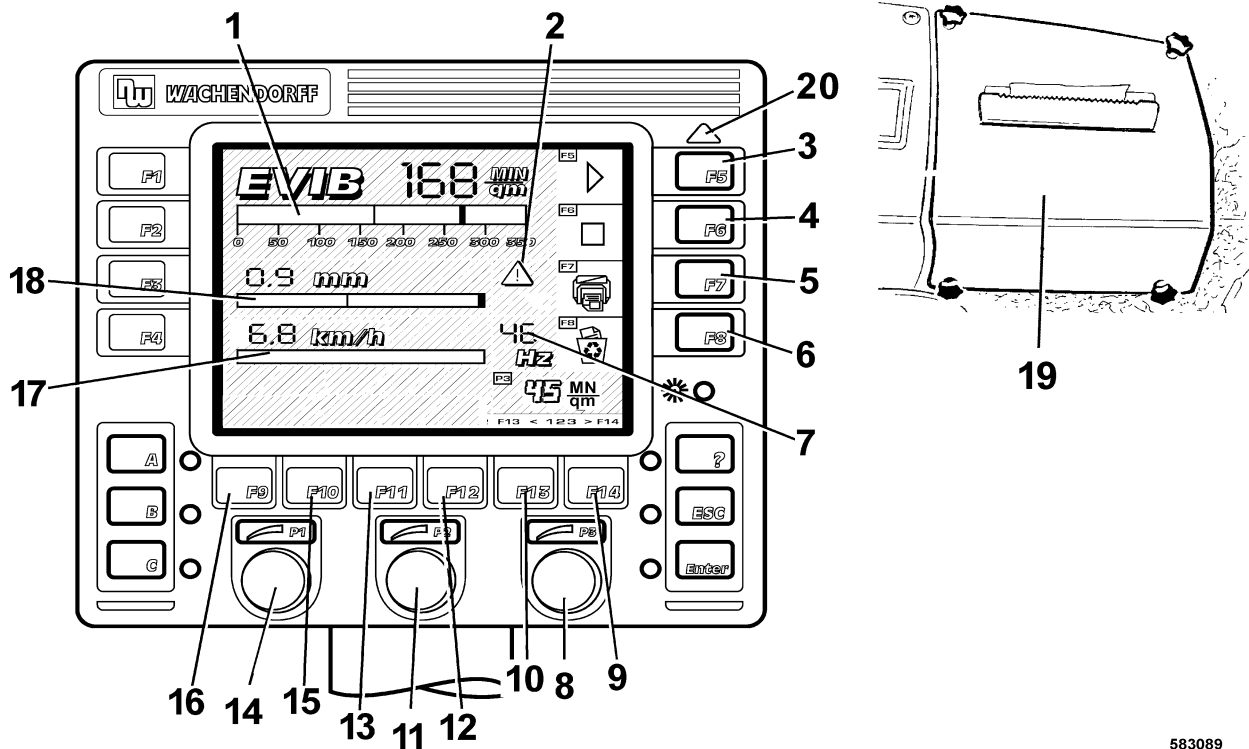


Fig. 42

- |    |  |    |  |
|----|--|----|--|
| 1  | EVIBdisplay                            | 11 | not used                                     |
| 2  | Display for jump operation             | 12 | not used                                     |
| 3  | Push button F5 START                   | 13 | not used                                     |
| 4  | Push button F6 STOP                    | 14 | not used                                     |
| 5  | Push button F7 PRINT (only BTM prof)   | 15 | not used                                     |
| 6  | Push button F8 DELETE                  | 16 | not used                                     |
| 7  | Vibration frequency display            | 17 | Speed display                                |
| 8  | Rotary switch setting of nominal value | 18 | Amplitude display                            |
| 9  | Push button F14 nominal value increase | 19 | Printer for measuring values (only BTM prof) |
| 10 | Push button F13 nominal value decrease | 20 | Fault light                                  |



## Indicators and Controls

### 3.4 Description of indicating and control elements BTM

**i Note**

The BTM plus can be upgraded to BTM prof and/or BCM 05.

#### Surface covering dynamic compaction control (SCCC)

The BOMAG compaction measuring systems  $E_{VIB}$ -meter (BEM) and Terrameter BTM plus/prof are integrated in the work process for continuous and surface covering evaluation of compaction and load bearing capacity of soils and non-bonded bearing courses.

The  $E_{VIB}$ -value, designated as vibration modulus, with the unit  $MN/m^2$  is directly linked with the deformation modules EV1 or EV2 known from the plate load test acc. to DIN 18134.

**No. 1 =  $E_{VIB}$ -display**

Display of the dynamic soil stiffness in  $MN/m^2$ .

**No. 2 = Display for jump operation**

yellow symbol = Drum jumps  
red symbol = Drum jumps excessively or tumbles

Select a smaller amplitude, if necessary!

**No. 3 = Button F5 START**

press = Starts recording of measuring values

Control field "F5" flashes green on the screen.

**No. 4 = Button F6 STOP**

press = Stops recording of measuring values

The green control field "F7" PRINT on the screen lights up.

**i Note**

Depending on the measuring result the green control field "F5" CONTINUE or the red control field "F6" FINISHED will light up.

**No. 5 = Button F 7 Print\***

To print out the measuring data saved during the last pass press button F7 PRINT.

short actuation = Line diagram

long actuation  $\geq 5$

sec. = Bar chart

Control field F7 goes out and the measuring value printer starts to print out measuring data.

**i Note**

After the printing process has finished any amount of diagrams can be printed out by pressing the same button F7 (PRINT).

**No. 6 = Button F8 DELETE**

press = All stored faults are deleted.

**⚠ Caution**

If the increase of the measuring value is to be calculated on a track press button F8 DELETE only when changing the track.

**No. 7 = Frequency display**

with vibration switched on this instrument shows the frequency (rotating speed) of the exciter shaft.

**No. 8 = Rotary switch P3 pre-setting of nominal values**

The desired maximum dynamic stiffness modulus  $E_{VIB}$  [ $MN/m^2$ ] can be pre-selected in 6 stages (45, 80, 100, 120, 150 and Max.).

The selected value is shown on the screen in field „P3“

**No. 9 = Button F14 increase of nominal value**

With each actuation of the button the presetting is raised by one stage.

The selected value is shown on the screen in field „P3“

**No. 10 = Button F13 reduction of nominal value**

With each actuation of the button the presetting is reduced by one stage.

\* only with BTM prof



## Indicators and Controls

The selected value is shown on the screen in field „P3“

**No. 11 = Button F11 is not used**

**No. 12 = Button F12 is not used**

**No. 13 = Button F11 is not used**

**No. 14 = Rotary switch P1 is not used**

**No. 15 = Button F10 is not used**

**No. 16 = Button F9 is not used**

**No. 17 = Travel speed display**

Shows the travel speed of the machine.

**No. 18 = Amplitude display**

This gauge shows the current vertical amplitude of the machine.

**No. 19 = Printer for measuring values\***

To print out the measuring data saved during the last pass press button (7) "PRINT".

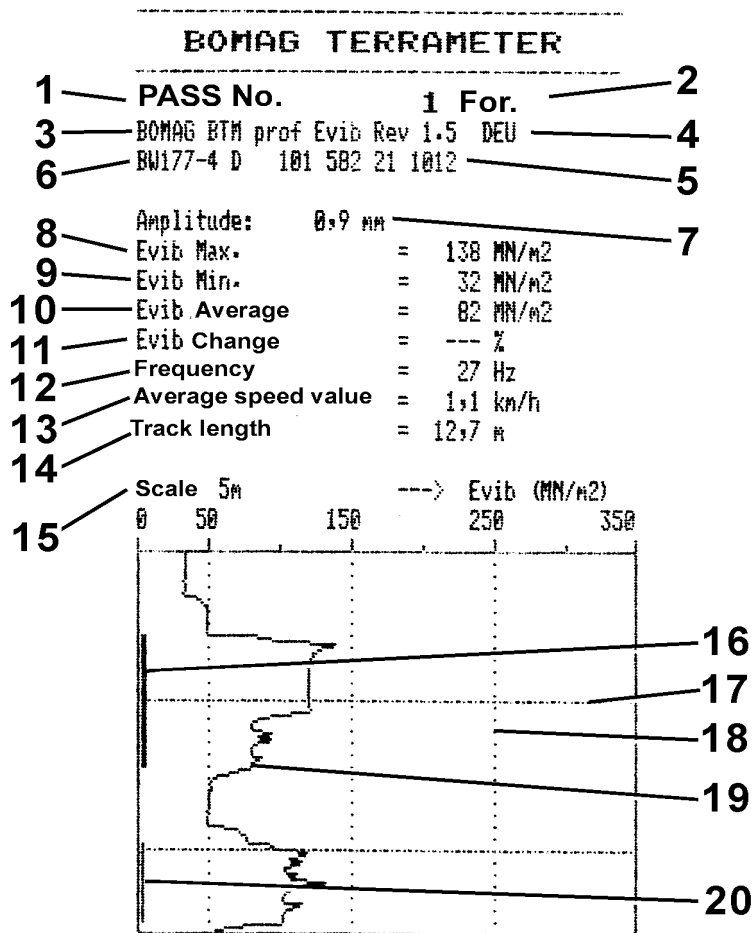
**No. 20 = Fault light**

Infor the BOMAG After Sales Service if it lights up.

Indicators and Controls

**3.5 Line diagram\* (E<sub>VIB</sub>)**

\* only BTM prof



584 200 e

Fig. 43



## Indicators and Controls

- |    |  |    |  |
|----|--|----|--|
| 1  | Pass-No.                                   | 11 | $E_{VIB}$ -change  |
| 2  | Travel direction                           | 12 | Medium frequency   |
| 3  | Machine equipment (BTM 05/BTM-E)           | 13 | Mean travel speed  |
| 4  | Software status of the measuring equipment | 14 | Track length   |
| 5  | Machine number                             | 15 | Raster division in longitudinal direction                    |
| 6  | Machine type                               | 16 | Marking (thick line) excessive jumping, tumbling of the drum |
| 7  | Amplitude                                  | 17 | Longitudinal raster line                                     |
| 8  | Maximum $E_{VIB}$ value                    | 18 | Measuring value raster line                                  |
| 9  | Minimum $E_{VIB}$ value                    | 19 | Diagram line   |
| 10 | Mean $E_{VIB}$ -value                      | 20 | Marking (thin line) jumping of the drum                      |



## Indicators and Controls

### 3.6 Description of line diagram<sup>\*</sup> ( $E_{VIB}$ )

**No. 1 = Pass**

Total number of measured passes on this track.

**No. 2 = Travel direction**

**No. 3 = Machine equipment**

**No. 4 = Software status of the measuring equipment**

**No. 5 = Machine number**

**No. 6 = Machine type**

**No. 7 = Amplitude**

This gauge shows the vertical amplitude the machine has worked with on this track.

**No. 8 = Maximum  $E_{VIB}$  value**

**No. 9 = Minimum  $E_{VIB}$  value**

**No. 10 = Mean  $E_{VIB}$ -value**

This gauge shows the vertical amplitude the machine is currently working with on this track.

**No. 11 =  $E_{VIB}$ -change**

$E_{VIB}$ -change in %. This always refers to the previous pass in the same direction of travel.

**No. 12 = Medium frequency**

**No. 13 = Mean travel speed**

shows the mean value of speed driven during this pass.

**i Note**

*Always shows the same travel speed in order to avoid a falsification of the measuring results.*

**No. 14 = Track length**

Measured track length between START and STOP.

**No. 15 = Raster division in longitudinal direction**

Is used to pinpoint individual measuring values on the measuring curve.

**i Note**

*The raster lines mark measuring track sections of 5 m length.*

\* only BTM prof

Graduation of the measuring track (track length in printout) into fixed sections.

**No. 16 = Marking of jump information**

Indicates excessive jumping/tumbling of the drum on the marked track section (thick line).

**i Note**

*Select a smaller amplitude, if necessary!*

**No. 17 = Longitudinal raster line**

**No. 18 = Measuring value raster line**

**No. 19 = Diagram line**

Shows the  $E_{VIB}$ -value at any point of the rolled track. The raster line enables the location related assignment of the  $E_{VIB}$ -value and the location of a fault (over or under compaction).

**No. 20 = Marking of jump information**

Indicates jumping of the drum on the marked track section (thin line).



## Indicators and Controls

---

### 3.7 Bar diagram\* ( $E_{VIB}$ )

---

The bar diagram differs from the line diagram only by the graphic representation of measuring values. In the bar diagram the mean values of 5 m sections are shown as bars. In addition, the  $E_{VIB}$  changes of the individual 5 m sections are specified in percent after the second pass in the same travel direction.

\* only BTM prof



## 4 Operation



## Operation

### 4.1 General

If you are not yet acquainted with the controls and indicating elements on this machine you should thoroughly read chapter 3 “Indicators and control elements” before starting work.

All indicators and control elements are described in detail in this chapter.

### 4.2 Tests before taking into operation

Before the everyday use or before a longer working period the following tests and inspections must be performed.

#### **⚠ Danger**

**Danger of accident!**

**Please observe strictly the safety regulations in chapter 2 of this instruction manual!**

- Park the machine on ground as level as possible.

#### **Check:**

- fuel tank and fuel lines for leaks
- screw joints for tight fit
- function of steering
- function of emergency stop
- machine for cleanliness, damage
- presence of the appropriate operating and maintenance instructions
- proper maintenance of the machine

#### **i Note**

*For a description of the following tasks refer to the chapter “maintenance every 10 operating hours”.*

- Engine oil level, top up if necessary
- Fuel level, top up if necessary.
- Coolant level, top up if necessary
- Hydraulic oil level, top up if necessary.

### 4.3 Electronic immobilizer\*

Before starting the engine the anti-theft protection must be disarmed by entering a code.

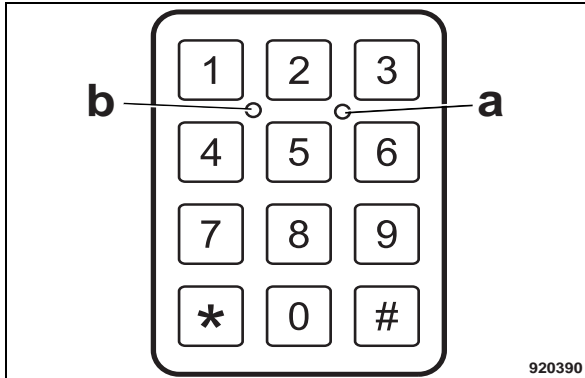


Fig. 44

**i Note**

With the electronic immobilizer armed, the light emitting diode (a) (Fig. 44) flashes slowly.

- Slowly enter the six-digit user code.

**i Note**

When entering the code, the light emitting diode (b) lights up with every digit.

- Press the diamond button.
- The electronic immobilizer is now disarmed and the engine can be started within the next 15 minutes.

\* Optional equipment

### 4.4 Starting the engine

**⚠ Danger**

**Danger of accident!**

Start the engine only from the operator's seat.

**⚠ Caution**

In this chapter it is assumed that the operator is fully acquainted with the function of the different control elements on the machine.

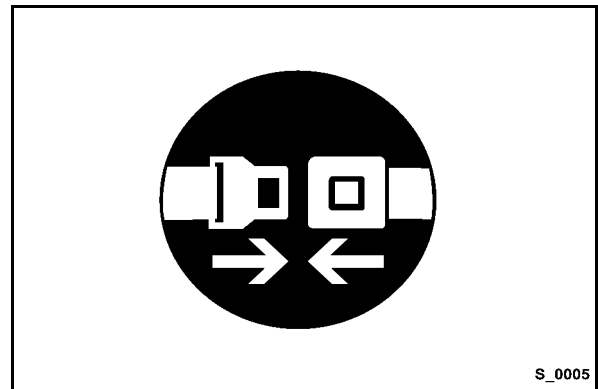


Fig. 45

- Fasten your seat belt (Fig. 45).

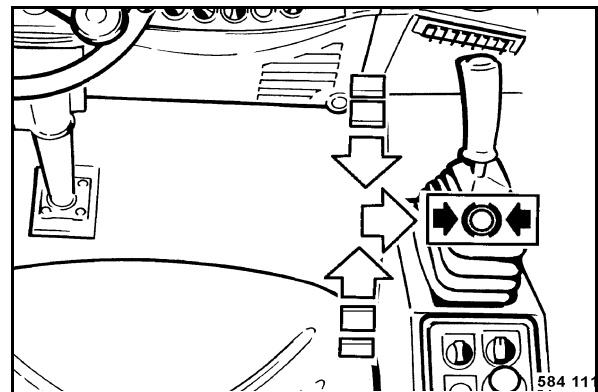


Fig. 46

- Check, whether the travel lever (Fig. 46) is engaged to the right in brake position.

## Operation

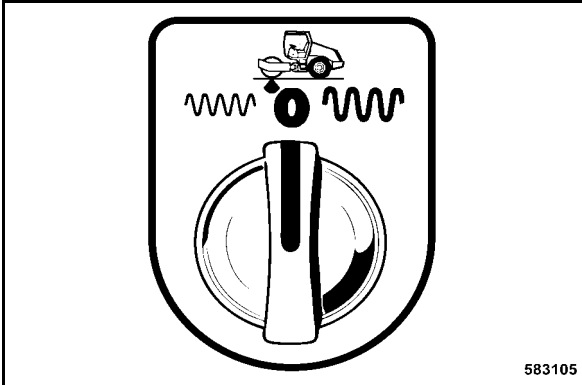


Fig. 47

- Switch the rotary switch for vibration amplitude pre-selection (Fig. 47) to position "0".

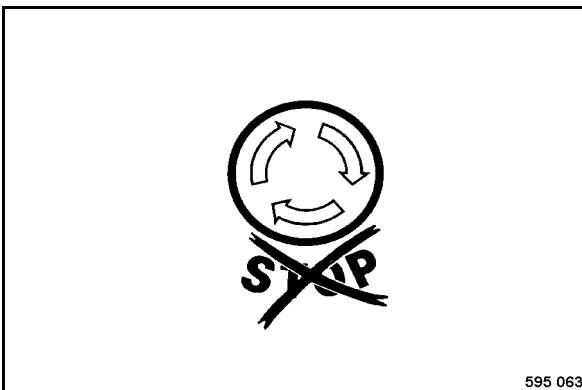


Fig. 48

- Check, whether the emergency stop switch (Fig. 48) is unlocked.

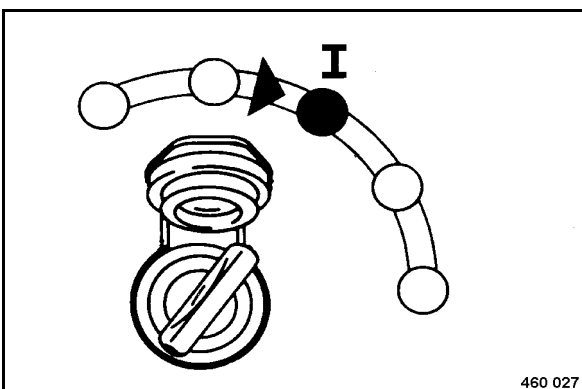


Fig. 49

- Turn the ignition key (Fig. 49) to position "I".

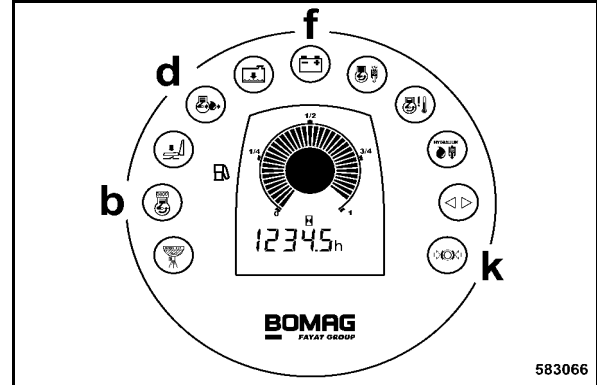


Fig. 50

All control and warning lights (Fig. 50) in the instrument cluster light up for a moment.

The engine oil pressure warning light (d) flashes, the charge control light (f) and the parking brake warning light (k) stay on.

Under cold ambient temperatures the preheating control lamp (b) will also light up. Do not start before the preheating control lamp (b) has gone out.

### Caution

Run the starting process for maximum 20 seconds without interruption and pause for a minute between starting attempts.

If the engine has not started after two attempts perform trouble shooting.

### Note

The starter switch is designed with a re-start lock. For a new starting attempt the ignition key must first be turned back to position "0".

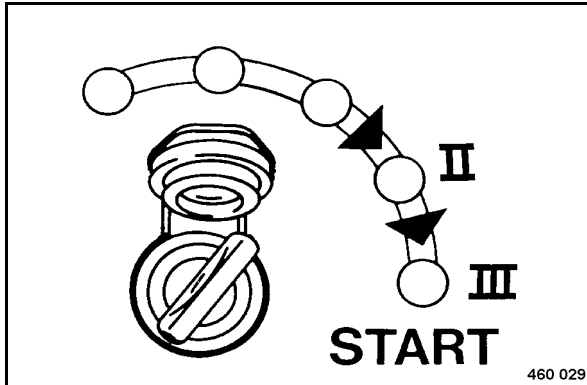


Fig. 51

- Turn the ignition key (Fig. 51) through position "II" to position "III", the starter will crank the engine.
- As soon as the engine ignites return the ignition key to position "I".

The engine oil pressure warning light and the charge control light go out. The parking brake warning light stays on.

**⚠ Caution**

**Run the engine warm for a short while before starting work. Do not rev up a cold engine to high idle speed/full load speed.**

## 4.5 Starting with jump wires

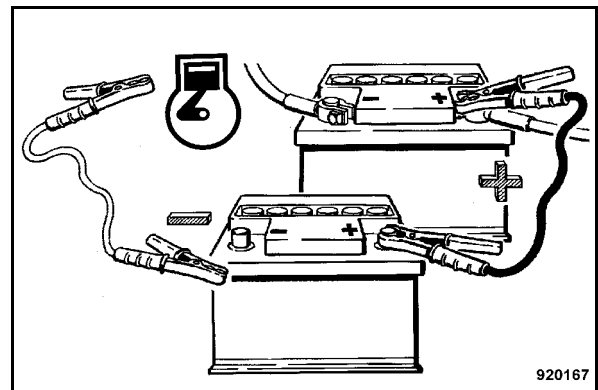


Fig. 52

**⚠ Caution**

**A wrong connection will cause severe damage in the electric system.**

- Bridge the machine only with a 12 Volt auxiliary battery.
- When jump starting with an external battery connect both plus poles first.
- Then connect the ground cable first to the minus pole of the current supplying auxiliary battery and then to engine or chassis ground, as far away from the battery as possible (Fig. 52).
- Start as described under 'Starting the engine'.
- Once the engine is running switch on a powerful consumer (working light, etc.).

**⚠ Caution**

**If no powerful consumer is switched on voltage peaks may occur when separating the connecting cables between the batteries, which could damage electrical components.**

- After starting disconnect the negative poles (ground cable) first and the positive poles after.
- Switch off the consumer.

## Operation

### 4.6 Driving the machine

#### **⚠ Danger**

**Danger of accident!**

Wet and loose soils considerably reduce the ground adhesion of the machine on inclinations and slopes.

Soil conditions and weather influences impair the gradability of the machine.

Do not drive up and down inclinations exceeding the maximum gradability of the machine (see technical data).

Do not drive without wearing your seat belt.

Always give way to loaded transport vehicles!

Before starting to drive make sure that the drive range is absolutely safe.

#### **⚠ Caution**

Always keep the cabin door closed while driving with the machine. With the door opened and the machine fully articulated extreme oscillations of the machine may damage the door.

#### **i Note**

The machine is equipped with a seat contact switch\* (safety feature).

If the driver gets up from his seat while driving, the signal horn is activated and the machine is slowed down to standstill after four seconds. When the driver sits down again the machine will continue the travel.

Before resuming operation sit down on the seat, engage the travel lever in "0"-position (brake position), then operate the travel lever again to the desired travel direction.

\* Only with option SN1



Fig. 53

- Close the cabin door (Fig. 53).

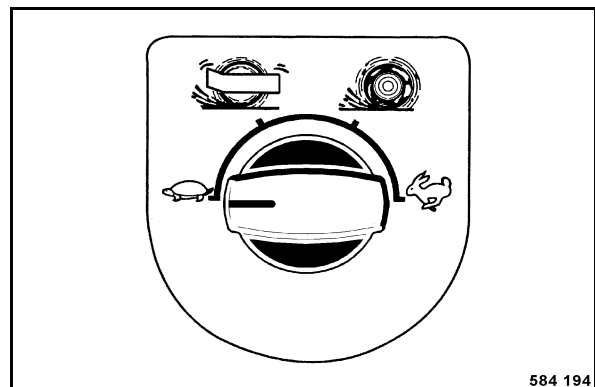


Fig. 54

- Select the desired travel speed range (Fig. 54).

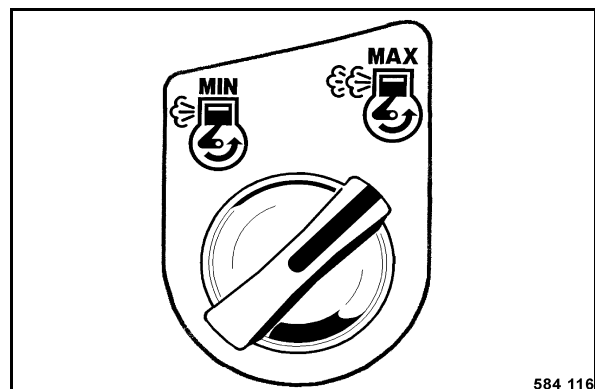


Fig. 55

- Turn the rotary momentary contact switch for engine speed (Fig. 55) clockwise to "MAX".



Operation

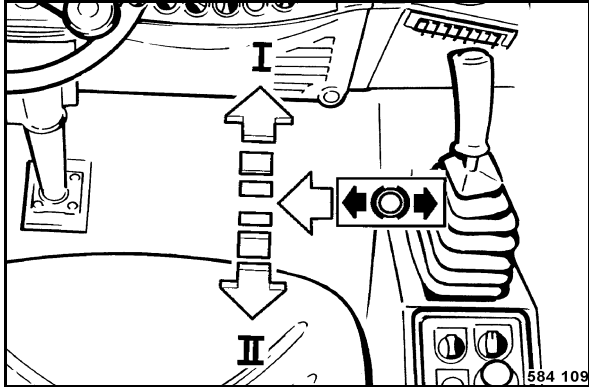


Fig. 56

- Shift the travel lever (Fig. 56) out of braking position to the left to disengage.
- Move the travel lever slowly to forward or reverse.

The machine drives forward or backward with a speed that corresponds with the actuation of the travel lever.

- Return the travel lever to position "0".

The machine decelerates to standstill.

**⚠ Danger**

**Danger of accident!**

**When stopping on inclinations and slopes pull the travel lever to the right and lock it in braking position.**

**Important notes on travel operation**

**⚠ Caution**

**When changing the travel direction hold the travel lever for a moment in "0"-position, until the machine has stopped, before actuating to the new travel direction.**

**Do not operate jerkily! Control the travel speed with the travel lever.**

**When driving up and down inclinations move the travel lever slowly back towards neutral to brake the machine.**

**If the engine speed drops under load when driving on steep gradients, take the travel lever slightly back towards neutral.**

**4.7 Stopping the machine, operating the parking brake**

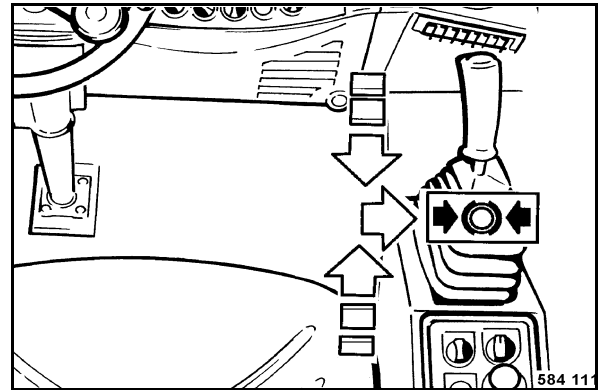


Fig. 57

- Return the travel lever (Fig. 57) slowly to "neutral"-position and engage it to the right in braking position.

The machine is automatically braked by the hydrostatic drive and the parking brake is applied.

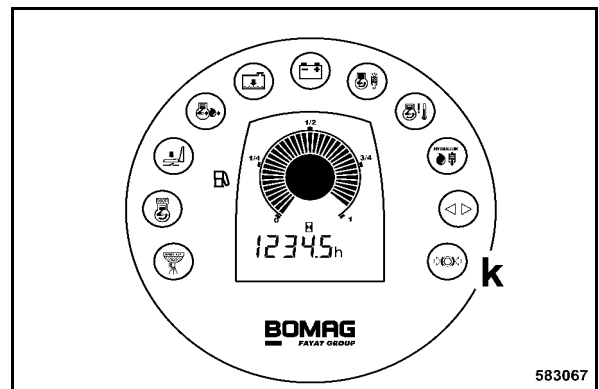


Fig. 58

The parking brake warning lamp (k) (Fig. 58) lights up.

**i Note**

*The parking brake also closes automatically when shutting the engine down.*

## Operation

### 4.8 Shutting down the engine

**⚠ Caution**

Straighten the articulated joint to provide easier access to the machine.

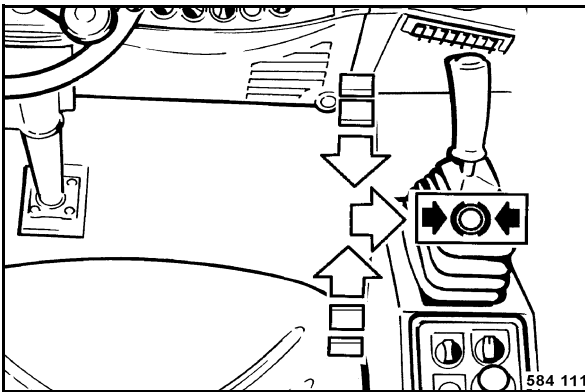


Fig. 59

- Return the travel lever (Fig. 59) slowly to "neutral"-position and engage it to the right in braking position.

The machine is automatically braked by the hydrostatic drive and the parking brake is applied.

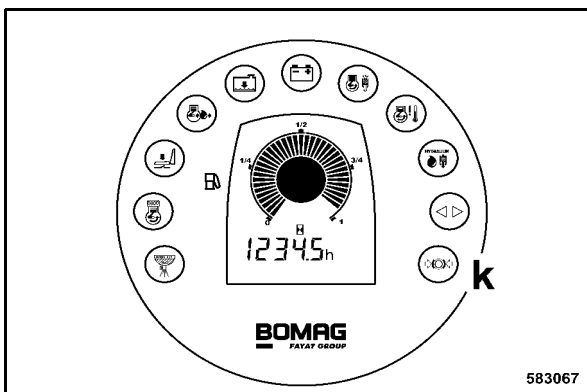


Fig. 60

The parking brake warning lamp (k) (Fig. 60) lights up.

**i Note**

The parking brake also closes automatically when shutting the engine down.

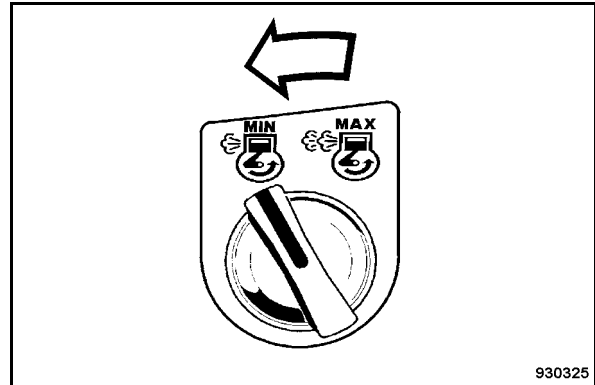


Fig. 61

- Turn the momentary contact switch for engine speed (Fig. 61) anti-clockwise to position "MIN" (idle speed).

**⚠ Caution**

Do not shut down the engine all of a sudden from full load speed, but let it idle for about 2 minutes.

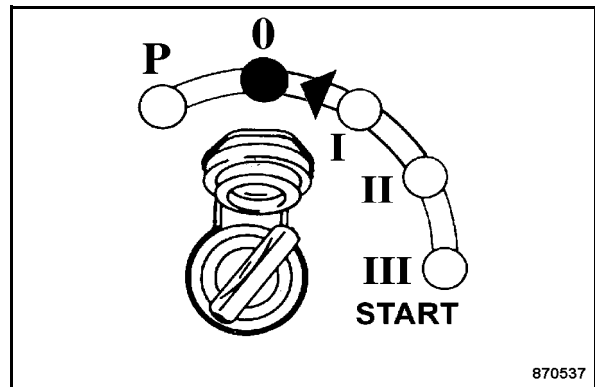


Fig. 62

- Turn the starter switch (Fig. 62) to position "0" or "P" and pull the ignition key out.

**i Note**

The parking brake closes automatically when shutting the engine down.

**⚠ Danger**

**Danger of accident!**

Secure the machine against unauthorized use, pull the ignition key out, lock the cabin door.

## 4.9 Switching the vibration on and off

**⚠ Danger**

Risk of damage!

When compacting with vibration you must check the effect of nearby buildings and underground supply lines (gas, water, sewage, electric power), if necessary stop compaction with vibration.

**⚠ Caution**

Danger of bearing damage!

Do not activate the vibration on hard (frozen, concrete) ground.

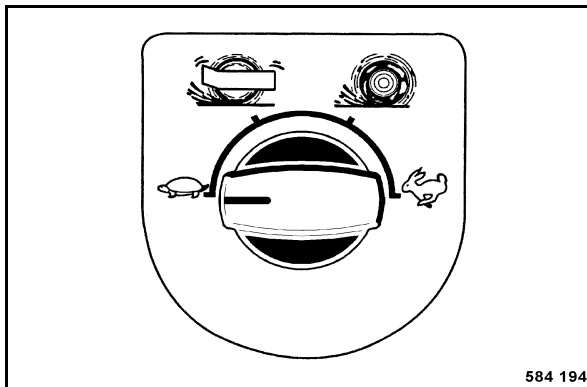


Fig. 63

- Turn the rotary travel speed range switch (Fig. 63) to position "turtle".

## Pre-selecting the vibration

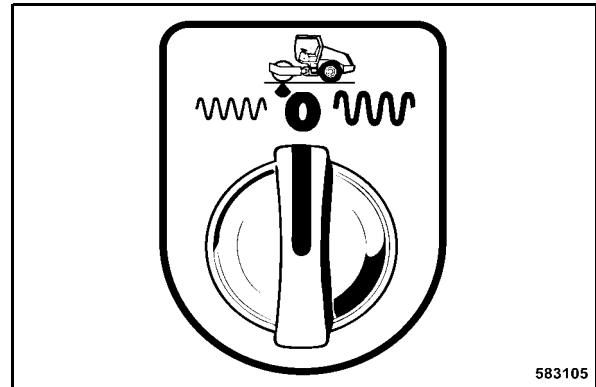


Fig. 64

- Preselect the desired amplitude with the rotary switch for vibration amplitude preselection (Fig. 64).

## Switching the vibration on

**⚠ Caution**

Switch the vibration on only at max. engine speed.

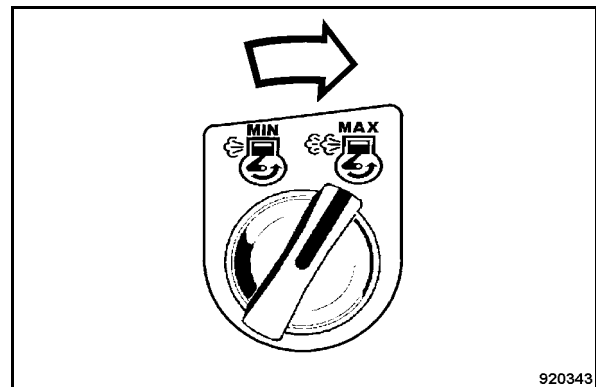


Fig. 65

- Turn the rotary momentary contact switch for engine speed (Fig. 65) clockwise to "MAX".

## Operation

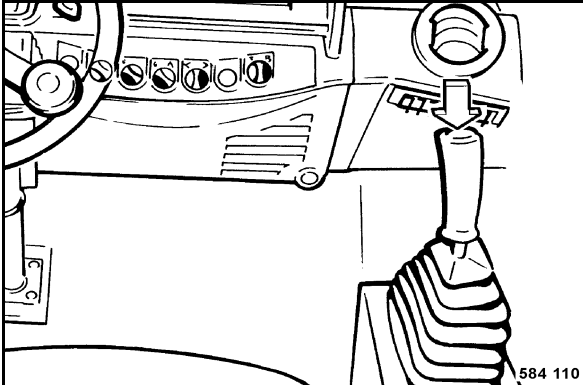


Fig. 66

- Actuate the vibration push button (Fig. 66) in the travel lever while driving.

### Switching the vibration off

- Press the vibration push button (Fig. 66) again.

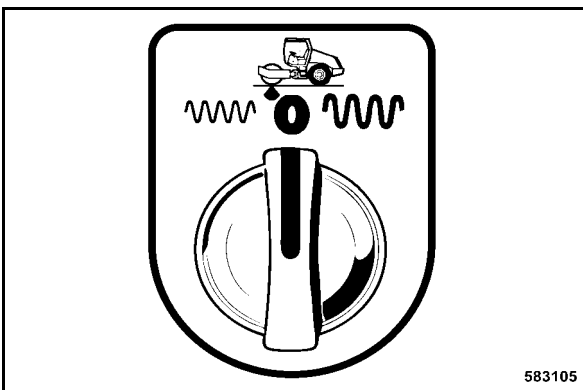


Fig. 67

- After the end of work turn the vibration amplitude preselecting switch (Fig. 67) back to position "0".

## 4.10 What to do in events of emergency

### Actuating the emergency stop switch

#### **⚠ Danger**

**Danger of accident!**

In events of emergency and in case of danger actuate the emergency stop switch immediately.

Start travel operation of the machine only after the danger that caused the actuation of the emergency stop switch has been eliminated.

#### **⚠ Caution**

Do not use as service brake. The deceleration is extremely high. In case of frequent use the wear on the multi-discs brakes will be very high.

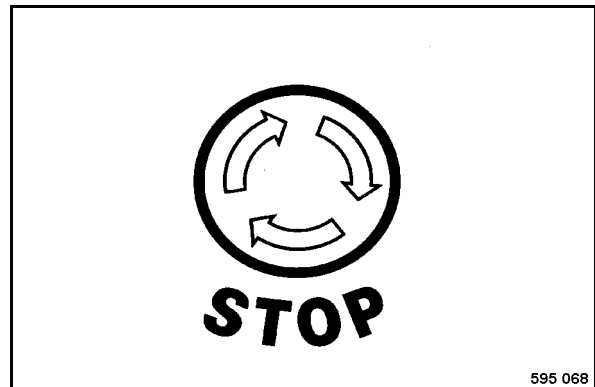


Fig. 68

- Press the button of the emergency stop switch (Fig. 68) completely down, it automatically locks in fully pressed position.

#### **i Note**

*Shuts the engine down and closes the brake.*

- Turn the button clockwise to unlock the emergency stop switch.
- Start the engine again, see chapter "Starting the engine".

## Emergency exit

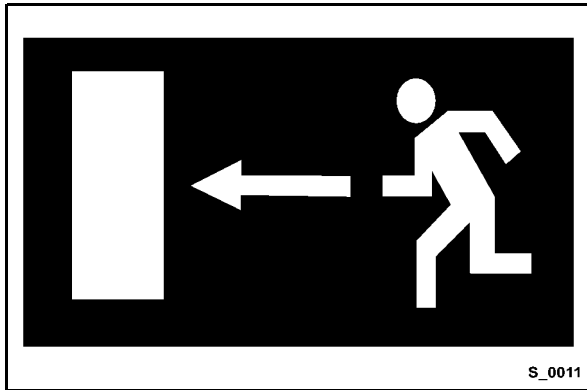


Fig. 69

- If a machine has turned over and the cabin door is jammed, the right hand cabin window can be used as an escape door.

## 4.11 Adjusting the steering wheel\*

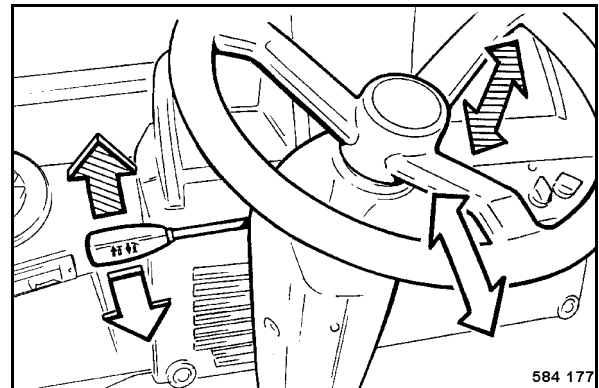


Fig. 70

- Adjustment of steering wheel in height, pull lever (Fig. 70) up and move the steering wheel to the desired height.
- Adjustment of steering wheel inclination, press lever down and adjust the inclination of the steering wheel.

### **⚠ Danger**

#### **Danger of accident!**

**After the adjustment make sure that the steering wheel adjustment is securely locked in place.**

\* Optional equipment

## Operation

### 4.12 Adjusting the seat

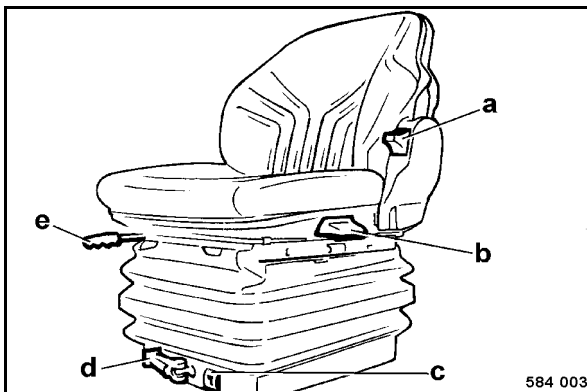


Fig. 71

- To adjust the seat in longitudinal direction disengage lever e (Fig. 71) upwards and push the seat forward or back.
- To adjust the weight turn lever (d) and read the weight in sight glass (c).
- To adjust the inclination of the backrest operate lever (a) and tilt the backrest forward or back.
- To swivel the seat pull lever (b) up and turn the seat to the desired direction.

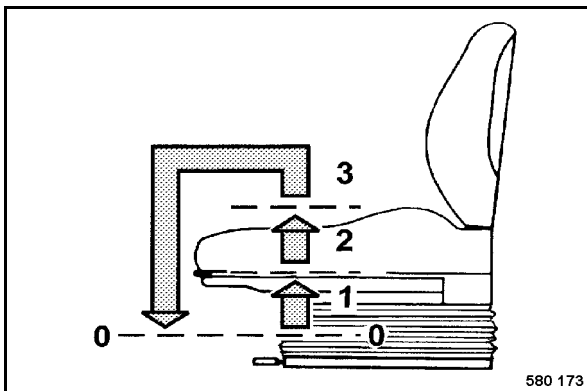


Fig. 72

- To adjust the height of the seat lift the seat up (Fig. 72) until it engages at the desired level.

When lifting the seat completely it will sink down to lowest position.

### 4.13 Operating the heating/air conditioning system\*

#### **⚠ Danger**

**Danger of suffocation!**

**Always keep the air inlet slots on the cabin free of snow, foliage and similar!**

#### **i Note**

*The heating power depends on the coolant temperature.*

*The air conditioning system only works when the engine is running and the fan is switched on.*

*Operation of the air conditioning system increases the fuel consumption.*

#### **Heating the interior**

- Close all windows completely.

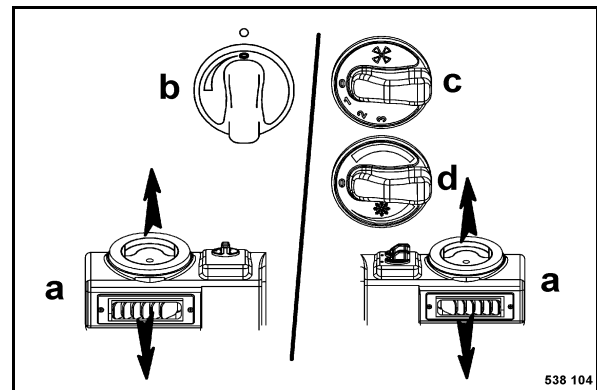


Fig. 73

- Turn the air nozzles a (Fig. 73) to direct the air flow down into the footwell.
- In case of cold or damp weather direct the air flow towards the windscreen and door screens.
- Switch on the fan with the rotary switch (c).
- Regulate the temperature with the rotary switch (b).

\* Optional equipment

## Operation

### Cooling the interior

- Close all windows completely.
- Direct the air flow towards the body/face (a).
- Switch on the fan (c).
- If necessary switch off the heating (b).
- Switch on the air conditioning system with rotary switch (d) and regulate the temperature.

### Reducing the humidity

- In case of damp weather direct the air flow towards the windscreen and door screens.
- Switch on the fan with the rotary switch (c).
- Regulate the temperature to "Max" with the rotary switch (b).
- Switch the air conditioning (d) on.

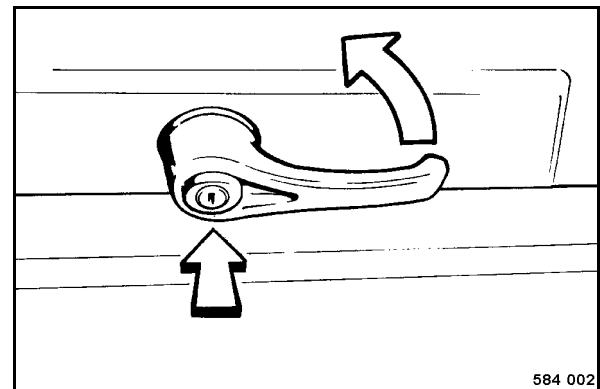
## 4.14 Operating the hood

### **⚠ Danger**

**Danger of accident!**

**If the hood needs to be opened further for maintenance or repair work, support it safely.**

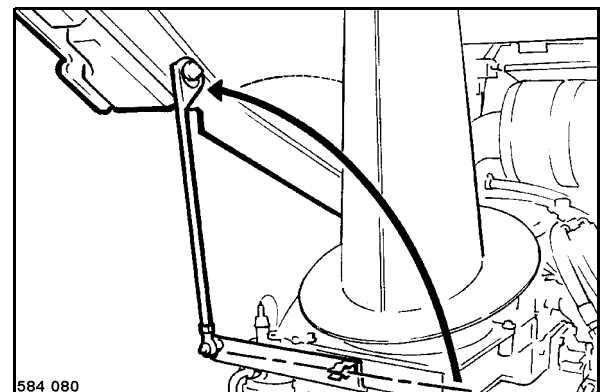
### Bottom position



584 002

Fig. 74

- Unlock the lock (Fig. 74).
- To open the hood press in the button and turn the handle.



584 080

Fig. 75

- Pull the support out of the bracket and support the hood (Fig. 75).

### Top position

- Push the hood to top position.

## Operation

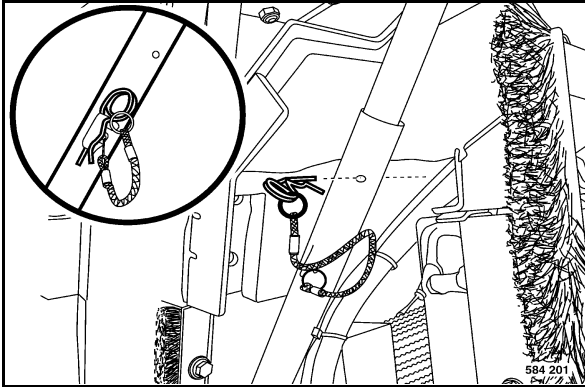


Fig. 76

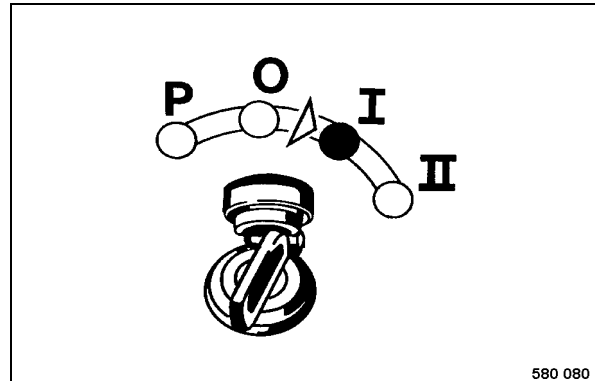
- Pull the spring pin (Fig. 76) out of the bracket.
- Secure the hood in the protection tube with spring plug.

## 4.15 BVC/BTM05 settings before start-up

### Changing the units system

**i Note**

The Asphalt Manager control unit can be used to change from metric units (km/h, °C) to imperial units (mph, °F) in both the display and the print-out\*.



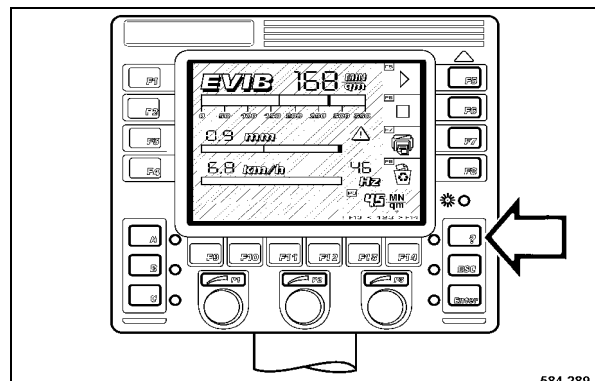
580 080

Fig. 77

- Turn the ignition key (Fig. 77) to position "I".

**i Note**

The control unit shows the start screen.



584 289

Fig. 78

- Press key "?" (menu) (Fig. 78).

\* Optional equipment



## Operation

### **i** Note

The menu appears on the screen.

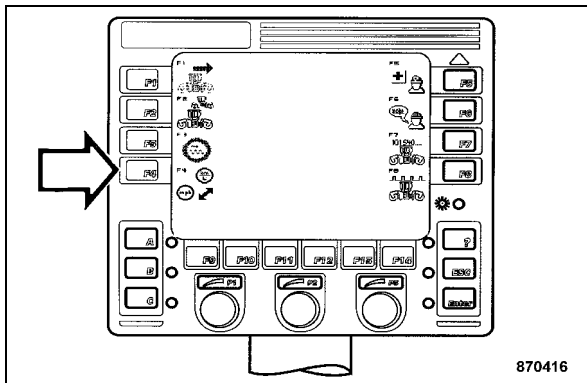


Fig. 79

- Press key "F4" (Fig. 79).

### **i** Note

The screen page to select the unit system appears on the screen.

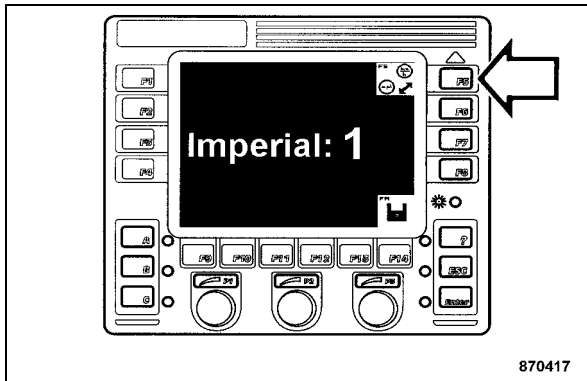


Fig. 80

- Press key "F5" (Fig. 80) and choose the units system.

Imperial 0 = metric units  
Imperial 1 = imperial units

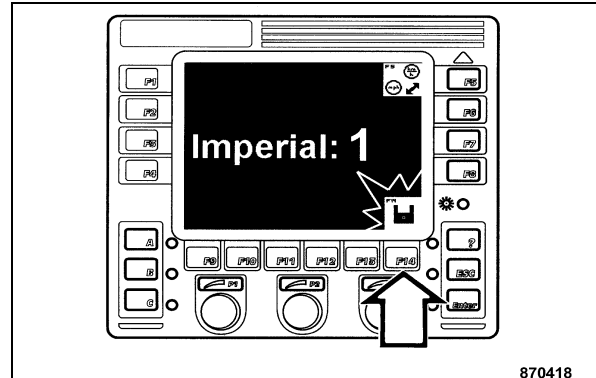


Fig. 81

- After the desired change press key "F14" (Fig. 81). The "Save" symbol on the screen lights up green for a moment as confirmation.

### **i** Note

After releasing key "F14" the system returns automatically to the start screen and restarts.

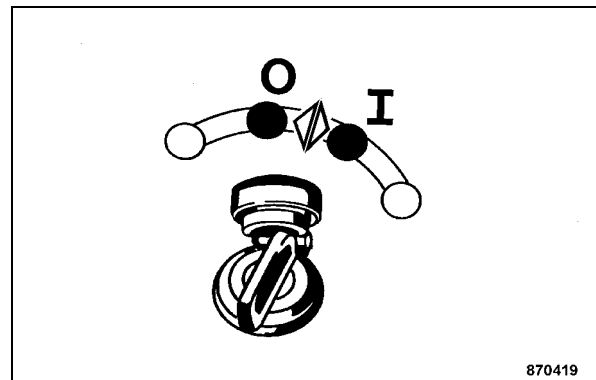


Fig. 82

- Switch the ignition off and on again (Fig. 82).

### **i** Note

Both Asphalt Manager control unit and printer have been set to the new units system.

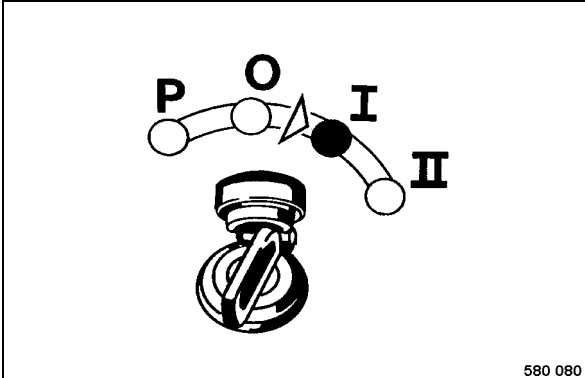
## Setting the printer language\*

### **i** Note

With a printer\* connected the language in the printout can be changed via the Asphalt Manager control unit.

\* Optional equipment

## Operation



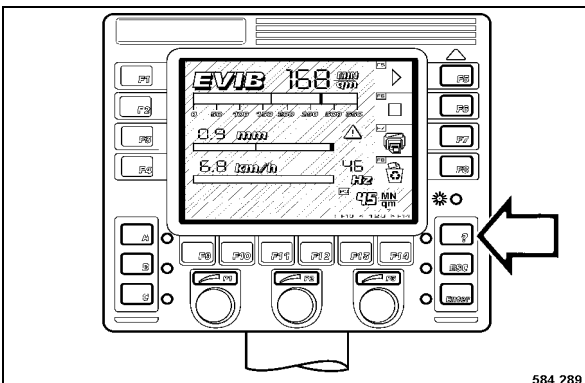
580 080

Fig. 83

- Turn the ignition key to position "I" (Fig. 83).

**i Note**

The control unit shows the start screen.



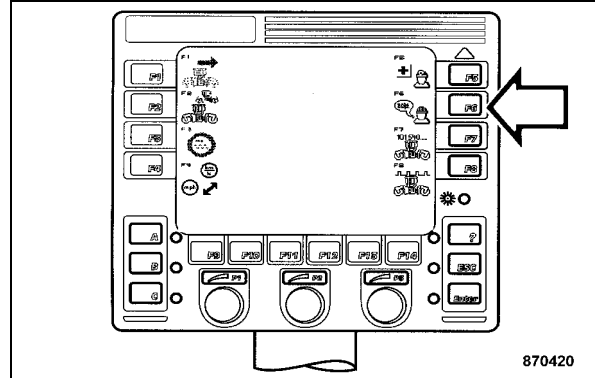
584 289

Fig. 84

- Press key "F12" (menu) (Fig. 84).

**i Note**

The menu appears on the screen.



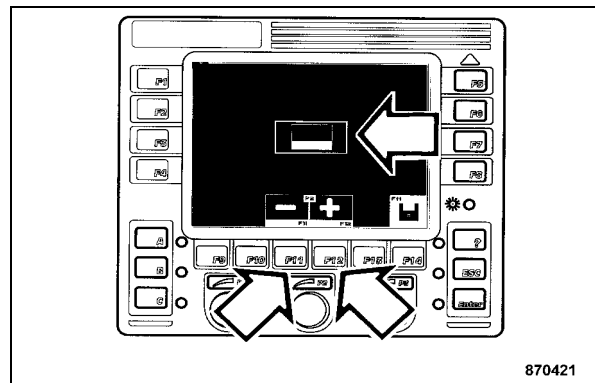
870420

Fig. 85

- Press key "F6" (Fig. 85).

**i Note**

The printer language screen page appears.



870421

Fig. 86

- Use keys "F11" or "F12" to choose the desired printer language (Fig. 86).

**i Note**

The screen shows country flags, which represent the associated language.

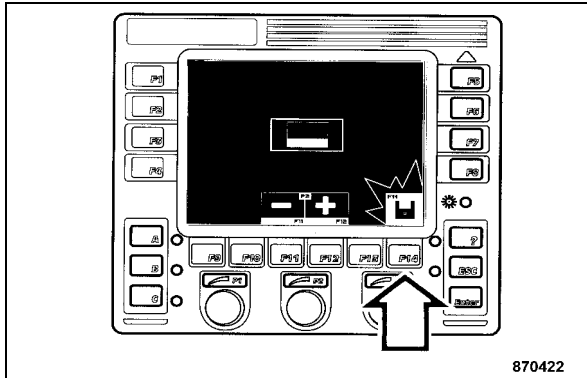


Fig. 87

- Press key "F14" to save the language setting (Fig. 87). The "Save" symbol on the screen lights up green for a moment as confirmation.

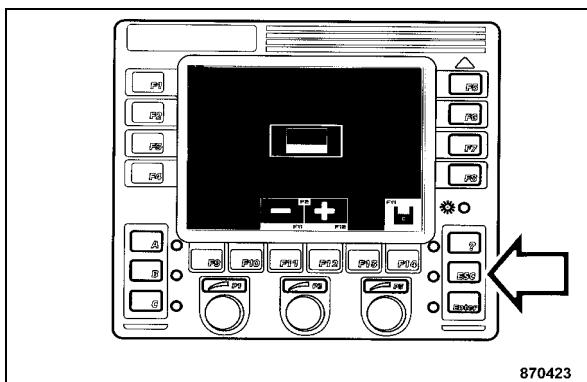


Fig. 88

- Press key "ESC" (Fig. 88) to return to the start screen.

## 4.16 Measuring pass with BTM\*

### General notes

#### **i** Note

The soil measuring values ( $E_{VIB}$ ) recorded during different passes can only be compared if the recording of measuring values took place in operating mode "Manual" with the same amplitude, frequency and travel speed and on exactly the same track.

Measuring values must only be compared for passes performed in the same direction.

The following description describes an measuring pass in forward. Measuring passes in reverse must be performed accordingly.

### Measuring pass

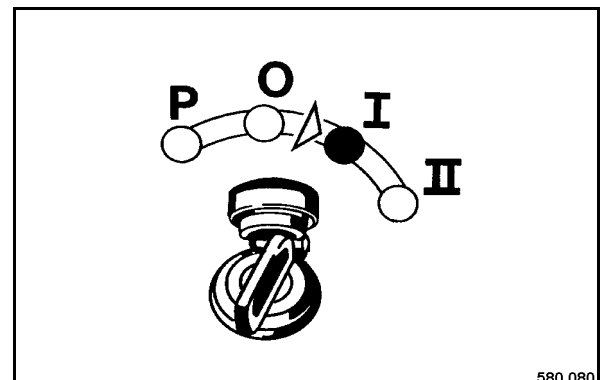


Fig. 89

- Turn the ignition key (Fig. 89) to position "I". The BTM plus/prof performs a self-test.

\* Optional equipment

## Operation

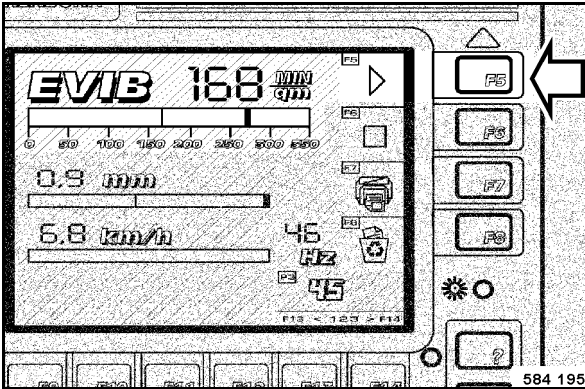


Fig. 90

- Control field F5 (Fig. 90) lights green.

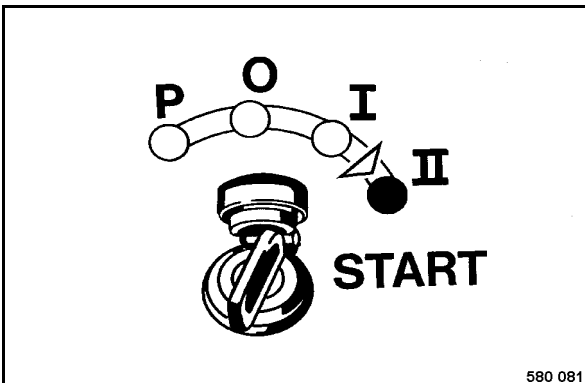


Fig. 91

- Turn the ignition key (Fig. 91) to position „II engine start.

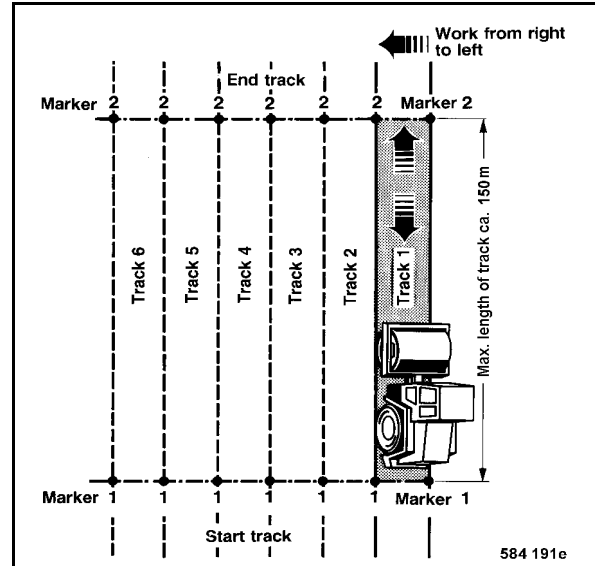


Fig. 92

- Mark the track to be compacted (Fig. 92).

### **Caution**

Since the transducer unit is mounted on the left hand side of the drum, it is necessary to arrange the tracks so that track 1 is processed first, followed by further tracks offset to the left.

### **Note**

Maximum track length 150 m.

### **Forward:**

Mark 1 = Start of track  
Mark 2 = End of track

### **Note**

The operator may also remember the start and the end of the track by means of distinct points.

Operation

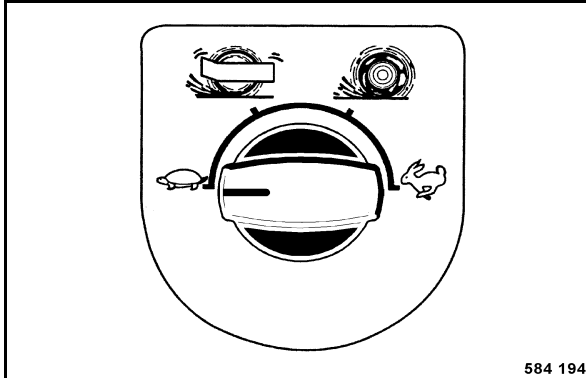


Fig. 93

- Pre-select working speed (Fig. 93).

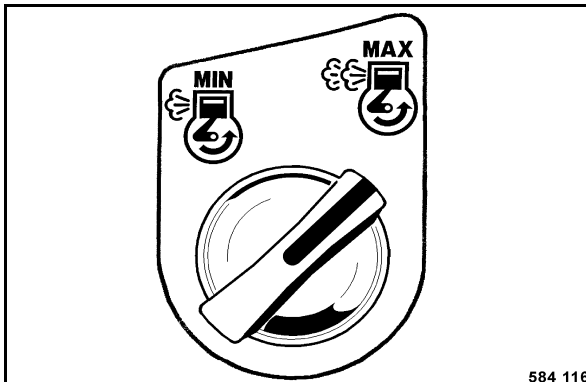


Fig. 94

- Turn the rotary switch (Fig. 94) for engine speed to position "MAX".

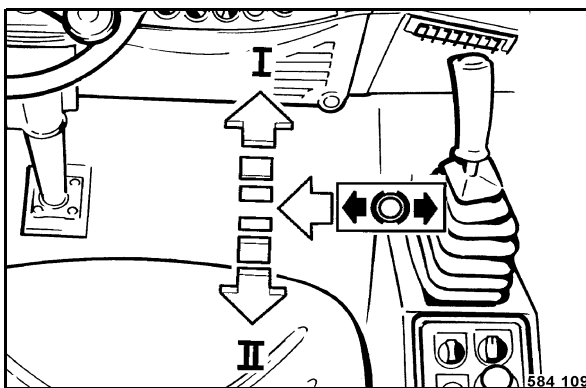


Fig. 95

- Shift the travel lever (Fig. 95) fully to position „I“.

The machine accelerates up to the preadjusted travel speed.

**⚠ Caution**

Differences in the travel speeds falsify the measuring result!

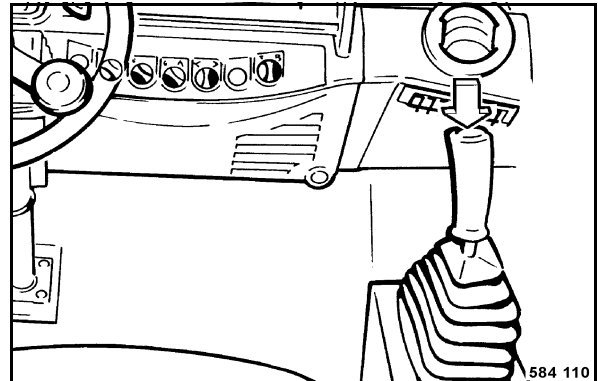


Fig. 96

- Switch the vibration on (Fig. 96).

**⚠ Caution**

Before reaching mark 1 the nominal exciter shaft speed must have been reached and a valid  $E_{vib}$ -value should be displayed.

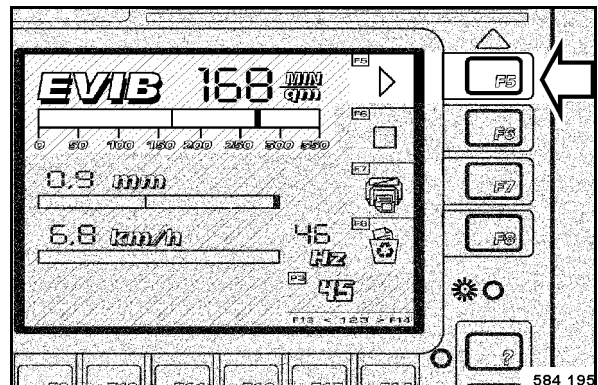


Fig. 97

- When mark 1 is reached, press button F5 "START" (Fig. 97).

Control field to the left of F5 lights green.

The  $E_{vib}$ -display shows the present value.

## Operation

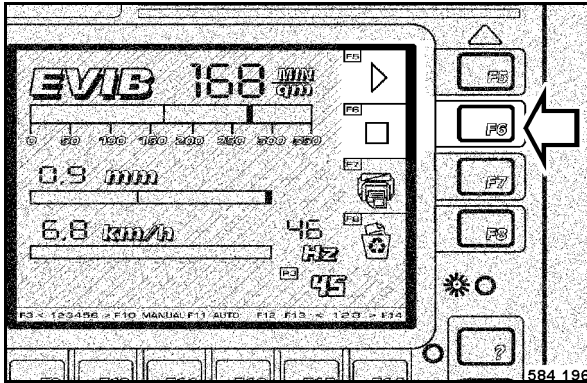


Fig. 98

- When the end of the track, mark 2, is reached, press the button F6 “STOP” (Fig. 98).
- Stop the machine.

### **i** Note

*The first forward pass is finished.*

Control field F5 lights green. This means, that the compaction is not yet completed. One or several passes are still required.

## 4.17 Finishing compaction of a track

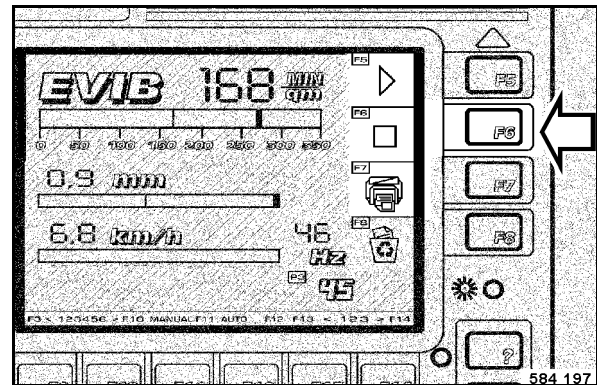


Fig. 99

- Drive forward and reverse passes on a track until the green control field to the left of F5 (Fig. 99) goes out and the red control field F6 below lights up after pressing the stop button F6.

The compaction process on this track is finished.

### **Criterion for a finished track:**

Compared with the previous track the increase of the  $E_{VIB}$ -value in the same travel direction was less than 10%. This criterion is also fulfilled if the  $E_{VIB}$  decreases.

### **i** Note

*Another pass on this track does not make any sense, because an increase in load bearing capacity is hardly possible with this machine.*

- If necessary print out the measuring data for this track (see following section).

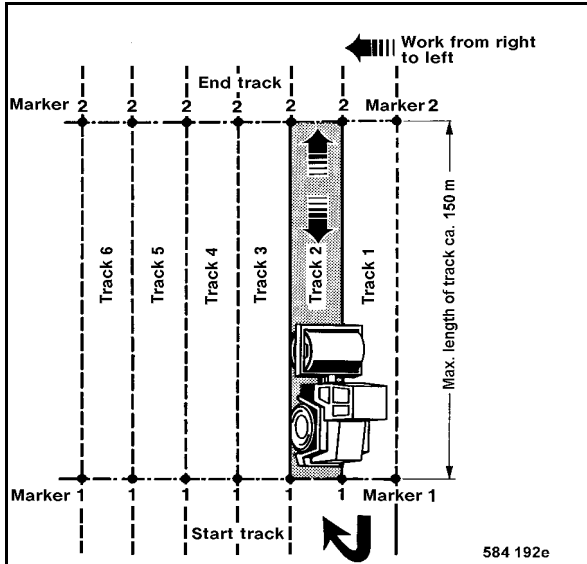


Fig. 100

- Repeat the complete compaction process on the next track (Fig. 100) to record measuring values.

#### 4.18 Printing measuring data after completing compaction\*

**i Note**

Measuring data can be printed after completion of any pass.

Always check the paper provision before starting work.

Change the paper roll if a red stripe appears on the paper.

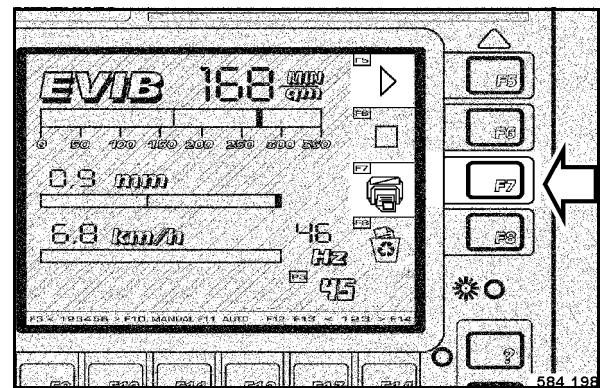


Fig. 101

- At the end of the measurement press push button F7 "PRINT" (Fig. 101).

short actuation = Line diagram

long actuation  $\geq 5$

sec. = Bar chart

Control field F7 goes out and the measuring value printer starts to print out measuring data.

**i Note**

After the printing process has finished any amount of diagrams can be printed out by pressing the same button F7 (PRINT).

\* only BTM prof

## Operation

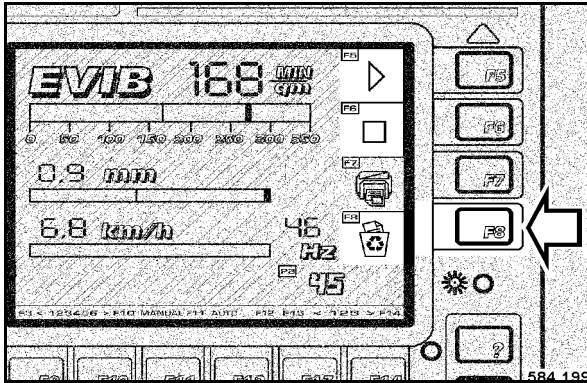


Fig. 102

- If no further printouts of this track are needed, press the button F8 “DELETE” (Fig. 102) when the red control lamp F6 “FINISHED” lights up.

The red control field F6 “FINISHED” goes out and the green control field F5 “CONTINUE” lights up.

BTM plus/prof is ready to compact the next track.

## 4.19 Changing the paper roll in the measuring value printer\*

### **i** Note

Use a new paper roll if a red stripe appears on the paper.

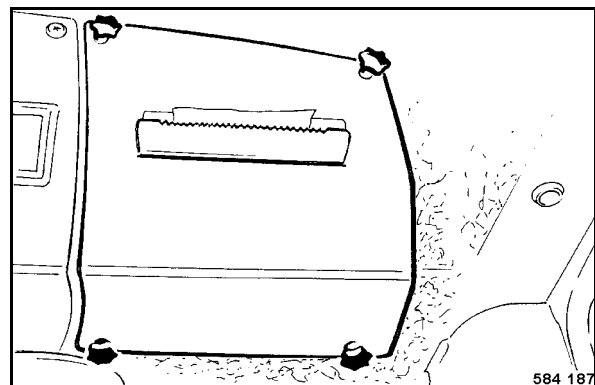


Fig. 103

- Unscrew the star handles (Fig. 103) and remove the cover.

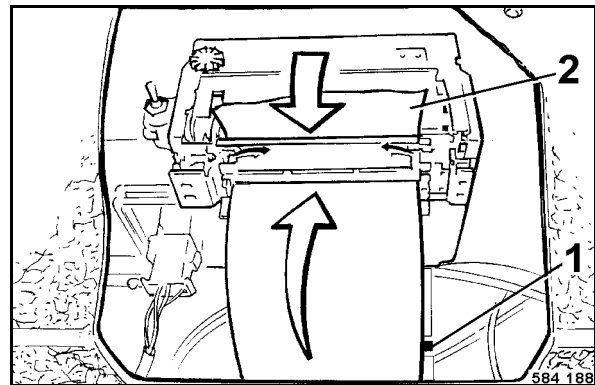


Fig. 104

- Remove shaft 1 (Fig. 104) with the rest of the paper roll (2).

\* only BTM prof



Operation

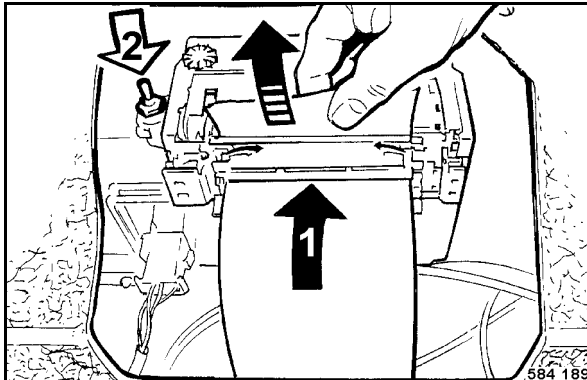


Fig. 105

- Insert a new paper roll (Fig. 105).
- Feed the paper into the guide (1) on the printer.
- Actuate the toggle switch (2) in direction of arrow, until the paper comes out of the printer.
- Reassemble the cover.

#### 4.20 Changing the printer ribbon in the measuring value printer\*

**i Note**

*In case of faint or poorly legible diagrams the printer ribbon needs to be replaced.*

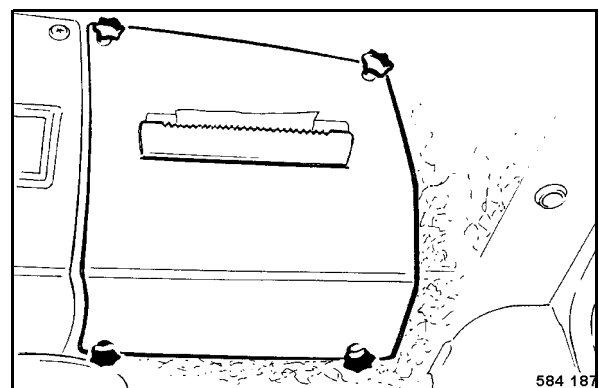


Fig. 106

- Unscrew the star handles (Fig. 106) and remove the cover.

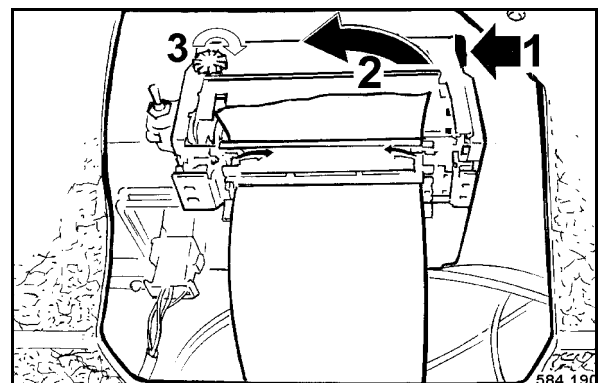


Fig. 107

- Lift the tongue at point 1 (Fig. 107) and take the printer ribbon (2) out of the printer.
- Insert the new printer ribbon into the printer, then press in the tongue (1) on the right.
- Tension the printer ribbon by turning the rotary button (3) in direction of arrow.
- Reassemble the cover.

\* only BTM prof

## Operation

### 4.21 Towing in case of an engine failure

#### **⚠ Danger**

Secure the machine with wheel chocks against unintentional rolling.

**Danger of accident!**

When using towing ropes tow the machine only uphill.

When towing downhill you must use a rigid towing device.

The machine cannot be steered.

- Secure the machine with wheel chocks against unintentional rolling.

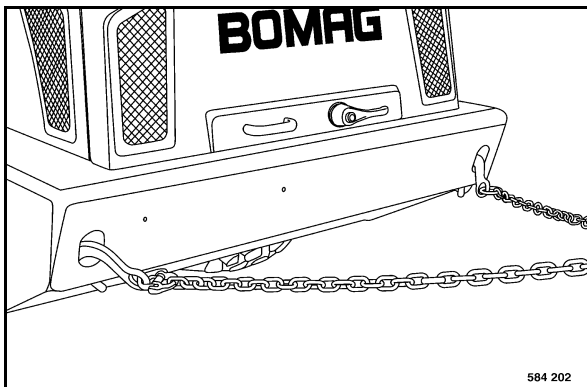


Fig. 108

- Attach chains (Fig. 108) or towing ropes to the lifting hooks.

#### **⚠ Caution**

Towing speed 1 km/h, max. towing distance 500 m.

- Open the tailgate.

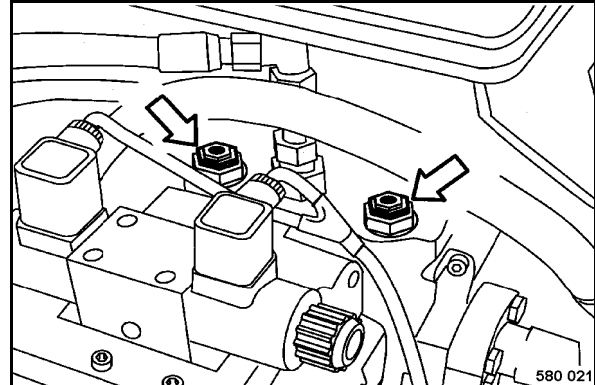


Fig. 109

- Slacken the middle hexagon on both valves (Fig. 109) for approx. 2 to 3 turns.

#### **⚠ Caution**

Do not turn the valves out completely.

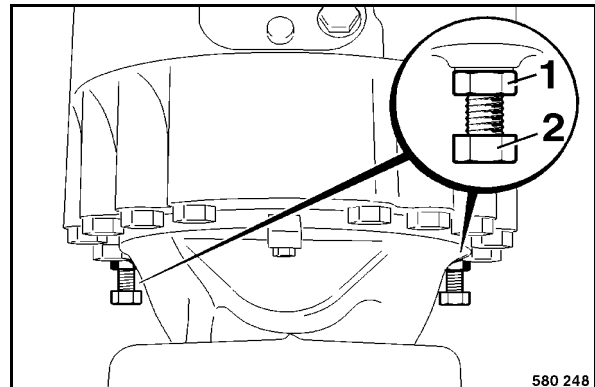


Fig. 110

- To release the brake turn counter nuts 1 (Fig. 110) approx. 8 mm back.
- Turn the brake releasing screws (2) completely in against the stop.

#### **⚠ Caution**

From this stop turn the screw in for maximum another turn to release the brake!

Turn the screws in evenly on both sides.

- Turn the screws in alternately for turn at a time.
- Repeat this measure on the opposite wheel side.

## Operation

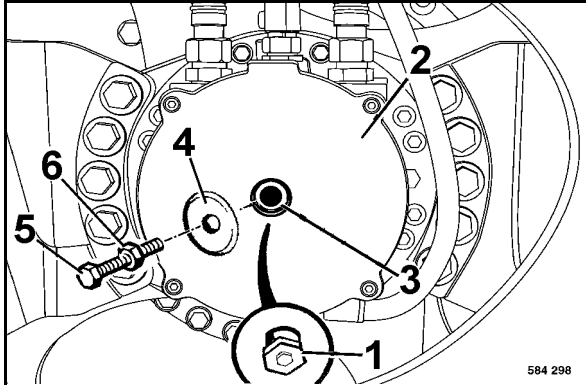


Fig. 111

- Unscrew\* plug 1 (Fig. 111) to release the brake in the drum drive motor.
- Place clamping disc (4) across the brake housing (2) and turn the screw (5) into the tapped bore (3), until it bottoms.
- Turn the nut (6) down and tighten it for approx. one turn. The drum must rotate freely.

### After towing

**⚠ Caution**

**Before detaching the tow bar block the machine with chocks to prevent unintended rolling.**

- Turn the high pressure relief valve cartridges tightly back in.
- Turn all brake releasing screws of the axle evenly back out, until they are light moving again.

\* only with option SN1

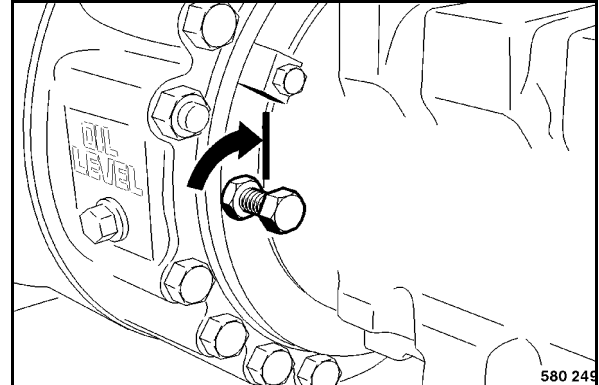


Fig. 112

- Turn the brake releasing screws (Fig. 112) back in again, until they abut against the brake piston.

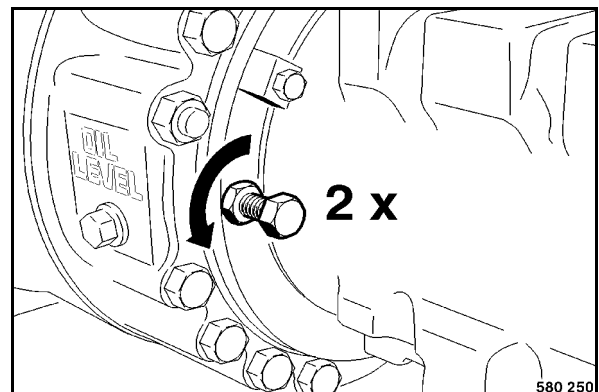


Fig. 113

- Unscrew the brake releasing screws (Fig. 113) for two turns and tighten the counter nuts.
- Repeat this adjustment procedure on the opposite wheel side.
- Unscrew the brake releasing screw from the brake\* in the drum drive motor, screw the plug back in and tighten it.

## Operation

### 4.22 Loading/transport

#### **⚠ Danger**

**Danger of accident! Life hazard!**

Use only stable loading ramps of sufficient load bearing capacity. The ramp inclination must be less than the gradability of the machine.

Make sure that persons are not endangered by the machine tipping or sliding off.

During demonstration and when loading the machine do not remain in the danger zone of the machine.

Always use shackles on the lifting points for loading or tying the machine down.

Check all lifting and lashing points for damage before lifting or lashing down the machine. Do not use a damaged or in any other way impaired lifting and lashing eyes.

Lift the machine only with suitable lifting gear. Use only safe lifting gear of sufficient load bearing capacity. Minimum lifting capacity of lifting gear: see operating weight in chapter "Technical Data".

The machine must not swing about when being lifted.

Do not step or stand under suspended loads.

Lash the machine down, so that it is secured against rolling, sliding and turning over.

After transport release the articulation lock again and store it in the receptacle.

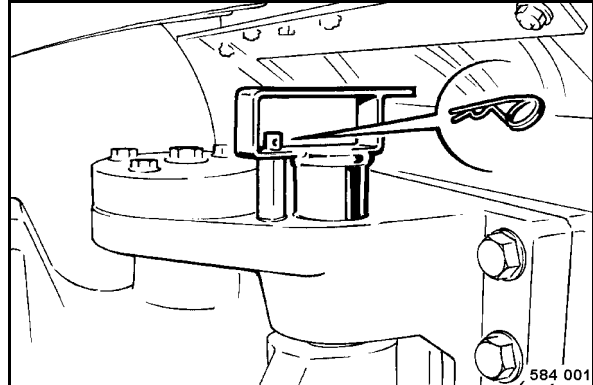


Fig. 114

- Pull the spring pin (Fig. 114) out.
- Lift up the articulation lock and swivel it by 180°.

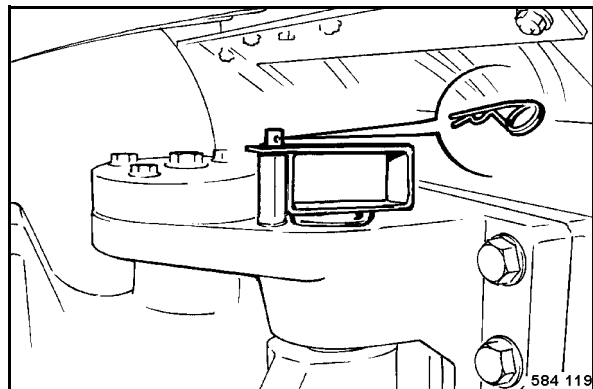


Fig. 115

- Engage the articulation lock and secure it with the spring pin (Fig. 115).

Operation

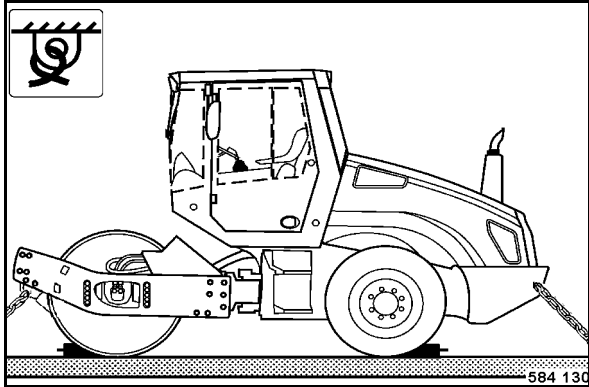


Fig. 116

- Lash the machine on the transport vehicle (Fig. 116), use the four lashing eyes on front and rear frame for this purpose.
- Support the front frame to avoid overstressing of the rubber buffers.

Loading by crane

**⚠ Danger**

Life hazard!

Do not step or stand under suspended loads.

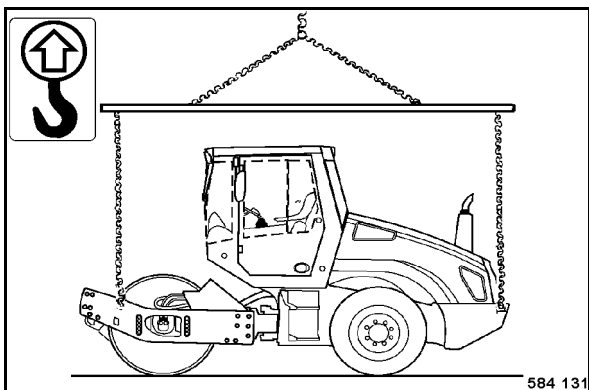


Fig. 117

- For lifting use the four lifting eyes (Fig. 117) and appropriate lifting gear.

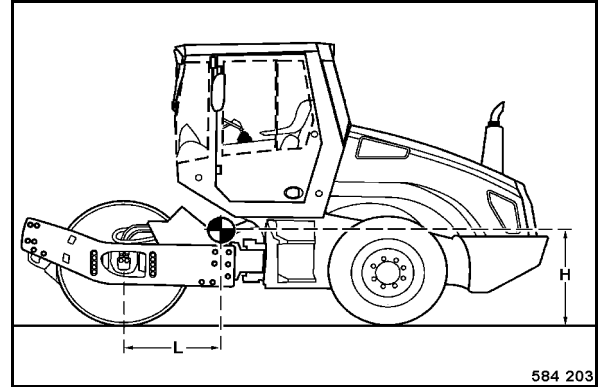


Fig. 118

Position of centre of gravity (Fig. 118):

Machine	L [mm]	H [mm]
BW 211 – 214 -4	1150 ± 240	860 ± 60

**i Note**

The tolerances account for all possible options, such as cabin, additional weight etc.

After transport

**⚠ Danger**

Danger of accident!

The machine cannot be steered if the articulation lock is applied.

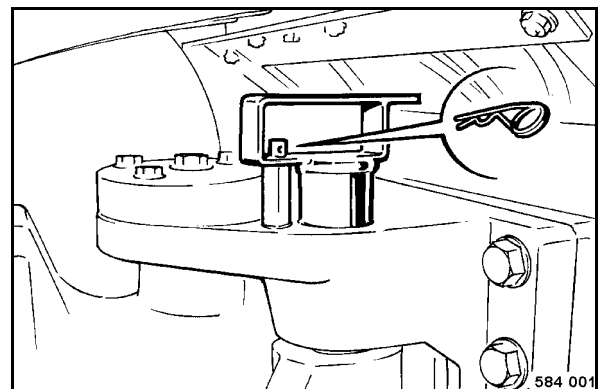


Fig. 119

- After the transport loosen the articulation lock (Fig. 119) again, fix it in its receptacle and lock it with the spring plug.



**Operation**





## 5 Maintenance

## Maintenance

### 5.1 General notes on maintenance

When performing maintenance work always comply with the appropriate safety regulations.

Thorough maintenance of the machine guarantees far longer safe functioning of the machine and prolongs the lifetime of important components. The effort needed for this work is only little compared with the problems that may arise when not observing this rule.

The terms right/left correspond with travel direction forward.

- Support the engine hood for all maintenance and repair work.
- Always clean machine and engine thoroughly before starting maintenance work.
- For maintenance work stand the machine on level ground.
- Perform maintenance work only with the motor switched off.
- Relieve hydraulic pressures before working on hydraulic lines.
- Before working on electric parts of the machine disconnect the battery and cover it with insulation material.
- When working in the area of the articulated joint attach the articulation lock (transport lock).

#### Environment

**During maintenance work catch all oils and fuels and do not let them seep into the ground or into the sewage system. Dispose of oils and fuels environmentally.**

**Keep used filters in a separate waste container and dispose of environmentally.**

**Catch biodegradable oils separately.**

#### Notes on the fuel system

The lifetime of the diesel engine depends to a great extent on the cleanliness of the fuel.

- Keep fuel free of contaminants and water, since this will damage the injection elements of the engine.

- Drums with inside zinc lining are not suitable to store fuel.
- When choosing the storage place for fuel make sure that spilled fuel will not harm the environment.
- Do not let the hose stir up the slurry at the bottom of the drum.
- The fuel drum must rest for a longer period of time before drawing off fuel.
- The rest in the drum is not suitable for the engine and should only be used for cleaning purposes.

#### Notes on the performance of the engine

On diesel engines both combustion air and fuel injection quantities are thoroughly adapted to each other and determine power, temperature level and exhaust gas quality of the engine.

If your engine has to work permanently in "thin air" (at higher altitudes) and under full load, you should consult the customer service of BOMAG or the customer service of the engine manufacturer.

#### Notes on the cooling system

Prepare and check coolant with highest care, since otherwise the engine may be damaged by corrosion, cavitation and freezing.

Coolant is prepared by adding an ethylene-glycol based anti-freeze agent with corrosion inhibiting properties to the cooling water.

Mixing with cooling system protection agent is necessary in all climatic zones. It prevents corrosion, lowers the freezing point and raises the boiling point of the coolant.

#### Notes on the hydraulic system

During maintenance work on the hydraulic system cleanliness is of major importance. Make sure that no dirt or other contaminating substances can enter into the system. Small particles can produce flutes in valves, cause pumps to seize, clog nozzles and pilot bores, thereby making expensive repairs inevitable.

- If, during the daily inspection of the oil level the hydraulic oil level is found to have dropped, check all lines, hoses and components for leaks.





**Maintenance**

- Seal external leaks immediately. If necessary inform the responsible customer service.
- Do not store drums with hydraulic oil outdoors, or at least under a cover. Water can be drawn in through the bunghole when the weather changes.
- We recommend to use the BOMAG filling and filtering unit with fine filter to fill the system. This ensures finest filtration of the hydraulic oil, prolongs the lifetime of the hydraulic oil filter and protects the hydraulic system.
- Clean fittings, filler covers and the area around such parts before disassembly to avoid entering of dirt.
- Do not leave the tank opening unnecessarily open, but cover it so that nothing can fall in.

**5.2 Fuels and lubricants**

**Engine oil**

**Quality**

For use in DEUTZ engines the lubrication oils are classified in DEUTZ Lubrication Oil Quality Classes (DQC).

Approved engine oils			
Deutz	ACEA*	API**	DHD
DQC II-05 or DQC II-10	E3-96, E5-02, E7-08, E4-07, E6-04, E9-08	CG-4, CH-4, CI-4, CI-4 Plus, CJ-4	DHD-1
DQC III-05 or DQC II-10	-	-	-
DQC IV-05 or DQC II-10	-	-	-

\* Association des Constructeurs Europeen d'Automobiles  
\*\* American Petroleum Institute

The list of approved lubrication oils is also available in the Internet under the following address:

www.deutz.com	
de	>>SERVICE >> Betriebsstoffe und Additive >> DeutzQualityClass >> DQC-Freigabeliste
en	>>SERVICE >> Operating Liquids and Additives >> DeutzQualityClass >> DQC Release List

Consult your local service station if in doubt.

- Use winter grade engine oil for winter operation!

**Oil viscosity**

Since lubrication oil changes its viscosity with the temperature, the ambient temperature at the operating location of the engine is of utmost importance when choosing the viscosity class (SAE-class) .

## Maintenance

Too high viscosity can cause starting difficulties, too low viscosity can jeopardize the lubrication effect and result in a high lubrication oil consumption.

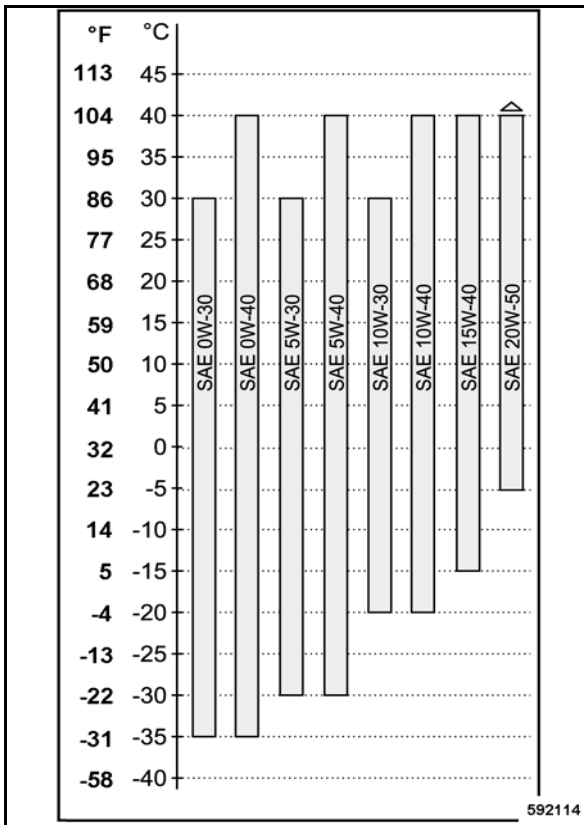


Fig. 120

Optimal operating conditions can be achieved by using the oil viscosity chart (Fig. 120) as a reference.

At ambient temperatures below  $-40\text{ }^{\circ}\text{C}$  ( $-58\text{ }^{\circ}\text{F}$ ) the lubrication oil must be pre-heated (e.g. by parking the machine indoors).

The viscosity is classified acc. to SAE. Multi-purpose oils should generally be used.

### Oil change intervals

The longest permissible time a lubrication oil should remain in an engine is 1 year. If the following oil change intervals are not reached over a period of 1 year, the oil change should be performed at least once per year, irrespective of the operating hours reached.

### DQC II, DQC III, DQC IV: 500 operating hours

#### Caution

When using fuels with a sulphur content of more than 0.5% to 1% or under permanent ambient temperatures below  $-10\text{ }^{\circ}\text{C}$  ( $14\text{ }^{\circ}\text{F}$ ) and when using biodegradable diesel fuel the oil change intervals must be halved.

### Fuels

You should only use commercially available brand diesel fuel with a sulphur content of less than 0.5% and ensure strict cleanliness when filling in. A higher sulphur content has a negative effect on the oil change intervals.

The fuel level should always be topped up in due time so that the fuel tank is never run dry, as otherwise filter and injection lines need to be bled.

### Quality

The following fuel specifications are permitted:

- EN 590
- DIN 51628
- ASTM D975 Grade-No. 1-D and 2-D.
- JIS K 2204 Grade Fuel 1 and Grade Fuel 2 with lubrication properties acc. to EN 590

### Winter fuel

For winter operation use only winter diesel fuel, to avoid clogging because of paraffin separation. Diesel fuels suitable for temperatures down to  $-44\text{ }^{\circ}\text{C}$  ( $-47\text{ }^{\circ}\text{F}$ ) are available for Arctic climates. At very low temperatures disturbing paraffin separation can also be expected when using winter diesel fuel.

The admixture of petroleum and the addition of "flow enhancing additives" (fuel additives) is not permitted.

### Coolant

For fluid cooled engines the cooling fluid must be prepared by admixing a cooling system protection agent to the fresh water and should be checked within the specified maintenance intervals.

This prevents damage caused by corrosion, cavitation, freezing and overheating.



## Maintenance

### Fresh water quality

The correct quality of water is highly important when preparing coolant. Clear and clean water within the boundaries of the following analysis values should generally be used.

Fresh water analysis values	
pH-value at 20 °C (68 °F)	6.5 - 8.5
Chloride ion content (mg/l) (ppm)	max. 100
Sulphate ion content (mg/l) (ppm)	max. 100
Water hardness (ion content of calcium and magnesium ) (mmol/l)]	max. 3.56
Conversion to other units:	
- German degree (°dH)]	max. 20
- English degree (°eH)]	max. 25
- French degree (°fH)]	max. 36.5
corresponds with the content of CaCO <sub>3</sub> (mg/l) (ppm)	max. 356

Information concerning the water quality can be obtained from the waterworks.

If the fresh water analysis values are unknown, these must be determined with the help of a water analysis.

If the values of the analysis deviate, the water must be treated accordingly.

- pH-value too low  
Adding of caustic lye of soda or caustic potash solution.
- Water hardness too high:  
Mix with soft, distilled or fully demineralized water
- Chlorides and/or sulphates too high:  
Mix with distilled or fully demineralized water
- Total hardness or carbonate hardness too low:  
Mix with hardened water (harder water is in most cases available in the form of drinking water).

### Caution

**Another analysis must be made after the fresh water has been prepared.**

### Cooling system protection agent

As a protection against frost, corrosion and boiling point anti-freeze agents must be used under any climatic conditions.

Coolant for fluid cooled engines is prepared by adding an ethylene-glycol based anti-freeze agent with corrosion inhibiting properties to the cooling water.

We therefore highly recommend our BOMAG cooling system protection agent.

If our cooling system protection agent is not available for any important reasons, you may, in exceptional cases, use products that have been approved by the engine manufacturer.

The list of approved cooling system protection agents is also available in the Internet under the following address:

www.deutz.com	
de	>>SERVICE >> Betriebsstoffe und Additive >> Kühlsystemschutz >> Kühlsystemschutz Technisches Rundschreiben
en	>>SERVICE >> Operating Liquids and Additives >> Cooling System Conditioner >> Flyer Cooling System Conditioner Technical Circular

Products of the same product group (see Deutz Technical Circular Cooling System Protection Agents) can be mixed with each other.

The BOMAG cooling system protection agent corresponds with product group A.

### Caution

**Do not mix different coolants and additives of any other kind.**

**Before changing the product you must clean the entire cooling system.**

**Consult your local service station if in doubt.**

To ensure proper corrosion protection you must use the cooling system protection agent all year



## Maintenance

around, whereby the following concentration must not be fallen short of or exceeded.

Mixing ratio		
Cooling system protection agent	Fresh water	Cold protection down to
min. 35%	65%	-22 °C (-8 °F)
40%	60%	-28 °C (-18 °F)
45%	55%	-35 °C (-31 °F)
max. 50%	50%	-41 °C (-42 °F)

### Caution

A proportion of more than 50% of cooling system protection agent causes a drop in cooling power.

The use of corrosion protection oils as cooling system protection agents is not permitted.

### Note

When working at temperature below -41 °C (-42 °F) you should consult our local service representative.

### Environment

Coolant must be disposed of environmentally.

### Mineral oil based hydraulic oil

The hydraulic system is operated with hydraulic oil HV 46 (ISO) with a kinematic Viskosität von 46 mm<sup>2</sup>/s bei 40 °C und 8 mm<sup>2</sup>/s bei 100 °C betrieben. For topping up or for oil changes use only high-quality hydraulic oil, type HVLP according to DIN 51524, part 3, or hydraulic oils type HV according to ISO 6743/3. The viscosity index (VI) should be at least 150 (observe information of manufacturer).

### Bio-degradable hydraulic oil

The hydraulic system can also be operated with a synthetic ester based biodegradable hydraulic oil.

The biologically quickly degradable hydraulic oil Panolin HLP Synth.46 meets all demands of a

mineral oil based hydraulic oil according to DIN 51524.

In hydraulic systems filled with Panolin HLP Synth.46 always use the same oil to top up.

When changing from mineral oil based hydraulic oil to an ester based biologically degradable oil, you should consult the lubrication oil service of the oil manufacturer for details.

### Caution

Check the filter more frequently after this change.

Perform regular oil analyses for content of water and mineral oil.

Replace the hydraulic oil filter element every 500 operating hours.

### Gear oil

For the gearboxes use only ,ulti-purpose gear oils ISO VG 220 of API-GL5-class with a minimum viscosity of 20 mm<sup>2</sup>/s at 100 °C.

This is a hypoid lubricant of highest quality class for extremely loaded transmissions.

The additives in this oil ensure low wear lubrication under all operating conditions.

### Exciter shaft oil

For the exciter unit in the drum use a fully synthetic gear oil SAE 75W-90, API GL5.

### Lubrication grease

For lubrication purposes use an EP-high pressure grease, lithium saponified (penetration 2), acc. to DIN 51502 KP 2G.



**Maintenance**

**5.3 Table of fuels and lubricants**

Assembly	Fuel or lubricant		Quantity
	Summer	Winter	Attention
			Observe the level marks
Motor			
- Engine oil	ACEA: E3-96, E5-02, E7-04, E4-07, E6-04 API: CG-4, CH-4, CI-4, CI-4 Plus, CJ-4 SAE 10W-40 (-15 °C to +40 °C) (BOMAG 009 920 06; 20 l) SAE 15W-40 (-15 °C to +40 °C) SAE 5W-40 (-30 °C to +40 °C)		approx. 15.5 litres
- Fuel	Diesel	Winter diesel fuel	approx. 340 litres
- Coolant	Mixture of water and anti-freeze agent Specification see "Fuels and lubricants - coolant"		approx. 16 litres
Hydraulic system	Hydraulic oil (ISO), HLP 46 (BOMAG 009 930 09; 20 l) or ester based biodegradable hydraulic oil		approx. 60 litres
Vibration bearings	SAE 75W-90, API GL-5 (BOMAG 009 925 05; 20 l)		approx. 1.0 litres
Drive axle	SAE 80W-140, API GL-5 (BOMAG 009 925 07; 20 l)		approx. 9.5 litres
Wheel hubs	SAE 80W-140, API GL-5 (BOMAG 009 925 07; 20 l)		approx. 1.9 l each
Tires	Water		approx. 295 litres
	Calcium chloride (CaCl <sub>2</sub> ) or magnesium chloride (MgCl <sub>2</sub> )		approx. 100 kg
Air conditioning system	Refrigerant R134a		approx. 1500 g



## Maintenance

### 5.4 Running-in instructions

The following maintenance work must be performed when running in new machines or overhauled engines:

**⚠ Caution**

Up to approx. 250 operating hours check the engine oil level twice every day.

Depending on the load the engine is subjected to, the oil consumption will drop to the normal level after approx. 100 to 250 operating hours.

**After a running-in time of 30 minutes**

- Retighten the V-belt

**After 250 operating hours**

- Retighten bolted connections on intake and exhaust tubes, oil sump and engine mounts.
- Retighten the bolted connections on the machine.
- Retighten all wheel fastening screws with the specified tightening torque.
- Change engine oil and oil filter
- 1. Oil change vibration bearings
- Oil change in drive axle
- Oil change in wheel hubs

**After 500 operating hours**

- 2. Oil change vibration bearings



**Maintenance**

**5.5 Maintenance table**

No.	Maintenance work	Comment	every 10 operating hours, daily	every 250 oper. hours	every 500 oper. hours	every 1000 oper. hours	every 2000 oper. hours	every 3000 oper. hours	every 6000 oper. hours	as required
5.6	Check the engine oil level	Dipstick mark	X							
5.7	Check the fuel level		X							
5.8	Check the coolant level	Inspection glass	X							
5.9	Check the hydraulic oil level	Inspection glass	X							
5.10	Check the tire pressure			X						
5.11	Clean the cooling fins on engine and hydraulic oil cooler			X						
5.12	Check the oil level in the drive axle			X						
5.13	Check the oil level in the wheel hubs			X						
5.14	Check the oil level in the vibration bearings			X						
5.15	Check the parking brake			X						
5.16	Check, replace the refrigerant compressor V-belt			X						
5.17	Change engine oil and oil filter cartridge	see foot note min. 1x per year			X					
5.18	Check, clean the water separator				X					
5.19	Drain the fuel tank sludge				X					
5.20	Battery service	pole grease			X					
5.21	Service the air conditioning				X					
5.22	Clean the circulation air filter for the heating				X					
5.23	Change the bypass filter**	see foot note min. 1x per year			X					



**Maintenance**

No.	Maintenance work	Comment	every 10 operating hours, daily	every 250 oper. hours	every 500 oper. hours	every 1000 oper. hours	every 2000 oper. hours	every 3000 oper. hours	every 6000 oper. hours	as required
5.24	Check / replace the ribbed V-belt					X				
5.25	Replace the fuel filter cartridge					X				
5.26	Change the fuel pre-filter cartridge					X				
5.27	Check the engine mounts					X				
5.28	Change the oil in the vibration bearings <sup>***</sup>	see foot note min. 1x per year				X				
5.29	Change the oil in the drive axle <sup>****</sup>	see foot note min. 1x per year				X				
5.30	Change the oil in the wheel hubs <sup>****</sup>	see foot note min. 1x per year				X				
5.31	Retighten the fastening of the axle on the frame					X				
5.32	Tighten the wheel nuts <sup>*****</sup>	see foot note				X				
5.33	Check the ROPS					X				
5.34	Check the travel control					X				
5.35	Check, adjust the valve clearance	Intake valve: 90° +10° Exhaust: 150° +10°					X			
5.36	Change hydraulic oil and breather filter <sup>**</sup>	at least every 2 years					X			
5.37	Change the hydraulic oil filter <sup>**</sup>	at least every 2 years					X			
5.38	Change the coolant	at least every 2 years					X			
5.39	Replace ribbed V-belt and idler pulley	at least every 2 years						X		
5.40	Replace the injection valves	only by authorized service personnel							X	
5.41	Replace the crank case ventilation valve	at least every 2 years							X	





**Maintenance**

No.	Maintenance work	Comment	every 10 operating hours, daily	every 250 oper. hours	every 500 oper. hours	every 1000 oper. hours	every 2000 oper. hours	every 3000 oper. hours	every 6000 oper. hours	as required
5.42	Air filter maintenance	min. 1x per year, Safety cartridge at least every 2 years								X
5.43	Adjust the scrapers									X
5.44	Clean the machine									X
5.45	Change the tires									X
5.46	Change the fresh air filter in the cab- in									X
5.47	Fill the provision tank for the wind- screen washer system									X
5.48	Tightening torques									X
5.49	Engine conservation									X

\* oil change after 250 and 500 operating hours, then every 500 operating hours

\*\* Also in case of repair in the hydraulic system.

\*\*\* Running-in instructions: oil change after 250, 500 and 1000 operating hours, then every 1000 operating hours

\*\*\*\* Running-in instructions: oil change after 250 and 1000 operating hours, then every 1000 operating hours

\*\*\*\*\* Running-in instructions: oil change after 250 and 1000 operating hours, then every 1000 operating hours



## Maintenance

Every 10 operating hours

## 5.6 Checking the engine oil level

### **⚠ Danger**

Danger of injury!

Support the engine hood for all maintenance and repair work.

### **⚠ Caution**

The machine must be in horizontal position.

If the engine is warm, shut it down and check the oil level after five minutes.

With a cold engine the oil level can be checked immediately.

For quality of oil refer to the "table of fuels and lubricants".

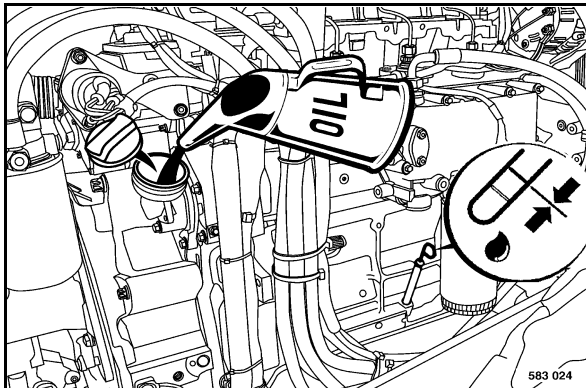


Fig. 121

- Pull the dipstick (Fig. 121) out, wipe it off with a lint-free, clean cloth and reinsert it until it bottoms.
- Pull the dipstick back out.
- The oil level must always be between the "MIN"- and "MAX"-marks. If the oil level is too low, top up oil to the "MAX" mark immediately.

## 5.7 Checking the fuel level

### **⚠ Caution**

Do not drive the fuel tank dry, as otherwise the fuel system needs to be bled.

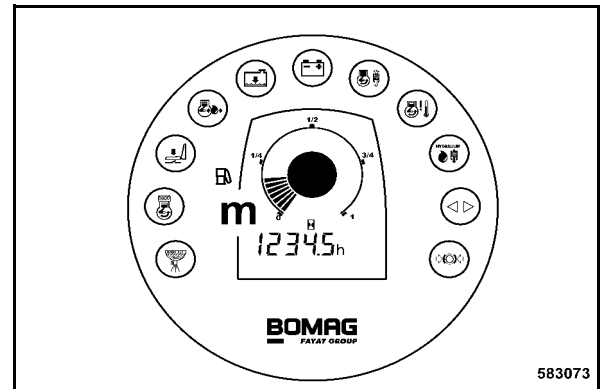


Fig. 122

- Check the fuel level on fuel gauge (m) (Fig. 122) in the instrument cluster.

## Refuelling

### **⚠ Danger**

Fire hazard!

When working on the fuel system do not use open fire, do not smoke, do not spill any fuel.

Do not refuel in closed rooms.

Shut down the engine.

### **⚠ Danger**

Health hazard!

Do not inhale any fuel fumes.

### **⚠ Caution**

Monitor the entire refuelling process.

For quality and quantity of fuel refer to the "table of fuels and lubricants".

### **♻ Environment**

Catch running out fuel, do not let it seep into the ground.

Every 10 operating hours

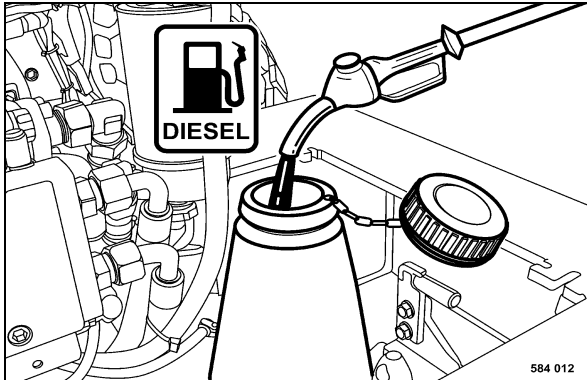


Fig. 123

- Shut down the engine.
- Clean the area around the filler opening.
- Open the fuel tank cover (Fig. 123).

**⚠ Caution**

Contaminated fuel can cause malfunction or even damage of the engine.

If necessary, fill in fuel through a funnel with screen.

- Top up with fuel (diesel or winter diesel).
- Screw the fuel tank cover back on.

## 5.8 Check the coolant level

**⚠ Danger**

Danger of scalding!

Fill up coolant only when the engine is cold.

**⚠ Caution**

If, during the daily inspection the coolant level is found to have dropped, check all lines, hoses and engine for leaks.

Do not use radiator sealant to seal leaks.

For quality and quantity of coolant refer to the "table of fuels and lubricants".

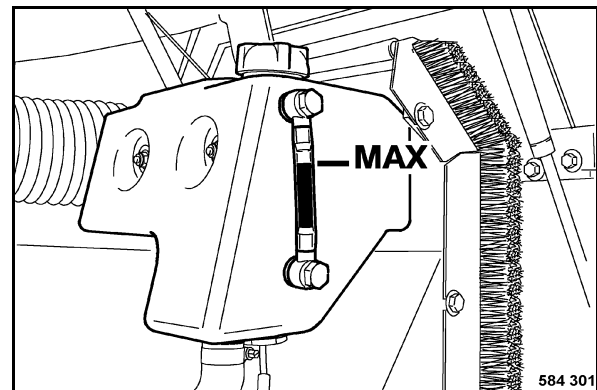


Fig. 124

- Check the coolant level (Fig. 124).
- To top up unscrew the filler cap and fill in coolant up to the MAX-mark.

Every 10 operating hours

## 5.9 Check the hydraulic oil level

### Caution

In hydraulic systems filled with Panolin HLP Synth. 46 always use the same oil to top up. With other ester based oils consult the lubrication oil service of the respective oil manufacturer.

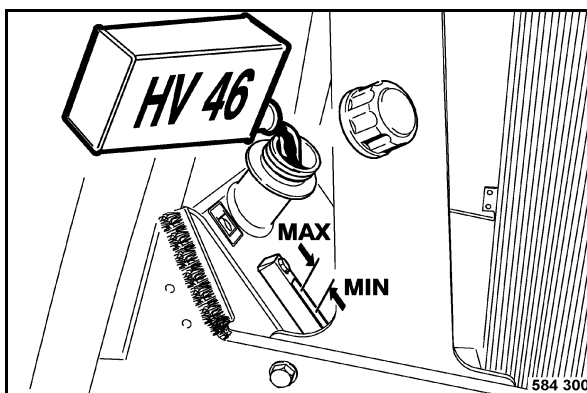


Fig. 125

- Check the hydraulic oil level in the inspection glass (Fig. 125).

### Normal level

approx. 3 cm below the top edge of the inspection glass.

### Minimum level

Middle of inspection glass.

### Caution

If, during the daily inspection of the oil level the hydraulic oil level is found to have dropped, check all lines, hoses and components for leaks.

- If necessary fill in hydraulic oil through the filler neck.

For quality and quantity of oil refer to the table of fuels and lubricants.



Every 10 operating hours



Every 250 operating hours

## 5.10 Check the tire pressure

### **⚠ Caution**

Because of the water filling in the tires, you should always check the tire pressure with the tire valve in top position!

Always close the valves with their dust caps.

### **i Note**

Adaptation to operating conditions:

The tire pressure can be adapted to the operating conditions within the specified limits.

A reduced tire pressure improves the traction especially on sandy soils. Higher tires pressures improve the driving stability of the machine.

The total height of the machine can also be influenced by changing the tire pressure.

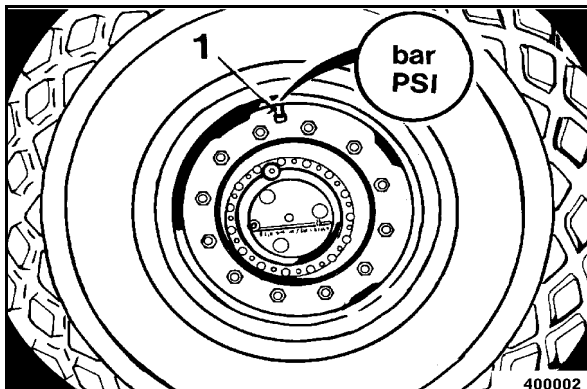


Fig. 126

- With the tire inflation valve check the air pressure on tire inflation valve 1 (Fig. 126) with a pressure gauge.

Nominal value, see "technical data".

### **i Note**

Ensure equal pressure in all rubber tires!

- Screw the valve caps back on again.

## 5.11 Clean the cooling fins on engine and hydraulic oil cooler

### **⚠ Danger**

Danger of injury!

Perform cleaning work only after the engine has cooled down and with the engine stopped.

### **⚠ Caution**

Do not damage any cooling fins on the cooler core when cleaning.

### **i Note**

Dirt on fan blades and oil cooler reduce the cooling effect. Dirt deposits in these areas are substantially supported by oil and fuel on these surfaces. For this reason you should always seal any oil or fuel leaks in the vicinity of the cooling fan or the oil cooler and clean the cooling surfaces after.

### Cleaning with compressed air

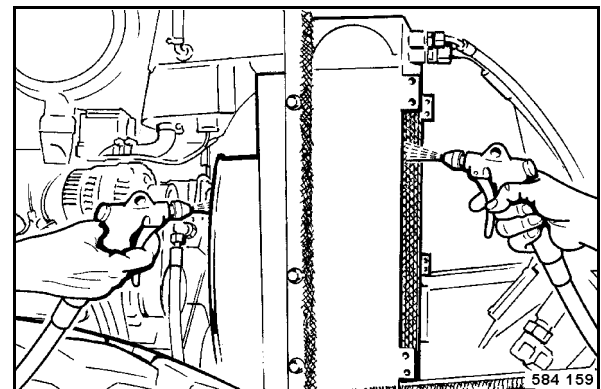


Fig. 127

### **i Note**

Start to blow out from the exhaust side.

- Blow the cooler (Fig. 127) out with compressed air.

Every 250 operating hours

Cleaning with cold cleansing agent

**⚠ Caution**

Protect electrical equipment such as generator, regulator and starter against the direct water jet.

- Spray the engine with a suitable cleansing agent, e.g. cold cleanser, let it soak in for a while and spray it off with a strong water jet.
- Run the engine warm for a while to avoid corrosion.

**5.12 Check the oil level in the drive axle**

- Park the machine on level ground.

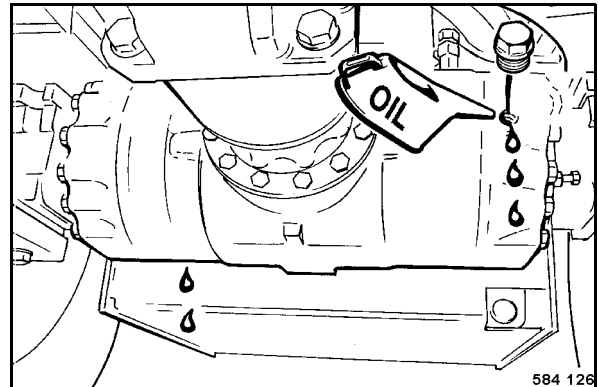


Fig. 128

- Unscrew the oil level inspection plug (Fig. 128) and check the oil level.

**i Note**

*The second level inspection plug as at the back.*

*After filling in oil wait until the oil has evenly distributed inside the axle.*

The oil level must reach the bottom edge of the level bore.

- Top up oil, if necessary.

**For quality of oil refer to the table of fuels and lubricants.**

- Turn the level inspection plug tightly back in.



Every 250 operating hours

### 5.13 Check the oil level in the wheel hubs

**⚠ Caution**

Check the oil level in both wheel hubs.

For quality of oil refer to the "table of fuels and lubricants".

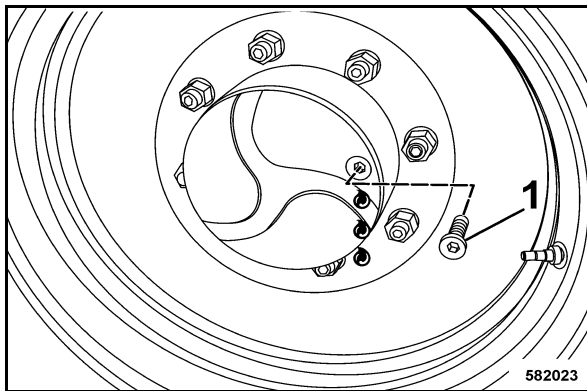


Fig. 129

- Park the machine so that the plug (1) (Fig. 129) is in horizontal position.
- Clean the area around the plug and unscrew the plug.
- Check the oil level. The oil level must reach the bottom edge of the bore, top up oil if necessary.
- Screw the plug back in tightly.

### 5.14 Check the oil level in the vibration bearings

**⚠ Caution**

Check only at operating temperature after running the machine approx. 1/2 hour with vibration.

**Danger of bearing damage! Make sure that no dirt falls into the exciter housing.**

If a loss of oil is found perform trouble shooting, repair the drum if necessary.

For quality of oil refer to the "table of fuels and lubricants".

- Park the machine on level ground.

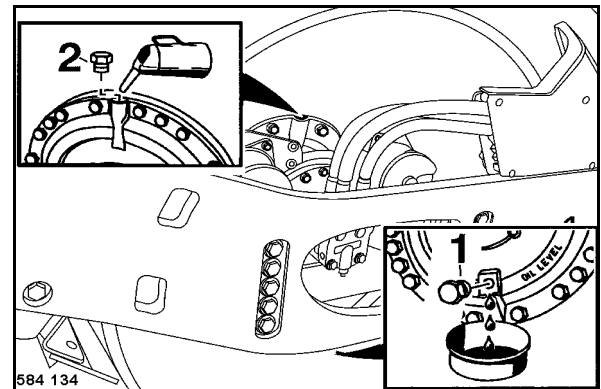


Fig. 130

- Move the drum, until oil level inspection plug (1) (Fig. 130) on the left hand side of the drum is in bottom position.
- Thoroughly clean the area around the level inspection and filler plug.
- Unscrew level inspection plug (1).  
Some oil should run out of the inspection bore.
- If necessary unscrew oil filler plug (2) and fill in some oil through the oil filler bore (2), until oil starts to drip out through the inspection bore.
- Screw oil filler (2) and level inspection plug (1) back in tightly.
- Repeat this inspection on the other side.

Every 250 operating hours

## 5.15 Check the parking brake

### **⚠ Danger**

Life hazard!

Before checking the parking brake make sure that there are no persons or obstacles in front or behind the machine.

- Park the machine on level ground.
- Open the engine hood.

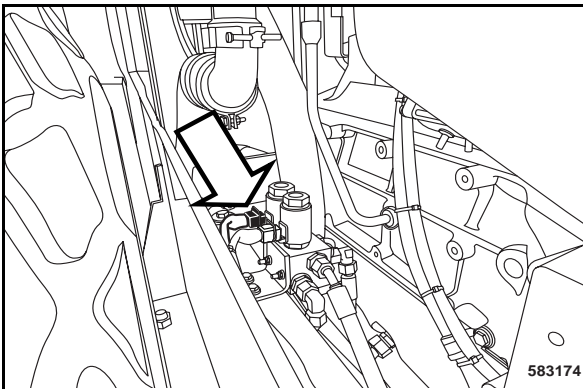


Fig. 131

- Pull the plug off the brake solenoid valve (Fig. 131).
- Start the engine.

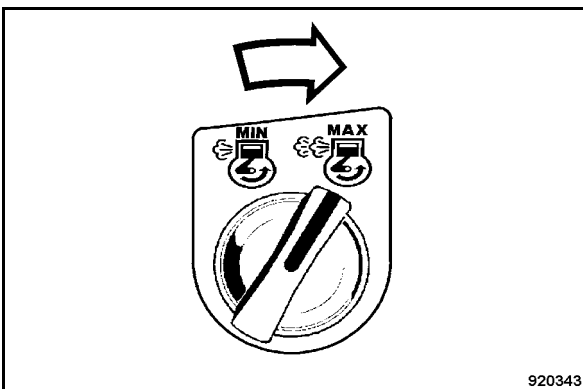


Fig. 132

- Turn the rotary momentary contact switch for engine speed (Fig. 132) clockwise to "MAX".

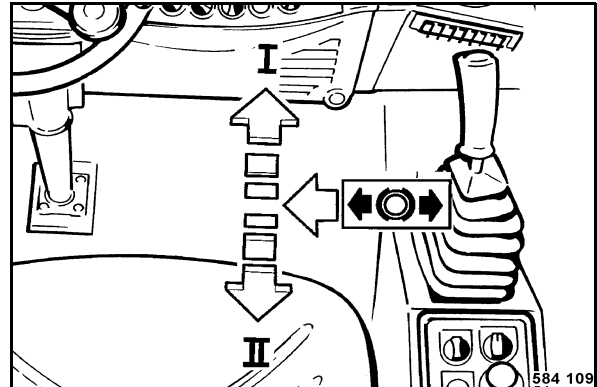


Fig. 133

- Shift the travel lever (Fig. 133) out of braking position to the left to disengage.
- Pull the travel lever back first.
- Then shift the travel lever forward.

### **⚠ Caution**

The machine should not move during this test.

However, if the machine moves the parking brake needs to be adjusted or repaired.

Adjustments to the parking brake must only be made by authorized service personnel!

Only operate the machine after the travel control has been repaired.

- Reconnect the plug to the parking brake solenoid valve (Fig. 131).
- Close the engine hood.

Every 250 operating hours

## 5.16 Checking, replacing the refrigerant compressor V-belt\*

### **⚠ Danger**

Danger of injury!

Work on the V-belt must only be performed with the engine shut down.

### Check the V-belt

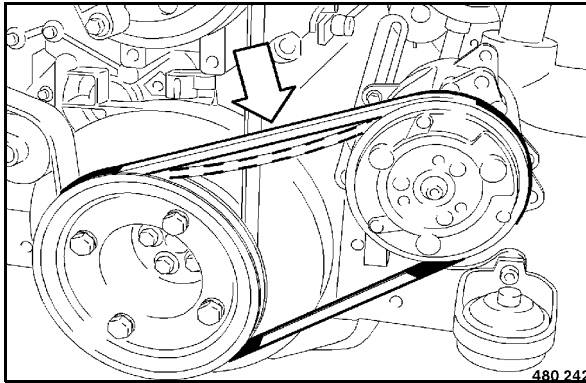


Fig. 134

- Inspect the entire circumference of the V-belt (Fig. 134) visually for damage and cracks. Replace damaged or cracked V-belts.
- Check with thumb pressure whether the V-belt can be depressed more than 10 to 15 mm (0.4 – 0.6 inches) between the V-belt pulleys, retighten if necessary.

\* Optional equipment

### Tighten the V-belt.

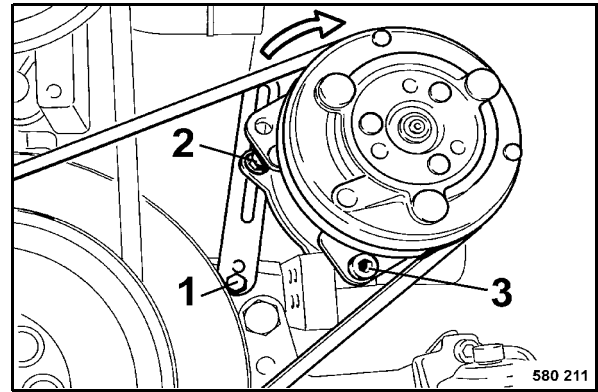


Fig. 135

- Slightly slacken fastening screws 1, 2 and 3 (Fig. 135).
- Press the compressor in direction of arrow, until the correct V-belt tension is reached.
- Retighten all fastening screws.

### Changing the V-belt

- Slightly slacken the fastening screws 1, 2 and 3.
- Press the compressor against the direction of arrow completely against the engine.
- Take the old V-belt off.
- Fit the new V-belt to the V-belt pulleys.
- Tension the V-belt as previously described.

### **⚠ Caution**

Check the V-belt tension after a running time of 30 minutes.



Every 250 operating hours



Every 500 operating hours

## 5.17 Changing engine oil and oil filter

### **⚠ Danger**

**Danger of scalding!**

When draining off hot oil.

By hot oil when unscrewing the engine oil filter.

### **⚠ Caution**

Drain the oil only when the engine is warm.

For quality and quantity of oil refer to the "table of fuels and lubricants".

### **♻ Environment**

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

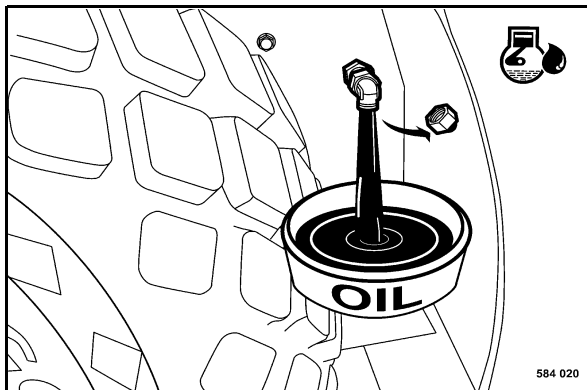


Fig. 136

- Unscrew the drain plug (Fig. 136) and catch running out oil.
- Turn the drain plug tightly back in.

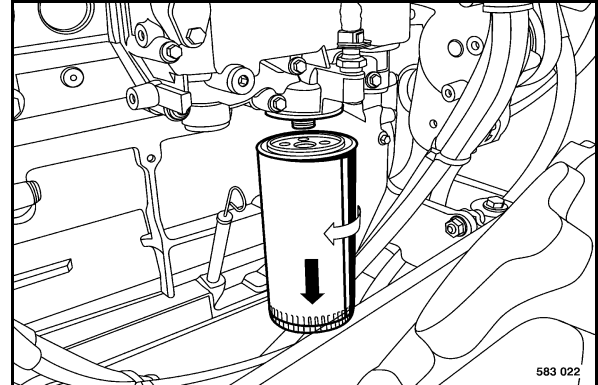


Fig. 137

- Thoroughly clean the outside of the filter cartridge (Fig. 137).
- Unscrew the filter cartridge using an appropriate filter wrench.
- Clean the sealing face on the filter carrier from any dirt.
- Slightly oil the rubber seal on the new filter cartridge.

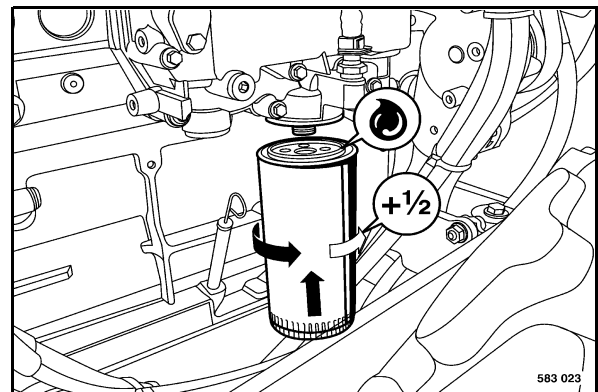


Fig. 138

- Turn the new filter cartridge (Fig. 138) on by hand, until the seal contacts.
- Tighten the filter element for another half turn.

Every 500 operating hours

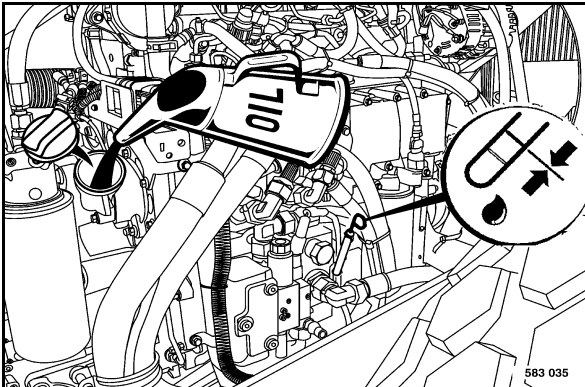


Fig. 139

- Fill in new engine oil (Fig. 139).
- Tighten the oil filler cap properly.
- After a short test run check the oil level on the dipstick . The oil level should reach the MAX-mark, top up oil if necessary.
- Check filter cartridge and drain plug for leaks.

5.18 Check, clean the water separator

**⚠ Danger**

Fire hazard!

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

**♻ Environment**

Any fuel must be caught and disposed of in an environmentally friendly manner.

**i Note**

The service intervals for the water separator depend on the water content in the fuel and can therefore not be determined precisely. After taking the engine into operation you should check the filter bowl initially every day, later as required, for signs of water.

If a too high quantity is drained off, the filter needs to be bled, see section "Replacing the fuel pre-cleaner cartridge".

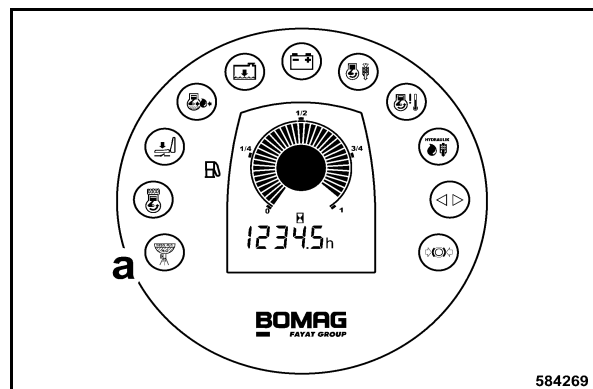


Fig. 140

- If the "water in fuel" warning light (a) (Fig. 140) lights up when starting or during operation, drain the water from the fuel filter immediately.

Every 500 operating hours

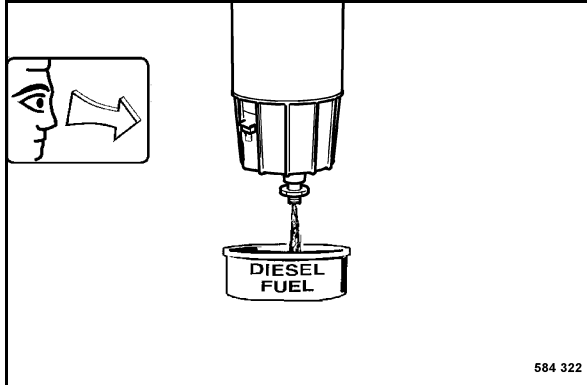


Fig. 141

- Slacken the drain plug (Fig. 141) for a few turns and catch running out fuel / water.
- Turn the plug tightly back in. Check for leaks, if necessary use a new seal ring.

**i Note**

Once the water separator is empty the warning light for water in fuel must go out.

## 5.19 Draining the sludge from the fuel tank

**⚠ Danger**

Fire hazard!

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

Do not spill any fuel.

Catch running out fuel, do not let it seep into the ground.

Do not inhale any fuel fumes.

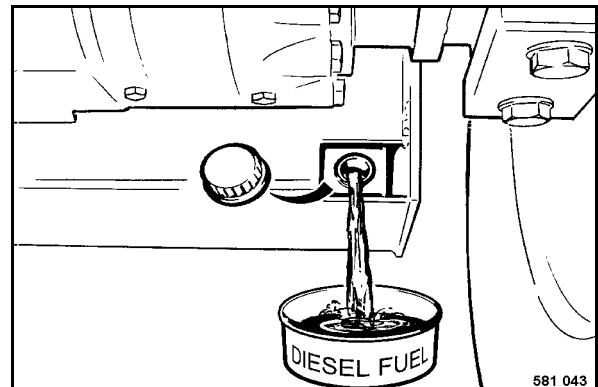


Fig. 142

- Unscrew the cap (Fig. 142) and drain off approx. 5 litres of fuel.
- Turn the cap tightly back in.

Every 500 operating hours

## 5.20 Battery service

### **⚠ Danger**

**Danger of cauterisation ! Danger of explosion!**

**When working on the battery do not use open fire, do not smoke!**

**The battery contains acid. Do not let acid come in contact with skin or clothes!**

**Wear protective clothing!**

**Do not lay any tools on the battery!**

**For recharging remove the plugs from the battery to avoid the accumulation of highly explosive gases.**

### **♻ Environment**

**Dispose of the old battery environmentally.**

### **i Note**

*Maintenance free batteries also need care. Maintenance free only means that the fluid level does not need to be checked. Each battery suffers under self-discharge, which may, in not checked occasionally, even cause damage to the battery as a result of exhaustive discharge.*

**The following therefore applies for the service life:**

- Switch off all consumers (e.g. ignition, light, inside light, radio).
- Check open-circuit voltage of the battery at regular intervals. At least once per month.

Reference values: 12.6 V = fully charged; 12.3 V = 50% discharged.

- Recharge the battery immediately after an open-circuit voltage of 12.25 V or less is reached. Do not perform quick charging.

The open-circuit voltage of the battery occurs approx. 10 hours after the last charging process or one hour after the last discharge.

- After each charging process allow the battery to rest for one hour before taking it into service.
- For resting periods of more than one month you should always disconnect the battery. Do not forget to perform regular open-circuit voltage measurements.

### **⚠ Caution**

**Exhausted batteries (batteries with formation of sulphate on the plates) are not covered under warranty!**

- Open the engine hood and remove the covering

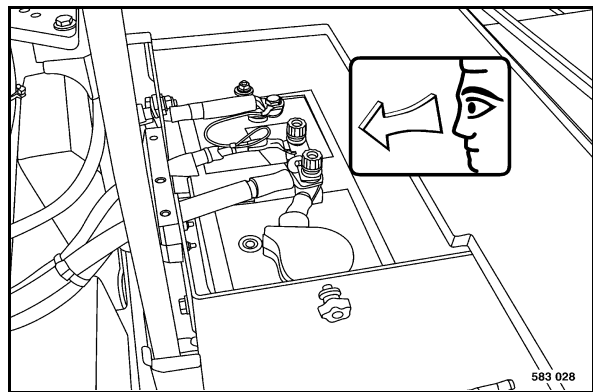


Fig. 143

- Remove the battery (Fig. 143) and clean the battery compartment.
- Clean the outside of the battery.
- Clean battery poles and pole clamps and grease them with pole grease (Vaseline).
- Check the fastening of the battery.
- On serviceable batteries check the acid level, if necessary top up to the filling mark with distilled water.



Every 500 operating hours

## 5.21 Service the air conditioning\*

### Clean the condenser

#### **⚠ Danger**

Danger of accident!

Do not clean with a hot water jet. Heat will cause extreme overpressure, which could cause damage or explosion of the system.

Use access steps and grips to mount and dismount the machine.

#### **⚠ Caution**

A soiled condenser results in a considerable reduction of air conditioning power.

Under extremely dusty conditions it may be necessary to clean the condenser several times per day.

If, during operation of the air conditioning system, the warning buzzer sounds switch the air conditioning off and clean the condenser.

In case of formation of foam have the air conditioning system inspected by the service department.

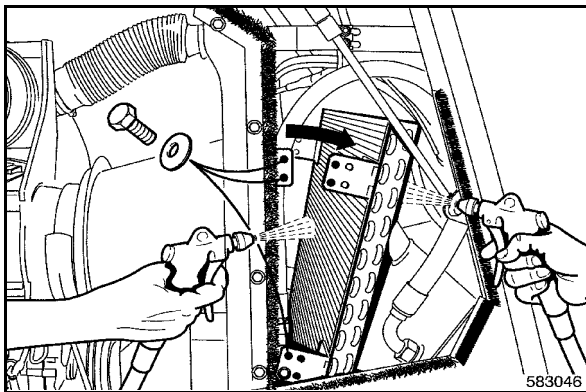


Fig. 144

- Unscrew the condenser fastening screws (Fig. 144) and fold the condenser forward.
- Clean the condenser fins on front and back with compressed air or cold water .

\* Optional equipment

### Checking the refrigerant level

- Start the engine.

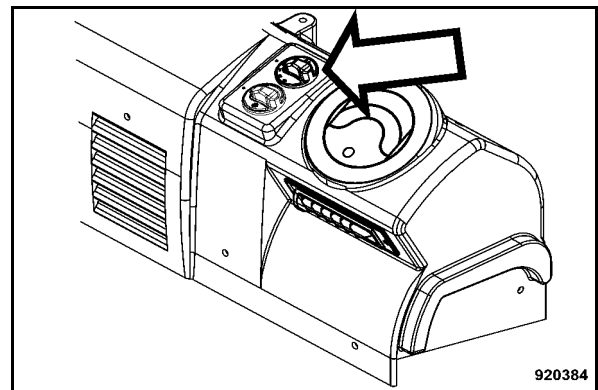


Fig. 145

- Turn the rotary switch for the cab ventilator (Fig. 145) to position "1".

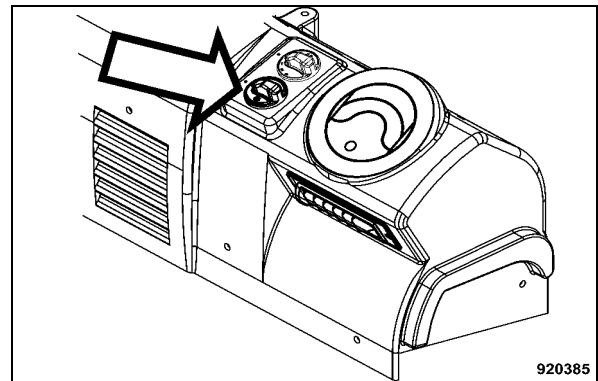


Fig. 146

- Choose a cooling temperature with the rotary switch for the air conditioning system (Fig. 146) in the blue section.
- Open the air outlet nozzles.
- Check, whether the out flowing air is noticeably cooler.

#### **i Note**

The adjusted temperature must be below the actual temperature inside the cabin, so that the compressor will be switched on.

Every 500 operating hours

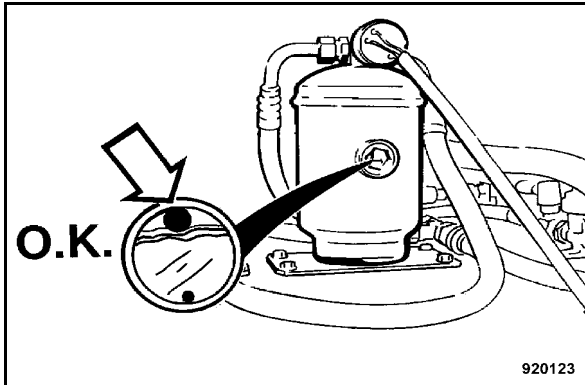


Fig. 147

- Check whether the white float (Fig. 147) inside the inspection glass of the drier/collector unit floats right at the top.

**i Note**

The refrigerant level is correct.

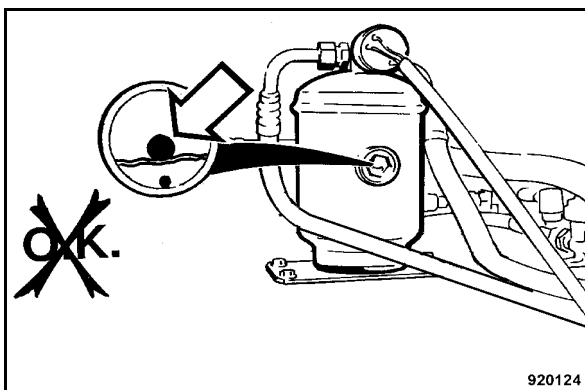


Fig. 148

- If the white float (Fig. 148) inside the inspection glass of the drier/collector unit floats at the bottom, inform the service department.

**i Note**

The refrigerant level is not correct.

- Refrigerant must be filled up, if necessary check the air conditioning system for leaks.

Checking the moisture level of the drying agent

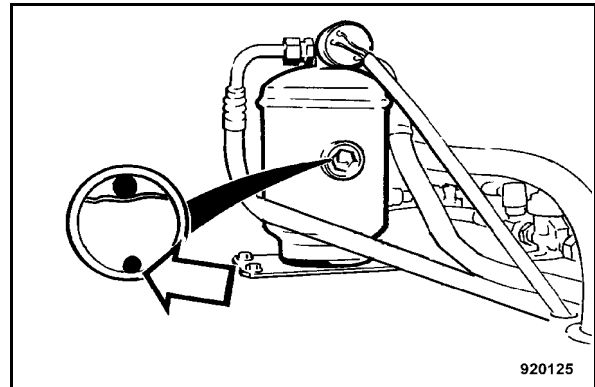


Fig. 149

- Check the moisture indication pearl (Fig. 149) inside the inspection glass of the drier/collector unit.

orange = Drying agent o.k.

colour-

less = moisture level of drying agent too high.

- Inform the service department. Replace drier/collector unit, check air conditioning system.

**⚠ Caution**

Have the drier/collector unit replaced by the service department every year before the operating season.

Checking the condition of the drier/collector unit

**⚠ Caution**

According to the regulation for pressure reservoirs all pressure reservoirs must be repeatedly inspected by a specialist. In this sense repeated inspections are external examinations, normally on pressure reservoirs in operation. In connection with this inspection the drier/collector unit must be visually examined twice every year. During these inspections special attention must be paid to corrosion and mechanical damage. If the reservoir is not in proper condition it must be replaced for safety reasons, as a precaution to protect operators and third parties against any danger

Every 500 operating hours

arising from the handling and operation of pressure reservoirs.

**⚠ Danger**

**Danger of injury!**

In case of mechanical damage or corrosion on this drier/collector unit this unit must be replaced, to avoid bursting and further damage.

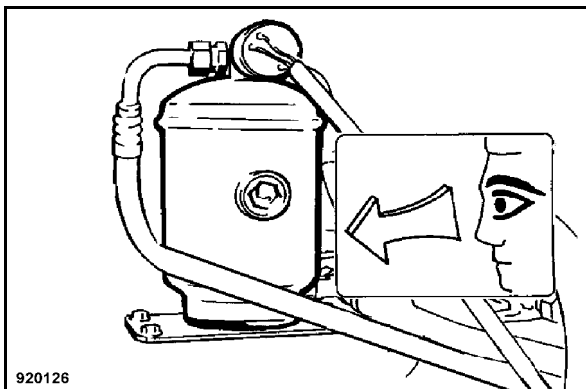


Fig. 150

- Check the drier/collector unit (Fig. 150) for mechanical damage or rust.

## 5.22 Cleaning the circulation air filter for the heating\*

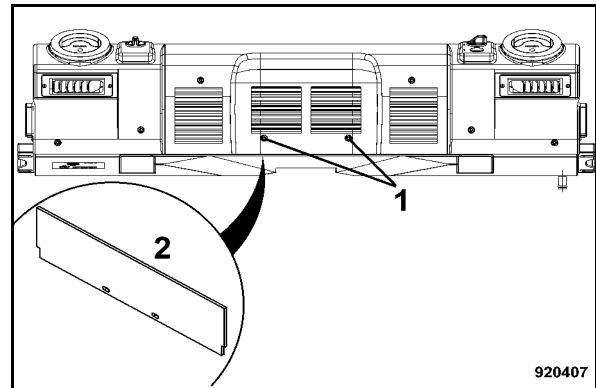


Fig. 151

- Unscrew screws (1) (Fig. 151).
- Pull the filter (2) downwards out.
- Clean the filter, replace if necessary.
- Assemble the filter and tighten the screws.

\* Optional equipment

Every 500 operating hours

## 5.23 Changing the bypass filter\*

### **⚠ Danger**

Danger of scalding!

Danger of scalding by hot oil when unscrewing the oil filter.

### **⚠ Caution**

If the filter has to be changed together with the hydraulic oil, the filter must only be changed after the oil change and after the test run.

Replace the filter element at the latest after one year

### **♻ Environment**

Dispose of the old filter element environmentally.

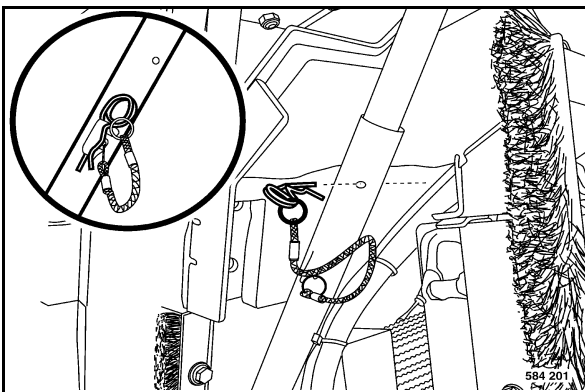


Fig. 152

- Open the engine hood (Fig. 152) completely and secure it.

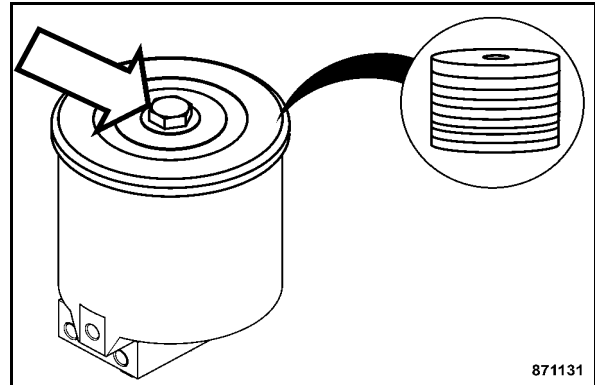


Fig. 153

- Unscrew the fastening screws (Fig. 153) and take off the cover.
- Replace the filter element, attach the cover and fasten it with the screw.

\* Optional equipment

Every 1000 operating hours

## 5.24 Checking / replacing the ribbed V-belt

### **⚠ Danger**

Danger of injury!

Work on the V-belt must only be performed with the engine shut down.

### Checking the wear limit of the ribbed V-belt

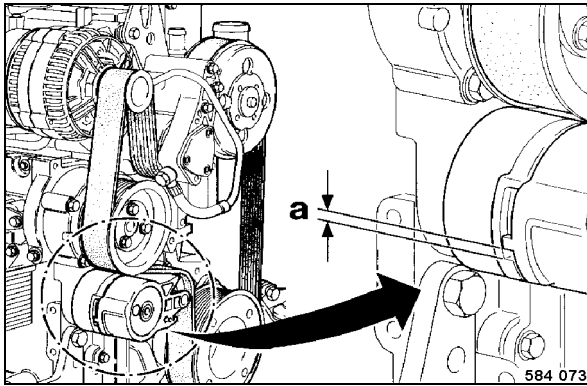


Fig. 154

- Check the distance between the tongue of the moveable tensioner arm and the fixed tensioner housing (Fig. 154).
- If measurement "a" is smaller than 3 mm, replace the ribbed V-belt.

### Changing the ribbed V-belt

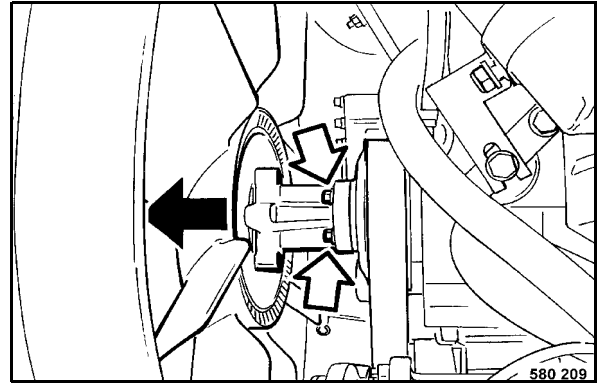


Fig. 155

- Unscrew the fastening screws (Fig. 155) and slide the fan forward.

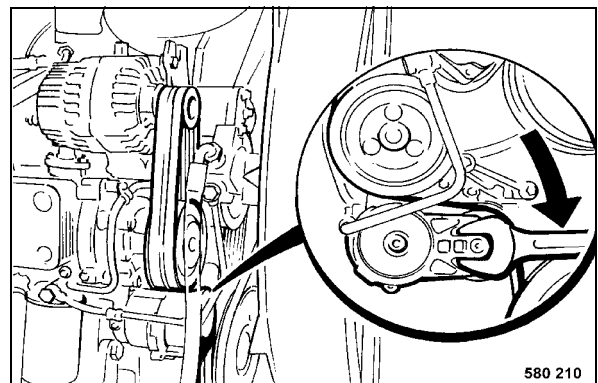


Fig. 156

- Release the idler pulley (Fig. 156) in direction of arrow until the ribbed V-belt is free.
- Pull the ribbed V-belt first to the smallest pulley.
- Install the new ribbed V-belt.
- Release the idler pulley against the direction of arrow until the V-belt is tensioned.
- Measure the V-belt tension, tighten if necessary.

### **i Note**

Retighten the new fan V-belt after a running time of 20 minutes.

Every 1000 operating hours

## 5.25 Replace the fuel filter cartridge

### **⚠ Danger**

Fire hazard! Health hazard!

When working on the fuel system do not use open fire, do not smoke and do not spill any fuel.

Do not inhale any fuel fumes.

### **⚠ Caution**

Ensure strict cleanliness! Thoroughly clean the area around the fuel filters.

The filter cartridge must never be filled beforehand.

After work on the fuel system bleed the system, perform a test run and check for leaks.

Additional bleeding of the fuel system by a 5 minute test run in idle speed or low load is mandatory.

### **♻ Environment**

Catch running out fuel and dispose of environmentally.

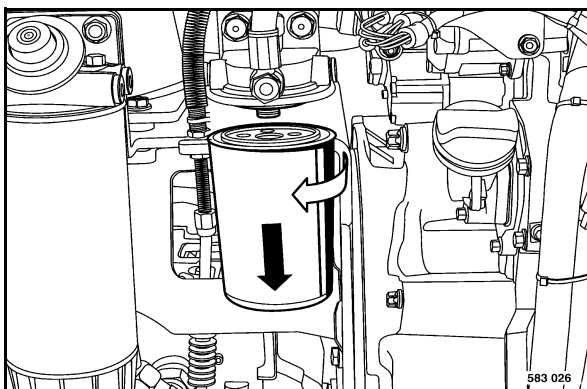


Fig. 157

- Loosen and unscrew the fuel filter cartridge (Fig. 157) using an appropriate filter wrench.
- Clean the sealing face on the filter carrier from any dirt.

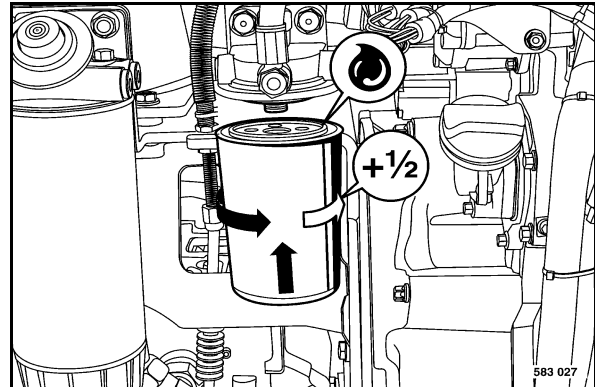


Fig. 158

- Slightly oil the rubber seal (Fig. 158) on the new filter cartridge.
- Turn the new filter cartridge on by hand, until the seal contacts.
- Tighten the filter element for another half turn.

Every 1000 operating hours

## 5.26 Change the fuel pre-filter cartridge

### **⚠ Danger**

Fire hazard! Health hazard!

When working on the fuel system do not use open fire, do not smoke and do not spill any fuel.

Do not inhale any fuel fumes.

### **⚠ Caution**

Ensure strict cleanliness! Thoroughly clean the area around the fuel filters.

The filter cartridge must never be filled beforehand.

After work on the fuel system bleed the system, perform a test run and check for leaks.

Additional bleeding of the fuel system by a 5 minute test run in idle speed or low load is mandatory.

### **♻ Environment**

Catch running out fuel and dispose of environmentally.

### Change the fuel pre-filter cartridge

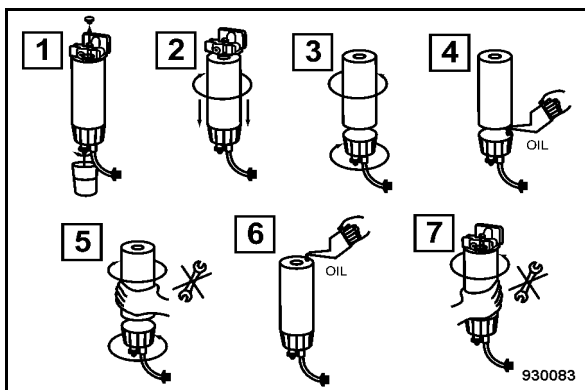


Fig. 159

- Tighten the cable on the water separator (Fig. 159).
- (1) Loosen the bleeding screw and drain off fuel from the bleeding screw.

- (2) Loosen and unscrew the fuel pre-filter cartridge using an appropriate filter wrench.
- (3) Unscrew the water separator from the filter cartridge.
- (4) Apply a thin coat of oil to the rubber seal of the water separator.
- (5) Turn the water separator on by hand, until the seal contacts, then tighten hand-tight.
- (6) Apply a thin coat of oil to the rubber seal of the filter element (5).
- (7) Turn the filter cartridge on by hand, until the seal contacts, then tighten hand-tight.
- Plug the water sensor cable back on.

### Bleed the fuel system

#### **i Note**

Air in the fuel system causes irregular running of the engine, a drop in engine power, stalls the engine and makes starting impossible.

Therefore bleed the fuel system after changing the fuel pre-filter or working on the fuel system.

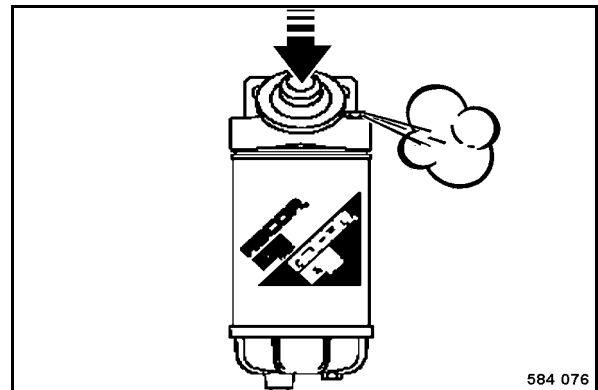


Fig. 160

- Slacken the bleeding screw (Fig. 160) on the fuel pre-filter for 2 to 3 turns.
- Operate the hand pump manually, until fuel flows out of the slackened bleeding screw without air bubbles.
- Then tighten the bleeding screw while pumping.
- Check the filter cartridge for leaks

Every 1000 operating hours

### 5.27 Check the engine mounts

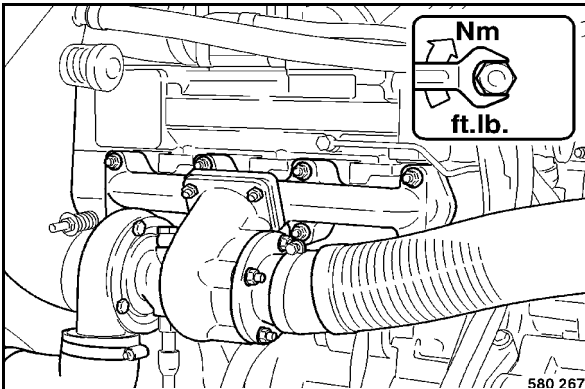


Fig. 161

- Tighten fastenings of intake and exhaust manifolds (Fig. 161) on the cylinder heads.
- Check sockets and clamps between air filter, exhaust turbocharger and charge air line as well as the lubrication air line for tight fit and leaks.
- Retighten the fastening screws for oil sump and engine mounts.

### 5.28 Change the oil in the vibration bearings

#### **⚠ Danger**

Danger of scalding when draining off hot oil!

#### **⚠ Caution**

Drain oil only at operating temperature. For this purpose run the machine approx. half an hour with vibration.

For quality and quantity of oil refer to the "table of fuels and lubricants".

#### **⚠ Caution**

Danger of bearing damage!

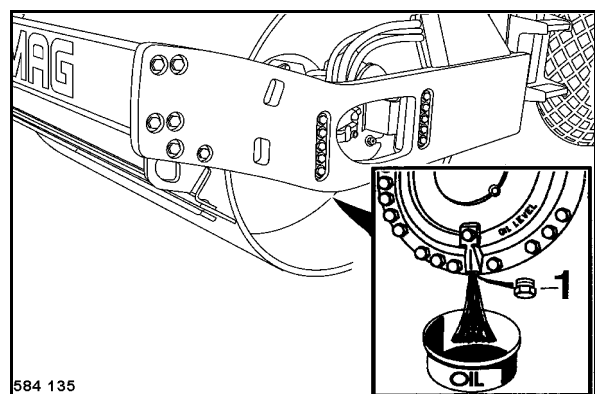
Make sure that no dirt falls into the exciter housing.

Overfilling causes overheating and destruction of the vibration bearings!

#### **♻ Environment**

Catch running out oil and dispose of environmentally.

- Park the machine on level ground.



584 135

Fig. 162

- Move the drum, until the drain plug 1 (Fig. 162) is in bottom position.
- Unscrew the drain plug, let the oil run out and catch it.
- Turn the oil drain plug back in tightly after all oil has run out.



Every 1000 operating hours

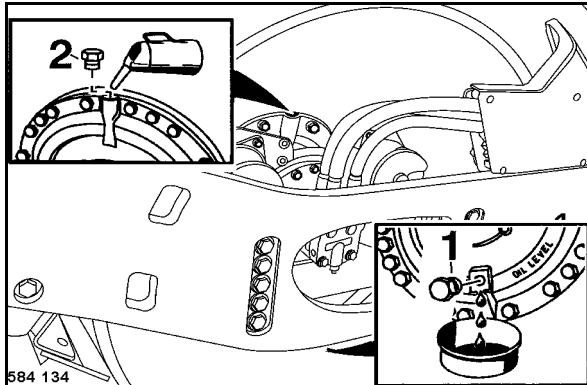


Fig. 163

- Unscrew oil level inspection plug (1) (Fig. 163) on the drum and fill in oil through the filler opening (2), until it starts to drip out from the level inspection bore.
- Screw oil filler (2) and level inspection plug (1) back in tightly.
- Repeat the oil change on the opposite side.
- Check the oil level once again at operating temperature (after running the machine for about half an hour with vibration).

## 5.29 Change the oil in the drive axle

### **⚠ Danger**

Danger of scalding when draining off hot oil!

### **⚠ Caution**

Drain oil only at operating temperature.

For quality and quantity of oil refer to the "table of fuels and lubricants".

### **♻ Environment**

Catch running out oil and dispose of environmentally.

### **i Note**

On other axle versions drain and filler plugs are of slightly different design. Perform the oil change accordingly.

- Park the machine on level ground.

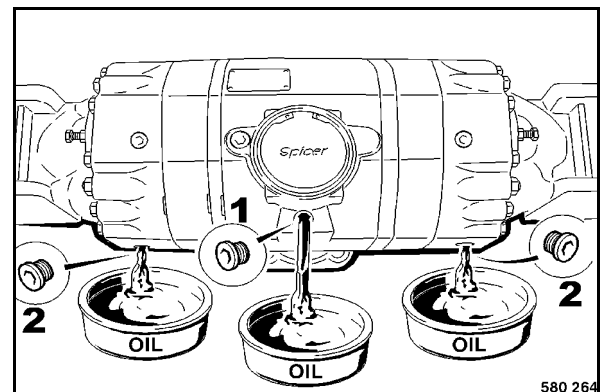


Fig. 164

- Clean and unscrew all level inspection and drain plugs (Fig. 164).
- Drain and catch all oil.
- Clean the drain plug and turn it back in with a new seal ring.

Every 1000 operating hours

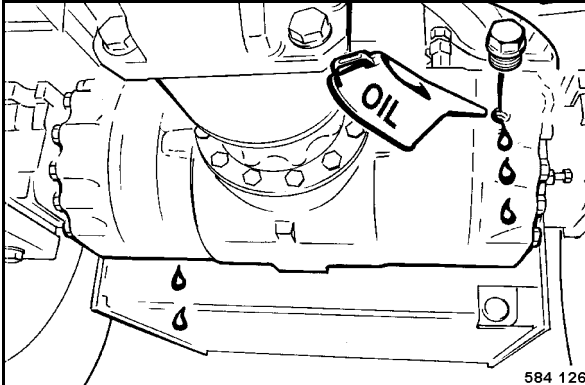


Fig. 165

- Fill in oil through the oil level inspection bores (Fig. 165), until it has reached the bottom edge of the bore.

**i Note**

The second level inspection plug as at the back.

After filling in oil wait until the oil has evenly distributed inside the axle.

- Retighten the filler and level inspection plug.

### 5.30 Changing the oil in the wheel hubs

**⚠ Danger**

Danger of scalding when draining off hot gear oil!

**⚠ Caution**

Drain oil only at operating temperature.

Change the oil on both sides of the axle.

For quality and quantity of oil refer to the "table of fuels and lubricants".

**♻ Environment**

Catch running out oil and dispose of environmentally.

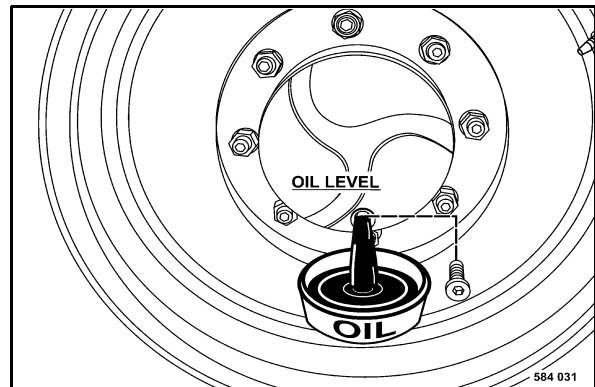


Fig. 166

- Move the drive wheel, until the plug (Fig. 166) is in bottom position.
- Clean and unscrew the plug.
- Drain and catch all oil.

Every 1000 operating hours

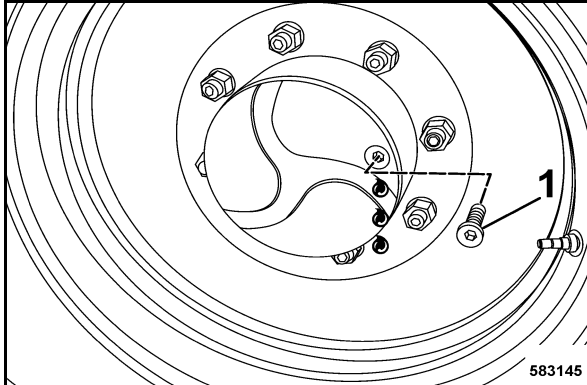


Fig. 167

- Move the drive wheel, until the plug (Fig. 167) is in horizontal position on the housing.
- Fill in oil, until it reaches the bottom edge of the bore .
- Turn the plug tightly back in.
- Change the oil also on the opposite side.

### 5.31 Retighten the fastening of the axle on the frame

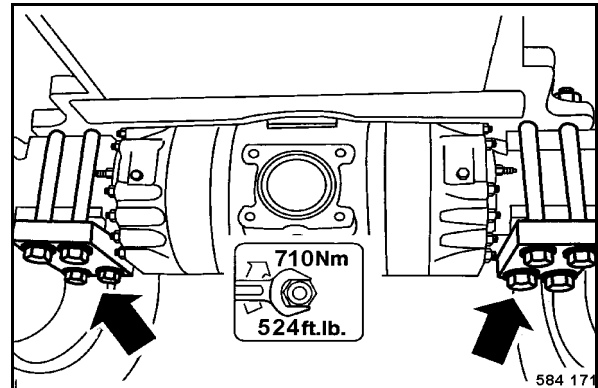


Fig. 168

- Check all fastening nuts on axle mounting bolts (Fig. 168) for tight fit.

Every 1000 operating hours

### 5.32 Tightening the wheel nuts

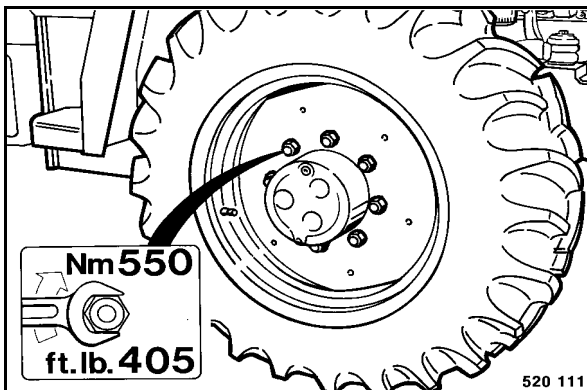


Fig. 169

- Tighten the wheel nuts (Fig. 169) in a cross-type pattern.

### 5.33 Check the ROPS

#### **i** Note

On machines with cabin the ROPS (roll over protection structure) is an integral part of the cabin.

Please observe also the corresponding section in the safety regulations in this manual.

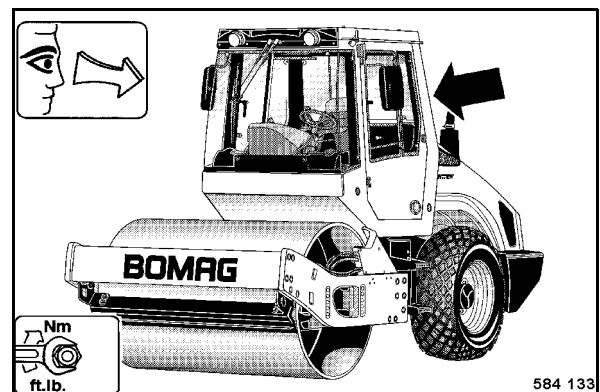


Fig. 170

- Inspect the cabin, especially the ROPS (Fig. 170), for cracks, corrosion, damage and missing fastening parts.

#### **i** Note

Unusual movements and noises (vibrations) during operation are signs for damage or loosened fastening elements.

- Check the fastening screws for the cabin (ROPS) to the operator's stand for tight fit.
- Check the rubber buffers of the operator's platform suspension for condition and tight fit.
- Check the condition and fastening of the seat belts.

Every 1000 operating hours

### 5.34 Check the travel control

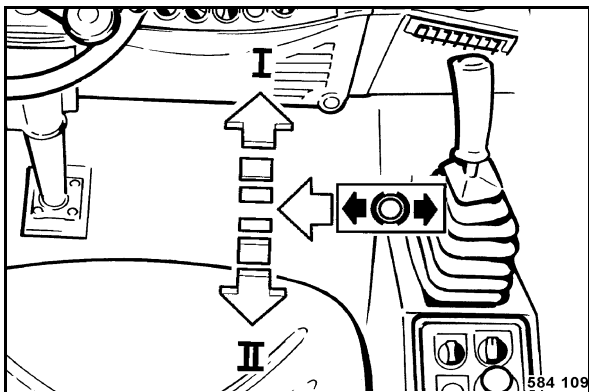


Fig. 171

- Move the travel lever (Fig. 171) forward, backwards and to braking position. Thereby check for function, light movement, clearance and damage.
- In case of malfunction perform trouble shooting and replace the corresponding parts.

**⚠ Caution**

**Only operate the machine after the travel control has been repaired.**



Every 1000 operating hours



Every 2000 operating hours

### 5.35 Adjust the valve clearance

**⚠ Caution**

We recommend to have this work carried out by trained personnel or our after sales service.

Before checking the valve clearance let the engine cool down for at least 30 minutes. The engine oil temperature must be less than 80 °C.

- Remove the valve covers.
- Turn the crankshaft with the cranking device until the valves are overlapping.

**i Note**

Firing order 1-3-4-2

Overlapping of valves: Exhaust valve not yet closed, intake valve starts to open.

Valves	Cylinder			
overlapping	1	3	4	2
adjustment	4	2	1	3

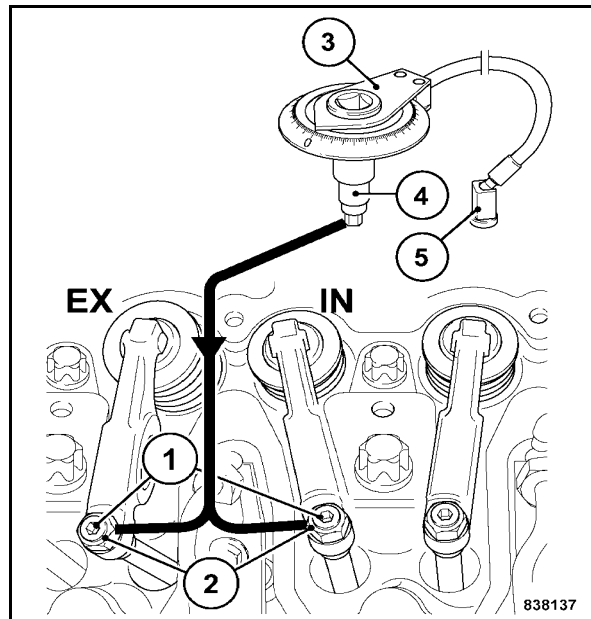


Fig. 172

- Loosen the counter nut (1) (Fig. 172).

- Attach the rotation angle disc (3) and the spanner socket (4) to the valve clearance adjustment screw (2).
- Fix the magnet (5) of the rotation angle disc.
- Turn the rotation angle disc clockwise against the stop (rocker arm no clearance) and set the scale to zero.
- Turn the rotation angle disc counter-clockwise, until the specified angle is reached.

Intake valve = 90° +10°

Exhaust valve = 150° +10°

- Hold the rotation angle disc tight, so that it does not turn, and tighten counter nut (1).

Tightening torque: 20 Nm

- Repeat this adjustment procedure on all other cylinders, after cranking the crankshaft accordingly.
- Install the cylinder head cover with a new gasket.

Tightening torque: 13 Nm

- After a short test run check the engine for leaks.

Every 2000 operating hours

## 5.36 Changing hydraulic oil and breather filter

### **i** Note

See also the notes on the hydraulic system in the chapter "General notes on maintenance".

### **⚠** Danger

**Danger of scalding!**

**When draining off hot hydraulic oil!**

### **⚠** Caution

The hydraulic oil must also be changed after major repairs in the hydraulic system.

Perform the oil change when the hydraulic oil is warm.

Replace the hydraulic oil filter elements with every hydraulic oil change.

Change the filter only after the hydraulic oil change and after the test run.

Clean the area round hydraulic oil tank, filler opening and breather filter.

Do not start the engine after draining the hydraulic oil.

Do not use any detergents to clean the system.

Use only lint-free cleaning cloths.

For quality and quantity of oil refer to the "table of fuels and lubricants".

When changing from mineral oil based hydraulic oil to an ester based biologically degradable oil, you should consult the lubrication oil service of the oil manufacturer for details.

### **♻** Environment

Catch running out hydraulic oil and dispose of environmentally.

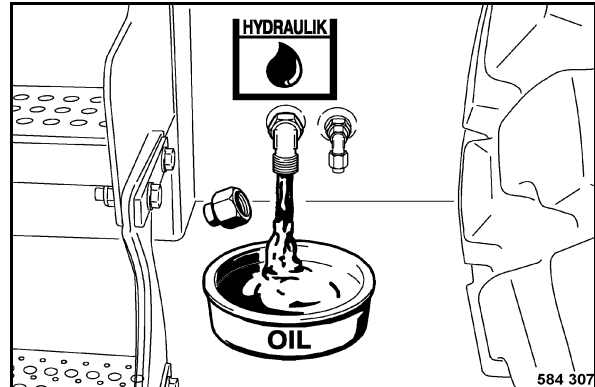


Fig. 173

- Unscrew the plug (Fig. 173) and drain off all hydraulic oil.
- Check the seal ring, replace if necessary and turn the plug tightly back in.

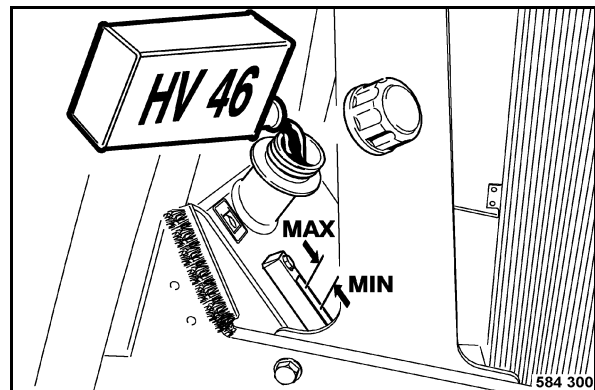


Fig. 174

- Remove the filler cap (Fig. 174).
- Fill in new hydraulic oil through the screen.

### **i** Note

We recommend to use the BOMAG filling and filtering unit with fine filter to fill the system. This ensures finest filtration of the hydraulic oil, prolongs the lifetime of the hydraulic oil filter and protects the hydraulic system.

- Check the oil level in the inspection glass.

### Nominal value:

approx. 3 cm below the upper edge of the inspection glass



Every 2000 operating hours

**i Note**

The breather filter for the hydraulic oil tank is integrated in the filler cap. You should therefore replace the complete filler cap.

- Close the tank with a new cover.

### 5.37 Changing the hydraulic oil filter

**⚠ Danger**

**Danger of scalding!**

There is a danger of scalding by hot oil when unscrewing the filter.

**⚠ Caution**

If the filter has to be changed together with the hydraulic oil, the filter should in any case be changed after the oil change and the test run.

Do not use the oil in the filter bowl.

**♻ Environment**

Catch running out oil, dispose of oil and filter element environmentally.

**i Note**

The filter element must be changed with every hydraulic oil change and after major repairs in the hydraulic system.

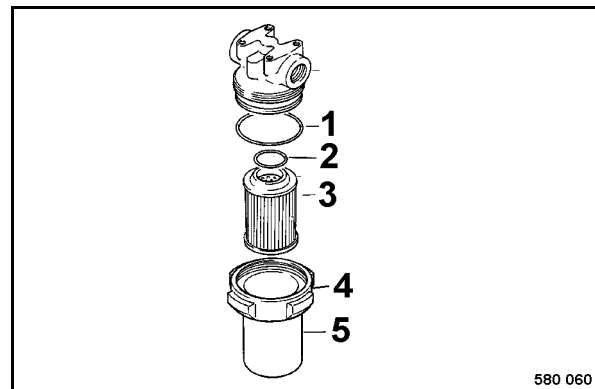


Fig. 175

- Unscrew the cap nut 4 (Fig. 175) and take the filter bowl (5) with the filter element (3) off.
- Examine the sealing face on the filter element thoroughly for any visible dirt.

**⚠ Caution**

Visible impurities may be an early indicator for a failure of system components and predict the

## Every 2000 operating hours

possible malfunction of important parts. In such a case you should perform trouble shooting and replace or repair the defective components. Nonobservance may lead to total damage of the hydraulic system.

**Do not clean or reuse the filter element.**

- Take the old filter element (3) out and clean the filter bowl and the thread.
- Reinstall the filter bowl with the new filter element, check the condition of the O-rings (1) and (2), replace if necessary.
- After a test run check the filter for leaks.

## 5.38 Changing the coolant

### **⚠ Danger**

**Danger of scalding!**

**Change the coolant only when the engine is cold.**

### **⚠ Caution**

**Do not start the engine after draining off the coolant.**

**In case of lubrication oil entering into the cooling system or a suspicious turbidity caused by corrosion residues or other suspended matter, the coolant must be drained off and the complete cooling system needs to be cleaned. Lubrication oil can damage the sealing materials used in the engine.**

**When changing the coolant without any signs of contamination, cleaning of the cooling system is not necessary.**

**For quality and quantity of coolant refer to the "table of fuels and lubricants".**

**Do not mix different coolants and additives, see section "Fuels and Lubricants - Coolant".**

### **♻ Environment**

**Catch coolant and dispose of environmentally.**

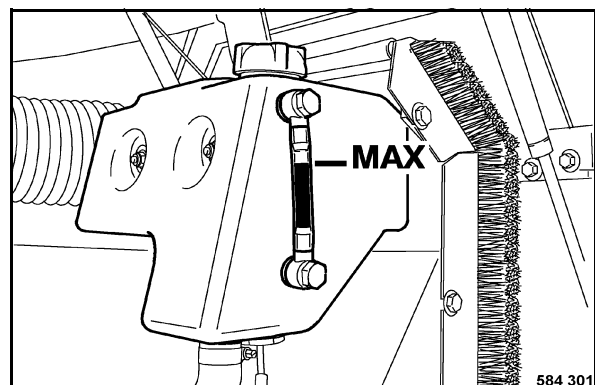


Fig. 176

- Unscrew the cover (Fig. 176) from the compensation tank.

Every 2000 operating hours

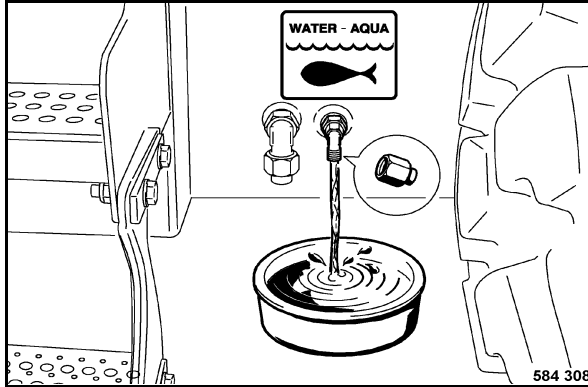


Fig. 177

- Unscrew the plug, let the coolant run out and catch it (Fig. 177).
- Check the condition of the coolant.

**⚠ Caution**

**Thoroughly flush the cooling system if the coolant is contaminated by corrosion residues or other suspended matter.**

**If lubrication oil has entered you must add a cleansing agent in order to remove any residues from the system. Follow the instructions of the manufacturer. If in doubt consult your local service station or the engine manufacturer.**

- Remove the thermostat.
- Fill in clean water.
- Start the diesel engine and run it warm to operating temperature.
- Allow the engine to cool down to approx. 50 °C.
- Drain all water off.
- Repeat the flushing process twice using a cleansing agent with clear water.
- Screw the plug back in once all coolant has run out.
- Reinstall the thermostat .

**⚠ Caution**

**The anti-freeze concentration (additive) must be at least 35 Vol% and maximum 50 Vol%.**

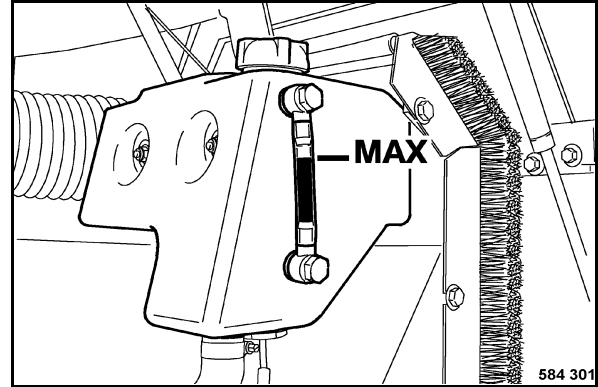


Fig. 178

- Fill in coolant (Fig. 178) up to the MAX-mark and screw the filler cap back on.
- Start the diesel engine and run it warm to operating temperature.
- Check the coolant level again, top up if necessary.



Every 2000 operating hours



Every 3000 operating hours

### 5.39 Replacing ribbed V-belt and idler pulley

- Remove the compressor V-belt\*.

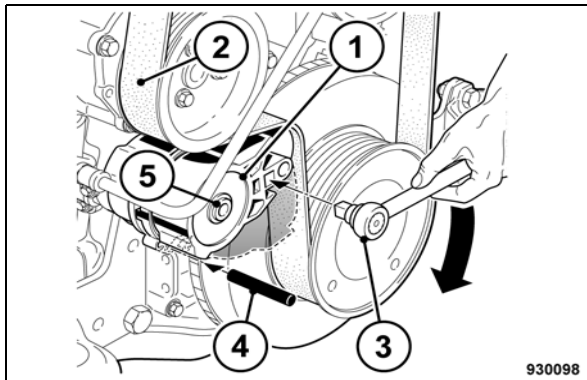


Fig. 179

- Press idler pulley (1) (Fig. 179) in direction of arrow using a socket wrench (3), until the locking pin (4) engages in the assembly bore.
- Take the ribbed V-belt (2) first off the smallest pulley.
- Unscrew fastening screws (5) and take off idler pulley.
- Install a new idler pulley and tighten the fastening screw with 80 Nm (59 ft.lbs)
- Install the new ribbed V-belt.
- Counter the idler pulley with a ratchet and remove the locking pin.
- Check whether the ribbed V-belt is correctly seated in the guides.
- Install and tighten the compressor V-belt.

\* Optional equipment



Every 3000 operating hours



Every 6000 operating hours

## 5.40 Replace the injection valves

**⚠ Caution**

This work must only be performed by authorized service personnel.

Injection lines must be renewed after they have been loosened three times.

## 5.41 Replacing the crank case ventilation valve

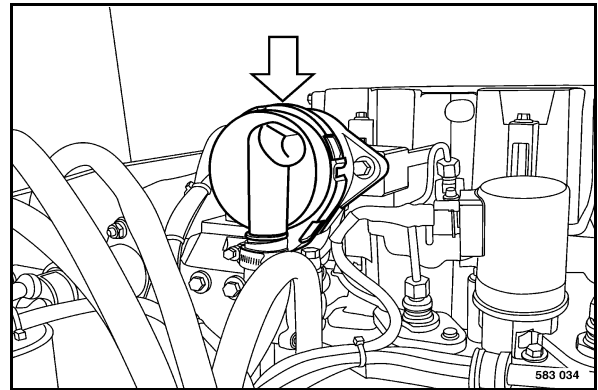


Fig. 180

- Replace the crank case ventilation valve (Fig. 180).



Every 6000 operating hours





As required

## 5.42 Air filter maintenance

### **⚠ Caution**

Do not start the engine after having removed the air filter.

If necessary, the air filter may be cleaned up to six times. After one year at the latest it must be replaced together with the safety element.

Cleaning does not make sense if the air filter element is covered with a sooty deposit.

Do not use gasoline or hot fluids to clean the filter element.

After cleaning the air filter must be inspected for damage using a torch.

Do not continue to use a damaged air filter element. If in doubt use a new air filter.

If the air filter is damaged, the safety element must be replaced as well.

The safety element must not be cleaned.

### **i Note**

We generally recommend to renew the air filter. A new filter element is far less expensive than a possible engine damage.

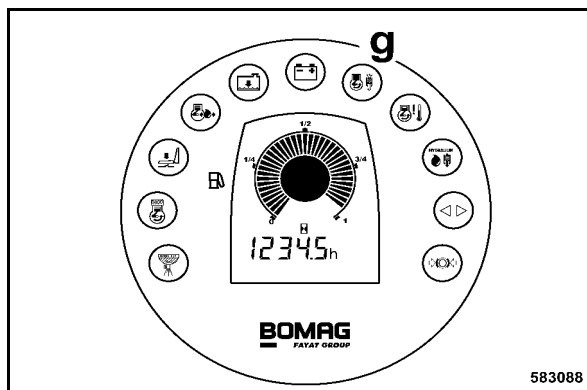


Fig. 181

Maintenance of the air filter is due when air filter control lamp (g) (Fig. 181) lights permanently when the engine is running, but at the latest after one year.

### **i Note**

Once the air filter warning light lights up, work may be continued until the end of the day.

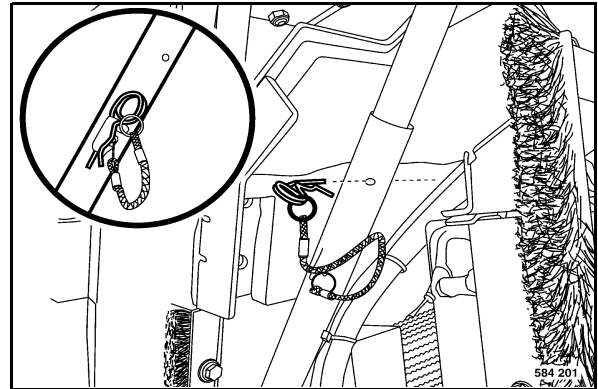


Fig. 182

- Open the engine hood (Fig. 182) completely and secure it.

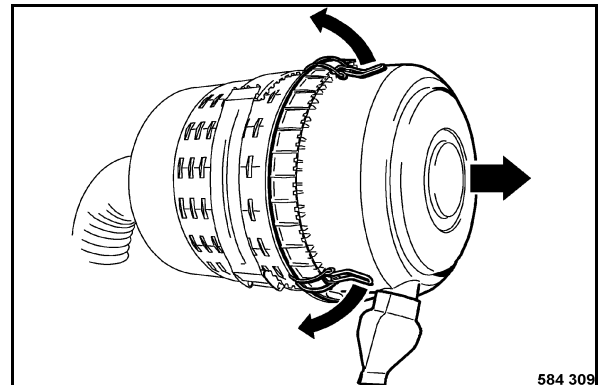


Fig. 183

- Loosen both locking hooks (Fig. 183) on the housing cover and take the cover off.
- Clean cover and dust discharge valve.

As required

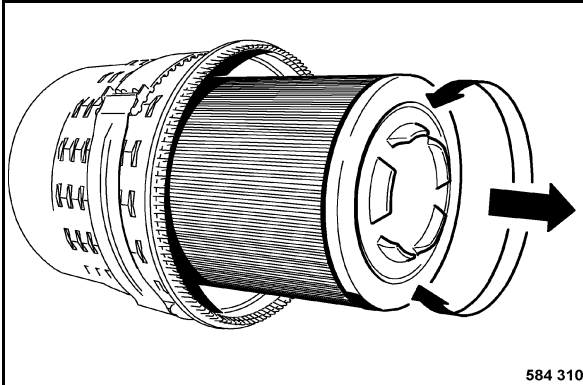


Fig. 184

- Pull out the air filter (Fig. 184) with light turning movements.

**⚠ Danger**

**Danger of injury!**

**Wear protective clothing (goggles, gloves).**

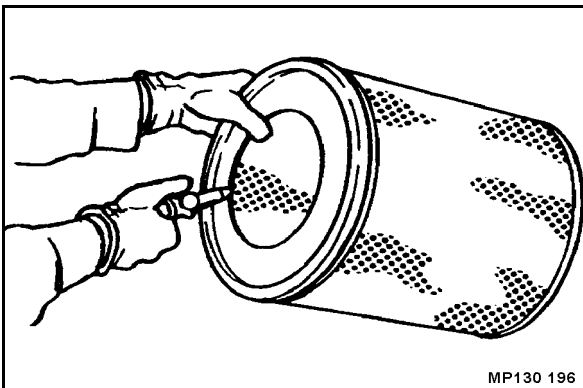


Fig. 185

- Blow the air filter (Fig. 185) out with compressed air (max. 5 bar (70 psi)) from inside to outside by moving the tube up and down inside the element, until it is free of dust.

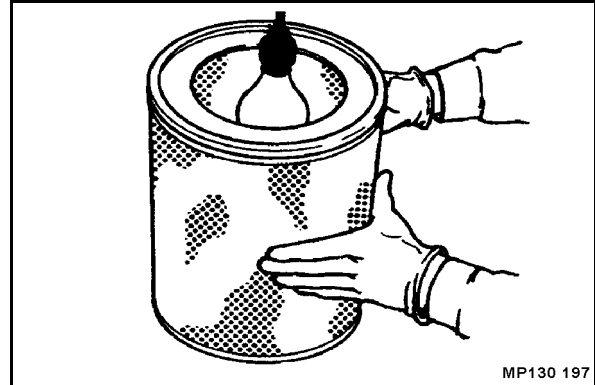


Fig. 186

- Examine the air filter with a torch for cracks and holes in the paper bellows (Fig. 186).
- In case of damage replace the air filter and the safety element.

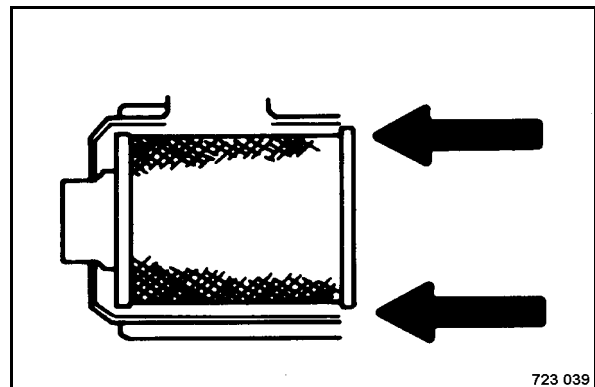


Fig. 187

- Slide the air filter carefully into the housing (Fig. 187).

**⚠ Caution**

**The dust discharge valve must point vertically downwards.**

**Make sure that the cover locks engage correctly.**

- Reassemble the housing cover.

As required

## Replacing the safety element

### Caution

The safety element must not be cleaned and should not be used again after it has been removed.

The safety element must be replaced:

- if the air filter is damaged.
- at the latest after 2 years.
- if the air filter warning lamp comes on again after the air filter has been cleaned.

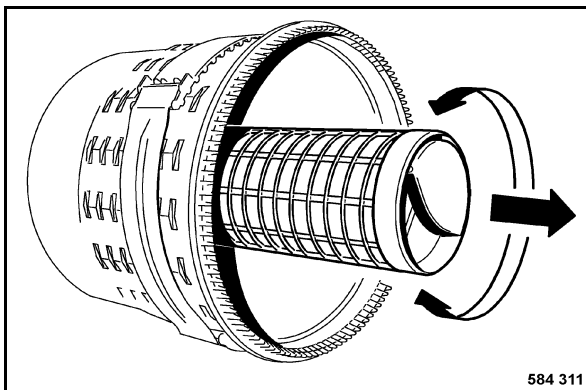


Fig. 188

- Remove the housing cover and pull the air filter off.
- Pull the safety element (Fig. 188) out by turning it lightly.
- Push in a new safety filter element.
- Insert the air filter and reassemble the housing cover.

## 5.43 Adjust the scrapers

### Smooth drum

- Check adjustment and condition of front and rear scrapers, if necessary adjust or replace the scraper rubber.

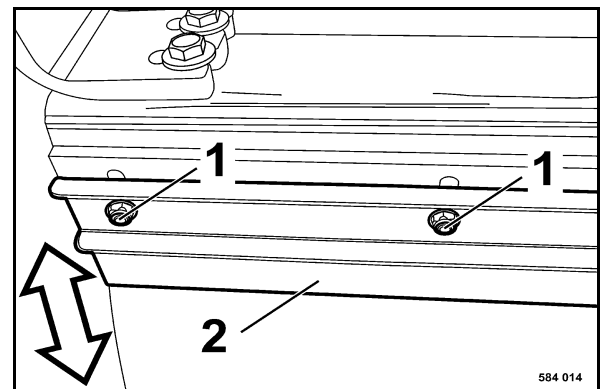


Fig. 189

- In order to adjust the scrapers 2 (Fig. 189), slacken the fastening screws (1) in the slots and push the scraper towards the drum to contact.
- Retighten the fastening screws.

### Padfoot drum

- Check adjustment and condition of front and rear scrapers, if necessary adjust or replace the scraper rubber.

As required

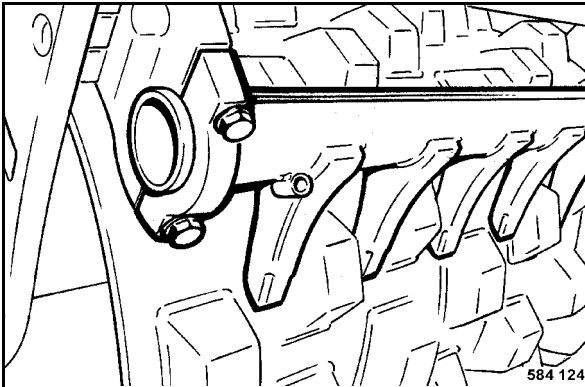


Fig. 190

- Check adjustment and condition of scrapers (Fig. 190), adjust or replace the teeth if necessary.
- To adjust the scrapers slacken the clamping screws and push the scrapers towards the drum, leaving a gap of about 25 mm.
- Retighten the clamping screws.

## 5.44 Clean the machine

**⚠ Caution**

When using a steam cleaner for cleaning do not subject electrical parts and insulation material to the direct jet or cover these items beforehand.

Allow the engine to cool down before cleaning.

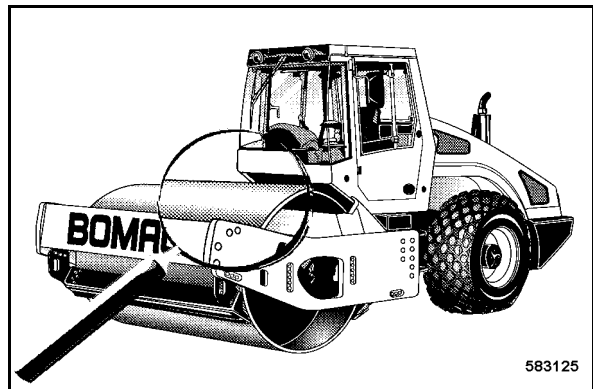


Fig. 191

- Clean the machine (Fig. 191) thoroughly at least once per week.

When used on highly cohesive soils, on cement or trass-lime mortar or for similar work, the machine must be thoroughly cleaned every day.

Please observe that the correct function of the scrapers is ensured and that no material will build up between rollers and frame.

As required

## 5.45 Changing the tires

### **⚠ Danger**

**Danger of accident!**

**Observe all safety notes for the lifting of loads.**

- Place a jack (min. 5 t bearing capacity) under the rear frame and jack the machine up so that the wheel can turn freely.
- Unscrew the wheel nuts and take the wheel off.

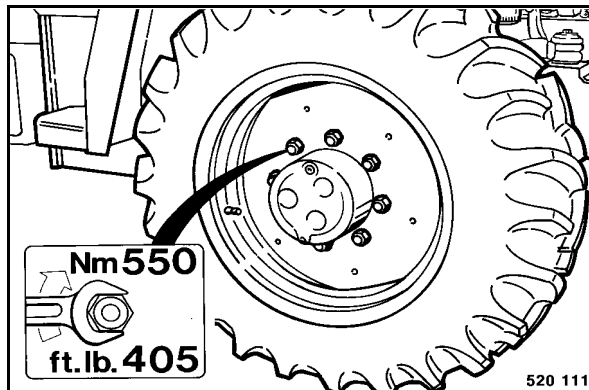


Fig. 192

- Attach the wheel (Fig. 192) and tighten the wheel nuts crosswise with 550 Nm (405 ft. lb.).
- Check the tire pressure, see technical data.

## 5.46 Change the fresh air filter in the cabin

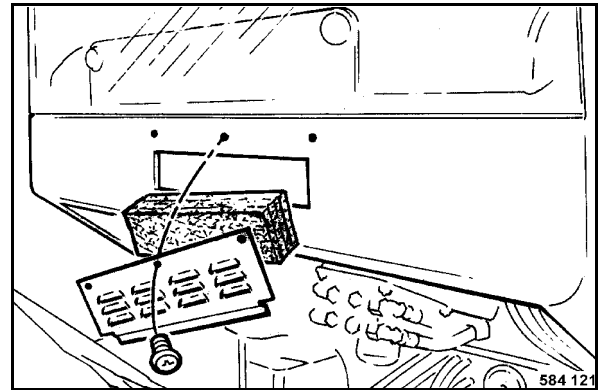


Fig. 193

- Unscrew fastening screws for the ventilation grid (Fig. 193) and remove the filter.
- Insert a new filter and reassemble the ventilation grid.

As required

### 5.47 Fill the provision tank for the windscreen washer\* system

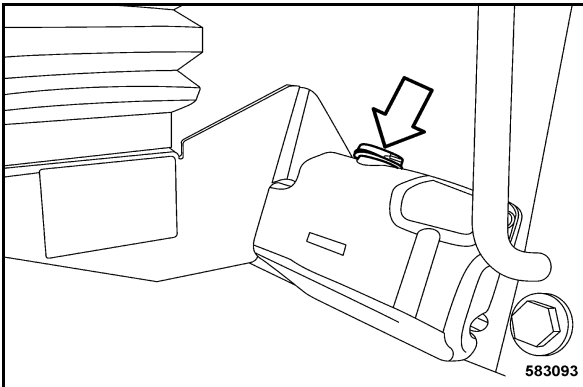


Fig. 194

- Check the fluid level in the tank (Fig. 194), top up if necessary.
- For winter operation fill in the appropriate amount of ant-freeze agent; refer to the specifications of the manufacturer of the ant-freeze agent.

\* Optional equipment

### 5.48 Tightening torques

Bolt dimensions	Tightening torques Nm*		
	8.8	10.9	12.9
M4	3	5	5
M5	6	9	10
M6	10	15	18
M8	25	35	45
M10	50	75	83
M12	88	123	147
M14	137	196	235
M16	211	300	358
M18	290	412	490
M20	412	578	696
M22	560	785	942
M24	711	1000	1200
M27	1050	1480	1774
M30	1420	2010	2400

Fig. 195

\* Strength classes for screws with untreated, non-lubricated surface. Screw quality designations are stamped on the screw heads.

8.8 = 8G

10.9 = 10K

12.9 = 12K

- Axle - frame

M 22x1.5 = 710 Nm

- Wheel nuts

M 22x1.5 = 550 Nm

The values result in a 90% utilization of the screw yield point at a coefficient of friction  $\mu_{total} = 0,14$ . When using lubricant  $MOS_2$  the specified tightening torques do not apply.

#### **i** Note

*Self-locking nuts must always be replaced once they have been unscrewed.*

**As required**

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## 5.49 Engine conservation

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If the engine is to be shut down for a longer period of time (e.g. over winter), please consult the service department of the engine manufacturer for further details.



**As required**







## 6 Trouble shooting

## Trouble shooting

### 6.1 General notes

The following work must only be carried out by qualified and trained personnel or by the sales service.

Please observe strictly the safety regulations in chapter 2 of these operating and maintenance instructions.

Faults occur frequently due to the fact, that the machine has not been properly operated or serviced. Therefore, whenever a fault occurs, read through these instructions on correct operation and maintenance. If you cannot locate the cause of the fault or eliminate it yourself by following the trouble shooting charts, you should contact our customer service departments at our branch office or dealers.

**⚠ Danger**

**Danger of injury!**

Keep away from rotating parts of the engine.

### 6.2 Reading out faults BVC/ BTM05

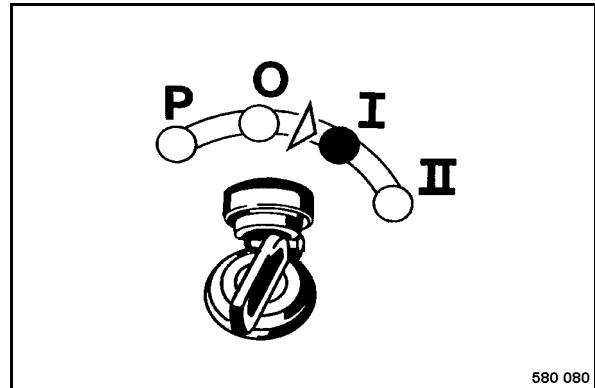


Fig. 196

- Turn the ignition key (Fig. 196) to position "I".

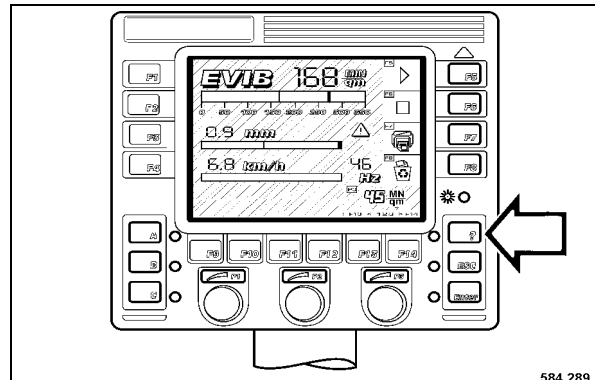


Fig. 197

- Press key "?" (menu) (Fig. 197).

**i Note**

The menu appears on the screen.

Trouble shooting

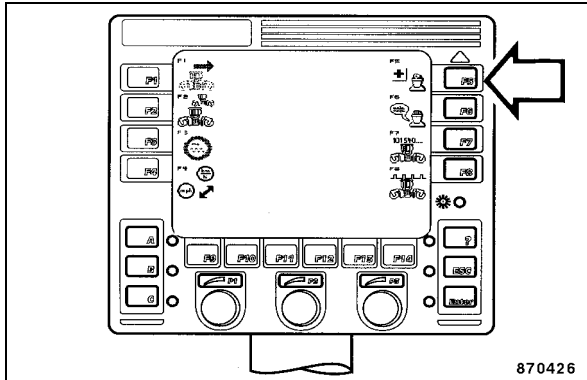


Fig. 198

- Press key "F5" (diagnostics) (Fig. 198).

**i Note**

The screen with the currently available fault codes is displayed.

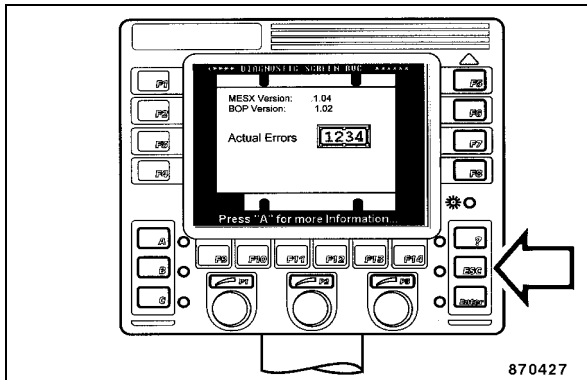


Fig. 199

- Currently present faults are indicated by a corresponding fault code in the field "Actual Errors".
- Press key "ESC" (Fig. 199) to leave the screen page with the actual fault codes.



**Trouble shooting**

**6.3 Engine problems**

<b>Fault</b>	<b>Possible cause</b>	<b>Remedy</b>
Engine does not start or starts poorly	Temperature below starting limit Oil level too low Lubrication oil level too high Lubrication oil cooler defective  Exhaust gas counter pressure too high V-belt/ribbed V-belt (fuel pump in belt drive) Engine oil with wrong SAE viscosity class Fuel quality not as specified in the operating instructions Air in the fuel system Battery defective or not charged Cable to starter loose or oxidized Starter defective or pinion does not engage	Check Fill up lubrication oil Check the lubrication oil level, drain off if necessary Check Check check, whether torn or loose Change the lubrication oil Change the fuel Bleed the fuel system Check the battery Check cable connection Check starter
Engine does not start and diagnostic lamp flashing	Engine electronics prevent starting	Check fault by fault code, repair as necessary
Engine starts, but runs irregularly or misfires	V-belt/ribbed V-belt (fuel pump in belt drive) Incorrect valve clearance Injector defective Injection valve defective Glow plug defective Air in the fuel system Fuel pre-cleaner soiled Fuel quality not as specified in the operating instructions Injection line leaking	check, whether torn or loose Adjust Replace Check / replace the injection valve Replace Bleed the fuel system Clean/replace Change the fuel Check the injection line



**Trouble shooting**

<b>Fault</b>	<b>Possible cause</b>	<b>Remedy</b>
Speed changes are possible and diagnostic lamp lights	Engine electronics detected a system fault and activates a substitute speed	Check fault by fault code, repair as necessary
Engine overheating, temperature warning system responds	Bleeding line clogged Injector defective Coolant heat exchanger soiled Coolant pump defective (V-belt torn or loose) Lack of coolant Charge air pipe leaking V-belt/ribbed V-belt (fuel pump in belt drive) Lubrication oil filter soiled Lubrication oil level too low Lubrication oil level too high  Air filter clogged / exhaust turbocharger defective Fan defective / V-belt torn or loose Short circuit of heat in cooling system Resistance in cooling system too high / flow quantity too low	Clean ventilation line Replace Clean check, whether torn or loose Fill up Check the charge air pipe check, whether torn or loose Replace Fill up lubrication oil Check the lubrication oil level, drain off if necessary Check/replace Check fan / V-belt, replace if necessary Check the cooling system Check the cooling system
Engine has to low or no oil pressure	Lubrication oil level too low Engine oil with wrong SAE viscosity class	Fill up lubrication oil Change the lubrication oil



## Trouble shooting

Fault	Possible cause	Remedy
Insufficient engine power	Engine oil level too high	Drain the engine oil down to the top dipstick mark
	Fuel quality not as specified in the operating instructions	Change the fuel
	Air filter clogged / exhaust turbocharger defective	Check/replace
	Charge air pipe leaking	Check the charge air pipe
	Intercooler soiled	Clean
	Injection line leaking	Check the injection line
	Injector defective Injection valve defective	Replace Check the injection valve
Insufficient engine power and diagnostic lamp lights	Engine electronics reduces the power	Check fault by fault code, repair as necessary
Engine does not work with all cylinders	Injection line leaking	Check the injection line
	Injection valve defective	Check / replace the injection valve
Engine has excessive oil consumption	Lubrication oil level too high	Check the lubrication oil level, drain off if necessary
Blue engine exhaust smoke	Lubrication oil level too high	Check the lubrication oil level, drain off if necessary
White engine exhaust smoke	Temperature below starting limit	Check
	Fuel quality not as specified in the operating instructions	Change the fuel
	Injection valve defective	Check/replace
Black engine exhaust smoke	Air filter clogged / exhaust turbocharger defective	Check/replace
	Charge air pipe leaking	Check charge air line
	Injection valve defective	Check / replace the injection valve
	Injector defective	Replace



## 7 Cab assembly before initial start-up



## Cab assembly before initial start-up

### General safety regulations for assembly

When installing the cabin to your machine you must strictly comply with the valid accident prevention instructions or the country specific regulations. However, dangers for persons and property may still arise, if:

- the lifting gear used has a too low bearing capacity
- damaged or worn lifting tackle is used
- unqualified personnel is entrusted with the installation
- the safety instructions are not observed

Each person involved in the installation of the cabin must therefore read and comply with these safety regulations. If necessary, the customer must demand a written confirmation with signature.

Moreover, the following instructions and regulations must obviously also be complied with:

- applicable accident prevention instructions
- generally accepted safety and road traffic regulations
- country specific safety regulations. It is the duty of the operator to be acquainted with these instructions and to apply these accordingly. This applies also for local regulations concerning different types of handling work. Should the recommendations in these instructions be different from the regulations valid in your country, you must comply with the safety regulations valid in your country.

### Changes and conversions to the cabin/machine

Unauthorized changes to the cabin are prohibited for safety reasons.

Original parts and accessories have been specially designed for this machine. We wish to make explicitly clear that we have not tested or approved any parts or accessories not supplied by us. The installation and/or use of such products may have an adverse effect on the active and/or passive driving safety.

The manufacturer explicitly excludes any liability for damage caused by the use of non-original parts or accessories.

### Notes on safety in the assembly instructions

#### Danger

Paragraphs marked like this highlight possible dangers for persons.

#### Caution

Paragraphs marked like this highlight possible dangers for machines or parts of the machine.

#### Note

Paragraphs marked like this contains technical information and hints for optimal assembly.

#### Environment

Paragraphs marked like this point out practices for safe and environmental disposal of fuels and lubricants as well as replacement parts.

Strictly observe the national regulations for the protection of the environment.

### Information and safety stickers/decals on the cabin

Keep stickers/decals in good and legible condition (see spare parts catalogue) and comply with their meaning.

Replace damaged stickers/decals

### Work on heating lines

Before starting work on heating pipes relieve any pressure and let them cool down - danger of scalding!

After completing work on the heating system of the machine check all connections and fittings for leaks.

### Working on electric parts of the machine

Before starting to work on electric parts of the machine disconnect the battery and cover it with insulating material.



## Cab assembly before initial start-up

Do not use fuses with higher ampere ratings and do not repair fuses with a piece of wire. Fire hazard.

### 7.1 Preparations

**▲ Danger**

**Danger of accident!**

For transport purposes the driver's seat must be tied down with cable straps thus to operate the seat contact switch. Before resuming operation of the machine these cable straps must strictly be removed to ensure safe and reliable function of the seat contact switch.

Check the 4 lifting eyes on the cabin roof for tight fit.

Fasten the lifting gear to all four lifting eyes.

Use lifting gear (chains or ropes) of sufficient load bearing capacity. The minimum load bearing capacity of the crane must be 1000 kg.

Do not stand or step under loads being lifted.

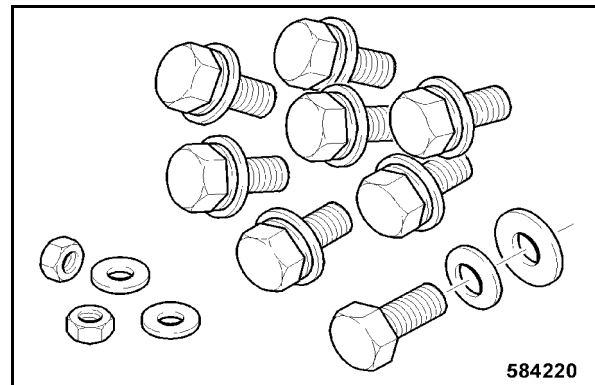


Fig. 200

- Make sure that all fastening screws, washers, spacers and nuts to fasten the cabin are available (Fig. 200).
- Check whether rear rack, foot mat, step plate and fastening kit are available.

## Cab assembly before initial start-up

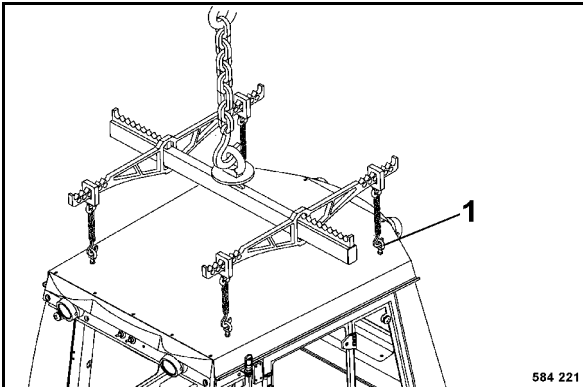


Fig. 201

- Fasten the lifting gear to the four lifting eyes 1 (Fig. 201).
- Loosen possible fastening on the transport pallet.
- Slowly list the crane with a crane.

### **⚠ Danger**

**Danger of accident!**

**Do not stand or step under loads being lifted.**

## 7.2 Cabin assembly

### **⚠ Danger**

**Danger of accident!**

Use lifting gear (chains or ropes) of sufficient load bearing capacity. The minimum load bearing capacity of the crane must be 1000 kg.

**Do not stand or step under loads being lifted.**

- Clean the operator's stand of dirt, oil and moisture.

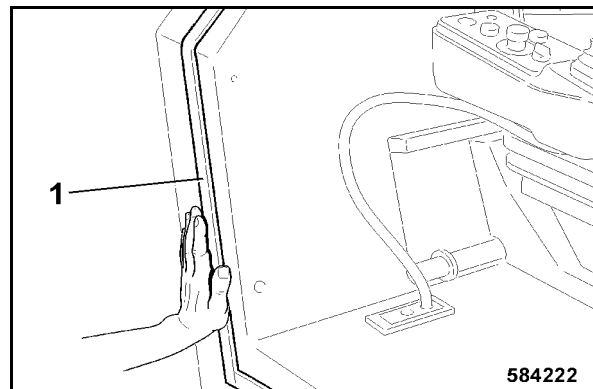


Fig. 202

- Stick the supplied sealing tape 1 (Fig. 202) along the edge of the operator's stand.

### **⚠ Caution**

**Only unroll and stick the sealing tape on just before mounting the cab to the operator's stand. The sealing tape will swell a few minutes after being unrolled. In this case the cabin can no longer be mounted!**

## Cab assembly before initial start-up

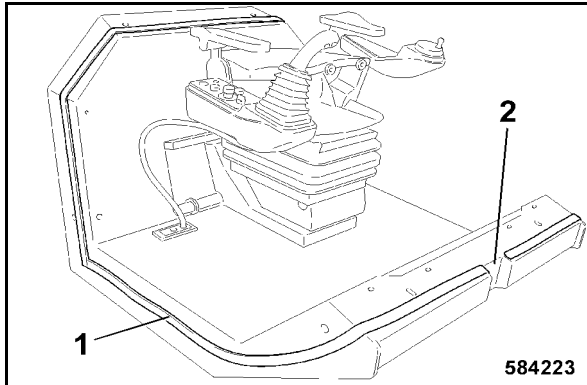


Fig. 203

- Stick the sealing tape 1 (Fig. 203) all around the operator's stand.
- Do not run the sealing tape across the front recess in the operator's stand (2), since this is the air inlet for the cabin ventilation.

### **i** Note

Mount the cabin immediately after sticking on the sealing tape, because the sealing tape will swell.

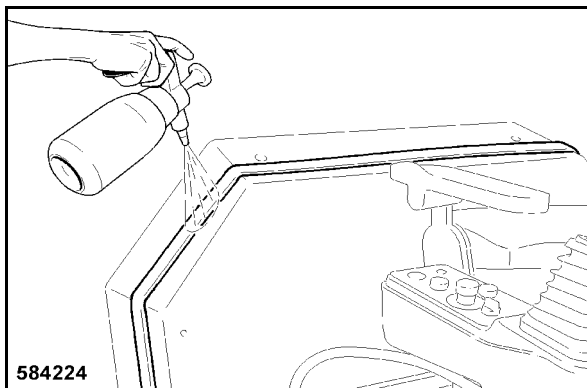


Fig. 204

- Spray the sealing tape with soapsuds (Fig. 204), to be able to slide the cabin on the operator's stand.

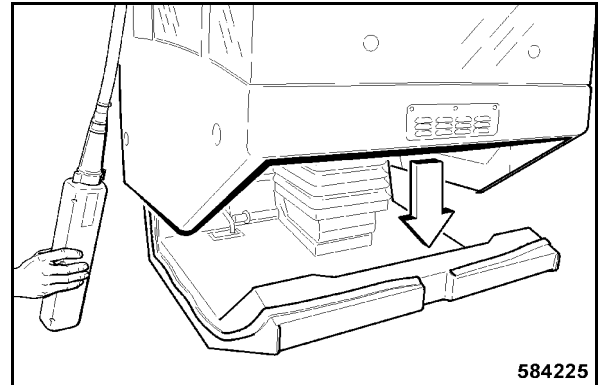


Fig. 205

- Slowly lower the cabin vertically to the operator's stand (Fig. 205).

### **⚠** Caution

The cabine must be lowered vertically onto the operator's stand.

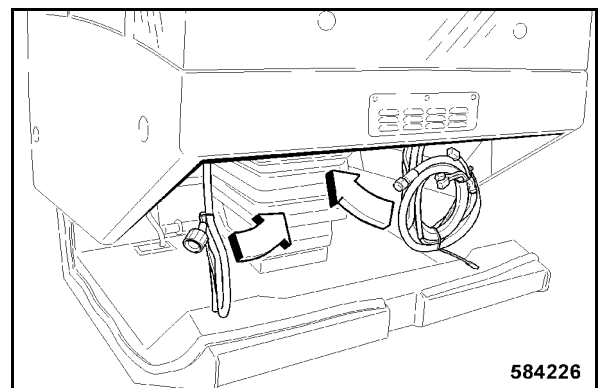


Fig. 206

### **⚠** Caution

Take care that none of the hoses and electric cables become squashed (Fig. 206).

- Run cables and hoses from inside the cabin through the operator's stand to the outside.

## Cab assembly before initial start-up

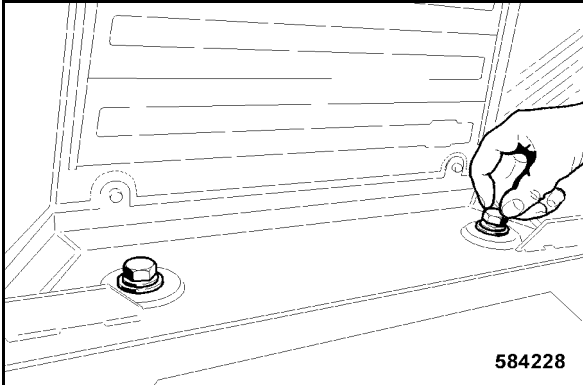


Fig. 207

- Turn both fastening screws (Fig. 207) at the rear of the cabin in handtight.

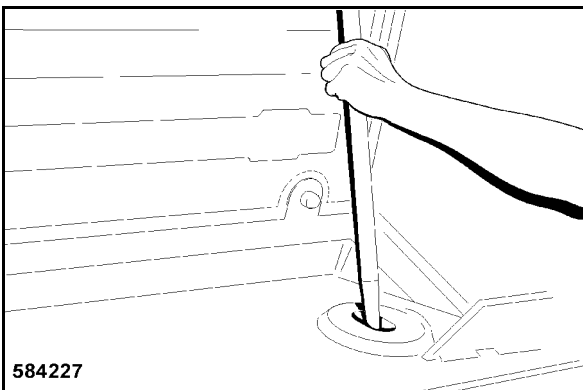


Fig. 208

### **i** Note

*If the bores do not match the cabin can be moved into position by means of a crow bar (Fig. 208).*

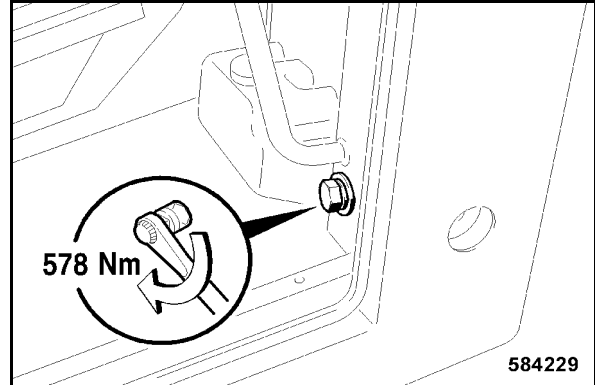


Fig. 209

- Tighten the bottom fastening screw on the access side (Fig. 209) with 578 Nm.

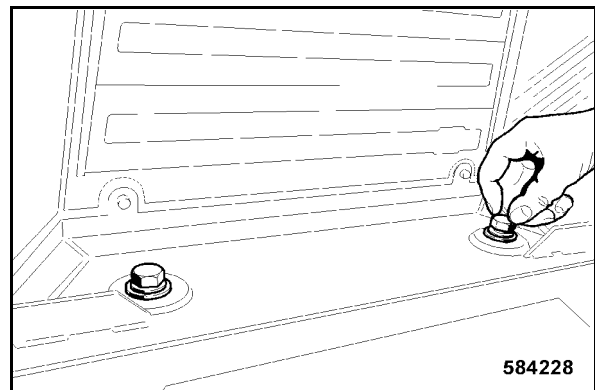


Fig. 210

- Loosen both fastening screws (Fig. 210) at the rear of the cabin again.

### **i** Note

*The cabin will now slide into final assembly position.*

- Tighten both fastening screws (Fig. 210) at the rear of the cabin with 578 Nm.

**Cab assembly before initial start-up**

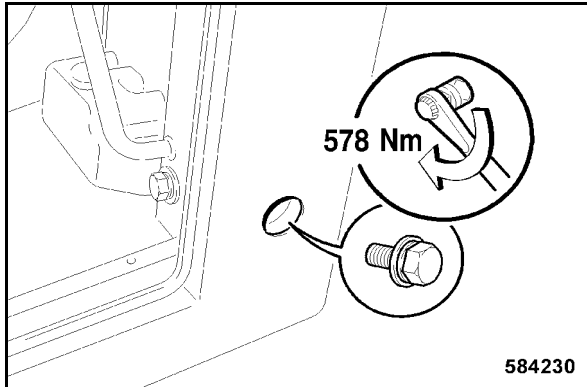


Fig. 211

- Tighten the rear lateral fastening screw on the left hand side with 578 Nm (Fig. 211).

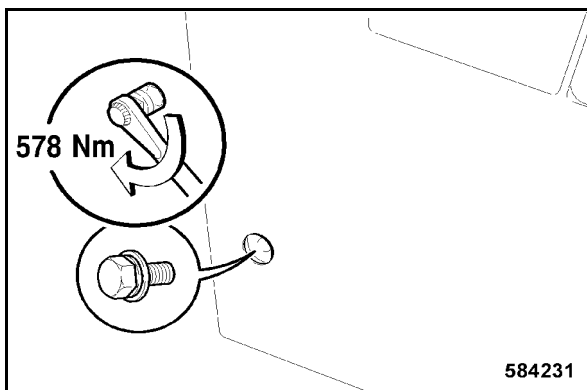


Fig. 212

- Tighten the rear lateral fastening screw on the right hand side with 578 Nm (Fig. 212).

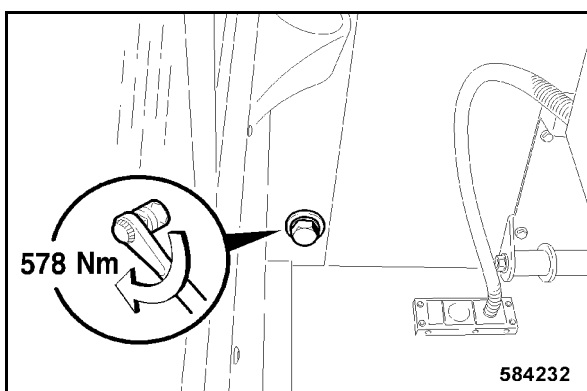


Fig. 213

- Tighten the rear inside fastening screw on the right hand side with 578 Nm (Fig. 213).

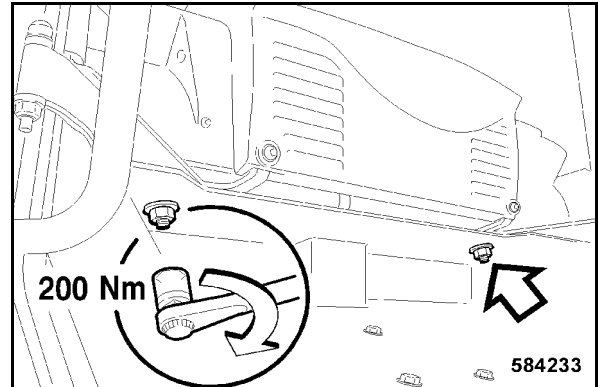


Fig. 214

- Turn nuts with washers onto both studs and tighten with 200 Nm (Fig. 214).

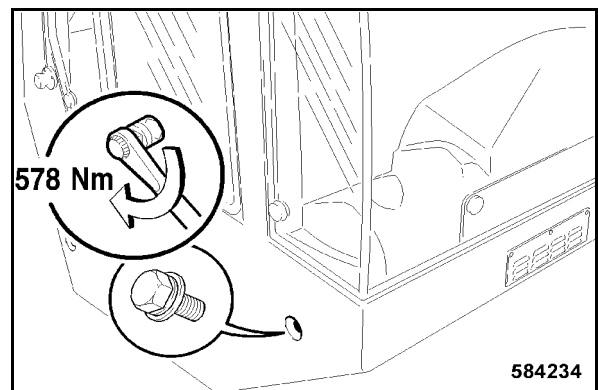


Fig. 215

- Tighten the front lateral fastening screw on the right hand side with 578 Nm (Fig. 215).

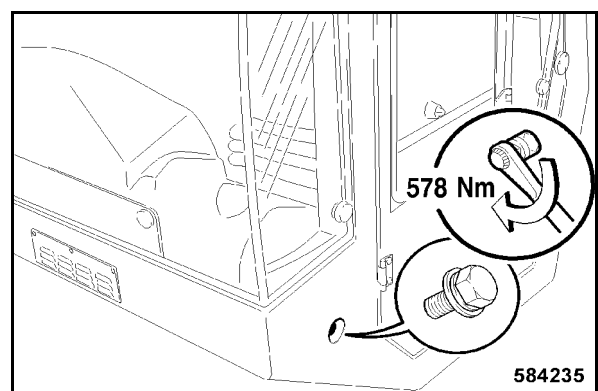


Fig. 216

- Tighten the front lateral fastening screw on the left hand side with 578 Nm (Fig. 216).

**Cab assembly before initial start-up**

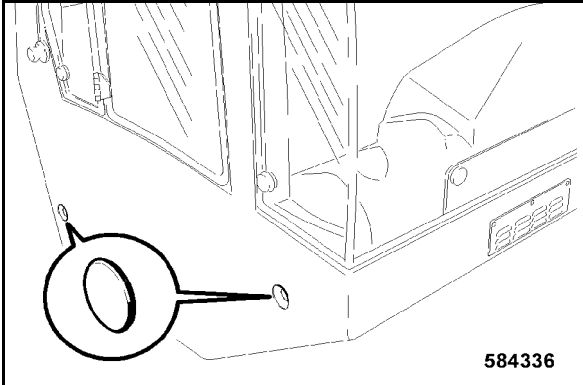


Fig. 217

- Cover all lateral fastening screws with plastic caps (Fig. 217).

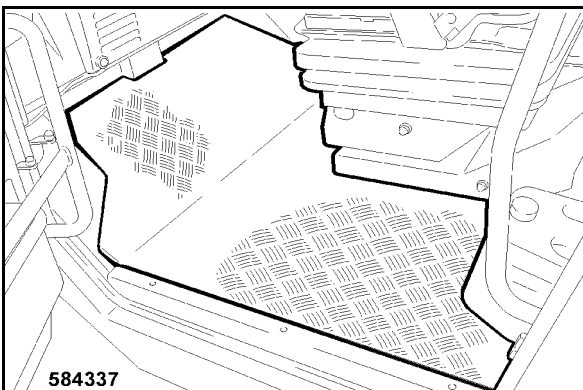


Fig. 218

- Insert the foot mat 1 (Fig. 218).

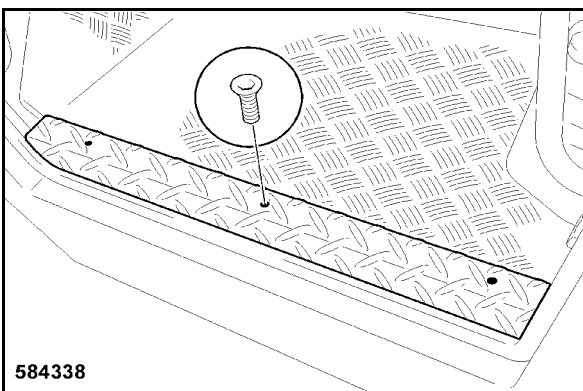


Fig. 219

- Attach the step plate 1 (Fig. 219) and tighten the three fastening screws (2).

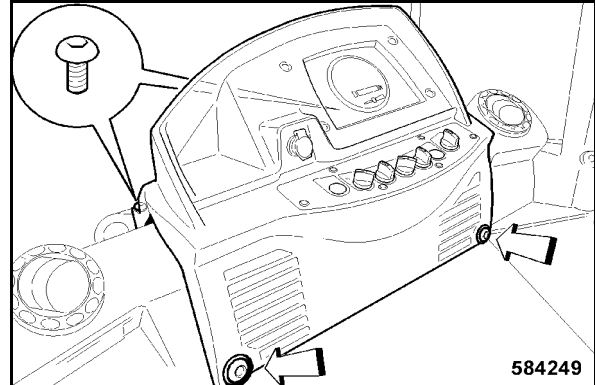


Fig. 220

- Insert the dashboard and fasten it with four fastening screws (Fig. 220).

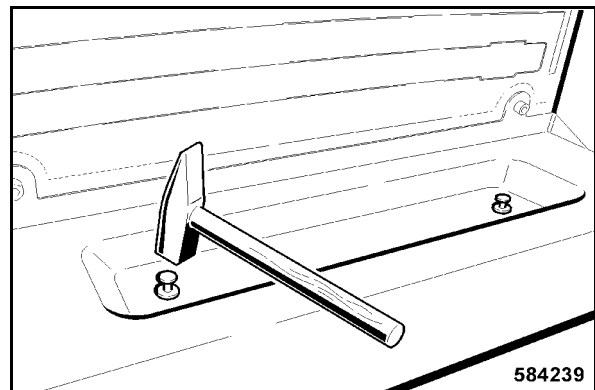


Fig. 221

- Insert the rear rack and knock both plastic fasteners carefully into the bores with a hammer (Fig. 221).

## Cab assembly before initial start-up

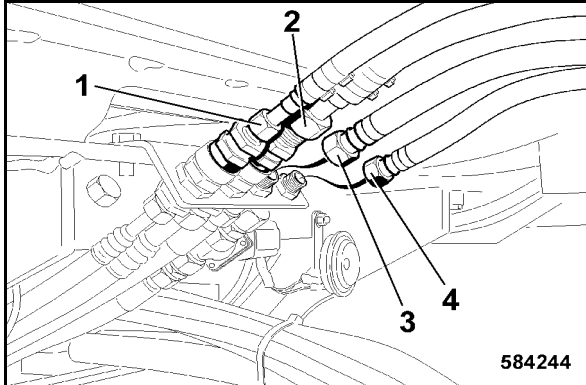


Fig. 222

- Connect the feed 1 (Fig. 222) and the return flow (2) for the air conditioning system with quick release couplings.
- Connect the feed (4) and the return flow (3) of the heating. (Observe the marks on the hoses).

### **i** Note

Run the connecting lines for the heating parallel to each other (do not cross).

### **i** Note

Check the function of air conditioning and heating within the scope of the function test.

Observe identical hose diameters when connecting.

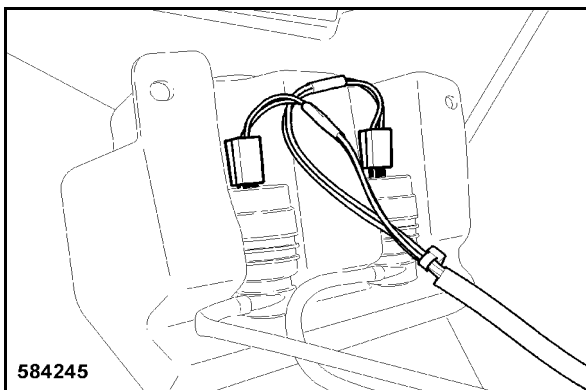


Fig. 223

- Plug on both connecting plugs for the washing water pumps (Fig. 223).

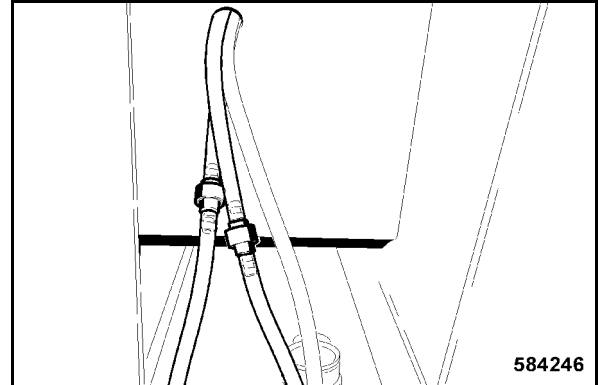


Fig. 224

- Plug on the hoses for the washing water supply to front and rear windscreens 1 (Fig. 224).

### **i** Note

Check the function of the washing water system within the scope of the function test.

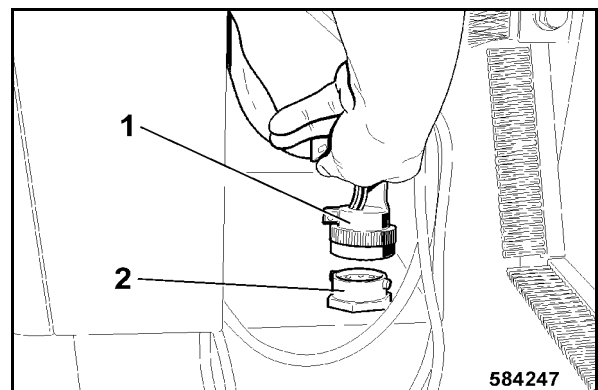


Fig. 225

- Insert the plug 1 (Fig. 225) into the socket (2).
- Close the bayonet catch by turning the corrugated cap nut in clockwise direction against the stop.

### **⚠** Danger

Before starting to work on electric parts of the machine disconnect the battery and cover it with insulating material.

## Cab assembly before initial start-up

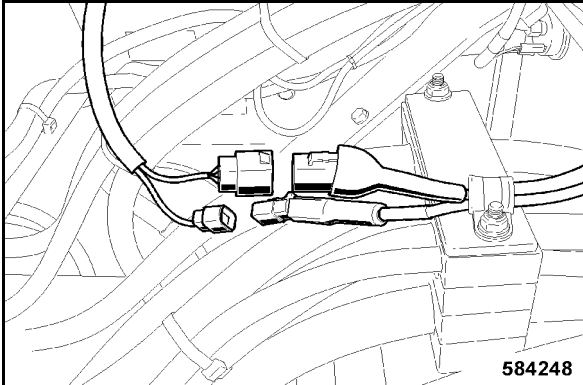


Fig. 226

- Connect the plug connection of the air conditioning system (Fig. 226).

## 7.3 Final function tests and checks

### **Caution**

Make sure that all screws have been tightened with the specified torque.

### **Note**

After the cabin assembly the following tests must be performed to assure that all cables and lines are correctly connected.

- Insert the ignition key and turn clockwise to position "1".
- Operate the switches for headlights, direction indicators and interior light to check their function.
- Operate the switches for front and rear windscreen washer system and check their correct function.

### **Note**

If the function of the windscreen washer system is reversed, the two washing water hoses must be interchanged.

- Start the engine.
- Switch the air conditioning on by the switch. After a five minute operation the cabin must become noticeably cooler.
- Switch the air heater on by the switch. After a five minute operation the cabin must become noticeably warmer.
- Function of the seat contact switch.

### **Caution**

The machine must not be operated if the seat contact switch is not functioning correctly.





## 8 Disposal



## Disposal

### 8.1 Final shut-down of machine

If the machine can no longer be used and needs to be finally shut down you must carry out the following work and have the machine disassembled by an officially recognized specialist workshop.

#### **⚠ Danger**

**Danger of cauterisation ! Danger of explosion!**

**When working on the battery do not use open fire, do not smoke!**

**The battery contains acid. Do not let acid come in contact with skin or clothes!**

**Wear protective clothing!**

- Remove the batteries and dispose of in compliance with legal regulations.

#### **🌿 Environment**

**Catch all fuels and lubricants, do not let them seep into the ground and dispose of in compliance with legal regulations.**

- Empty the fuel tank.
- Drain the hydraulic oil tank.
- Drain coolant from engine and cooling system.
- Drain off engine and transmission oil

#### **⚠ Danger**

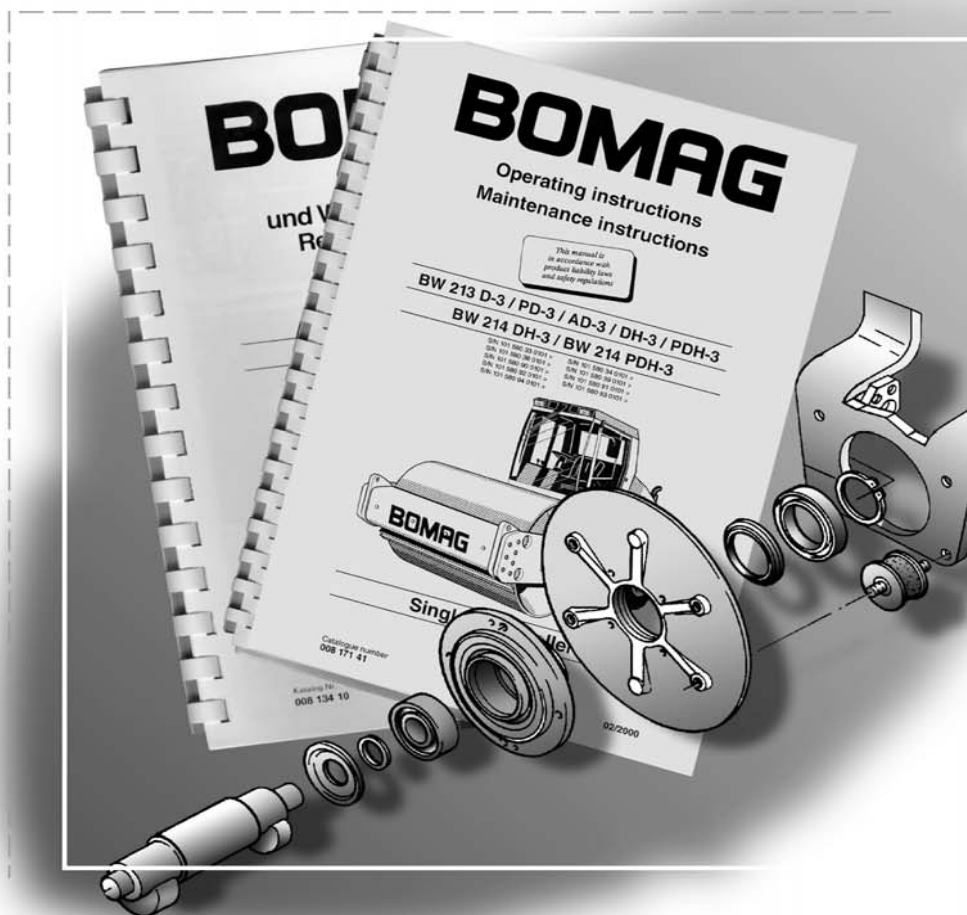
**Danger of explosion!**

**Parts that previously contained combustible fluids must not be cut with a cutting torch.**

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