

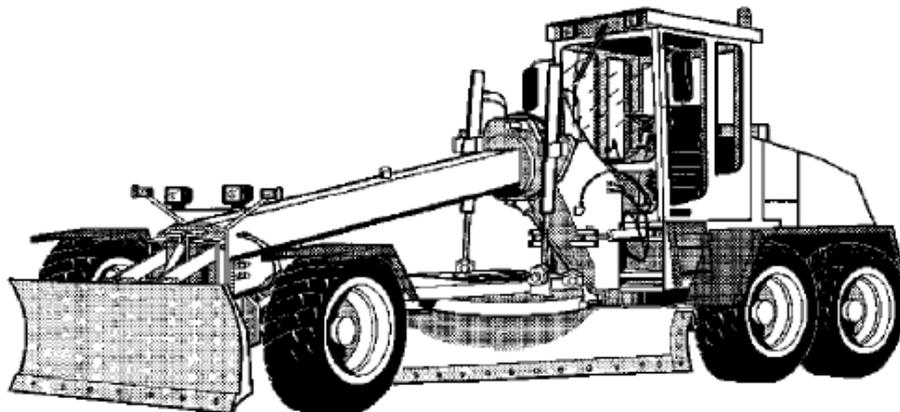
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# Operating instructions

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## BG 110TA-4

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Motor Grader

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Motorgrader

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Niveleuse

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**Motor Grader  
Motorgrader  
Niveleuse**

**BG 110TA-4**

**Operating instructions  
Bedienungsanleitung  
Instructions de service**

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**1 Introduction**

**1.1 Preface**

This technical documentation describes the grader BG 110TA. The knowledge of the technical structure of the machine and the operation manual are decisive for a correct work at the grader. The maintenance regulations have to be consequently complied with.

A workmanlike operation and a thorough maintenance are inevitable to preserve the serviceability and the value of the construction machine.

The operation manual is part of the machine; it has to be at the disposal of the machine driver at any time.

Read the operation manual and safety instruction attentively, and carefully comply with all instructions. The required inspection and maintenance activities have to be carried out regularly in the intervals given. Possible guarantee claims can only be raised if all prescribed inspections and maintenance services have been carried out in a workmanlike manner and on schedule by the occurrence of the damage.

Consider that unexpected and unnecessary downtimes can be avoided by the regular execution of the inspection and maintenance activities.

In case failures occur at the machine or the devices notify this to the people responsible for maintenance and repair. If consequential damaged may be expected the machine has to be put out of operation until the failure has been removed.



Activities described in the operation manual and marked by this symbol shall only be carried out by agencies of the manufacturer.

The construction machine described here in corresponds to the latest technical state at the moment this manual was printed. In the interest of further development, we reserve the right of modifications at our machines without changing the technical description at the same time. Thus, you cannot reason any claims on technical data, descriptions and figures not corresponding to the machine.

The grader BG 110TA is a result of the permanent further development and extension of the HBM-NOBAS-construction machine -program.

This grader proves its qualities everywhere, whether in the preparations of routes, in melioration, in roadwork in forests, or as an auxiliary building machine.

Its outer shape is up-to-date and purposeful.

The work environment of the machine driver is also important. Thus the driver's cabins are comfortable and can be equipped with further comfort. The handling is easy and clear, the machine is maintenance-friendly.

**Parameters of the grader**

To avoid any enquiries of our service organization, you should give the following information for a speedy settlement of your request:

(1) <b>Type of grader:</b>	
(2) <b>Chassis No.:</b>	(3) <b>Engine No.:</b>
(4) <b>Date of delivery:</b>	(5) <b>Number of operating hours:</b>

Insert the first three parameters immediately so that they are on disposal if required.

## **1.2 Safety regulations**

The applicable safety regulations of the regarding country, where the construction machine is used, and of the trade association have to be urgently complied with during the operation of the machine.

The regulations specified in European standards EN 474-1 and EN 474-8 are applicable to this.

On the basis of harmonized standard EN 474-8 and its requirement for the use of seat systems of vibration spectrum class EM 4 (or better), it can be assumed that the health and safety requirements of the Machine Directive are fulfilled. To determine the exposure to vibrations under normal conditions of use it can be assumed that the highest effective value of the weighted acceleration of  $0.5 \text{ m/s}^2$  is not exceeded.

In the Federal Republic of Germany, the requirements are applicable in accordance with the material content of the "Operation" section in the accident prevention regulations for "earth-moving machinery" (VBG 40).

### **1.2.1 Proper use of the machine**

The machine is built according to the latest state of engineering and the generally accepted safety regulations. Nevertheless, dangers for the health and life of the user or of third persons, or impairments of the machine and other property could arise.

The machine shall only be used in a technically proper state and for the intended purpose, taking the aspects of safety and the prevention of danger into due consideration by complying with the operation manual. Above all, failures which may affect the safety have to be removed immediately!

The machine is exclusively intended for the use as described in chapter 9. Any other use or a use in excess of this is considered as not a purposeful one. The manufacturer / supplier are not liable for damages resulting from this. This risk is exclusively on the side of the user.

The purposeful utilisation also includes the compliance with the operation manual and the requirements of inspection and maintenance.

### **1.2.2 Organisational measures**

Permanently keep the operation manual ready to use at the location where the machine is working.

In addition to the operation manual, generally applicable legal and other binding regulations for the prevention of accidents and for the protection of the environment have to be complied with and instructed on.

Obligations with regard to the prevention of accidents could, for example, refer to the provision / wearing of the personal protective clothing or to regulations on road traffic.

The operation manual has to be completed by instructions, including obligations for supervision and notification, which take peculiarities of the company into due consideration, as e.g. work organisation, work procedures or the personnel employed.

The personnel charged with activities at the machine must have read the operation manual, and here above all the chapter "Safety instructions" before the commencement of the work. It is too late to do this during the execution of the work. This applies, above all, to personnel which is working at the machines sometimes only.

The following has to be considered:

The personnel shall not wear long hair, loose clothing or jewellery, including rings. There is the danger of injuries, e.g. by being jammed or being pulled.

As far as necessary or requested by regulations, wear your personal protective clothing!

Comply with all safety and danger instructions at the machine!

Maintain all safety and danger instructions at/on the machine completely in a legible state!

In case of changes of the machines or of its operation behaviour which are of relevance for safety the machine has to be put out of operation immediately. The failure must be notified to the competent authority / person!

Do not carry out any changes, attachments or conversions at the machine which could affect safety without the approval of the supplier! This also applies to the installation and adjustment of safety devices and valves as well as to the welding at supporting components.

Intervals for repeated tests / inspections prescribed or indicated in the operation manual have to be complied with!

For repair activities, a workshop equipment sufficient for this work is urgently required.

The location and the handling of fire extinguishers must be made public!

The opportunities for fire alarming and fire fighting have to be utilised!

### **1.2.3 Employment and qualification of the personnel; basic obligations**

Work at/with the machine shall only be carried out by reliable personnel. The legally prescribed minimum age has to be considered!

Only trained or instructed personnel shall be employed. The responsibilities of the personnel for operation, maintenance and repair must be clearly fixed!

It has to be ensured that only personnel charged to do so works at the machine!

The responsibilities of the machine driver, also with regard to traffic regulations, have to be fixed. He shall have the opportunity to reject instructions of third persons which contradict any safety requirements.

Personnel which shall be trained, educated, instructed or which attends a general vocational or other training shall only work at the machine under the permanent supervision of an experienced person.

Only personnel with special knowledge and experience in hydraulics are allowed to work at hydraulic systems.

### **1.2.4 Safety instructions on specific phases of operation**

#### **Normal operation:**

Any working method that could affect safety shall not be applied!

Measures must be taken to operate the machine in a safe and functioning state only. The machine shall only be operated when all protective and safety-related devices are provided and functioning, as e.g. removable protective devices, silencers, suction and exhaust-gas devices.

The machine has to be checked for externally visible damages and deficiencies at least once per shift! Changes occurred (including changes in operation behaviour) have to be notified to the competent authority / person immediately! If required, the machine must be put out of operation and secured immediately!

In the case of functioning failures, the machine must be put out of operation and secured immediately! Have the failures immediately removed!

Comply with the procedures for switching on and off of control indicators described in the operation manual!

**Specific activities in the frame of the use of the machine and repair work as well as removal of failures:**

The adjustment, maintenance and inspection activities and intervals, including the information on the replacement of components given, must be complied with! These activities shall only be carried out by specialists. The operating personnel has to be informed before the commencement of any specific and maintenance work! A supervisor has to be designated for this!

For all activities related to the operation, production adaptation or the adjustment of the machine and its facilities required for safety reasons, as well as to inspection, maintenance and repair, the switching-on and switching-off procedures as described in the operation manual and the instructions on repair work have to be complied with! The area where the repair is carried out shall be protected, if required!

If the machine is completely switched off during maintenance and repair activities it must be protected against unexpected switching-on:

- Remove the ignition key (key switch automatically changes to "OFF" after approx. 30 s)
- Attach warning sign or sticker on the ignition switch or disconnect battery.

For the replacement of individual parts and larger component groups, they must be carefully attached to hoisting devices and secured in such a way that they do not cause a danger anymore. Only suitable hoisting devices in good technical state and load take-ups having a sufficient bearing capacity shall be used! The stay or the work under hanging load is prohibited!

Only experienced people shall be charged with the hanging-on of loads and the directing of crane drivers! The directing person has to stay in the view range of the crane driver, or must have voice contact to him.

All handles, steps, railings, landings, platforms, ladders must be kept free of dirt, snow and ice!

The machine, and above all its connections and screw connections, must be cleaned from oil, fuel or cleaning agents when the maintenance/repair activities are commenced! Aggressive detergents shall not be used! Use lint-free cleaning cloth!

Before the machine is cleaned with water or steam jet (high-pressure cleaning unit) or other cleaning agents, all openings have to be closed into which no water/steam/cleaning agent shall penetrate for safety and / or functioning reasons. Remove the covers completely after cleaning! After the cleaning, inspect all fuel, engine-oil and hydraulic-oil lines for leakages, loose connections, abrasions and damages! Deficiencies found have to be removed immediately!

Always tighten screw connections which have been loosened during maintenance and repair activities!

Care for a safe and environmentally friendly disposal of fuel, coolants and lubricants and of replaced parts!

### **1.2.5 Instruction on specific dangers**

Welding, cutting and grinding works at the machine shall only be carried out if this has been expressly permitted. There may be the danger of fire, for example! Before welding, cutting and grinding, clean the machine and its surroundings of dust and all inflammable matters, and care for sufficient ventilation! The battery and the dynamo have to be disconnected. Pull off the plug from the microcontroller (front axle) and from the power shift transmission control unit.

Works at the hydraulic facilities shall only be carried out by people having specialist knowledge and experiences in hydraulics!

All lines, hoses and screw connections shall be regularly checked for leakages and damages visible from the outside! Damages have to be removed immediately! Splashing oil may cause injuries and fire.

The system sections and pressure lines which must be opened have to be depressurised before the commencement of the repair work!

The hydraulic lines must be laid and assembled in a workmanlike way! Do not mix up the connections! Fittings, the length and the quality of the hose lines have to comply with the requirements.

When handling with oils, greases and other chemical substances, comply with the safety regulations applicable to the regarding product!

Handle hot fuels and lubricants with care (danger of burning or scalding)!

### **1.2.6 Loading**

For loading, only use hoisting devices and load take-ups having a sufficient bearing capacity!

An experienced directing person for the lifting procedure must be nominated!

The machines shall only be lifted by a hoisting device in a workmanlike manner in accordance with the instructions of the operation manual (hanging-on points for load take-ups, etc.)!

Only use a suitable transport vehicle having a sufficient bearing capacity!

The load must be secured. Use suitable hanging-on points!

Before or immediately after the loading activities, provide the machine with the recommended facilities against any unintended change in position! Regarding warnings must have been attached!

The components which had to be disassembled for transport purposes must be carefully re-assembled and fixed before the next putting into operation!

During the next putting into operation, proceed in accordance with the operation manual!

The towing coupling shall only be used for the towing of the vehicle in non-functioning state. The use for trailers hanged to this coupling in public traffic is not permitted.

The **original HBM-NOBAS parts** are especially designed for HBM-NOBAS machines.

**1.2.7 Original components**

We expressly point out that original parts and accessories not supplied by us have not been checked and released by us either. The installation and/or the use of such products may therefore possibly negatively change structurally reasoned properties of your machines, and so affect the active and/or passive safety. For damages caused by the use of non-original parts and accessories, any liability of the manufacturer of the machine is excluded.

**1.3 Symbols**

Fig. 1.3/1 and 1.3/2

The documentation and / or the machine include the following symbols.

	<u>BG 110T</u>	<u>BG 110TA</u>
1 Main switch (button)	x	x
2 Air filter	x	x
3 Hydraulic oil filter	x	x
A = Return filter	x	x
B = Pressure filter		x
4 Parking brake	x	x
5 Brake fault - service brake	x	x
6 Screen wiper	x	x
7 Wash-wiper, screen wiper	x	x
8 Heating	x	x
9 Roof beacon	x	x
10 Worklamp, front side	x	x
11 Worklamp, rear side	x	x
12 Top front work floodlight	x	x
13 Front axle traction power		x
14 Charging control, system voltage	x	x
15 Ignition lock	x	x
16 Mirror heating (option)	x	x
17 Lower / Raise left blade	x	x
19 Move right / left blade	x	x
20 Adjust cutting angle forward / backward	x	x
21 Lower / Raise right blade	x	x
23 Move slewing ring to the left / right	x	x
28 not defined		
29 Articulated steering right / left	x	x
32 Move slewing ring right / left	x	x
33 Unlock slewing bridge	x	x
34 Turn indicator	x	x
35 Full beam	x	x
36 Emergency flasher indicator	x	x
37 Lower / Raise dozer blade	x	x
38 Lower / Raise scarifier	x	x

	<u>BG 110T</u>	<u>BG 110TA</u>
39 Level control minimum / maximum	x	x
40 Parking light switch and driving light switch	x	x
42 Lamp testing	x	x
43 Plug socket	x	x
44 Seat heating (option)	x	x
50 Parking brake	x	x
51 Front axle drive		x
53 Wheel camber	x	x
60 Front axle drive forward / backwards (option)		x
61 Windscreen wiper at the bottom left	x	x
62 Windscreen wiper at the bottom right	x	x
63 Windscreen wiper at the back	x	x
64 Load shift gearbox display	x	x
65 Floating position - lifting cylinder operation (option)	x	x
66 Floating position - lifting cylinder preselection (option)	x	x
67 Operating the angledozer blade floating position (option)	x	x
68 Swinging the angledozer blade to the left or right	x	x
69 Lower / Raise front ripper (option)	x	x
70 Front differential lock (only for powered front axle with wheel camber)		x
73 Warning Lamp (Also know as Alert Lamp) Engine (yellow)	x	x
74 Shutdown Lamp (Also know as Action Lamp) Engine (red)	x	x
76 Heater timer auxiliary heater – program (option)	x	x
77 Throttle lever	x	x

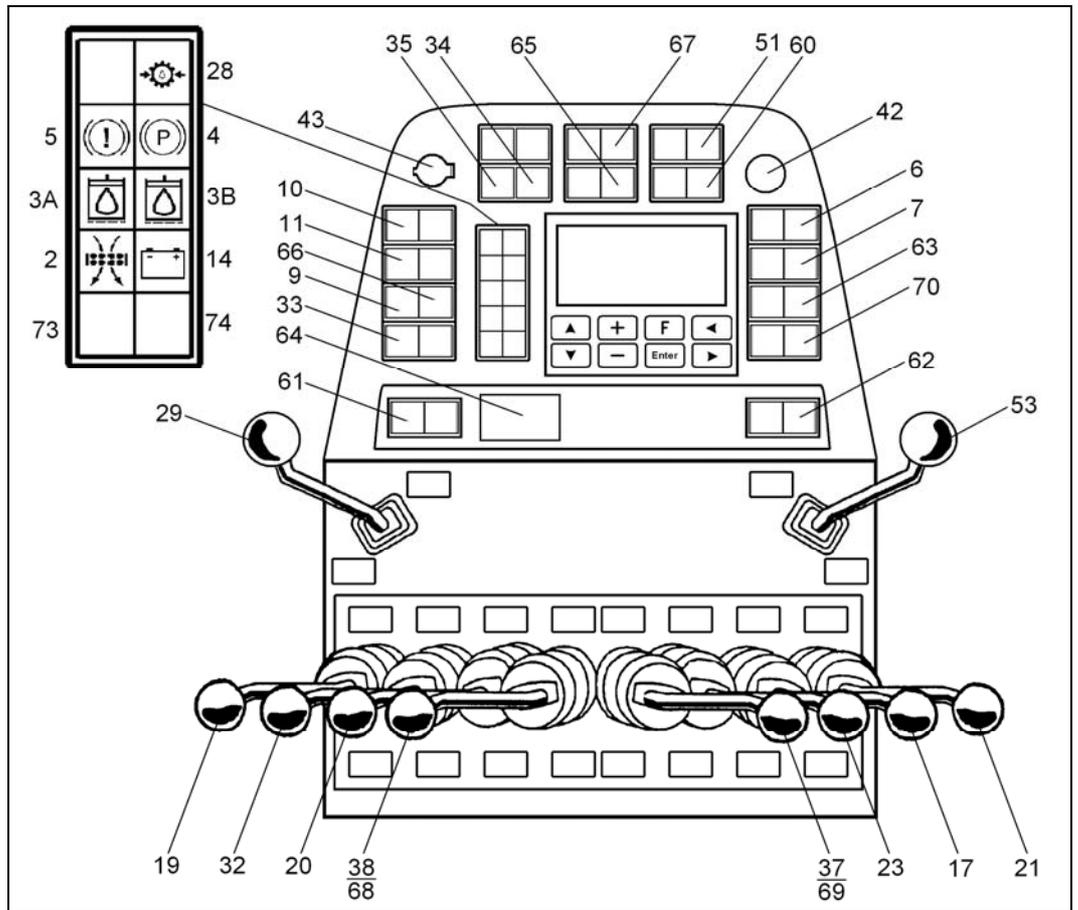


Fig. 1.3/1

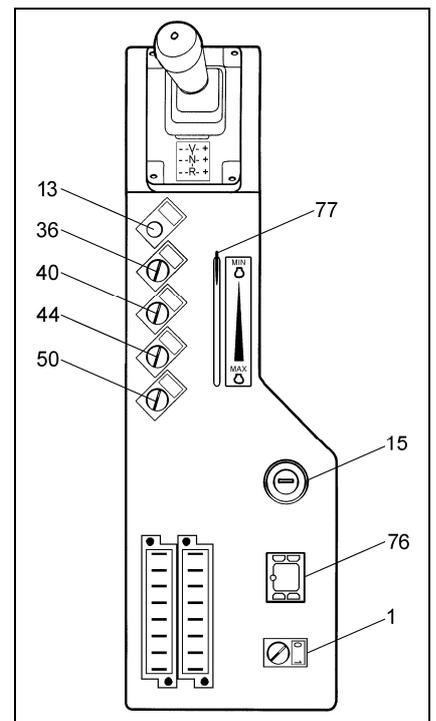
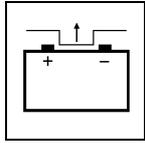


Fig. 1.3/2

1.3.1 Meaning of symbols, description and troubleshooting



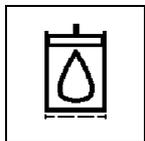
1 Main switch (button)

Switch (1) to position "0" – main switch OFF (battery disconnected from the electrical supply system)  
 Switch (1) to position "1" – main switch ON (LED in switch lights up)  
 See operating instructions section 3.1 and section 3.3.



2 Air filter

If the air filter is clogged, the signal lamp (2) lights. Clean the air filter.  
 See maintenance instructions section 6!



3 Hydraulic oil filter

A = Return filter  
 B = Pressure filter  
 Replace the filter element of the return filter if the signal lamp (3A) lights.  
 Replace the filter element of the pressure filter if the signal lamp (3B) lights.  
 See maintenance instructions section 13.4!



4 Parking brake

Signal lamp (4) lights if the parking brake (50) is activated.  
 See operating instructions section 4.4.



5 Brake fault - service brake

If signal lamp (5) lights, the service brake is at fault.  
 Stop the machine.  
 See operating instructions sections 4.4 and 5.  
 Repair the malfunction.  
 See maintenance instructions section 11.



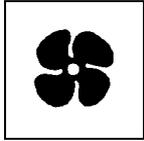
6 Windscreen wiper

Switch (6) moved to the left - Windscreen wiper OFF  
 Switch (6) in the central position - periodic switching ON  
 Switch (6) moved to the right - Windscreen wiper ON = continuous operation  
 See operating instructions section 4.11.



7 Wash-wiper

Switch (7) moved to the left - Wash-wiper OFF  
 Switch (7) moved to the right - Wash-wiper ON  
 Windscreen wiper is also activated.  
 See operating instructions section 4.11.



8 Heating

Air conditioner (option) - See operating instructions section 11.



9 Roof beacon

Switch (9) moved to the left - Roof beacon ON  
 Switch (9) moved to the right - Roof beacon OFF  
 See operating instructions section 4.13!



10 Worklamp front side

Switch (10) moved to the left - Worklamp front side ON  
 Switch (10) moved to the right - Worklamp front side OFF  
 The switch (10) also switches the parking light on.  
 See operating instructions section 4.9.



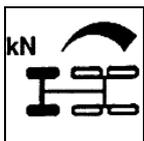
11 Worklamp rear side

Switch (11) moved to the left - Worklamp rear side ON (Signal lamp incorporated in the switch light)  
 Switch (11) moved to the right - Worklamp rear side OFF  
 The switch (11) also switches the parking light on.  
 See operating instructions section 4.9.



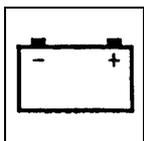
12 Top front work floodlight

The switch (12) is located at the top at the front of the inside of the cabin.  
 Switch (12) moved to the left - Top front work floodlight ON  
 Switch (12) moved to the right - Top front work floodlight OFF  
 See operating instructions sections 4.9.



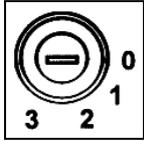
13 Front axle traction power

grader type: BG 110TA  
 Controller (13) at clockwise stop: Maximum traction power  
 Controller (13) at counter-clockwise stop: Minimum traction power  
 Controller (13) in central position: Reduced traction power  
 See operating instructions section 4.18.

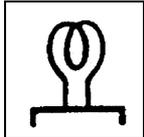


14 Charging control, system voltage

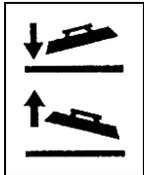
The tell-tale lamp (14) indicates the voltage generated by the generator. If the generator supplies voltage, tell-tale lamp (14) extinguishes.  
 See operating instructions section 2 and maintenance instructions section 8.



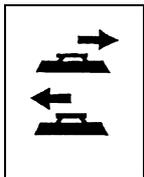
15 Ignition lock  
 0 - Engine switched off  
 1 - Normal operation, engine is running  
 2 - not defined  
 3 - Engine start  
 See operating instructions section 3.



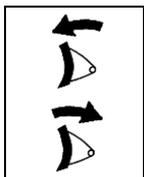
16 Mirror heating (option)  
 The switch (16) is located at the top at the front of the inside of the cabin.  
 Switch (16) moved to the left - Mirror heating ON  
 Switch (16) moved to the right - Mirror heating OFF  
 See operating instructions section 4.9.



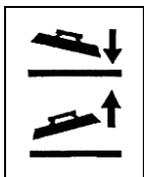
17 Lower / Raise left blade  
 Pushing lever (17) forwards - lowers the blade  
 Pulling lever (17) backwards - raises the blade  
 See operating instructions section 9.



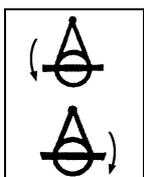
19 Move right / left blade  
 Pushing lever (19) forwards - Shift blade, to the right  
 Pulling lever (19) backwards - Shift blade, to the left  
 See operating instructions section 9.



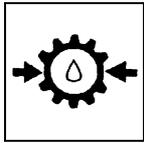
20 Adjust cutting angle forward / backward  
 Pushing lever (20) forwards - Adjust cutting angle forward  
 Pulling lever (20) backwards - Adjust cutting angle backward  
 See operating instructions section 9.



21 Lower / Raise right blade  
 Pushing lever (21) forwards - lowers the blade  
 Pulling lever (21) backwards - raises the blade  
 See operating instructions section 9.



23 Move slewing ring to the left / right  
 Pushing lever (23) forwards - Rotate slewing rim, left  
 Pulling lever (23) backwards - Rotate slewing rim, right  
 See operating instructions section 9.



28 not defined

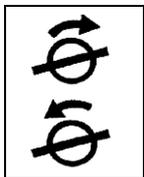


29 Articulated steering right / left



Unlock the lever before operation.

Pushing lever (29) forwards - Frame articulated to the right  
 Pulling lever (29) backwards - Frame articulated to the left  
 See operating instructions section 4.12.



32 Move slewing ring right / left

Pushing lever (32) forwards - Clockwise rotation  
 Pulling lever (32) backwards - Counter-clockwise rotation  
 See operating instructions section 9.

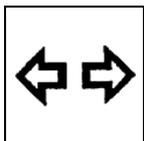


33 Unlock slewing bridge

Switch (33) moved to the left - Unlocking slewing bridge  
 Switch (33) moved to the right - Locking slewing bridge

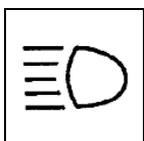


See operating manual chapters 9.7 and 9.8.4.  
 Unlocking is only possible if the gear lever is in neutral position.



34 Flasher indicator

See operating instructions section 4.8.



35 Full beam signal

If full beam is switched on, the blue signal lamp is active.  
 See operating instructions section 4.9.



36 Emergency flasher indicator

Press button (36) to switch the emergency flasher on. If it is on, the control indicator incorporated in the button (36) also flashes.

See operating instructions section 4.9.





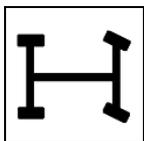
44 Seat heating (option)

Switch (44) in position „0“ - Seat heating OFF  
 Switch (44) in position „1“ - Seat heating ON



50 Parking brake

Switch (50) in position „0“ - Parking brake OFF  
 Switch (50) in position „1“ - Parking brake ON  
 See operating instructions section 4.4.



51 Front axle drive

Grader type: BG 110TA  
 Switch (51) moved to the left - Front axle drive OFF  
 Switch (51) moved to the right - Front axle drive ON (4-wheel drive)  
 See operating instructions section 4.18.1.

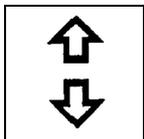


53 Front wheel camber



Unlock the bridge before you switch on the front wheel camber.

Pushing lever (53) forwards - Tilt wheel, to left  
 Pulling lever (53) backwards - Tilt wheel, to right  
 See operating instructions section 4.7.

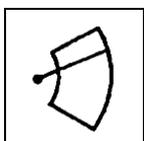


60 Front axle drive forward / backwards (option)

Grader type: BG 110TA  
 Switch (60) moved to the right - Front axle drive forward ON  
 Switch (60) moved to the left - Front axle drive backwards ON  
 Switch (60) in the central position - Front axle drive OFF  
 See operating instructions section 4.18.1.

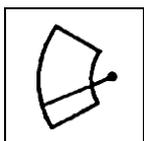


Switch must always stand when switching on of the equipment on in central position!



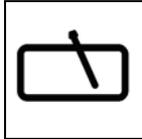
61 Windscreen wiper at the bottom left

Switch (61) moved to the left - Windscreen wiper at the bottom left ON  
 Switch (61) moved to the right - Windscreen wiper at the bottom left OFF  
 See operating instructions section 4.11.



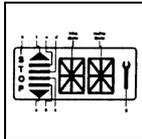
62 Windscreen wiper at the bottom right

Switch (62) moved to the left - Windscreen wiper at the bottom right OFF  
 Switch (62) moved to the right - Windscreen wiper at the bottom right ON  
 See operating instructions section 4.11.



63 Windscreen wiper at the back

Switch (63) moved to the left - Windscreen wiper at the back OFF  
 Switch (63) moved to the right - Windscreen wiper at the back ON  
 See operating instructions section 4.11.



64 Load shift gearbox display (LSG)

Display – forwards / reverse  
 Gears; LSG fault  
 Maintenance indicator  
 Fault code  
 See operating instructions section 4.1.



65 Floating position - lifting cylinder operation (option)

First, press switch (66) to the right, and, simultaneously, press switch (65) to the right - floating position ON;  
 The indicator light in switch (65) is lit (yellow);  
 Press switch (65) to the left - floating position OFF;  
 The indicator light in switch (65) is OFF.



**Attention!**

No person must be within the range of pusher blade travel or traverse when the switch for the floating position is pressed. Risk of accident!



66 Floating position - lifting cylinder preselection (option)

Press switch (66) to the right - floating position preselected;  
 The floating position is ready for operation only together with switch (65) - lift switch or switch (67) - angle-dozer blade.



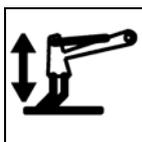
67 Operating the angledozer blade floating position (option)

First, press switch (66) to the right, and, simultaneously, press switch (67) to the right - floating position ON;  
 The indicator light in switch (67) is lit (yellow);  
 Press switch (67) to the left - floating position OFF;  
 The indicator light in switch (67) is OFF.



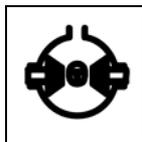
68 Swinging the angledozer blade to the left or right (option)

Pushing lever (68) forwards - Swinging the angledozer blade to the left  
 Pulling lever (68) backwards - Swinging the angledozer blade to the right



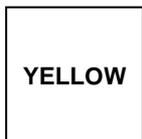
69 Lower / Raise front ripper (option)

Pushing lever (69) forwards - lowers the front ripper  
 Pulling lever (69) backwards - raises the front ripper



70 Front differential lock (only for powered front axle with wheel camber)

Grader type: BG 110TA (with wheel camber)  
Switch (70) moved to the left - Differential lock OFF  
Switch (70) moved to the right - Differential lock ON



73 Warning Lamp (Also know as Alert Lamp) Engine (yellow)

See operating instructions section 1.3.2.



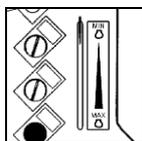
74 Shutdown Lamp (Also know as Action Lamp) Engine (red)

See operating instructions section 1.3.2.



76 Heater timer auxiliary heater – program (option)

See operating instructions section 11.10.



77 Throttle lever

See operating instructions section 4.16.

1.3.2 Indicator lamps Logic

Fig. 1.3/1

Warning Lamp (Also know as Alert Lamp)	Shutdown Lamp (Also know as Action Lamp)	Lamp State	Description of what Lamp Status is Indicating	Engine State
ON	ON	Bulb Check	When the ignition is turned on the EMS shall illuminate each bulb for 2 seconds and extinguish them afterwards.	Key on but engine has yet to be cranked.
OFF	OFF	No Faults Present.	With both lamps off whilst engine is running then there are no currently active warnings diagnostic's or events.	Engine is running with no detected faults.
ON	OFF	Active Diagnostic	Should the warning lamp illuminate during engine running this indicates that an active diagnostic (electrical fault) is present.	Engine is running normally but has one or more faults with the engine management system.
ON	FLASH	Derate. (Invoked by Active Diagnostic)	Should the warning lamp illuminate and the shutdown lamp flash during engine running this indicates that an active diagnostic (electrical fault) is present. The diagnostic is sufficiently serious to invoke engine derate.	Engine is running but has one or more active diagnostic events that have initiated engine derate.
FLASH	OFF	Warning (Warning only)	Should the warning lamp flash during engine running this indicates that one or more of the engine protection strategy warning values have been exceeded but not to a level that will invoke Derate or Shutdown.	Engine is running normally but has one or more monitored engine parameters outside of the acceptable range.
FLASH	FLASH	Derate. (Warning and Derate).	Should both the warning lamp and shutdown lamp flash during engine running this indicates that one, or more, of the engine protection strategy values have been exceeded beyond the level required to invoke engine derate.	Engine is running but one or more of the monitored engine parameters has gone beyond that of warning only and has now exceeded those set for engine derate.
ON	ON	Engine Shutdown	Should both the warning lamp and shutdown lamp illuminate during engine running this indicates that either 1. One or more of the engine protection strategy shutdown values has been exceeded. 2. A serious active diagnostic has been detected. Shortly after (time duration to be agreed) engine will shutdown.	Engine is either shutdown or shutdown is imminent, one or more monitored engine parameters have gone beyond that of warning or derate and have now exceeded those set for engine shutdown. Or a serious active diagnostic has been detected.

**1.4 Display panel at the steering unit**

Fig. 1.4/1

Turn the starting key (15) to position "1".

→ Display message: **Main menu** (Fig. 1.4.1/1)

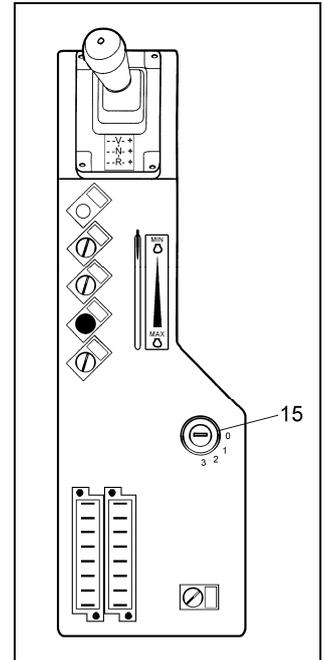


Fig. 1.4/1

**1.4.1 Main menu**

- 1 = Display parameter field 1
- 2 = Display parameter field 2
- 3 = Cursor (black bar)
- 4 = Fault indicator
- 5 = Service interval display (SIA)
- 6 = Time of day
- 7 = Speed

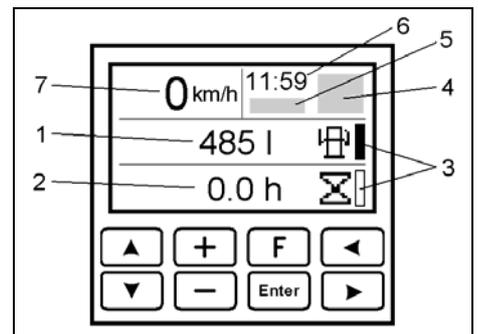


Fig. 1.4.1/1

The parameter displayed in the active parameter field is changed by pressing the "▲" and "▼" buttons.

The active parameter field is changed by pressing the "F" and "▼" or "F" and "▲" buttons simultaneously.

The "Enter" button has to be pressed to acknowledge fault messages and the service interval display.

Press the "F" button for two seconds to move from the main menu to the following menus.

- Press once - Set-up menu (section 1.4.2)
- Press twice - Fault memory (section 1.4.3)
- Press three times - Setting the time (section 1.4.4)

1.4.1.1 Display parameters



Tank level (l)



Coolant temperature (°C)



Gear oil temperature (°C)



Hydraulic oil temperatur (°C)



Diesel engine speed (rpm)



Operating hours (h)



Total distance (km)



Trip distance (km) <sup>(1)</sup>



Battery voltage (V)



Engine oil temperature (°C)  
The temperature of the diesel engine is not transmitted if 4 lines are displayed in this parameter field.



Engine oil pressure (bar)



Current consumption - diesel (l/h)



Total consumption - diesel (l)



Position of accelerator pedal (%)



Current torque (Nm)



Current power (KW)

1.4.1.2 Fault symbols



Diesel engine



Gearbox



Front-wheel steering

<sup>(1)</sup> To delete the trip distance: 1. The distance and symbol must be displayed in the active field  
2. Press "+" and "-" simultaneously

**1.4.2 Set-up menu**

Fig. 1.4.2/1

The "▲" and "▼" buttons move the cursor between the individual menu items.

*Cursor up:*

"+" and "-" switch between the German and English languages.

*Cursor in the middle:*

"+" and "-" adjust the basic brightness of the display



Fig. 1.4.2/1

*Cursor down:*

- "+" and "-" change the variable units,
- "◀" and "▶" call the following variables

Speed	km/h	- MPH
Distance	km	- mls
Pressure	bar	- PSI
Volume	l	- Gal
Temperature	°C	- °F
Engine speed	U/min	- rpm
Time	24 h	- 12 h

Press "Enter" once to return to the main menu.

**1.4.3 Fault memory**

Fig. 1.4.3/1

Up to 50 faults can be displayed with the "▲" and "▼" buttons.

Diesel engine (see table following pages), gearbox and front-wheel steering fault codes are displayed. Please contact your authorized service agency.

The fault memory is deleted by pressing "+" and "-" simultaneously.

Press "Enter" twice to return to the main menu.

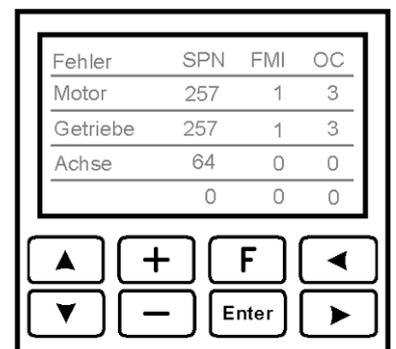


Fig. 1.4.3/1

<u>Description</u>	<u>J1939 Code</u> <u>SPN - FMI</u>	<u>Flash code</u>
No diagnostic code recorded	N/A	551
Cylinder 1, pump nozzle element - irregular, sporadic or incorrect	651-2	111
Cylinder 1, pump nozzle element - current below normal	651-5	111
Cylinder 1, pump nozzle element - current above normal	651-6	111
Cylinder 1, pump nozzle element does not respond correctly	651-7	111
Cylinder 2, pump nozzle element - irregular, sporadic or incorrect	652-2	112
Cylinder 2, pump nozzle element - current below normal	652-5	112
Cylinder 2, pump nozzle element - current above normal	652-6	112
Cylinder 2, pump nozzle element does not respond correctly	652-27	112
Cylinder 3, pump nozzle element - irregular, sporadic or incorrect	653-2	113
Cylinder 3, pump nozzle element - current below normal	653-5	113
Cylinder 3, pump nozzle element - current above normal	653-6	113
Cylinder 3, pump nozzle element does not respond correctly	653-7	113
Cylinder 4, pump nozzle element - irregular, sporadic or incorrect	654-2	114
Cylinder 4, pump nozzle element - current below normal	654-5	114
Cylinder 4, pump nozzle element - current above normal	654-6	114
Cylinder 4, pump nozzle element does not respond correctly	654-7	114
Cylinder 5, pump nozzle element - irregular, sporadic or incorrect (only with C6.6 engine)	655-2	115
Cylinder 5, pump nozzle element - current below normal (only with C6.6 engine)	655-5	115
Cylinder 5, pump nozzle element - current above normal (only with C6.6 engine)	655-6	115
Cylinder 5, pump nozzle element does not respond correctly (only with C6.6 engine)	655-7	115
Cylinder 6, pump nozzle element - irregular, sporadic or incorrect (only with C6.6 engine)	656-2	116
Cylinder 6, pump nozzle element - current below normal (only with C6.6 engine)	656-5	116
Cylinder 6, pump nozzle element - current above normal (only with C6.6 engine)	656-6	116
Cylinder 6, pump nozzle element does not respond correctly (only with C6.6 engine)	656-7	116
8 volt DC power supply - voltage above normal	678-03	517
8 volt DC power supply - voltage below normal	678-04	517
Gas position sensor - irregular, sporadic or incorrect	91-02	154
Gas position sensor - voltage above normal	91-03	154
Gas position sensor - voltage below normal	91-04	154
Gas position sensor - unusual frequency, pulse width or period	91-08	154
Engine oil pressure sensor - voltage above normal	100-03	157
Engine oil pressure sensor - voltage below normal	100-04	157

<u>Description</u>	<u>J1939 Code</u> <u>SPN - FMI</u>	<u>Flash code</u>
Engine oil pressure sensor - abnormal rate of change	100-10	157
Coolant temperature sensor - voltage above normal	110-03	168
Coolant temperature sensor - voltage below normal	110-04	q
Voltage of electrical system - high	168-00	422
Voltage of electrical system - low	168-01	422
Voltage of electrical system - irregular, sporadic or incorrect	168-02	422
Intake manifold air temperature sensor - voltage above normal	105-03	133
Intake manifold air temperature sensor - voltage below normal	105-04	133
Engine speed sensor - unusual frequency, pulse width or period	190-08	141
SAE J1939 data link - abnormal updating rate	-	514
SAE J1939 data link - failure	-	514
Personality module irregular, sporadic or incorrect	631-02	415
Engine tuning - adjustment error	637-11	143
5 volt DC power supply to the sensor - voltage above normal	1079-03	516
5 volt DC power supply to the sensor - voltage below normal	1079-04	516
Error, programmed parameter - irregular, sporadic or incorrect	630-02	527
Secondary engine speed sensor - unusual frequency, pulse width or period	723-08	142
Turbocharger pressure regulator drive - current below normal	1188-05	177
Turbocharger pressure regulator drive - current above normal	1188-06	177
Turbocharger pressure regulator drive does not respond correctly	1188-07	177
Secondary gas position sensor - irregular, sporadic or incorrect	29-02	155
Secondary gas position sensor - voltage above normal	29-03	155
Secondary gas position sensor - voltage below normal	29-04	155
Secondary gas position sensor - unusual frequency, pulse width or period	29-08	155
Machine safety system - abnormal updating rate	1196-09	426
Engine mode selector switch - irregular, sporadic or incorrect	2882-02	144
Electromagnet in fuel distributor pipe pressure valve 1 - current below normal	1347-05	162
Electromagnet in fuel distributor pipe pressure valve 1 - current above normal	1347-06	162
Intake manifold pressure sensor - voltage above normal	102-03	197
Intake manifold pressure sensor - voltage below normal	102-04	197
Intake manifold pressure sensor - abnormal rate of change	102-10	197
Fuel distributor pipe pressure sensor - voltage above normal	157-03	159
Fuel distributor pipe pressure sensor - voltage below normal	157-04	159
Ignition switch - loss of signal	158-02	439
Glow plugs ignition aid relay - current above normal	676-06	199

<u>Description</u>	<u>J1939 Code</u> <u>SPN - FMI</u>	<u>Flash code</u>
Blocked air filter	107-05	151
High exhaust gas temperature	173-15	185
Fuel/water separator - high water level	97-15	-
Low oil pressure - warning	100-17	157
Low oil pressure - switch off	100-01	157
High engine coolant temperature - warning	110-15	168
High engine coolant temperature - slowing	110-16	168
High engine coolant temperature - switch off	110-16	168
Engine overspeed	190-15	141
High pressure in fuel distributor pipe	157-00	159
Low pressure in fuel distributor pipe	157-01	159
High intake manifold air temperature - warning	105-15	133
High intake manifold air temperature - slowing	105-16	133
Low engine coolant level	111-01	169

**1.4.4 Setting the clock**

Fig. 1.4.4/1

The clock is set by the four lower buttons:

- "▼" - Sets the first digit
- "-" - Sets the second digit
- "Enter" - Sets the third digit
- "▶" - Sets the fourth digit

Press "+" and "Enter" simultaneously to exit the menu.

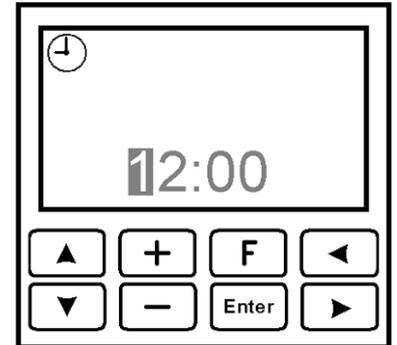


Fig. 1.4.4/1

**1.4.5 Automatic control of operating status**

When the warning thresholds are reached, the respective values are displayed in the active field.

In the warning thresholds 1, the symbol in the active field flashes.

When the warning threshold 2 is reached there is also an acoustic signal (Bleep).

The acoustic signal can be switched off with any button on the multifunction display.

These warnings have to be acknowledged by pressing the "Enter" button. After this acknowledgement, the main menu opens.

Transmission oil temperature

Warning threshold 1: Temperature > 114 °C (237 °F) —> Symbol flashes

Warning threshold 2: Temperature > 120 °C (248 °F) —> Symbol flashes;  
Acoustic signal

Engine coolant temperature

Warning threshold 1: Temperature > 108 °C (226 °F) —> Symbol flashes

Warning threshold 2: Temperature > 110 °C (230 °F) —> Symbol flashes;  
Acoustic signal

Hydraulic oil temperature

Warning threshold 1: Temperature > 90 °C (194 °F) —> Symbol flashes

Warning threshold 2: Temperature > 95 °C (203 °F) —> Symbol flashes;  
Acoustic signal

Tank level

Warning threshold 1: Filling < 25 litres —> Symbol flashes

Warning threshold 2: Filling < 10 litres —> Symbol flashes; Acoustic signal

**2 Before starting the machine**

Check – list

- |  |  |
|--|--|
| 1. Tyre air pressure                             | Nominal: diagonal tyres 2,0 bar<br>radial tyres 2,5 bar  |
| 2. Tank volume                                   | Nominal: indicator (fig. 9.3/1)  |
| 3. Hydraulic tank                                | Nominal: Level indicator: Upper mark = maximum<br>Lower mark = minimum = top up  |
| 4. Oil level engine                              | Nominal: upper notch = maximum<br>lower notch = Minimum  |
| 5. Oil level transmission                        | Nominal: upper notch = maximum<br>lower notch = Minimum<br>Comply with the test conditions.  |
| 6. Visual check around the machine               | -after leakages<br>-after damages at hoses, aggregates, working devices, the fixing components, screw connections, the tyres, the instruments and the lighting, the warning and control lamps  |
| 7. Check of coolant level                        | daily  |
| 8. Acid level in batteries                       | quarterly  |
| 9. Check of the functioning of the control lamps | Switch on ignition, and press the control button (42), the following lights must come on (fig. 2/1).<br>5 = brake control/service brake<br>2 = air-filter control<br>3A = control of backflow filter<br>3B = control of pressure filter<br>14 = charge control<br>73 = Warning Lamp (yellow)<br>74 = Shutdown Lamp (red)<br>4 = parking brake "ON"<br>28 = Do not light up → not connected |

These lamps must turn off after the start of the engine.

These lights go out after about 2 seconds.

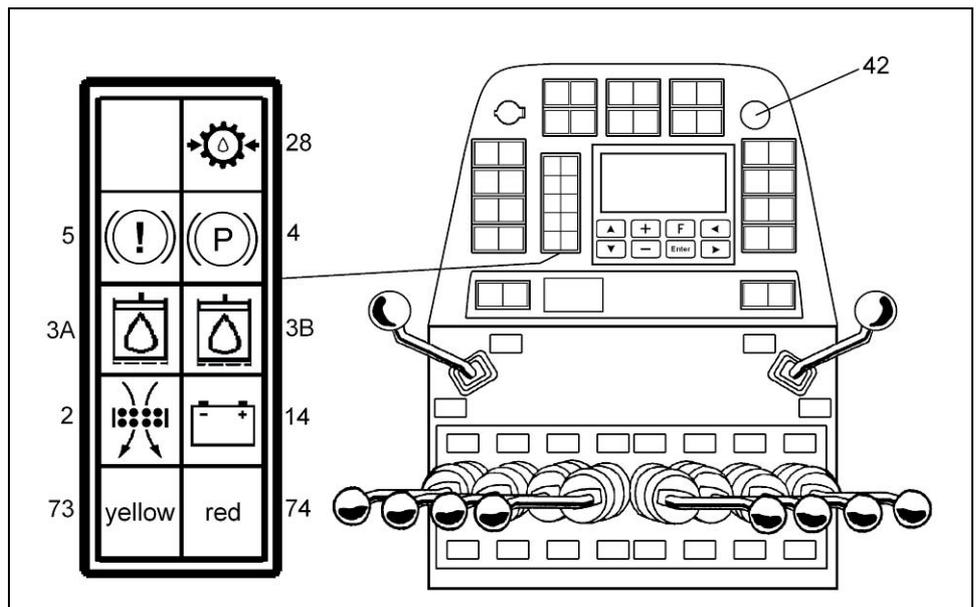


Fig. 2/1

**2.1 Unlocking the engine bonnet or hood**

Fig. 2/2

- Rotate the cable control handle (1) counterclockwise to release it, and allow free movement.
- Pull to unlock the engine bonnet or hood (double locking).
- The gas struts will open the engine bonnet or hood automatically.
- If the gas strut force is too small, rotate the cable control handle clockwise to block the control cable in its pulled position, and open the engine bonnet or hood completely by hand.

**Locking the engine bonnet or hood**

- Rotate the cable control handle (1) counterclockwise to release it.
- Press the engine bonnet or hood by hand down on the locking mechanism until it locks in.

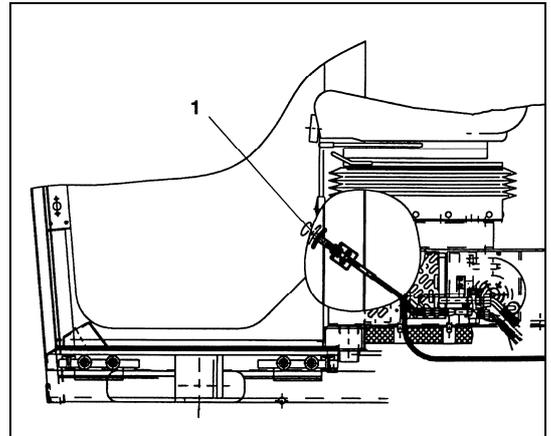


Fig. 2/2

**3 Starting and stopping the engine**

**3.1 Starting the engine**

Fig. 3/1

Close the circuit breaker by briefly activating the main switch (button - 1).

If the ignition, the parking light or the emergency flasher switch does not switch on within 35 seconds the circuit breaker opens again.

If the ignition, the parking light or the emergency flasher switch go on within 35 seconds the circuit breaker remains closed.

The starter (15) for the start of the engine is in the driver's cabin, on the right of the seat.

- Ignition key (15) in the ignition lock
- gear switch lever (2) in position "N"

**3.1.1 How the engine is started**

Several factors influence the engine start, as for example:

- the capacity of the battery,
- the capacity of the starter,
- the oil viscosity,
- the installed cold-start system.

**3.1.2 Starting a hot engine**

1. Turn the starting key to position "3" to switch on the starter.
2. Turn the starting key (15) to position "1" as soon as the diesel engine starts running.



Never start the engine when the engine runs or the starter rotates.



An error message may appear in the engine management when the diesel engine is switched on and off quickly using the start key (15). See the operating instructions, chapter 1.4.3.

**3.1.3 Starting a cold engine without a starting aid**

1. Turn the ignition key into the position "3" to actuate the starter. As soon as the engine runs, turn the ignition key into the position "1". Reduce the engine speed so that a sound idle run is reached.
2. If the engine has not been ignited after 30 seconds, turn the ignition key back to the "1" position and wait for another 30 seconds before the engine can be re-started again, but do not start for more than 30 seconds.

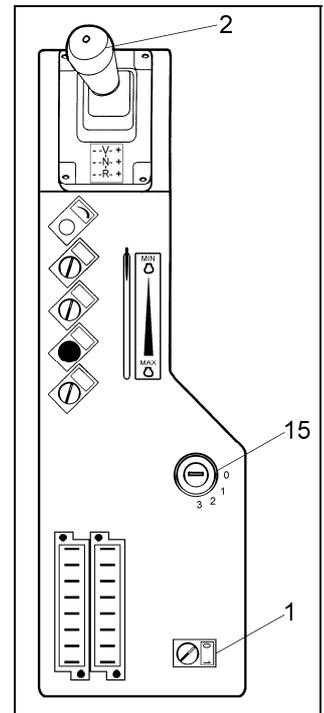


Fig. 3/1

**3.1.4 Starting the motor at temperature below -15 °C (5°F) with the air heating system**

At ambient temperatures below -15 °C (5 °F), an air heating system controlled by the motor controller autonomously takes over the start mode.

The combustion air is pre-heated electrically.  
The motor does not start until after this procedure.



When the ambient temperatures are low, always ensure that the starter batteries have been well maintained and are fully charged.

**3.2 Stopping the engine**

Turn the ignition key (15) into the position "0" at the ignition lock.

**3.3 Switch the main switch off**



The main switch cannot be turned off mechanically!



If the ignition, the parking light or the emergency flasher switch are switched off the main switch automatically switches off after 35 seconds.

Batteries are disconnected from the on-board power supply when the main switch (15) switches off.

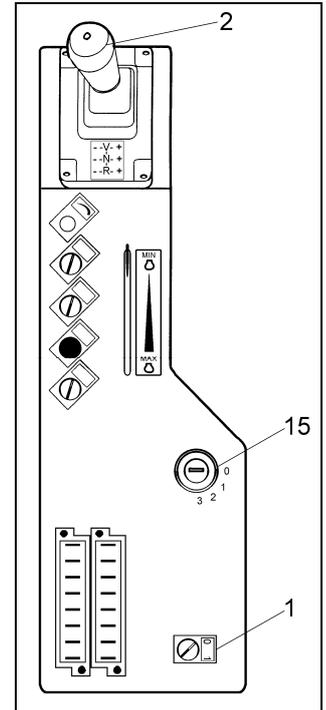


Fig. 3/1

4 Driving mode

4.1 Changing gear

Fig. 4.1/1 and Fig. 4.1/2

**Note:** The transmission oil temperature must reach 70 °C (158 °F) in order to achieve optimal gear changing and driving conditions.

Put the Controller at the starting of the engine always to the Neutral position.



The engine will not start unless the traction switch (1) is in the "neutral" position.

With the engine running and the gear in neutral, the parking brake must be switched on or the service brake applied to prevent the vehicle from rolling away.

The machine has an electronic, switchable load shift gearbox.

To release for driving mode, hold knob (1) down and select the forwards or reverse direction of travel. The direction can be changed. Knob (1) must not be touched when changing the direction of travel.

The driving switch becomes locked again after a short time in the "neutral" position.

**Manual** driving mode is always selected after releasing the driving lever.

You can switch from manual driving mode into automatic driving mode and vice versa by lightly touching the knob (1) and moving the driving switch into position "V" (forwards) or "R" (reverse).

**The optimal engine speed for using the grader is 2000 rpm.**

For forward speeds 1-3, engine speed is controlled electronically. For speeds 4-6, the engine speed can be set to allow a higher travelling speed (up to 2000 rpm).

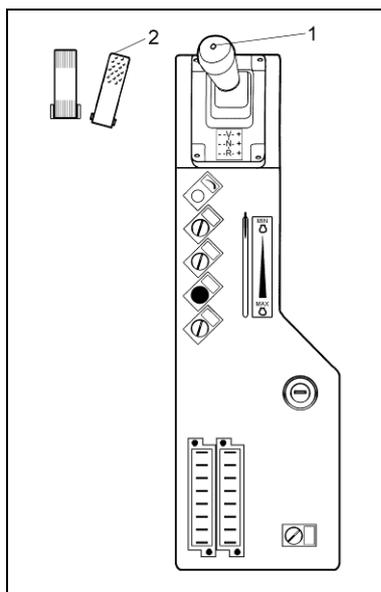


Fig. 4.1/1

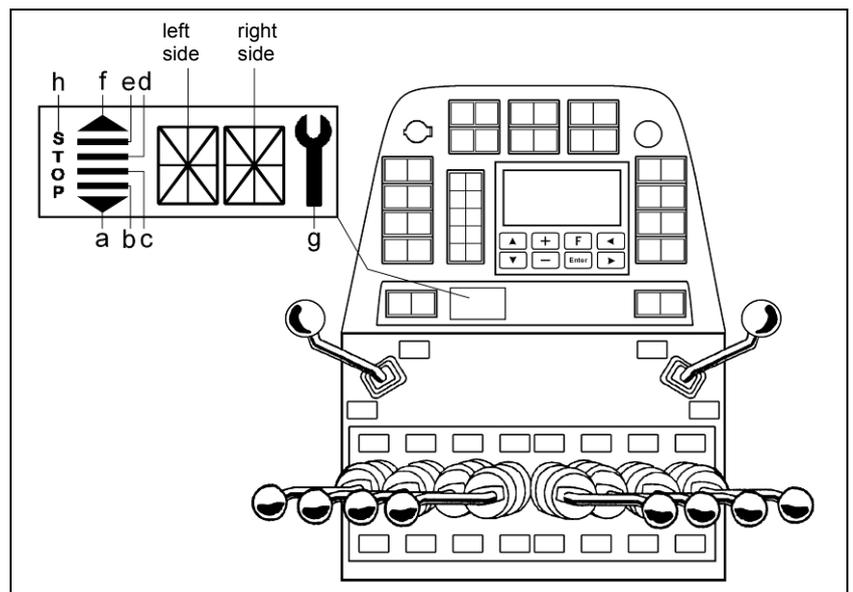


Fig. 4.1/2

**Automatic driving mode:**

Accelerate with pedal (2). Up to six forward gears and three reverse gears can be used. If the machine is in automatic mode, arrows a and f appear on the left in the display. The currently selected gear and direction of travel are visible on both alphanumeric indicators on the display (Fig. 4.1/2):

- Left position: current gear
- Right position: current direction of travel

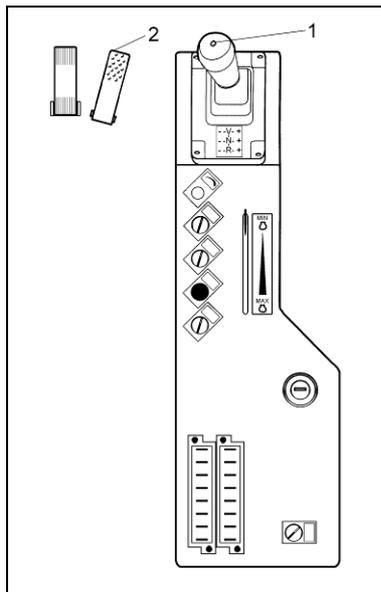


Fig. 4.1/1

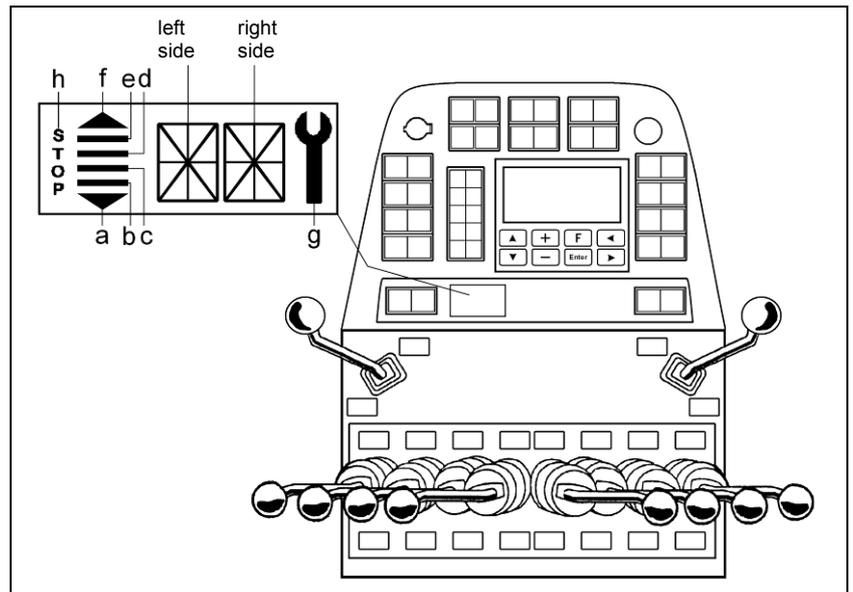


Fig. 4.1/2

**Manual driving mode**

Pressing the driving switch to the right (+) changes to the next higher gear, pressing it to the left (-) to the next lower gear. The bar code on the display indicates the preselected gear. As described under automatic mode, the currently selected gear and direction of travel are visible on both alphanumeric indicators on the display. The starting gear can be selected if the driving switch is in the central position.

The display shows the symbol for a flashing wrench when the self-diagnosis function detects a fault.

"NN" appears on the display if the ignition is switched on and the gear lever is not in the neutral position. "NN" means waiting for the gear selector to be put in the neutral position (Not Neutral).



Switch off the parking brake before driving the vehicle!

**4.2 After starting the engine**

**Note:** At ambient temperatures from 0 °C to 60 °C (32 °F to 140 °F), the warm-up time is about 3 minutes. Additional warm-up time may be required at temperatures below 0 °C (32 °F).

Pay attention to leaking liquids and air at idle speed and at half speed (without engine load) before loading the engine. This is not possible with some operations.

Allow the engine to idle for 3 to 5 minutes or until the water temperature display (see chapter 1.4.2) starts to rise. Monitor all indicators and displays during the warm-up time.

**4.3 Operating at high altitudes**

At altitudes above 2500 m, the motor controller autonomously takes over the control of the necessary power reduction.

**4.4 Braking the grader**

Fig. 4.4/1 and Fig. 4.4/2

The brake pedal (1) is positioned to the right of the steering column, to the left of the speed pedal (2). When the brake pedal is pressed, the machine is braked, the rear wheels are braked.



In case of the 1st or 2nd gear is in lock-in position, to brake the grader to the completely stops running will only be possible, if the speed is low or the gear is in lock-out position (be caused by starting conversion of a hydrodynamic drive).



If the control lamp (5) shines, the machine has a sufficient operating safety for 9 braking procedures only. There is a brake failure. Stop the machine!

The parking brake switch (50) is located to the left of the driver's seat. Turning the switch to position "1" switches on the parking brake, and the parking brake indicator light 4) in the steering column lights up.



The parking brake is no operating brake! It may only be used when the machine stands, to secure it against rolling away.



The throttle lever must be set to minimum speed when driving on public roads or at higher speed (refer also to item 4.16).

**4.5 Steering**

Fig. 4.4/1

By turning the steering wheel (3), the front wheels are swivelled to the left or right side, and the machine drives into a left-hand or right-hand curve. The steering movement of the front wheels is synchronous to the turning movement of the steering wheel.

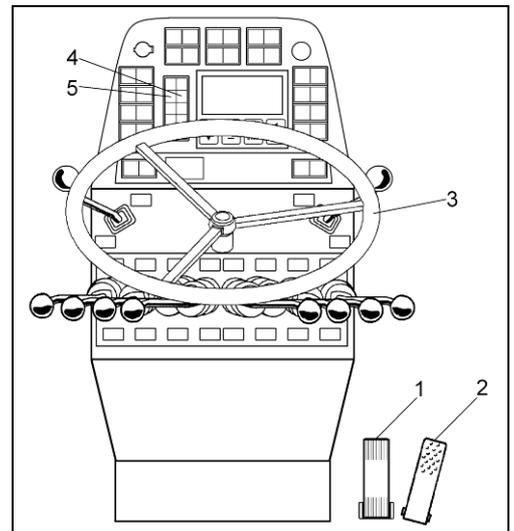


Fig. 4.4/1

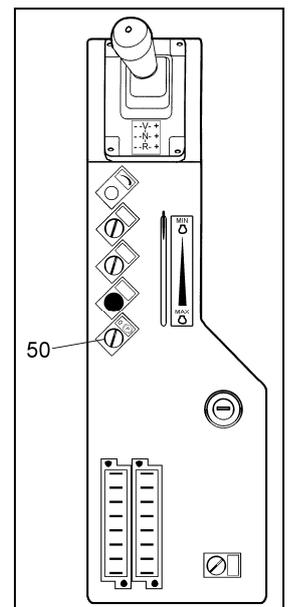


Fig. 4.4/2

**4.6 Emergency steering**

In case of a failure (standstill) of the diesel engine, the delivery of hydraulic oil for steering is interrupted. In such a case, the steering aggregate inside the steering column acts as a pump, when the steering wheel is turned. The oil columns between the steering aggregate and the steering cylinder are shifted to the left or right by the turning movement of the steering wheel. The steering of the machine is possible in this way, with increased steering force required and at a slow driving speed of the machine (when towed to a workshop).



Use the emergency steering system only for a removal of the machine out of an endangered area or during towing. It is not permitted to drive the machine downhill by using the emergency steering system!

**4.7 Front-wheel dish**

Fig. 4.7/1

The dish of the front wheels can be changed by the lever (53), i.e. the front wheels can be changed from their vertical position to a left-hand or right-hand inclination. In this way, the steering stability of the machine during the work process can be stabilised when the wheels are swivelled into to opposite direction of the direction of the material haulage. The wheel dish can also be used to support the steering of the machine. The steering wheel turns something back, when the wheel dish is inclined with the complete turned wheels.



Before the wheel dish is used, disconnect the catch of the connecting rod between the wheels. The use of the wheel dish in public traffic is not permitted. The wheel dish must be connected.

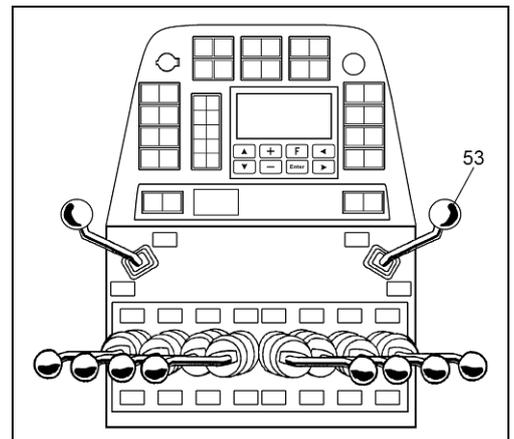


Fig. 4.7/1

**4.8 Signalling facilities**

Fig. 4.9/2

The signalling facilities are operated by the steering-column switch (3) installed in the steering column. The change in the driving direction is indicated by the control lamp (34) for the direction indication. This lamp is switched on by the steering-column switch (3). Left switch position for indicating a curve to the left side, right switch position for indicating a curve to the right side.

The headlight flasher is operated by a vibrating movement of the steering-column switch (3) into direction A.

The push button for the horn is installed on the top of the steering-column switch.

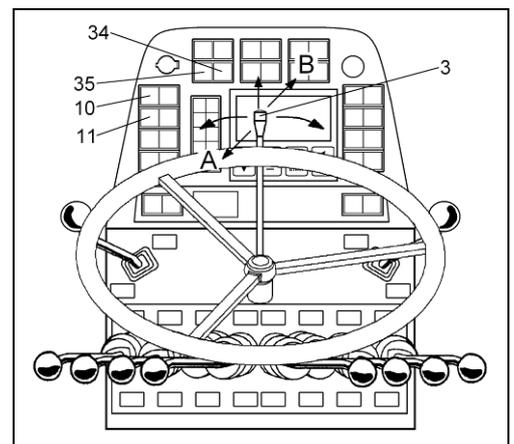


Fig. 4.9/2

**4.9 Lighting facilities**

Fig. 4.91 to Fig. 4.9/3

When the machine is equipped with the complete lighting set, it complies with the public traffic regulations in Europe.

The light is switched on by the switch (40) in the instrument panel. Turning the switch to position "1" switches on the parking light, and position "2" the driving light.

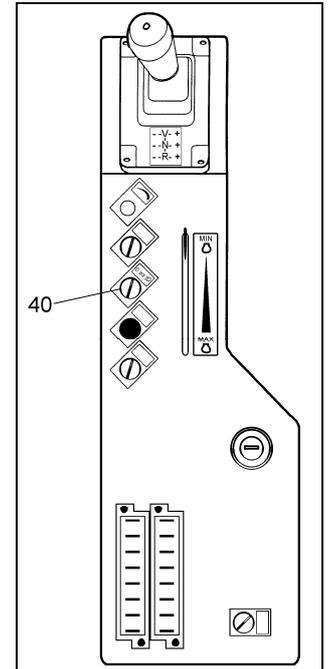


Fig. 4.9/1

The antidazzle headlight is switched on by moving the steering-column switch into direction A, the distance light by moving it into direction B.

When the distance light is switched on the blue control lamps (35) shines.

The additional lights comprise the front and rear work floodlights and the reversing light.

The front work floodlights are switched on with switches (10), and the rear work floodlight is switched on by switch (11).

The reverse lamps are switched through the gear switching. The control lamps in switches (10 and 11) shine when the rear working headlamps are switched on.

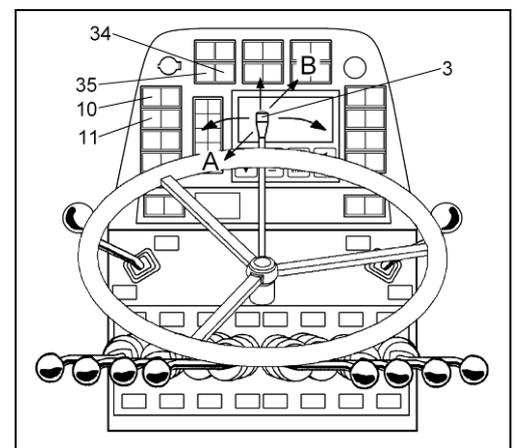


Fig. 4.9/2



When driving in public traffic, the additional headlamps shall not be switched on.

**Note:** When the working headlamps are switched on, the front and rear position lamps as well as the contour lamps at the cabin are switched on too.

It is necessary to switch on the front working headlamps on the top at the cabin with the switch (12), if the front working headlamps are switched on. Press switch (12) to the left to switch the work floodlights on. Press the switch to the right to switch the work floodlights off.

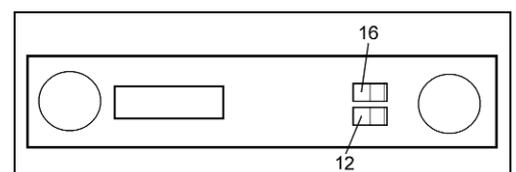


Fig. 4.9/3

The mirror heater (option) is switched on by switch (16).

**4.11 Windscreen wiper and washing system**

Fig. 4.11/1

The wiper of the front windscreen is switched on and off by the switch (6).

When the machine is equipped with a washing system, the washing system is switched on by the switch (7).

The tank with the cleaning fluid is located below the instrument panel to the right of the seat. It is fixed to the side wall of the cabin. It is filled from above the instrument panel. For this, a funnel with a long discharge pipe is required.

The rear window wiper is switched on using switch (63).

The bottom-left windshield wiper is switched on and off by the switch (61) and the bottom-right windshield wiper is switched on and off by the switch (62).

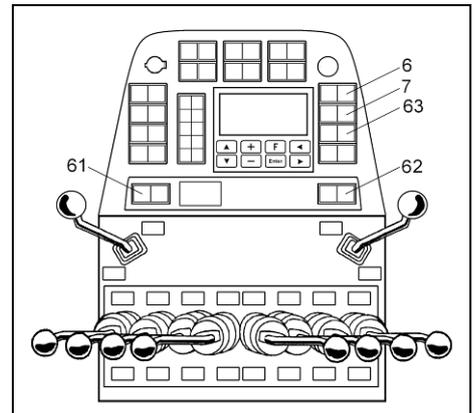


Fig. 4.11/1

**4.12 Frame articulation steering**

Fig. 4.12/1

The frame articulation steering is actuated by the levers (29), in dependence on the lever chosen to the left or to the right by shifting the main frame out of its central position. The degree of the frame shifting depends on the duration of the lever's movement. The movement is provided by the piston stroke of the steering cylinders. The (optional) display of articulation angle shows the degree of displacement.



Before the frame articulation steering is operated, the catching has to be disconnected. Do not use the frame articulation steering when the machine is in standstill position.



When driving in public traffic, never drive the machine without locked articulated steering (refer also to item 7, fig. 7/1).

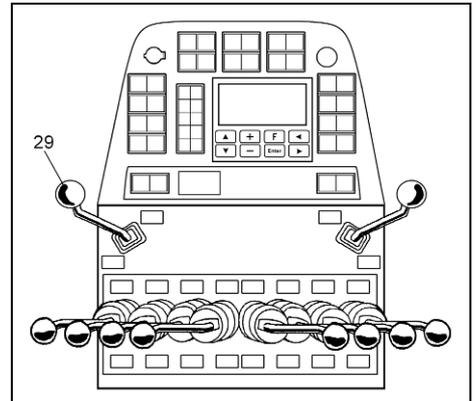


Fig. 4.12/1

- Notes:**
- a) The front-wheel steering and the frame articulation steering can be used simultaneously.
  - b) When using both steering systems, the machine can be driven in the "dog's walk" speed.



If you operate the articulated frame steering, make sure that there is sufficient clearance between the blades edges and the rear wheels.

**4.13 Roof-mounted flashing rotating warning light**

Fig. 4.13/1

Because of the machine's size and weight, it is a complicated member of public traffic. A warning lamp attached to the roof of the machine draws the attention of the other road users to it. This lamp is switched on by switch (9).



According to applicable regulations of public traffic, the warning lamp has to be covered when it is switched off.

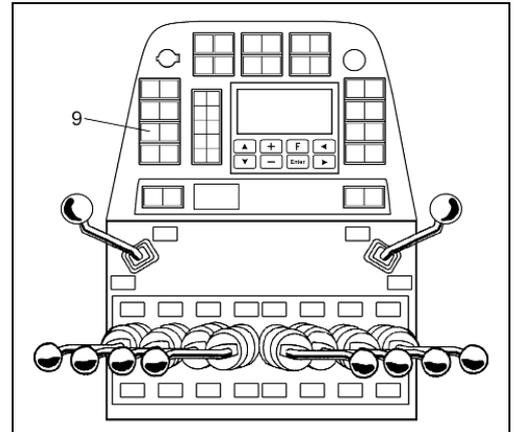


Fig. 4.13/1

**4.14 Flashing warning light**

Fig. 4.14/1

If the driving operation has to be interrupted outside the building site, i.e. in road traffic, for example, or if the machine has to be towed away, the warning flashlight must be switched on.

For this, actuate switch (36). Then, all direction indicator lamps of the machine flash in intervals. The operation of the warning flashlight is indicated by the control lamp in switch (36).

**4.15 Stopping the machine**

Fig. 4.14/1

Shift the gears to neutral position (3).

- Press the braking pedal down, and brake the machine until standstill.
- Move the working devices to transport position or put them down on the ground. Pull the hand accelerator lever (2) to its foremost position.
- Allow the engine to idle for 5 minutes in order and switch off the engine. For this, turn the keyswitch (15) into position "0".

Before you leave the machine:

- Switch on the parking brake by turning switch (50) to position "1",
- Take off the ignition key (15),
- Main switch (1) turns off automatically after 35 seconds.

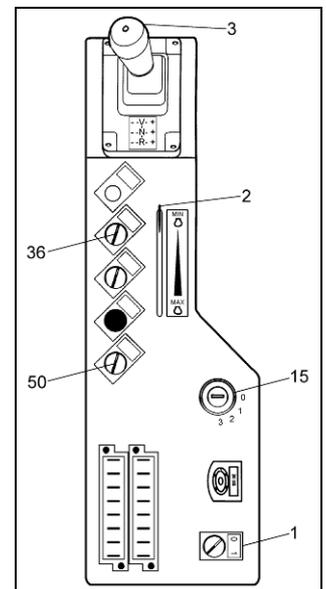


Fig. 4.14/1

**4.16 Driving the machine**

Fig. 4.14/1 to Fig. 4.16/2

All operating levers for the work hydraulics must be blocked for driving on public roads.

Red setting buttons are attached to each operating lever.

- Pressed in - function blocked
- Pulled out - function released

It must also be ensured that the throttle lever (2) is set to minimum speed.



If the throttle lever is set to a high speed, braking then also has to work against the diesel engine running at high speed.

- Check operability of the machine. (See section 2.)
- Before driving on public roads, check to make sure all parts are securely fitted in place and cannot drop off during travel. Check the teeth of the rear mounted ripper, the catchers on the pusher blade, the wheel chocks, and other parts that are available as an option for the machine.
- Start the engine. (See section 3.)
- Accelerate engine speed somewhat (1) and move working equipment into transport or working position. (See section 9.)
- Switch off the parking brake by turning switch (50) to position "0". The control light (4) goes out.
- Select first gear using the speed selector (3). (See section 4.1.)
- Accelerate engine pressing the accelerator (6) and start up machine it way.
- Reduce engine speed to increase travel speed, then gear up and accelerate engine again.
- To reduce travel speed, reduce the engine speed, activate the foot-brake (5) to break the machine and gear down.

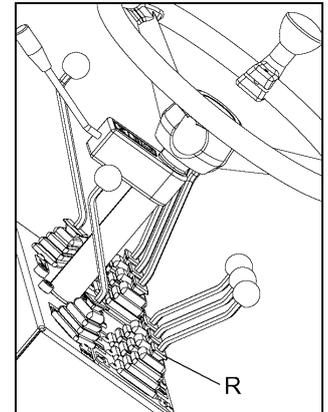


Fig. 4.17/1

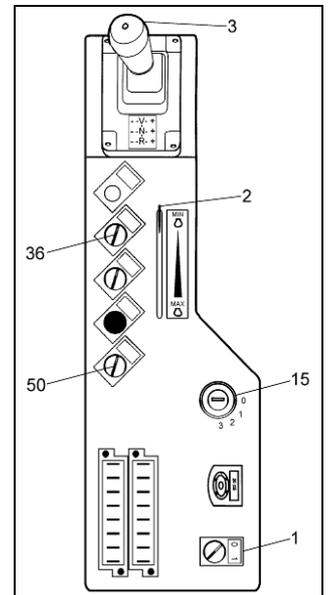


Fig. 4.14/1

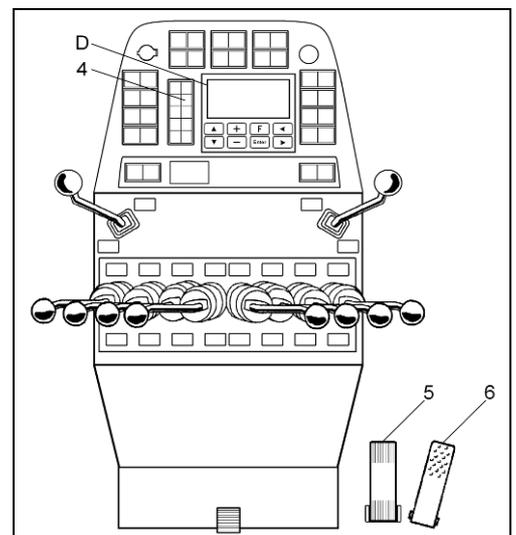


Fig. 4.16/2

**Note:**

- a) All speeds can be shifted under load.
- b) Make sure that always a speed is chosen which corresponds to the prevailing driving or working conditions. A too high speed has negative effects on fuel consumption and the work capacity. In addition, the transformer oil is unnecessarily heated up. The relevant operating temperature can be seen in the display (D - section 1.4). There is a two-stage warning when the operating temperature of the gearbox reaches a limit temperature (see section 1.4.6). The grader must be stopped and switched off. Read out the fault code as described in section 1.4.3.
- c) The gears are equipped with a down-shifting blockage. Any shifting down from speed to speed is only possible by adapting the engine speed accordingly.

During driving operation, all control lamps have to be checked permanently! In case of irregularities or failures, the driving operation has to be interrupted immediately, the cause has to be found, and the defect has to be removed!

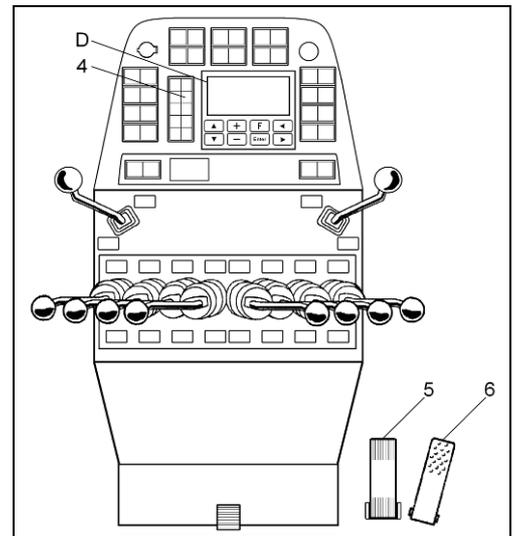


Fig. 4.16/2



**Caution!**

- Never drive with the gears in neutral position!
- When driving in public traffic, the wheel dish has to be fixed.
- Never drive the machine in warning step 2 (1.4)
- When driving in public traffic, never drive the machine with high regulated hand accelerator.
- Do not drive faster than 40 km/h.

**Instructions for driving with a NOSPIN axle:**

The wheels of the NOSPIN axle must be in tight contact to the ground, as otherwise steering problems will occur.

Highest caution is required during the acceleration or braking with the engine on an icy or slippery road lane. Experience shows that axles with NOSPIN differentials tend to skip sooner.

Care that the tyre diameter at the NOSPIN axle is urgently kept uniform, otherwise problems in steering may occur.

Shift to a low speed when rolling down sloping curves. NOSPIN axles restrict the braking effect of the engine or of the retarder when driving through sloping curves.



A non-compliance with these preventive measures may cause the failure of components or ends up in an accident which may result in material damages or injuries, or even death.

**4.17 Adjustment of the steering column**

Fig. 4.17/1

The upper part of the steering column can be adjusted to the seating position, i.e. the steering wheel including the operating elements can be moved towards or away from the seat. For that purpose, strongly press the pedal (1) located in the lower area of the central column so that the catch is disengaged, and move the column by pulling or pushing the steering wheel. After the button is released, the steering column must be neatly engaged in the catch again.



The steering column has to be folded forwards to give more freedom of movement when getting into and out of the driver's cab. Be aware of the risk of accidental actuation of gear levers.

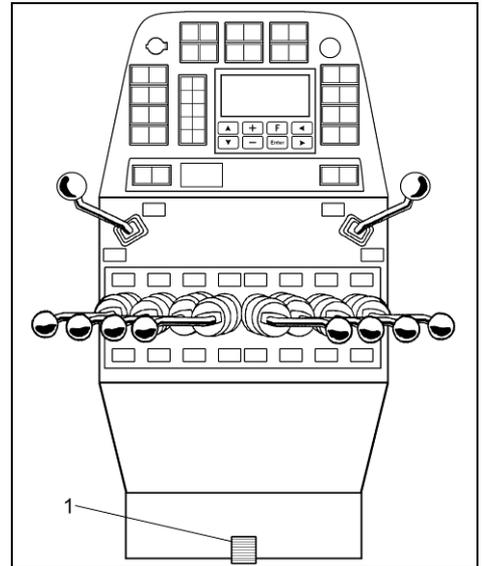


Fig. 4.17/1

**4.18 Front-wheel drive**

Fig. 4.18/1 and Fig. 4.18/2

Front-wheel drive can be switched on and off with the switch (51).

With front-wheel drive switched on (all-wheel drive), the front axle thrust can be regulated with the thrust potentiometer (60). The exact setting of the thrust potentiometer depends upon the ground conditions and thus has to be set for the actual conditions by the driver.

If necessary or in the case of faults, the front axle can be switched off with switch (51). Then, only the rear axle drive functions with the hydrodynamic 6-gear load shift gearbox.

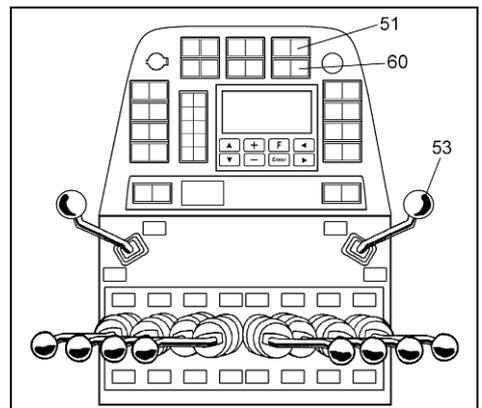


Fig. 4.18/1

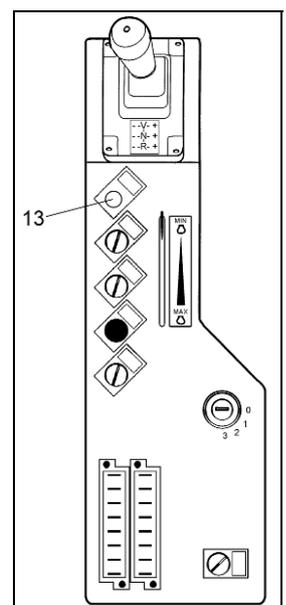


Fig. 4.18/2

**4.18.1 Inching (Option)**

Fig. 4.18/1 and Fig. 4.18/2

The front-wheel drive can be used alone when slow and sensitive driving conditions are required, or if there are faults in the rear axle drive.

- Range selector in neutral position
- The front-wheel drive switch (51) is switched off.
- Turn the switch in the steering control panel (60) to the right or left for travelling forwards or backwards respectively.
- To avoid an accidentally driving start, the driving potentiometer (13) should be switched into "N". (While driving in crawling speed the driving potentiometer has the function of speed preset.)
- After that the speed gets preselected. Except of low diesel engine speed, the speed does not depend on the engine speed.
- To reverse there is no need to switch the driving potentiometer into "N".



**Important!**  
The drive is activated immediately after actuating the switch. Take care!

The front axle drive is switched off automatically if the micro controller sends an error message (59).

If the fault light lights up, then the gear switch, front axle switch (51) and inching switch (60) must be set to zero - fault light OFF.

Then set the desired operating mode again. If the fault light lights up again, then the front axle switch and inching switch must be set to zero.



**Call Service!**  
Further operation is possible with the rear axle alone.

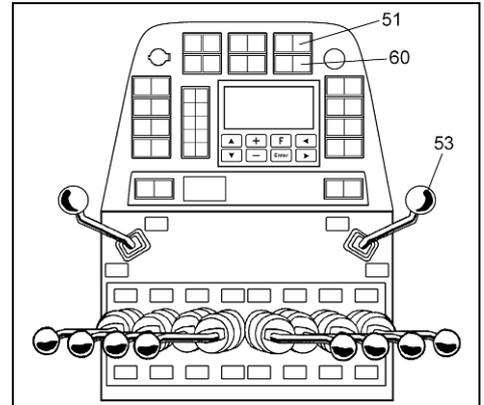


Fig. 4.18/1

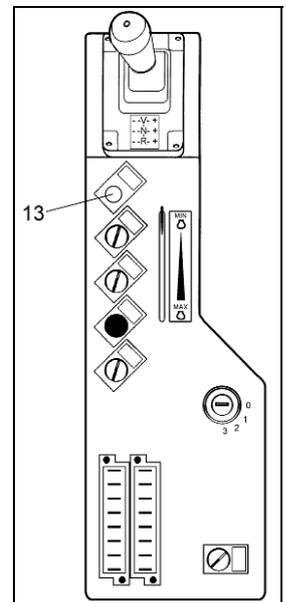


Fig. 4.18/2

**4.18.2 Front axle with wheel tilt**

Fig. 4.18/1

The wheel tilt is actuated by means of lever (53). The wheels on the front axle are tilted from their central position to the right or left according to the lever position selected. The magnitude of the angle of tilt depends on the length of time the lever is actuated. The wheels are moved by the piston stroke of the tilting cylinder in the front axle carrier.

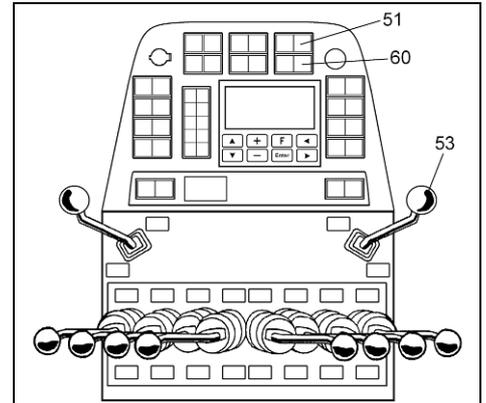


Fig. 4.18/1



Never drive in the public traffic without bolting device of the fall adjustment (Refer to item 4.18.3, fig 4.18/3).



Before manipulation of the wheel camber adjustment the bolting device pin at the tie bar of both wheels must be solved.

**4.18.3 Wheel camber adjustment opens**

Fig. 4.18/2 and Fig. 4.18/3

During mechanically blocked wheel camber adjustment stands the wheels perpendicularly on the subgrade level and the tie bar to both wheel photographs is connected by means of pin (1) with the front axle support.

Spring cotters of the pin loosen. Pins from the connection pull, possibly aids use. If the pin between tie bar and front axle support wedges, lever (53) easily to the right and/or left move.

Pins for keeping into the hole (2) at the front axle support (fig. 4.18/4) put and with spring cotter secure.

Wheel camber adjustment secure in reverse order.

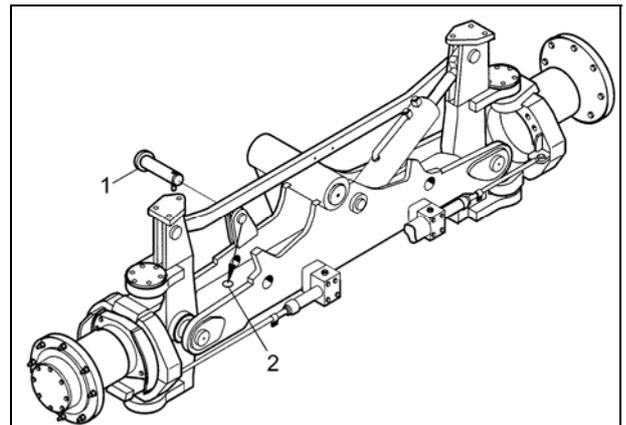


Fig. 4.18/3



Never with unsecured pin move the grader.

#### 4.21 Attaching the catcher to the front bulldozer blade (option)

Fig. 4.21/1

To avoid restricting the lighting equipment, comply with the following when driving with catchers mounted on the bulldozer blade:

- Do not fully raise the bulldozer blade. Leave a clearance of about 400 mm between the bottom of the bulldozer blade and the ground.
- This position is marked by a "T" on the depth indicator.  
T = Transport position



#### Caution!

Before driving on public roads, the catchers on the pusher blade must be checked for proper, tight fit, to avoid losing them.

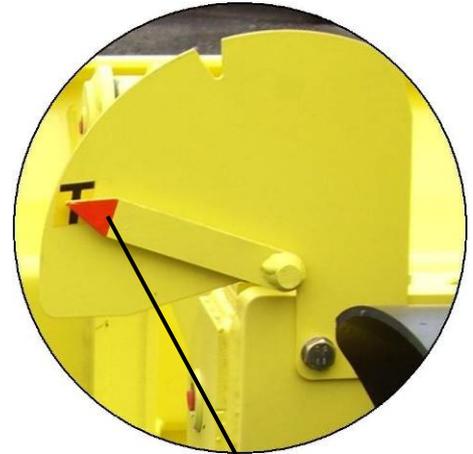


Fig. 4.21/1

## 5 Towing the grader

If the machine does not run, all hydraulic circuits are shut off.

Thus, if you have to tow the machine, keep in mind the following rules and instructions:

- Steering will require more force. It is not possible to use the articulated steering.
- Do not use steering while the machine is at standstill.
- Switch on the hazard warning indicators.
- If you have to tow the machine over distances of more than 10 km (6 miles) per hour, disassemble the cardan joint located between p.t.o. shaft and axle drive.



It is not allowed to tow the machine over distances of more than 10 km (6 miles), if the cardan joint located was not disassembled before. Otherwise the p.t.o. shaft will get damaged. Maximum towing speed is 10 km (6 miles) per hour, maximum distance with no cardan joint disassembled is 10 km (6 miles).

- Use a tow bar, since braking action will deteriorate when you actuated the braking pedal several times, since the fluid accumulators cannot be recharged.
- Do not actuate the working equipment. There is no pressure available to raise the equipment.
- For towing the machine only the towing clutch to the machine in front (at the earth levelling scoop or at the framework head end plate) use.



The steering aid is not available if the engine does not run.  
The pressure reserve is used up after several braking actions.

- Before switching off the parking brake, use wheel chocks to prevent the stationary machine from rolling away.
- Bolt the towing coupling available on board of the machine securely onto the front side of the machine (dozer blade or front plate), using the bolts supplied.
- If the machine has to be towed backward over a short distance, use the (optional) towing device at the rear side.

## 7 Locking the articulated hinge

Fig. 7/1

Place the machine into forward drive position. Loosen and pull out the rear bolt of the connecting fish-plate. Tilt the connecting fish-plate to the front part of the frame, and place the borings of the connecting fish-plate and the supporting eyes at the front part of the frame on top of each other.

If required, correct the position of the front part.

Lock the articulated hinge with the bolt.

Secure the bolt with the spring plug.

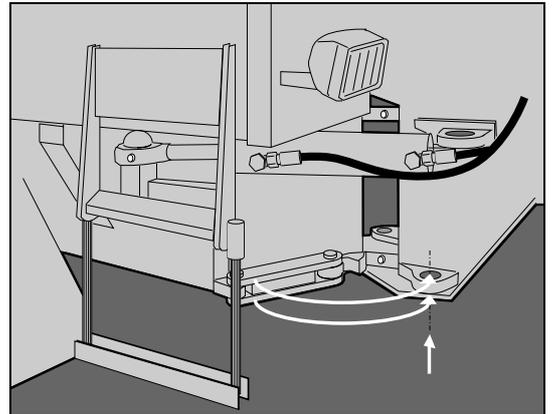


Fig. 7/1



Never move the machine if the connecting fish-plate is not secured.

**8 Loading the grader onto a railway wagon**

Fig. 8/1 and Fig. 8/2



For the loading of the grader, the loading regulations of the railway line carrying through the transport apply, above all.

Always carry the grader on the wagon with locked articulated hinge and secured connecting fish-plate.

Place the grade correctly into the centre of the wagon. All six wheels have to be secured with wedges. Nail the wedges to the wagon bottom (comply with the loading regulations). The front axle and the rear axle must be spanned with two wire ropes on each side of the axles. For this purpose, use double spanning wire of 5 mm (0.2 in.) diameter for each spanning rope (fig. 8/1). To comply with the loading profile, screw off the rotating warning flashlight.

Fig. 8/2 shows the grader loaded on the wagon according to the free-space profile of the Deutsche Eisenbahn (DR, DB).

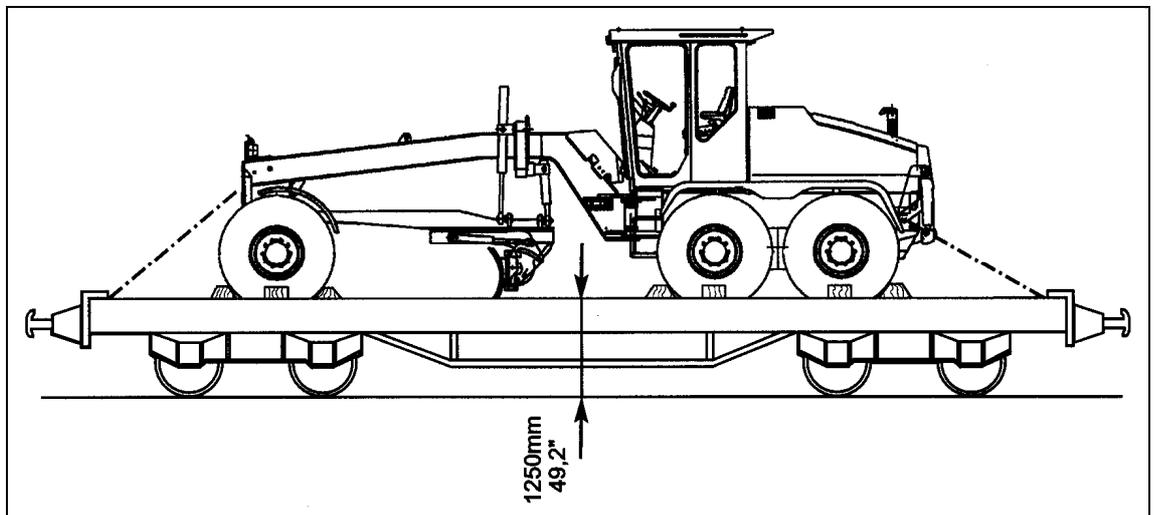


Fig. 8/1

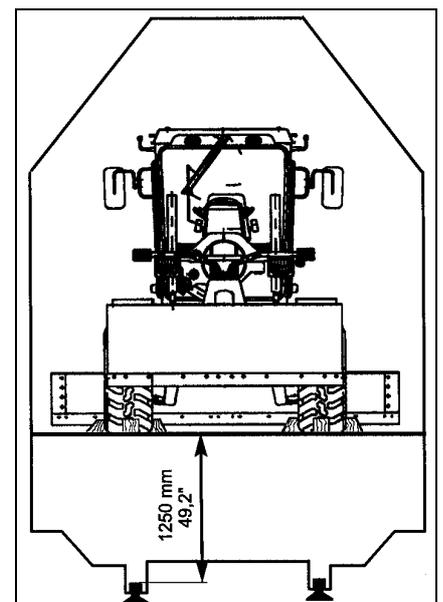


Fig. 8/2

## 9 Working with the grader

### 9.1 General and basic rules

Motor graders are universal and versatile earth-moving machines which are not bound to tracks. However, just this universality and versatility require that the machine driver exactly knows the machine and that he has gained experiences.

The following ground rules must be observed when working with the grader:

1. The following rule for the cutting angle applies for the stripping of soil:
  - solid soil - small cutting angle
  - cohesive soil - medium cutting angle
  - frictional soil - large cutting angle
2. The following rule applies to earth moving:
  - A small angle of incidence of the blade to the longitudinal axis results in a larger transverse moving volume when compared with a large angle if incidence to the longitudinal axis.
3. The hauled material shall always be put down inside or outside the track. Never put it down in front of the rear wheels.
4. Make sure that only as much material is cut as runs off the blade!
5. A small chip thickness and a larger number of passages result in a higher levelling quality when compared to a large chip thickness and few passages.
6. Choose the speed for each passage so that no thrust interruption is required because of a change in speed. In this way, any unevenness of the levelled ground is avoided.
7. Always produce the fine and final grade with a small chip thickness. Avoid any overloading of the blade. Choose a large angle if incidence of the blade to the longitudinal axis for the fine and final grader.

### 9.2 Adjustment angles of the blade

The setting angles for working with the grader are explained and defined in the following sections.

#### 9.2.1 Cutting angle

Fig. 9.2/1

The cutting angle (a) is the angle to which the edge of the blade is adjusted towards the soil to cut off or to process. This angle is determined by the kind of work and the compactness of the soil.

#### 9.2.2 Angle of incidence

Fig. 9.2/2

The angle of incidence (a) is the angle to which the blade is adjusted to the longitudinal axis of the grader. In dependence on the intended transverse moving direction, this angle applies to the right or left side of the grader. The largest angle of incidence is 90 degrees.

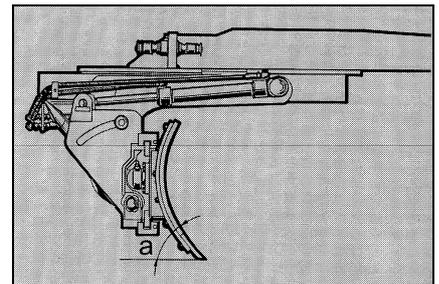


Fig. 9.2/1

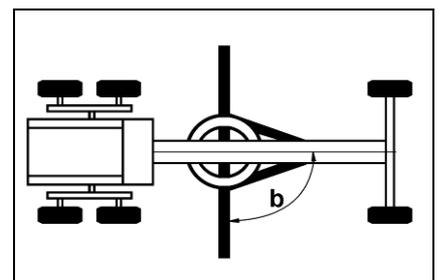


Fig. 9.2/2

**9.2.3 Slope angle**

Fig. 9.2/3

The slope angle is the angle to which the blade is adjusted upwards in its longitudinal direction to the surface of the drive lane. The largest slope angle is 90 degrees, the smallest one 0 degrees. This angle can also be negative, then the blade is adjusted downwards to the surface of the drive lane.

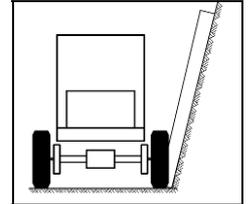


Fig. 9.2/3

**9.3 Use of the adjustment options**

Fig. 9.3/1 and Fig. 9.3/2

All adjustments possible at the grader can be made from the driver's cabin. The levers and switches which are provided for them are shown in fig. 9.3/1 and fig. 9.3/2.

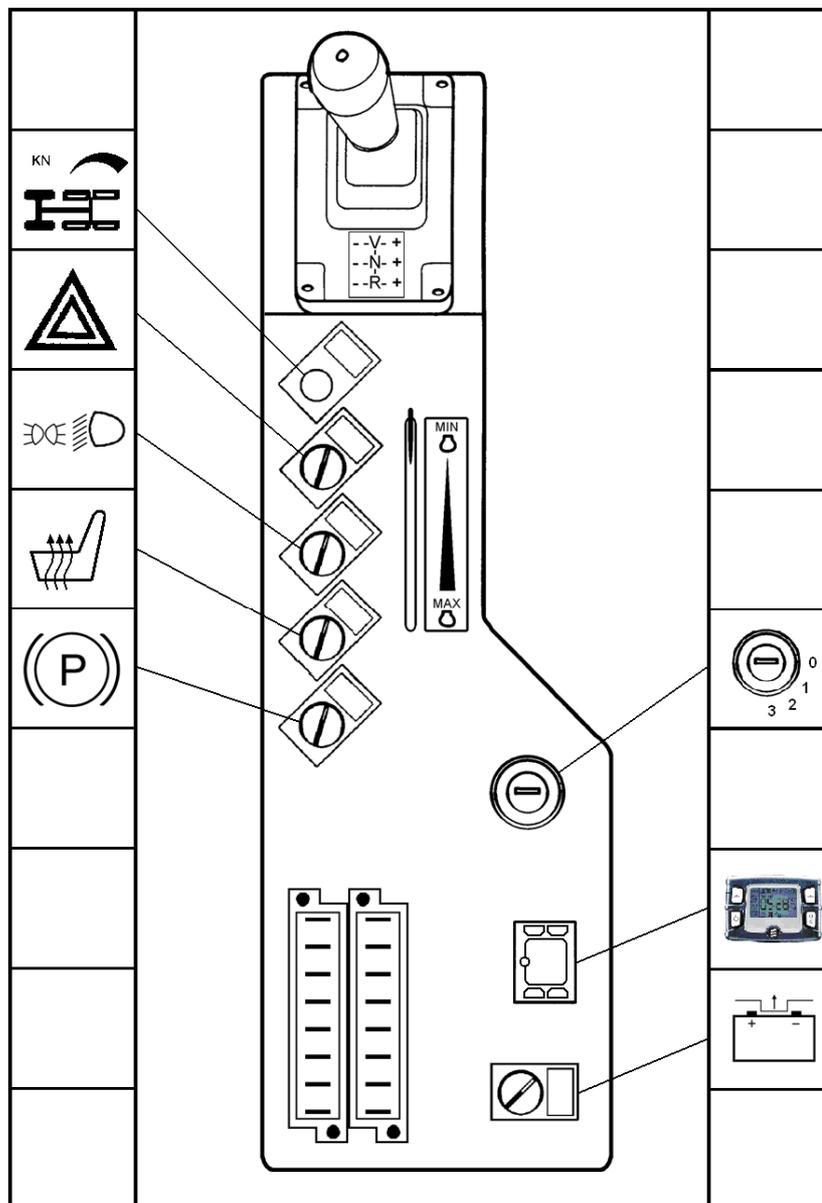


Fig. 9.3/2



#### 9.4 Positioning the blade for transport

By the positioning of the blade described in the following, the grader can be driven on public roads and to other sites. The swing bridge on the grader frame must be in central position, i.e. the fixing bolt has to be engaged in position III (see fig. 9.8.4/1). Lift the blade and turn it to such an angle of incidence that the right end is located behind the right front wheel.



There must be such a gap between the front wheel and the blade end that the front wheel can carry out the steering movements without any obstruction.

The rear blade end has to be within the track of the rear wheels, too. Align the blade into a horizontal position.



The rear blade end must have a sufficient distance to the frame so that the blade end and the frame do not touch when the articulation steering is used.



When the blade is aligned to a horizontal position, the blade end shall not be pulled against the frame from below.

In this position, the ground clearance can even be improved when the blade is tilted to the position of the smallest cutting angle.



In transport position, the blade shall not project over the width of the machine.

#### 9.5 Limitations on the use of the grader

For the use of the grader, there are natural limiting conditions.

##### 9.5.1 Machine inclinations

The following angles of inclination shall not be exceeded:

Longitudinal inclination to the front	35 degrees
Longitudinal inclination to the rear	35 degrees
Inclination to the left side	25 degrees
Inclination to the right side	25 degrees



When the machine is driven on slopes of such inclinations, the tilting limit shall not be exceeded by an additional force from the blade or ground irregularities.

##### 9.5.2 Ground stability

Motor graders are not suitable for cutting work on stony or rocky ground. Loose rock can only be cleared from ground surfaces or hard road lanes without projecting stones (e.g. road courses). The limit for the cutting force of the grader is dry hard ground whose processing is only possible with the wide hoe. On humid, not naturally grown soil and loose sand, the grader sinks in and does not have any shear force.

**9.5.3 Climatic limits**

The grader can be used within the following climatic limits:

- frost up to -20 °C (-4 °F)
- heat up to 40 °C (104 °F)
- Air humidity 90 % at 33 °C (91 °F)

At temperatures below - 18 °C (-0,4 °F), the cold-starting aids support the start of the engine (starting aids are special accessories in dependence on the frost area).

**9.6 Recommended adjustment angles of the blade**

The correctly chosen adjustment angle of the blade severely increases the effectiveness of the grader. The following table includes recommendations for the adjustment of correct angles of the blade in dependence on the kind of job and soil:

<u>Job and type of soil</u>	<u>Cutting angle - degrees</u>	<u>Angle of incidence - degrees</u>	<u>Slope angle - degrees</u>
Soil displacement natural, slightly cohesive natural, hoe-solid, dry	40 30 - 35	40 - 45 35 - 40	up to 15 up to 20
Transverse haulage of soil dry humid frictional	45 40 50	35 - 40 40 - 50 40 - 45	up to 18 up to 15 up to 10
Final grade	45	40 - 45	up to 18
Material placement Placement of road courses Distribution of road course material	45 45	55 - 60 35 - 40	up to 3 up to 4
Shifting of dry mixture	45	35	up to 3
Shifting of binding materials	45	35 - 40	up to 2
Clearing of snow	45	40 - 45	1 - 3

**9.7 Safety rules for working with the grader**

No-one should stay within the blade hazard area during adjustment, especially if you swivel the blade to the slope angle.

Before you unlock the bridge catch at the frame, check the centre of weight of drawbar, slewing ring and blade, since the system will tilt immediately along the line of action as soon as the bridge catch is removed.

Do not remove the bridge catch of the slewing ring if the blade is more than 100 mm above ground. The bridge catch can only be removed if the machine is at standstill (electrical interlock).

Do not exceed the tilt limits of the machine.

Everyone must keep out of the danger area around the grader.

If you work below trees, keep care that no branches contact the cab windows.

It's forbidden to scarify or break soil (or removal other obstacles) taking a run-up with the grader. The high dynamic loads and shocks resulting from this method are an operator hazard and may cause fractures of the machine.

Use and operate graders such that stability is always ensured.



First unlock the articulated steering before you start using the grader.

When reversing the machine, the brake should be pressed slightly to reduce the driving speed to approx. 10 km/h in order to ensure the safety of the driver, and protect both the vehicle's drive components, and the subgrade completed so far.

**9.8 Instructions on the execution of work tasks**

**9.8.1 Transverse haulage of the soil**

Fig. 9.8.1/1

This job occurs for example during the clearing of the trench edges when trenches are cut, and during the clearing of the slope footing, but also during the distribution of cut material or the removal of topsoil.

The angle of incidence of the blade and the cutting angle have to be adjusted in accordance with the instructions given in chapter 9.6. The blade has to be positioned by the swivelling cylinder for the tie beam and the cylinder for the longitudinal shifting of the blade in such a way that the material will be put down outside the track. The front wheels are slightly (approx. 5 degrees) inclined into the haulage direction (not applicable to graders with four-wheel drive).



Do not put down the material below the rear wheels. A uniform surface is not possible anymore then.

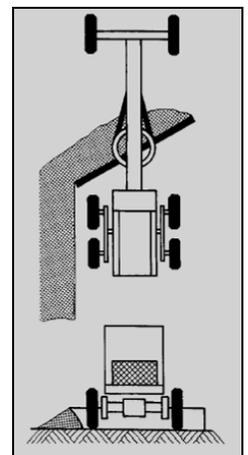


Fig. 9.8.1/1

**9.8.2 Longitudinal haulage of the soil**

Fig. 9.8.2/1

A longitudinal haulage by the grader blade, as e.g. with the plate of a bulldozer, is generally impossible or ineffective with the grader. The grader is not designed for such a job. A longitudinal haulage with the grader only happens during the preparation of the final grade, and when road course material is placed. Then, the angle of incidence has to be adjusted to 90 degrees, and a large cutting angle must be chosen in dependence on the material. The blade shall not be over-filled with material, as it will then run above the upper edge of the blade. Depressions in the grade are filled. If a large volume has to be placed, it is advantageous to previously distribute the material by the front grading plate. During this work, the front wheel are in a vertical position.

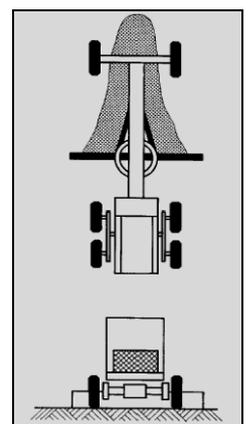


Fig. 9.8.2/1

**9.8.3 Trenching**

Fig. 9.8.3/1 and Fig. 9.8.3/2

During trenching, both trench slopes can be prepared from one working side, or each slope on its side. In the latter case, the instructions given for the cutting of the "inner" slope apply to both slopes.

To cut the inner slope of the trench (fig. 9.8.3/1) adjust the blade to an angle of incidence of 35 - 40 degrees, and shift it to the right so that the right blade end inclined to the front is on line with the external edge of the right front wheel. Use the shifting cylinder for the adjustment of the blade.

During the first cutting of the trench, the front wheels drive on natural soil, the rear wheel in the cut. In the subsequent passages, the right front and rear wheels drive on the trench bottom. The dish of the front wheels has to be adjusted in such a way that they are in a vertical position when driving in the trench (not for graders with four-wheel drive). After each passage, clear the excavated material stored at the trench edge so far away that the wheels driving on the trench edge are not obstructed, otherwise it is not possible to carry out a correct cutting of the trench.



Do not exceed the permissible transverse inclination of the machine during trenching (chapter 9.5.1).

For the cutting of the outer trench slope (fig. 9.8.3/2), adjust the blade to an angle of incidence of 20 degrees, and swing it out by the blade pushing cylinder and the swivelling cylinder so that the blade corresponds to the slope angle.

The right front and rear wheels drive on the trench bottom. The dish of the front wheels has to be adjusted in such a way that they are in a vertical position when driving in the trench (not for graders with four-wheel drive). The material temporarily stored on the inner slope is removed to the outside afterwards in accordance with the system of the inner slope cross-section.

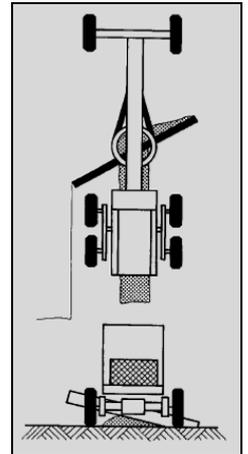


Fig. 9.8.3/1

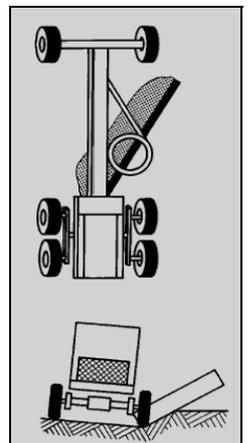


Fig. 9.8.3/2

### 9.8.4 Adjustment of the slope angle

Fig. 9.8.4/1 to Fig. 9.8.4/3

In normal position, the bridge is locked in position III (fig. 9.8.4/1). To adjust the slope angle, the swing bridge must be turned to the side opposite to the slope, i.e. if the slope is on the right side, the swing bridge must be turned in counter-clockwise direction (fig. 9.8.4/2), if the slope is on the left side, the swing bridge must be turned in clockwise direction (fig. 9.8.4/3). The turning movement of the swing bridge is carried out by two lifting cylinders (see chapter 9.8.5).

The swing bridge is unlocked by pressing the switch to the left of the steering wheel on the steering-column panel (fig. 9.3/1). To lock the swing bridge, put the switch to zero position, and move the bridge to its locked position by means of the lifting cylinder.



Only unlock the locked bridge when the blade is placed on the ground or when it is not more than 100 mm above ground (see chapter 9.7!).

### 9.8.5 Working at slopes

Fig. 9.8.4/1 to Fig. 9.8.4/3

The grader can work at slopes of up to 90 degrees on both sides of the grader.



During the complete adjustment procedure, watch the system and avoid any jamming by touching solid components. Such possibilities of collision are extremely rare. The consequence are mostly avoidable damages at the hydraulic cylinders.

If working frequently on a slope to the left, it is advantageous to shift the attachment of the head of the piston rod to the right.

The adjustment of the slope angle of 90 degrees is made as follows:

Turn the blade so that its right end is located at the right front wheel. Push out the blade completely and adjust the smallest cutting angle. Swivel the tie beam with the swivelling cylinder to the right side, and lower the blade down to the ground. Press the switch (33 - fig. 1.3/1) to the left to release the locking bar of the pivot bridge.

First press switch (33 - fig. 1.3/1) to the right, then turn the pivot bridge anticlockwise with the two cylinders for raising and lowering the blade until the locking bar slots into the outermost slot. During this procedure, move out the piston of the right cylinder and move in the piston of the left cylinder.

As soon as the swing bridge is solidly locked again the slope angle is adjusted by the lifting cylinders. The swivelling cylinder of the tie beam has to be corrected for this too. Turn the slewing gear and the blade into the desired position, and adjust the cutting angle for the work. Make sure that the lower blade end is on line with the outer edges of the wheels.

For the treatment of slopes on the left side, the same operations apply. However, the swing bridge has to be turned in clockwise direction to position V.

The above mentioned instruction on the change in the attachment of the piston-rod head of the blade shifting cylinder must be complied with.

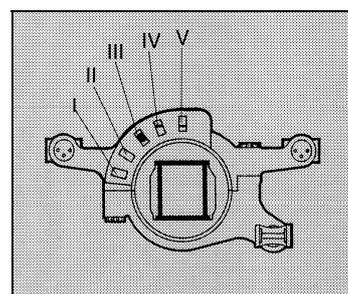
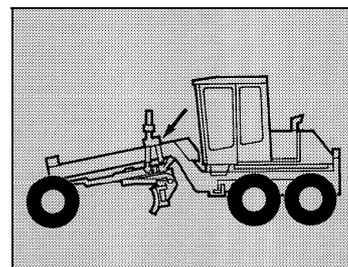


Fig. 9.8.4/1

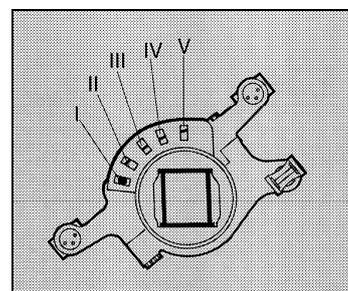


Fig. 9.8.4/2

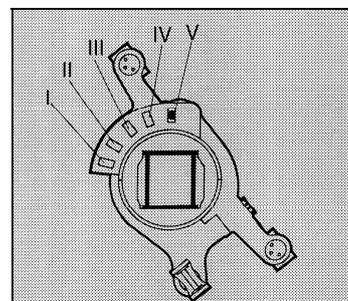


Fig. 9.8.4/3

**9.9 Working with the grading plate**

Fig. 9.9/1

The grading plate is suitable for the longitudinal haulage of bulk materials and other materials, to form heaps, to fill trenches and pits etc. The grading plate of a grader is not suitable for the displacement of soil with cuts below the grade.

The lever (37) is used for the setting and steering.



If you drive on public roads, raise the dozer blade just as little that the front headlamps' beam is not affected.

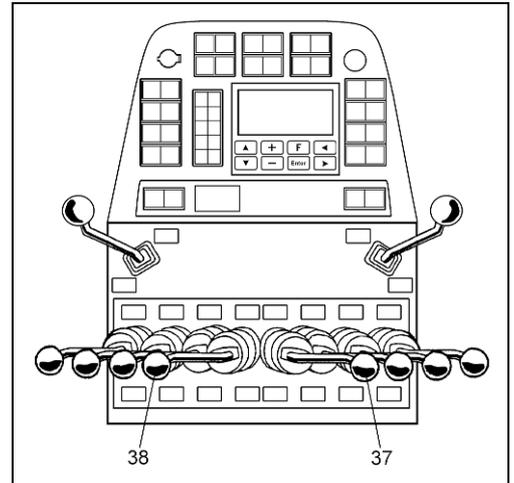


Fig. 9.9/1

**9.10 Working with the ripper**

Fig. 9.9/1

Hard and strongly compacted soil (no rock) can be loosened by the ripper. Worn road courses and pavements can be ripped too. The ripper can also be used for mixing during the building of stabilised soil roads. During ripping, the machine driver should collaborate with a directing person who indicated the optimum position of the ripping teeth. The ripping of deeply frozen soil, rocky ground and of cement-concrete courses is not permissible. The adjustment and control are carried out by using the switch as shown in fig. 9.3/1.

To increase the ripping effect, individual teeth can be folded upwards and secured (only applies to a heavy, rear mounted ripper).

The lever (38) is used for the setting and steering.



All the attached bucket teeth must be folded down and secured for transport journeys on public roads (only applies to a heavy, rear mounted ripper).



Take note of the physical limits for ripping up surfaces when using the light rear-mounted ripper in order to avoid damaging the parts.



The tightness of the keyed joints securing the teeth must be checked every day, and restruck if required. (This does not apply to the heavy-duty rear mounted ripper.)

**9.11 Tilting the Cabin for Service Work**

Fig. 9.11/1 to Fig. 9.11/4

Access to the area underneath the cabin for assembly and maintenance work is achieved with the use of a hydraulic tilting cylinder (6) and a hydraulic hand pump (7).

The work steps and safety regulations must be observed during this procedure.

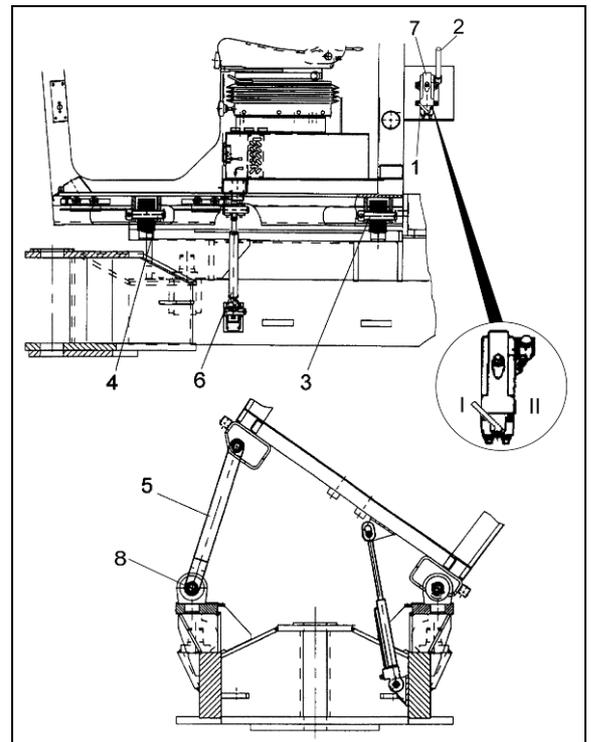


Fig. 9.11/1

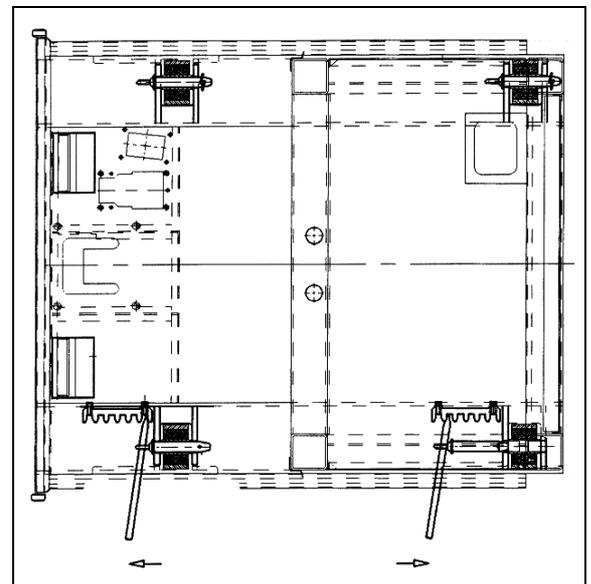


Fig. 9.11.1/1

**Raising the cabin**

1. Remove the mounting lever (10), pump lever (2) and pin (8) from the cabin. The support (5) is removed from the slewing rim bar.
2. Close the cabin door on the right hand side to avoid any damages. Open the engine hood (see section 2.1).
3. The main switch turns off automatically after 35 seconds. (See section 3.3.)
4. Remove the spring cotters (9) from fixing pins (3 and 4).
5. Set the pump valve (1) to position "II" (lift position).
6. Work the pump until there is a noticeable unloading of the left-hand rear fixing pin (3) of the driver's cab vibration bearing.
7. Pull the fixing pin out of the bearing with the mounting grip (10).
8. Pull out the front, left fixing pin (4) similarly as described in points 6 and 7.
9. Raise the driver's cab to the height of the support (5). Fixate the support (5) on the rear cabin bearing with the previously removed fixing pin (3) and pin (8). Secure the pins (3 and 8) with the spring cotters (9).

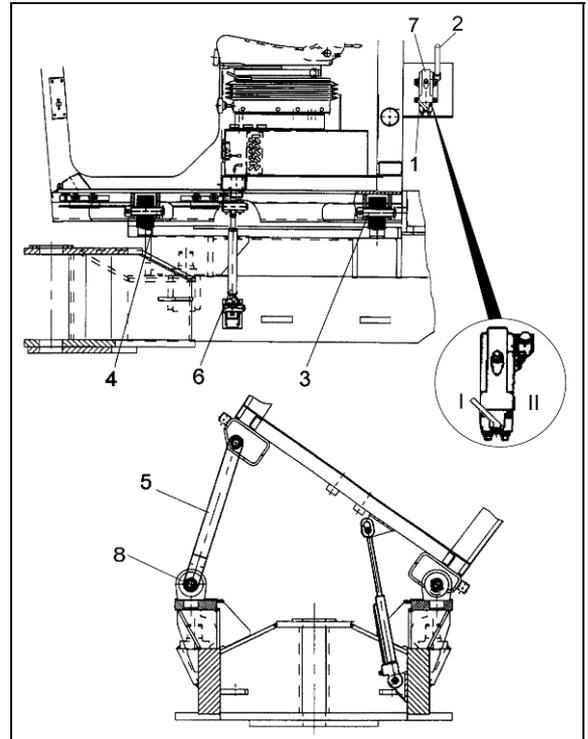


Fig. 9.11/1



**Attention!**

The support (5) must be always be inserted for reasons of working safety.

**Lowering the driver's cabin into the ready position**

1. Remove the support.
2. Set the pump valve to position "I" (lowering position).
3. Lower the driver's cab, align the bearing boreholes, insert the pins, and secure them with spring cotters.
4. Close the bonnet.

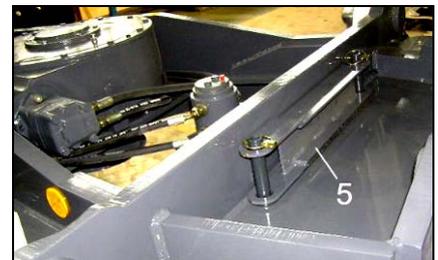


Fig. 9.11/2

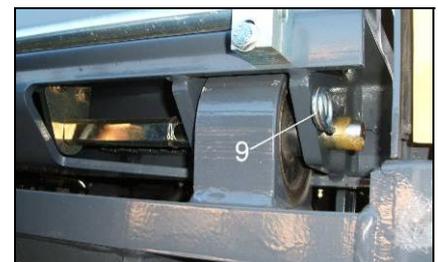


Fig. 9.11/3

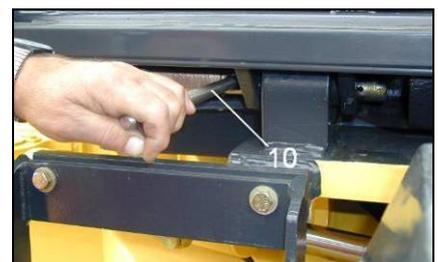


Fig. 9.11/4

**9.12 Access ladder for maintenance work**

Fig. 9.12/1 and Fig. 9.12/2

For maintenance work in the rear engine compartment

- Hydraulic oil filter / filling
- Venting filter
- Checking/filling the cooling water

use the access ladder (A) on the rear mount and the grip (G).



Fig. 9.12/1

The access ladder must be unhooked for transport, and bolted to the rear mount (fig. 9.12/2) with the bolt (M16) (risk of loss!).



**Note:** Hot surfaces, hot media.

**Risk of burns!**

Allow the machine to cool before starting maintenance work.



Fig. 9.12/2

**11 Operation of the air conditioner (option)**

The control panel (fig. 11.1/1) is located at the top left in the driver's cab.

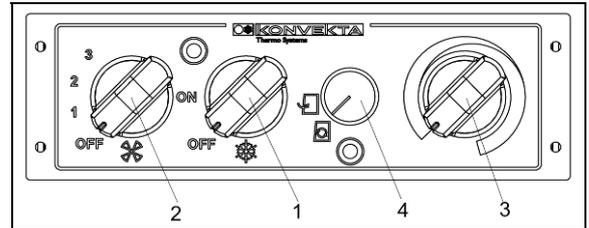


Fig. 11.1/1

**11.1 Switching on the air conditioner**

Fig. 11.1/1

- Start the vehicle engine.
- Turn the switch (1) to the right (ON) – air conditioner is ON  
The indicator light next to the switch lights up when the air-conditioning unit is on
- Turn the three-stage switch (2) to the right
- Position 0 - Fan OFF
- Position 1 - Minimum setting
- Position 2 - Middle setting
- Position 3 - Maximum setting
- The thermostat regulates the air outlet temperature.  
Attention: Turning the switch (3) to the right - lower temperature
- Open the window for 2 to 3 minutes to let hot air (heat build-up) escape from the cabin.
- Close again the window. The best cooling capacity will be achieved when the windows and doors of the vehicle are kept closed.
- The air flow is regulated by the three-stage switch
- We recommend that the air in the vehicle is not cooled more than 6° to 8 °C (11° to 14 °F) below the outside temperature.  
Fresh air must be added after a few minutes to prevent an oxygen deficiency developing.
- Switch (4) switches from fresh air to recirculation mode



An oxygen deficiency can develop with total air-recirculation mode. In this case, the fresh air supply must be switched on with the switch or the door or window opened a little.

**11.2 Switching on and off the air conditioner**

Fig. 11.1/1

Turn the switch (1) to the left (OFF) - air conditioner is OFF.  
Signal lamp in the switch is OFF.

**11.3 Sight glass and triple pressure switch**

Fig. 11.3/1 and Fig. 11.3/2

The sight glass and triple pressure switch are fixed on the dryer-receiver unit.

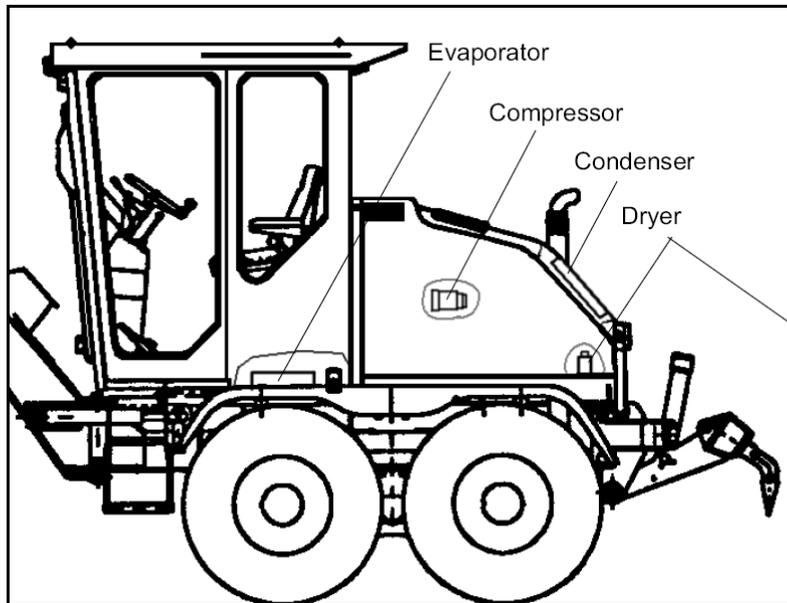


Fig. 11.3/1

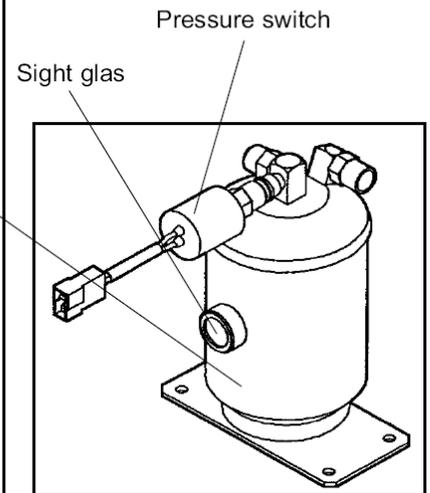


Fig. 11.3/2

**11.4 Checking the refrigerant level**

Fig. 11.4/1

- Put the unit into operation.
- The adjusted temperature must be below the actual inside temperature to ensure that the compressor is switched on.

If the (white) float ball is in its lower position, there is a deficiency of refrigerant. Consult the service station.

If the (white) float ball is in its upper position, the quantity of refrigerant is o.k.

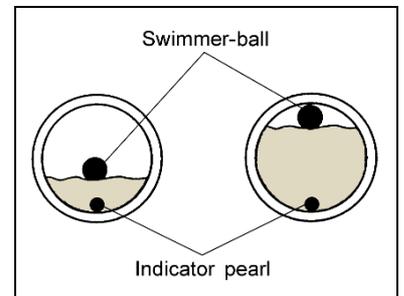


Fig. 11.4/1

**Checking the moisture indicator**

In order to determine the moisture content of the drying medium, pay attention to the indicator pearl in the sight glass.

Indicator pearl: blue i.e. "dry"

Indicator pearl: pink i.e. "moist". Consult the service station.

If the indicator pearl is pink, change the dryer-receiver unit.

**11.5 Condenser**

Take care that the fins of the condenser are always clean. In case of extreme pollution, overpressure will be produced in the air-conditioning system and the unit will automatically be interrupted.



Clean the condenser regularly by blowing through with compressed air.

### 11.6 Refrigerant receiver

Due to an operational overpressure in the receiver, its manufacture and inspection are subject to the Pressure Vessel Regulation (as amended in April 1989). By this regulation the pressure vessels are subdivided in test groups with reference to the permissible operational overpressure  $p$  (measured in bar), volume  $V$  (in litres) and the product of pressure and volume  $p \times V$ . Assuming this regulation, the refrigerant receivers are to be qualified in test group II.

#### Attention:

According to § 10 of the Pressure Vessel Regulation, these pressure vessels shall be subject to a periodical inspection by an expert as defined in § 32. Periodical inspections shall include outside checks to be done normally with vessels operated. In connection with such check, the refrigerant receiver shall be subject to a visual inspection twice a year. Particular attention should be paid to corrosion and mechanical damage. If the vessel should be found to be in improper condition, it must be replaced for safety reasons to ensure that the user and third parties are sufficiently protected from the risks in handling or operation of pressure vessels.

### 11.7 Compressor

Fig. 11.7/1

The compressor is mounted to the vehicle engine and driven by the latter via a V-belt (SPA profile). Care should be taken that the V-belt has the proper tension. In order to avoid leakages on the shaft packing of the compressor, two different cases should be observed:

1. If the vehicle itself is withdrawn from operation for a longer time, it is also not necessary to switch on the compressor.
2. If the vehicle is used, however, for a longer time without using the cooling/air-conditioning system, users are recommended to activate the compressor every two weeks. Otherwise, the shaft packing of the compressor could be damaged by vibration of the engine.

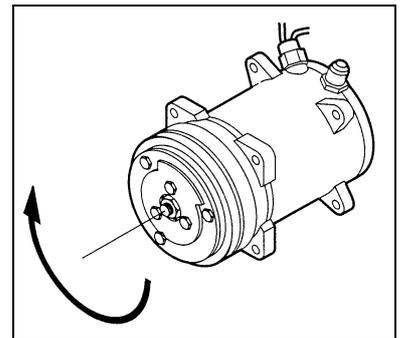


Fig. 11.7/1

## 11.8 Hints for troubles and troubleshooting

<u>Trouble</u>	<u>Cause of trouble</u>	<u>Remedy</u>
Unit does not work	Electric terminals loose  Defective relay Defective fuse	Check the terminals on the magnetic clutch and on the switchboard. Check the switches in the dashboard. Check the relays in the switchboard. Replace the fuse and check the operation of the blower switch.
Unit does not work	Excess pressure	Check whether the fans operate. Clean the condenser laminas.
Unit does work, but turns off.	Excess pressure due to high outside temperature	Allow the unit to operate until the pressure is normal.
Unit does not work	Low pressure, dryer contaminated	Replace the dryer (to be done by a refrigeration expert only).
Unit does not work	Low pressure, screen of the expansion valve clogged	Clean or renew, if necessary, the screen of the expansion valve (to be done by a refrigeration expert only).
Unit does not work	Leakage in the unit. Lack of refrigerant	Check the unit for leakages and refill refrigerant (to be done by a refrigeration expert only).
Loud noise on the compressor	Ball bearing of the compressor worn off. Magnetic clutch defective.	Replace the ball bearing or the whole compressor. (To be done by a refrigeration expert only). Replace the magnetic clutch.
Whistling noise on the V-belt	V-belt worn off. V-belt slack.	Replace the V-belt. Tighten the V-belt.

**11.9 Safety instructions**

Federal Law Gazette 1991, Part 1, Section 8

„Operation, maintenance, taking out of service, obligation for taking back“

1. When operating, maintaining and taking any products out of service, which contain refrigerants according to § 3 or extinguisher fluids according to § 6, it is prohibited to release the agents contained in them into the atmosphere, in opposition to the state of the art, unless in case of the use of extinguisher fluids for the designed purpose, with the exception of exercise purposes. Used quantities for operation and maintenance work have to be recorded and, upon request, such records have to be presented to the authorities in charge.
2. Distributors of any such agents and formulations as listed in § 1, paras. 1 and 2, are obliged either to take back the old, used agents and formulations or to ensure taking back of the said products by a third party. Sentence 1 shall not be applicable so far as the provision of the Regulation on the Disposal of Used Halogenized Solvents is to be used.
3. Maintenance work and taking any products out of service, which contain refrigerants according to § 3 or extinguisher fluids according to § 6, as well as taking back the agents mentioned in § 1, paras. 1 and 2, and formulations may be done only by persons possessing the necessary knowledge and equipment.
4. Manufacturers and distributors are obliged to record the kind, quantity and the whereabouts of the returned agents and formulations as listed in § 1, paras. 1 and 2. Such records have to be kept for at least three years and, upon request, to be presented to the authorities in charge at any time.

Air conditioners with open-type compressor unit have to be inspected at intervals of about six months. During such' inspections special attention shall be paid to a check for any losses of refrigerant, in particular, on the shaft end sealing of the compressor.

The experts in charge of installation and maintenance work should be trained at least in accordance with § 30 of VBG 20 (Regulations of the Professional Trade Association) and strictly obey the legal regulations.

**4.11.1 Engine-independent heating system (optional)**

Fig. 11.1/1 and Fig. 11.10.1/1

The cab can also be heated when the engine is turned off. Simply press key 1 of the timer (manual activation) or switch the the auxiliary heater on by programming the timer.

Simultaneously turn the fan switch 2 (Fig. 11.1/1) to position 1, and turn switch 3 (Fig. 11.1/1) to the maximum position to blow hot air into the cab.

For further information on operator control and maintenance, please refer to the documentation of the engine-independent heating system enclosed as a separate document.

- 1 Activation key
- 2 Status indicator
- 3 OK key
- 4 Control key – Forward
- 5 Indicator bar
- 6 Menu bar
- 7 Program bar
- 8 Control key – Reverse

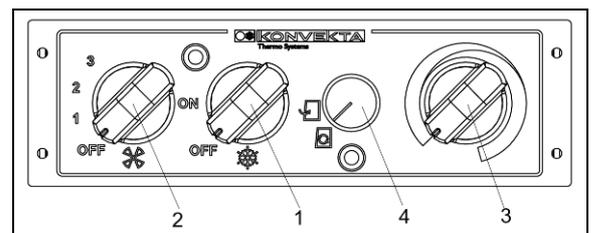


Fig. 11.1/1



Fig. 11.10.1/1

11.11 Operating the automatic air-conditioning system (option)

11.11.1 Controls and indicators

The control panel (fig. 11.11/1) is located at the top left in the driver's cab.



Fig. 11.11/1

<u>Button</u>	<u>Button function</u>
1	Button for switching the air-conditioning on and off
2	Button for raising the setpoint temperature <i>Alternative: Manual setting "up"</i>
3	Button for lowering the setpoint temperature <i>Alternative: Manual setting "down"</i>
4	Button for switching the control unit on and off
5	Button for switching the evaporator fan speed between Manual and Automatic
6	Button for switching REHEAT mode on and off
7	Button for switching the heating between Manual and Automatic
8	Button for switching between fresh-air and recirculated air mode
<b>LCD</b>	Function of the LCD display
9	Icon indicates recirculated air mode
10	Icon indicates REHEAT mode
11	Icon indicates air-conditioning mode
12	Icon indicates that fully automatic mode is switched on
13	Bars indicate the fan speed in manual mode
14	Icon indicates manual fan mode
15	Icon indicates the "Head" air louvre position
16	Icon indicates the "Foot" air louvre position
17	The 4-digit, seven-segment display indicates a set value or a fault code
18	Icon indicates the temperature unit ( ° )
19	Displays the icon for the driver's position

11.11.2 Example of operation

11.11.2.1 Switching on the system

Switch on the control unit:

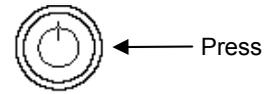
Note:

After switch on, the control unit carries out a self-test, the software version and the device function are displayed for about 5 seconds. For example:



**Note:**

**Version F** is always set in the "as-supplied" state



E.g. 6 operating hours are displayed

Resetting to another version is only required for the first installation.

The number of operating hours of the air-conditioning unit are then displayed for 5 seconds:

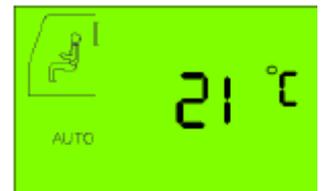
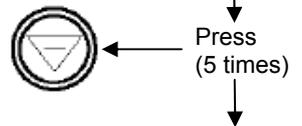
The last saved setting is then shown in the display.

11.11.2.2 Setting the desired setpoint temperature

The last saved setting is shown in °C, e.g. 26 °C (78 °F).

The control unit is in automatic mode.

In order to reduce the desired setpoint temperatures to e.g. 21 °C (69 °F), press button (3) until the desired value appears in the display. The new setpoint value is saved 5 seconds after the last button press.



11.11.2.3 Switching the air-conditioning on and off

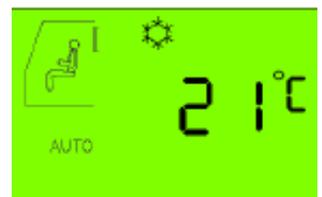
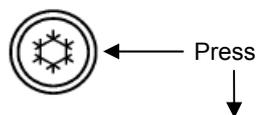
Switch the air-conditioning on with button (1)

The following screen appears in the display:

The air-conditioning is now switched on, icon (11) indicates air-conditioning mode, the control switches on the compressor when required.

**Note:**

Pressing button (1) again switches off the air-conditioning (compressor deactivated), icon (11) is no longer displayed.



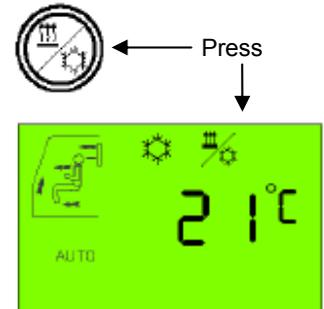
**11.11.2.4 Switching REHEAT on and off**

Switch REHEAT mode on with button (6)

The following screen appears in the display:

REHEAT mode is now switched on, icon (10) indicates REHEAT mode is on, the compressor is switched on continuously.

The evaporator fan speed is raised to 100%. The control unit switches the heating on when required to maintain the room temperature at the setpoint.



**REHEAT mode is automatically limited to 10 minutes.**

**Note:**

Pressing button (6) again switches off REHEAT mode, icon (10) is no longer displayed.

**11.11.2.5 Manual setting of the evaporator fan speed**

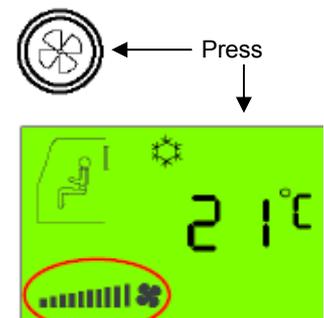
Switch on the manual evaporator fan speed with button (5)

Manual setting of the fan speed is now active, the currently set speed is indicated by the bar display (icon 13)

AUTO – icon (12) is no longer displayed.

Fan – icon (14) flashes for 5 seconds, during this time the fan speed can be increased (+) in increments of 10% with button (2) or decreased (-) with button (3).

The lowest settable fan speed is 30% (three bars displayed).



The manual evaporator fan speed is currently set to 100%

**Note:**

Pressing button (5) twice reactivates AUTO mode, icon (12) is displayed, icons 13 and 14 are no longer displayed.

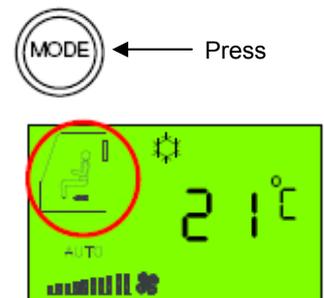
**11.11.2.6 Setting the HEAD / FOOT air louvre**

The air louvre is in the head position, icon (15) is displayed.



Pressing button (7) switches the air louvre into the foot position.

The new foot air louvre position is indicated by icon (16).



The air louvre position "foot" is displayed

**Note:**

Pressing button (7) again switches the air louvre back into the head position. Icon (15) is displayed again.

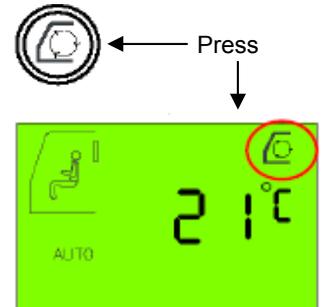
**11.11.2.7 Fresh air / recirculated air mode**

Switch from fresh air to recirculated air mode with button (8)

The fresh air louvre is closed, icon (9) indicates recirculated air mode:

**Note:**

Pressing button (8) again switches fresh-air mode on again, icon (9) is no longer displayed.



**11.11.2.8 Switching the temperature display to °Fahrenheit**

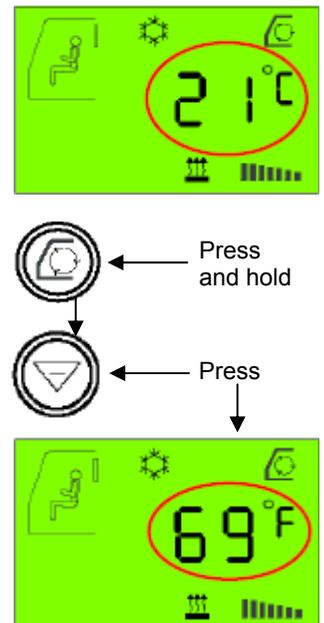
The setpoint temperature is displayed in °Celsius.

Press and hold down button (8) and press button (3), the display switches to °Fahrenheit.

The setpoint temperature is displayed in °Fahrenheit.

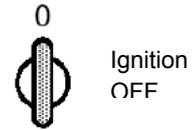
**Note:**

Pressing the two buttons again switches the display back to °Celsius.



11.11.2.9 Operation with parking heating

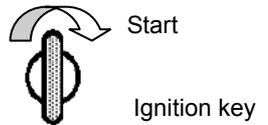
1. The ignition is switched off:
2. Parking heater control unit: enables parking heating mode
3. While the control unit carries out a self-test, the software version is displayed for approx. 5 seconds, e.g.:



Parking heating mode is displayed.

4. Parking heating mode is shown in the display:

5. After the diesel engine has started, parking heating mode is switched off, and normal mode is activated.  
The last set setting is active.



**Note:**

Manual settings cannot be made in parking heating mode. The heating valve setting is always 100%.  
The evaporator fan speed is 50%.



### 11.11.3 Indication of faults in the display

#### 11.11.3.1 Fault code "F0" - room temperature sensor

Fault indication in the display

A room temperature sensor fault is indicated by (F0) flashing in the display.

*Note:*

The control unit has detected a fault in the room temperature sensor, regulation is no longer operative.

*Cause of the sensor fault:*

Short circuit or break in the sensor line, plug-in connection to sensor or control unit, or the temperature sensor is defective.



The regulator is not ready for use until the fault has been eliminated, the sensor fault is then no longer displayed.

*Note:*

When a sensor fault occurs, the regulator continues to run with the last valid setting before the fault occurred.

#### 11.11.3.2 Fault code "F1" - blow-off temperature sensor

Fault indication in the display

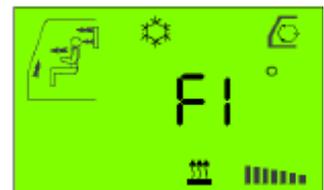
A blow-off temperature sensor fault is indicated by (F1) flashing in the display.

*Note:*

The control unit has detected a fault in the blow-off temperature sensor, regulation is no longer operative.

*Cause of the sensor fault:*

Short circuit or break in the sensor line, plug-in connection to sensor or control unit, or the temperature sensor is defective.



The regulator is not ready for use until the fault has been eliminated, the sensor fault is then no longer displayed.

*Note:*

When a sensor fault occurs, the regulator continues to run with the last valid setting before the fault occurred.

## 12 Filling pump (option)

### 12.2 Operating the filling pump with switch off

Fig. 12.2/1 and Fig. 12.2/2

Open the engine hood.

The filling pump (P) is located in the lower compartment of the toolbox, and is permanently connected to the diesel tank by a hose.

Press the "ON" push button (T1) for at least two seconds to start the pump (P).

The push button is located in the lower compartment of the toolbox alongside the pump.

Press the "OFF" push button (T2) to switch off (barrel change).

A measuring probe (M) switches the pump off automatically when the diesel tank is almost full. The tank is never completely filled for safety reasons. The tank can be filled to the top by keeping the "ON" push button (T1) pressed. When so doing, the following instruction must be followed without fail.

Before starting the filling pump, switch the main switch on, attach the suction hose (S) via the quick coupling to the pump (P), and insert the other end into the diesel barrel that is to be emptied, and open the fuel filler cap. Then switch on the filling pump. The pump starts pumping at a rate of 50 l/min.

**Note:** The level at the filling neck must be checked continually while the tank is being filled. The pump must be switched off in good time in order to avoid contamination from overflowing diesel oil.

The suction hose (S) must also be completely emptied before it is stored in the storage compartment.

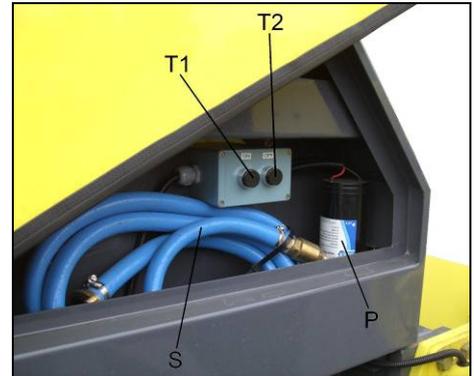


Fig. 12.2/1



Fig. 12.2/2