TEREX | FUCHS

Operating Instructions

MHL460

Mobile Hydraulic Loading Machine for Wood Transport and Rehandling

MHL 460

Vehicle ID No. starting at

460045 / 0037 - 0079

Year of manufacturing beginning

2006

Version

13.07.07 en (englisch)

Please note! MHL460 loading machines towing other vehicles

TEREX | Fuchs loading machines are not towing machines. Despite this fact, it happens continuously that the machines are modified with towing equipment. If loading machines are to be used to pull trailers, the following general conditions must be considered and observed in all cases.

- Only trailer devices that are officially approved for trailer operation may be used.
- The maximum theoretical towing force of the machine is 177 kN in first gear and 46 kN in second gear.
- The tongue weight on the trailer drawbar must not exceed the admissible value for the hitch coupling, in any case not more than 1000 kg.
- The total permissible weight of the trailer as allowed by the design must be considered.
- Only appropriately licensed and approved trailers may be used.
- Trailer operation is only permitted on level, solid, uncluttered, and dry surfaces.
- Check the guidelines and legal requirements for trailer operation to which the design of the trailer, brake system, and lighting must correspond. The operator is responsible for verifying these details.
- The instruction manual and technical information of the trailer that is being towed must always be observed.
- Restrictions imposed by the design of the trailer that is being towed must always be observed.
- Towing trailers on terrain not suitable for driving or on slopes and uneven areas is prohibited.
- The trailer must be suitable for use in terms of its construction and design.
- The towing device must be positioned on the rigid-axle side.
- Placing the towing device on movable parts is not permitted.

The FUCHS operating instructions consist of 9 chapters aimed at different staff members:

Chapter	Subject	Staff members
1	FOREWORD	**Operating staff** **Inspection and maintenance staff** **Repair staff**
2	SAFETY AND ACCIDENT PREVENTION	**Operating staff** **Inspection and maintenance staff** **Repair staff**
3	TECHNICAL DATA	**Operating staff** **Inspection and maintenance staff** **Repair staff**
4	OPERATOR CONTROLS	**Operating staff** The operating staff must be familiar with the contents of the operating instructions and the use of this or comparable machinery.
5	WORK OPERATION	**Operating staff** The operating staff must be familiar with the contents of the operating instructions and the use of this or comparable machinery.
6	TRANSPORT AND RECOVERY	**Operating staff** **Inspection and maintenance staff** **Repair staff**
7	CARE AND MAINTENANCE	**Operating staff** **Inspection and maintenance staff** **Repair staff** The inspection, maintenance and repair staff must have expert knowledge as well as experience about inspection, maintenance and repair of this or comparable machinery.
8	TROUBLE-SHOOTING	**Operating staff** **Inspection and maintenance staff** **Repair staff**
9	APPENDIX	**Operating staff** **Inspection and maintenance staff** **Repair staff**

1 Foreword

1.1 General

The **MHL 460 Mobile Hydraulic Wood Transport and Rehandling Machine** was thoroughly tested before it left the factory. The final inspection showed that all parts are in perfect working order, and the machine achieves the expected level of performance.

The operating instructions are intended to help you to familiarize yourself with your machine and the uses to which it may be put.

The operating instructions contain important information telling you how to use the machine safety, expertly and economically. Observing the operating instructions will help you to avoid danger and to increase the reliability and life expectancy of the machine.

1.2 Proper use

The MHL 460 wood transport and rehandling machine is intended solely for work which is suited to the function of the machine and its work attachment. Such work involves

- the loading,
- the moving and
- the shifting

of logs.

The appropriate work attachments for these purposes are:

- lumber grab
- load hook
- trailer

The specifications of the manufacturer contained in these operating instructions must be complied with.

! ATTENTION

The operating temperature at which the machine may be used is within the range from -15 °C to +45 °C.

Any usage above and beyond that specified here and any non-compliance with the manufacturer's instructions is regarded as improper use. The manufacturer shall not be liable for damages resulting from improper use. This risk is borne solely by the user.

When mounting work attachments (provided by outside suppliers), the proper use of this attachment as stated by its manufacturer must be observed.

Compliance with the operating instructions, the performance of maintenance work as specified and adherence to maintenance intervals are all aspects of proper use.

1.3 Abbreviations and equivalent expressions

Below is an explanation of abbreviations and equivalent expressions which are used in these operating instructions:

MHL 460: **M**obile **H**ydraulic **L**oading machine for Wood Transport and Rehandling

StVO : Road Traffic Regulations (Germany)

StVZO : Regulations Authorizing the Use of Vehicles for Road Traffic (Germany)

UVV : Accident Prevention Regulation in Germany

ANSI : American National Standards Institute (in the USA)

OSHA : Occupational Safety and Health Administration (in the USA)

Load limit sensing control: Excavator Electronic Control Unit

1.4 Introduction

It is basically assumed that the machine will only be operated by authorized, trained and specially instructed personnel.

The operating instructions and any other supplied instructions must be kept handy in the machine at all times.

Your attention is drawn in the operating instructions to points of special importance for safe, expert use of the machine.

Only if the user is familiar with the operating instructions can errors be prevented and trouble-free operation assured. It is therefore very important that those persons who are actually responsible for operation are familiar with the instructions. They must be thoroughly read and understood, as the manufacturer will not assume liability for damages and operating problems arising as a result of non-compliance with instructions.

If you require additional information or if any point is unclear, please contact your dealer immediately.

We reserve the right to modify the machine within the scope of technical developments, without changing the operating instructions.

1.5 Warranty and maintenance

! ATTENTION

FUCHS can provide no warranty for modifications or attachments to equipment on FUCHS products which have not been approved by us or have not received our express written consent. In such cases, our warranty for the machine lapses, as does our product liability for any resulting consequential damages.

The warranty period is 12 months or 2000 hours of operation. It begins when the machine is delivered to the purchaser.

Safe working conditions and good working order of the machine are prerequisites for efficient work. Your machine fulfills these requirements when correctly handled and when serviced and maintained as specified.

Careful observation of the machine while in function and the use of the specified fuels, lubricants and coolants will prevent mal-function.

Trained specialist personnel are responsible for any servicing of the machine which requires expert knowledge. Inspections and repairs must therefore be carried out by your dealer's customer service.

In respect of possible claims for damages during the warranty period, all service work contained in the maintenance and inspection plan must be carried out at the specified intervals.

After the warranty period, too, regular maintenance must be performed in order to ensure that the machine is constantly in good working order and enjoys a reasonable service life.

Insist that only **original FUCHS spare parts** are used in the event of any repair work. In this way, you will have a product of lasting high quality, thereby ensuring that your machine maintains its original condition.

ATTENTION

Please state the vehicle identity number when making inquiries or orders, and in all written correspondence.

ATTENTION

The vehicle identity number of the machine is stamped on the identification plate (fig. 1/1) and on the right of the undercarriage (fig. 1/2), as seen in the direction of travel.

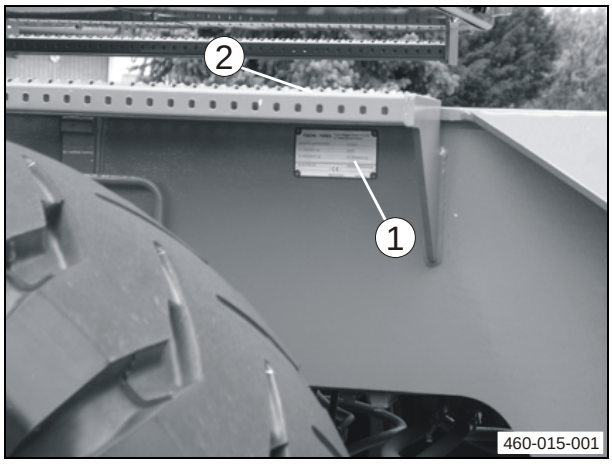


Fig. 1 Vehicle identity number

1.6 Environmental standards

When operating or working on the machine the environmental standards currently valid must be observed at all times.

When performing repair and maintenance work, special care must be taken to ensure that ecologically harmful substances such as

- grease and lubricating oil
- hydraulic oil
- fuel
- coolant
- liquid detergents containing solvent

do not seep into the ground or the sewerage system.

These substances must be collected, kept, transported and disposed of in suitable containers.

If above-mentioned liquids seep into the ground, their escape must be stopped immediately and the liquid be bound with suitable binding agents. If necessary, the soil must be excavated. Binding agents and excavated soil must be disposed of in the proper manner. The relevant environmental regulations must be complied with.

1.7 Notes on using the operating instructions

1.7.1 References to pictures and items

The references to pictures and items contained in the text, such as (14/1), for example, mean figure 14, item 1.

1.7.2 Dangers and important notes

DANGER

DANGER – indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

WARNING

WARNING – indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION

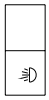
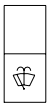
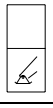
CAUTION – indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

ATTENTION

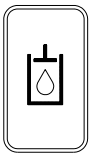
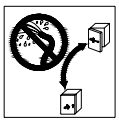
ATTENTION – indicates a situation which, if not avoided, may result in property or equipment damages.

1.7.3 Pictograms

The table below explains the meaning of the pictograms on the operator control panel. Functions and displays marked (*) are optional.

Display Symbol	Description (Indicators)	Function Symbol	Description (Switches)
	Direction indicator control lamp		Working floodlights
	Battery charge indicator		Headlamps
	Engine oil pressure		Autom. central lubricating system Trigger additional lubrication
	Parking brake		Work zone extension
	Pre-heating indicator		Speed range 1st/2nd gear
	Dual assignment: Clogged air filter Clogged return air filter		In an emergency only: bypass the thermo-switch or the hydraulic oil level switch; disable all travel and work functions / at the same time: reduction of the pressure in the hydraulic system
	Brake pressure of service brake		Windshield wiper/wash-wipe (upper window section)
	Hydraulic oil temperature		Windshield wiper/wash-wipe (lower window section)
	Load limit sensing control		Overload warning device *
	Coolant level indicator lamp		Oscillating axle lock/ Oscillating axle lock release
	Dual assignment: Coolant temperature Hydraulic oil level		Auto-idling system
	Engine coolant temperature		Hazard warning system
	Fuel level		Outrigger *
	Operating hour meter		Cab up/down

The table below explains the meaning of the pictograms on the machine.

Symbol	Description	Symbol	Description
	Safety distance		Hydraulic oil
	Danger of injury		Fuel
	Lashing point		Suspension point for loading by crane
	No pressure jet!		Air conditioning

1.8 Operating instructions provided by outside suppliers

The operator must also observe the subsequent operating instructions covering components from outside suppliers. Reference is made to these instructions in the FUCHS operating instructions.

Operating instructions	Manufacturer
Diesel engine	Deutz
Central lubricating system	Lincoln
Air conditioning	Various
Optional:	
Trailer connection	Rockinger
Supplementary heating	Eberspächer

1.9 Copyright

1.10 Company address

1.10.1 Headquarters / Sales and Customer Service

Fuchs-Bagger GmbH & Co. KG Maschinenfabrik
Postfach 1161 Industriestraße 3
D-76662 Bad Schönborn D-76669 Bad Schönborn

Telephone: +49-7253-84-0
Fax: +49-7253-84-411
http://www.fuchs-terex.de e-Mail: info@fuchs-terex.de

1.10.2 Spare parts

Schaeff Ersatzteile Service GmbH & Co. KG
Postfach 1264 Erlbacher Straße 115
D-91534 Rothenburg D-91541 Rothenburg

Telephone: +49-9861-972-0
Fax: +49-9861-972-410
http://www.schaeff-terex.com e-Mail: info@schaeff.com

Order number of the operating instructions: **5 781 122 803 (englisch)**
Vehicle identity number: 460/0037>

2 Safety and Accident Prevention

2.1 Introductory remarks

The following contains information for the safe operation of the machine.

National safety regulations, e.g. the Accident Prevention Regulations, "Earth-Moving Machinery" (VBG 40) and "Vehicles" (VBG 12) in the Federal Republic of Germany, or "ANSI – American National Standards Institute" and "OSHA – Occupational Safety and Health Administration", must be complied with when operating machines.

In addition to the operating instructions, legal regulations for road safety measures must also be observed. Such requirements could also apply in respect of handling hazardous goods or the wearing of personal safety gear, for example.

Furthermore, safety laws governing work in particular locations (tunnels, adits, quarries, pontoons, contaminated areas, etc.) must likewise be observed.

2.2 General safety notes

It is important to refrain from any working methods which impair safety.

The machine is only to be used when it is in a safe, operational condition.

The manufacturer's instructions must be complied with for transportation, assembly, operation, maintenance and repair.

The user must provide additional special safety instructions, wherever necessary, for specific local conditions.

The operating instructions and any information pertaining to safety must be carefully kept in the driver's cab.

The operating instructions and safety notes must be complete and fully readable.

Safety devices on machines shall not be deactivated or removed during operation.

Protective work clothing must be worn during operation. Rings, scarves and unbuttoned jackets are to be avoided. Protective goggles, protective boots, helmets, gloves, reflecting vests, ear-muffs, etc. may be required.

Before commencing work, information must be obtained on first aid and possible means of rescue (ambulance, fire brigade, helicopters).

The optional fire extinguisher (max. 4 kg) is located in the driver's cab on the rear left pillar. Personnel must be aware of the operation of the fire extinguisher as well as on-site fire-warning and fire-fighting equipment.

Loose parts such as tools or other accessories must be secured to the machine.

2.3 Operation

Machines may only be independently operated and serviced by persons who

- are physically and mentally suitable
- have been instructed in the operation or maintenance of the machine and have demonstrated this ability to the user
- can be expected to perform their allocated duties reliably.

All such persons must be of the legal minimum age.

They must be designated by the user to operate or service the machine.

Operating equipment (controls) is only to be activated from the driver's cab or operator console.

The steps and surfaces that are provided must be used for mounting and entering the vehicle. They must be kept in good condition and must be safe to step on.

2.4 Danger zone

No one is to enter the danger zone of the machine.

The danger zone encompasses the area around the machine in which persons may be injured by movements of the machine during operation, its work equipment and work attachments, or by load that may swing out or fall.

The machine operator must give a warning signal to persons who may be in danger.

The machine operator shall stop work with the machine if anyone remains in the danger zone despite the warning.

To ensure no danger of crushing, a sufficient safety distance (min. 0.5 m) must be kept from other objects, e.g. buildings, excavation slopes, scaffolding, other machines, etc.

If the safety distance cannot be maintained, the area between the objects and the working zone of the machine must be blocked off.

If conditions are such that the machine operator's view of the traveling and working zone is restricted, he must be guided or the traveling and working zone must be marked by a solid barricade.

2.5 Transport of persons

The transport of passengers on the machine is prohibited.

2.6 Stability

Machines must be used, traveled and operated in such a manner that their stability against overturning is ensured at all times.

The machine operator must travel at speeds which are suitable for local conditions.

The permitted carrying capacity of the machine shall not be exceeded.

Machines must remain at a sufficient distance from the edges of quarries, pits, mounds and slopes to ensure there is no risk of falling.

Machines must be secured so that they cannot roll or slip when in the vicinity of excavations, shafts, ditches, pits and slopes.

2.7 Travel operation

Before putting the machine into operation, the driver's seat, mirrors and operator controls must be adjusted so as to ensure safe working.

The windows must be clean and free of ice.

Travel tracks must be designed so as to ensure smooth, safe operation, i.e. they must be sufficiently wide, on ground which has sufficient carrying capacity and as few slopes as possible.

Downhill tracks must be set out in such a way that machines can be safely braked.

The carrying capacity of bridges, cellar roofs, vaults, etc. must be verified before the machine can travel over them.

The internal dimensions of constructions must be noted before entering underground passages, tunnels, etc.

On steep drops and uphill gradients, the load must be carried on the uphill side, if possible, in order to increase stability.

Before traveling downhill, the appropriate gear for the terrain must be selected and the gear lever shall not be moved during downhill travel (on-road or off-road gear).

Machines are only to be traveled on the open road when the machine and the driver both have the appropriate license as required by the country in question.

Permissible trailer load (optional: if a trailer connection is installed before delivery) – see the identification plate on the undercarriage.

! ATTENTION

*The **MHL 460** is not licensed for use on the road. It must not be traveled on public roads in Germany.*

Outside areas covered by general traffic regulations, e.g. on construction sites, traffic regulations should be applied in the proper manner. This should also apply with regard to driver's licenses.

2.8 Special code of conduct when using tree clamps

The following rules of conduct must be observed without fail:

- When traveling, take the changed machine properties and the environmental conditions into consideration, especially when towing.
- Avoid abrupt changes of velocity (e.g. braking, accelerating, changing the direction of travel) especially when towing.
- Do not swing the uppercarriage without load unless the undercarriage is not moving. Do not swing it with a load unless the machine is supported.
- Do not swing the uppercarriage until you have supported the machine and picked up and lifted the load.
- Do not move the machine until you have set down the load and the support is completely retracted.
- Raised work equipment constitutes a hazard due to potential reciprocating movements and due to the possibility of the picked up load falling off.
- Observe the maximum permissible carrying capacity of the tree clamp.

(The weight of the logs is calculated from the length, the diameter and the specific gravity. The influencing variables present in the case of natural products, such as humidity, must be taken into consideration.)

The work procedures when using machines with tree clamps require that the machine operator be specially instructed and trained.

Only after the machine operator has been sufficiently instructed and trained and has gained sufficient practical experience may he perform the respective work procedures.

2.9 Loading and unloading

The machine operator may **not** swing the loading equipment over occupied driver's seats, operator consoles and workplaces of other machines.

The vehicles must be loaded in such a manner as to ensure that there is no overloading and no material can be lost during travel. The vehicle must be loaded from the lowest possible height.

At dumping points, machines are only to be operated when suitable measures have been taken to prevent rolling or falling.

2.10 Guides

Guides must be easily recognizable, e.g. by means of warning clothing. They must remain within the machine operator’s field of vision.

For better communication between the machine operator and the guide signals must be agreed upon. These must only be given by the machine operator and the guide.

While guiding the machine, guides shall not be given other jobs which may distract them from their task.

2.11 Danger of falling objects

Machines are only to be used where there is a danger of falling objects when the driver’s seat and operator consoles have overhead guard (FOPS). A front guard must be employed if there is a risk of materials breaking into the cab.

In front of walls e.g. of stacked materials, machines must be positioned and operated in such a way that the driver’s seat and its entry to the driver’s seat are not situated on the side facing the wall.

2.12 Working in the vicinity of overhead power lines

When the machine is being used in the vicinity of overhead power lines and trolley wires, a safety distance which varies depending upon the nominal voltage of the overhead line must be maintained between the lines and the machine and its loading equipment, in order to prevent current overspill. This also applies to the distance between these lines and the work equipment or the attached loads.

The safety distances specified below must be complied with:

Power Line Voltage	Required Clearance
0 to 50 KV	10 FT (3.03 m)
50 to 200 KV	15 FT (4.60 m)
200 to 350 KV	20 FT (6.10 m)
350 to 500 KV	25 FT (7.62 m)
500 to 750 KV	35 FT (10.67 m)
750 to 1000 KV	45 FT (10.67 m)

In the observation of safety distances, all working movements of the machine, e.g. positions of the boom, swinging ropes and the dimensions of attached loads must be taken into consideration. Uneven ground which would cause the machine to be inclined and thus nearer to overhead lines must also be taken into account.

During work in windy conditions, the overhead lines may swing out, thus reducing the safety distance.

If it is impossible to maintain sufficient distance from overhead power lines and trolley wires, the user must consult with the proprietor or supervisor of the overhead lines to find other safety precautions to prevent current overspill. Such measures could be, e.g.

- switching off the current
- re-routing the overhead line
- cabling, or
- limiting the work zone of machines.

2.13 Operation in closed rooms

If machines are to be used in closed rooms, these areas must be sufficiently ventilated and the special regulations observed.

2.14 Work stoppages

Before rest periods and at the end of the working day, the driver of the machine must park the machine on ground which has sufficient carrying capacity and is as level as possible, and must secure it against movement.

Before rest periods and at the end of the working day, the driver must lower loading equipment onto the ground or secure it so that it cannot move.

The driver is not to leave the machine if loading equipment has not been lowered to the ground or secured.

Machines are only to be parked in places where they do not present an obstacle to others, e.g. on the construction site or to plant traffic. Warning devices, e.g. triangles, warning cordons, flashing or hazard lights are to be used if necessary.

Before leaving the control console, the driver must bring all loading equipment into home position and apply the parking brakes.

If the driver is leaving the machine unattended, he must first turn off the engine and ensure that it cannot be started up by unauthorized persons.

2.15 Load hook applications

Load hook applications are the hoisting, transporting and lowering of loads with the aid of a fixing device (rope, chain, etc.). The assistance of personnel is required to attach and release the load.

Machines are only to be used for load hook applications when the prescribed safety devices are present and in full working order.

According to EC Machinery Directive 98/37/EC and EN 474-5 of October 2001, these are:

- overload warning device
- pipe burst safety valves on the boom cylinders (lift cylinders) *
- the table of carrying capacity in the cab
- secure attachment of loading implements (e.g. load hook or shackle)

* only for a carrying force of more than 1000 kg or a tipping torque of more than 40,000 Nm

If a machine is to be equipped for load hook applications, an overload warning device and pipe burst valves on the boom cylinders and, if necessary, a load hook must be installed.

Note the following when working with load hook applications:

- Loads must be attached in such a way that they cannot slip or fall out.
- Persons presently guiding the machine and persons attaching the load must not go outside the field of view of the machine operator.
- The machine operator must guide the load as close to the ground as possible and must avoid allowing it to swing back and forth.
- Machines are only to travel with an attached load if the path of travel is fairly level.
- In load hook applications, personnel attaching loads shall only approach the boom with the machine operator's permission and only from the side.
- The machine operator is only to give his permission if the machine is standing still and the work equipment is not in motion.
- Do not use fixing devices (ropes, chains) which are damaged or of inadequate dimensions. Protective gloves must always be worn when working with fixing devices.
- The operator is responsible for operation in load hook applications. Furthermore the accident prevention requirements of relevant trade unions apply.

2.16 Assembly, maintenance, repair

Machines are only to be assembled, converted or disassembled under the guidance of a suitable person designated by the plant operator and following the manufacturer's operating instructions.

Work on braking, steering, hydraulic and electric systems of the machine is only to be carried out by expert personnel specially trained in these areas.

Stability must be ensured at all times during work on machines.

The work equipment must be secured against movement by lowering them to the ground or equivalent measures, e.g. stays, trestles. If necessary, the revolving uppercarriage of the machine must be secured so that it cannot swivel round.

Counterweights are only to be attached at the locations designated by the manufacturer. Be aware of the significant change of the machine's center of gravity.

When jacking up machines, jacking devices must be positioned so that they cannot slip. Jacks must be positioned and applied absolutely straight, without tilting.

Raised machines must be supported by suitable structures such as crosswise stacks of planks, square timbers or steel trusses.

Machines which are raised with work equipment must be stabilized by a supporting structure immediately after lifting. Do not work under raised machines which are only supported by their hydraulics.

The engine/motor(s) must be turned off prior to all maintenance and repair work.

These requirements are only to be ignored in the case of maintenance or repair work which cannot be performed without the engine/ motor(s) running.

Before working on the electrics or when performing arc-welding on the machine, the connection to the battery must be disconnected.

When disconnecting the battery, first the negative pole then the positive pole must be disconnected. The battery must be re-connected in reverse order.

During repair work around the battery, it must be covered with insulating material; tools should never be placed on or near the battery.

Protective devices of moving machine parts are only to be opened or removed when the drive has been switched off and cannot be switched on again by unauthorized persons.

Protective devices are e.g. engine/motor covers, doors, protective grating, trim.

Upon completion of assembly, maintenance or repair work, all protective devices must once more be attached in the proper manner.

Load-bearing parts of the machine are only to be welded following consultation with the manufacturer and in accordance with recognized welding principles.

Overhead guard (FOPS) shall not be welded or drilled in any way.

Alterations of the hydraulic system, shall only be undertaken with the manufacturer's permission.

Before commencing work on the hydraulic system, the pilot pressure, back pressure and pressure inside the tank must be let off.

DANGER

Hydraulic accumulators must not be opened when under gas pressure. They contain nitrogen (danger of asphyxiation).

Only trained specialist should replace the hydraulic accumulator or place it in service. Do not touch a hydraulic accumulator unless it has cooled off.

No changes must be made to the hydraulic accumulators (welding, drilling, opening it by force, etc.).

Only the hydraulic hoses specified by the manufacturer are to be used.

Hydraulic hoses must be routed and assembled by expert personnel.

When filling the tank, smoking and naked flames are prohibited.

2.17 Recovery, transportation

Machines are only to be loaded onto recovery vehicles when adequate fixing devices are used.

Fixing devices specified by the manufacturer, e.g. eyes, hooks, must be employed.

For loading and transportation, machines and all necessary auxiliary equipment must be secured against unwanted movement.

The track-laying gear of machines must be sufficiently cleaned of mud, snow and ice to ensure that ramps can be traveled up without risk of slipping.

Before setting off, the route to be taken must be examined to determine whether the roads are wide enough, entrances and passages under bridges are large enough and that roads and bridges have sufficient carrying capacity.

2.18 Monitoring and inspections

The machine must be submitted to a general inspection carried out by an expert:

- before the machine is put into operation for the first time and before the machine is again put into operation after essential modifications have been made
- at least once a year
- in the meantime, according to operating conditions and local environments.

Furthermore, prior to each work shift, the machine operator must check the function of traveling and working equipment in accordance with the manufacturer's instructions, see chapter 4 "Operator Controls" and chapter 5 "Work Operation".

When work equipment is attached to quick-change systems, the equipment in question must be moved in all positions to ensure that it is securely fastened; during this check, no one shall be in the danger zone.

Hydraulic hoses must be replaced every 6 years or as soon as the following damage is recognized:

- Damage to the outer layer which reaches the intermediate layer.
- Embrittled patches on the outer layer.
- Deformations when under pressure or without pressure which differ from the original shape of the installed hose.
- Leaks
- Damage to hose fittings or to the connection between the fitting and the hose.

The coolant level shall only be checked **after** the engine has **cooled down;** the cap must be turned carefully in order to let off excess pressure.

Prior to load hook applications, the machine operator must check the function of the safety devices specially required for this type of work.

The machine operator must advise the supervisor immediately – and his replacement, if there is a change of operator – with regard to any shortcomings.

In the event of shortcomings which jeopardize the operating safety of the machine, it shall not be used until these have been eliminated.

2.19 FOPS protective roof grating in compliance with DIN ISO 3449-II

The cab features four holes in the roof for fastening a FOPS roof guard. This guard is a special version for the applications in question. Test certificates to DIN ISO 3449-II can be obtained from the manufacturer.

2.20 FOPS/Front guard in compliance with DIN ISO 10262

The cab features six holes on the front side and in the roof for fastening the front roof rock guard. Test certificates in compliance with DIN ISO 10262-1998 and SAE I 1356-February 1988 can be obtained from the manufacturer.

2.21 Emergency exit

The front window serves as an emergency exit. If a front roof rock guard is fitted or this exit can no longer be used for any other reason, the rear window must be used as an emergency exit. An emergency hammer is affixed inside the driver's cab on the rear right pillar.

2.22 Other dangers

2.22.1 Failure of hydraulic system

If the standstill of the diesel engine, a defect of the hydraulic pump or the loss of hydraulic oil leads to the failure of the hydraulic system, only the following **emergency functions** remain possible:

- manual steering (without power assistance)
- lower work equipment (only if the ignition is turned on) and activate the "disable all work functions" button.

2.23 Elevating cab

When the elevating cab is lowered to its end position, there is a danger to third parties of being crushed by the lift frame, as the driver (operator) in the cab does not have a complete view of the area beneath him.

This also applies to the emergency lowering function of the elevating cab through the ball valve located outside (see chapter 4.8.6).

CAUTION

As long as the machine is taveled the cab must be in its bottom rest position.

CAUTION

When the cab is being moved, and during traveling and working, the left armrest must be folded down and the cab door shut.

2.23.1 Working operation

When loading or transporting trunk wood that stands out of the loading grab, the wood may break into the driver's cab despite front rock guard (frontal protection) if it swings out strongly.

3 Technical Data

3.1 Dimensions

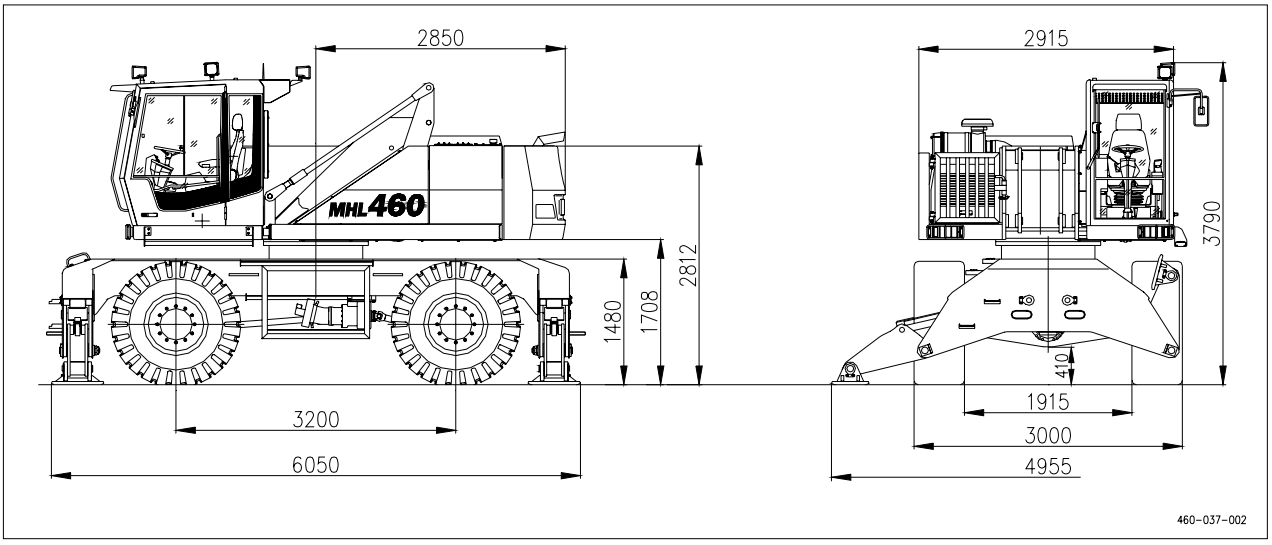


Fig. 2 Dimensions (in mm) with 20.5 R25 tires

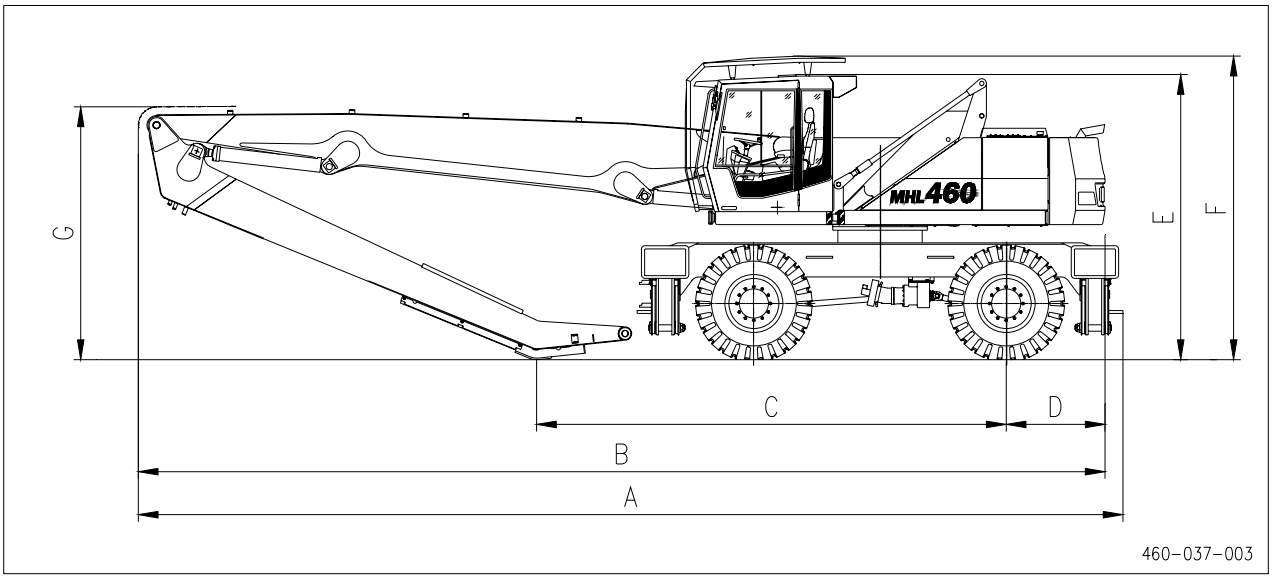


Fig. 3 Transport dimensions with 20.5 R25 tires

TRANSPORT DIMENSIONS				
Dimension mm	**Reach 10.9 m**	**Reach 12.5 m**	**Reach 13.5 m**	**Reach 15 m**
A	10200	11690	11580	12490
B	9960	11460	11350	12260
C	5480	6990	5955	5960
D	1250	1250	1250	1250
E	3610	3610	3610	3610
F	3840	3840	3840	3840
G	3170	3175	3200	3200

3.2 General structure

1 Front axle (steering oscillating axle)
2 Rear axle (rigid)
3 2-speed power shift gear with steplessly adjustable axial piston engine
4 4-point outrigger
5 Counterweight
6 Boom cylinder
7 Elevating cab
8 Cab lift frame
9 Box-type boom
10 Dipperstick cylinder
11 Dipperstick
12 Lumber grab

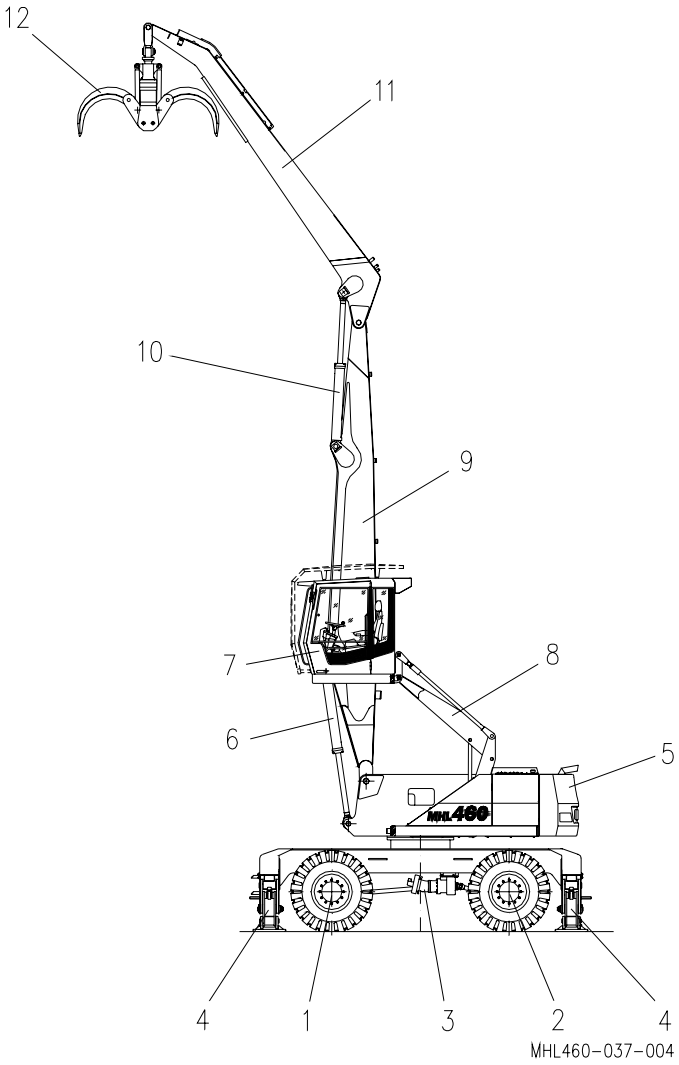


Fig. 4 General structure

3.3 Diesel engine

Manufacturer	DEUTZ
Type	BF 6 M 1013 FC
Design	6-cylinder in-line engine / exhaust turbo loader + charging air cooling
Engine power in compliance with DIN 70020	165 kW at 2000 rpm
Stroke displacement	7.15 liters
Cooling type	Water- and charging air-cooling
Legislation governing exhaust	COM II / EPA TIER II
Specific fuel consumption	218 g/kWh at 100 % nominal output
Fuel tank	Fuel pre-filter with water separation
Air filter	Two-stage filter with safety valve

3.4 Electrical system

Nominal voltage	24 V
Battery	2 x 12 V – 100 Ah / 450 A (DIN-compliant) – 760 A (EN-compliant)
Generator	28 V 80 A
Starter	24 V 4.0 kW
Cold start auxiliary device	Heating flange attached to the engine
Lighting system	3 Xenon floodlights on the cab roof 2 Xenon floodlights on the dipper stick 2 driving headlights built into the tail Limiting and flasher lights

3.5 Hydraulic system

Main pump	Adjustable double pump in the open circuit Pump capacity: max. 640 l/min at 2000 rpm Working pressure: max. 360 bar The pump is regulated by the amount of current required and thus pumps only the amount of oil actually required by the consumers. The power transfer between the pump and the engine is monitored by the load limit sensing control. The engine is thus protected from speed pressures and overloads that are too high even in the partial throttle range. This allows load limit sensing control to ensure optimal use of the available engine power. A selection switch by the driver's seat makes allows for infinitely variable adjustment of the pump in fine mode.
Additional pumps	Gear pumps in the open circuit for supplying auxiliary consumers such as "elevatable movable cab" or the "grab rotation", "pilot control" and "brakes" functions.
Control valve block	Control valve block in section design – single-circuit system
Oil cooler	The fan speed is controlled thermostatically.
Hydraulic oil filter	Full flow filtering by means of specially developed combination return air filter built into the oil tank. Absolute filter fineness 10 µm in the main element and 200 µm via the bypass.

3.6 Rotation drive

Large diameter slewing ring with inner gear teeth. The drive is transferred by a multi-stage planetary gear with an integrated multi-disk parking brake. It can be locked in place by a foot pedal.

Uppercarriage speed: 0 – 8 rpm

Swinging range: 360° unlimited

3.7 Travel drive

The hydrostatic travel drive is controlled by a steplessly adjustable axial piston engine with a direct flange connection on the two-speed power shift drive gear. The transmission has a engine speed/shifting protection mechanism.

All-wheel drive via propeller shafts between the drive transmission and the axles.

The attached brake pedal valve provides wear-free braking by means of the travel motor.

Travel speed in 1st gear: 0 – 6 km/h

Travel speed in 2nd gear: 0 – 20 km/h

Maximum drawbar pull, 1st gear: 177 kN

Maximum drawbar pull, 2nd gear: 46 kN

Turning radius: 9.5 m

3.8 Brakes

Service brake

Wet, maintenance-free multi-disk brakes with hydraulic activation, acting on all four wheels, lockable.

Parking brake

Electrically-hydraulically activated single-circuit brake system on the power shift gear acting on both axles via cardan shafts (auxiliary brake).

Swing brake

Pedal-activated multi-disc brake, can be fixed in place

3.9 Axles

Front axle

Steering/drive axle with multi-disk brake, self aligning bearing and switching oscillating lock

Maximum permissible static wheel load: 300 kN

Max. steering angle: 30°

Rear axle

Planetary drive axles with multi-disk brake and rigid bearing

Maximum permissible static wheel load: 300 kN

3.10 Tires

Tire size	Tire grouping	Type	Tire pressure front [bar]	Tire pressure rear [bar]
20.5 R25 4x	Basic tires	Michelin XKA	8	8
		Michelin XLB	7	7

3.11 Trailer operation

Three different trailer connections are available for trailer operation:

1. for a permissible towing load of 300 kN

Reference number: 560A6000
Bolt diameter: 48.7 mm
Permissible D value: 190 kN
Permissible static support load: 1000 kg

2. for a permissible towing load of 300 kN

Reference number: 500A61002
Bolt diameter: 48.7 mm
Permissible D value: 190 kN
Permissible static support load: 1000 kg

3. for a permissible towing load of 182 kN

Reference number: 460A5000
Bolt diameter: 38.5 mm
Permissible D value: 120 kN
Permissible static support load: 1000 kg

On request, a 13-pin socket can be attached to the undercarriage. It allows for dimming lights, parking lights, brake lights and flashers.

3.12 Heating

Heating

Hot water heater and air conditioning unit with stepless temperature adjustment and 3-level fan plus four adjustable defroster nozzles.

3.13 Permissible loads

Permissible gross vehicle weight	35,500 kg
Permissible axle load, front	22,000 kg
Permissible axle load, rear	22,000 kg
Maximum permissible towing load	30,000 kg
* Maximum surface load with outrigger claw ($Q_{max.}$ = 42 kN / A = 228.2 kN)	$p_{max.}$ = 126 N/cm²

(* Load bearing according to the table of carrying capacity in accordance with DIN ISO 10567 – 15 m loading equipment)

3.14 Sound level values according to directive 2000/14/EC and ISO 6395 Appendix A

The machine has CE-approval (confirmed by German Civil Engineering Trade Association) and, based on this approval, complies with European harmonized standards and draft standards.

Type Examination in compliance with Measuring Method Directive 2000/14/EC.

Measured representative sound power level:	L_{WA} = 104.9 dB(A)
Guaranteed sound power level:	L_{WA} = 106 dB(A)
Sound pressure level, driver's seat:	L_{pA} = 75 dB(A) *

* This value is smaller than the permissible limit value of L_{pA} = 85 dB(A).

3.15 Vibrations

Weighted r.m.s. value of acceleration of upper limbs is below 2.5 m/s².

Weighted r.m.s. value of acceleration of seat area and feet is below 0.5 m/s².

3.16 Control

The machine is equipped as standard with an ISO control see chapter 5.1.

3.17 Working zone of the machine

3.17.1 Working range diagram (10.9 m loading equipment)

Work equipment: box-type boom 5.9 m, dipperstick 4.5 m and lumber grab

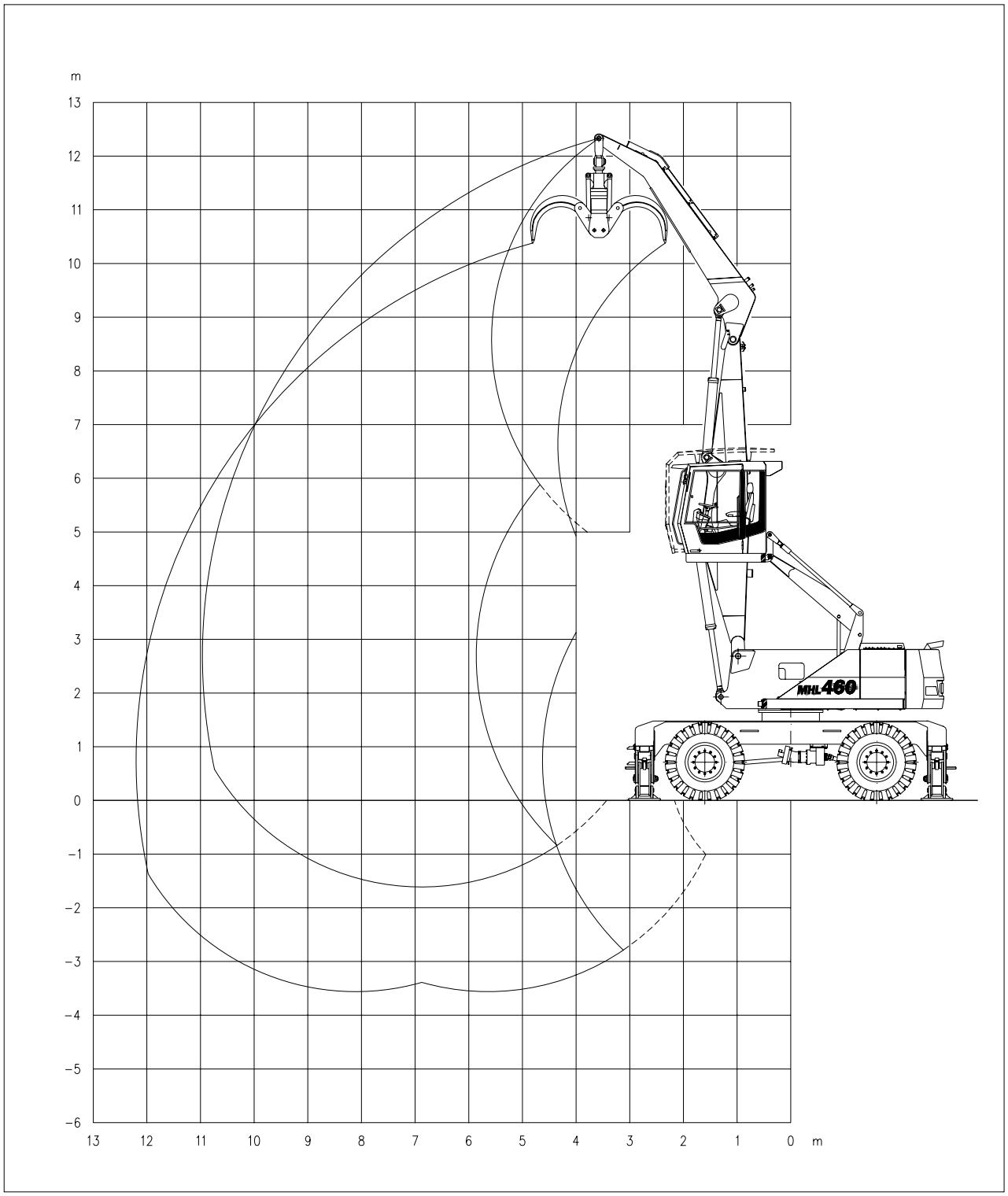


Fig. 5 Working range diagram (10.9 m loading equipment)

3.17.2 Table of carrying capacity (10.9 m loading equipment)

The carrying capacity values are stated in metric tons (t). The pump pressure for this table is 360 bar. The figures are 75 % of the static overturning limit or 87 % of the hydraulic lifting force, in compliance with ISO 10567, marked (°).

When the machine is standing on solid, even ground, the values apply to swinging operation through 360°. The figures in brackets apply in the lengthwise direction of the undercarriage. The values specified as "unsupported" only apply when the load is hoisted above the front or rear axle.

! ATTENTION

The weight of the attached load hoisting implement (grab, load hook, etc.) must be deducted from the carrying capacity values.

In accordance with CE guidelines, pipe burst safety valves on the boom cylinders and an overload warning device are required for crane operation.

Work equipment: box-type boom 5.9 m, dipperstick 4.5 m						
Height m	Undercarriage Outriggers	Reach in m 4.5	6	7.5	9	10.5
10.5	outriggers up 4-pt. outriggers down		(9.1°) 9.1° (9.1°)			
9	outriggers up 4-pt. outriggers down		(8.4°) 8.4° (8.4°)	(7.5) 7.9° (7.9°)		
7.5	outriggers up 4-pt. outriggers down		(8.5°) 8.5° (8.5°)	(7.5) 7.9° (7.9°)	(5.7) 7.4° (7.4°)	
6	outriggers up 4-pt. outriggers down		(9.2°) 9.2° (9.2°)	(7.4) 8.2° (8.2°)	(5.6) 7.5° (7.5°)	
4.5	outriggers up 4-pt. outriggers down	(13.3°) 13.3° (13.3°)	(10.0) 10.5° (10.5°)	(7.2) 8.8° (8.8°)	(5.5) 7.8° (7.8°)	(4.4) 6.5 (6.9°)
3	outriggers up 4-pt. outriggers down	(14.7) 17.0° (17.0°)	(9.6) 12.1° (12.1°)	(7.0) 9.7° (9.7°)	(5.4) 8.0 (8.0°)	(4.4) 6.4 (7.0°)
1.5	outriggers up 4-pt. outriggers down	(14.1) 17.4° (17.4°)	(9.3) 13.3° (13.3°)	(6.8) 10.3° (10.3°)	(5.3) 7.9 (8.3°)	(4.3) 6.4 (6.9°)
0	outriggers up 4-pt. outriggers down	(13.0°) 13.0° (13.0°)	(9.1) 13.6° (13.6°)	(6.7) 10.1 (10.3°)	(5.3) 7.8 (8.3°)	

Fig. 6 Table of carrying capacity (10.9 m loading equipment)

3.17.3 Working range diagram (12.5 m loading equipment)

Work equipment: box-type boom 7.4 m, dipperstick 4.5 m and lumber grab

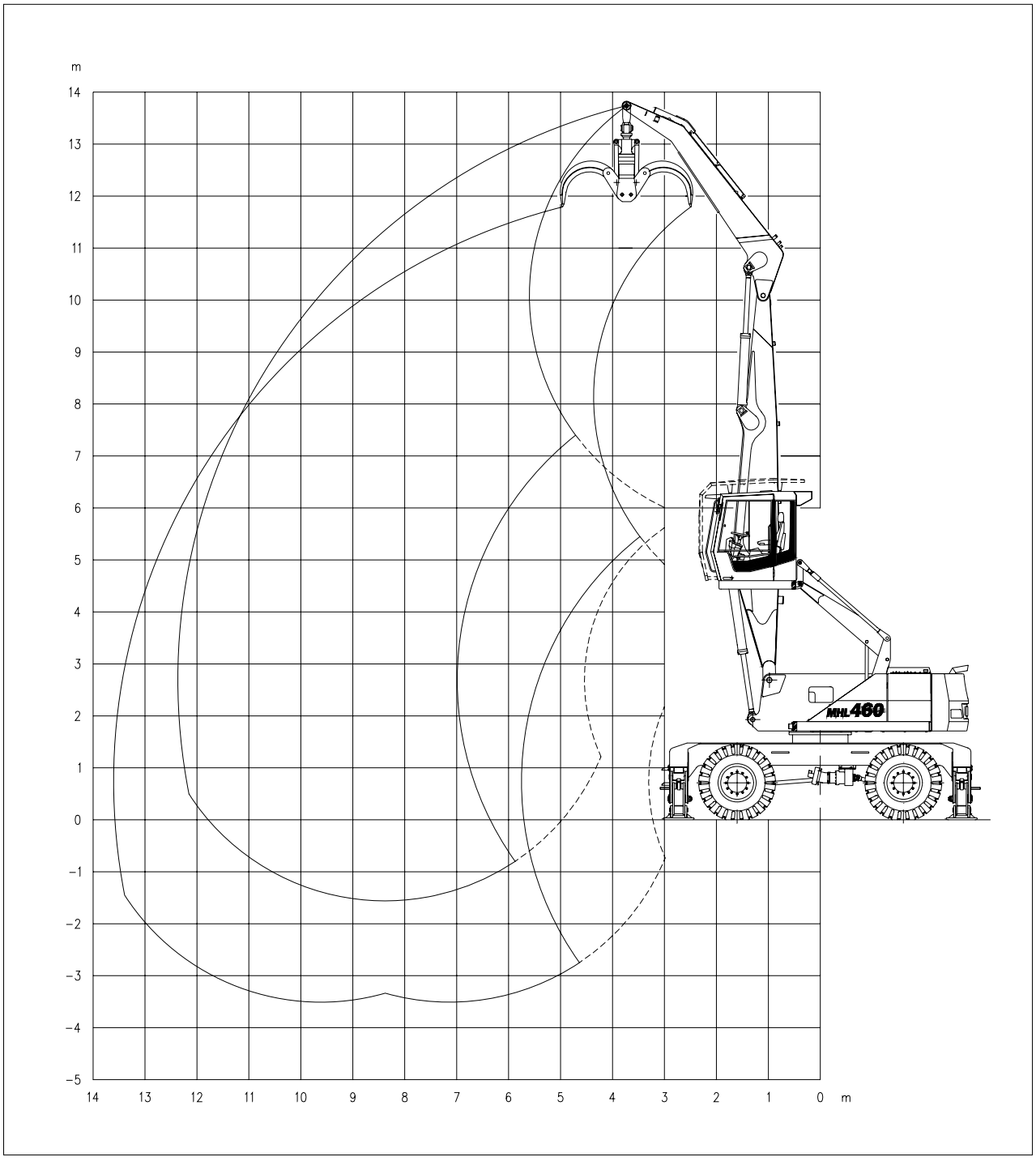


Fig. 7 Working range diagram (12.5 m loading equipment)

3.17.4 Table of carrying capacity (12.5 m loading equipment)

The carrying capacity values are stated in metric tons (t). The pump pressure for this table is 360 bar. The figures are 75 % of the static overturning limit or 87 % of the hydraulic lifting force, in compliance with ISO 10567, marked (°).

When the machine is standing on solid, even ground, the values apply to swinging operation through 360°. The figures in brackets apply in the lengthwise direction of the undercarriage. The values specified as "unsupported" only apply when the load is hoisted above the front or rear axle.

! ATTENTION

The weight of the attached load hoisting implement (grab, load hook, etc.) must be deducted from the carrying capacity values.

In accordance with CE guidelines, pipe burst safety valves on the boom cylinders and an overload warning device are required for crane operation.

Work equipment: box-type boom 7.4 m, dipperstick 4.5 m							
Height m	Undercarriage Outriggers	Reach in m 4.5	6	7.5	9	10.5	12
12	outriggers up 4-pt. outriggers down		(8.0°) 8.7° (8.7°)				
10.5	outriggers up 4-pt. outriggers down		(8.1°) 8.1° (8.1°)	(5.7) 7.2° (7.2°)			
9	outriggers up 4-pt. outriggers down		(8.0°) 8.0° (8.0°)	(5.7) 7.1° (7.1°)	(4.3) 6.5° (6.5°)		
7.5	outriggers up 4-pt. outriggers down		(8.0) 8.5° (8.5°)	(5.6) 7.4° (7.4°)	(4.2) 6.4 (6.6°)	(3.3) 5.0 (6.0°)	
6	outriggers up 4-pt. outriggers down	(12.0) 12.1° (12.1°)	(7.7) 9.4° (9.4°)	(5.5) 7.9° (7.9°)	(4.1) 6.3 (6.8°)	(3.2) 5.0 (6.1°)	
4.5	outriggers up 4-pt. outriggers down	(11.1) 15.1° (15.1°)	(7.2) 10.7° (10.7°)	(5.2) 8.2 (8.5°)	(4.0) 6.2 (7.2°)	(3.2) 4.9 (6.3°)	(2.6) 4.0 (5.6°)
3	outriggers up 4-pt. outriggers down		(6.8) 11.0 (12.2°)	(5.0) 7.9 (9.3°)	(3.9) 6.0 (7.6°)	(3.1) 4.8 (6.5°)	(2.5) 4.0 (5.6°)
1.5	outriggers up 4-pt. outriggers down		(6.5) 10.6 (12.8°)	(4.8) 7.7 (9.8°)	(3.7) 5.9 (7.8°)	(3.0) 4.8 (6.5°)	(2.5) 3.9 (5.5°)
0	outriggers up 4-pt. outriggers down		(6.3) 10.4 (12.8°)	(4.7) 7.5 (9.8°)	(3.6) 5.8 (7.8°)	(3.0) 4.7 (6.4°)	(2.5) 3.9 (5.1°)
-1.5	outriggers up 4-pt. outriggers down			(4.6) 7.4 (9.3°)	(3.6) 5.8 (7.5°)		

Fig. 8 Table of carrying capacity (12.5 m loading equipment)

3.17.5 Working range diagram (13.5 m loading equipment)

Work equipment: box-type boom 7.4 m, dipperstick 5.8 m and lumber grab

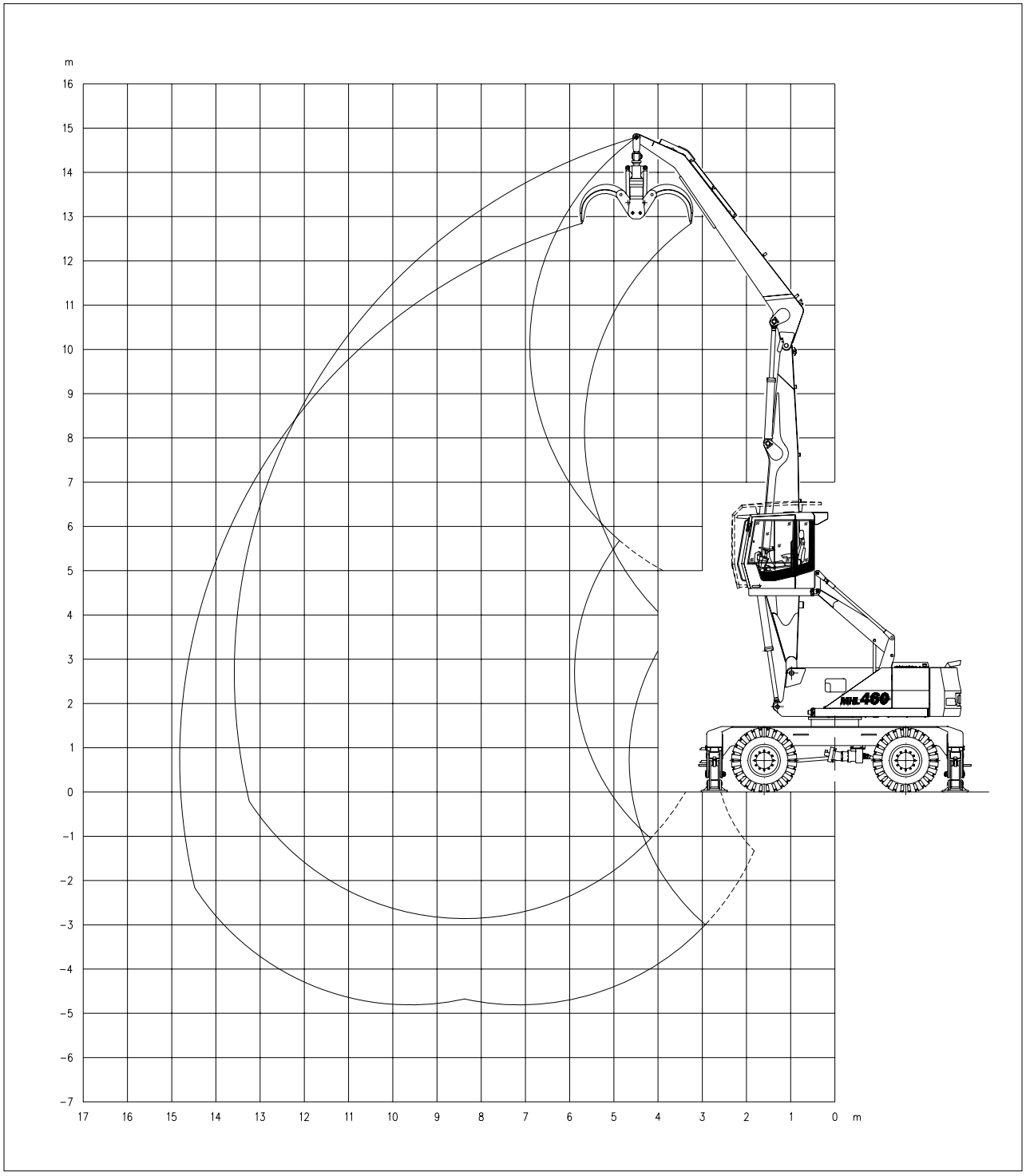


Fig. 9 Working range diagram (13.5 m loading equipment)

3.17.6 Table of carrying capacity (13.5 m loading equipment)

The carrying capacity values are stated in metric tons (t). The pump pressure for this table is 360 bar. The figures are 75 % of the static overturning limit or 87 % of the hydraulic lifting force, in compliance with ISO 10567, marked (°).

When the machine is standing on solid, even ground, the values apply to swinging operation through 360°. The figures in brackets apply in the lengthwise direction of the undercarriage. The values specified as "unsupported" only apply when the load is hoisted above the front or rear axle.

! ATTENTION

The weight of the attached load hoisting implement (grab, load hook, etc.) must be deducted from the carrying capacity values.

In accordance with CE guidelines, pipe burst safety valves on the boom cylinders and an overload warning device are required for crane operation.

Work equipment: box-type boom 7.4 m, dipperstick 5.8 m

Height m	Undercarriage Outriggers	Reach in m 4.5	6	7.5	9	10.5	12	13.5
12	outriggers up			(6.6°)	(5.8)			
	4-pt. outriggers down			6.6° (6.6°)	6.1° (6.1°)			
10.5	outriggers up			(6.3°)	(5.8)	(4.6)		
	4-pt. outriggers down			6.3° (6.3°)	6.0° (6.0°)	5.6° (5.6°)		
9	outriggers up			(6.3°)	(5.9°)	(4.6)	(3.8)	
	4-pt. outriggers down			6.3° (6.3°)	5.9° (5.9°)	5.6° (5.6°)	5.3° (5.3°)	
7.5	outriggers up			(6.7°)	(5.8)	(4.5)	(3.7)	
	4-pt. outriggers down			6.7° (6.7°)	6.1° (6.1°)	5.6° (5.6°)	5.3° (5.3°)	
6	outriggers up		(8.3°)	(7.2°)	(5.6)	(4.5)	(3.6)	
	4-pt. outriggers down		8.3° (8.3°)	7.2° (7.2°)	6.4° (6.4°)	5.8° (5.8°)	5.3° (5.3°)	
4.5	outriggers up	(12.8°)	(9.7°)	(7.1)	(5.5)	(4.4)	(3.6)	(3.0)
	4-pt. outriggers down	12.8° (12.8°)	9.7° (9.7°)	8.0° (8.0°)	6.9° (6.9°)	6.1° (6.1°)	5.3 (5.4°)	4.4 (4.9°)
3	outriggers up	(14.3)	(9.4)	(6.8)	(5.3)	(4.3)	(3.5)	(2.9)
	4-pt. outriggers down	16.3° (16.3°)	11.3° (11.3°)	8.8° (8.8°)	7.3° (7.3°)	6.3° (6.3°)	5.2 (5.5°)	4.4 (4.9°)
1.5	outriggers up	(7.3°)	(8.9)	(6.5)	(5.1)	(4.1)	(3.4)	(2.9)
	4-pt. outriggers down	7.3° (7.3°)	12.5° (12.5°)	9.5° (9.5°)	7.7° (7.7°)	6.2 (6.5°)	5.1 (5.6°)	4.3 (4.8°)
0	outriggers up	(6.4°)	(8.6)	(6.3)	(5.0)	(4.1)	(3.4)	(2.9)
	4-pt. outriggers down	6.4° (6.4°)	12.9° (12.9°)	9.8° (9.8°)	7.5 (7.9°)	6.1 (6.6°)	5.1 (5.5°)	4.4 (4.6°)
-1.5	outriggers up		(8.4)	(6.2)	(4.9)	(4.0)	(3.4)	
	4-pt. outriggers down		12.5 (12.6°)	9.6 (9.7°)	7.4 (7.8°)	6.0 (6.4°)	5.0 (5.2°)	

Fig. 10 Table of carrying capacity (13.5 m loading equipment)

3.17.7 Working range diagram (15 m loading equipment)

Work equipment: box-type boom 8.2 m, dipperstick 6.5 m and lumber grab

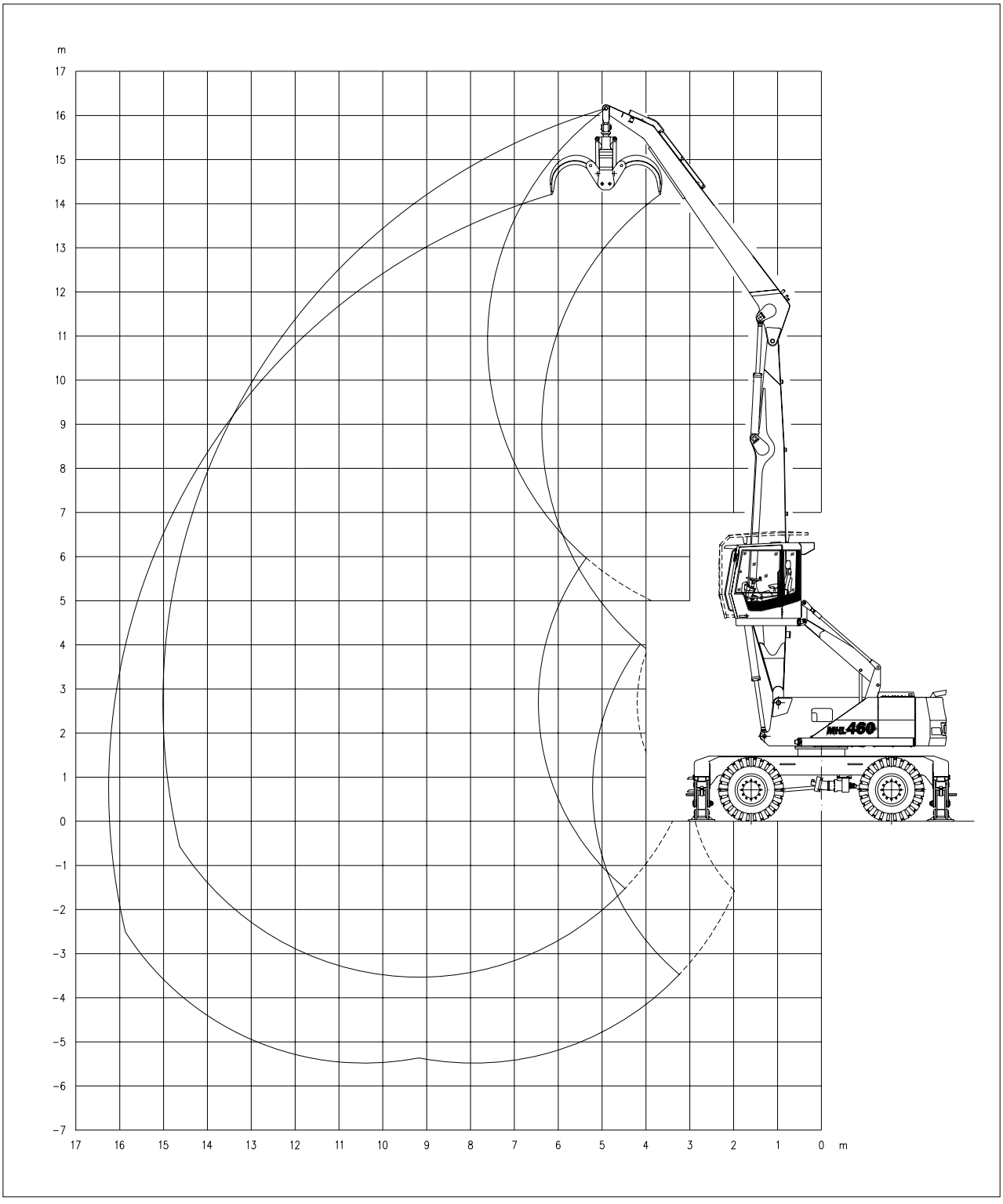


Fig. 11 Working range diagram (15 m loading equipment)

3.17.8 Table of carrying capacity (15 m loading equipment)

The carrying capacity values are stated in metric tons (t). The pump pressure for this table is 360 bar. The figures are 75 % of the static overturning limit or 87 % of the hydraulic lifting force, in compliance with ISO 10567, marked (°).

When the machine is standing on solid, even ground, the values apply to swinging operation through 360°. The figures in brackets apply in the lengthwise direction of the undercarriage. The values specified as "unsupported" only apply when the load is hoisted above the front or rear axle.

! ATTENTION

The weight of the attached load hoisting implement (grab, load hook, etc.) must be deducted from the carrying capacity values.

In accordance with CE guidelines, pipe burst safety valves on the boom cylinders and an overload warning device are required for crane operation.

Work equipment: box-type boom 8.2 m, dipperstick 6.5 m

Height m	Undercarriage Outriggers	Reach in m 4.5	6	7.5	9	10.5	12	13.5	15
13.5	outriggers up 4-pt. outriggers down			(6.1°) 6.1° (6.1°)	(5.6°) 5.6° (5.6°)				
12	outriggers up 4-pt. outriggers down				(5.3°) 5.3° (5.3°)	(4.9°) 4.9° (4.9°)			
10.5	outriggers up 4-pt. outriggers down				(5.3°) 5.3° (5.3°)	(4.9°) 4.9° (4.9°)	(3.9) 4.6° (4.6°)		
9	outriggers up 4-pt. outriggers down			(5.9°) 5.9° (5.9°)	(5.4°) 5.4° (5.4°)	(4.9°) 4.9° (4.9°)	(3.9) 4.6° (4.6°)	(3.1) 4.1° (4.1°)	
7.5	outriggers up 4-pt. outriggers down			(6.2°) 6.2° (6.2°)	(5.6°) 5.6° (5.6°)	(4.8) 5.1° (5.1°)	(3.8) 4.7° (4.7°)	(3.1) 4.3° (4.3°)	
6	outriggers up 4-pt. outriggers down		(8.0°) 8.0° (8.0°)	(6.8°) 6.8° (6.8°)	(5.9°) 5.9° (5.9°)	(4.6) 5.2° (5.2°)	(3.7) 4.8° (4.8°)	(3.1) 4.3° (4.3°)	
4.5	outriggers up 4-pt. outriggers down	(12.7°) 12.7° (12.7°)	(9.3°) 9.3° (9.3°)	(7.4) 7.5° (7.5°)	(5.6) 6.3° (6.3°)	(4.5) 5.5° (5.5°)	(3.6) 4.9° (4.9°)	(3.0) 4.4° (4.4°)	
3	outriggers up 4-pt. outriggers down	(14.2°) 14.2° (14.2°)	(9.5) 10.7° (10.7°)	(6.9) 8.2° (8.2°)	(5.4) 6.7° (6.7°)	(4.3) 5.7° (5.7°)	(3.5) 5.0° (5.0°)	(2.9) 4.4° (4.4°)	(2.5) 3.9° (3.9°)
1.5	outriggers up 4-pt. outriggers down	(4.9°) 4.9° (4.9°)	(8.8) 11.6° (11.6°)	(6.5) 8.8° (8.8°)	(5.1) 7.0° (7.0°)	(4.1) 5.9° (5.9°)	(3.4) 5.1° (5.1°)	(2.9) 4.4° (4.4°)	(2.5) 3.8° (3.8°)
0	outriggers up 4-pt. outriggers down	(4.7°) 4.7° (4.7°)	(8.4) 11.1° (11.1°)	(6.2) 9.0° (9.0°)	(4.9) 7.2° (7.2°)	(4.0) 6.0° (6.0°)	(3.3) 5.1° (5.1°)	(2.8) 4.3° (4.3°)	
-1.5	outriggers up 4-pt. outriggers down	(5.4°) 5.4° (5.4°)	(8.2) 9.9° (9.9°)	(6.1) 8.9° (8.9°)	(4.8) 7.2° (7.2°)	(3.9) 5.9° (5.9°)	(3.3) 5.0° (5.0°)	(2.8) 4.1° (4.1°)	

Fig. 12 Table of carrying capacity (15 m loading equipment)

3.18 Work devices

The documentation covering work devices supplied by FUCHS is contained in every shipment of work devices.

It includes:

- Operating instructions
- Spare Parts List

3.18.1 Other equipment (optional)

- Overload warning device
- Pipe burst safety valves of boom cylinders
- Pipe burst safety valves of dipperstick cylinders
- Seat heater
- Comfort seat with integrated seat heating
- Supplementary heating
- Electrical tank filling pump
- Special tires
- Preheating of hydraulic oil
- Engine preheating
- Manual central lubrication with central lubricating point
- Lubricant pump for central lubricating system undercarriage
- High pressure filter for grab operation
- Tray for radio equipment
- Powder fire extinguisher
- Front end guard
- Cab stone guard
- Protective grid for working floodlights
- Cab with bullet-proof glass for front windshield and the skylight
- Cab with lexan glazing of front windshield
- Gear protection
- Four-wheel steering
- Trailer connection on the undercarriage
- Diverse electrical accessories such as additional working floodlights, rotating beacon, radio, etc.

Further supplementary equipment available on request.

! ATTENTION

FUCHS products may not be modified or fitted with supplementary equipment or work devices which are not included in our delivery range without our express written permission. Without such permission our warranty expires, as does our product liability for any resulting consequential damages.

3.19 Filling quantities

Designation	Filling quantity	Fluid	Remarks
Fuel tank	350 l	Diesel	
Engine oil	17 l	High pressure oil	
Hydraulic oil tank	380 l	Hydraulic oil	Change quantity
Front axle, cpl.	24.5 l	Transmission oil	
Per wheel hub	3 l	Transmission oil	
Differential	18.5 l	Transmission oil	
Rear axle, cpl.	28 l	Transmission oil	
Per wheel hub	3 l	Transmission oil	
Differential	22 l	Transmission oil	
Power shift gear	3.2 l	Engine oil	
Swing gear	6.5 l	Transmission oil	
Ring gear of slewing joint	Supplied by central lubricating system		
Grease lubrication system	3 kg	Multi-purpose grease	
Service brake	Supplied by hydraulic system		
Oil-immersed air filter (heater)	0.16 l	Engine oil	Only when supplementary heating fitted
Air conditioning	1750 g	Coolant R134a	
	150 g	Cooling oil PAG	
Cooling system	20 l	Coolant	Water + nitrite-, amine- and phosphate-free coolant (for composition, please refer to the engine manufacturer's instructions)
Windshield wash/wipe system	4 l	Water with windshield detergent	

! ATTENTION

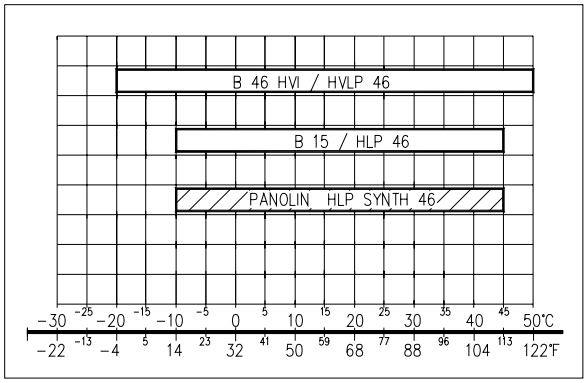
The level marking is always the decisive factor for the correct filling quantity, not the values stated above.

3.20 Fuels, lubricants and coolants

Application	Prescribed fuels, lubricants and coolants for Central Europe		
	Designation	**Product recommendation**	**Specification, Standards, Quality**
Engine	Diesel fuel	Use of branded fuels with a sulfur content of < 0.05 %	DIN EN 590 ASTM D 975-88; 1-D/2-D Before using **RME-fuels** (rape oil methyl ester), it is essential to consult your responsible FUCHS dealer for further details.
Engine	Engine oil	Titan Cargo MC 10W-40	DQC III API CG-4/CH-4 ACEA-E4-99 see also engine manufacturer's instructions
Cooling for engine	Coolant	Fricofin	BASF G 48 clean water and antifreeze based on ethylene glycol see also engine manufacturer's instructions
Hydraulic working circuits	Hydraulic oil or hydraulic multi-grade oil	Renolin B 15 or Renolin B 46 HVI (Brand label on machine.)	HLP or HVLP ISO VG 46 the following viscosity limit values must be kept (according to ASTM 445): at 100 °C min. 7,0 mm²/s (cSt) at -10 °C < 1300 mm²/s (cSt)
	Biodegradable hydraulic oil on synthetic ester base	PANOLIN HLP SYNTH 46	HEES ISO VG 46 Filling according to customer specifi-cations. Brand label on machine. Do not mix biodegradable oils of different suppliers. The same viscosity specifications apply as for mineral hydraulic oils. When changing from mineral to biodegradable hydraulic oils, the tank and hydraulic system must be completely drained, cleaned and flushed. For further details before changing oils, please consult your responsible FUCHS dealer.
Power shift gear	Engine oil	Titan Cargo MC 10W-40	MIL-L-2104 C ZF-TE-ML 07B, 07D
Swing gear	Transmission oil	Titan Supergear SAE 80W-90	SAE 80W-90 API GL-4/GL-5 ZF-TZ-MZ 02B, 05A, 07A, 12B, 16F, 17B
Wheel hubs and axles	Transmission oil	Titan Gear LS 90	API GL-5 LS ZF-TE-ML 05C, 12C, 16E
Grease lubrication system, other lubricating points	Multi-purpose grease	Renolit Duraplex EP 2	Lithium-complex soap K P 2P-30 DIN 51 502

3.20.1 Alternative recommendations for other temperature ranges

Hydraulic oil: ambient temperature



3.20.2 Biologically degradable PANOLIN HLP SYNTH 46 hydraulic oil

We recommend biodegradable hydraulic oils based on synthetic ester as an alternative to mineral oils. The same viscosity limit values apply as for mineral oils.

CAUTION

When changing from mineral to biodegradable hydraulic oils, the tank and hydraulic system must be completely drained, cleaned and flushed. Warrantee conditions as well as the changing guideline of KLEENOIL PANOLIN AG should be observed.

***Do not mix** biodegradable oils of different suppliers.*

Before changing oils, please ask your FUCHS dealer for more details.

4 Operator Controls

4.1 First commissioning

If you are not yet familiar with the operating and display elements of this machine, read this chapter carefully **before** operating the machine.

This chapter deals with all functions.

Before traveling and working with the machine it is necessary to thoroughly familiarize yourself with the display elements and operator controls.

Each time before putting the machine into operation it must be subjected to a thorough visual inspection. Take care to ensure that there are no damages, loose or missing screws, oil accumulations, oil or fuel leakages. Defects must be remedied immediately. In the event of shortcomings which jeopardize the operating safety, the machine shall not be put into operation until these have been eliminated.

Each time before putting the machine into operation, the inspections according to chapter 7.3 must be carried out.

4.2 Operator controls in cab

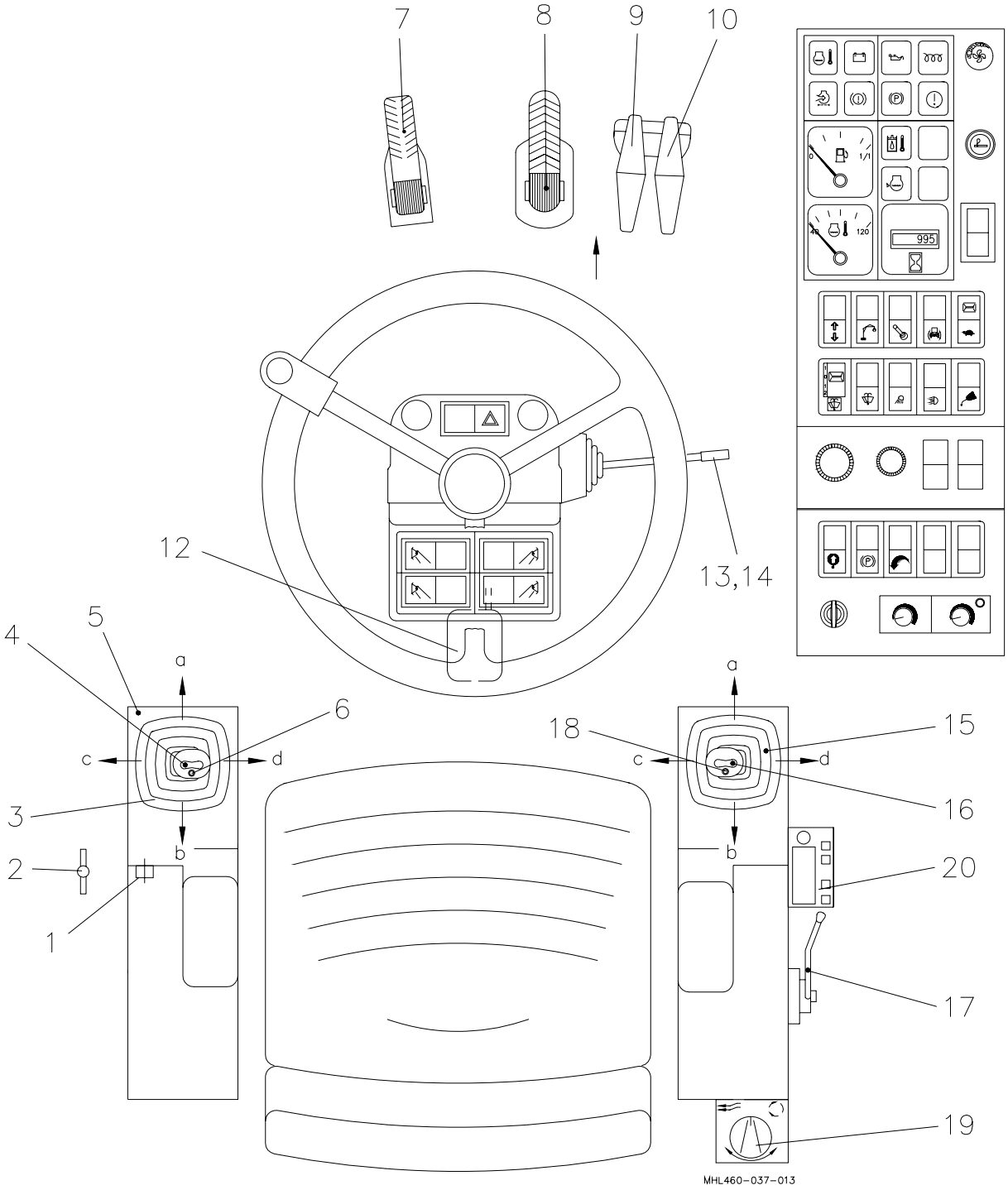


Fig. 13 Operator controls

Operator controls in cab

1 = "Fine mode" potentiometer
2 = Emergency lowering of cab
3 = Four-way control lever (ISO control)
4 = Button for outrigger up/down
5 = Upward folding armrest
6 = Not assigned
7 = Swing brake pedal, lockable
8 = Service brake pedal, lockable
9 = Accelerator pedal, forward
10 = Accelerator pedal, reverse
11 = Not assigned
12 = Tilt adjustment of steering wheel
13 = Turn signal flasher
14 = Horn
15 = Four-way control lever (ISO control)
16 = Push-button for grab rotation
17 = Engine speed control lever
18 = Push-button for operating pressure increase
19 = Rotary knob for fresh air/re-circulating air (air conditioning)
20 = Operator control panel for supplementary heating (optional)

4.3 Operator control panel in cab

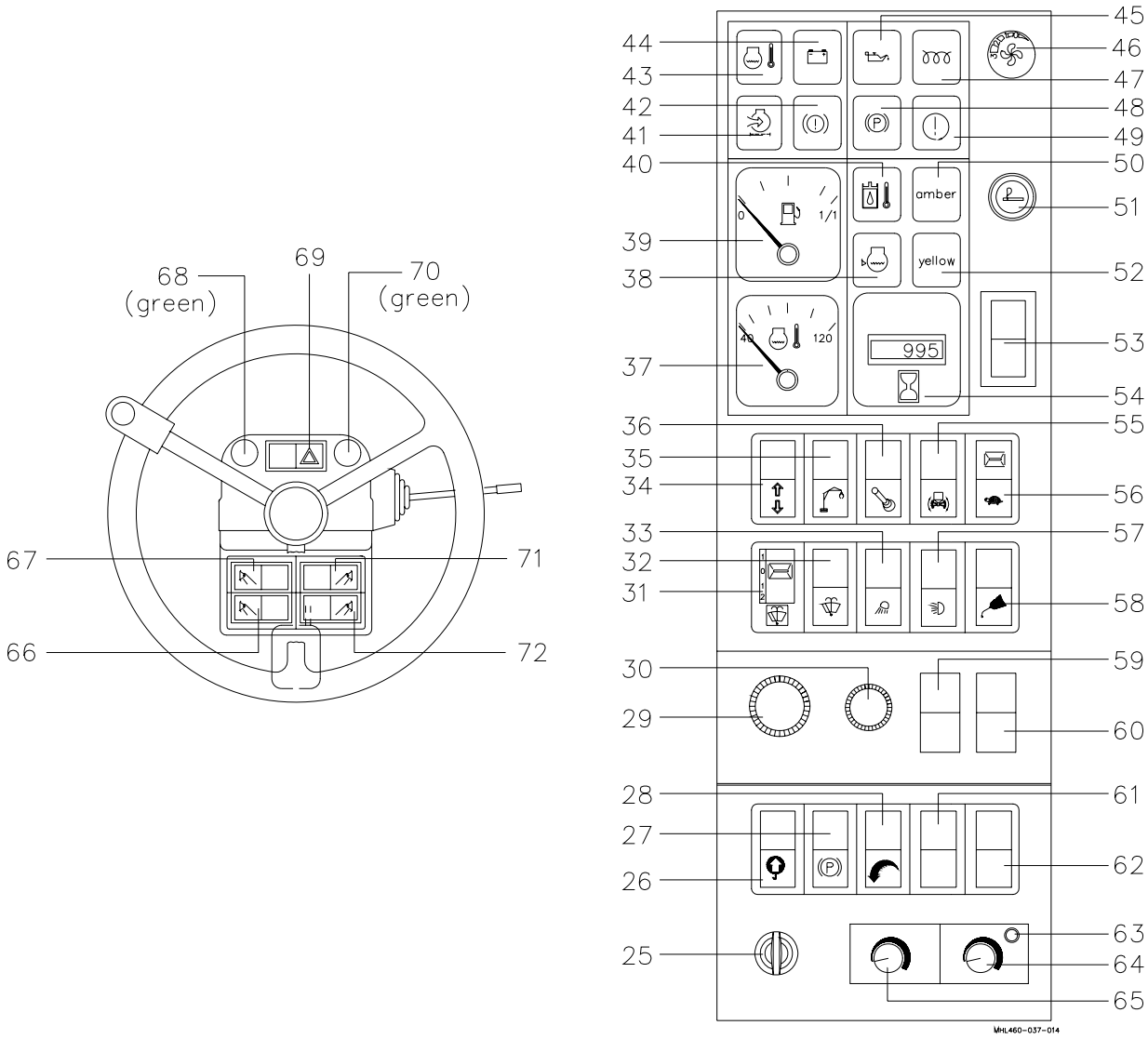


Fig. 14 Operator control panel

Operator control panel in cab

25 = Ignition lock

26 = Toggle switch for overload warning device (optional)

27 = Toggle switch for parking brake

28 = Toggle switch for auto-idling system

29 = Not assigned

30 = Not assigned

31 = Switch for windshield wiper (upper window section)

Position 1, bottom : windshield wiper

Position 1, top : intermittent

Position 2, top : wash/wipe

32 = Toggle switch for windshield wiper, wash/wipe (lower window section)

33 = Toggle switch for working floodlight(s)

34 = Push-button for cab up/down

35 = Toggle switch for work zone extension

36 = Travel and work functions toggle switch disabled; pressure reduction in hydraulic system

37 = Engine coolant temperature indicator

38 = Coolant level indicator lamp

39 = Fuel gauge

40 = Hydraulic oil temperature indicator lamp

41 = Indicator lamp (dual assignment):
Clogged air filter
Clogged return air filter

42 = Service brake indicator lamp

43 = Indicator lamp (dual assignment):
Coolant temperature
Hydraulic oil level

44 = Battery charge indicator lamp

45 = Engine oil pressure indicator lamp

46 = Rotary knob for fan

47 = Pre-heating indicator

48 = Parking brake indicator lamp

49 = Indicator lamp for load limit sensing control

50 = Indicator lamp for disabling travel and work functions

51 = Cigarette lighter

52 = Indicator lamp for work zone extension

53 = Not assigned

54 = Operating hour meter

55 = Oscillating axle lock toggle switch

56 = Toggle switch with lock 1^{st} / 2^{nd} gear

57 = Headlamp toggle switch

58 = Push-button for triggering additional lubrication

59 = Not assigned

60 = Not assigned

61 = Not assigned

62 = Not assigned

63 = Air conditioning indicator lamp

64 = Rotary knob for air conditioner

65 = Rotary knob for hot water heating

66 = Outrigger – individual control rear left (optional)

67 = Outrigger – individual control front left (optional)

68 = Direction indicator control lamp left

69 = Hazard warning system toggle switch

70 = Direction indicator control lamp right

71 = Outrigger – individual control front right (optional)

72 = Outrigger – individual control rear right (optional)

4.4 Engine

Before starting the engine the battery disconnect switch must be closed. The battery disconnect switch of the machine is located on the diesel tank.

WARNING

Before switching on the engine, the operator has to take care to ensure that no one is on the machine or in the immediate vicinity of it.

4.4.1 Starting the engine

ATTENTION

Every time the machine is put into operation, the inspections described in chapter 7.3 must first be performed.

- All gearshift levers to neutral.
- Flip toggle switch (15/27) for the parking brake. Indicator lamp (15/48) is lit.
- Insert the ignition key in the ignition lock (15/25).

If a buzzer sounds and the red service brake indicator lamp (15/42) lights up after the engine has been started, the necessary braking pressure has not yet been built up.

Once the engine is running and the braking pressure has built up, the buzzer stops and the indicator lamp is extinguished.

4.4.1.1 Cold start (normal start)

- Insert the ignition key in the ignition lock (15/25).
- Bring the engine speed control lever (15/17) to low idle position.
- Turn the ignition key to position I. Indicator lamps (15/44) and (15/45) light up.
- Then turn the ignition key further to position II. The preheat display (15/47) is lit for several seconds until the temperature is reached in the heater flange and the preheat display goes out. Wait until this happens, then turn the ignition key further to position III and start the engine.
- As soon as the engine is running, allow the ignition key to turn back to position I. The indicator lamps (15/44), (15/45) must go out.

4.4.1.2 Hot start

- Insert the ignition key in the ignition lock (15/25).
- Bring the engine speed control lever (15/17) to low idle position.
- Turn the ignition key to position I. Indicator lamps (15/44) and (15/45) light up.
- Then turn the ignition key further to position II. If the engine is hot, the preheat display (15/47) will only be lit briefly. Then turn the ignition key further to position III and start the engine.
- As soon as the engine is running, allow the ignition key to turn back to position I. The indicator lamps (15/44), (15/45) must go out.

If the engine does not start up after 15 sec. max., turn the ignition key to I or 0 and, after waiting for at least 30 sec., repeat the start-up procedure.

CAUTION

Do not drive the engine at full throttle right away. Drive with restraint until the engine reaches operating temperature.

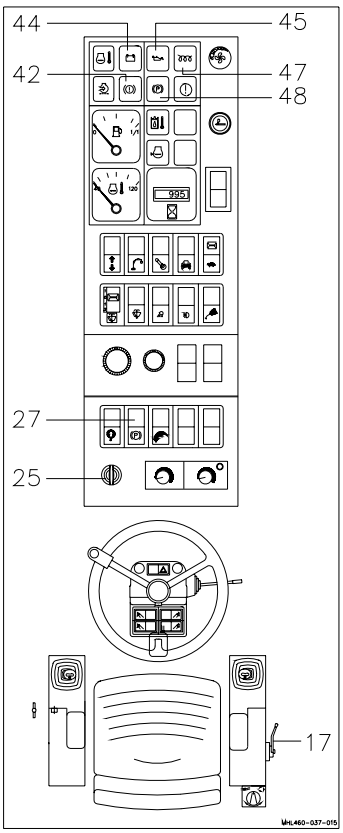


Fig. 15 Starting the engine

4.4.2 Monitoring during operation

- If the battery charge indicator lamp (16/44) or engine oil pressure indicator lamp (16/45) light up, switch off the engine immediately and determine the cause, or call for service personnel if necessary.
- If the permissible coolant temperature of approx. 110 °C (16/37) is exceeded or if the hydraulic oil level falls below the minimum amount, an acoustic signal (a buzzing tone) is generated and all travel and work functions are disabled. The indicator lamp (16/43) and (16/50) light up. Open the engine hood and allow the engine to cool down by the engine running at idle. Once the coolant temperature and the hydraulic oil level are again within the permitted limits, blocked functions will be made available again. Indicator lamps (16/43) and (16/50) go out.
- If the indicator lamp (16/38) lights up, there is not enough coolant in the engine cooling system. Stop work immediately and replenish coolant **after** the engine has **cooled down.**

WARNING

Do not top off coolant unless the engine is cold. Risk of scalding from hot coolant!

- If the hydraulic oil exceeds the permitted temperature, the indicator lamp (16/40) lights up red. Work must be discontinued immediately and the engine switched off. For possible causes and remedies, see chapter 8; if necessary, call for service personnel.

4.4.2.1 Deactivating the overheat protection

The overheat protection can be deactivated using the push-button (16/36). The machine can be relocated and the work equipment moved.

CAUTION

As long as the overheat protection is deactivated, the machine may only be moved briefly as otherwise damage to the engine may occur.

The deactivation only takes effect as long as the push-button (16/36) is pressed.

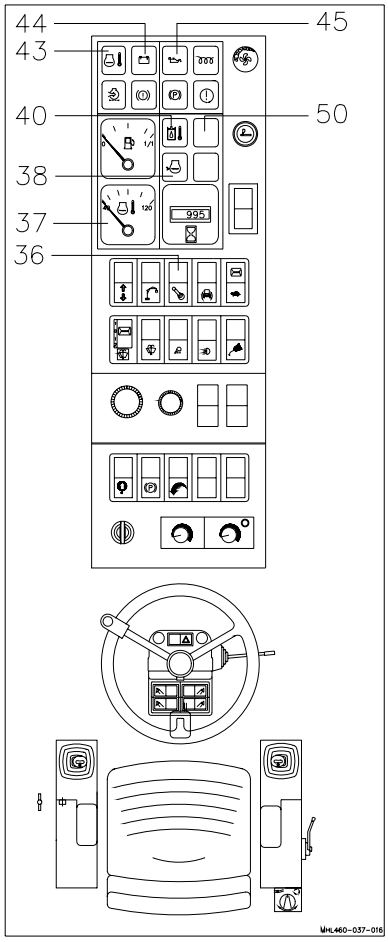


Fig. 16 Monitoring during operation

4.4.3 Switching off the engine

ATTENTION

Do not switch off the engine when running at full throttle, but allow it to run for a short time at idle.

- Bring the engine speed control lever (17/17) to idle position.
- Turn the ignition key (17/25) to "0". The engine stops automatically.

4.4.4 Load limit sensing control

The machine is equipped with a load limit sensing control. The control also includes:

- an electrical speed control
- an auto-idling system
- a sensitive adjustment of the pump response characteristic (Fine mode)

Load limit sensing control protects the engine from speed pressures that are too high and thus from overloads for each engine speed selected.

This allows load limit sensing control to ensure optimal use of the available engine power.

For possible malfunctions in the load limit sensing control, please read chapter 8.4.

4.4.4.1 Auto-idling system

The auto-idling system has the effect of lowering the engine speed if there is no work maneuver during the pre-set time of 5 seconds.

The auto-idling system must be switched on/ off using the toggle switch (17/28). While the auto-idling system is activated the indicator lamp in the switch lights up.

4.4.4.2 Fine mode

On the potentiometer (17/1) the flow rate of the pump can be continuously adjusted between the settings "normal" and "sensitive".

- Turn to the left (→ 0): normal (max. flow rate)
- Turn to the right (→ 100): sensitive (min. flow rate)

ATTENTION

During normal working operations, the potentiometer must be set to "0".

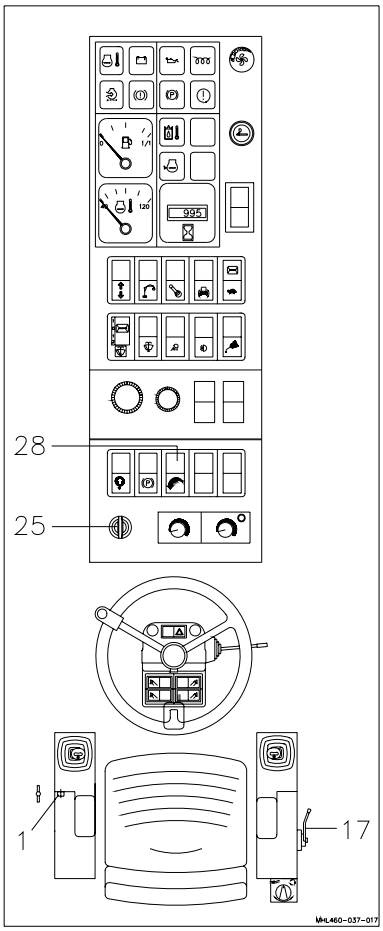


Fig. 17 Switching off the engine

4.4.5 Notes for use in winter

4.4.5.1 Hydraulic oil

If the machine is not used for longer periods at temperatures around and below freezing, warm up the engine by running at medium speed. The operating temperature must be reached by performing the following work maneuvers:

- Raise/lower box-type boom
- Open/close grab
- Extend/retract dipperstick

! ATTENTION

When the machine is warmed up by the engine running at idle, the following guidelines apply:

Temperature in °C	Warming up time in minutes
0 °C and over	approx. 15 min
-18 °C up to 0 °C	approx. 30 min
below -18 °C	over 30 min

The following points – and the relevant notes in the operating instructions of the engine manufacturer – should be observed during use in winter:

4.4.5.2 Engine oil

The viscosity class (SAE class) of the engine oil should be selected according to the ambient temperature at the machine's site of operation (also refer to the description of the fuels, lubricants and coolants in chapter 3.20).

4.4.5.3 Notes on options

If the customer so wishes, the machine may be equipped with a engine preheating.

For places of operation with lower temperatures, these preheating features ensure that the machine is ready for operation within a very short time and also extend service life.

4.4.5.4 Battery

Pre-heating the battery makes it possible to facilitate a cold start.

4.4.5.5 Fuel

Only use commercially available brand-name diesel fuel with a sulfur content of less than 0.5 % (see chapter 3.20 "Fuels, lubricants and coolants").

Only use winter diesel fuel with additives for cold temperatures to prevent clogging of the fuel system due to paraffin separation. Even if winter diesel fuel is used, disturbing paraffin separations (jelling) can occur at very low temperatures.

4.5 Operator's stand

4.5.1 Comfort driver's seat

The comfort driver's seat is an air-cushioned seat with shock absorbers.

The seat complies with the safety and health requirements according to ISO 6683 and ISO 7096, Class IV.

(18/1) Rocker switch for upper and lower lumbar support
- Tilt forward ⇒ lumbar part round; tilt backward ⇒ lumbar part straight

(18/2) Handle for seat back adjustment (tilt)

(18/3) Handle for seat upholstery adjustment (tilt)

(18/4) Handle for seat depth adjustment (leg support)

(18/5) Handle for longitudinal adjustment of seat (upper part)

(18/6) Lever for horizontal spring system (reduces horizontal bouncing in travel direction)
- Lever locked in place backwards ⇒ seat locked in place
- Lever set forwards ⇒ seat not locked in place

(18/7) Handle for combined height and body weight adjustment
- Press handle briefly: weight is adjusted automatically
- Raise or press lever: adjust height

(18/8) Handle for longitudinal adjustment of entire seat assembly

(18/9) Two point safety belt

(18/10) Rocker switch seat heating (optional)

WARNING

The two-point safety belt (lap belt) must be fastened before commencing work.

4.5.2 Steering wheel position

4.5.2.1 Tilt adjustment of steering wheel

- Press lever (19/12) forward using your foot and adjust the desired tilt of the steering column. Set lever (19/12) to home position. Slightly move steering column back and forth until the lever (19/12) clicks in.

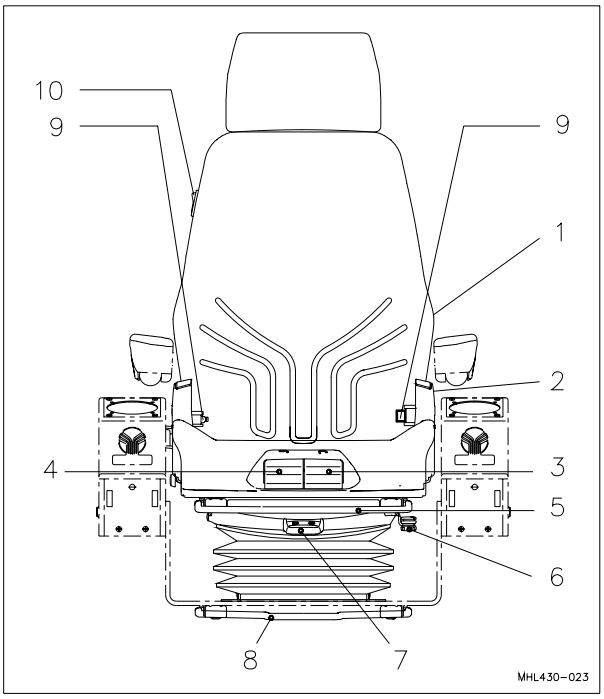


Fig. 18 Comfort driver's seat

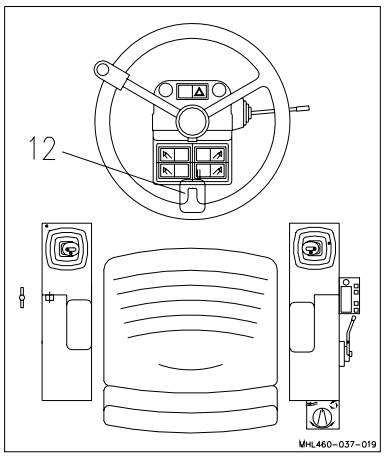


Fig. 19 Steering wheel adjustment

4.6 Heating and ventilation

4.6.1 Hot water heating

The cab heating is dependent upon the engine coolant temperature. The fan air flow is routed through a heat exchanger whose temperature is controlled by the flow rate of the coolant.

The heater is operated as follows:

- Adjust the desired level of heat using the rotary knob (22/65). Turn clockwise ⇒ greater heat.
- Adjust the desired fan setting using the rotary knob (22/46).
- The air is distributed and aimed as desired by adjusting the heating vents (20/1), (20/2) and (20/3).

In order to prevent the heater from becoming dirty, the circulating air / fresh air is drawn off through the air filter (rear of cab below driver's seat).

! ATTENTION

In the case of high exposure to dust, the filter matting should be cleaned or changed every 100 operating hours. See chapter 7.5.

- Remove the covering plate, take out the filter fleece and clean or replace it.
- When re-fitting the fleece, make sure that the blue side of the fleece shows to the inside to ensure optimum filtering of the circulating air / fresh air.

4.6.2 Supplementary heating (optional)

Ventilation and heating can also be operated when the engine is not running. Ignition does not have to be switched on. The rotary knob (22/46) must be set to the "Off" position.

Heating is operated on the operator control panel (20/20) in the right armrest of the driver's seat.

The functions and the operation of the heater may be read up in the operating instructions provided by the heater manufacturer.

WARNING

The heating must always be switched off when filling up with fuel. The heating shall not be operated in enclosed spaces.

! ATTENTION

In order to ensure that the heater functions correctly, the combustion air is drawn off through the oil-immersed air filter (rear of cab). In the case of high exposure to dust, the oil should be changed every 100 operating hours (see chapter 7.5 and oil analyses, chapter 7.1.1).

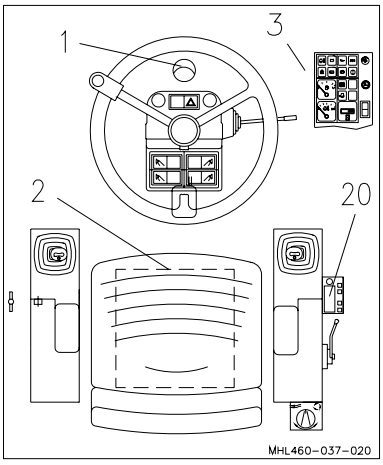


Fig. 20 Heating and ventilation

The heater is located in the driver's cab, on the right side under a sheet-metal cover.

The following maintenance tasks must be carried out before each heating period:

- Check the glow plug (21/1) for burn-off and replace if necessary.
- Examine the fuel filter for clogging and replace if necessary.
- Check that electrical connections are securely fastened.
- Check that fuel lines and connections are not leaking.
- Check the oil level in the oil-immersed air filter.

If the heating does not come on, proceed as follows:

- Switch heating off
- Check fuses
- Switch heating on

If the **heating still does not function when switched on for the third time,** please contact the Eberspächer Customer Service. In the case of further unsuccessful attempts, the heating is completely switched off and cannot be switched on again.

If the heating overheats:

Possible causes may be that the outflow openings are covered up or the suction intake grate is dirty.

- Switch heating off
- Uncover vents
- Switch heating on

Other malfunctions which cannot be remedied by self-help measures shall be checked and repaired by Customer Service only.

CAUTION

The battery disconnect switch shall only be turned off approx. 5 minutes after the heating has been switched off. Otherwise, the heater cooling process is interrupted, which can lead to fire.

The battery disconnect switch of the machine is located on the diesel tank.

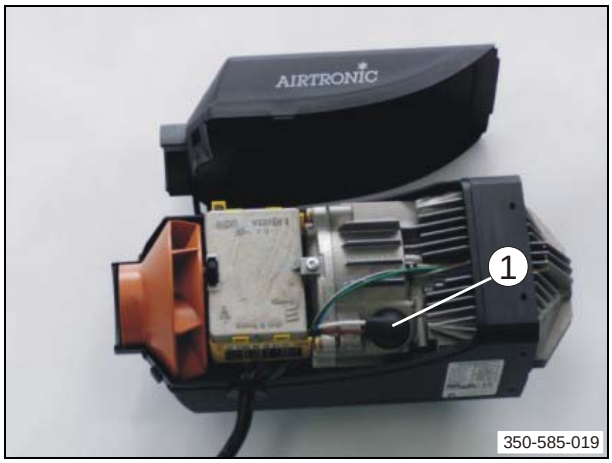


Fig. 21 Supplementary heating

4.6.3 Air conditioning

ATTENTION

The air conditioning only works when the motor is running.

For air conditioning mode, make certain heater mode is turned off.

The air conditioning is switched on using the rotary knob (22/64). At the same time, the rotary knob for fan (22/46) must be set to at least "1", so that the air conditioning starts to operate. The indicator lamp (22/63) lights up.

The room temperature in the cab falls.

Temperature is adjusted by operating the rotary knob (22/64):

Turn clockwise ⇒ increase in cooling performance.

The greater the cooling output of the air conditioning you have selected with the rotary knob (22/64), the higher you should also adjust the fan level (22/46).

To achieve maximum cooling in the cab:

- the rotary knob (22/64) must be turned clockwise as far as it will go
- the highest fan level (22/46) must be set
- the heater must be turned off
- the air flap must be set to circulating air
- and the cab must be closed.

The air conditioning can be operated even in the coldest time of the year. If the air conditioning is operated together with your heater, the air in the can remains dry. This prevents the windowpanes from getting coated with moisture. All there is to do is set the rotary knob (22/64) of the air conditioning to the lowest level.

ATTENTION

The air conditioning must be turned on for a brief period at least once a month. The system needs to be operated to lubricate the compressor.

ATTENTION

Coolant must be visibly flowing with no bubbles in the sight glass (22/1) on the side of the fluid container or at the top of it while the engine is running and the air conditioning is at the highest level. If there are bubbles in the sight glass, there is not enough coolant in the system. The system must be checked by an authorized specialist for leaks and filled again.

DANGER

Maintenance work on the air conditioning must only be carried out by trained specialists.

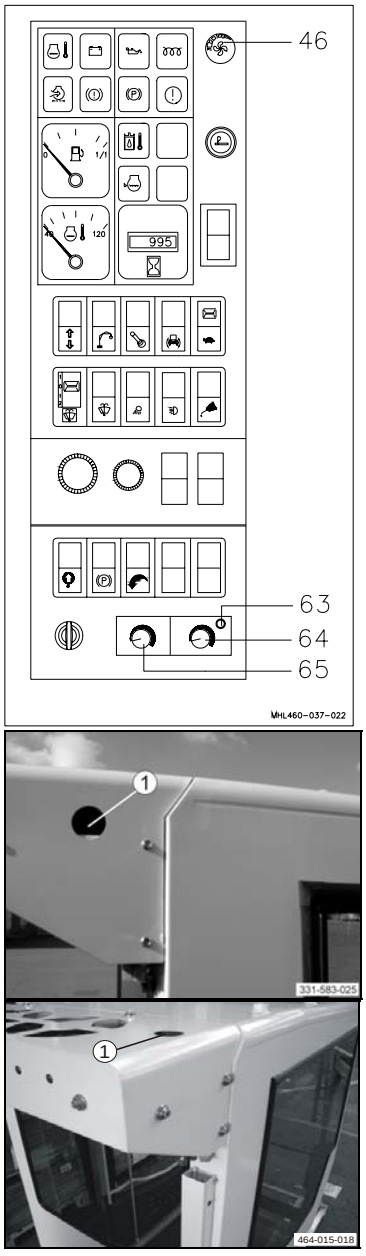


Fig. 22 Air conditioning

4.7 Driver's cab

4.7.1 Opening/closing the windshield

The windshield can only be opened completely. It is not possible to open it in stages. The windshield is released from the catch by pressing in both release levers (23/1) and can be pulled in under the cab roof.

The windshield is released from the catch by pressing in both release levers (23/1) and can be brought back to the end position.

CAUTION

Always take care to ensure that the windshield is locked in the end position.

ATTENTION

When opening and closing the windshield, take care to ensure that the window does not collide with the steering wheel. If it does, alter the position of the steering wheel.

ATTENTION

At customer's request the front windshield and the skylight may be made out of bullet-proof glass. If made out of bullet-proof glass, the windows can no longer be opened.

4.7.2 Venetian blind

A venetian blind (23/2) that can be locked in three different positions to prevent light glare during work is attached above the windshield.

Another venetian blind (23/3) that can be locked in position is attached below the roof screen.

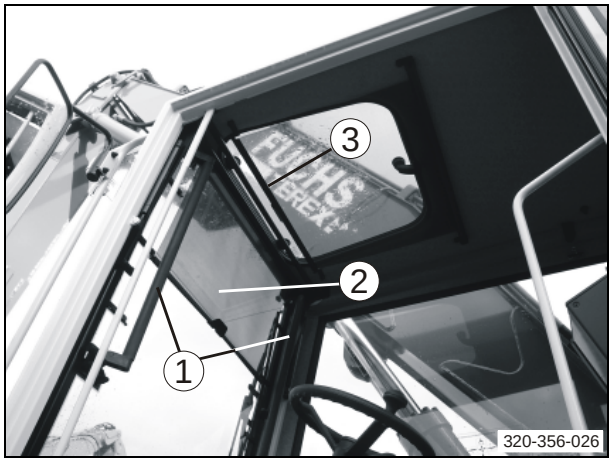


Fig. 23 Opening/closing the windshield

4.7.3 Cab door

From the interior, the cab door is released by pressing in on the lever (24/1).

ATTENTION

If the cab door is opened to get in and out, it must be engaged in the catch (25/2) using the locking device (25/1).

The cab door is released from the catch by means of the lever (26/1).

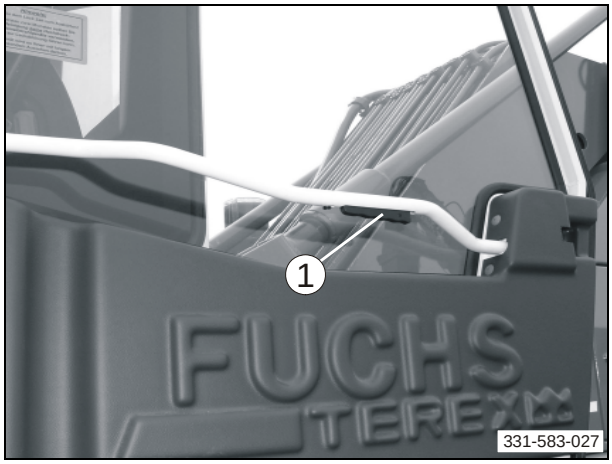


Fig. 24 Opening the cab door

4.7.4 Door window

Adjust the sliding window in the door of the driver's cab using the handle as required.

4.7.5 Skylight of driver's cab

To ventilate the cab, the skylight can be tilted up.

4.7.6 Interior lighting of driver's cab

The interior lighting is switched on and off by turning the lamp glass.

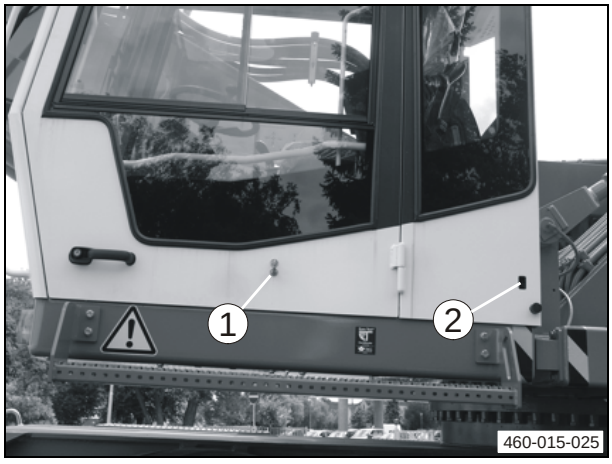


Fig. 25 Door catch

4.7.7 Windshield wash/wipe system

The container for the windshield washer fluid is situated in the cab behind the driver's seat. The container holds approx. 4 liters. We recommend that you always add window cleaner with antifreeze to the water.

Fig. 26 Releasing the door from the catch

4.8 Cab with hydraulic elevation

The cab can be continuously adjusted in height.

4.8.1 Before putting into operation

The lifting equipment of the cab must be subjected to a function test every day.

DANGER

The cab may only be repaired while it is in an elevated position when the lift frame is adequately supported.

A sleeve may be affixed to the piston rod of the lift frame cylinder to support the cab. This support sleeve can be obtained from FUCHS. Order number of the support sleeve: 6090031600.

4.8.2 During operation

Only enter or leave the cab when it is in the lower end position. Do not remain on the chassis or undercarriage or on the steps. During all movements of the cab, the machine operator must take care to ensure that s/he and other persons are not in danger.

DANGER

When traveling with the cab raised, special care must be taken to ensure that no overhead power lines are touched. If the machine has touched an overhead power line, it must only be left or touched by persons standing outside the cab when it is certain that the machine is no longer in contact with the power line or the current has been switched off. See also chapter 2.12.

DANGER

When stick cut-off is activated, care must be taken that the distance between the cab and the work attachment decreases. When loading long and thin parts which stand out of the loading grab, these parts may break into the cab if the loading grab swings out strongly.

4.8.3 Traveling with elevated cab

WARNING

When traveling with the cab elevated, even small irregularities in the ground cause the cab to dip. This may result in injuries of the driver (operator) or to incorrect operation of the machine.

The machine may only be driven with the cab elevated when the door is closed and safety belt is fastened, and not on public roads.

When traveling with the cab raised, it must be ensured that there are sufficient entrance heights to work bays and other premises. In the event of a collision the operator is exposed to an increased risk of injury.

The following points must also be observed:

- There must be no obstacles in the vehicle's path.
- The route must be such as not to endanger the stability of the machine and the safety of the person in the cab.
- The driver must have a sufficient overview of the vehicle's path, or the area must be marked, e.g. by safety posts.

4.8.4 Switching off the machine

The cab must be returned to the rest position.

4.8.5 Positioning the cab

The cab can be continuously adjusted in height.

WARNING

When the cab is being moved, and during traveling and working, the left armrest must be folded down, the seat belt fastened and the cab door shut.

Adjust the cab height-wise as follows:

- Close the cab door and fold down the left armrest (27/5).
- Press the push-button (27/34, arrow pointing upward) until the cab reaches the desired height.
- Pressing the push-button (27/34, arrow pointing downward) lowers the cab.

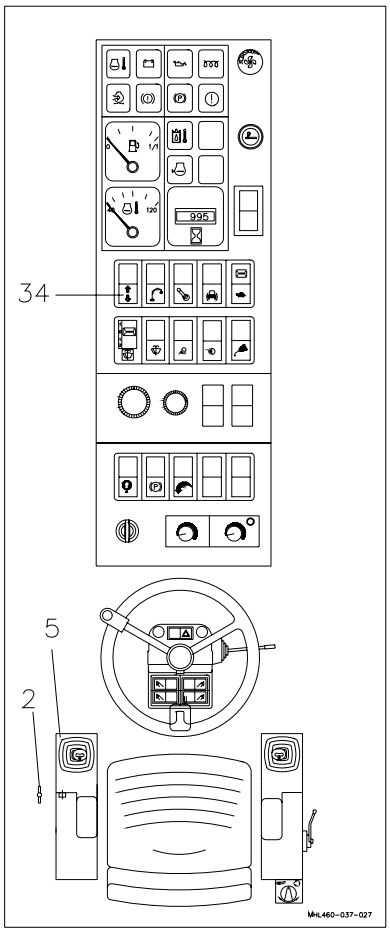


Fig. 27 Positioning the cab

4.8.6 Procedure for manual lowering of elevated cab (in case of malfunction)

The cab can be lowered from the cab interior using the ball valve (27/2) or from the superstructure using the ball valve on the hydraulic tank (28/1).

In order to raise the cab once more, after lowering, the ball valves (27/2) and (28/1) must be returned to the shut-off position.

DANGER

When lowering the elevating cab to its bottom position, there is a danger that persons outside the cab could be crushed between the cab and the uppercarriage.

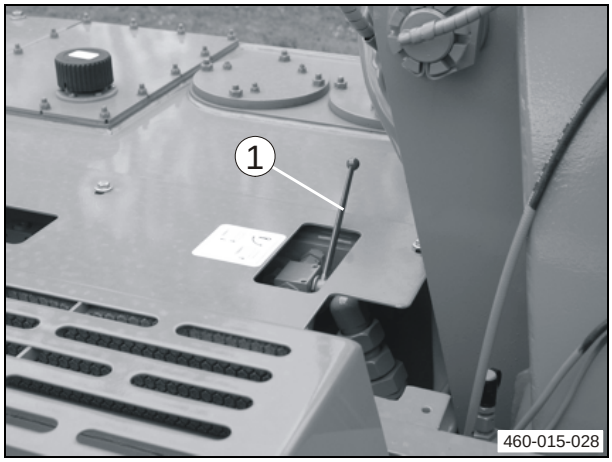


Fig. 28 Ball valve

4.9 Travel operation

ATTENTION

The machine is not licensed for use on the road, and therefore shall not be driven on public highways (in Germany).

4.9.1 Placing the machine in motion

ATTENTION

The travel direction is always based on the normal position of the undercarriage (steering axle to the front).

- Start the engine as described on page 4.6.
- Release the parking brake (29/27) and service brake (29/8) toggle switch when the pedal is locked.

ATTENTION

The machine cannot be placed in motion if the parking brake is applied. Indicator (29/48) lights up red.

- Drive forwards by pressing pedal (29/9), reverse by pressing pedal (29/10).
- Travel speed is regulated by means of the accelerator pedals (29/9) and (29/10).

CAUTION

*Change from forward to reverse traveling and vice versa only when the machine is at a standstill. Do **not** change direction while the machine is still moving.*

If the machine is stuck in difficult terrain, do not attempt to free it by rocking. See chapter 6, "Transport and Recovery" for how to proceed.

The machine operator must be absolutely certain that no one is in the vehicle's path.

Machines carrying loads with laterally shifted uppercarriage may travel exclusively on level paths and with the oscillating axle locked. The oscillating axle is locked using toggle switch (29/55) (refer to chapter 5.1.5).

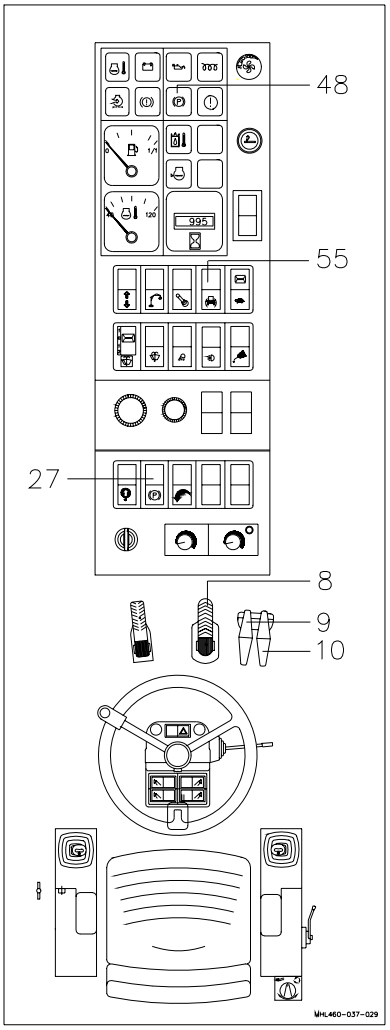


Fig. 29 Travel

4.9.2 Coming to a halt

Travel speed is reduced by releasing the accelerator pedals (30/9) and (30/10). The hydrostatic drive acts as a non-wearing service brake. See also chapter 4.9.4, "Brakes".

4.9.3 Steering

The steering of the front axle of the machine is hydraulic.

CAUTION

In the event of steering malfunctions, stop work immediately, determine the cause (see Trouble-shooting section) and call for service personnel if necessary.

4.9.4 Brakes

- Service brake (can be locked in place)

  Apply the service brake (30/8) as required. When the service brake is locked in place, care must be taken that the **brake pressure diminishes after the engine has been stopped** for some time.

- Parking brake

  Apply the parking brake (30/27) when stopping the machine.

CAUTION

Do not engage the parking brake unless the machine is stopped, with the exception of emergency braking.

ATTENTION

When the parking brake is applied the oscillating axle lock is activated at the same time. Working while the parking brake is engaged is prohibited.

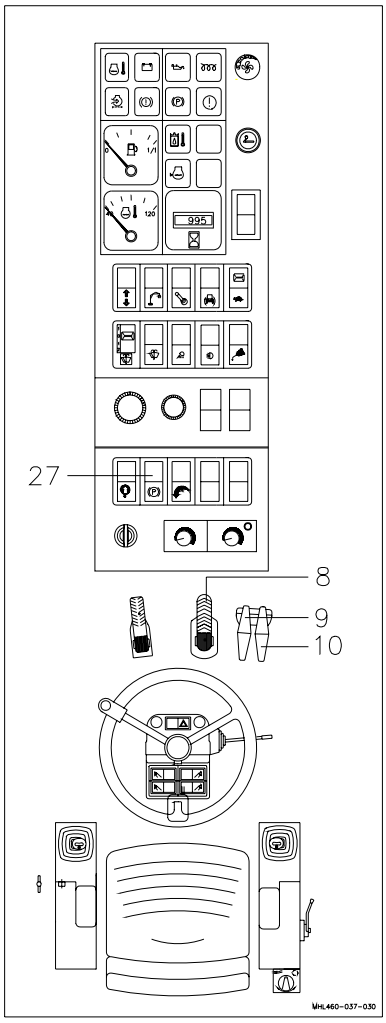


Fig. 30 Travel

4.10 Parking the machine

CAUTION

When switching off the machine, the work attachment must be let down carefully since the surface could be damaged by the weight of the work equipment.

- Only park the machine on **solid and level** ground.
- Lower the work equipment onto the ground.
- Apply the parking brake (31/27) and release the service brake (31/8).
- Apply the swing brake by pressing the pedal (31/7).
- Reduce the engine speed by moving the engine speed control lever (31/17) away from the body, and allow the engine to run at idle for a short time in order to cool down.
- Move the engine-speed control lever (31/17) away from the body until the stop; switch off the engine. Turn the ignition key to "0".
- Turn the ignition key to "I". Hold down button (31/36) and briefly actuate all hydraulic levers in order to relieve the hydraulic system of pressure.
- Turn the ignition key to "0" and withdraw it.
- Fold up the left armrest (31/5).
- Lock the cab as well as all windows and skylights when work is finished, so that it cannot be entered by unauthorized persons.
- The machine must be cleaned at regular intervals.

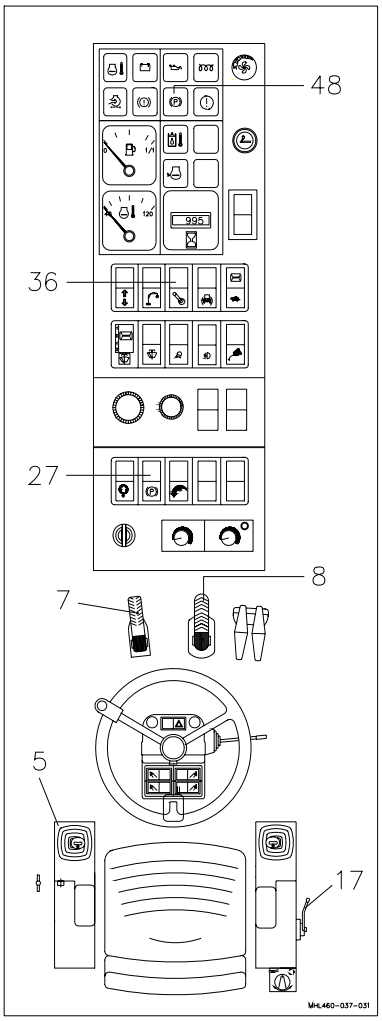


Fig. 31 Parking the machine

DANGER

When parking the machine, the uppercarriage must be in longitudinal direction as compared to the under carriage, and the cab must be in its bottom rest position. The stick has to be positioned vertically, the open grab must be placed onto the ground (see fig. 32).

Plates should be pushed under the grab tips. Otherwise they will press down on the surface.

Fig. 32 Proper parking of the machine

5 Work Operation

5.1 Work operation

The machine is equipped as standard with ISO control (fig. 33), upon which the following description is based.

CAUTION

If the customer so wishes, the machine may be equipped with a special control. Your machine must therefore be checked to see whether or not a different control is installed. Incorrect operation may endanger persons or tangible assets.

Before commencing work, memorize the lever controls well. Commence at low engine speed when familiarizing yourself with the controls.

5.1.1 Operation of work equipment

Four-way control lever, left

a = Extend dipperstick
b = Retract dipperstick
c = Swing uppercarriage counterclockwise
d = Swing uppercarriage clockwise

Four-way control lever, right

a = Lower box-type boom
b = Raise box-type boom
c = Close grab
d = Open grab
e = Swing grab

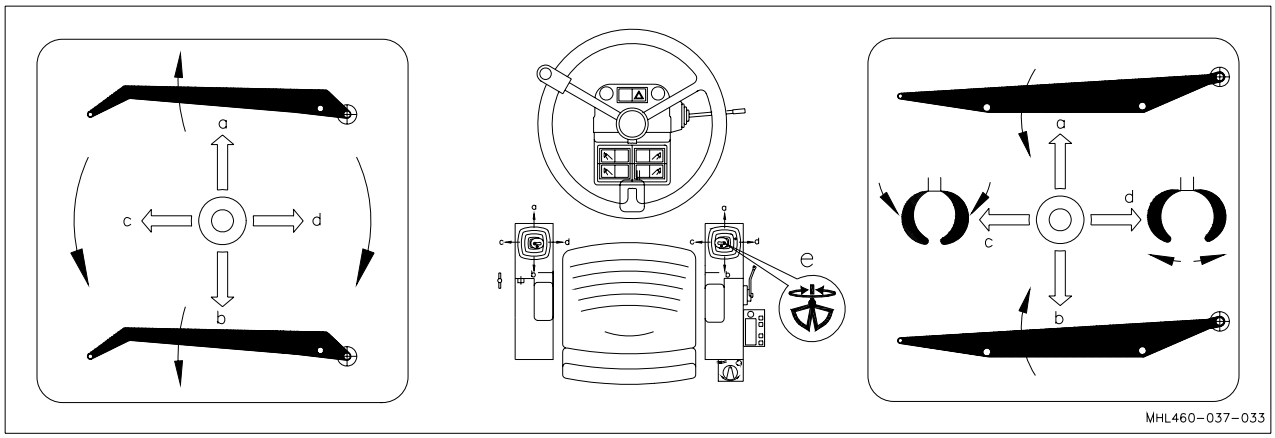


Fig. 33 ISO control

5.1.2 Increasing the operating pressure

With the function "increase operating pressure", the hydraulic pressure can be increased from 320 to 360 bar. This may be necessary for heavy-duty work. To increase pressure, press the push-button in the right four-way control lever (see fig. 34). The function only takes effect while the push-button is being pressed.

The pressure increase affects the boom and stick only. There is no pressure increase for the functions "travel" and "open/close grab".

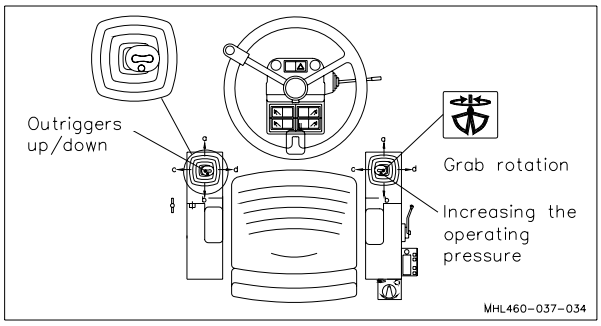


Fig. 34 Increasing the operating pressure

5.1.3 Operation of outrigger

- Press button (35/4) on left: outrigger down
- Press button (35/4) on right: outrigger up

5.1.3.1 Individually controlled support (optional)

Using the four switches (35/66-72) on the steering column, any combination of outriggers to be raised or lowered can be preselected. The indicator lamps in the switches of the selected supports are lit.

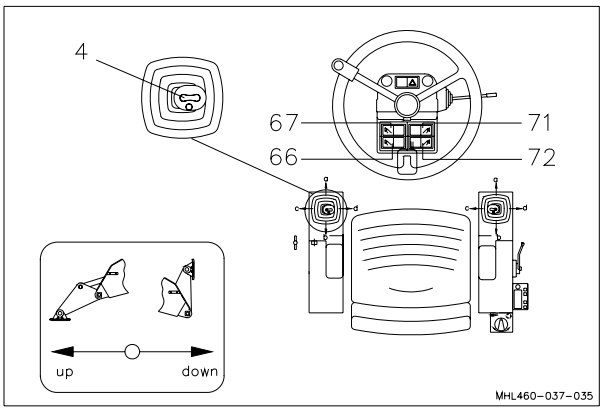


Fig. 35 Outrigger

! ATTENTION

If there is a visual signal indicating a support is extended, the operator must always also check that the machine is in a secure state and ensure it remains so!

- Switch (35/71) : support, front right
- Switch (35/67) : support, front left
- Switch (35/66) : support, rear left
- Switch (35/72) : support, rear right

The specifications front, rear, right and left refer to the normal position of the uppercarriage (steering axle in forward direction of travel).

5.1.4 Disabling all travel and work functions

- All travel and work functions can be disabled using the toggle switch (36/36). The indicator lamp in the switch **does not** light up; the indicator lamp (36/50) lights up.
- All travel and work functions are disabled when the armrest (36/5) is folded up. The indicator lamp (36/50) lights up.
- If the permissible coolant temperature is exceeded or if the hydraulic oil level falls below the minimum amount, an acoustic signal (a buzzing tone) is generated and all travel and work functions are disabled. The indicator lamp (36/43) lights up (see also chapter 4.4.2).

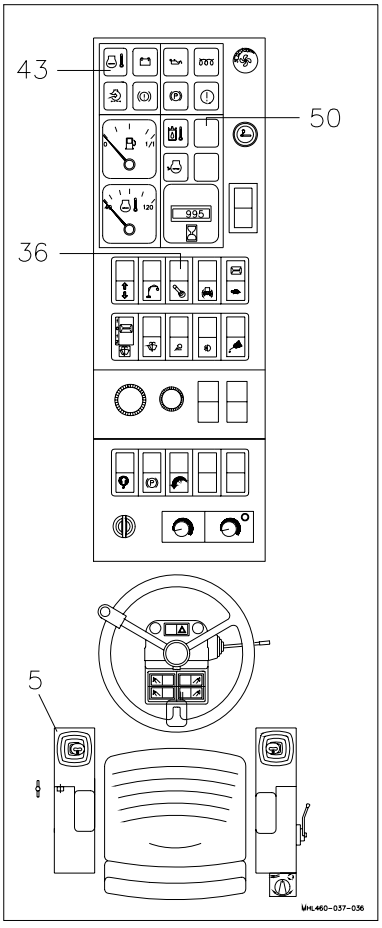


Fig. 36 Disabling travel and work functions

5.1.5 Operation of oscillating axle lock

The oscillating axle lock is activated by the parking brake toggle switch (37/27), i.e. the oscillating axle is locked automatically when the parking brake is applied. The oscillating axle may also be locked independently from the parking brake using the toggle switch (37/55). The indicator lamp on the switch does **not** light up.

- For swinging and loading operations, lock the oscillating axle. Lock the oscillating axle in place. The indicator lamp in the switch (37/55) does **not** light up.
- For travel (without load): unlock the oscillating axle. The indicator lamp in the switch (37/55) lights up.

5.1.6 Work zone extension

The work zone extension is activated by means of the toggle switch (37/35), i.e. the dipperstick may be moved inside the safety zone of the cab.

Work zone extension active: the lamp (37/35) lights up.

DANGER

When the work zone extension is active, the work attachment or log may knock into the cab.

If the dipperstick exceeds the limit of the safety zone, the red indicator lamp (37/52) lights up.

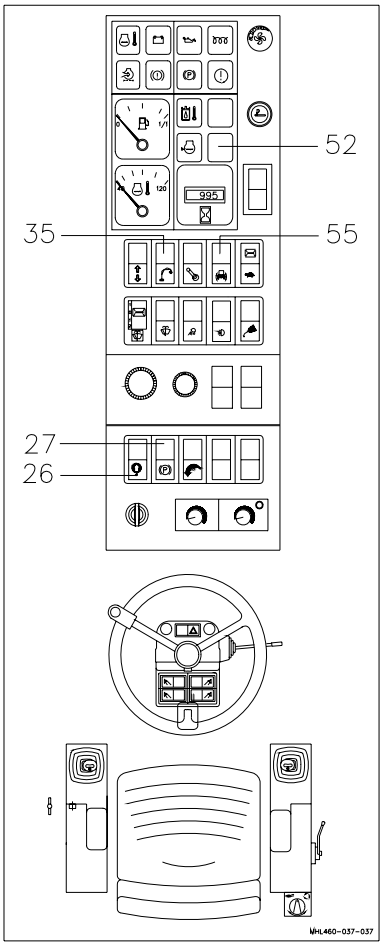


Fig. 37 Oscillating axle lock

5.1.7 Overload warning device (optional)

The machine can be equipped with an overload warning device. This emits an acoustic signal (discontinuous buzzing tone) when the permissible load limit is reached. If this signal sounds, no more work movements increasing the load moment are to be performed.

CAUTION

The overload warning device requires the machine to be supported by outriggers.

CAUTION

The overload warning device is a safety device and shall not be used as part of normal operation. The values in the table of carrying capacity must be strictly observed. We recommend that you work only with the overload warning device switched on.

The overload warning device is switched on using the toggle switch (37/26). The red indicator lamp in the toggle switch lights up.

5.2 Working methods

Observation of the following points is essential:

- Machine with outriggers up

⇒ When the outriggers are up, loads shall only be hoisted above the front or rear axle respectively, see table of carrying capacity.

⇒ When outriggers are up, perform work operations only with the oscillating axle being locked, see chapter 5.1.5.

⇒ When the machine is at a standstill, the service brake must be activated and locked. Furthermore, the oscillating axle lock must be activated.

- Machine with outriggers down

⇒ When the machine is supported, the wheels must be blocked with the service brake.

⇒ The 4-point outriggers must rest firmly upon the ground during work operations. This must also be monitored continuously during work, and the support cylinders re-adjusted if necessary.

- General notes

⇒ **The values in the table of carrying capacity must be strictly observed and must not be exceeded.**

⇒ Released while the uppercarriage is swinging, the left four-way control lever (38/3) automatically goes to neutral position, and the uppercarriage is "smoothly" braked. The uppercarriage may also be braked by countering, i.e. steering in the opposite direction of swinging.

⇒ The uppercarriage can be kept and locked in a certain position by pressing the pedal (38/7), for example for transport on a flatbed trailer for travel. **The swing brake (38/7) must not be used to brake the uppercarriage.**

⇒ Do not level the ground in front of the machine with the work equipment by swinging the uppercarriage to and fro.

⇒ Neither push, knock nor beat with the grab.

⇒ Pay attention to hoses when lowering the grab into a lateral construction.

⇒ Do not pull loads with the swing gear.

⇒ Do not swing the uppercarriage so fast that the load is pulled strongly outward through centrifugal force or the load swings when braking.

⇒ Do not brake the swinging motion of the machine by dropping the work equipment.

⇒ When swinging, ensure that there is sufficient all-round carrying capacity.

⇒ No one may remain in the danger zone of the machine during operation.

⇒ Never force the controls.

5.3 Load hook applications

Refer to chapter 2.15

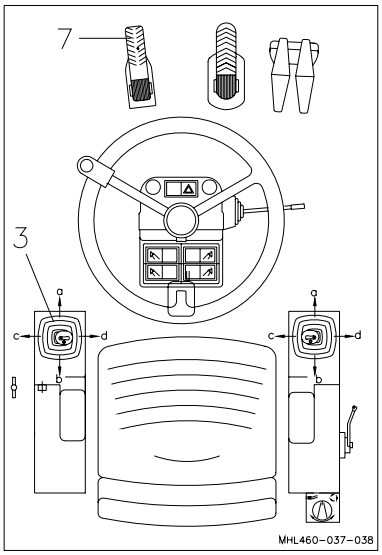


Fig. 38 Swinging the uppercarriage

6 Transport and Recovery

6.1 Towing the machine

The machine is equipped with two towing lugs, one on the front and one on the rear of the undercarriage.

Symbol: 

ATTENTION

The towing lugs have a maximum bearing pressure of 120 kN.

Before the machine can be towed, the power shift gear must be set to neutral position (idle running).

The maximum permissible towing speed corresponds to the permissible final speed.

CAUTION

When the diesel engine is switched off it, bear in mind that the machine can neither be steered nor braked.

Diesel engine is stopped

- Switch on the ignition (39/25).
- Switch the transmission through using the push-button (39/56) for approx. 10x. The transmission control is now pressureless; the transmission is in neutral position.

Position of the cutoff device lever for towing the machine

Loosen the screw on the of the cutoff device (40/2), adjust the lever (40/1) manually so that the screw can be fixed in the hole (40/3).

Do not use any tools to position the lever.

CAUTION

The parking brake no longer has any braking force.

The transmission is pressureless and remains in neutral position even while the engine is running.

After towing, reset the lever (40/1) again.

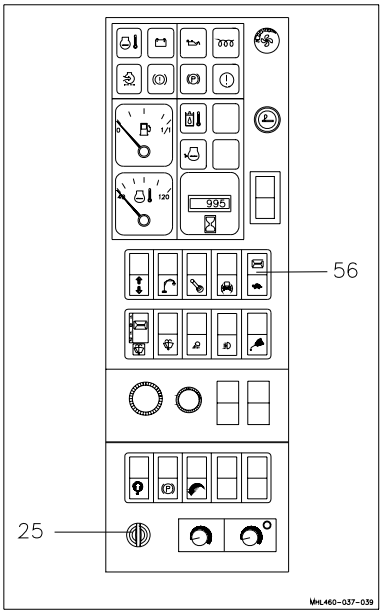


Fig. 39 Switching gears

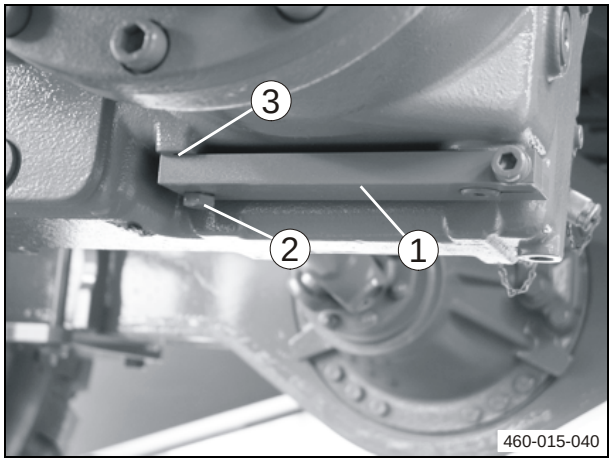


Fig. 40 Transmission control

6.2 Recovery of the machine

If the machine is stuck fast in difficult terrain, do not attempt to free it by rocking.

The machine can be pulled free with the aid of the work equipment. Here, it must be in 1st gear (42/56). In certain conditions, the work device must be removed.

If the machine cannot be freed using the work equipment, it must be towed clear following the instructions in chapter 6.1.

6.3 Loading onto a flat-bed trailer or train

For transport on a flat-bed trailer or train wagon, the machine must be lashed in place so that it cannot move. The machine is equipped with two lashing points for this purpose (see fig. 41).

If the height of the machine is more than 3.9 m, the cab must be removed. The back rest of the driver's seat must be laid down depending on the height of the flat-bed trailer. The total height for road transport must not exceed 4 m.

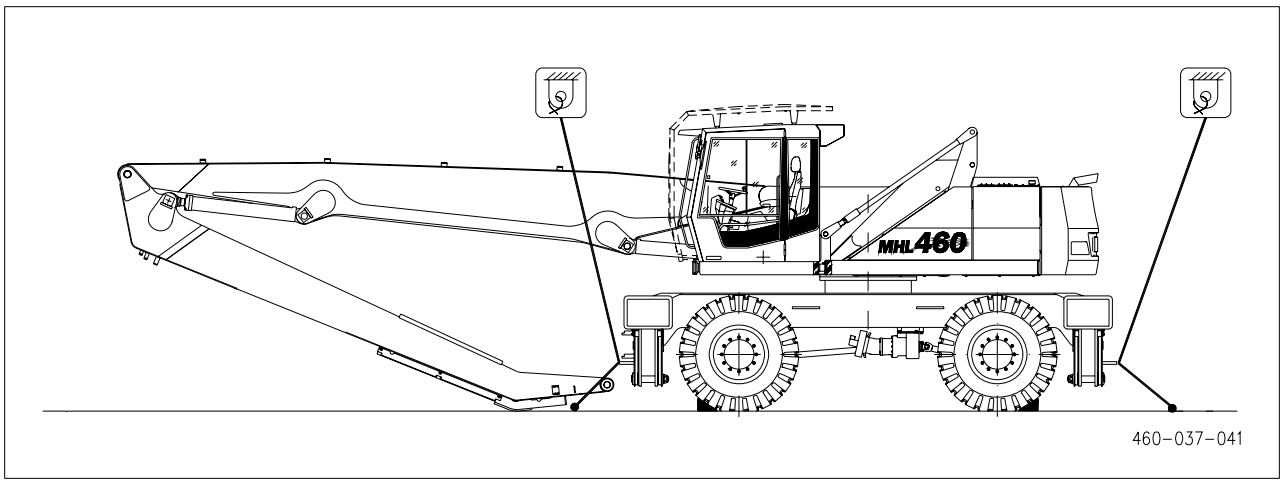


Fig. 41 Loading onto a flat-bed trailer or train

To ensure safe transport, the machine must be prepared as follows:

- Bring the uppercarriage into travel direction and lock the swing brake (42/7).
- Position the work equipment on the loading area, do not lift the machine.
- Apply the parking brake with the toggle switch (42/27).
- Place wooden chocks under the four twin tires to keep the machine in place.
- Attach ropes or chains to the lashing points and secure the machine on the loading area (see fig. 41).

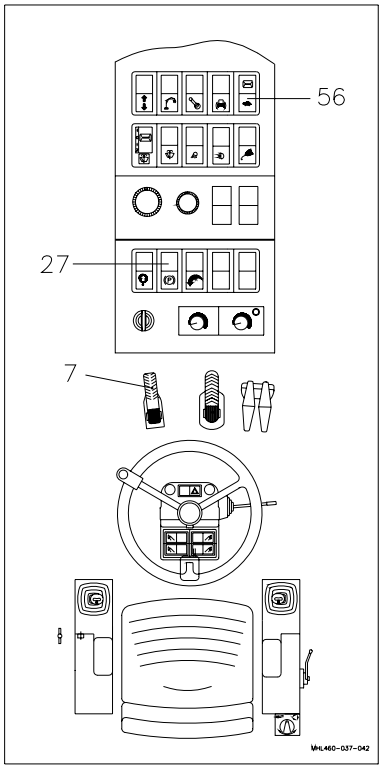


Fig. 42 Parking the machine

6.4 Fixing points for lifting the machine with a crane

The entire machine may be lifted for loading it carefully onto flat-bed trailers.

ATTENTION

Pivot-mounted work attachments such as a grab must be removed before the machine is lifted. Swinging movements of the work attachment would otherwise make safe lifting impossible.

Dismantle the outrigger feet from the outrigger legs.

Fasten the hoisting device (43/1) with the pins (43/2) and fastening elements (43/3). Move the outriggers (43/4) to horizontal position.

The pins and fastening elements match the attachment of the outrigger feet.

If required, the fixing device may be obtained from FUCHS.

Shackle (43/5) size 20 in compliance with DIN 82101 is recommended, in accordance with the weight of the machine.

Bring the work equipment to the transport position, as for loading onto a flat-bed trailer (see fig. 41).

In this position, the load, based on the fixing points, is distributed fairly evenly.

The minimum lifting capacity per rope must be 200 kN (20 t).

The four fixing ropes (43/6) shall not be shorter than 13 m for reasons of weight distribution or a lifting harness must be used.

The ropes must be routed so that no damage occurs to the cab or paneling.

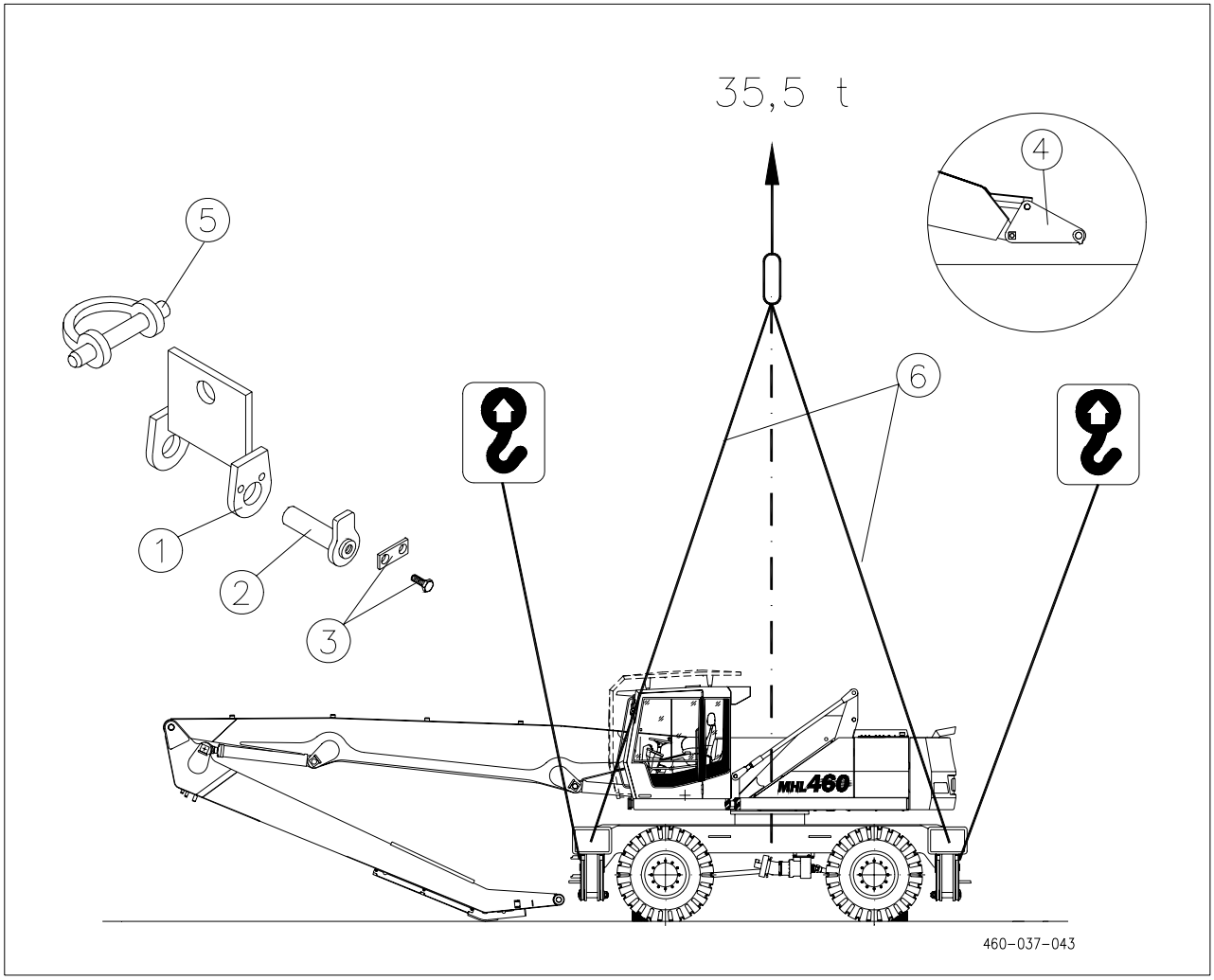


Fig. 43 Lifting the machine

7 Care and Maintenance

7.1 General information

The good operating condition and life expectancy of the machine are largely influenced by care and maintenance.

For this reason, it is in every machine owner's interest to comply with these maintenance instructions. The operating instructions contain detailed information on daily and weekly maintenance, inspection and lubrication tasks in this chapter.

Inspections are stipulated during the warranty period. They must be carried out by trained specialist personnel.

Inspection intervals

Inspection intervals in operating hours	
1. Inspection	after 500 operating hours
2. Inspection	after 1000 operating hours
3. Inspection	after 1500 operating hours
Subsequently	every 500 operating hours

ATTENTION

The inspections as specified are obligatory during the warranty period and must be paid for.

The performance of the inspections as specified shall be confirmed on the inspection cards in the warranty and handing-over certificate.

If this is omitted, the warranty may be subject to restrictions.

ATTENTION

The battery disconnect switch of the machine is located on the diesel tank. Before working on the electrical system, the electric circuit must be interrupted by means of the battery disconnect switch. Before welding, the electric circuit must be interrupted by disconnecting the battery ground cable. The running machine shall not be switched off using the battery disconnect switch, as this causes damage to the electrical system.

CAUTION

When changing fuels, lubricants and coolants, such as engine oil, lubricating oil, hydraulic oil, fuel, etc., care must be taken to ensure that these fluids do not seep into the ground. Suitable containers must be used to collect them. If they do run into the soil nevertheless, their escape must be stopped immediately and the fluid bound with suitable binding agents. If necessary, the soil must be excavated. Binding agents and excavated soil must be disposed of in the proper manner. The relevant environmental regulations must be complied with.

DANGER

Repair work may only be performed on the elevated cab when the lift frame is securely supported (see chapter 4.8.1).

CAUTION

When performing maintenance and repair work, the necessary safety precautions according to chapter 2.16 and the following chapters must be observed.

DANGER

Hydraulic accumulators must not be opened when under pressure. They contain nitrogen (danger of asphyxiation).

Only trained specialist should replace the hydraulic accumulator or place it in service. Do not touch a hydraulic accumulator unless it has cooled off.

No changes must be made to the hydraulic accumulators (welding, drilling, opening it by force, etc.).

7.1.1 Regular oil analyses

Oil analyses are not meant to question the oil change intervals specified but to take into account a potential reduction of maintenance costs, the early recognition of imminent damage as well as increased environmental consciousness.

Advantages of an oil analysis

- Extension of oil change intervals in the case of normal or light-duty operating conditions.
- Minimum wear of high-quality components because of optimum utilization of fuels, lubricants and coolants.
- Periodic lab analyses allow early recognition of imminent damage.
- Early service/repair work protects equipment from serious and unforeseeable damage.
- Consequential damage is avoided.

At what intervals should the oil be analyzed?

Regular oil analyses show the development of the oil condition and the condition of the machine.

Upon reaching the scheduled oil sampling point, oils should be checked at the following intervals in order to check the quality of the oil and thus extend oil change intervals:

- Hydraulic oil: 1000 operating hours
- Transmission oil: 500 operating hours
- Engine oil: 500 operating hours

Oil sample intervals according to the first results and as specified by test lab.

Your FUCHS dealer will let you have an informative leaflet specifying oil test procedures, etc.

7.1.2 Letting off residual pressure in the hydraulic circuit

CAUTION

When performing maintenance and repair work on the hydraulic system, the residual pressure in the hydraulic circuit must be let off. Before performing this work, the work equipment must be safely lowered onto the ground.

To release pressure, the following operator controls must be actuated with the diesel engine switched off. **The ignition must be switched on (ignition key in position I) and the armrest (44/5) folded down. Press the button (44/36) at the same time.** Indicator lamp (44/50) for disabling "travel and work functions" must be off.

ATTENTION

Items 1, 2 and 3 must be executed consecutively at least 5 times e.g. to reduce the pilot pressure.

1. Lower four-way control levers (44/3) and (44/15), work equipment, swing upper-carriage, open/close grab
2. Accelerator pedals (44/9), (44/10)
3. Outriggers button (44/4)
4. Service brake pedal (44/8) (actuate for at least 20 times)
5. Turn off the parking brake with the toggle switch (44/27)
6. Swing brake pedal (44/7)
7. Elevating cab emergency lowering function (44/2) or (28/1)
8. Push-button (44/16) for grab rotation
9. Toggle switch (44/55) for oscillating axle

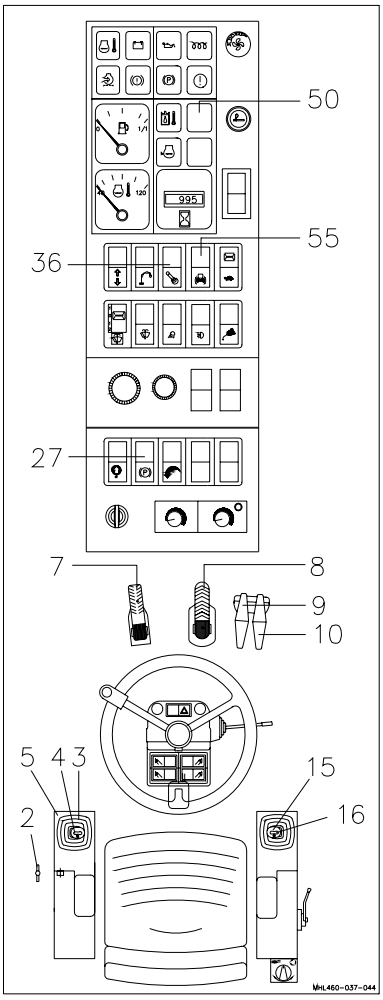


Fig. 44 Letting off residual pressure

7.2 Service parts

! ATTENTION

Service parts for inspections must be stocked in good time!

Service parts	Spare part number
Return filter element 2x	5 003 660 422
Insert of ventilation filter	5 003 730 010
Engine oil filter	5 411 656 298
Fuel filter 2x	5 411 657 146
Fuel pre-filter component	5 501 648 523
Engine air filter: Main cartridge Safety cartridge	 5 501 660 737 5 501 660 738
Valve cover seal (engine)	5 411 656 720
V-belts: Water and fuel pump drive Generator drive Air conditioning	 5 411 656 386 5 411 656 691 5 411 663 018
Filter fleece (hot water heating)	5 821 662 080

Fuels, lubricants and coolants

The machine's life expectancy and operating condition are largely dependent upon the use of the specified fuels, lubricants and coolants and compliance with the service intervals.

If fuels, lubricants and coolants which do not conform to our recommendations are used, consequential damage may occur for which we will not assume liability, even within the warranty period.

FILLING QUANTITIES **refer to chapter 3.19**

FUELS, LUBRICANTS AND COOLANTS **refer to chapter 3.20**

7.3 Work before putting into operation

- Before getting in the machine, slew the uppercarriage into direction of travel. Move the dipperstick to a steep position if possible. Make certain the grab is open and place it on the ground (see fig. 32).
- Before starting maintenance jobs on the machine, open the door (45/1) by removing the bolt (45/2).
- After the maintenance tasks are complete, close the door (45/1) by inserting the (45/2) bolt again.

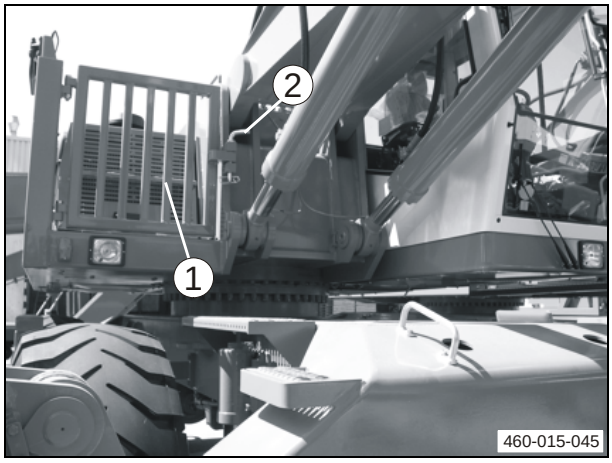


Fig. 45 Service ladder

7.3.1 Checking the engine oil level

- The oil level must be checked daily before start-up, with the machine standing on level ground.
- The notches on the oil dipstick (see 65/4) indicate the minimum and maximum oil levels.
- Top up the existing level of engine oil if necessary. Screw off the filler cap and replenish oil from a clean vessel.

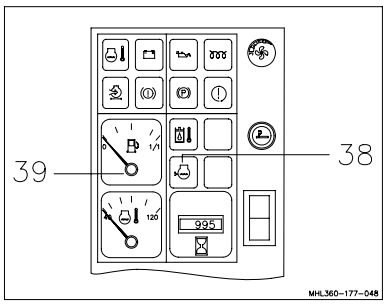


Fig. 46 Fuel level

7.3.2 Fuel system

7.3.2.1 Fuel level

Check the fuel level on the fuel gauge (46/39). In order to prevent condensation forming before the next time the machine is used, the tank must be filled up with fuel after daily use. To do so, open the tank cap (47/1).

! ATTENTION

Wear protective goggles and gloves while pouring.

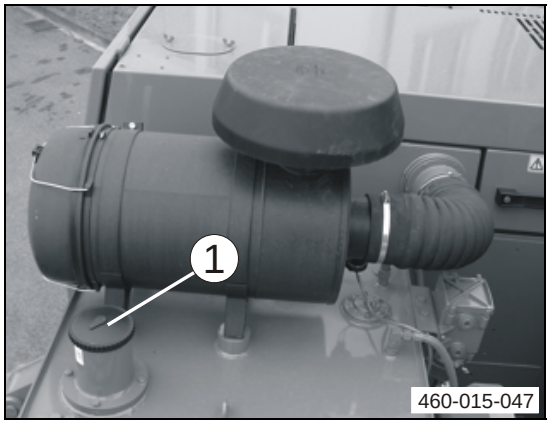


Fig. 47 Tank cap

! ATTENTION

Never allow the fuel tank to run empty, as otherwise the fuel system has to be vented.

7.3.2.2 Water separator

Screw on the drain valve (48/1) on the water separator once a week and observe the escaping fluid. Once fuel instead of water escapes, close the drain valve.

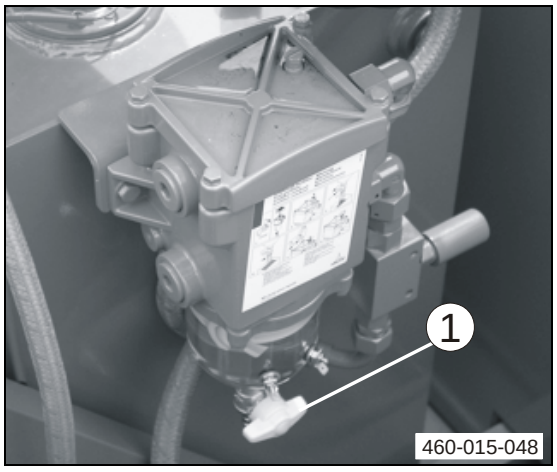


Fig. 48 Water separation

7.3.3 Cooling system

7.3.3.1 Coolant level

WARNING

Only check the coolant level when the engine is cold. Risk of scalding from hot coolant!

Engine water cooler

If the coolant level is too low, the lamp (46/38) lights up.

- Unscrew the protective cover (49/1).
- Remove the cap (49/2) and check the coolant level.
- The coolant must be up to the overflow pipe.

7.3.3.2 Checking the antifreeze

Check the level of antifreeze protection before the beginning of the cold season.

ATTENTION

Always use an antifreeze with anti-corrosion protection. The antifreeze level is set to approx. -35 °C at the factory. When topping up, only a mixture of water and 45 % low-temperature protection agent should be used. Low-temperature protection agent in higher concentrations than 45 % must be avoided, as this impairs the effectiveness of the cooling system. For the exact concentration of the individual substances, please refer to the operating instructions of the engine manufacturer (see also chapter 3.19).

7.3.4 Checking the hydraulic oil level

Check the hydraulic oil level using the sight glass (50/1), and top up if necessary (see 7.6.13).

ATTENTION

Extend the boom and dipperstick cylinders to about 50 %. Move the outriggers to the uppermost position.

The hydraulic oil level must lie between the two marks on the sight glass (50/1) (between the middle of the sight glass and the Max mark).

7.3.5 Cleaning the radiator

The cooling fins of the water-charge air cooling (51/2) and of the hydraulic oil cooler (51/1) must be cleaned from any dirt drawn in.

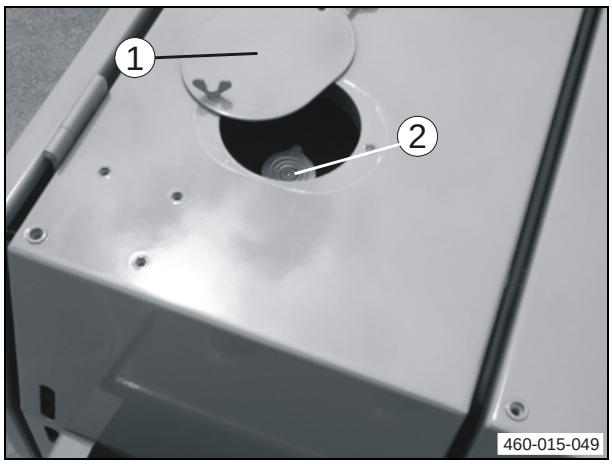


Fig. 49 Engine radiator

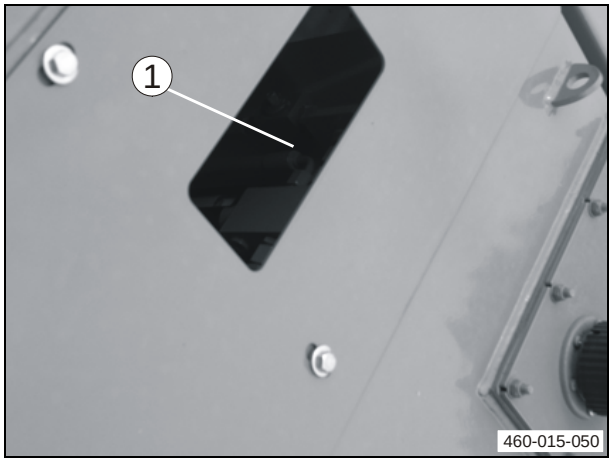


Fig. 50 Hydraulic oil sight glass

Fig. 51 Cleaning the radiator

7.3.6 Tires

Tightness of wheel nuts

During the first 50 operating hours, check the torque of the wheel nuts daily, and subsequently at regular intervals, and tighten to the correct torque if necessary.

Tightening torque: 650 Nm

When changing a wheel, always tighten the nuts to the specified torque crosswise in several steps.

7.3.7 Checking the oil levels in axles, swing gear and power shift gear

- Park the machine on level ground.
- Turn the wheel until the drain plug (54/2) is at the bottom.
- Switch off the engine.

Remove the checking plugs from:

- the rear axle (52/1)
- the front axle (53/1)
- the wheel hub (54/1)
- power shift gear (56/1),

check the oil level and top up if necessary (see 7.6.14).

- Check the oil level on the swing gear using the oil dipstick (55/1) and refill oil when necessary (see 7.6.15). The notches on the dipstick indicate the minimum and maximum oil levels.

7.3.8 Electrical equipment

The lighting and warning equipment as well as the function of the indicator lamps, must be checked prior to use.

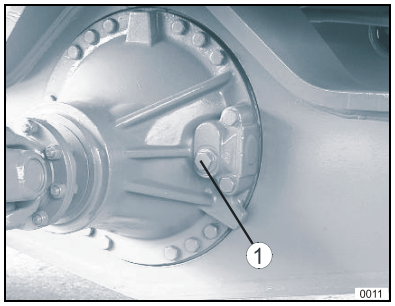


Fig. 52 Rear axle

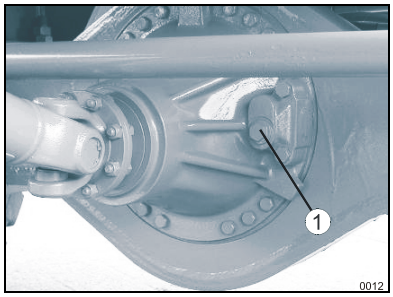


Fig. 53 Front axle

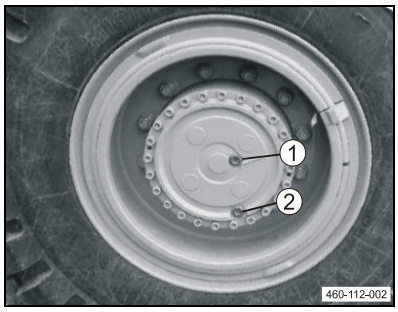


Fig. 54 Wheel hub

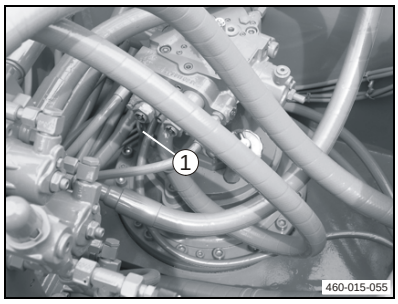


Fig. 55 Swing gear

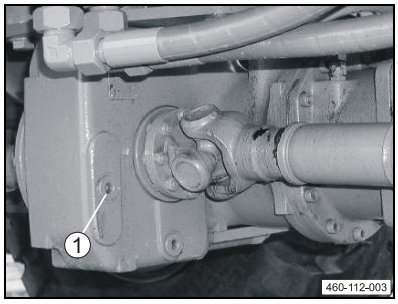


Fig. 56 Power shift gear

7.4 Overview of lubricating points

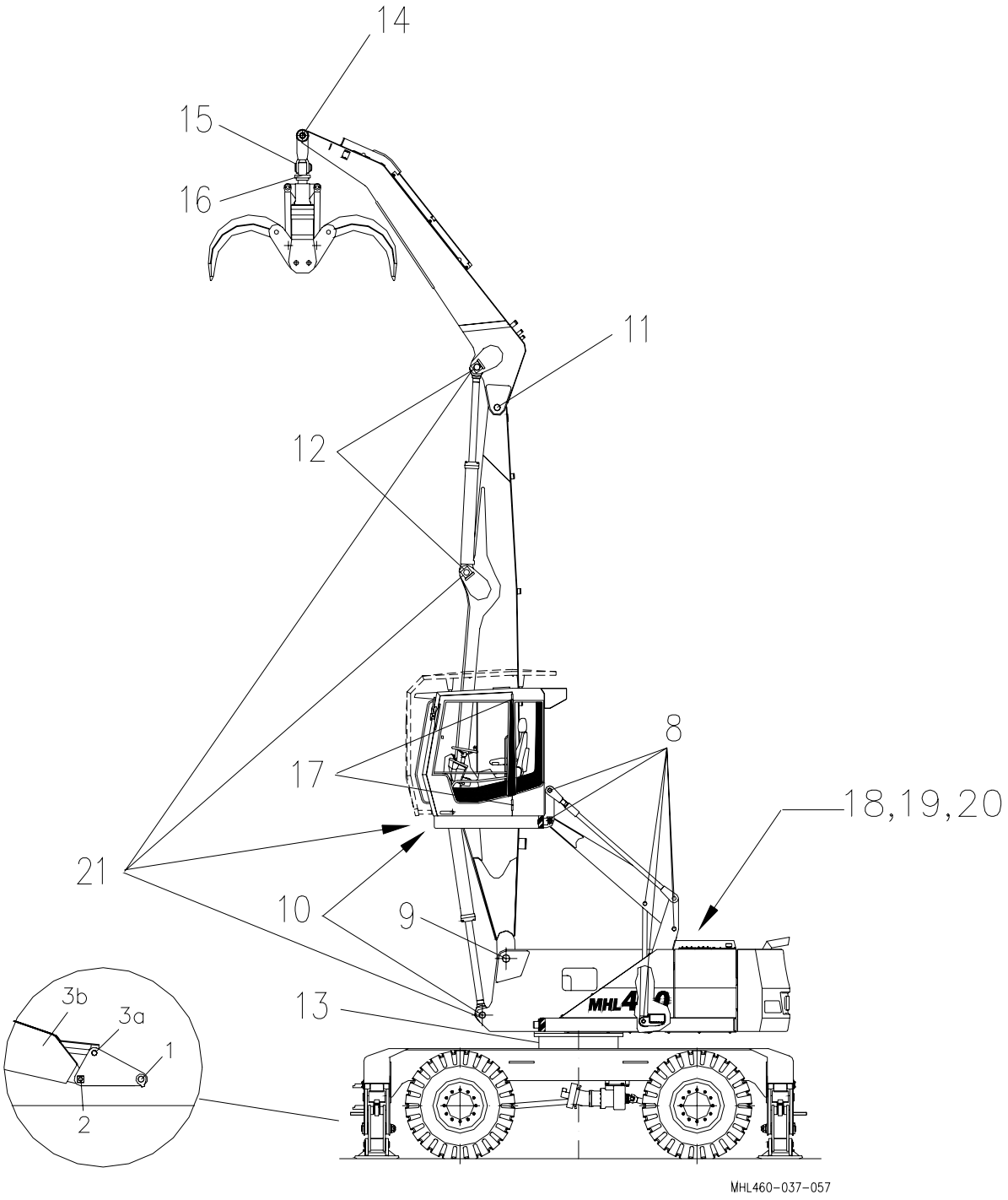


Fig. 57 Overview of lubricating points

Overview of lubricating points

No.	Lubricating points	Qty.	Daily	Weekly	Remarks
1	Bearing of outrigger pad	4		X	manual lubrication
2	Bearing of outrigger leg	4		X	
3a	Bearing of outrigger cylinder (to the outrigger leg)	4		X	
3b	Bearing of outrigger cylinder (to the undercarriage)	4		X	optional manual central lubrication undercarriage
4	Bearing of steering gear case	4		X	see fig. 59
5	Bearing of steering rod	2		X	see fig. 59
6	Bearing of steering cylinder	4		X	see fig. 58
7	Bearing of oscillating axle	1		X	see fig. 60
8 *	Bearing of elevating cab	10	X		automatic central lubrication uppercarriage
9	Bearing of box-type boom	2	X		
10	Bearing of boom cylinder	4	X		
11	Bearing of dipperstick	2	X		
12	Bearing of dipperstick cylinder	4	X		
13	Slewing joint (ring gear, toothing)	4	X		
14	Bearing of work attachment mounting	2	X		
15	Bearing of grab	1	X		
16	Connection for central grab lubrication	1	X		for the connection of a grab with central lubricant distribution only
17	Hinge of cab door	2		X	Manual lubrication
18	Hinge of engine cover	2		X	
19	Hinge of engine radiator cover	2		X	
20	Hinge of hydraulic oil radiator cover	2		X	
21	Lubricating nipple on cylinder bearings	8	X		Perform additional lubrication (manual lubrication) with loading equipment lowered to the ground (system without pressure).

CAUTION

** The points marked must be subjected to a visual and functional inspection **every 500 operating hours** (see chapter 7.5). In particular, general damage and wear must be observed.*

ATTENTION

To grease the machine, apply the outrigger and lower the work equipment (boom in horizontal position).

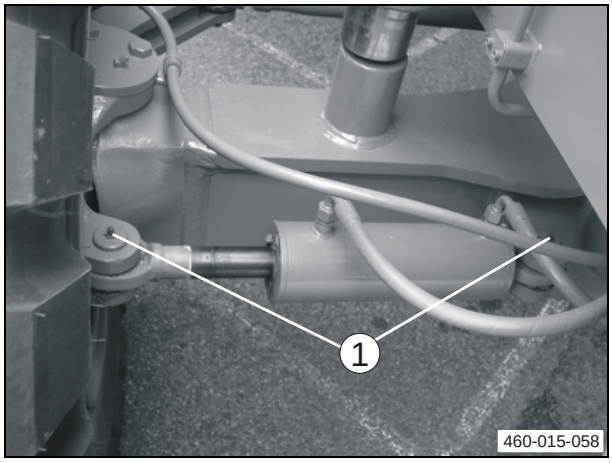


Fig. 58 Steering cylinder

Steering cylinder: 4 lubricating points

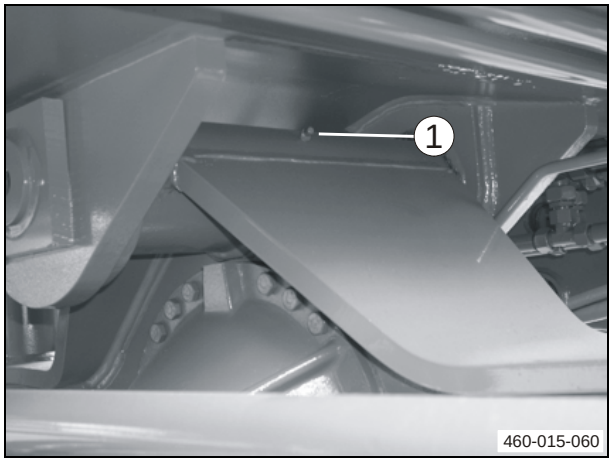


Fig. 60 Oscillating axle

Oscillating axle: 1 lubricating point

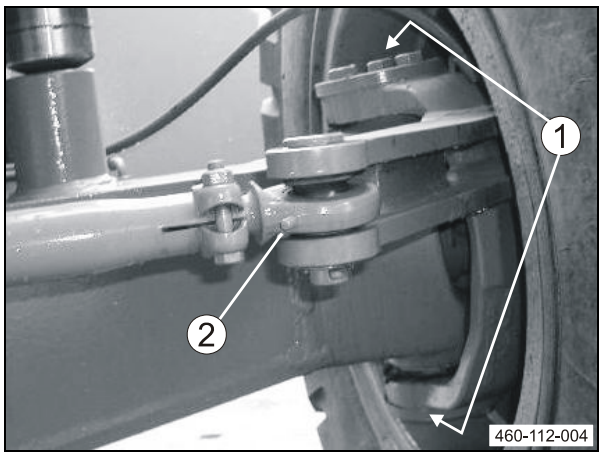


Fig. 59 Steering gear case and steering rod

Steering gear case : 4 lubricating points

Steering rod : 2 lubricating points

7.4.1 Automatic central lubrication uppercarriage, work equipment and work attachment mounting

The machine is equipped with a central lubricating system which automatically supplies certain bearing points on the upper-carriage with grease (as shown in "Overview of lubricating points").

7.4.1.1 Automatic check

Each time that the ignition (61/25) is switched on, a function check of the central lubricating system drive motor and indicator lamp (61/58) takes place. The indicator lamp (61/58) in the button lights up for 2 seconds. If no mal-function is present, the indicator lamp goes out.

If the indicator lamp flashes, there is a malfunction in the lubricating system.

If the indicator lamp does not light up at all, it is defective.

If the indicator lamp flashes during operation, please read the meaning of the flash code signals in the central lubricating system instructions.

7.4.1.2 Central grab lubrication

By simple switching of the ball valve (61/1), the standard automatic central uppercarriage lubrication allows the supply of the grab with central lubricant distribution.

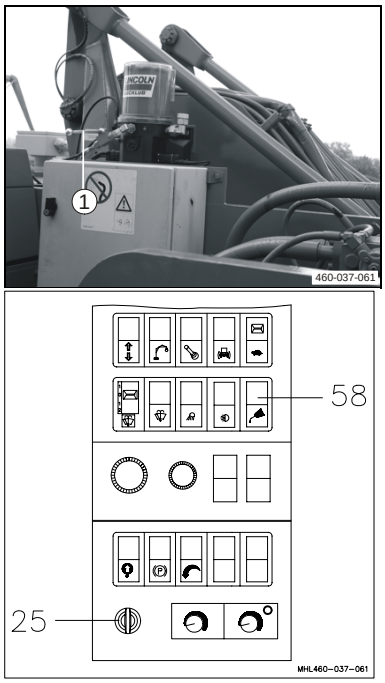


Fig. 61 Central lubrication system

7.4.1.3 Filling the grease container

Fill the grease container using the filler pump which is in the tool kit.

- To do so, insert an appropriate re-fill cartridge into the filler pump.
- Remove the protective plug (62/1).
- Screw the filler pump onto the gland with threat.
- Operate the filler pump (container has a capacity of approx. 3 kg of multi-purpose grease).

It is also possible to fill the container via the filler nipple (62/2) up to the "Max" mark.

For recommended types of grease, please refer to chapter 3.20 “Fuels, Lubricants and Coolants”.

! ATTENTION

If the lubricating system runs completely dry, you should add a few drops of oil before refilling it with grease. This will force the air out of the piston components.

! ATTENTION

Grease must be free from impurities and its viscosity shall not change over time. Grease additives, such as molybdenum disulfide, shall not be added.

! ATTENTION

Run the pump while filling. The lines are vented automatically up to the lubricating point.

After filling, it may be necessary to trigger additional lubrication (see chapter 7.4.1.3), in order to ensure that lines are fully vented.

7.4.1.4 Triggering additional lubrication

The operator may trigger additional lubrication at any time.

Additional lubrication is triggered as follows:

- Press the button (61/58) and hold for approx. 3 seconds. The indicator lamp lights up while lubrication takes place.

7.4.1.5 Lubrication when lubricating pump is defective

If the lubricating pump is damaged, the bearing points may be greased manually using the lubricating nipple (62/3) on the pump.

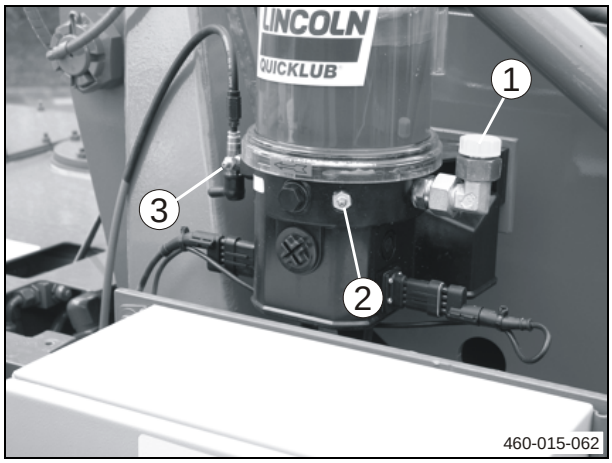


Fig. 62 Grease container

7.4.2 Central lubrication with central lubricating point (optional)

The machine can be optionally equipped with a central lubricating system on the undercarriage. A central lubricating point supplies all bearing points on the undercarriage with low-viscosity grease (see Overview of lubricating points).

The central lubrication system is operated by means of a grease gun via the lubricating point (63/1).

For recommended types of grease, please refer to chapter 3.20 “Fuels, Lubricants and Coolants“.

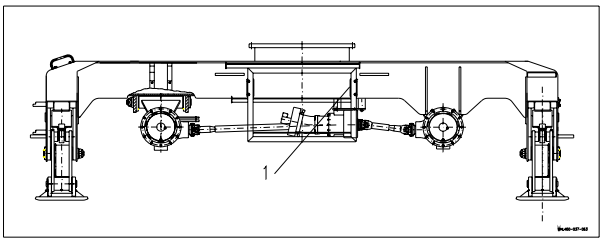


Fig. 63 Central lubricating point – undercarriage

! ATTENTION

Grease must be free from impurities and its viscosity shall not change over time. Grease additives, such as molybdenum disulfide, shall not be added.

7.4.3 Daily and weekly tasks

7.4.3.1 Daily tasks

Inspection and maintenance tasks to be performed by service personnel:

Area	Criterion	Test method	Test interval	Measure
Entire machine	Damage, missing equipment	Visual inspection	Daily	Replace equipment, have repairs made if necessary
Operator controls	Function	Function test	Daily	Have repairs made
Lighting, warning and indicator lamps	Function, insulation, faulty bulbs	Function test, visual inspection	Daily	Replace bulbs, have repairs made if necessary
Brakes	Function	Function test	Daily	Have repaired if necessary
Engine	Oil level, leaks	Visual inspection	Daily	If necessary refill oil, have repairs made if necessary
	Coolant level, leaks, cleanliness of cooling fins	Visual inspection	Daily	If necessary, top up with water + nitrite-, amine- and phosphate-free coolant (for composition, please refer to the engine manu-facturer's instructions) have repairs made and cooler cleaned, if necessary
Fuel tank	Fuel level, leaks	Visual inspection and visual check of tank indicator	Daily	If necessary refill tank, have repairs made if necessary
Water separator	Dirt and water level	Visual inspection via sight glass	Daily	If necessary drain water, have repairs made if necessary
Hydraulic system	Function, leaks	Visual inspection	Daily	Tighten couplings, replace hoses and lines, replace leaky hydraulic components
Hydraulic oil tank	Oil level, leaks	Visual inspection	Daily	If necessary refill oil, have repairs made if necessary
Manual lubricating points	Function, clean lubricant filling	—	Daily	Lubricate according to lubrication plan on pages 7.8 – 7.13, have repairs made if necessary

7.4.3.2 Weekly tasks

Area	Criterion	Test method	Test interval	Measure
Engine hood	Damage, functionality of pneumatic springs, heat insulation	Visual inspection and function test	Weekly	Replace if necessary
Air conditioning	Coolant filling level and functionality	Visual inspection using sight glass and function test	Weekly	Have repaired if necessary
Swing assembly	Fastening of hydraulic motor, transmission, ring gear	Check torque using torque wrench	Weekly	Retighten bolts
Wheels	Tightness of wheel nuts	Check torque using torque wrench	Weekly	Retighten wheel nuts
Axles, propeller shafts	Tightness of bolts	Check torque using torque wrench	Weekly	Retighten bolts
Manual lubricating points	Function, clean lubricant filling	—	Weekly	Lubricate according to lubrication plan on pages 7.8 – 7.13, have repairs made if necessary

7.5 Inspection plan

Work to be performed by trained dealer or service personnel.

O = Checking, maintenance X = Replace		**Operating hours**		
	Perform work with machine at operating temperature!	every 500	every 1000	min. 1 x yearly
1	Check whether machine-specific operating instructions is in the machine	**O**		**O**
2	Engine oil	**X**		**X**
3	Engine oil filter	**X**		**X**
4	Drain water from fuel tank	**O**		**O**
5	Flexible fuel lines (replace completely) [1)]		**O**	
6	Fuel filter		**X**	**X**
7	Fuel pre-filter component		**X**	**X**
8	Air filter pipe	**O**		**O**
9 *	Air filter		**X**	**X**
10	Clean cooling fins of engine and hydraulic oil radiators **The cleaning intervals should be shortened if there is high exposure to dust.**	**O**		**O**
11	Coolant antifreeze (AVIA, BASF, SHELL)			**O**
12	Change coolant [1)]	**O**		
13	V-belts (retension or replace if necessary) [1)]	**O**		
14	Engine mounts, pump attachments	**O**		**O**
15	Engine speed control/load limit sensing control	**O**		**O**
16	Exhaust system	**O**		**O**
17	Valve lash on the drive motor (adjust if necessary) [2)]			
18	Wheel nuts	**O**		**O**
19	Secure fastening of axles and propeller shafts	**O**		**O**
20	Tighten the fastening bolts on the counterweight (1,000 Nm)	**O**		**O**
21	Bearing of height-adjustable cab (see chapter 7.4)	**O**		**O**
22	Perfect function of door catches	**O**		**O**

1) At least every 2 years

2) Every 1500 operating hours

! ATTENTION

** A filter element is not considered dirty and has to be replaced until the contamination indicator responds once the hydraulic system has reached operating temperature and the signal comes up continuously.*

O = Checking, maintenance X = Replace		Operating hours		
	Perform work with machine at operating temperature!	every 500	every 1000	min. 1 x yearly
23	Function of brakes	**O**		**O**
24	Brake pads (service brake and parking brake)	**O**		**O**
25	Bleed service brake and parking brake (if necessary)	**O**		**O**
26	Adjust the play of the parking brake (if necessary)	**O**		**O**
27	Bearing bushings and bolts of work equipment	**O**		**O**
28	Electrical indicating and warning elements and lighting system	**O**		**O**
29	Ease of movement of operator controls	**O**		**O**
30	Check hydraulic axle lock and vent oscillating axle cylinders	**O**		**O**
31	Steering function	**O**		**O**
32	Condition and function of outriggers	**O**		**O**
33	Check tightness of all lines, hoses, control valves, hydr. pumps, cylinders, etc. **When tightening hose and line connections, the screw couplings must be locked to prevent rotation.**	**O**		**O**
34	Pump drive	**O**		**O**
35	Secure fastening of slewing ring attachment, swing gear, swing gear motor	**O**		**O**
36	Grease machine according to overview of lubricating points	**refer to chapter 7.4**		
37	Check function, condition and completeness of safety equipment	**O**		**O**
38	Hydraulic function check with pressure function test	**O**		**O**
39	Oil-immersed air filter heater (optional): oil change [3)]	**O**		**X**
40	Air filter / filter fleece (hot-water heating)	**O**		**X**
41	V-belt tension, generator	**O**		**O**
42	Check the condition, V-belt tension and filter of the air conditioning	**O**		**O**
43	Power shift gear: oil check or oil change	**X**		**X**
44	Swing gear: oil check or oil change	**X**		**X**
45	Hydraulic oil tank ventilation filter		**X**	**X**
46	Test run and test work	**O**		**O**
47	Initial inspection cards and return to FUCHS	**O**		

3) The intervals should be shortened if there is high exposure to dust.

O = Checking, maintenance X = Replace		Operating hours		
	Perform work with machine at operating temperature!	after 500	every 2000	min. 1 x yearly
48	Wheel hubs, front and rear axles: oil check or oil change	**X**	**X**	**X**
49	Differential, rear and front axles: oil check or oil change	**X**	**X**	**X**

O = Checking, maintenance X = Replace		Operating hours		
	Perform work with machine at operating temperature!	every 500	every 3000	min. 1 x yearly
50	Injection valves on diesel motor		**X**	
51	Check hydraulic oil, or oil change [4)]	**O**	**X**	**X**
52	Hydraulic oil return filter insert		**X**	**X**

4) Extension of the Hydraulic Oil Change Intervals
Change of the hydraulic oil depending on the oil sample analysis and the laboratory report. Oil sample interval as specified by test lab.

7.6 Inspection and maintenance work

7.6.1 Diesel engine

All inspection and maintenance work not contained here should be performed as described in the separately supplied diesel engine operating instructions.

7.6.2 Changing the engine oil

For information on the amount of engine oil to be filled in the case of an oil change and on recommended lubricating oils, please refer to chapters 3.19 – 3.20.

Change according to the inspection schedule, refer to chapter 7.5, for information on the oil analyses, please refer to chapter 7.1.1.

Oil change

- Bring the engine to operating temperature, lubricating oil temperature approx. 80 °C.
- Park the machine on level ground.
- Switch off the engine.
- Place suitable oil drip pan below the engine.

ATTENTION

Collect the oil, do not allow it to seep into the ground. ***Dispose of it properly!***

- Unscrew the protective cap from the valve (64/1).
- Screw the oil drain hose (64/2) onto the oil change valve (64/1) and drain the oil.

WARNING

Danger of scalding when hot oil is drained!

- Remove the oil drain hose (64/2) and screw the protective cap onto the valve (64/1).
- Replace the oil filter insert (see 7.6.3).
- Remove the cap (65/1).
- Fill with lubricating oil up to the "Max." mark on the oil dipstick.
- Close the cap (65/1).
- Start the engine and run at bottom-end idle for approx. 2 minutes.
- Switch off the engine.
- Check the oil level after approx. 15 minutes and top up oil if necessary.

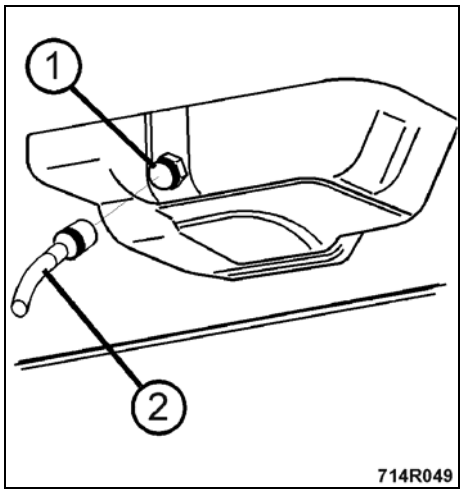


Fig. 64 Oil change valve

7.6.3 Engine oil filter

- The engine oil filter must be replaced every time the engine oil is changed.
- Clean the outside of the engine oil filter cartridge (65/2).
- Unscrew the engine oil filter cartridge (65/2) and dispose of in the proper manner.
- Clean the sealing area of the filter carrier.
- Wet the sealing ring of the new filter with oil.
- Screw in the engine oil filter cartridge by hand until the gasket of the engine oil filter cartridge touches the filter head.
- Turn the engine oil filter cartridge manually with one more half turn.
- **Start the engine only if the engine oil level is sufficient (refer to chapter 7.6.2).**
- Check the tightness of the engine oil filter cartridge.

7.6.4 Fuel system

7.6.4.1 Fuel filter

Change according to inspection plan, chapter 7.5.

- Thoroughly clean the outside of the fuel filter unit.
- Unscrew the fuel filter cartridge (65/3) (by possibly using a tightening strap wrench) and dispose of it according to regulations.
- Clean the sealing area of the filter carrier.
- Fill the fuel filter with fuel.
- Coat the seal on the fuel filter with fuel, and screw in by hand until the seal of the fuel filter cartridge touches the filter head.
- Turn the fuel filter cartridge with one more half turn.
- Check the tightness of the fuel filter cartridge.

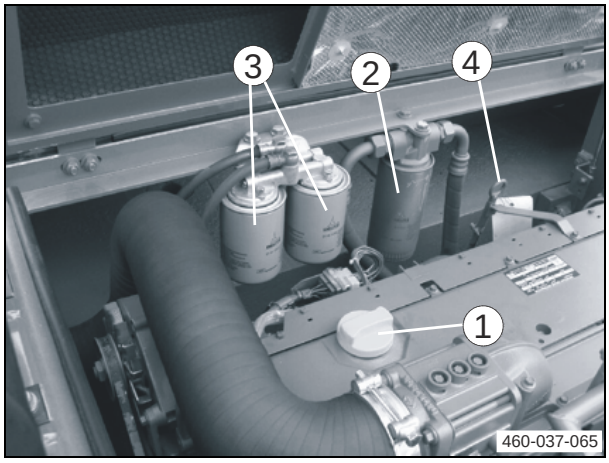


Fig. 65 Engine oil filter cartridge, fuel filter cartridges

7.6.4.2 Cleaning fuel pre-filter with integrated filter element

Maintenance according to inspection plan, chapter 7.5.

ATTENTION

All maintenance work on the fuel pre-filter must be carried out with the ***engine off.***

- Switch off the engine.
- Open the filter cover bleeder screw (66/1).
- Open the drain valve (66/2), collect any dirt and water in an appropriate container and dispose of according to regulations.
- Close the drain valve (66/2).
- Vent the fuel pre-filter using the hand pump (66/6).
- Operate the hand pump (66/6) until fuel free of bubbles escapes from the open fuel pre-filter cover bleeder screw (66/1). Collect the escaping fuel and dispose of according to regulations.
- Close the vent plug (66/1).

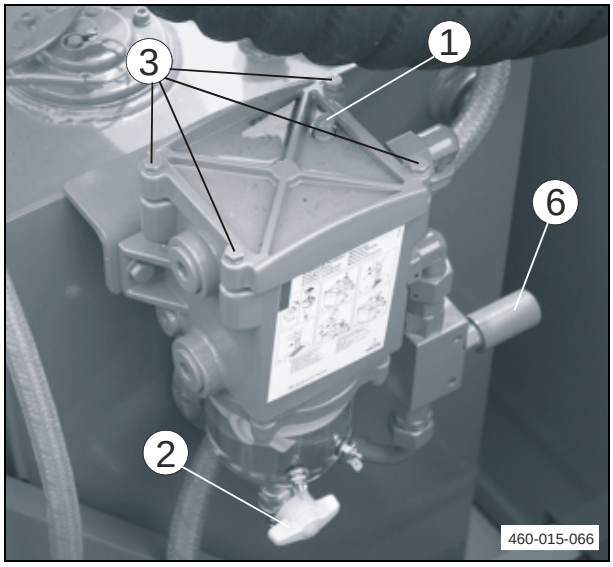


Fig. 66 Fuel pre-filter

7.6.4.3 Replacing fuel pre-filter with integrated filter element

Change according to inspection plan, chapter 7.5.

! ATTENTION

All maintenance work on the fuel pre-filter must be carried out with the ***engine off.***

! ATTENTION

Function of drain valve: press control knob towards the valve body, then turn.

- Switch off the engine.
- Open the filter cover bleeder screw (66/1).
- Open the drain valve (66/2), collect any dirt and water in an appropriate container and dispose of according to regulations. **The volume of fluid to be disposed of should not exceed 0.5 – 1.0 liters.**
- Close the drain valve (66/2).
- Unscrew the filter cover screws (66/3).
- Remove the filter cover.
- Take out the spring cassette (67/4).
- Take out the filter element (67/5) by the bracket.
- Insert the new filter element.
- Place the cassette (67/4) onto the new filter element.
- Check the filter cover gasket, replace if necessary. Insert the gasket in the filter cover observing the correct seat.
- Re-mount the filter cover. Tighten screws crosswise.
- Vent the fuel pre-filter as described in chapter 7.6.4.2.
- After starting the engine, check the tightness of the fuel pre-filter.

! ATTENTION

The starter is not to be operated longer than max. 20 seconds.

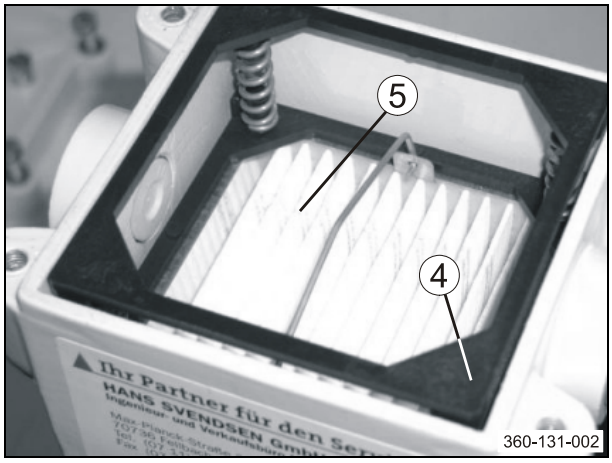


Fig. 67 Fuel pre-filter

7.6.4.4 Draining water from the fuel system

Maintenance according to inspection plan, chapter 7.5.

Water must be drained from the fuel system through the fuel tank and the fuel pre-filter.

ATTENTION

Collect the fuel-water mixture in a suitable container.

Fuel tank

- Drain water from the fuel tank via the drain valve (68/1).
- Screw the drain hose onto the drain valve and drain water. As soon as fuel instead of water escapes tighten drain valve.

Fuel pre-filter

- Open the drain valve (66/2) once a week and observe the escaping fluid. Once fuel instead of water escapes, close the drain valve.

7.6.4.5 Venting the fuel system

- Operate the hand pump (66/6) until fuel free of bubbles escapes from the open fuel pre-filter cover bleeder screw (66/1). Collect the escaping fuel and dispose of according to regulations.
- Re-tighten the vent plug (66/1) (tightening torque 25 Nm).

ATTENTION

If the engine has not started after max. 30 sec., turn the ignition key to pos. "I" or "0", and pause for at least 30 sec. before trying again. Repeat the start-up procedure.

CAUTION

Do not drive the engine at full throttle right away. Drive with restraint until the engine reaches operating temperature.

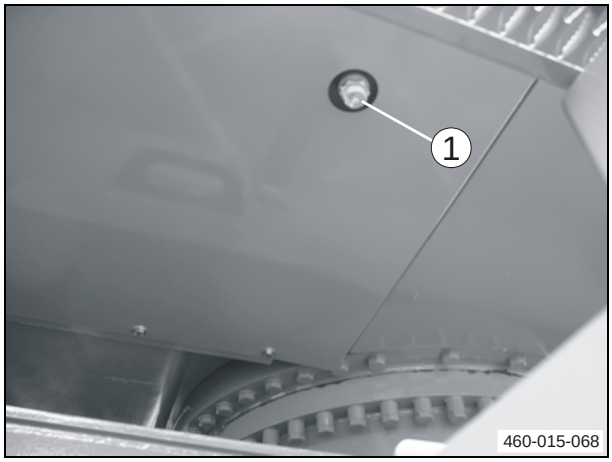


Fig. 68 Drain valve

7.6.5 Air filter, air filter pipe

CAUTION

All maintenance work on the air intake system must be carried out with the engine off! Do not start the engine while the main cartridge and safety cartridge is removed.

ATTENTION

Before replacing the air filter, the suitable equipment to this purpose (e.g. a pedestal) has to be provided.

7.6.5.1 Air filter pipe

- Check the air filter attachment.
- Check the tightness of the air filter pipe section after the air filter. Examine rubber parts for damage. Replace defective parts immediately.
- Empty the dust collector and clean.

The air filter must be serviced as soon as the indicator lamp (69/41) on the operator control panel lights up continuously. This lamp may light up briefly, but this is unimportant and is mostly due to the engine speed being increased too quickly.

Furthermore, a clogged filter makes itself noticeable through smoky exhaust fumes and perceptibly lower engine power.

7.6.5.2 Removing and installing the main cartridge

- Loosen the mounting brackets (70/1) of the dust collector (70/2) and remove it.
- Remove the cover (71/2), clean the dust collector and re-fit the cover (71/2).
- Unscrew hexagon nut (71/1) and withdraw the main cartridge for the purpose of cleaning.

The main cartridge is installed in the same manner but in reverse order.

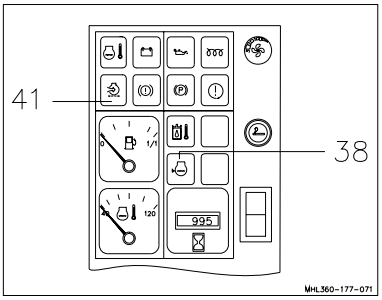


Fig. 69 Air filter indicator lamp

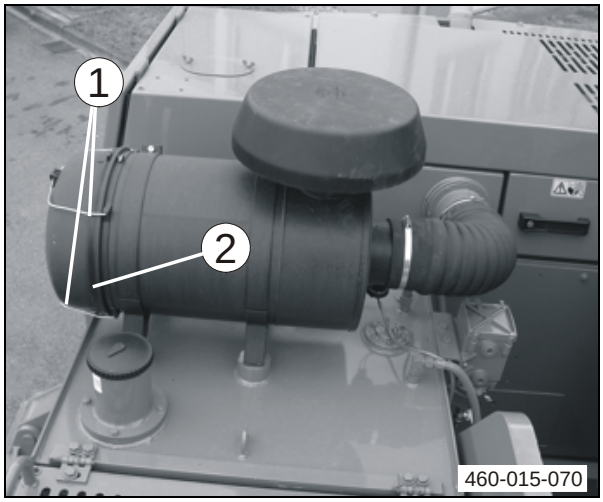


Fig. 70 Dust collector

Fig. 71 Filter replacement

7.6.5.3 Cleaning the main cartridge

ATTENTION

Only blow out, never wash or brush out the main cartridge. When blowing out, take care to ensure that dust does not land on the inside of the main cartridge.

The main cartridge can be cleaned up to 5x if necessary. The main cartridge must be replaced once it reaches its maximum service life of one year, at the latest. A note must be made of the number of times it is cleaned.

For cleaning, a pipe the end of which is bent at 90° should be attached to the compressed-air pistol. It must be sufficiently long to reach the floor of the cartridge. Blow out the main cartridge from the inside to the outside with dry compressed air (max. 5 bar) by moving the pipe up and down in the cartridge. Continue until no more dust escapes (fig. 72).

Check the clean main cartridge for damage to the paper bellows and rubber seals. Tears and perforations in the paper bellows can be determined using a torch.

ATTENTION

Never continue to use a damaged main cartridge. If in doubt, use a new one.

The main cartridge must be installed in reverse order to removal, see chapter 7.6.5.2.

7.6.5.4 Removing the safety cartridge

The safety cartridge is in the main cartridge.

ATTENTION

Do not clean the safety cartridge and do not use it again.

- Remove the main cartridge.
- The safety cartridge is removed in the same manner as the main cartridge.
- Insert a new safety cartridge.
- Re-assemble the safety cartridge in reverse order.

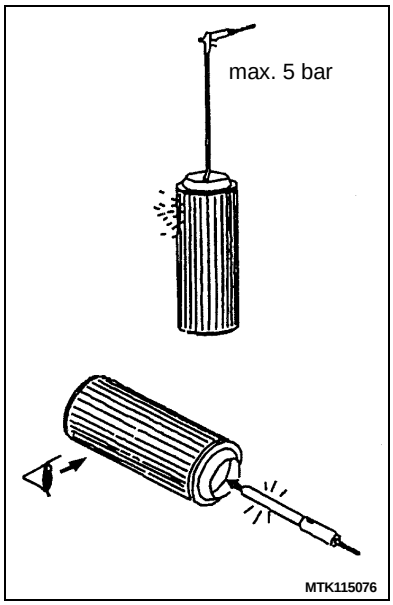


Fig. 72 Cleaning the main cartridge

7.6.6 Cooling system

The machine has separate radiators for engine cooling and hydraulic oil.

7.6.6.1 Cleaning the radiator

WARNING

The radiator shall only be maintained and cleaned when the engine is not running.

Maintenance according to inspection plan, chapter 7.5.

ATTENTION

Dirt accumulation in radiators causes the engine and/or the hydraulic oil to overheat.

- Clean both radiators (engine and hydraulics) from the outlet side with compressed air.
- Blow out the engine with compressed air.
- Remove any dirt.

7.6.6.2 Change coolant (combined water-charge air cooler)

Change according to inspection plan, chapter 7.5.

WARNING

All work on the cooling system (e.g. opening the cooler cap, removing hoses) is only to be carried out when the engine and the coolant have cooled down. Risk of scalding from hot coolant!

ATTENTION

Collect the coolant that is drained out. Do not allow it to seep into the ground. ***Dispose of it properly!***

- Park the machine on level ground.
- Remove the radiator cap.
- Unscrew the water drain plug (74/1) on the cylinder block and drain coolant.
- Remove the lower water hose on the radiator and dispose of the coolant in an environmentally proper manner.
- Screw the drain plug back on to the engine and re-fit the water hose.
- Release the vent plug (73/1) by 2 turns.
- Fill the cooling system with coolant (see "Filling quantities", chapter 3.19 and chapter 7.3.3.2). Close the cap and tighten the vent plug (73/1).
- Start the engine and bring to operating temperature.
- Turn off the engine and allow to cool down.
- Check the coolant level and top up (several times, if necessary).
- Check the tightness of the cooling system.

If the coolant level is too low, the indicator lamp (69/38) lights up.

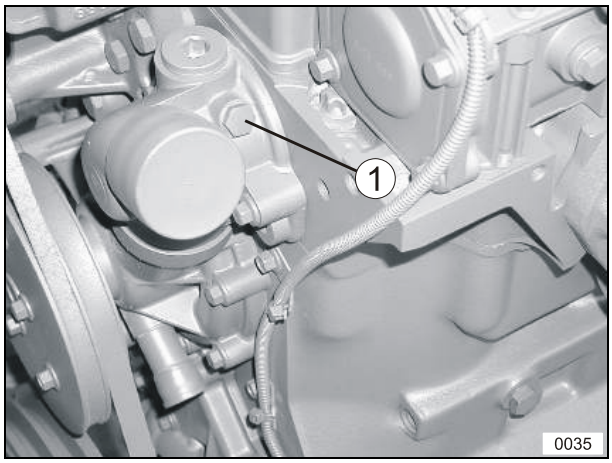


Fig. 73 Vent plug

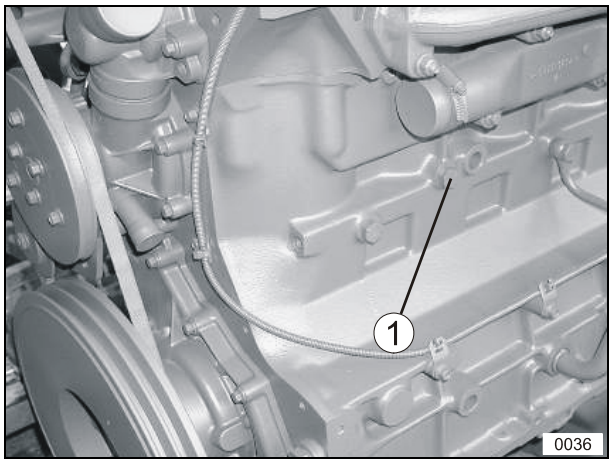


Fig. 74 Coolant drain

7.6.7 Checking V-belts

Maintenance according to inspection plan, chapter 7.5.

! ATTENTION

Worn or damaged V-belts must be replaced immediately.

To check the tension, press the V-belt in the middle of the greatest free length with your thumb and measure the sag. Using medium thumb pressure of approx. 45 N, the V-belt sag should equal 10 mm.

If a V-belt shows cracks or if it is dirtied by oil, coolant, grease and the like, it must be replaced.

7.6.7.1 Tightening the V-belt (generator)

- Loosen the adjusting screw (75/1) (do not screw out completely).
- Loosen the screws (75/2); do not unscrew completely.
- With the aid of a suitable tool, e.g. a ½" square, rotate the generator until the belt tension is correct.
- Re-tighten the screws (75/1) and (75/2).

7.6.7.2 Changing the V-belt (generator)

- Loosen the adjusting screw (75/1) (do not screw out completely).
- Loosen the screws (75/2); do not unscrew completely.
- Swivel the generator until the V-belt can be removed.
- Fit new V-belt.
- Tension the V-belt as described in chapter 7.6.7.1.

! ATTENTION

If a new V-belt is mounted, it should be checked for tension after the first 15 minutes and adjusted if necessary.

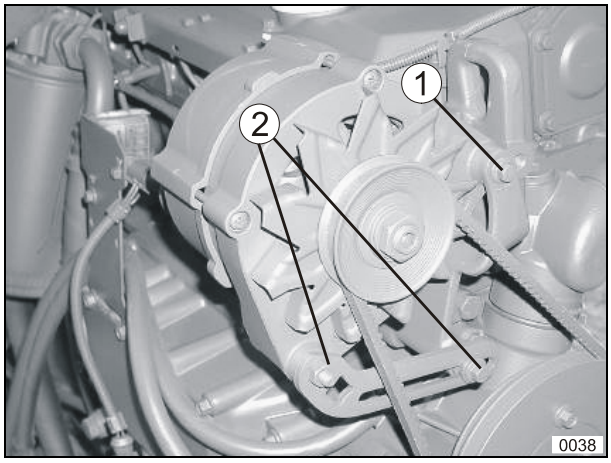


Fig. 75 V-belt for generator

7.6.7.3 Tensioning V-belts (water/fuel pump)

- Loosen the screws (76/1) and (76/2).
- Push the fuel pump (76/3) in the direction of arrow until the V-belt tension is correct.
- Tighten the screws (76/1) and (76/2).

7.6.7.4 Replacing V-belts (water/fuel pump)

- Loosen the screws (76/1) and (76/2).
- Push the fuel pump (76/3) in opposite direction of arrow until the V-belt can be removed.
- Fit new V-belt.
- Move the fuel pump (76/3) in the direction of the arrow with a suitable tool, for example a ½" square, until the tension on the V-belt is correct.
- Tighten the screws (76/1) and (76/2).

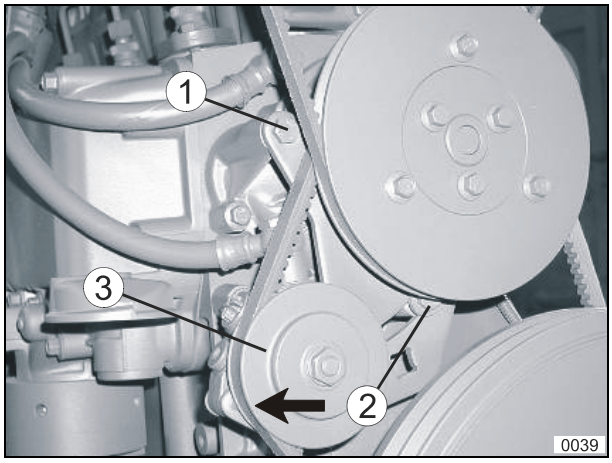


Fig. 76 V-belt (water/fuel pump)

7.6.8 Checking and adjusting the valve lash

Maintenance according to inspection plan, chapter 7.5.

The valve lash is tested according to the operating instructions provided by the engine manufacturer and adjusted if necessary.

7.6.9 Battery

! ATTENTION

Before installing or removing the battery, the electric circuit must be interrupted by means of the battery disconnect switch.

! ATTENTION

The instructions of the battery manufacturer must be observed when using the battery for the first time.

Removing the battery

- Disconnect first the negative then the positive cable.
- Remove the fastening bracket and lift out the battery.

Installing the battery

- Insert the battery.
- Connect first the positive then the negative cable.

! ATTENTION

Ensure that the negative terminal is attached to the negative pole (-) and the positive terminal to the positive pole (+).

In winter, in particular, the battery charge should be closely monitored.

7.6.10 Vent the pilot control

The pilot control must be vented if the pilot control lubricant circuit has been opened during maintenance or repair work.

The pilot control is vented via the venting outlets (measuring connections) positioned on the control caps of the valves on the control valve block and on the control caps of the valves on the torque motor.

7.6.11 Bleeding the brake

Maintenance and inspection plan, chapter 7.5.

! ATTENTION

Collect the oil, do not allow it to seep into the ground. ***Dispose of it properly!***

- Run the engine at medium speed.
- Apply the parking brake!
- Press the service brake pedal and lock in place.
- Remove the cap on the ventilation valve (77/1) and fit suitable hose.
- Direct the hose into a container.
- Slightly loosen the ventilation valve using a key (W/F 9) and keep open until hydraulic oil escapes in the container without bubbles.
- Tighten the ventilation valve and re-fit dust cap.
- Bleed the other three brakes as described.

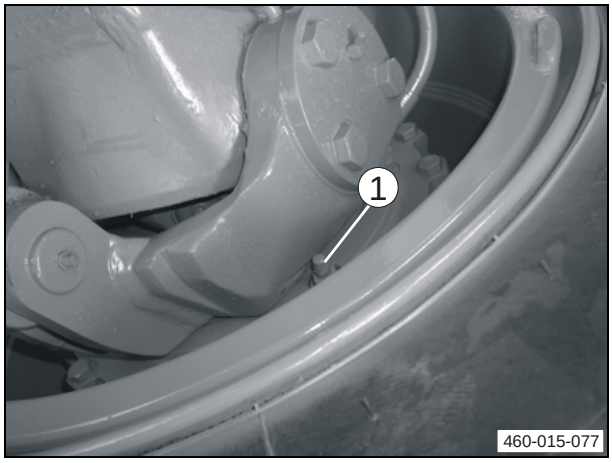


Fig. 77 Brake

7.6.12 Venting the oscillating axle cylinders

ATTENTION

Collect the oil, do not allow it to seep into the ground. ***Dispose of it properly!***

- The oscillating axle is not to be locked; indicator lamp (78/55) lights up.
- Jack up the machine so that the wheels of the oscillating axle are off the ground.
- Engage the service brake (78/8).
- Release the parking brake (78/27).
- Run the engine at medium speed.
- Open the vent plugs (79/1) one after the other, until there are no bubbles in the escaping hydraulic oil.
- Close the vent plugs.

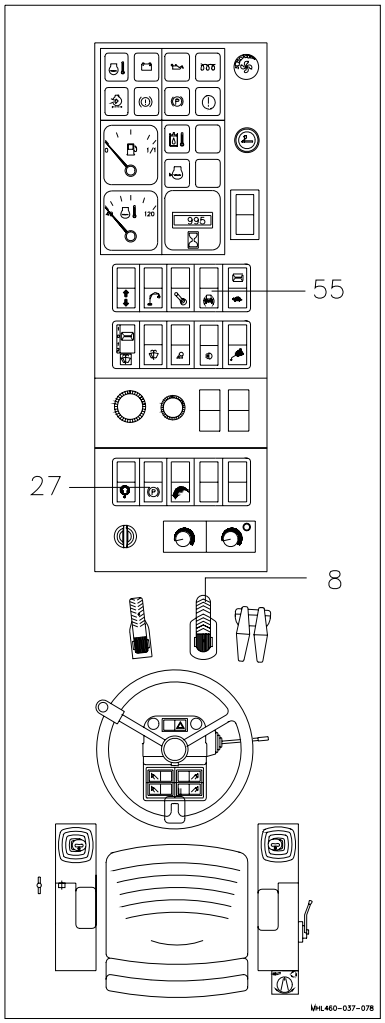


Fig. 78 Oscillating axle lock

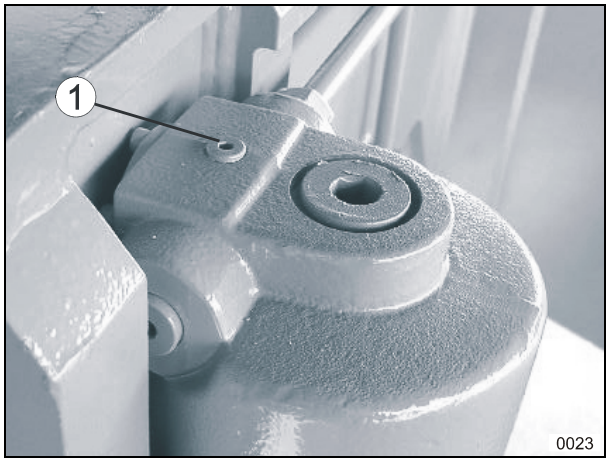


Fig. 79 Oscillating axle cylinder bleeder screw

7.6.13 Hydraulic oil

For hydraulic oil filling quantities and specifications refer to chapters 3.19 and 3.20.

Change according to the inspection schedule, refer to chapter 7.5, for information on the oil analyses, please refer to chapter 7.1.1.

7.6.13.1 Changing the hydraulic oil

! ATTENTION

Change the hydraulic oil at operating temperature

! ATTENTION

Collect the oil, do not allow it to seep into the ground. ***Dispose of it properly!***

! ATTENTION

Before filling in hydraulic oil the appropriate preparations for the work to be done must be made (e.g. a pedestal).

- Retract all hydraulic cylinders.
- Switch off the diesel engine.
- Unscrew the ventilation filter (81/1).
- Open the covers (81/2) of the return filters and remove the complete filter assemblies.
- Unscrew the cap (80/1) of the drain valve. Before unscrewing the cap (80/1), the cover must previously have been removed.
- Insert the oil drain hose (included in the tool set) into a collecting pan before it is screwed on.
- Screw on the oil drain hose.
- Flush and clean the hydraulic tank as required.
- Unscrew the oil drain hose and seal the drain valve with the cap.
- Fill up with clean hydraulic oil via the openings of the return filters (81/2).
- Screw in the ventilation filter (81/1).
- Close the covers (81/2) of the return filters and install the complete filter assembly.

7.6.13.2 Hydraulic oil tank ventilation filter

Change according to inspection plan, chapter 7.5.

Remove the ventilation filter (81/1), replace it with a new one and tighten by hand.

! ATTENTION

Replace the ventilation filter if the cap is dirty, e.g. due to overfoaming hydraulic oil.

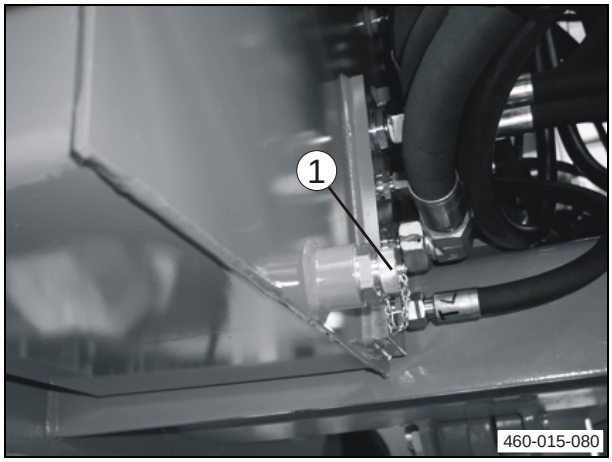


Fig. 80 Cap

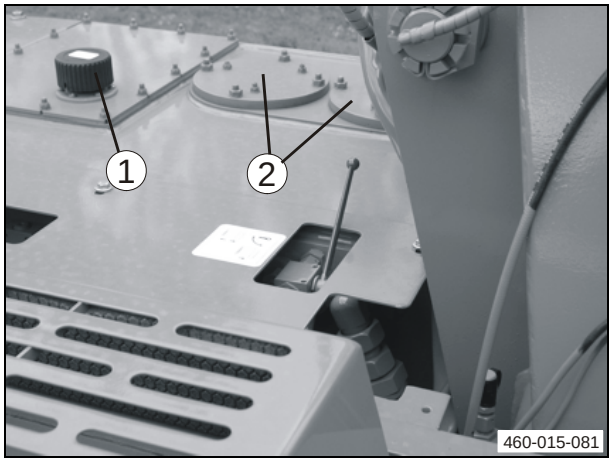


Fig. 81 Filter cover

7.6.13.3 Hydraulic oil return filter

Change according to inspection plan, chapter 7.5.

Replacing the return filter

! ATTENTION

Before replacing the filter insert, the suitable equipment to this purpose (e.g. a pedestal) has to be provided.

The way how to proceed applies to both return filters!

The filter element (83/2) (Exapor) cannot be cleaned.

The return filter must be replaced as soon as the indicator lamp (82/41) on the operator control panel lights up continuously. This lamp may light up briefly.

- Remove the cover (83/1) of the return filter.
- Remove the complete return filter from the tank by the bracket (83/6).
- Place an open-jaw wrench on the hex head (83/5) and push a rod through the bracket (83/6). Release the screen element (83/7) from the return filter (83/2) by turning.

! ATTENTION

The screen element (83/7) must be cleaned as described below every time the filter element is changed!

- Unscrew the screen element (83/7) and clean with a neutral detergent.
- Using a compressed-air pistol, blow out from the outside to the inside.
- Screw the new filter element on the cleaned screen element.
- Ensure that the seal between the screen element and filter element is lying flat.
- Clean the O-ring (83/3) between the hydraulic tank and the return filter cover.
- Check the O-ring (83/4) and replace if necessary.
- Insert the new return filter in the tank with the O-ring.
- Fasten the cover of the return filter to the tank with the O-ring.

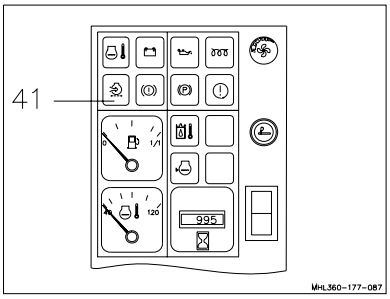


Fig. 82 Indicator lamp for contaminated return filter

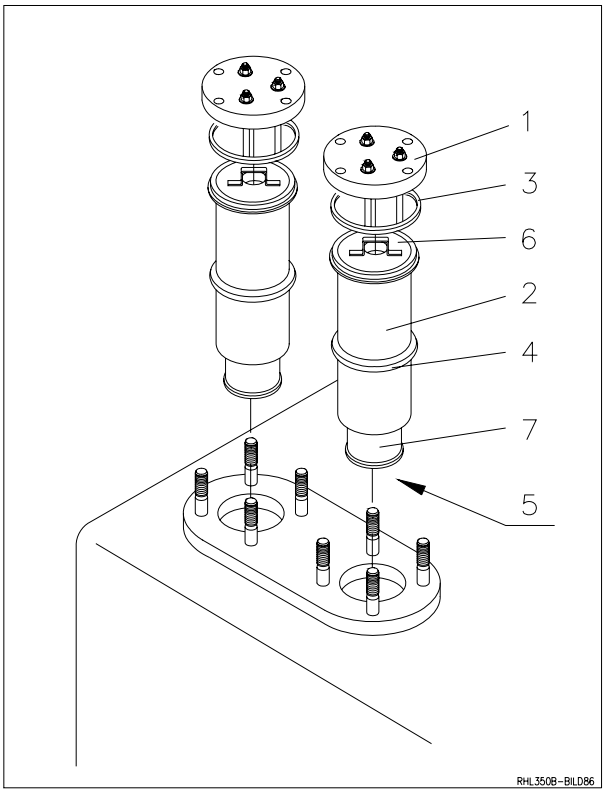


Fig. 83 Return filters

7.6.13.4 Blocking off the hydraulic oil on the tank

To enable repairs to the intake line, the hydraulic pump or the hydraulic lines to be undertaken without having to drain the oil from the tank, the oil supply line to the main pumps can be blocked off.

- Remove the fillister-head screws (84/1) on the retaining fixture.
- Remove the retaining fixture (84/2).
- The square is turned 90° using a fork wrench from the open position (85/1) to the shut-off position (85/2).

! ATTENTION

The marking on the end face of the square must lie across the passage.

! ATTENTION

When repair work is complete, it is essential to turn back the square to the open position (85/1) before the engine is switched on.

- Fasten the retaining fixture (84/2) once more with the fillister-head screws (84/1).

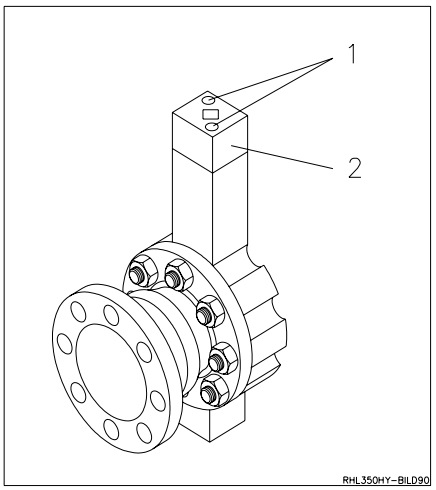


Fig. 84 Blocking off the hydraulic oil

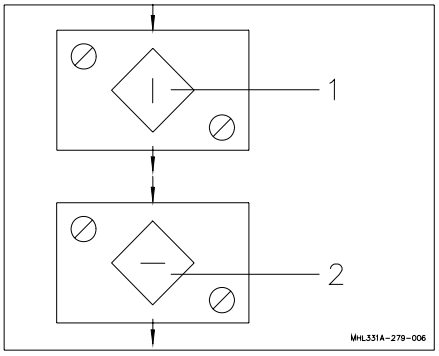


Fig. 85 Direction of flow

7.6.14 Changing axle and transmission oil

For oil filling quantities and specifications, please refer to chapters 3.19 and 3.20.

Change according to the inspection schedule, refer to chapter 7.5, for information on the oil analyses, please refer to chapter 7.1.1.

The axle oil must be changed at operating temperature.

! ATTENTION

Collect the oil, do not allow it to seep into the ground. ***Dispose of it properly!***

! ATTENTION

After filling the axles with oil, move the machine for approx. 5 minutes in order to ensure that the oil is distributed. Check the oil level again and top up if necessary.

7.6.14.1 Front axle differential

! ATTENTION

The wheel hubs and axle casings (differentials) of the steering axle have separate oil chambers.

- Park the machine on level ground.
- Apply the parking brake.
- Open the checking and filler plug (86/1).
- Open the drain plug (86/2) and drain the oil.
- Purge the axle if necessary.
- Carefully close the drain plug.
- Pour in oil.
- Carefully close the checking and filler plug.

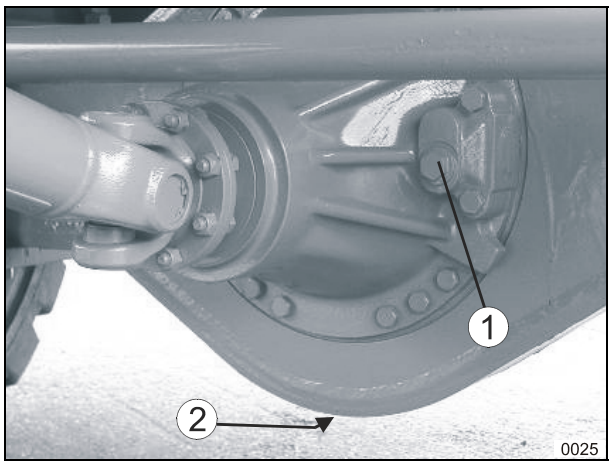


Fig. 86 Front axle differential

7.6.14.2 Rear axle differential

- Park the machine on level ground.
- Apply the parking brake.
- Open the checking and filler plug (87/1).
- Open the drain plug (87/2) and drain the oil.
- Purge the axle if necessary.
- Carefully close the drain plug.
- Pour in oil.
- Carefully close the checking and filler plug.

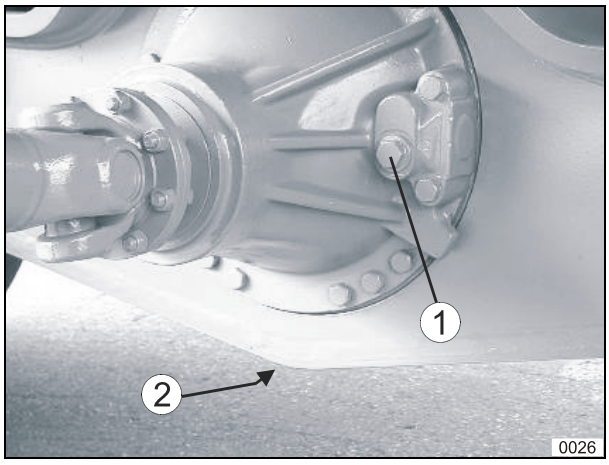


Fig. 87 Rear axle differential

7.6.14.3 Wheel hubs

ATTENTION

The wheel hubs and axle casings (differentials) have separate oil chambers.

- Turn the wheel until the drain plug (88/2) is at the bottom.
- Open the checking and filler plug (88/1).
- Open the drain plug and drain the oil.
- Purge as required.
- Carefully close the drain plug.
- Fill in oil via the checking and filler plug (88/1).
- Close the screw plug carefully.

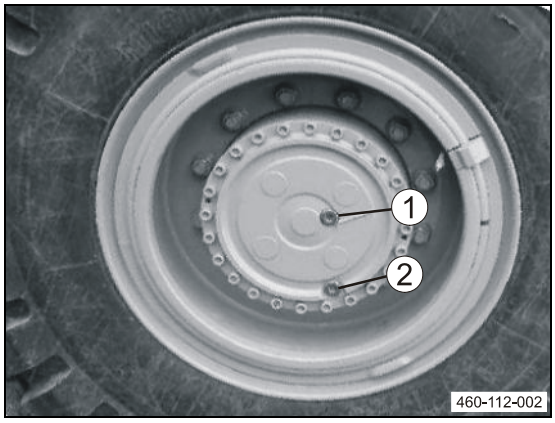


Fig. 88 Wheel hubs

7.6.14.4 Power shift gear

- Park the machine on level ground.
- Open the checking and filler plug (89/1).
- Open the drain plug (89/2) and drain the oil.
- Purge as required.
- Carefully close the drain plug.
- Pour in oil.
- Carefully close the checking and filler plug.

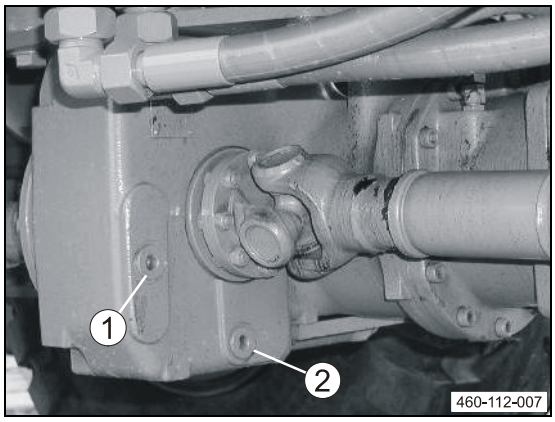


Fig. 89 Power shift gear

7.6.15 Swing gear

- Park the machine on level ground.
- Unscrew the cap on the oil filler neck (90/2).
- Remove the cover (90/4).
- Remove the hose (90/3) through the service opening.
- Open the drain valve on the hose (90/3) and drain the oil.
- Carefully close the drain valve and re-position the hose.
- Re-fit the cover (90/4).
- Pour in oil.
- Check the oil level using the oil dipstick (90/1).
- Carefully close the oil filler neck (90/2) with the cap.

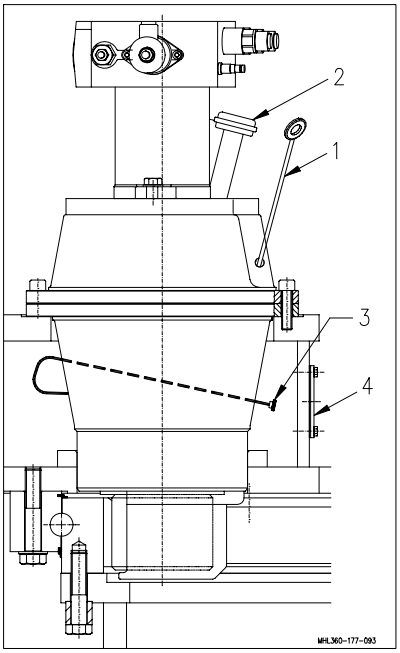


Fig. 90 Swing gear

7.6.16 Tightening torques

! ATTENTION

Contact faces of bolt heads must be of bright metal.

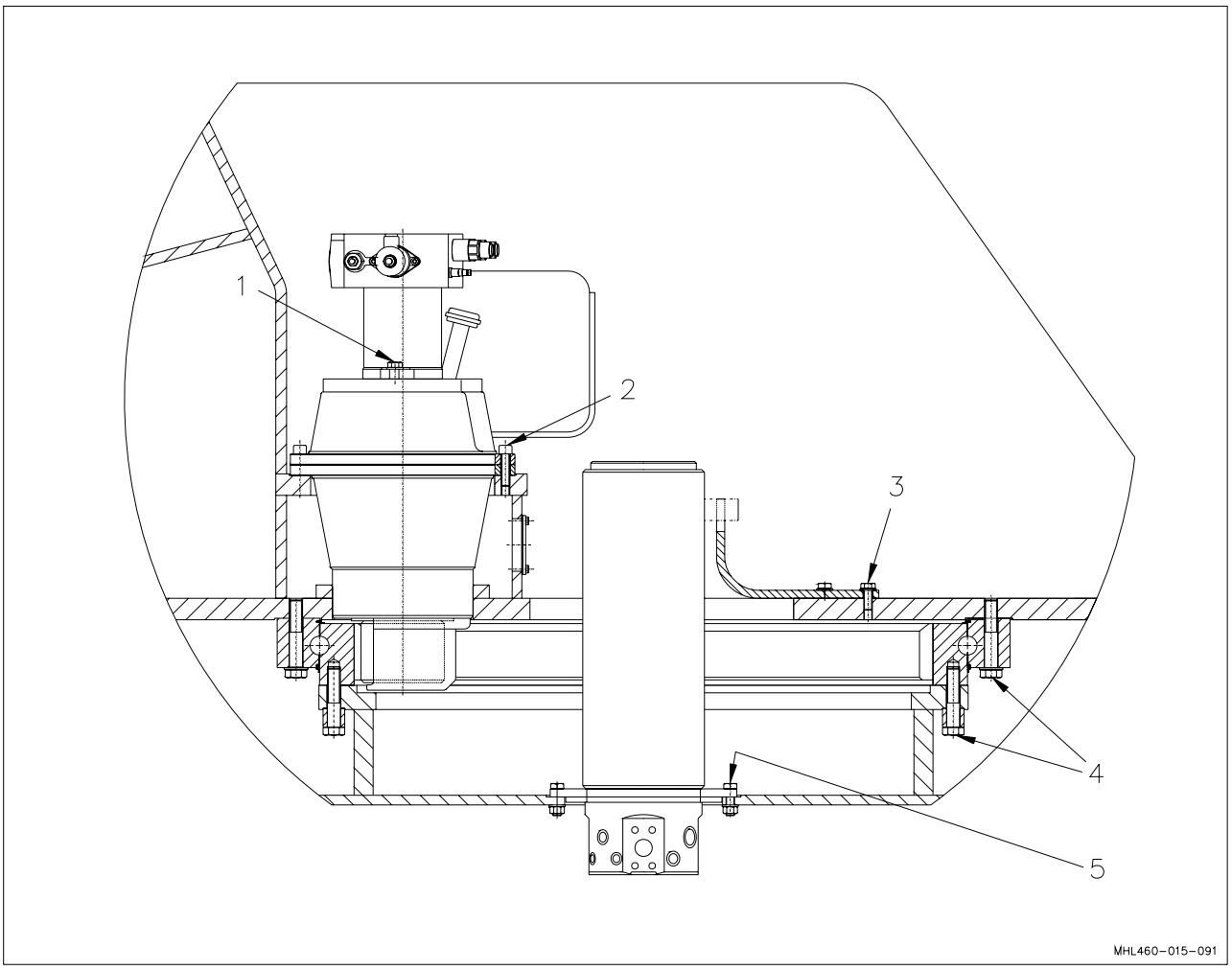


Fig. 91 Tightening torques

Item No.	Tightening torque
1	195 Nm
2	195 Nm
3	195 Nm
4	1070 Nm
5	195 Nm

Tightening torque of counterweight screws: 1000 Nm

! ATTENTION

Check the tightening torque of the counterweight screws after 100 operating hours and then every 500 operating hours.

7.7 Care and cleaning

- The machine must be cleaned on a suitable surface with an oil separator.
- A steam-jet appliance shall not be used for cleaning during the first two months after the machine is used for the first time or when newly painted.
- Do not use aggressive detergents for cleaning the machine. We recommend using commercially available cleaning agents for passenger cars.
- When cleaning with a steam-jet appliance, the hot water jet must not exceed 80 °C and a spray pressure of 20 bar. The nozzle must be at a minimum distance of 30 cm from the machine.
- The slewing ring of the machine must **not** be cleaned with a high-pressure or steam-jet cleaner, as this would damage the seals.
- Linings (insulating materials, etc.) shall not be exposed directly to water, steam or high-pressure jets.
- When cleaning with water or steam jets, take care not to spray electrical components such as solenoid valves and pressure switches with water. The water jet shall not be positioned into the opening of the exhaust and air filter.
- If cleaning the engine with water or steam jets, do not expose sensitive engine parts, such as generator, cabling, oil pressure switch, etc. directly to the jet.
- Remove foreign objects from the tires.
- After each wet clean, the machine must be lubricated in accordance with the lubrication plan. In the case of machines with central lubricating system, three lubricating processes must be manually triggered. To activate manual lubrication, please read chapter 7.4.1.3, "Trigger additional lubrication".
- After each wet clean, all work cycles and travel functions must be performed.

7.8 Preservation (temporary shutdown)

In order to prevent damage (corrosion, etc.) from storage during shutdown periods over three months, certain preservation measures must be taken:

- We recommend keeping the machine in a dry, dust-free room during the storage period.
- Clean the inside and outside of the machine thoroughly, including the engine.
- Lubricate the machine according to the lubrication plan.
- Check the oil levels of all assemblies such as axles, transmissions, etc. and top up if necessary.
- Check the hydraulic oil level and top up if necessary.
- Repair paint damages.
- Fill the diesel tank completely, in order to prevent corrosion of the tank walls.
- Check the antifreeze level in the coolant and adjust if necessary.
- Perform all the preservation measures contained in the diesel engine operating instructions.
- Treat bare piston rods with a commercially available anti-corrosion agent.
- Remove and clean the battery and store it as specified in a dry – in winter, frost-proof – room. Coat connections with a little pole grease.
- Seal off the air intake opening of the air filter system and the exhaust pipe opening.

7.8.1 During shutdown

When the machine is out of use for 6 months, after this time all assemblies must be brought to operating temperature and maneuvered for approx. 15 minutes. Beforehand, the anti-corrosion coat must be removed from the piston rods, and the openings of the air filter system and the exhaust pipe freed. After the maneuvering cycle, preserve the machine once more as previously described.

7.8.2 After shutdown

- Before putting the machine into operation once more, the anti-corrosion coat must be cleaned from the piston rods. The openings of the air filter and exhaust pipe must be freed. Clean the machine with a neutral detergent (see chapter 7.7).
- Check and install the battery.
- Carry out all measures for putting the diesel engine back into operation stated in the engine operating instructions.
- If the machine has been out of use for more than 6 months, the oil in assemblies such as axles, transmissions, etc. must be changed.
- Lubricate the machine according to the lubrication plan.

8 Trouble-shooting

8.1 General

Malfunctions are often the result of incorrect handling of the machine, the use of unsuitable fuels, lubricants and coolants, or irregular maintenance.

The following table presents a summary of a range of problems and their probable causes.

If a problem can only be eliminated through repair, then the responsible **Service Agent** must be called in.

All defects and faults in the diesel engine must be examined as described in the separate engine operating instructions.

During the warranty period, malfunctions must be dealt with by the responsible **Service Agent** or a specialist workshop.

8.2 Lowering the work equipment when the engine has shut down

If the diesel engine shuts down, lower the work equipment by means of the four-way control levers (see chapter 5.1.1 "Operation of work equipment") using the available pilot pressure. The ignition must be switched on.

8.3 Malfunctions in central electric system

The fuse protection of the electric circuits and relays are located in the central electric system (92/1) which is in the service section.

In case of malfunction, check the fuses. If they operate correctly, contact your Customer Service. Assignment of fuses see appendix, chapter 9.

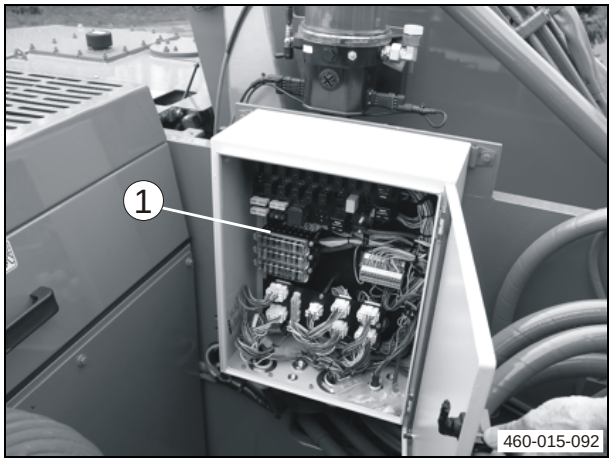


Fig. 92 Central electric system

8.4 Malfunction in load limit sensing control

Operating faults are displayed by means of a warning light (93/49) in the control console. When the engine is running, the warning light (93/49) must be off. If it is lit or if a flashing code is displayed, there is a fault present. You can determine the error code by counting the flash interval of the warning light (93/49). Please inform your Service Agent about this trouble code.

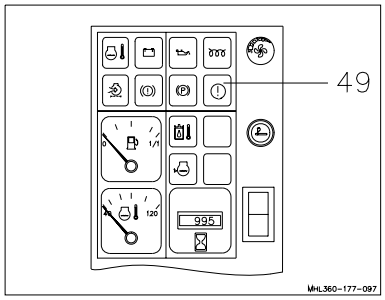


Fig. 93 Warning light for load limit sensing control

8.4.1 Bypassing the load limit sensing control

In order to ensure that the engine continues to operate in the event of control malfunctions, the control can be disconnected. **During this emergency service, the machine's use is limited.**

CAUTION

As long as load limit sensing control is deactivated, the machine may only be moved briefly; otherwise damage to the engine may occur.

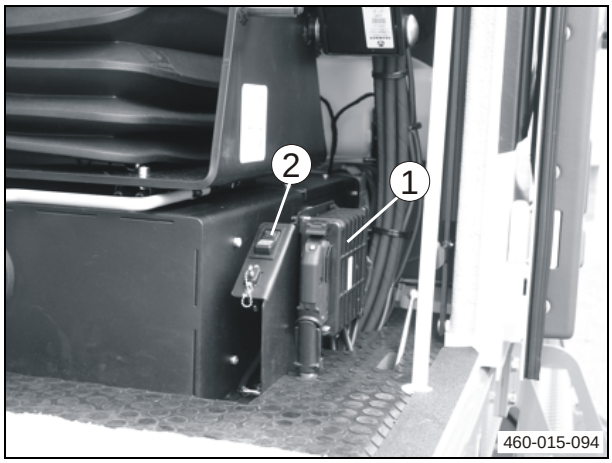


Fig. 94 Bypass switch load limit control

- Stop the engine and switch off the ignition.
- Open the battery disconnect switch (disconnect). The battery disconnect switch of the machine is located on the diesel tank.
- Switch off load limit sensing control by pressing the switch (94/2) next to the load limit sensing control box (94/1). The indicator lamp in the switch (94/2) and the warning light (93/49) light up (with ignition switched on).
- Close the battery disconnect switch.
- Start the engine.

The engine now runs at full throttle. There is no control of the hydraulic pump. An overload of the diesel engine by the hydraulics is possible, and may result in bringing the engine to a stop! Turning the engine off and on a number of times at full speed may result in damage to the engine!

8.4.2 Activating the load limit sensing control

Once the malfunctions in load limit sensing control have been remedied, the deactivation must be undone and load limit sensing control re-activated.

- Stop the engine and switch off the ignition.
- Open the battery disconnect switch (disconnect). The battery disconnect switch of the machine is located on the diesel tank.
- Switch on the load limit sensing control by pressing the switch (94/2) next to the load limit sensing control box (94/1). The indicator lamp in the switch (94/2) and the warning light (93/49) do not light up (with ignition switched on).
- Close the battery disconnect switch.
- Start the engine.

The system is working without any faults if the warning light (93/49) goes out while the engine is running.

Fault	Possible cause	Remedy
8.5 No steering		
1	Oil supply to pump interrupted	Check suction line and repair
2	Hydraulic pump defective	Remedy fault (by specialist)
3	Steering control unit / steering valve defective	Remedy fault (by specialist)
4	Priority valve defective	Remedy fault (by specialist)
5	Steering cylinders defective	Repair, replace
8.6 No brake pressure		
1	Oil supply to pump interrupted	Check suction line and repair
2	Hydraulic pump defective	Remedy fault (by specialist)
3	Shut-off valve in the compact brake block defective	Remedy fault (by specialist)
8.7 Insufficient braking power		
1	Foot-brake valve defective	Remedy fault (by specialist)
2	Oil loss in brake system	Check and repair
3	Discontinuous buzzing tone	Malfunction in service brake system. Lowest brake pressure range of 85 bar not reached. Check and repair
8.8 Parking brake cannot be released		
1	No brake pressure	Check oil supply to pump and shut-off valve, repair or replace
2	Disk brake is sticking	Check and repair
3	Parking brake valve defective	Check and repair or replace
4	Oil loss in parking brake system	Check and repair
8.9 Hydraulic oil exceeds max. permissible temperature		
1	Thermostat in fan motor defective	Replace
2	Oil level too low	Top up oil to mark on sight glass
3	Dirt in radiator	Clean

Fault	Possible cause	Remedy
8.10 Sluggish acceleration and deceleration, too little propulsive power		
1	Insufficient engine power	Check fuel supply (filter)
2	One of the brakes is sticking	Check, remedy fault
3	Oil loss in rotary transmission	Remedy fault (by specialist)
4	Air filter clogged	Clean or replace
5	The transmission does not shift into 1st gear	Check power supply and solenoid valve, repair, replace
6	Fault in brake actuation	Check, adjust
7	High pressure too low	Check high pressure, replace or re-adjust HP valves if necessary
8	Pump does not swivel fully	Check, re-adjust (by specialist)
9	Internal damage to variable displacement pump or motor	Replace units (by specialist)
8.11 No travel function		
1	Too little hydraulic oil in tank	Top up to mark on sight glass
2	Solenoid valve defective	Check and repair or replace
3	Power supply to solenoid valve interrupted	Check and repair
4	No pilot pressure	Measure pressure and detect fault
5	Internal damage to pump or motor	Replace complete unit (by specialist)
6	Mech. connection to axle interrupted	Check, repair
7	Service or parking brake engaged	Release the brakes

Fault	Possible cause	Remedy
8.12 Loading equipment is not working		
1	All travel and work functions are disabled	Releasing all travel and work functions (see chapter 5.1.4)
2	Left armrest raised or micro switch defective	Check and repair or replace if necessary
3	Oil supply to hydraulic pump interrupted	Check lines
4	Hydraulic pump has failed	Have hydraulic pump checked by a specialist, replace complete pump if necessary
5	Main pressure relief valve has failed	Check main pressure relief valve and replace completely if necessary (by specialist)
6	Engine temperature above 110 °C	Allow the engine to cool down (see chapter 4.4.2)
8.13 Machine is working too slowly, system gets too hot		
1	Main pressure relief valve set too low or is faulty	Reset main pressure relief valve, replace if necessary (by specialist)
2	Hydraulic pump has impermissible degree of wear	Replace hydraulic pump
3	Incorrect hydraulic oil	Hydraulic oil must be of the recommended quality
4	Air in hydraulic system	Vent the pilot control Tighten connections with engine off and system relieved of pressure
5	Fine mode not set to 0	Check if Fine mode is set to 0; set to 0 if required
8.14 Hydraulic cylinders are weakening		
1	Seals in hydraulic cylinders are worn	Replace the seals
2	Faulty secondary valves	Check secondary valves, replace if necessary
8.15 Swinging motion of the uppercarriage cannot be stopped		
1	Defective swing brake	Re-seal foot brake pedal, replace discs
2	Faulty secondary valves	Reset secondary valves, replace if necessary

Fault	Possible cause	Remedy
8.16 Problems in the electrical system		
1	Outside and/or interior light does not come on	Check cables, connections, bulbs and fuses
2	Windshield wiper does not work	Check cables, connections and fuses. Examine windshield wiper for mechanical damage. Corrosion on contacts between front windshield and cab. Replace complete wiper if necessary. Close the front windshield and lock it into place correctly
3	Horn does not work	Check cables, connections and fuses. Replace complete horn and get cause of failure investigated by a specialist
4	Warning/indicating components are not working accurately	Have an expert determine the source of the problem/malfunction and eliminate it
5	Starting system does not work satisfactorily	Check charge capacity of battery. Test the starter functions. Check connection and condition of power and battery ground cables. Have the functionality of the ignition lock checked and replace if necessary
8.17 Work devices		
1	Grab does not open or close, or opens and closes too slowly	Check quick coupling, replace if required
2	Grab does not rotate	Check quick coupling and electrical connection between micro switch and solenoid valve

9 Appendix

9.1 Assignment of fuses

Fuse number	Release current	Terminal designation	Function
F 1	10 A	Terminal 15	Fuse for ignition, engine shut-off, coolant level sensor, pre-heat relay
F 2	7.5 A	Terminal 15	Tank temperature indicator, engine overheating, coolant level indicator, air filter, oil filter, engine oil pressure, hydraulic oil temperature, operating hours counter, battery charge indicator
F 3	7.5 A	Terminal 15	Brake pressure monitoring, overload warning device *, solenoid valve for parking brake, gear lever
F 4	7.5 A	Terminal 15	Working hydraulics pilot control (switch off if engine overheats or hydraulic oil is low), oscillating axle, parking brake indicator
F 5	15 A	Terminal 15	Work zone extension, grease lubricating system, cab up/down, search light
F 6	10 A	Terminal 15	Grab rotation, bypass, pressure increase
F 7	5 A	Terminal 15	Turn signals
F 8	3 A	Terminal 15	Lower beam control
F 9	20 A	Terminal 15	Wiper/washer system for both windows, driver's seat, voltage converter, load limit sensing control
F 10	4 A	Terminal 15	Load limit sensing control
F 11	7.5 A	Terminal 15	Reserve switch
F 12	10 A	Terminal 15	Individual support *, brake light *
F 13	15 A	Terminal 15	Reserve terminal 15
F 14	20 A	Terminal 30	Reserve terminal 30
F 15	15 A	Terminal 30	Air heater for supplementary heating *
F 16	5 A	Terminal 30	Control system of supplementary heating *
F 17	10 A	Terminal 30	Hazard warning system
F 18	20 A	Terminal 30	Overhead lights operating working current
F 19	15 A	Terminal 30	Operating current for working floodlights on the box-type boom *, horn
F 20	15 A	Terminal 30	Operating current for working floodlights on dipperstick
F 21	10 A	Terminal 30	Right parking light, control current for working floodlight mounted on dipperstick
F 22	10 A	Terminal 30	Left parking light, control current for additional working floodlight (roof/box-type boom), lower beam
F 23	15 A	Terminal 30	Rotating beacon(s) *, radio *, socket 24 V, cigarette lighter, interior lighting
F 24	20 A	Terminal 30	Fan, heating, air conditioning thermostat
F 25	20 A	Terminal 30	Cooling fan for air conditioning system
F 26	20 A	Terminal 30	Reserve
F 33	20 A	Terminal 15	Reserve
F 34	70 A	Terminal 30	Master fuse K0 Terminal 15

* optional

9.2 Conversion factors

Pressure

1	bar	=	100 Kpa	=	14.5 psi
10	psi	=	68.95 Kpa	=	0.6895 bar

Flow

1	l/min	=	0.0353 cfm
1	gallon (Brit.)/min	=	0.1605 cfm

Distances

1	km	=	39370 in	3280.8 ft	1093.6 yd	0.62137 mile	0.53996 n mile	10^6 mm	1000 m

Weight

1	kg	=	2.205 lb	=	35.27 Oz

Length

1	m	=	1000 mm	=	39.38 inch	=	3.281 ft
1	inch	=	25.4 mm	=	0.0254 m	=	0.08333 ft
1	ft	=	304.8 mm	=	0.3048 m	=	12 inch

Output

HP	=	kW x 1.341
KW	=	HP x 0.746

Temperature

°F	=	(°C x 9/5) + 32
°C	=	(°F – 32) x 5/9

Volume

1	m^3	=	1000 liters	=	35.31 ft^3	=	61020 $inch^3$
1	ft^3	=	28.32 liters	=	0.02832 m^3	=	1728 $inch^3$
1	l	=	0.2642 gallons (US)	=	0.2201 gallons (Brit.)	=	
1	gallon (US)	=	3.785 liters	=	231 $inch^3$	=	
1	gallon (Brit.)	=	4.544 liters	=	277 $inch^3$	=	

9.3 Index of images

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