GRUNDODRILL 15XPT

FLUID-ASSISTED HDD RIG

Translation of the
ORIGINAL INSTRUCTIONS



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TRACTO
ADVANCED TRENCHLESS TECHNOLOGY

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This manual is designed for the operating company as well as for the personnel operating or maintaining the unit.

The user of the manual must be able to read and understand the language of this manual.
The user of the manual must know and have understood the safety instructions before any work is carried out on the unit.

To avoid serious injuries or death, please follow the safety instructions in this manual.
Please keep this manual for later reference.
If the machine is sold, this document must be handed over.

Any texts and drawings contained in this manual must not be copied or distributed – neither in full nor in part – without prior written permission from the manufacturer.

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1 INSTRUCTIONS FOR USING THIS MANUAL

1.1 Signal words and danger symbols

Text passages marked with signal words and symbols are of particular importance in this manual. Not all signal words and symbols specified below are used in this manual. However, they are all explained for an easier handling.

1.1.1 Signal words

⚠ DANGER

DANGER

... indicates a hazardous situation which, if not avoided, will result in death or serious injury.

⚠ WARNING

WARNING

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

⚠ CAUTION

CAUTION

... indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

1.1.2 Hazard symbols



Hazardous voltage!
This symbol indicates a risk of death or injury from hazardous voltage when handling the system.



Crush hazard!
The texts marked with this symbol inform about dangerous situations with a crush hazard for the entire body.



Hand injuries!
The texts marked with this symbol inform about dangerous situations entailing hand injuries from crushing. Tasks described in the corresponding text passages shall be carried out with utmost care to avoid hazardous situations and resulting injuries such as the loss of limbs.



Draw-in hazard!
The texts marked with this symbol inform about dangerous situations with a draw-in or entanglement hazard for clothes or limbs.



Explosion hazard!
The texts marked with this symbol inform about dangerous situations with an explosion hazard.



Danger due to suspended loads!
The texts marked with this symbol inform about dangerous situations due to suspended loads.



Danger of tipping over!
The texts marked with this symbol inform about dangerous situations involving the danger of the machine tipping over.



Trip hazard!
The texts marked with this symbol inform about situations involving a hazard of tripping over obstacles on the floor.



Fall hazard!
The texts marked with this symbol inform about dangerous situations with a fall hazard.



Hot surface!
The texts marked with this symbol inform about dangerous situations with a burn hazard due to hot surfaces.



Danger due to combustible substances!
This sign indicates dangers caused by combustible substances.



Dangerous for the environment!
This sign indicates that the used substance is environmentally hazardous.

1.1.3 Symbols for personal protective equipment



Wear head protection!
During the activities marked with this symbol it is absolutely necessary to wear head protection.



Wear hand protection!
Wearing hand protection is absolutely necessary for tasks marked with this symbol.



Wear eye protection!
Wearing eye protection is absolutely necessary for tasks marked with this symbol.



Wear protective clothing!
Wearing protective clothing is absolutely necessary for tasks marked with this symbol.



Wear ear protection!
During the activities marked with this symbol it is absolutely necessary to wear ear protection.



Wear foot protection!
During the activities marked with this symbol it is absolutely necessary to wear foot protection.



Wear high-visibility vest!
Wear a high-visibility vest in fluorescent colours when performing activities marked with this symbol.

1.1.4 Prohibitive symbols



Unauthorized access prohibited!
The texts marked with this symbol inform you that the indicated place must not be accessed by unauthorized persons.



Fire, open light and smoking prohibited!
The texts marked with this sign inform that open light, fire and smoking are prohibited.

1.1.5 Notice symbols

NOTICE

NOTICE

... indicates important information (e.g. material damage), but does not indicate hazardous situations.

1.1.6 Information symbols



Info!
Information marked with this symbol helps you to carry out your tasks quickly and safely.

1.2 Validity of this manual

This manual is valid for the following machine:
– GRUNDODRILL 15XPT

1.3 Nameplate

The nameplate is attached to the side of the machine:

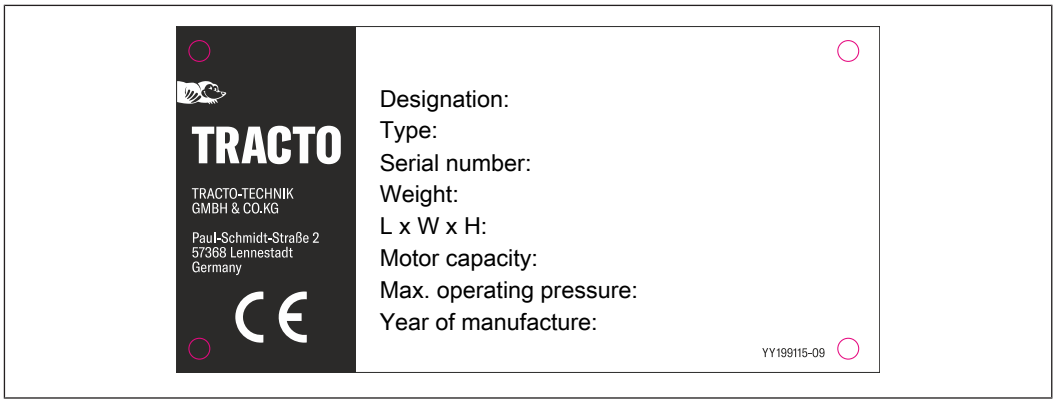


Fig. 1-1 Nameplate

2 SECURITY

2.1 Intended use

The machine is used for producing a pilot bore and then pulling in a product pipe.

The data for the bore length and outer pipe diameter can be gathered from the technical data.

The machine is suitable for the following fields of application:
- parallel installations
- crossings of roads, car parks, train lines, rivers, parks etc.
- culverts

The machine is to be used for pipes made of the following materials:
- polyethylene (PE)
- polypropylene (PP)
- polyvinyl chloride (PVC)
- cast iron
- steel

For use of other materials please contact the TRACTO-TECHNIK customer service.

To safeguard your warranty claims and to ensure safe machine operation, only use accessories complying with the specifications of TRACTO-TECHNIK.

The drilling fluid mixing system (MA07-D, MA07-E or MA010-D) to be applied and the machine with the drive unit form an integrated unit.

Intended use also includes the proper application of the correct accessories.

Operation in closed rooms is permitted only if appropriate extraction systems are used.

When working at slopes or rock spurs, sufficiently secure the entire bore rig against tipping over or falling. Without having taken such measures drilling is prohibited.

Structural modifications of the machine and the accessories are prohibited without prior written permission from the manufacturer.

In order to use the machine as intended, one has to observe all the instructions in this manual.

Any use other than the intended use is regarded as misuse.

2.2 Reasonably foreseeable misuse

Deployment of the unit by insufficiently qualified personnel is regarded as reasonably foreseeable misuse.

TRACTO-TECHNIK is not liable for any damages resulting from reasonably foreseeable misuse.

Other applications such as:

- using the stabiliser(s) for pushing soil
- using the machine for pulling/pushing objects other than the pipes to be installed
- loosening or retrieving tools or other objects with the machine outside the work steps specified in the instructions
- using the machine as a vehicle
- using the machine while not wearing personal protective equipment
- operating the machine underground
- operating the machine in areas with a danger of objects falling from above
- operating the machine in a potentially explosive environment

are regarded as **reasonably foreseeable misuse**.

2.3 General safety instructions

Please always observe the following safety instructions:

- When operating the machine the applicable national health, occupational safety, accident prevention, fire and environmental regulations must be observed. Personnel operating the machine must be familiar with these regulations.
- Always exercise caution when working with the machine.
- Ensure that the manual is available at any time to the personnel operating the machine.
- Determine the responsibilities of the personnel before starting work.
- At least two people are necessary for the set-up and disassembly, as well as the operation of the machine.
- Make sure that the personnel is equipped with appropriate communication means allowing the communication between entrance pit and target pit.
- If there is a change in the operating behaviour of the machine, it must be switched off immediately. Secure it against restart. The site manager must be informed of the change.
- Relieve the rod string of tension when interrupting pulling-in operation, e.g. for working in the intermediate pit or on the machine itself. To do so, advance and reverse the thrust rig. Simultaneously rotate the rod string. To avoid any danger, switch off the machine afterwards.
- Only use spare parts that conform to the technical requirements set by TRACTO-TECHNIK. This is always ensured when using original spare parts.
- Observe the maintenance intervals stated in the instructions.
- Observe all safety instructions and warnings on the machine.
- Keep all safety instructions and warnings on the machine in a legible condition.
- Unauthorized persons are not allowed in the machine's immediate danger area.
- Modifications, conversions or additions to the machine without prior permission from the manufacturer are prohibited. This also applies to the installation and adjustment of safety devices as well as for welding work on parts.
- Only operate the machine if all safety devices and covers (e.g. panels) are installed.
- Inspect the machine for visible defects before use.
- If you detect safety-related defects, shut the machine down and report all defects to the responsible supervisor.
- Have defects eliminated immediately.
- In case of an emergency press the emergency stop button.

2.4 Safety instructions for maintenance and troubleshooting

⚠ DANGER

All maintenance, repair and troubleshooting activities involve an increased risk of accident!

- Only perform maintenance, repair and troubleshooting activities when the machine is shut down.
- Switch off the engine and remove the ignition key before starting maintenance, repair and troubleshooting activities.
- Interrupt the power supply by switching off the main power switch.

  ⇨The hydraulic lines are immediately depressurized.

⚠ WARNING

Risk of injury due to coolant spurting out during maintenance work on the air conditioning system!

Pressurized coolant can injure you when it spurts out.

- Have work on the air conditioning system carried out only by a specialist company or specially trained personnel.

NOTICE

Oils and greases hazardous to the environment!



Danger of environmental pollution!

- Do not let oils and greases penetrate into the soil, waters or the sewage system.
- Dispose of used oil, oily cloths and empty hydraulic containers in an environmentally responsible way and according to the respective laws of your country, e.g. at collection points.

– Carefully read all safety information contained in this manual before starting any maintenance work.
– Maintenance work must only be carried out by appropriately authorised personnel.
– By yourself, only perform the maintenance and adjustment works specified in this manual. For additional works contact the customer service of TRACTO-TECHNIK.
– If necessary, secure a large area around the maintenance zone.
– Clean the machine, in particular the connections and screw fittings, to remove oil, fuel and maintenance products before starting maintenance and repair work.
– Once the maintenance, repair and troubleshooting work is completed, reattach all safety devices and check them for proper functioning.
– Retighten any screw connections that have been loosened for maintenance, repair and troubleshooting activities.
– After completion of maintenance, remove the tools and repair materials from the operating site.

2.5 Safety instructions for work on the hydraulic system

Observe the following when working on the hydraulics and when handling hydraulic oil:

⚠ CAUTION



Contact with hydraulic oil!

Hydraulic oil is a chemical product which, in the case of skin contact over a longer time, may cause skin irritations or allergic reactions. In the case of eye contact, hydraulic oil may damage your eyes.

- When performing maintenance work on the hydraulics, wear protective goggles and gloves.
- Observe the safety precautions and regulations in the technical and toxicological data sheet from the hydraulic oil producer!

⚠ DANGER

Hydraulic oil spurting out!
Residual pressure between cylinder and check valve when the rig boom is inclined or the clamping mechanism closed, as well as at the stabilisers!

Pressurized hydraulic oil can injure you when spurting out.

- Never tighten pressurized screw fittings.
- Depressurize the hydraulic system before starting maintenance, servicing and repair work by switching off the machine!
- The air in the hydraulic oil tank is under pressure. Vent the tank by opening the cap of the filler neck to allow the air to escape. Close the cap again immediately afterwards.



- When carrying out maintenance work on the hydraulics, fire, open light and smoking are prohibited.
- Work on the hydraulic system may only be performed by persons with special skills and experience in the field of hydraulics.

Hydraulic hose lines

Observe the following when handling hydraulic hose lines:

- Hydraulic hose lines must not be extended.
- Make sure that the connections are correct.
- Comply with the minimum bending radius for hydraulic hose lines as specified by the manufacturer.
- Regularly check all lines, hoses and screw fittings for leakages and visible damage. Rectify the damage immediately.
- Replace defective hydraulic hose lines.
- Exchange hydraulic hoses after expiry of their period of use even if there are no visible safety-related deficiencies on the hose line.

– The maximum period of use of the hydraulic hose lines is 6 years, including a storage duration of 2 years maximum. Notwithstanding this, the period of use can be determined in accordance with available test results, particularly taking into account the operating conditions. Please note the manufacturer's label on the hydraulic hose lines (date of manufacture: quarter and year or month and year).

NOTICE



Environmental damage due to hydraulic oil!

Leaking hydraulic oil will pollute the environment.

- Make sure that the damage is quickly remedied. Hydraulic oil entering the soil requires immediate large-scale excavation of the contaminated ground.
- Dispose of used oil, oily cloths and empty hydraulic containers in an environmentally responsible way and according to the respective laws of your country, e.g. at collection points.
- Observe the safety precautions and regulations in the technical and toxicological data sheet from the hydraulic oil producer!

2.6 Safety instructions for work on the electrical system

⚠ DANGER

Danger due to electrical power!



Risk of injury due to electric shock upon contact with live parts.

- Switch off the machine before starting work on the electric system.
- Before carrying out any repair works on the electrical system, disconnect the ground cable from the battery of the drive unit or actuate the main power switch.
- Only allow skilled electricians or instructed persons working under the supervision of a skilled electrician to carry out work on the electrical system in accordance with the electrical engineering rules and regulations.

– Have the machine's electrical equipment checked by trained, skilled electricians regularly.
– Eliminate defects such as loose connections or scorched cables immediately.
– In the event of a short circuit, there is a sparking and fire hazard.
– Only use original fuses with the required current rating and tripping characteristic. When you replace a fuse, first search for the cause of the fault and remedy the fault before replacing the fuse.
– For work on live parts, use insulated tools only.
Work with another person who can switch off the machine via the main power switch in the event of an emergency.
– The battery voltage of the electrical system is 24 V.
– Do not disconnect any cables between the battery, regulator and alternator (e.g. by disconnecting the battery) while the diesel engine is running.
– Keep the battery clean and free from corrosion.
– Dispose of used batteries according to regulations.
– Switch off the main power switch when carrying out repairs (e.g. welding work) and when the machine is not operated for more than 2 days.

2.7 Personnel qualification

Before starting work on the machine all persons charged with work undertake the following:

- They shall respect the basic regulations on work safety and accident prevention.
- They shall read the safety and warning information contained in these instructions and confirm with their signature that they have understood this information.
- They shall use their personal / work-related protective clothing and other means to guarantee operational safety during the operation of the device, provided that this is required for the purpose of ensuring safety.

The machine may only be operated by personnel who have been trained or instructed by TRACTO-TECHNIK and who have read and understood these instructions.

Personnel to be trained or instructed, as well as trainees, may only work with the machine under constant supervision of an experienced person.

Observe the legal regulations valid at the application site regarding the minimum age of the personnel.

The different personnel qualifications are based on the following skills and knowledge:

Tab. 2-1 Personnel qualification – skills and knowledge

Personnel with the qualification	**must be able to do the following:**
Instructed person	– operate the machine – identify possible damage and recognize possible hazards relating to the machine
Industrial mechanic	– read and understand construction drawings – carry out mechanical maintenance work – ensure the functionality of mechanical components – identify possible hazards when working with mechanical components
Skilled electrician	– read and understand electric circuit diagrams – put electrical systems into service and maintain them – wire switch and control cabinets – install control software – ensure the functionality of electrical components – identify possible hazards when working with electrical and electronic systems
Hydraulic specialist	– read and understand hydraulic circuit diagrams – put hydraulic systems into service and maintain them – mount and disassemble hydraulic hoses – ensure the functionality of hydraulic components – identify possible hazards when working with hydraulic systems

The individual activities on the machine require the following personnel qualifications:

Tab. 2-2 Required personnel qualification

Activities	Instructed persons[1)]	Specialists[2)] with the qualification "industrial mechanic"	TRACTO-TECHNIK service technicians	Site management
Construction site planning				X
Transport	X			
Set-up, assembly	X			
Electrical installation			X	
Start-up, operation, shutdown	X			
Disassembly	X			
Electrical de-installation			X	
Cleaning	X			
Mechanical work: trouble-shooting, repair and maintenance		X		
Work on the electrics: trouble-shooting, repair and maintenance			X	
Work on the hydraulics: trouble-shooting, repair and maintenance			X	
Disposal	X			

1) Instructed persons have been trained by TRACTO-TECHNIK in working with the machine. PC knowledge is required for machines supplied with a PC user interface.

2) A skilled worker is a person who, on the grounds of his/her specialist training, knowledge and experience and based on his/her knowledge of the relevant regulations, is able to assess the work he/she has been entrusted with and to identify possible hazards.

In addition to the training by TRACTO-TECHNIK, the site management must also be able to provide evidence of trainings in the field of "earthwork methods". The person must have knowledge and supervision of:

- potential dangers and hazard prevention
- securing the construction site
- deploying appropriate personnel
- wearing the personal protective equipment
- the correct application of the tools required
- the complete range of functions of the machine
- safety devices
- observing the operating conditions
- observing the maintenance intervals

Besides training by TRACTO-TECHNIK the operators must also have knowledge about:

- potential dangers and hazard prevention
- securing the construction site
- wearing the personal protective equipment
- the correct application of the tools required
- safety devices
- observing the operating conditions

Only personnel having this knowledge or who can operate the machine as intended may be allowed to operate the machine.

2.8 Safety signs and labels

The following safety signs and labels are attached to the machine. Check them on a regular basis. Replace illegible safety signs and labels.

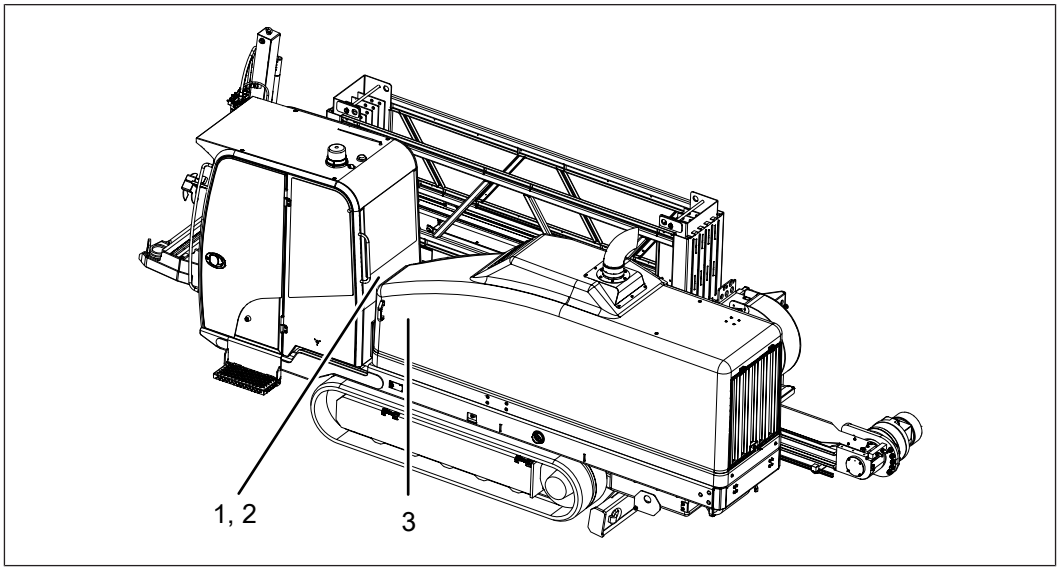


Fig. 2-1 Safety signs and labels at the cab and bonnet

Tab. 2-3 Safety signs and labels at the cab and bonnet

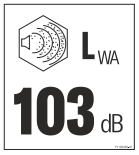
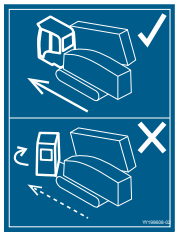
Item	Safety signs, labels	Meaning
1		Wear hearing protection! Always wear ear protection during machine operation and outside the cab.
2		Indicates the guaranteed sound power level outside the machine.
3		Only traverse the machine if the cab is locked. Stay out of the cab's swivel range and keep away from the cab!



Fig. 2-2 Safety signs and labels inside the cab

Tab. 2-4 Safety signs and labels inside the cab

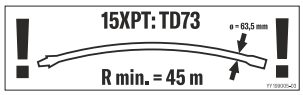
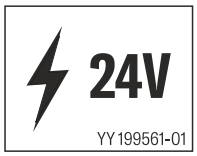
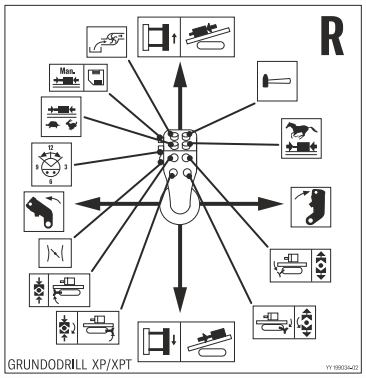
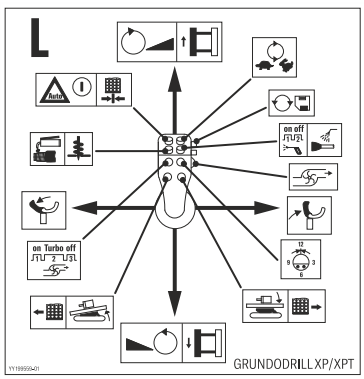
Item	Safety signs, labels	Meaning
1		The bore radius of the specified drill rod must not be smaller than $R_{min.}$, otherwise there is a danger of drill rod breakage.
2	 (sample)	Indicates the date for the next expert check



Fig. 2-3 Safety signs and labels inside the cab

Tab. 2-5 Safety signs and labels inside the cab

Item	Safety signs, labels	Meaning
1		Indicates the 24 V socket.
2		Configuration joystick right
3		Window can also be used as an emergency exit.
4		Configuration joystick left

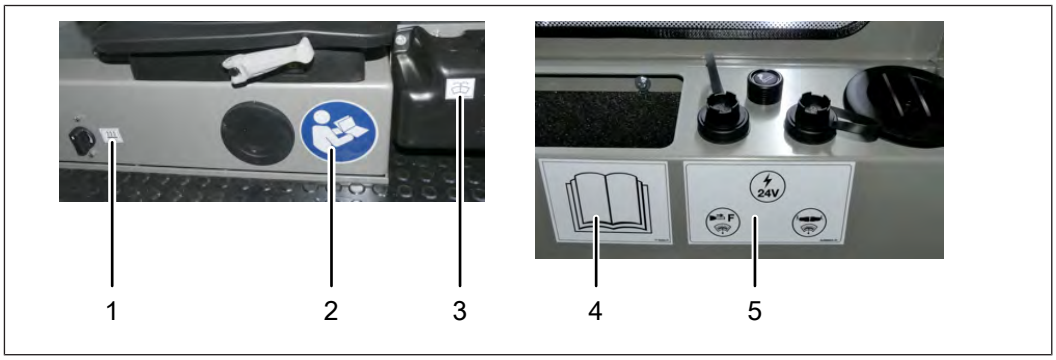
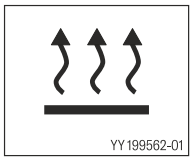
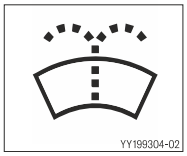
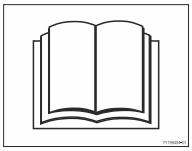
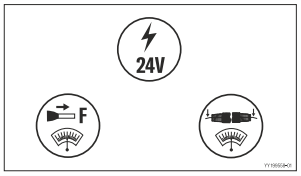


Fig. 2-4 Safety signs and labels inside the cab

Tab. 2-6 Safety signs and labels inside the cab

Item	Safety signs, labels	Meaning
1		Regulation of the heat output inside the cab
2		Read the instructions.
3		Indicates the filler neck of the windscreen washer fluid tank
4		indicates the compartment for machine documentation.
5		Assignment of the electrical connections behind the operator seat in the cab (from left to right): – tensile force measuring – 24 V power supply – wire-controlled measuring system

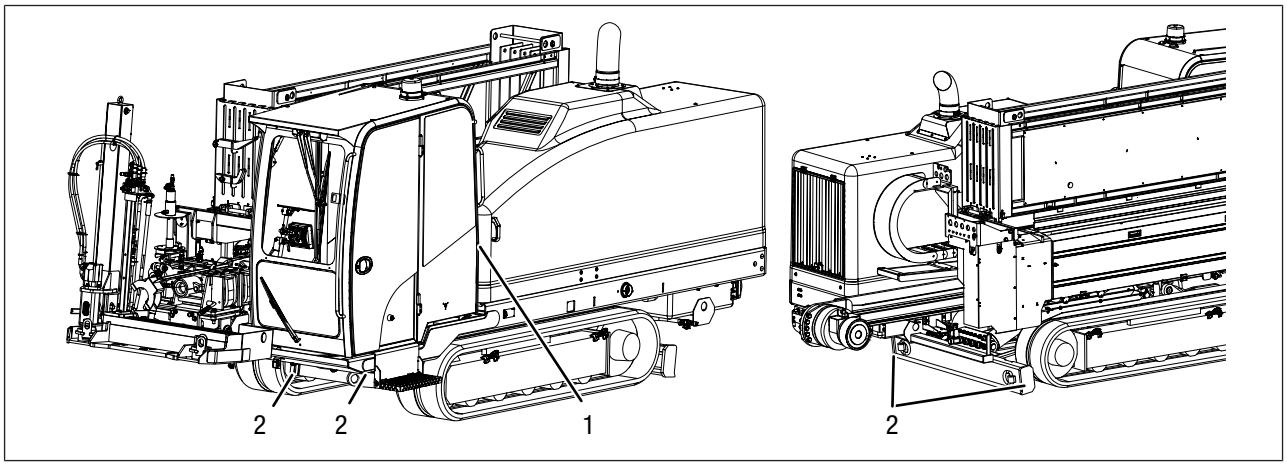
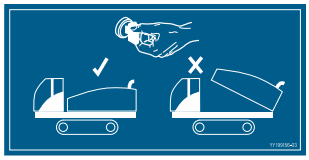


Fig. 2-5 Safety signs and labels on the machine

Tab. 2-7 Safety signs and labels on the machine

Item	Safety signs, labels	Meaning
1		Only open the protection cover when the engine is not running, otherwise there is a danger of injury.
2		Lashing point (4 x on the stabilisers) indicates the lashing eyes for transport on a truck/trailer

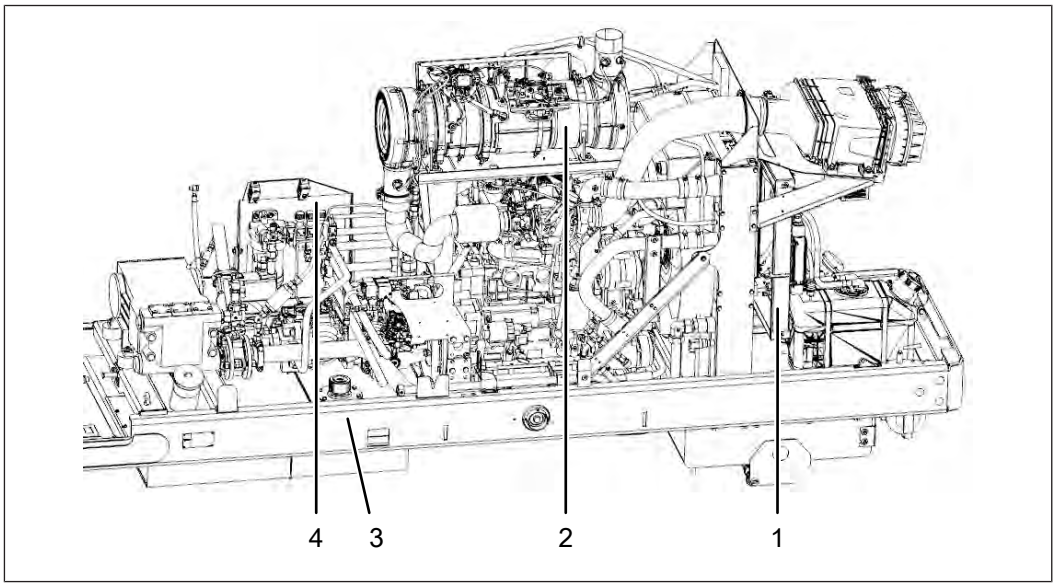
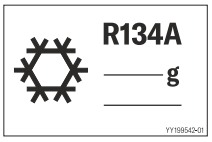


Fig. 2-6 Safety signs and labels in the engine compartment

Tab. 2-8 Safety signs and labels in the engine compartment

Item	Safety signs, labels		Meaning
1		Draw-in hazard	There is danger of pulling-in at the pump and the diesel engine.
2			Indicates the type and quantity of coolant used by the air conditioner.
3			Only use permitted or approved types of hydraulic oil for the hydraulic system in order to prevent any damages to the hydraulic system. Note: The precise labelling depends on the oil grade.
4			Manual control of the valves for bentonite slide valve, 2nd step thrust and chassis (tracks)

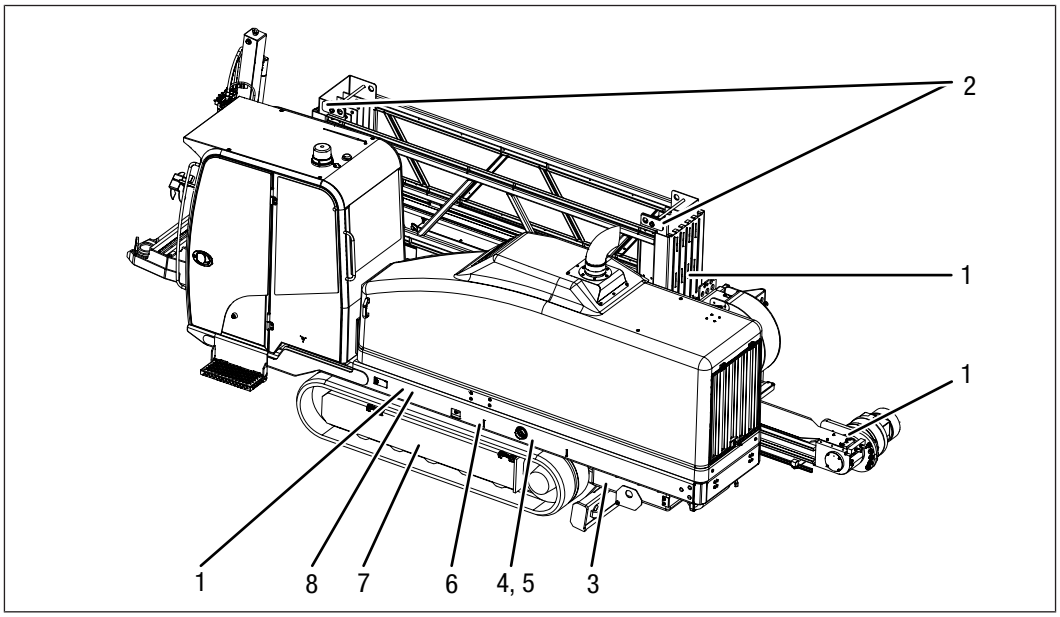
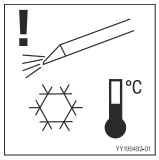
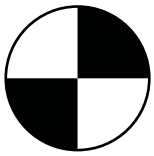


Fig. 2-7 Safety signs and labels on the machine

Tab. 2-9 Safety signs and labels on the machine

Item	Safety signs, labels	Meaning
1		Crush hazard when swivelling the cab inwards, at the rotational drive, at the thrust and at the rod box
2		Indicates the attachment points at the rod box
3		indicates the drain tap for the fresh water tank
4		At air and ground temperatures of approx. 0 °C and below there is a danger of the drilling fluid freezing. This might destroy the drilling fluid pump. Protect it with antifreeze.
5		indicates the supply connection for the drilling fluid
6		It is prohibited to stand in the danger area

Item	Safety signs, labels	Meaning
7		indicates the centre of gravity

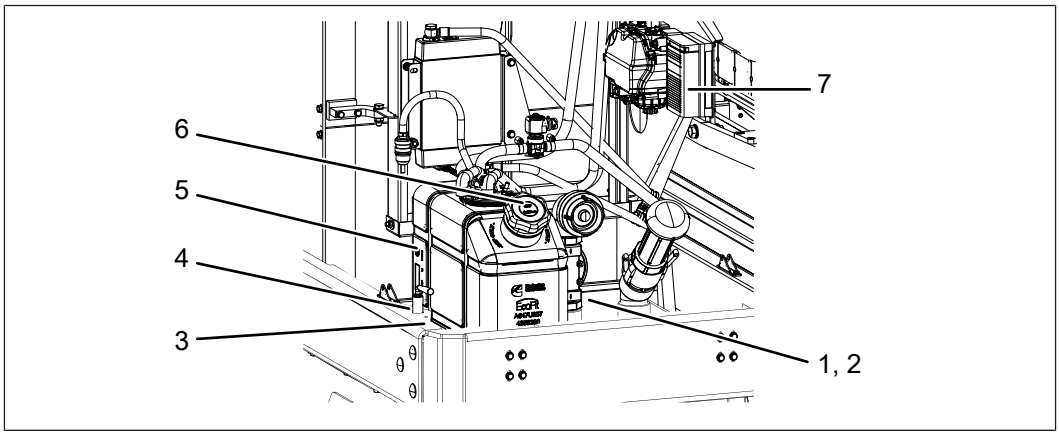
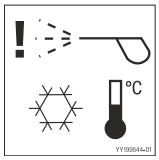
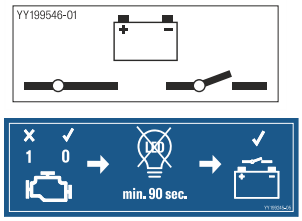
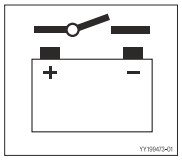
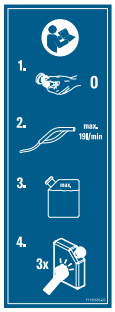
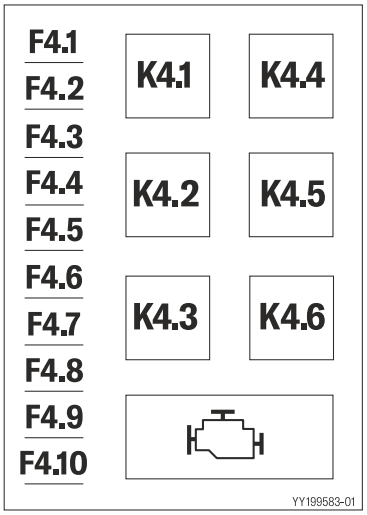


Fig. 2-8 Safety signs and labels on the machine

Tab. 2-10 Safety signs and labels on the machine

Item	Safety signs, labels	Meaning
1		At air and ground temperatures of approx. 0 °C and below there is a danger of the water freezing. This might destroy the high-pressure cleaning pump. Protect it with antifreeze.
2		Indicates the connection to fill the fresh water tank.
3		Switch position of the main power switch Do not operate the main power switch until the LED has gone out.
4		Indicates the main power switch.
5		behind the tailgate at the DEF tank Instructions for filling the DEF tank

Item	Safety signs, labels	Meaning
6		Indicates the filler neck for the diesel exhaust fluid (DEF)
7		In the engine compartment Assignment of the fuses and relays: F4.1 = 5 A = exhaust gas after-treatment - relay F4.2 = -- F4.3 = 15 A = DEF[1)] hose heatings F4.4 = 15 A = DEF feed module F4.5 = 15 A = exhaust gas after-treatment - sensor system F4.6 = -- F4.7 = -- F4.8 = -- F4.9 = -- F4.10 = -- K4.1 = exhaust gas after-treatment - relay K4.2 = DEF feed module K4.3 = DEF hose heating 1 (pressure line) K4.4 = DEF hose heating 2 (return line) K4.5 = DEF hose heating 3 (intake line) K4.6 = switch-on lock for starter [1)] DEF = Diesel Exhaust Fluid (e.g. AdBlue®)

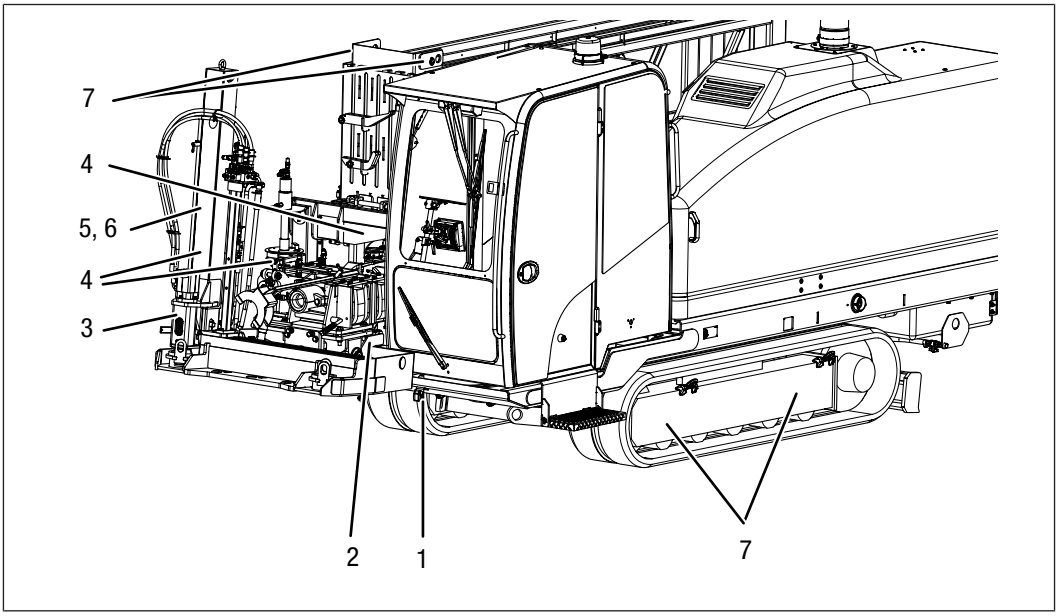
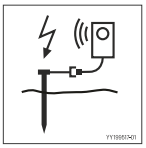
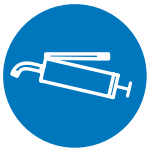
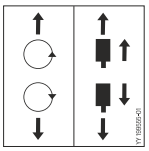
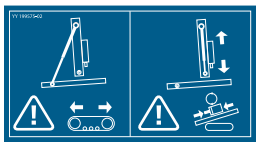


Fig. 2-9 Safety signs and labels on the machine

Tab. 2-11 Safety signs and labels on the machine

Item	Safety signs, labels		Meaning
1			indicates the grounding connection for the electric shock warning device (Zap-Alert)
2			indicates an important lubrication point
3		Draw-in hazard	There is a danger of pulling-in at the anchor boring rig
4		Crush hazard	There is a danger of crushing at the clamps, the rod grippers, the rod box and the stabiliser.
5			With anchor boring rig option enabled: left: screw drill in or out right: lift or lower anchoring unit
6			With anchor thrust unit option enabled: Reposition the safety bar before using the anchor thrust unit.

Item	Safety signs, labels	Meaning
7		Indicates the attachment points

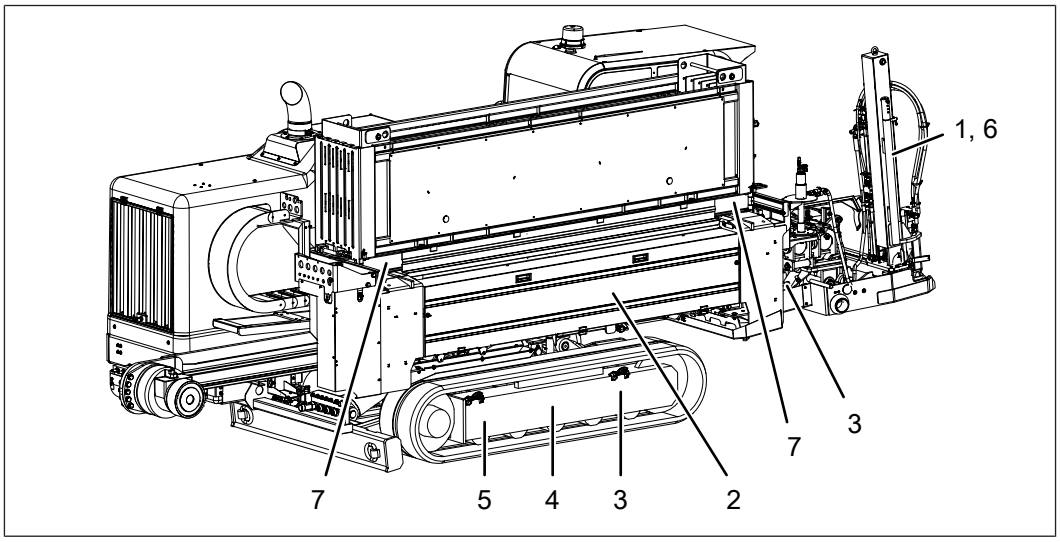
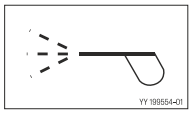
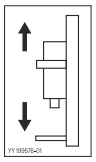
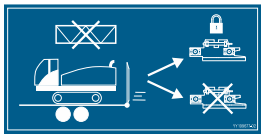


Fig. 2-10 Safety signs and labels on the machine

Tab. 2-12 Safety signs and labels on the machine

Item	Safety signs, labels	Meaning
1		Wear ear protection! Wear ear protection while anchoring and applying the percussive hammer.
2		indicates the connection for the high-pressure cleaning gun
3		It is prohibited to stand in the danger area
4		indicates the centre of gravity
5		Indicates the attachment points
6		With anchor thrust unit option enabled: functioning of the anchor thrust unit
7		Secure or remove the pusher plates of the rod boxes if you transport the machine without a rod box.

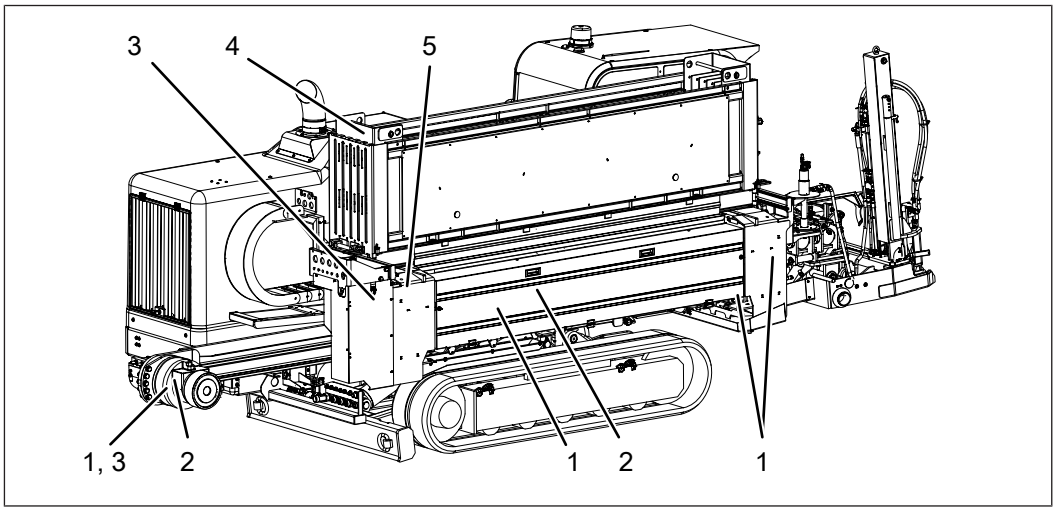
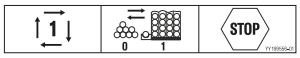


Fig. 2-11 Safety signs and labels on the machine

Tab. 2-13 Safety signs and labels on the machine

Item	Safety signs, labels		Meaning
1			indicates an important lubrication point
2		Draw-in hazard	There is a danger of pulling-in at the rotational drive and the thrust drive.
3		Crush hazard	There is a danger of crushing at the clamping jaw, the rod grippers and the rod box.
4		max. 2,260 kg	Rod box weight
5			on the additional operating panel on the rod box: Functions of the external magazine operation

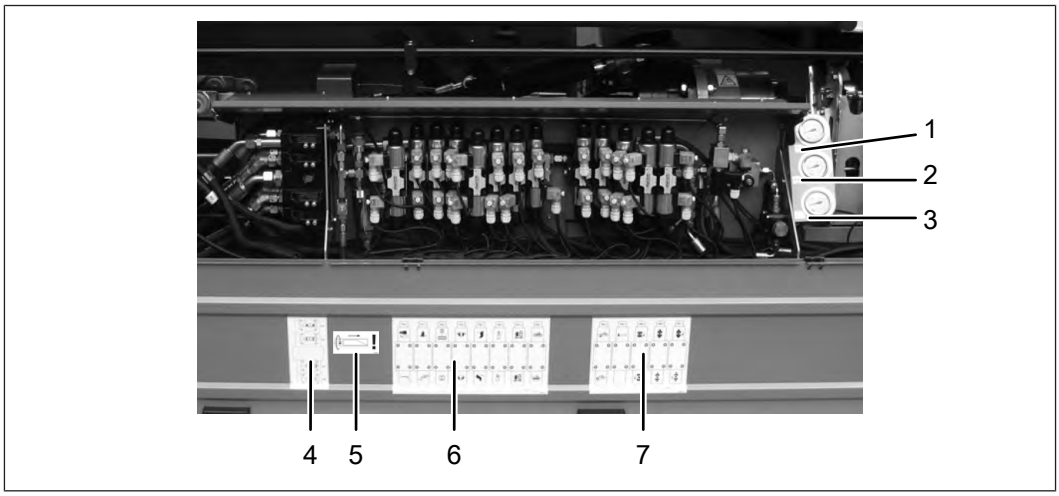
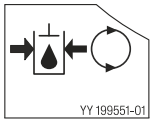
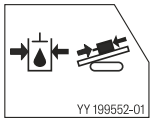
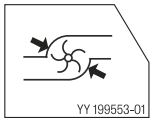
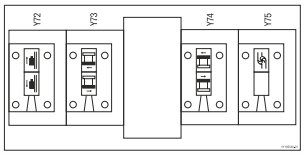
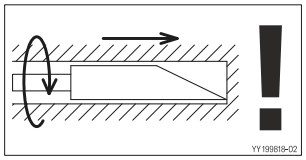
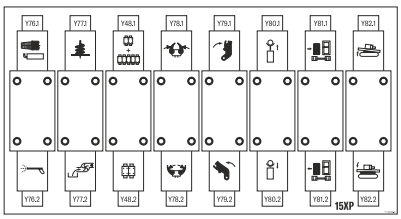
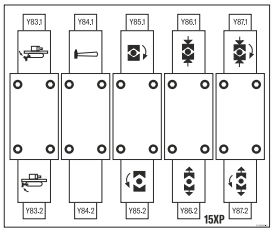


Fig. 2-12 Safety signs and labels at the hydraulic system

Tab. 2-14 Safety signs and labels at the hydraulic system

Item	Safety signs, labels	Meaning
1		Rotation pressure
2		Thrust pressure
3		Drilling fluid pressure
4		Functions proportional valve manifold
5		Ball valve for setting the anti-jamming function
6		Functions 8-valve manifold

Item	Safety signs, labels	Meaning
7		Functions 5-valve manifold

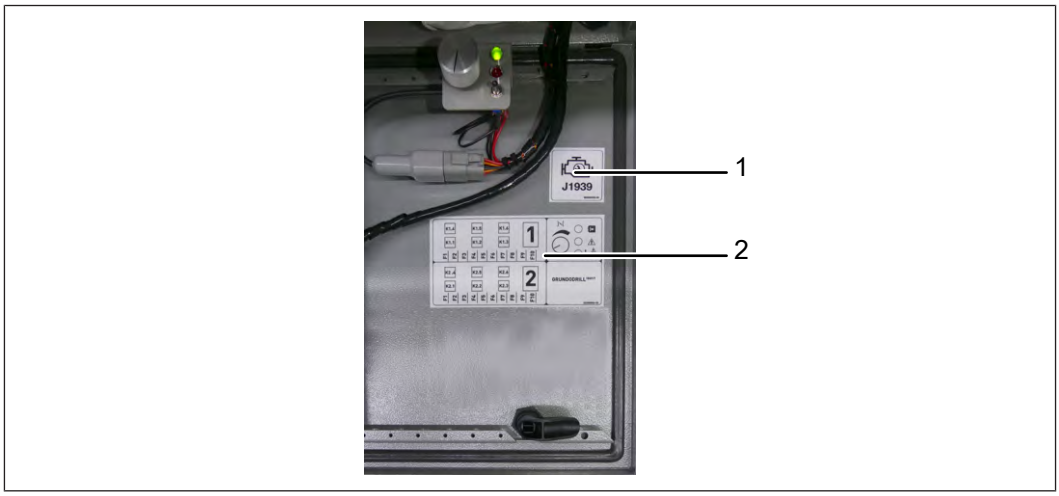
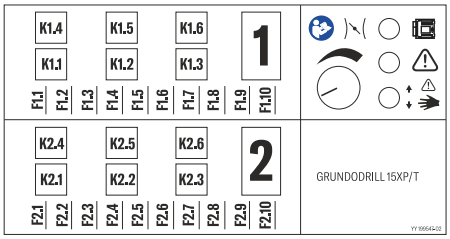
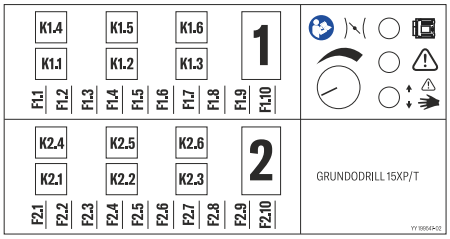
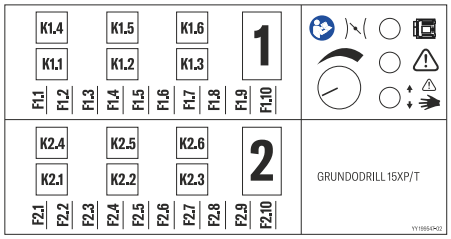


Fig. 2-13 Safety signs and labels in the control box

Tab. 2-15 Safety signs and labels in the control box

Item	Safety signs, labels	Meaning
1		Diagnostic connector diesel engine Grants the service technician direct access to the engine control unit via a standardised communication interface
2		engine speed potentiometer Is only enabled if the diesel engine does not communicate with the machine control. Through the potentiometer directly connected to the engine control unit, you can adjust the diesel engine speed.
2		1 relay and fuses for motor: K1.1 = charging indicator alternator K1.2 = air conditioning K1.3 = ignition K1.4 = emergency stop engine control unit K1.5 = hydraulic pump LS release K1.6 = --- F1.1 = 20 A ignition F1.2 = 30 A steady plus engine control unit F1.3 = --- F1.4 = --- F1.5 = 5 A ignition engine control unit F1.6 = 15 A air conditioning F1.7 = 10 A radio F1.8 = 15 A electrics cab F1.9 = 5 A Visco fan F1.10 = 20 A additional connection

Item	Safety signs, labels	Meaning
2		2 relays and fuses for control unit: K2.1 = gate valve transfer. K2.2 = rotation safety K2.3 = seat monitoring K2.4 = auxiliary functions safety K2.5 = thrust safety K2.6 = seat monitoring F2.1 = 3 A permanent positive CPU control F2.2 = 3 A panel PC F2.3 = 5 A diagnostic connector diesel engine F2.4 = 5 A charging indicator alternator F2.5 = --- F2.6 = 10 A remote control F2.7 = 10 A wire-controlled drilling F2.8 = 3 A rig supply (KB X4) F2.9 = 3 A drive supply (KB X2) + operator seat (KB X22) F2.10 = 3 A supply of hydraulic unit (KB X3)

2.9 Safety devices at the machine

The following safety devices are installed on the machine. Check them for proper functioning prior to start-up. Do not start the machine if the safety devices are not fully functional. Repair or replace defective safety devices before starting to operate the machine.

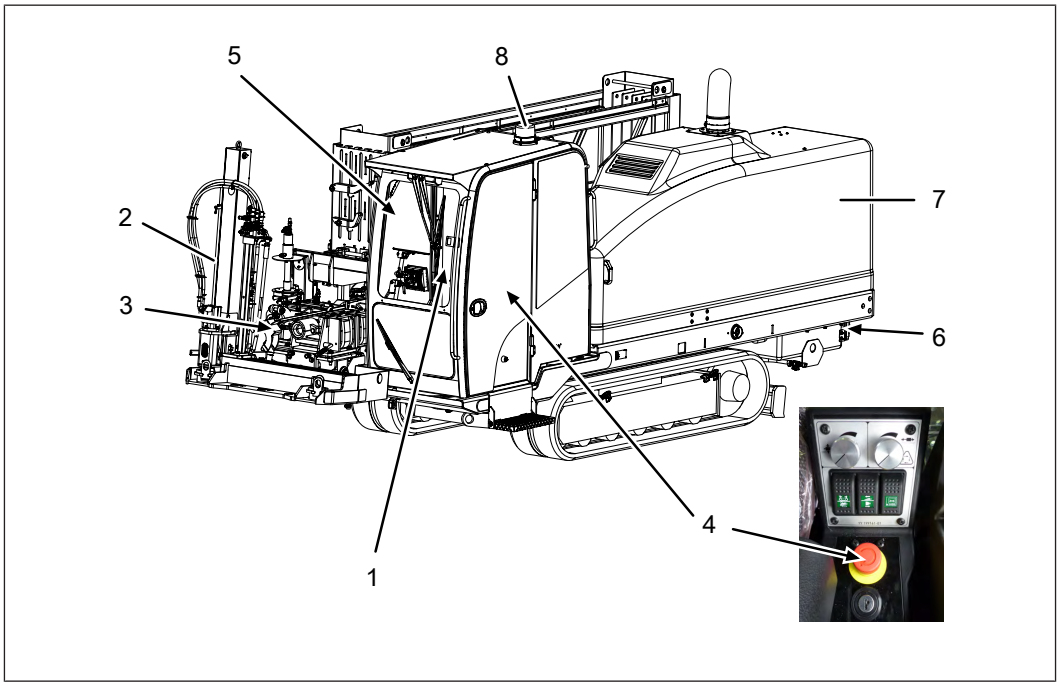


Fig. 2-14 Safety devices at the machine

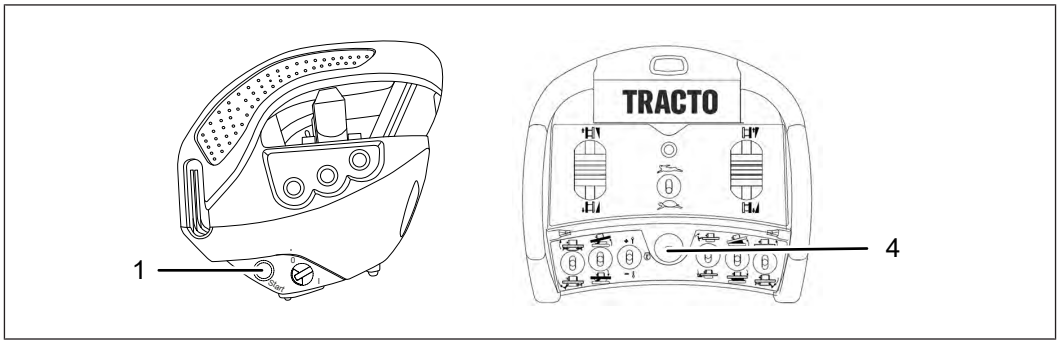


Fig. 2-15 Emergency stop button on the wireless drive remote control

Tab. 2-16 Safety devices at the machine

Item	Safety device	Function
1	Horn	Is operated via a push button on the left joystick panel or on the remote control.
2	Pressure relief of high-pressure cleaning pump	The water pressure can be relieved via a ball valve before the cleaning gun is connected.
3	Drilling fluid pressure relief	is carried out automatically when the clamping tongs are closed
4	Emergency stop button	on the right joystick panel: Switches the machine off in an emergency.

Item	Safety device	Function
5	Emergency exit	for exiting the cab in an emergency
6	Fire extinguisher	To extinguish a fire
7	Protective cover	Prevents the operator from reaching into the diesel engine area
8	Warning light	Is switched on via a switch on the left joystick panel to indicate that the machine is traversing.

Info!
When the wireless drive remote control is enabled, the operating elements inside the cab are disabled.

Emergency stop button

The emergency stop buttons are located in the following positions:
- on the wireless drive remote control
- on the operator seat
- at the wireless pit remote control
- on the hand controls for wire-controlled drilling

In case of an emergency press the emergency stop button.

Prior to start-up check the emergency stop buttons for proper functioning as described in chapter 9.8.3, page 296. If the emergency stop button is not fully functional, do not start the machine under any circumstances. Repair the defective emergency stop button first and replace it with a functional one.

Warning light

There is an orange warning light located on top of the machine. Switch on the warning light via the left joystick panel before traversing the machine.

Warning signals/ horn

The machine is equipped with a horn. You can operate the horn via the left joystick panel or the remote control.

The horn sounds automatically when the machine is traversed.

Fire extinguisher

Read the instructions on the fire extinguisher and familiarize yourself with its operation before working with the machine for the first time!

Protective covers

The motors, the hydraulic system and the control unit are situated behind the lockable protective covers. They prevent the operator from reaching into the danger area.

Emergency exit

Inside the cab there is an emergency hammer for breaking the front window. If the cab door cannot be opened, use the emergency hammer to break the front window. Then leave the cab through the hole in the window.

Drilling fluid pressure relief

The drilling fluid pressure relief is carried out manually during operating and prevents the drilling fluid from ejecting at the rod connection. When closing the clamping jaw, the bentonite pressure is automatically relieved.

Electric shock protection device

The electric shock protection device is to protect the operating personnel from electric shocks, possibly caused by damaging an electric cable during drilling.

The electric shock protection device consists of:

- electric shock warning device (1, located on the left-hand side behind the operator seat)
- grounding stake of the electric shock warning device (2)
- grounding mat (3) with connection cable to the machine
- 1 m grounding cable with grounding stake (4)
- a second optional grounding mat (5)
- test unit for electric shock warning device
- safety boots and gloves

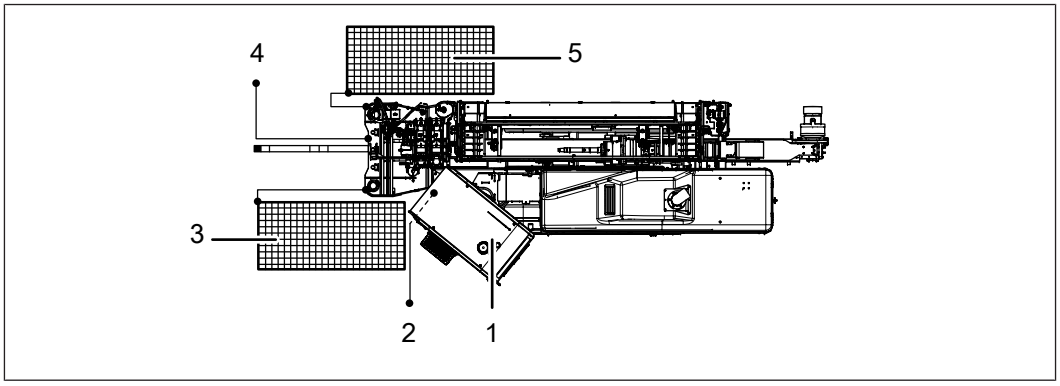


Fig. 2-16 Electric shock protection

The electric shock warning device is **no early-warning device**! It does not switch when slowly approaching an electric cable!

The electric shock warning device triggers an acoustic alarm when an electrical voltage of more than 40 V is present between the machine and the ground. This may be the case, for example, if a live wire is damaged.

NOTICE

Short circuit caused by damaged cables!

A short circuit between two individual wires may be caused if a cable is damaged.
If so, no current is conducted into the ground or the drill rods.
The electric shock warning device does not sound.

- Look out for any power failures in the surrounding area.
- Stop the drilling operation if you notice a power failure in the surrounding area.

Check the electric shock warning device for proper functioning before each application (chapter 5.5.1, page 91)!

⚠ DANGER



Danger due to electrical power!

Risk of injury due to electric shock upon contact with live parts.
If the warning signal of the electric shock warning device sounds, there is a risk of death!

- Do not touch the drill rods or try to remove them.
- Retract the drill head.
- Press the reset button on the enabled electric shock warning device.
- Stay on the grounding mat, as the power could otherwise flow through your body. Operators are safe when standing on the grounding mats.
- Warn people against touching the operators, the rig or the grounding mats.
- Have a non-affected person contact the relevant electric power station immediately.
- Notify the police or fire brigade if immediate danger to people (e.g. due to the retraction of the drill head) cannot be ruled out.
- Only leave the machine when it is absolutely sure that it is no longer live.

2.10 Residual risks

Dangers can arise when working with the machine.

Observe the following warnings:

⚠ WARNING



Risk of injury if personal protective equipment is not worn!

- Always wear your personal protective equipment, including ear protection and a work vest in fluorescent colours.
- During drilling, wear the comprehensive protective equipment included in the scope of delivery of the electric shock warning device.

⚠ DANGER



Crush hazard for hands and fingers!

- at the clamp
- on the rod box/stacking boxes
- at the rod grippers underneath the rod box/the stacking boxes
- between the drill rod and the retainer at the thrust rig
- when inclining the boom
- when raising and lowering the stabiliser
- when driving the anchor boring rig up and down

⇨ Only personnel required to operate the machine are allowed near the machine.

⇨ Keep out of the danger area!

⚠ DANGER



Draw-in hazard!

- at the rotating rotational drive
- at the rotating drill rods or drilling tools
- at the rotating anchor boring rig

⇨ Only personnel required to operate the machine are allowed near the machine.

⇨ Keep out of the danger area!

⚠ WARNING

Extending energy chain and extending drill rod!

The energy chain extends approx. 1.50 m to the rear. The drill rod extends to the front.
You may be hit.

- Keep out of the movement range of the extending energy chain and keep other persons away.
- Keep out of the movement range of the extending drill rod and keep other persons away.

⚠ DANGER

Rotating parts!

Contact with rotating parts can lead to injuries or death!

- Only start drilling operation if there is nobody in the range of rotating parts.
- Only personnel required to operate the machine are allowed near the machine.
- Keep away from rotating parts.

⚠ DANGER

Risk of injury due to pressurized diesel fuel!

High injection pressure of up to 1600 bar at engines with common rail injection leads to severe injuries when loosening the diesel lines!

- Never loosen the diesel lines within the high-pressure diesel circuit of the drive motors with common rail injection.

⚠ WARNING

Risk of injury due to unintentional joystick actuation!

When exiting the cab while the engine is running, there is a risk of actuating the left joystick unintentionally and thus initiating a machine movement. The machine movement could injure yourself or others.

- **Always** fold up the left joystick panel before exiting the cab.
  This disables all functions of both joysticks.

The following dangers can occur when working with the machine in the target pit:

⚠ DANGER

Crush hazard in the target pit:
- when preparing the product pipe to be connected
- when disconnecting the drill head
- when connecting the tool
- when connecting the product pipe
- when pulling accessories into the bore hole



- Completely relieve the machine and the rod string of tension before starting work on the drill head or on the draw-in accessories (e.g. clamping the expander). The rotational drive could cause the release of torsional force!
- Always operate the machine with the wireless pit remote control when working in the target pit (chapter 5.3.5, page 79).

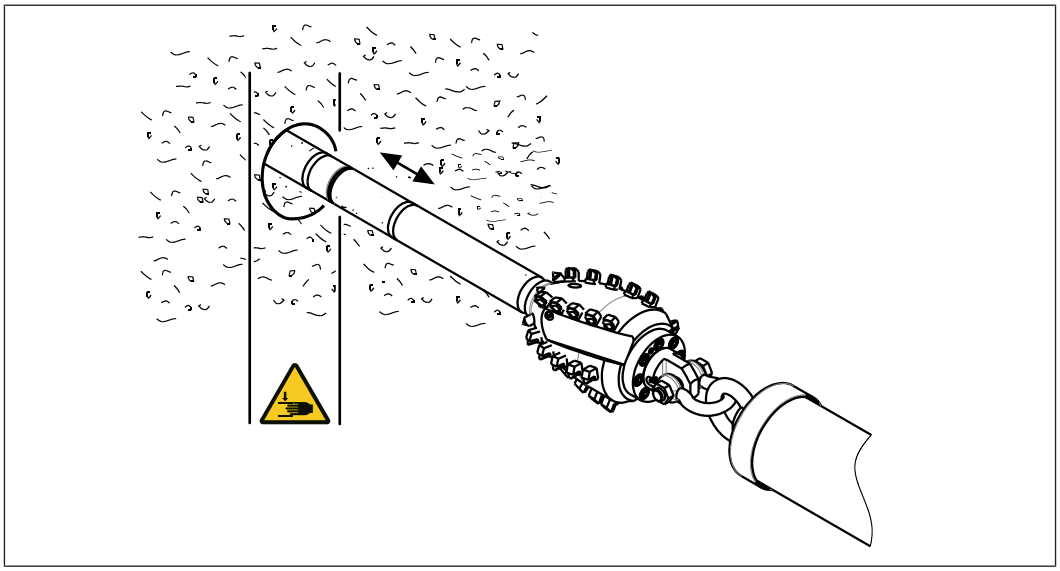


Fig. 2-17 Danger area for crushing injuries

The following dangers apply to the entire site:

⚠ WARNING

Trip hazard on the site:
- over drilling fluid hoses and hydraulic hoses
- over electric cables
- into the pits
- over the product pipe
- over machine accessories



- Always exercise caution when working!
- Watch out for obstacles!
- Watch out for jolting movements of the hoses!

⚠ DANGER

Hydraulic oil spurting out!
Residual pressure between cylinder and check valve when the rig boom is inclined or the clamping mechanism closed, as well as at the stabilisers!

Pressurized hydraulic oil can injure you when spurting out.

- Never tighten pressurized screw fittings.
- Depressurize the hydraulic system before starting maintenance, servicing and repair work by switching off the machine!
- The air in the hydraulic oil tank is under pressure. Vent the tank by opening the cap of the filler neck to allow the air to escape. Close the cap again immediately afterwards.

2.11 Danger due to adjacent lines and pipes

During the pilot bore the drill rod is forced into the ground with the drill head upfront. If the distance to adjacent lines is insufficient, they are in danger of being damaged or severed!

Hazard prevention

To prevent dangers, gather information during the construction site planning phase from the respective institutions regarding adjacent pipes and lines in the construction site area.

Regarding installed ...	you will be able to obtain information from ...
electric cables	power supply companies
telephone cables, data cables	cable network operators
gas lines	gas supply companies
water pipes	municipal utilities
sewage pipes	municipal utilities

What to do in case of danger

Lines in close vicinity to the bore hole can cause various dangers if they are damaged. In case of damage, take the following measures depending on the type of line:

Electrical lines

⚠ DANGER



Risk of death due to electrical power!

Risk of an electric shock when leaving the machine as damage occurs.

- If you are situated on the machine as damage occurs, stay on the machine!
- Observe the cable protection instructions from utility companies.
- Warn people against touching the operators, the rig or the grounding mats!
- Have a non-affected person contact the relevant electric power station immediately!
- Secure the damage area.
- Prevent unauthorized access.
- Notify the police or fire brigade if immediate danger to people (e.g. due to the retraction of the drill head) cannot be ruled out.
- Make sure that the fire brigade, ambulance and fault-clearing service have free access.
- Only leave the machine when it is absolutely sure that it is no longer live.

Fibre optic cables

⚠ WARNING

Risk of eye injuries!

- In the event of damage do not look into defective fibre optic cables.
- Observe the cable protection instructions from the telecommunication company.
- Notify the cable network operator.

Gas lines

⚠ DANGER

Explosion hazard due to leaking gas!



- Do not make use of open fire.
- Extinguish all flames and do not start a new fire.
- Switch off all engines.
- Do not actuate any electrical switches and do not unplug any cable connectors.
- Secure the damage area.
- Prevent unauthorized access.
- Inform the responsible utility company.
- Have the police, fire brigade and ambulance notified.
- Make sure that the fire brigade, ambulance and fault-clearing service have free access.

Water pipes

⚠ WARNING

Risk of injury due to pressurized water!

- Close the nearest gate valve.
- Inform the responsible utility company.
- Inform the police or fire brigade if persons are endangered.

Sewage pipes

⚠ WARNING

Risk of injury due to water escaping unexpectedly!

- Always enter manholes or sewage pipes with at least one other person.
- Always enter any manholes or sewage pipes with appropriate protective equipment.
- Inform the pipe owner.

2.12 Working in pits

When working in pits observe the following:

⚠ WARNING

Risk of falling into the pit!



- Determine the pit depth!
- Only enter the pit under the supervision of an expert!
- Only enter and exit pits and trenches with a depth of more than 1.25 m via appropriate facilities (support walls, stairs, footsteps, ladders, step irons).
- When there is danger of falling into a pit with a depth of > 5 m, always work with an appropriate safety device.

Secure the pits as follows:

– Secure holes in the ground with appliances in a way to prevent people from falling in. Fence off the opening, make it accessible or cover it with an immovable cover.

– Secure working areas near public roads or railway tracks by means of barriers, safety posts or signalling devices.

– When working in pits and trenches, earth and rock faces must be scarped or sheeted in a way that workers are secured against slipping soil. All influences possibly impairing the soil's stability (rain, vibrations etc.) must be taken into consideration.



– Prevent unauthorized access.

2.13 Behaviour in case of an emergency

1. Switch off the machine by pressing the emergency stop button on the remote control or on the right joystick panel or by having either pressed.
2. Secure the machine against restart by removing the ignition key.
3. Implement suitable measures depending on the type of damage (chapter 2.11, page 41).
4. If a line is affected, notify the operating company/owner of the line.
5. Determine the type and extent of the damage.
6. Warn passers-by and residents. Keep them away from the accident site.

Investigate the cause for actuating the emergency stop button and have the cause eliminated before setting the emergency stop button back.

Only restart the machine after elimination of the emergency. To do so, unlock the emergency stop button by turning it clockwise.

2.14 Behaviour in the event of an accident involving personal injury

Please proceed as follows in the event of an accident involving personal injury:

1. Switch off the machine immediately.
2. Secure the scene of the accident.
3. Take care of your own safety.
4. If possible, remove the person from the danger zone.
5. Report the accident by calling the local emergency number. Provide brief but precise details regarding:
   - ⇨ Place of accident
   - ⇨ Course of events leading to the accident
   - ⇨ Number of injured people
   - ⇨ Types of injuries
   - ⇨ Your own name
6. Please wait for possible further inquiries.
7. Administer first-aid treatment.
8. Notify the company management.

3.1 Functional principle

The bore starts in an entrance pit which facilitates the entry of the drill head.

For the operation of the machine an additional starting pit, intermediate pit or target pit may be prepared on the construction site.

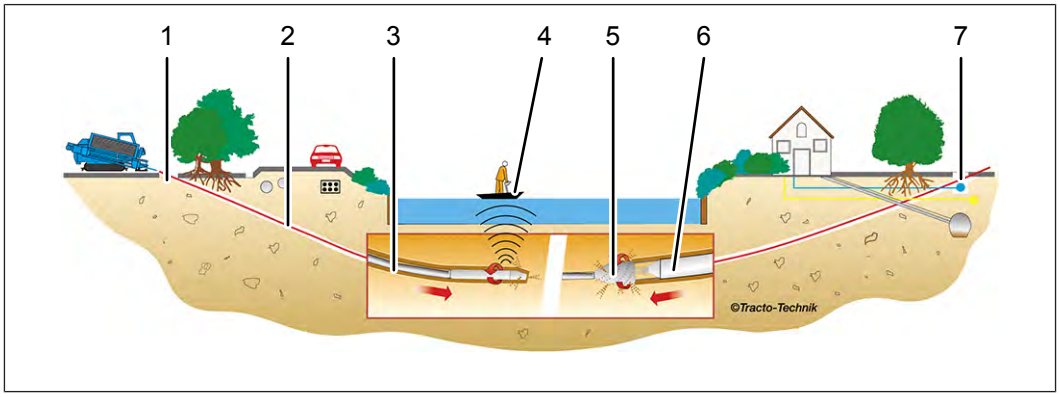


Fig. 3-1 Construction site with entrance pit, target pit and drill rods

1	Entrance pit	5	Expander head
2	Rod string	6	Product pipe
3	Pilot bore	7	Target pit
4	Detection system		

The machine is set up in front of the entrance pit and anchored to the ground via the anchoring unit. The machine is supplied with drive energy via the integrated drive unit.

Whilst drilling under hydraulic pressure, the machine shoves the rod string with the drill head through the ground. This is how a pilot bore is created between entrance pit and target pit.

A rod guidance on the machine prevents the drill rods from bending between the sub-saver and the entrance point in harder ground.

If the ground is very hard, thrusting is assisted by the percussive hammer.

The single drill rods are added via the semi-automatic rod changing system. For this, individual drill rods are taken out of the rod box by means of rod grippers and swung into the bore axis.

The thrust rig pushes the drill rod into the clamping jaw, where it is screwed by rotation means to the previous drill rod.

During the pilot bore, i.a. the position, depth and inclination of the drill head are measured by a detection system consisting of a transmitter inside the drill head and a receiver above ground. The operator controls the drilling direction via the thrust and rotation of the drill head.

Once the drill head has arrived inside the target pit, the operator dismantles the rock drilling unit and assembles the expander head as well as the product pipe to the drill rod.

The machine pulls the drill rod along with the expander head and the product pipe back through the bore hole using hydraulic pressure.

The individual drill rods are detached from one another within the clamp, retracted by the thrust rig and swung back by the grippers to a position underneath the rod box.

There the drill rods are retained by cylinders and pushed back into the rod box/ stacking box.

If required, one or several intermediate clearances can be carried out before assembling and pulling in the product pipe.

3.2 The machine and its main components

The bore rig consists of the following components:

- bore rig GRUNDODRILL 15XPT
- mixing system with a twin tank system (MA07-D, MA07-E or MA010-D)
- drive unit for the operation of the mixing system

Machine

The machine consists of the following components:

- rig boom (1)
- rear stabiliser (2)
- front stabiliser (3, optional)
- crawler tracks with transport eyelets (4)
- exchangeable rod box (5)
- clamp and break-away device (6)
- rod changing system (7)
- emergency hydraulic system (8, behind the casing)
- anchor plate (9)
- anchoring unit, here: anchor boring rig (10)
- rod lubrication (11)
- electrical connection for drilling fluid system (12)
- fresh water tank (13)
- fire extinguisher (14)
- energy chain (15)
- thrust drive (16)
- rotational drive (not depicted)

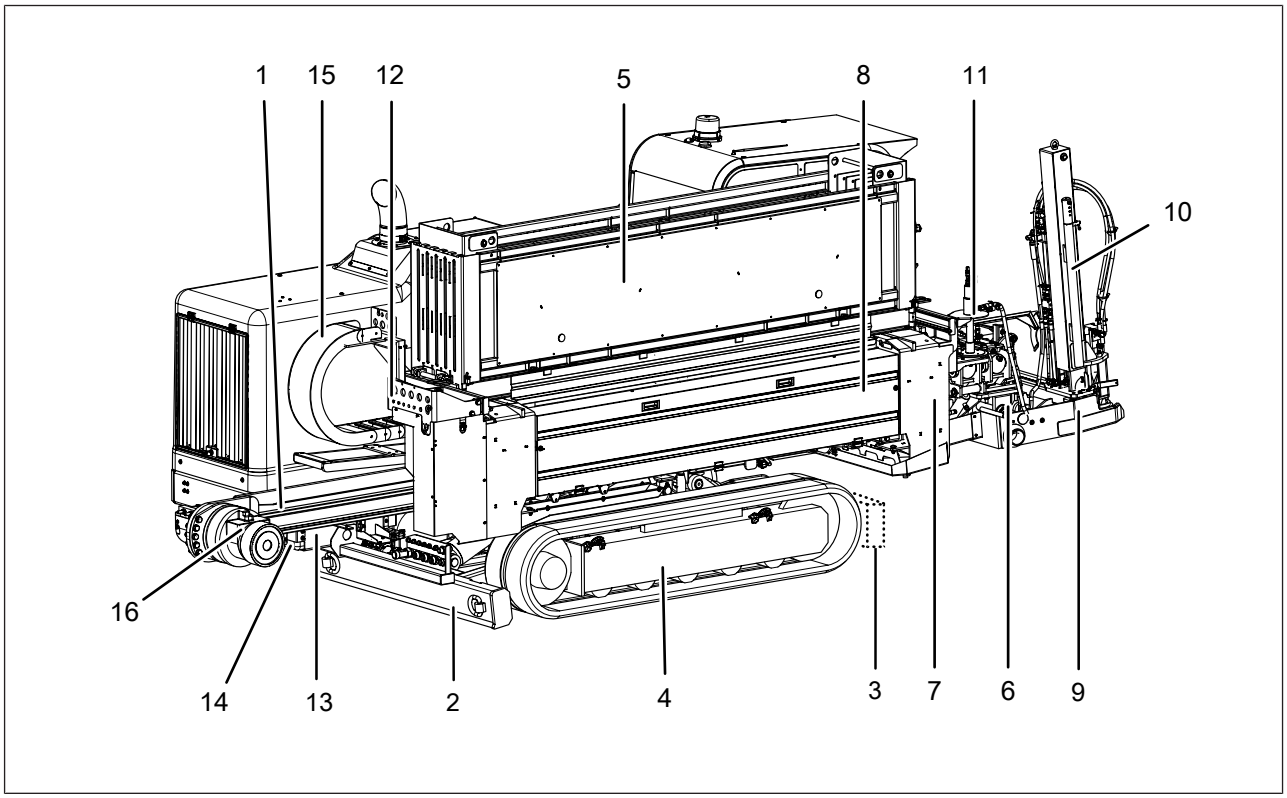


Fig. 3-2 The machine and its main components

Further machine components:

- warning light (1)
- LED working lights (2)
- cab (3)
- connection for drilling fluid (4)
- diesel engine with drive unit (5)
- exhaust system (6)
- air supply for diesel engine (7)
- front transport eyelets (8) and rear transport eyelets (9)
- footstep (10)
- rod guidance with rubber washer for rod cleaning (11)
- plug for electric shock warning device (12)
- drain of fresh water tank (13)

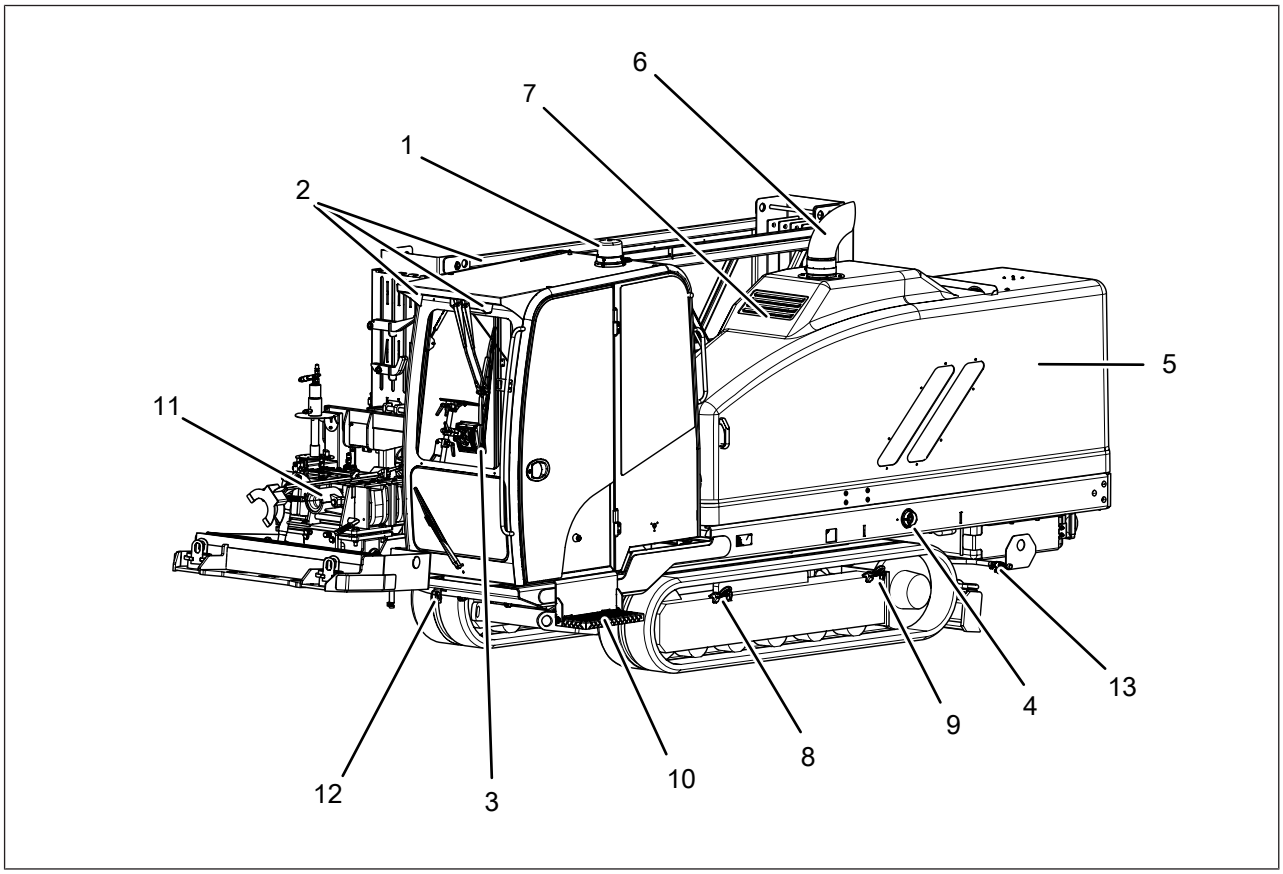


Fig. 3-3 The machine and its main components

Integrated drive unit

The integrated drive unit consists of the following components:

- high-pressure feed pump for drilling fluid (1)
- diesel filler neck (2)
- fresh water tank (3)
- high-pressure cleaning pump (4)
- hydraulic pumps (5)
- hydraulic oil tank level indicator (6)
- filler neck for hydraulic oil (7)
- diesel filter (8) with water separator
- fresh water supply connection with fresh water filter (9)
- suction connection for drilling fluid pump (10)
- engine oil dipstick (11)
- diesel particle filter (12)
- DEF tank (13)

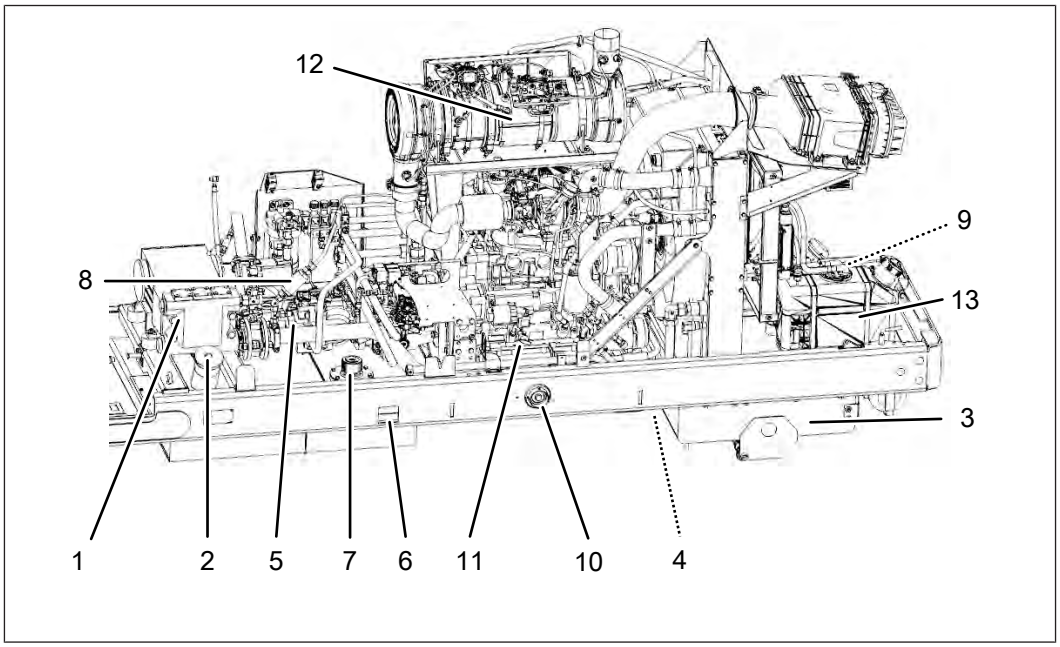


Fig. 3-4 Drive unit

Info!
The configuration of the high-pressure feed pump is customised.

Anchoring unit

The following components are part of the anchoring unit:

- anchor boring rig (1) or anchor thrust unit (optional)
- drain hose of the drilling fluid pressure relief (2)
- anchor plate (3)

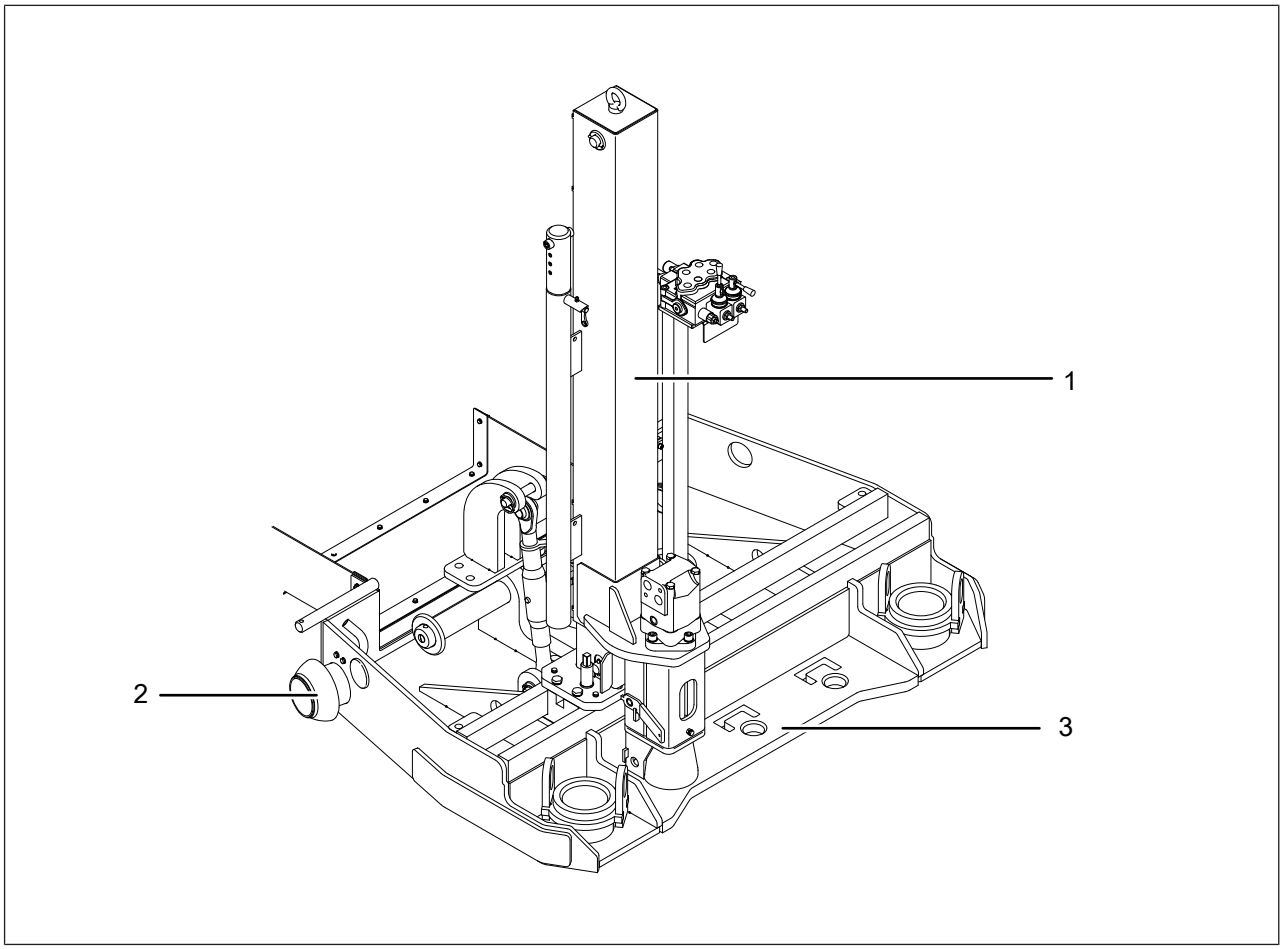


Fig. 3-5 Anchoring unit

Anchor boring unit The following components are part of the anchor boring unit:

- drill (1)
- drill holder (2)
- hand ratchet holder (3)
- drill motor (4)
- valve block with operating levers (5)

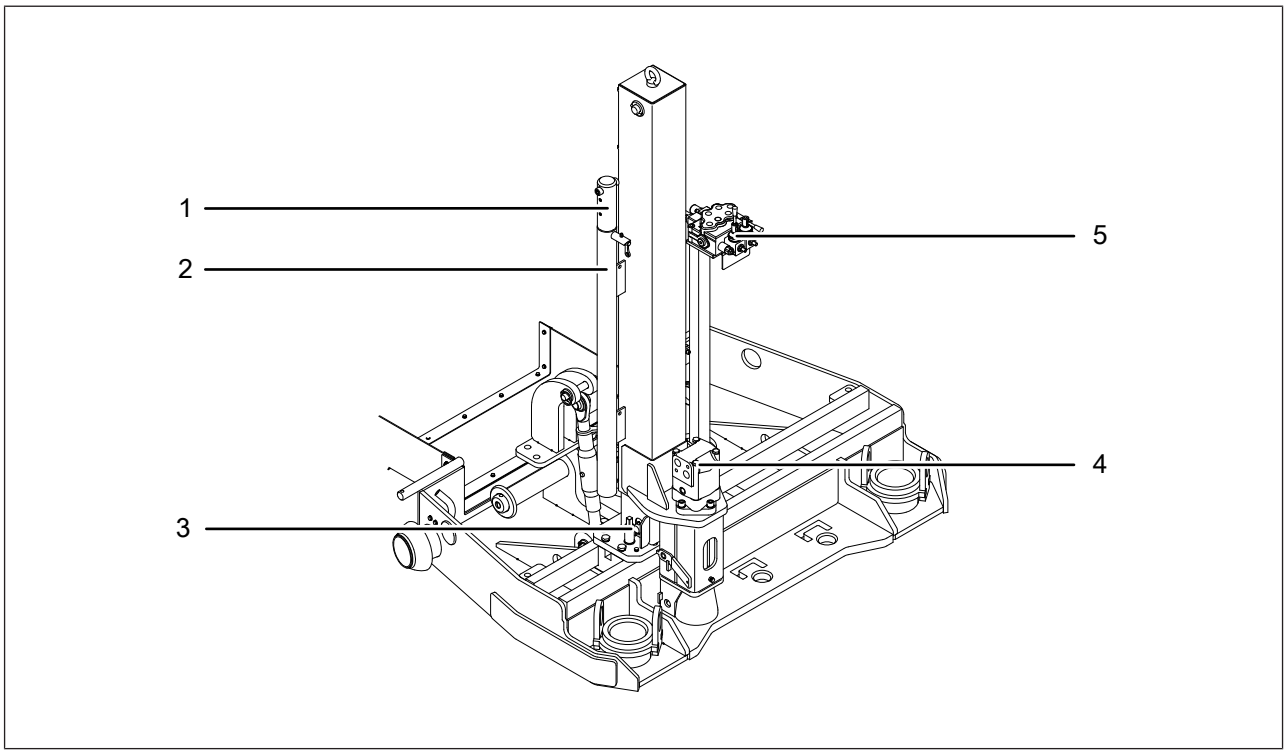


Fig. 3-6 Anchor boring unit

Anchor thrust unit (optional)

The following components are part of the anchor thrust system:

– anchor thrust unit (1)
– valve block with operating lever (2)

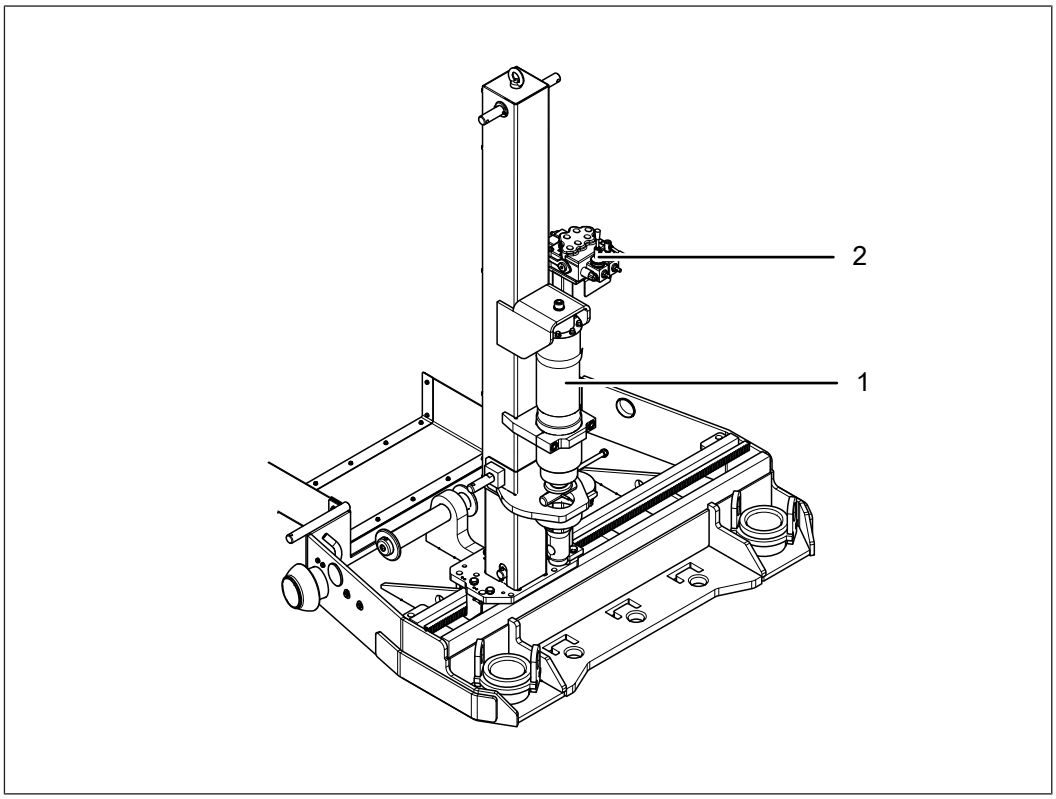


Fig. 3-7 Anchor thrust system

Drill head

The drill head serves to produce the pilot bore hole in the ground. It is connected to a standard transmitter housing.

The angled surface of the drill head enables steering.

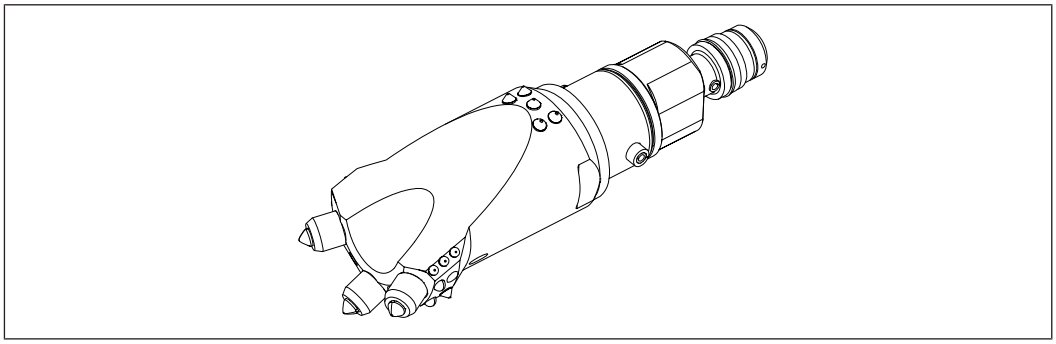


Fig. 3-8 Rinsing drill head (example illustration)

Expander head

The expander head serves to expand bore holes.

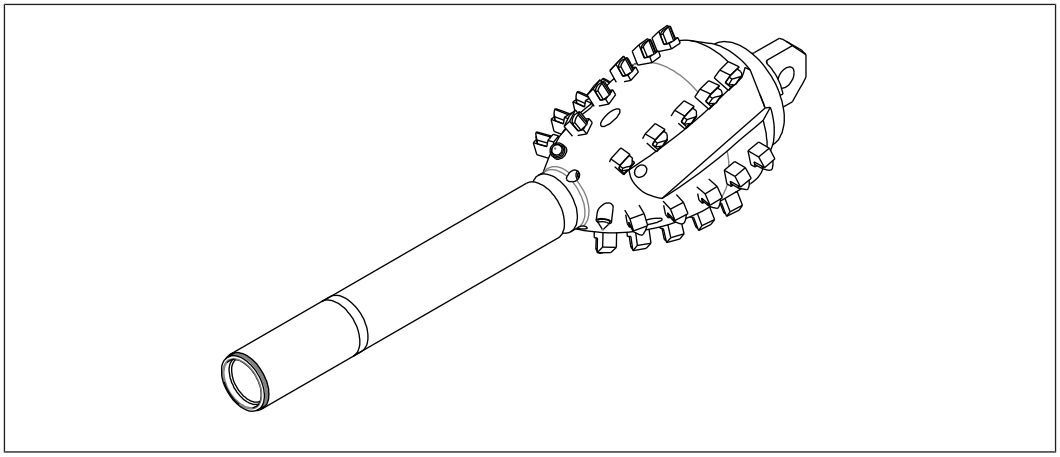


Fig. 3-9 Expander head for rinsing drilling (example illustration)

The expander head is screwed to the rod string in place of the drilling lance.

The pipe puller with the eyelet is connected to the swivel of the expander head. The product pipe is then connected to the pipe puller.

Info!
Additional accessories and their part numbers can be found in the machine's accessories catalogue. Please contact the TRACTO-TECHNIK customer service (chapter 8, page 279).

Detection system

The detection system consists of a transmitter, a receiver as well as a remote display (depending on the model).

The transmitter (1) is part of the bore head assembly and emits electromagnetic pulses which can be located by a receiver while being transmitted to the display at the same time.

The field strength of these pulses is displayed on the receiver's indicator panel and compared to the values determined during calibration. With this proviso the distance between transmitter and receiver unit (bore depth) can be determined.

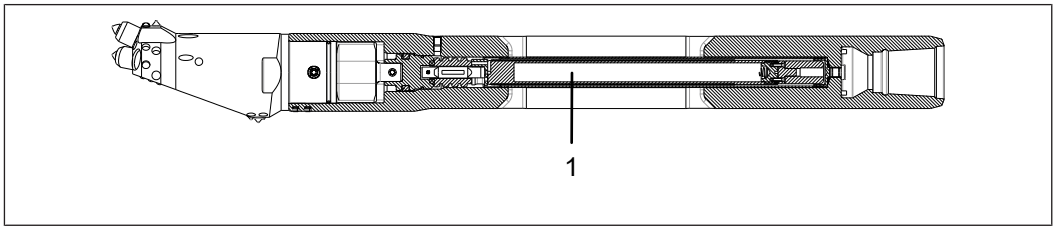


Fig. 3-10 Drill head with transmitter housing (example illustration)



Fig. 3-11 Monitor and receiver (example illustration)

3.3 Technical data

Tab. 3-1 Technical data – GRUNDODRILL 15XPT

Parameter	Additional information	Value
Designation		GRUNDODRILL 15XPT
Transport position	length[1)] width height	6,350–6,500 mm 1,850 mm 2,400 mm
Working position	length width[1)] height	7,250 mm 2,900–3,100 mm 2,700 mm
Machine weight	incl. rod box and drill rods, filled hydraulic and diesel tanks (empty fresh water tank)	11,240 kg
	without rod box and drill rods, incl. filled hydraulic and diesel tanks (empty fresh water tank)	8,320 kg
Tank levels		
Diesel tank	capacity	120 l
DEF tank	capacity	18.9 l
Fresh water tank	capacity	105 l
Hydraulic tank	capacity	filling quantity approx. 100 l (max. tank capacity 114 l)
Bore data		
Max. thrust force		160 kN
Max. tensile force		160 kN
Thrust speed		48 m/min
Max. torque (static)		6,500 Nm
Max. rotational speed		190 rpm

Parameter	Additional information	Value
Drill rod TD73	pilot bore diameter	80 mm
	drill rod diameter	73 mm
	effective length	3000 mm
	weight	42 kg
	bending radius	45 m
	max. expansion diameter (depending on the soil)	550 mm
	max. outer pipe diameter (depending on the soil)	450 mm
	max. bore length (depending on the soil)	400 m

Parameter	Additional information	Value
Rod box TD73		
Capacity		60
Weight	empty incl. 60 drill rods TD73	370 kg 2,920 kg
General		
Max. detection depth (depending on the system)		3–35 m
Max. drilling fluid feed rate, steplessly adjustable	bentonite pump P62	200 l/min
	bentonite pump P72/320 (optional)	320 l/min
Max. drilling fluid pressure	bentonite pump P62	90 bar
	bentonite pump P72/320 (optional)	110 bar
Hydraulic power rotation circuit	at 300 bar	180 l/min
Hydraulic power circuit 2 (drilling fluid and auxiliary functions)	at 295 bar 330 bar optionally	140 l/min
Max. hydraulic pressure	counter-clockwise rotation	350 bar
Max. travel speed	1st step	1.5 km/h
	2nd step	2.6 km/h
Rig inclination		0-20°
Max. inclination during operation	to all sides	6°
Max. inclination when traversing	to all sides (depending on the soil)	16°
Emission sound pressure level L_{pA} [2)]	measured 0.8 m ±0.05 m above the centre of the seating surface of the driver's seat in accordance with ISO 11201	74 dB
	uncertainty K_{pA}	3 dB
Guaranteed noise emission level L_{WAd} [2)]	as defined in 2000/14/EC	103 dB
Permissible temperature range		-10 °C to +40 °C
Highest permissible wind speed	under operating conditions	< wind force 12 (33 m/s)
Max. ground pressure	under operating conditions	7.82 N/cm^2
Working lights, 3 lights on the cabin	illuminance	40 lx together

Parameter	Additional information	Value
Whole body or hand / arm vibrations during work		< 0.5 m/s^2
Coolant		
Type		ALPINE C40 (CES 14603)
Quantity		25.5 l
Mixing ratio		1 : 1
Motor		
Engine manufacturer / engine type		Cummins diesel engine B4.5 – C165 Stage V
Max. rotational speed		2,200 rpm
Drive power	at 2,200 rpm	123 kW
Torque		536 Nm
Consumption		212 g/kWh
Starting unit		24 V DC
[1] Depending on the inclination of the boom and the swivel angle of the cab		
[2] The noise emission values were determined during a standardized test cycle. Accordingly, these values are not necessarily representative of all conditions arising during intended use. Certain operating or ambient conditions can cause higher noise levels than specified, examples are the type of earth or stone on which the machine is operated or the presence of sound-reflecting surfaces in close proximity.		

4.1 Transportation on a truck or trailer

Safety

For safe loading and unloading of the machine onto/from the truck/trailer, observe the following safety instructions:

⚠ WARNING

Danger of falling, tripping and slipping on/off the loading surface of the truck/trailer!



- Pay attention to obstacles and slippery surfaces on the loading surface. Move cautiously.
- Make sure that the loading surface is broom-clean and free from oil and dirt.
- If necessary, de-ice the loading surface in the winter.
- Nobody is allowed on or in the machine when driving it onto or off the loading surface.
- Always load and unload the truck/trailer on a stable, horizontal surface.

⚠ WARNING

Crush hazard between bore rig and walls of the truck/trailer loading surface!



- Keep a distance from the machine!
- Standing between a wall and the machine is prohibited.

⚠ DANGER

Machine or transport vehicle tipping over!



You can get buried under the bore rig or the transport vehicle!

- Observe the max. permissible total weight of the transport vehicle.
- Make sure that the machine is loaded onto the trailer correctly, in accordance with the trailer size and type.
- Observe the ramps' maximum inclination angle of 14°.
- Observe the safety instructions of the truck manufacturer as well as the regulations regarding the transportation of loads.
- Only transport empty mixing/water tanks. Full tanks can cause an overload of the transport vehicle. Full mixing tanks/water tanks cause a reduced brake performance of the truck and a shift of the centre of gravity during cornering. This entails a longer brake distance as well as an increased danger of the truck or trailer tipping over.
  Using the truck in road traffic with a full mixing tank is permitted only if the admissible maximum axle loads are observed. A strongly one-sided load is impermissible.

Transportation without rod box

Info!
If you transport the machine without a rod box, there is a danger of the pusher plates of the rod box disengaging from the guides at the front and rear and getting lost.

– Secure the pusher plates (1) against falling down or take the pusher plates out of the guides and transport them separately.
  Pay attention to the sticker (2) on the panel.

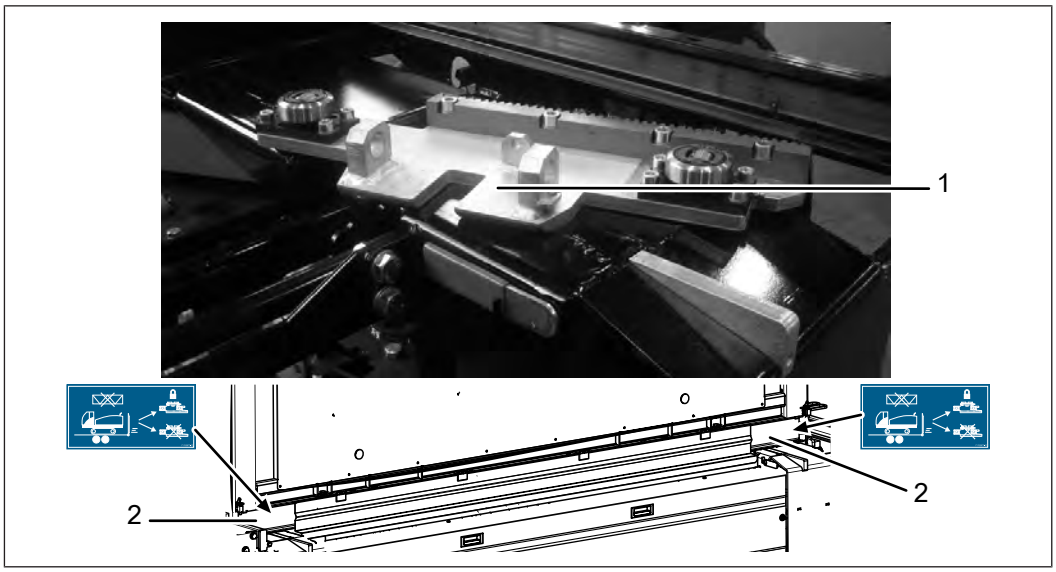


Fig. 4-1 Pusher plates below the rod box and sticker

NOTICE

Potential machine damage due to incorrect rod box approach position!

- When re-inserting the pusher plates, make sure that they are positioned in exactly the same way as when they were taken out.

Info!
Loading instructions for the machine can be obtained from the TRACTO-TECHNIK customer service.

⚠ DANGER

Risk of injury due to moving machine!
It is prohibited to ride on the bore rig!



The moving machine can cause fatal injuries to you and other persons.

- When traversing the machine, make sure that the orange warning light on the machine is switched on.
- Maintain a safety distance of at least 5 m.
- Walk behind or diagonally behind the bore rig when traversing it.
- Ensure good visibility.
- Make sure that you can oversee the travel range.

As standard, the entire drilling system is transported on a truck. Depending on space availability, an additional trailer may be required.

During the drilling operation, the drilling fluid mixing system remains on the truck.

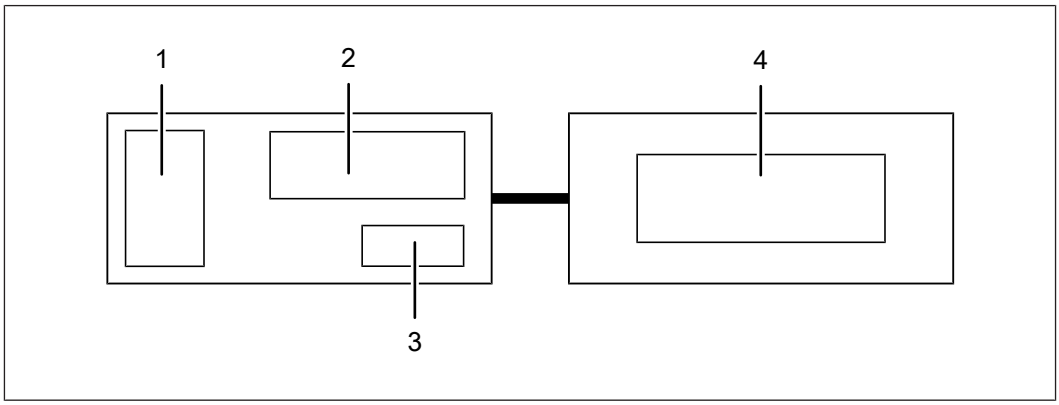


Fig. 4-2 Example set-up on the truck or trailer

1	Drilling fluid mixing system	3	Accessories and assembly tool boxes
2	Workbench and bentonite pallet	4	Machine

Driving onto the trailer

1. Ensure a sufficient maximum permissible weight of the truck (chapter 3.3, page 55).
2. Make sure that the trailer is properly connected to the towing vehicle.
3. Start the machine (chapter 6.4, page 213).
4. Check the thrust rig. It must be fully advanced. If necessary, advance the thrust rig.
5. Check whether the rod box is in transport position. If necessary, move the rod box in transport position.
6. Check the rig boom. It must be in horizontal position. If necessary, position it horizontally.
7. Enable the wireless drive remote control (chapter 5.3.5, page 79).
8. Switch on the orange warning light on the machine cab using the switch on the left joystick panel.

⚠ DANGER

Risk of injury due to moving machine!
It is prohibited to ride on the bore rig!

The moving machine can cause fatal injuries to you and other persons.

- Maintain a safety distance of at least 5 m.
- Walk behind or diagonally behind the bore rig when traversing it.
- Ensure good visibility.
- Make sure that you can oversee the travel range.

9. Use the wireless drive remote control to traverse the machine to the rear of the trailer (chapter 5.3, page 73).
10. Align the ramps of the trailer to the machine's track width and make sure that the ramps are firmly mounted.

⚠ DANGER

Machine tipping over!



When driving the machine on ramps or slopes, there is a risk of the machine tipping over and crushing your body.

- Reduce the danger of the machine tipping over by lowering the stabilisers.
- Maintain a safety distance of at least 5 m!
- Be mindful of weight shifts when driving up the ramp!
- Observe the ramps' maximum inclination angle of 14°.
- Only traverse the machine in the lowest gear step.
  To do so, set the switch for the speed level to "tortoise".
- Traverse/park and operate the machine only up or down a slope.
  The max. permissible inclination on slopes is 20°.

Info!
If you do not actuate any function for approx. 3 seconds, the engine speed will automatically be reduced to approx. 850 rpm (idle running).
The engine speed will increase as soon as a function has been actuated.

11. Set the engine speed to approx. 1,500 rpm via the flip lever (3) of the wireless drive remote control.
12. Lift the rear stabiliser by pushing the flip lever (2) on the wireless drive remote control upwards.
13. For machines equipped with two stabilisers, also lift the front stabiliser by pushing the flip lever (1) on the wireless drive remote control upwards.

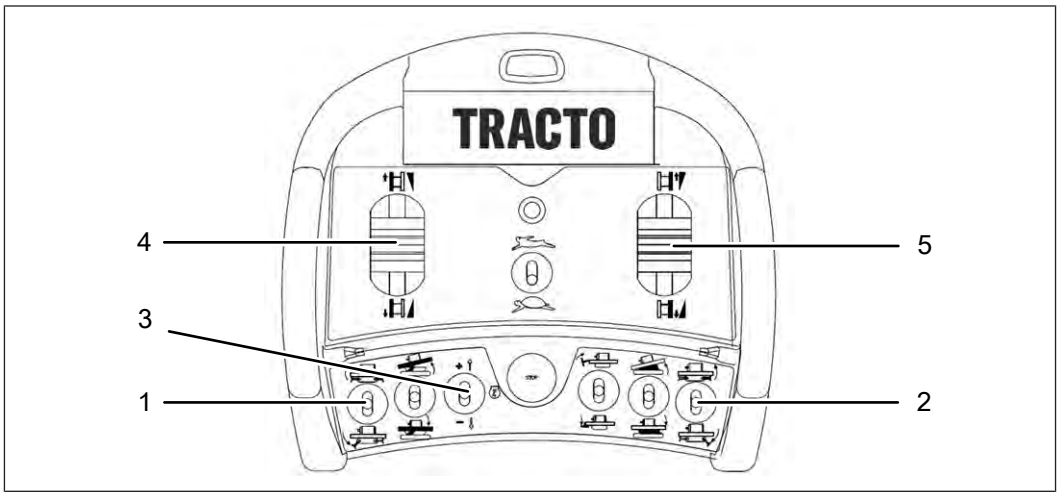


Fig. 4-3 Control – speed, stabilisers, traversing

14. Traverse the machine onto the trailer using the two flip levers (4, 5).
15. Bring the machine into the correct position on the trailer. Load the machine in a way that its centre of gravity is ideally located above the longitudinal centre line of the trailer so that the load is evenly distributed on both vehicle axles.

⚠ WARNING



Danger of crushing when raising and lowering the stabilisers!

- Keep a sufficient distance from the stabilisers!

16. Lower the rear stabiliser. To do so, press the flip lever (2) downwards.
17. For machines equipped with two stabilisers, also lower the front stabiliser. To do so, press the flip lever (1) downwards.
18. Switch off the orange warning light on the machine cab using the switch on the left joystick panel.
19. Switch off the engine with the ignition key.

Lashing the machine down

Before lashing the machine down, ensure the following:

- Observe the total weight of the machine specified in the technical data.
- The lashing points of the vehicle are suitable for the weight of the load. If you use lashing points of a lower lashing capacity, take additional safety measures.
- To muster the remaining securing force, use lashing means with a lashing capacity (LC) of at least 5,000 daN in a straight line.
- Make sure that the strength of the lasing point amounts to min. 5,000 daN.
- Check the lashing forces of all lashing means for every loading process.
- Attach the lashing means to the provided lashing points.
- To muster the remaining securing force, use lashing means attached diagonally.
- In case of diagonal lashing adhere to the following lashing angles, as possible:
  - angle α (vertical): 10° to 65°
  - angle β (horizontal): 10° to 50°

1. Lash the machine (3) via two transport eyelets (1) at the front and two transport eyelets (2) at the rear of the machine using one lashing strap (4, 5) each.

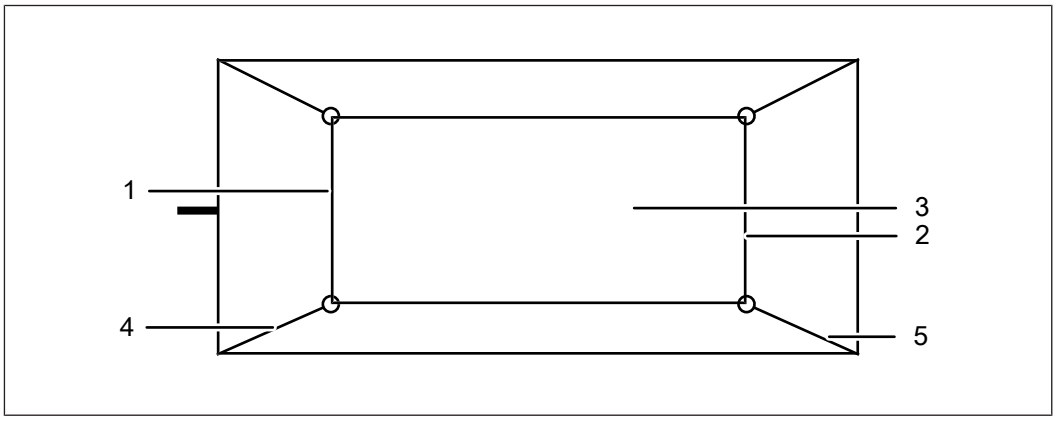


Fig. 4-4 Standard fastening on the truck or trailer

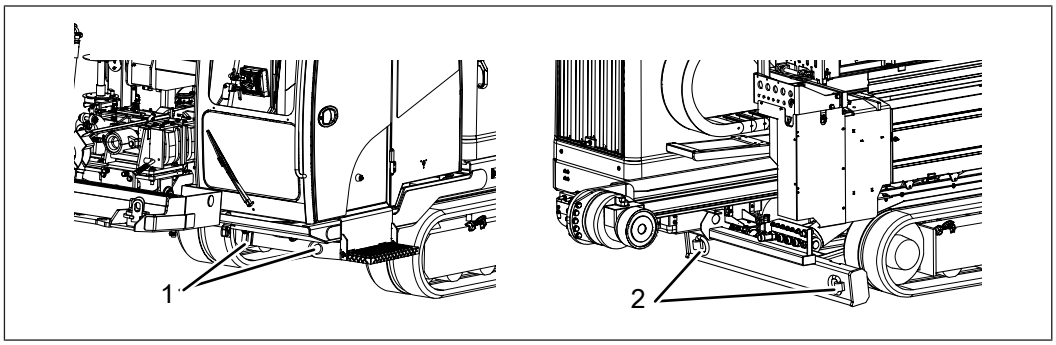


Fig. 4-5 Lashing eyes

2. Attach the lashing means to the trailer as firmly as possible. Always take the on-site conditions into account when determining the tension angle of the lashing means. Also pay attention to the positioning of the machine on the trailer. Observe the loading instructions of the machine.

⚠ WARNING

Falling parts!



During transport, there is a risk of loose parts falling off the truck/trailer and causing injuries.

- Make sure that the loading surface is free of loose parts.
- Load all individual components safely and lash them down.

3. Place all tools and drilling accessories at the provided storage places. Lock all doors and covers.

Driving off the trailer

⚠ DANGER

Machine tipping over!



When driving the machine on ramps or slopes, there is a risk of the machine tipping over and crushing your body.

- Reduce the danger of the machine tipping over by lowering the stabilisers.
- Maintain a safety distance of at least 5 m!
- Be mindful of weight shifts when driving up the ramp!
- Observe the ramps' maximum inclination angle of 14°.
- Only traverse the machine in the lowest gear step.
  To do so, set the switch for the speed level to "tortoise".
- Traverse/park and operate the machine only up or down a slope.
  The max. permissible inclination on slopes is 20°.

1. Make sure that the trailer is properly connected to the towing vehicle.
2. Remove the lashing means.
3. Align the ramps of the trailer to the machine's track width and make sure that the ramps are firmly mounted.
4. Start the machine (chapter 6.4, page 213).
5. Enable the wireless drive remote control (chapter 5.3.5, page 79).
6. Switch on the orange warning light on the machine cab using the switch on the left joystick panel.

Info!
If you do not actuate any function for approx. 3 seconds, the engine speed will automatically be reduced to approx. 850 rpm (idle running).
The engine speed will increase as soon as a function has been actuated.

7. Set the engine speed to approx. 1,500 rpm via the flip lever (3) of the wireless drive remote control.
8. Lift the rear stabiliser by pushing the flip lever (2) on the wireless drive remote control upwards.
9. For machines equipped with two stabilisers, also lift the front stabiliser by pushing the flip lever (1) on the wireless drive remote control upwards.

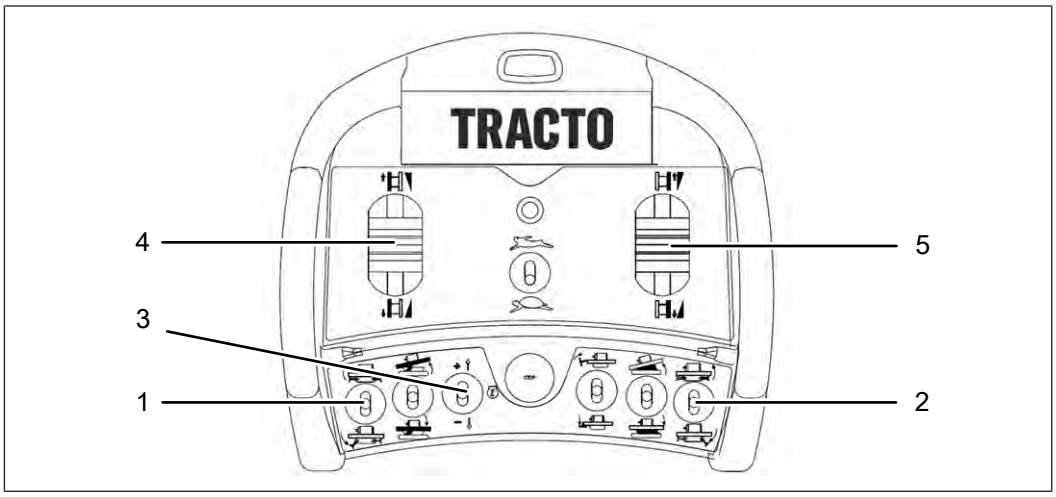


Fig. 4-6 Control – speed, stabilisers, traversing

10. Move the machine down the trailer using the two flip levers (4, 5).

4.2 Lifting the machine with an external crane

When lifting the machine with a crane, observe the following safety instructions:

- Before lifting the machine, contact the TRACTO-TECHNIK customer service (chapter 8, page 279).
- Observe the instructions for the lifting device, especially the safety information.
- Observe the specifications from the manufacturer of the lifting device, these always have priority.
- Make sure that the lifting device is placed on sufficiently stable ground when lifting the machine.
- Make sure that the lifting device is sufficiently stable.
- Dismantle or remove the rod box before lifting (Exchanging the rod box).
- Only use lifting beams approved for the machine weight and loading direction.
- Only use lifting beams where the minimum distance between the lower lifting eyes is large enough to prevent damage to the bore rig.
- Use lifting means of sufficient length so that the machine hangs balanced in the crane.
- Make sure that the lifting means are intact.

Info!
For the precise dimensions of lifting beam and lifting means please contact the TRACTO-TECHNIK customer service.

1. Empty the fresh water tank.

⚠ DANGER

Risk of death due to falling loads!



Loads can fall down or crush you.

- In the case of a different distance between lifting beam and footprint of the machine, change the front and rear lifting means proportionally to keep the centre of gravity in the middle during the lifting process.
- Avoid chafing the lifting means against the drive frame or other machine parts when lifting the machine.

2. Fasten the shorter lifting means (1 to the front transport eyelets (4) and the longer ones (2) to the rear transport eyelets (5). Fasten the other ends of the lifting means to the lifting beam (3).
3. Slowly lift the machine.
4. Make sure that the machine is hanging precisely balanced.
5. Transport the machine slowly and carefully.

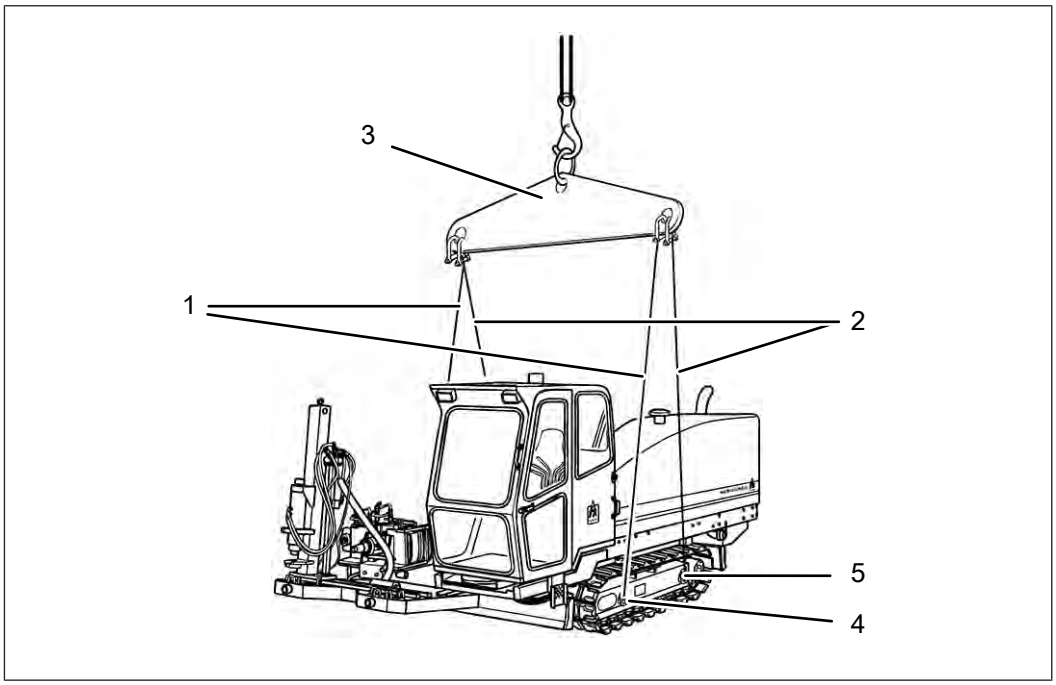


Fig. 4-7 Attaching the lifting means to the lifting beam and transport eyelets

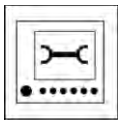
4.3 Towing the machine

When towing the machine, please observe the following safety instructions:
- Only use sufficiently dimensioned towing means!
- Attach the towing means to the anchor plate only.
- Nobody is allowed near the towing device!
- Only tow over short distances (up to approx. 1 km) and with a speed of less than 1.6 km/h!

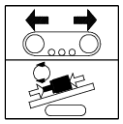
Do not tow the machine unless it has broken down and is getting in the way in the working area or it is situated in a danger area.

Info!
If the drive engine cannot be started, dismantle the central drive shaft of the crawler drive before towing.
Please contact the TRACTO-TECHNIK customer service.

1. Start the machine (chapter 5.3.2, page 75).



2. If necessary, switch over from service to operation via the right joystick panel.



3. If necessary, switch over on the right joystick panel from bore mode to drive mode.

The "Drive mode" screen is displayed on the panel PC:

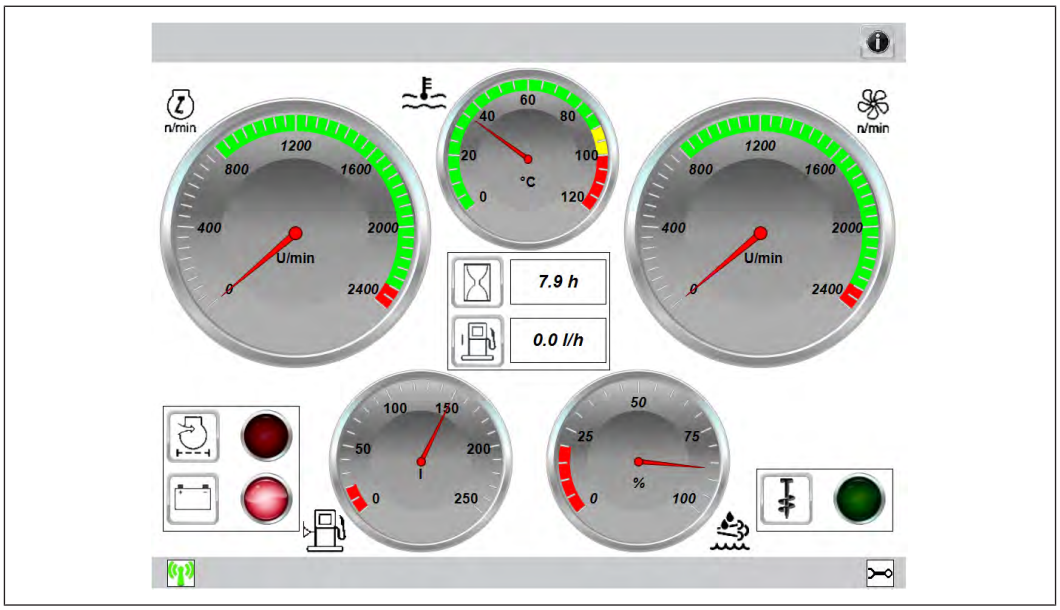


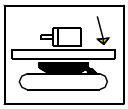
Fig. 4-8 "Drive mode" screen



4. Set the engine speed to approx. 1,500 rpm via the potentiometer on the right joystick.



Info!
If you do not actuate any function for approx. 3 seconds, the engine speed will automatically be reduced to approx. 850 rpm (idle running).
The engine speed will increase as soon as a function has been actuated.



5. If necessary, the rig boom must be moved into horizontal position. To do so, press the push button on the left joystick.
6. Swivel the anchor plate manually upwards with the rotating device.

7. Mount a sufficiently dimensioned towing means (1), e.g. a chain or rope with a hook or shackle to the transport eyelets (2) at the front of the machine.

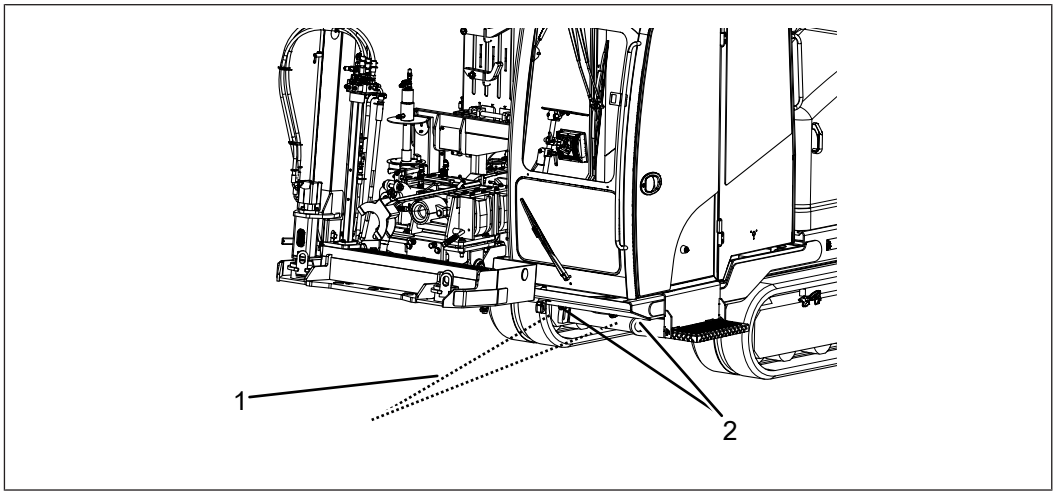


Fig. 4-9 Attaching the towing means (example illustration)

8. Start driving slowly.

⚠ DANGER

Risk of death due to machine rolling away!

The machine could roll away and run you over!

- After the towing process, secure the machine against rolling away. For this purpose, use e. g. brake chocks.

9. Tow the machine to the desired location and secure it against rolling away.

5.1 Planning of the construction site

Plan the site carefully. The checklist in the annex can be helpful for this purpose.

5.2 Site requirements

⚠ DANGER



Danger of falling or tripping!

- Cordon off the entire site against unauthorized access.
- Put up a sign reading: "CONSTRUCTION SITE – Unauthorized access prohibited!".

A minimum of two persons is required for machine set-up.

An operating area of 10 m x 4.5 m is required for the machine for surface start, including securing the installation surfaces.

Only use the machine in areas where there is no danger of any objects falling from above.

Illuminate the drilling site with at least 100 lux during night-time operation.
(In night mode, the three working lights at the cab emit approx. 40 lux at a distance of 7 m.)

5.2.1 Conditions for the entrance pit

The entrance pit is required for the starting phase and helps the drill head to penetrate the ground.

The entrance pit generally has the following dimensions:

– length x width: 50 cm x 60 cm
– depth: 20 cm

5.2.2 Conditions for the starting and target pits or the intermediate pit

The size of the pits basically depends on the depth of the bore path, the outer pipe diameter and the number of pipes to be installed.

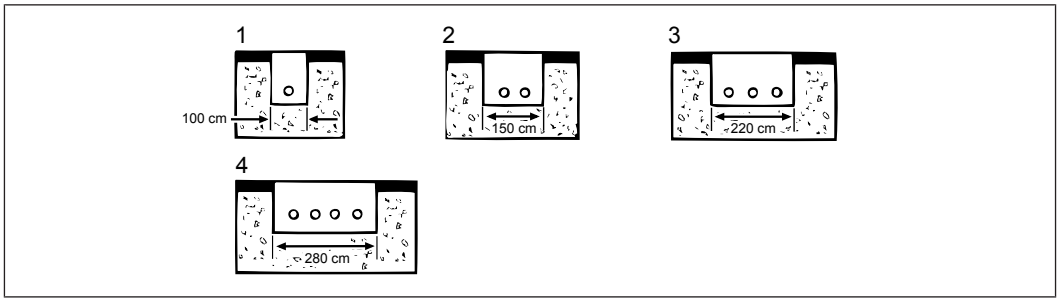


Fig. 5-1 Example cross-section of a starting or target pit (outer pipe diameter 100 mm)

5.2.3 Securing the construction site

⚠ DANGER



Danger of tripping or falling into the pits!
Risk of injury due to machine movements!

- Presence in the machine's immediate danger area is prohibited.
- Secure the installation surface or pit against unauthorized access!
- Secure holes in the ground with appliances in a way to prevent people from falling in.
  The opening is to be fenced off, made accessible or covered with an immovable cover.
- Secure the operating surface using traffic cones, barrier tape and warning signs reading: "Presence in the danger area is prohibited!".
- Secure working areas near public roads or railway tracks by means of barriers, safety posts or signalling devices.
- Observe a minimum distance of 1.50 m between the drilling system and the barriers.
- In pedestrian areas the product pipes are to be cordoned off by means of traffic cones!
- When working in pits and trenches, earth and rock faces must be scarped or sheeted in a way that workers are secured against slipping soil. All influences possibly impairing the soil's stability (rain, vibrations etc.) must be taken into consideration.

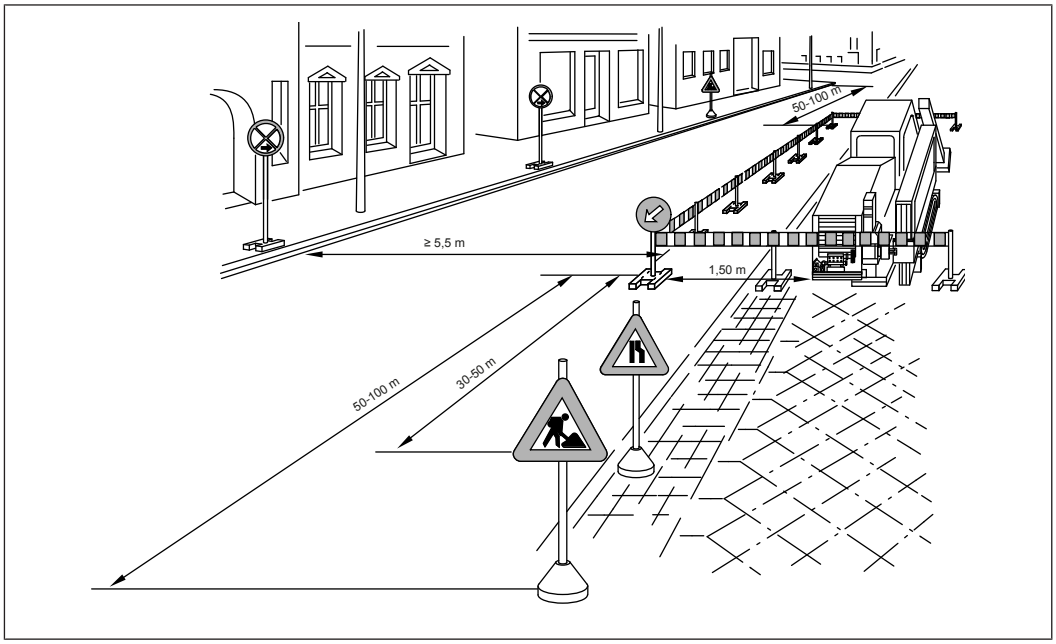


Fig. 5-2 Example for securing pits

5.3 Driving the machine to the operating site

5.3.1 Inspections before and during machine start-up

Carry out the following tests before starting to operate the machine (see also instructions provided by the engine manufacturer):

Requirements

- The machine is positioned horizontally.
- The engine is switched off.

1. Open the bonnet.
2. Check the engine oil level via the oil dipstick (1).
3. Check the hydraulic oil level by checking the oil level glass (2) of the hydraulic oil tank.
4. Remove the water in the fuel filter by use of the drain plug (3).
5. Close the bonnet.

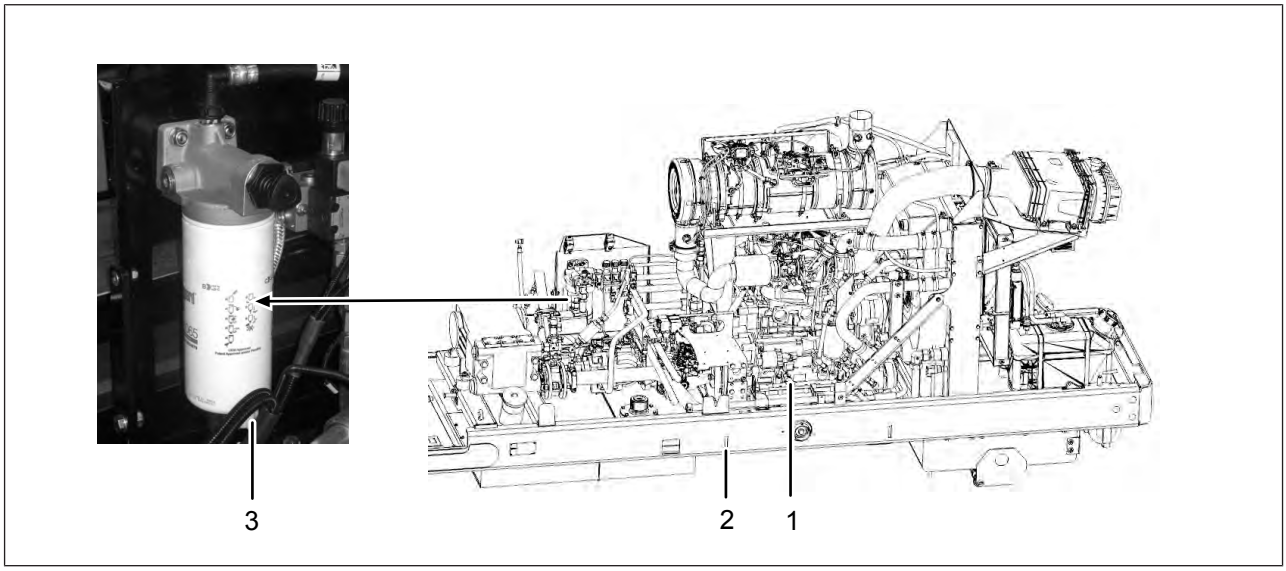


Fig. 5-3 Checks prior to start-up

Make sure that the warning indicator "Cleaning of exhaust gas system" (1) on the panel in front of the right joystick is not illuminated. Otherwise start to clean the exhaust gas system manually (chapter 6.11.2, page 274).

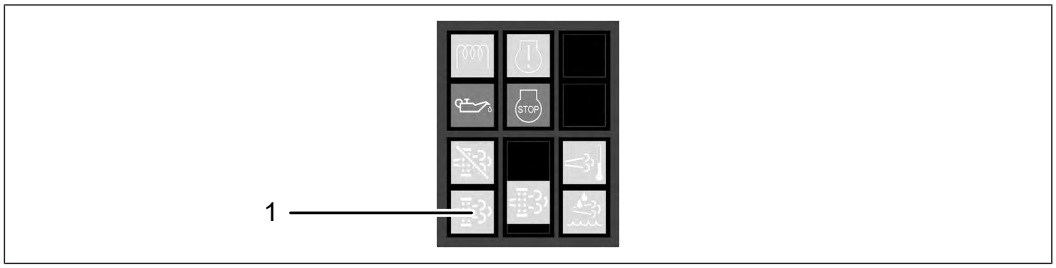


Fig. 5-4 Warning indicators on the panel

Carry out the following inspections at the panel PC while starting up the machine:

– Check the diesel supply via the diesel tank indicator (3).
  If the tank is filled with 20 litres, the indicator will be in the red range (reserve).
  A corresponding message will appear on the message display (1). Additionally, a corresponding indication symbol will appear in the status line (4).
– Check the supply of diesel exhaust fluid (5).

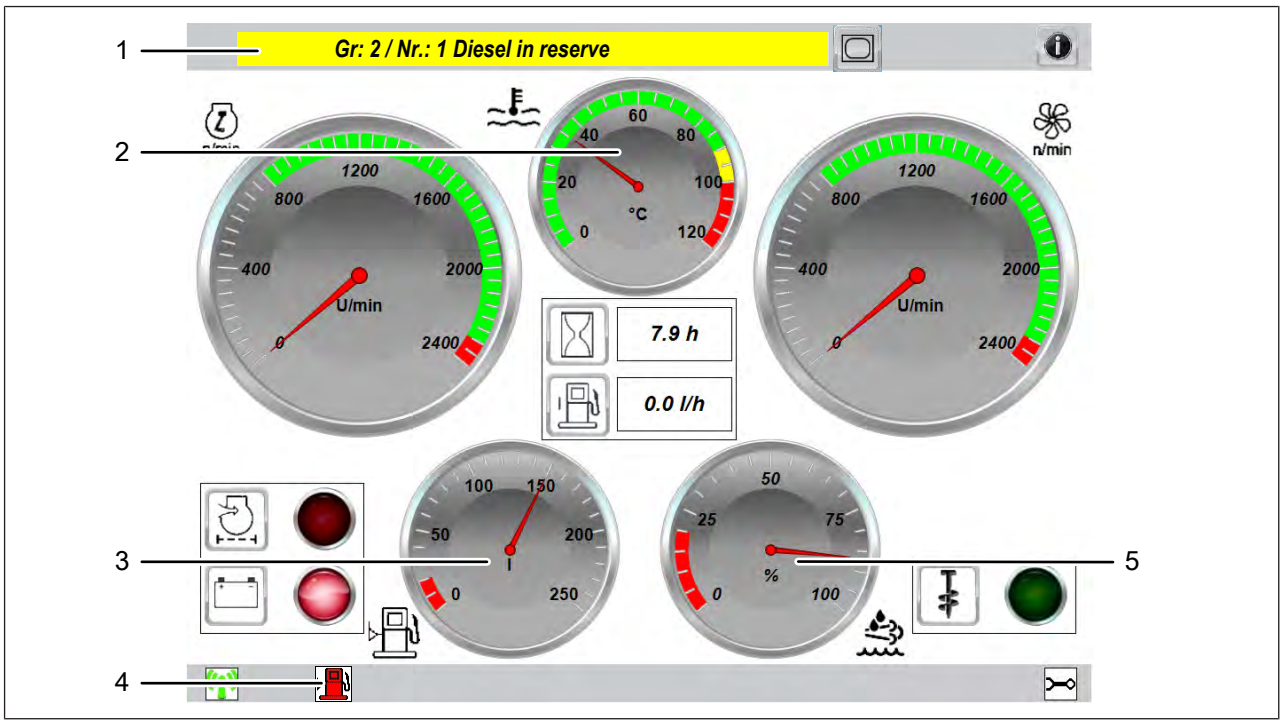


Fig. 5-5 Checks while starting to operate

Refilling diesel exhaust fluid

If there is DEF supply in the reserve range, refill the DEF tank as follows:

Prerequisites

- The machine is positioned horizontally.
- The ignition is switched off.

1. Fill the DEF into the tank (1) with a maximum of 19 l/min.
2. Fill the tank to the lower edge of the filler neck at the maximum.
3. After filling, tap the side of the tank with the flat of your hand or a rubber mallet until the air bubbles adhering to the wall and sensor are released.

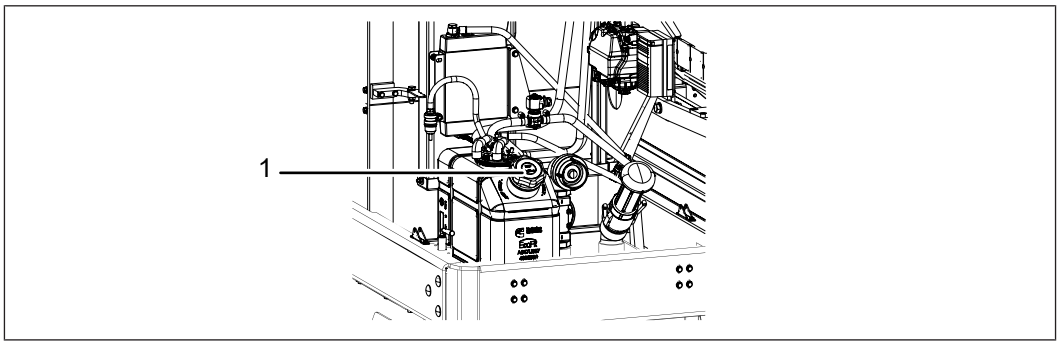
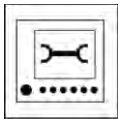
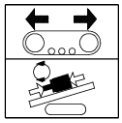


Fig. 5-6 DEF tank

5.3.2 Starting the engine



1. If necessary, switch over from service to operation via the right joystick panel.

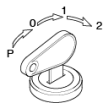


2. If necessary, switch over on the right joystick panel from bore mode to drive mode.

Info!
Only use the ignition key as a single key.
You are not allowed to have a bunch of keys hanging from the ignition lock.

Info!
When moving a joystick axis or actuating a joystick button while the ignition is being switched on, the actuated component will be disabled.
If, for example, the left joystick is pushed forward while the ignition is being switched on, the left track chain (in drive mode) or the rotation (in bore mode) cannot be controlled.

- To rectify the fault, switch off the ignition.
- Always set the ignition lock to the centre position when you switch off the ignition. This prevents the battery from being deeply discharged.
- Only switch the ignition back on when it is sure that, in doing so, no operating element is actuated.



The ignition lock has the following key positions:

- Position P: parking position for operation using the wireless remote control (driving the machine and operation inside the pit)
- Position 0: engine off (no function)
- Position 1: pre-heating
- Position 2: start-up

3. Make sure that neither a joystick nor a joystick button was actuated.
4. When cold starting the engine, first turn the ignition key into position "1" and wait until the "pre-heating" indicator light in the right joystick panel has gone out.
5. Turn the ignition key to the right to position "2" and hold it in place. Let go of the ignition key as soon as the engine starts running.

The "Drive mode" screen is displayed on the panel PC:

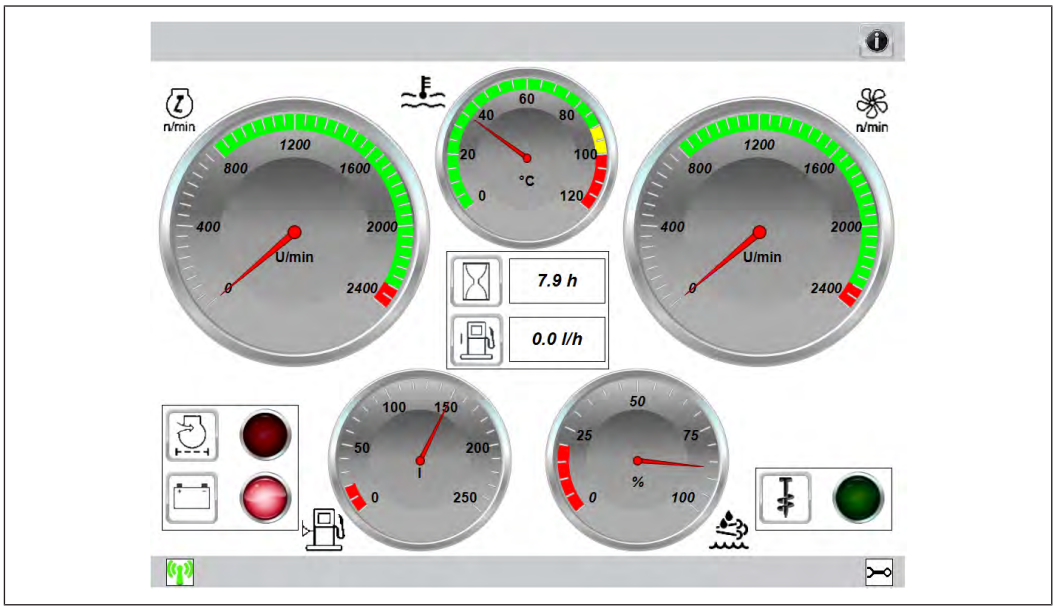


Fig. 5-7 "Drive mode" screen

If a machine error occurs, an error message will appear in the message display (chapter 8.1, page 279).

NOTICE

Engine performance can deteriorate with prolonged idling!

- Only allow the engine to run at idle for a short time. If the idle time is too long, this may lead to a poor engine performance.

5.3.3 Performing calculations

If necessary, perform the calculations required for a precise planning of the drilling (place of installation of the machine, bending radius of the drill rod etc.).

Refer to the screens starting in chapter 6.2.8.11, page 160.

5.3.4 Preparing the machine for traversing

For traversing the machine, the cab and the rod box must be in transport position and the step grid must be folded in.

1. Fold the footstep to the cab upwards before traversing the machine.
2. Pull up the cab lock (1) on the cab floor.

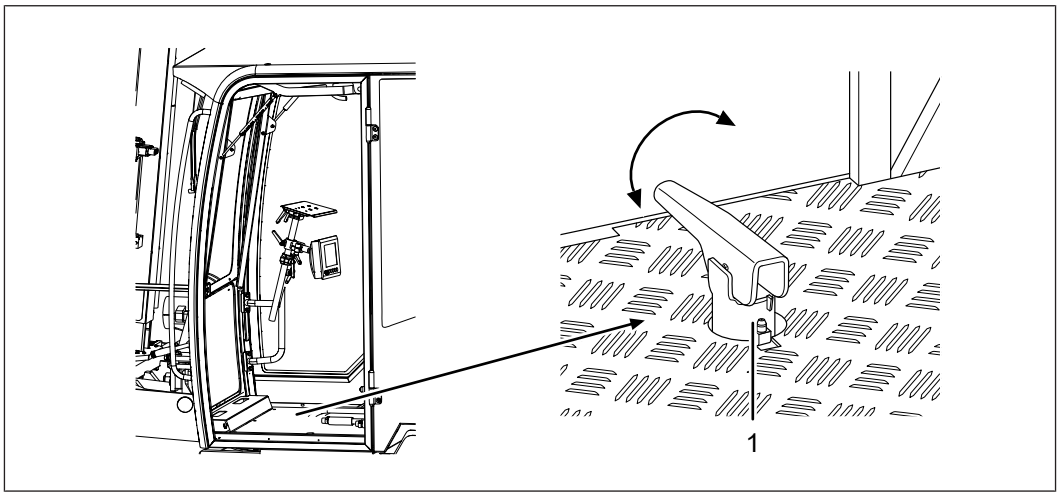


Fig. 5-8 Unlocking the cab

3. Swing the cab in manually.

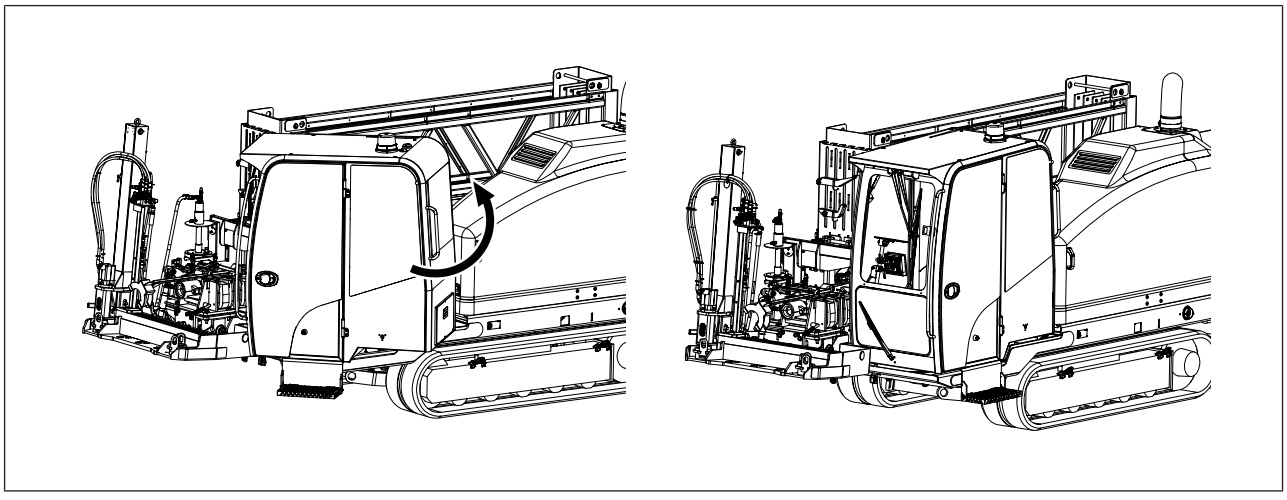
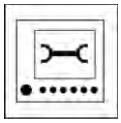
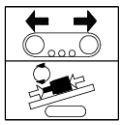


Fig. 5-9 Swinging the cab in

4. Fold the cab lock back down to lock the cab.



5. Make sure that the cab is locked and can no longer be swung out.
6. If necessary, switch over from service to operation via the right joystick panel.



7. If necessary, switch over on the right joystick panel from bore mode to drive mode.

The "Drive mode" screen is displayed on the panel PC:

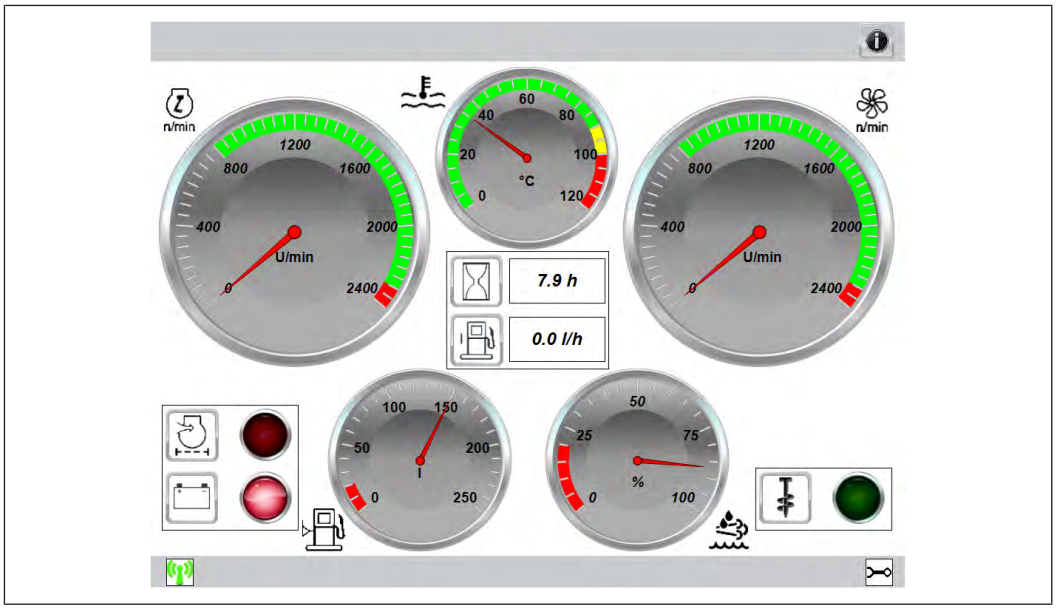
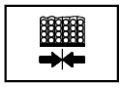


Fig. 5-10 "Drive mode" screen



8. Drive the drill rod box into transport position by briefly pressing the button on the left joystick.
   The transport position has been reached when the hydraulic jacks are situated precisely between two rods and the lifting cylinders have been lowered.

Info!
The drive functions of the wireless drive remote control (chapter 5.3.5, page 79) will only be enabled if the rod box is in transport position.

5.3.5 Enabling the wireless remote controls

The machine is operated via a wireless remote control system. The wireless remote control system consists of:

- a wireless drive remote control only for traversing the machine (chapter 6.2.2, page 129)
- a wireless pit remote control only for safe retrofitting of the drilling tools inside the target pit (chapter 6.2.3, page 130)

The machine can always only be operated via one of the following operating elements:

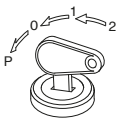
- from the operator seat
- using the wireless drive remote control
- using the wireless pit remote control

The operating element first activated has priority over the others. Whether the operating elements at the seat or in the wireless remote control are used depends on the position of the ignition key.

Info!
If the ignition key is set to position "P", no functions can be carried out from the cab.

- Do not leave the ignition key in position "P" for more than one day.
- For longer downtimes of the machine (> 2 days), switch off the power supply at the main power switch (chapter 6.2.1, page 128).

To activate the wireless remote control system,



1. set the ignition key on the operator seat to position "P" and
2. activate the desired wireless remote control.

Wireless drive remote control

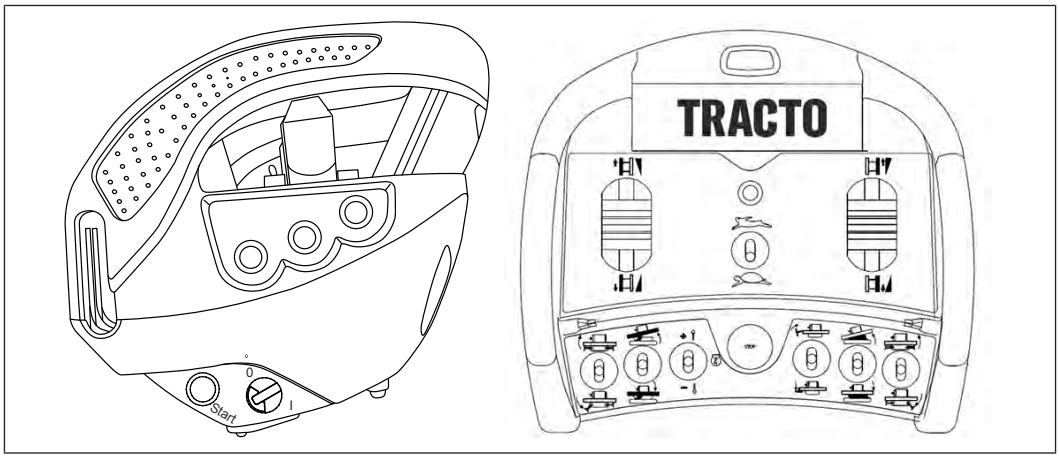


Fig. 5-11 Wireless drive remote control

The wireless drive remote control has a range of approx. 300 m. As soon as the signal is disturbed or interrupted, the machine is switched off. Also observe the information given in chapter 6.2.2, page 129.

Observe the safety information in chapter 5.3.8, page 85 when using the wireless drive remote control for operation.

Requirements

Conditions for the operation of the wireless drive remote control:

- The cab is swung in and locked.
- The rod box is in transport position.
- The ignition key is in position "P".
- The operator seat in the cab is unoccupied.

Operating with wireless drive remote control

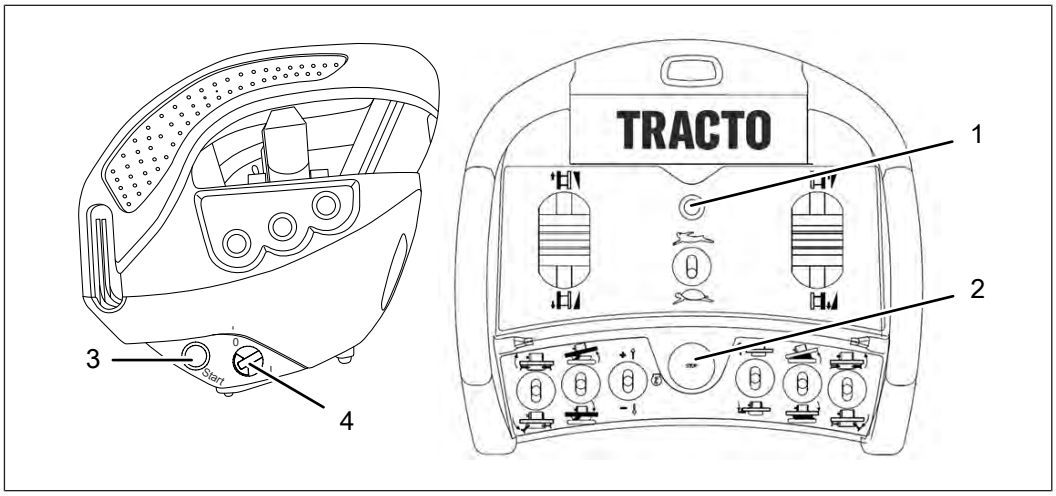


Fig. 5-12 Wireless drive remote control

1. Switch on the wireless drive remote control using the key switch (4).
2. Unlock the emergency stop button (2). If the emergency stop button has already been unlocked, press it and unlock it again.
3. When the green indicator light (1) flashes, start the machine by pressing the start button (3).
   ⇨ The control unit is now supplied with voltage. Hold the start button until the machine has started.
4. Carry out the desired machine operations.
5. Switch off the machine with the key switch (4) of the wireless drive remote control.
   Then turn the ignition key into zero position (centre position of the ignition lock).

Info!
Operation of the machine can be interrupted at any time by pressing the emergency stop button. The machine's engine will be switched off then.

Wireless pit remote control

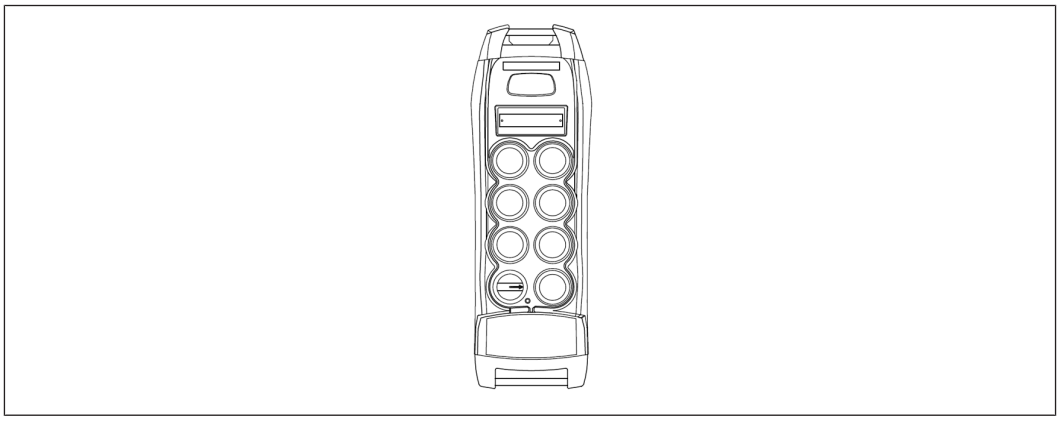


Fig. 5-13 Wireless pit remote control

The wireless pit remote control has a range of up to 300 m. The machine will be switched off as soon as the signal is disturbed or interrupted. Also observe the information given in chapter 6.2.3, page 130.

Info!
Objects between the machine and the pit, e.g. trees, buildings or vehicles, can interfere with the radio signal and reduce the range of the wireless pit remote control.

Requirements

Requirements for the operation of the wireless pit remote control:

- The ignition key is in position "P".
- The operator is sitting on the operator seat inside the cab of the machine.
- The left joystick panel is folded down.
- The operator and his skilled colleague in the target pit can communicate with one another via radio.

Operating from the target pit

1. Switch on the wireless pit remote control using the main switch (1).
2. Unlock the emergency stop button (4). If the emergency stop button has already been unlocked, press it and unlock it again.
3. Switch on the ignition of the engine by pressing the start button (3).
4. When the green indicator light (2) flashes, start the machine by pressing the start button (3).
   ⇨ The control unit is now supplied with voltage. Hold the start button until the machine has started.

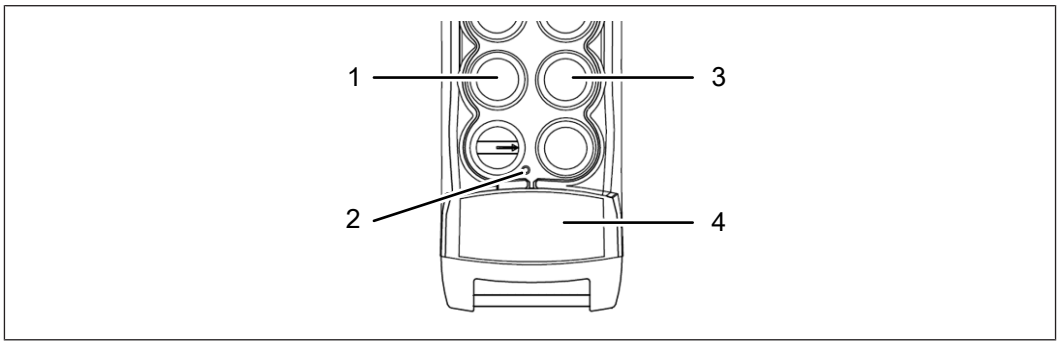


Fig. 5-14 Wireless pit remote control

5. Carry out the desired drilling functions. While the drilling functions are controlled via the wireless pit remote control, a warning signal will be emitted at the machine.
6. After completion of the work in the target pit, switch off both the machine and the wireless pit remote control by pressing the main switch.
7. Inform the operator at the machine that the machine can now again be started and operated from the operator seat.

Info!
Operation of the machine can be interrupted at any time by pressing the emergency stop button. The machine's engine will be switched off then.
If the operator has left the seat in the meantime, the wireless pit remote control must be re-enabled by pressing the start button when the operator has returned to the seat.

5.3.6 Lifting the stabilisers

Make the preparations starting in chapter 5.3.2, page 75.

⚠ WARNING



Danger of crushing when raising and lowering the stabilisers!

- Keep a sufficient distance from the stabilisers!

1. Lift the rear stabiliser and the optional front stabiliser by pressing the corresponding buttons on the right joystick.

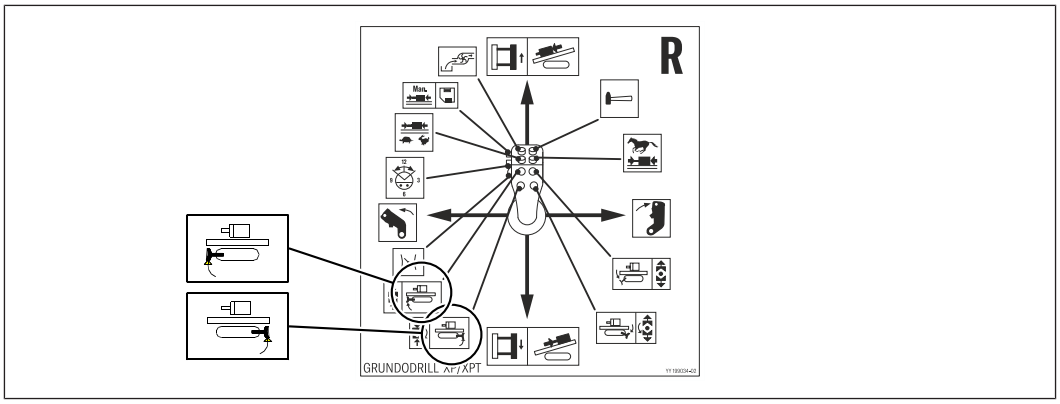


Fig. 5-15 Lifting the stabilisers

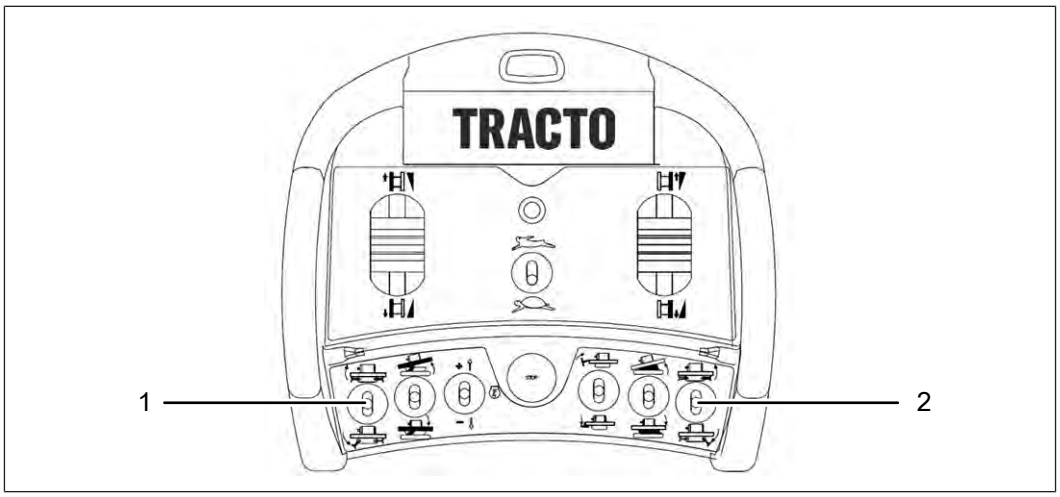


Fig. 5-16 Wireless drive remote control – flip levers for stabilisers

5.3.7 Aligning the boom horizontally

⚠ WARNING



Danger of crushing under the lowering boom!

Keep a sufficient distance from the boom.

1. Make the preparations starting in chapter 5.3.2, page 75.
2. Align the rig boom horizontally by pressing the corresponding buttons on the left joystick.

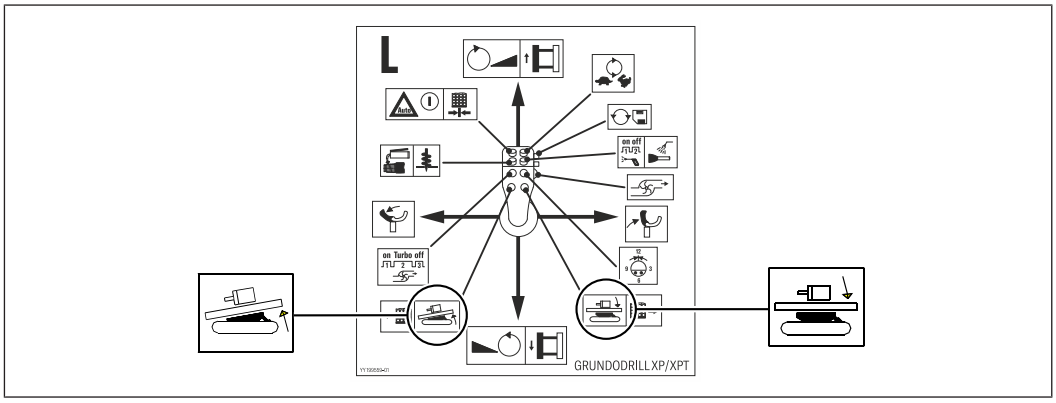


Fig. 5-17 Aligning the rig boom horizontally

Info!
You can lift and lower the rig boom by actuating the flip lever (1) on the wireless drive remote control.

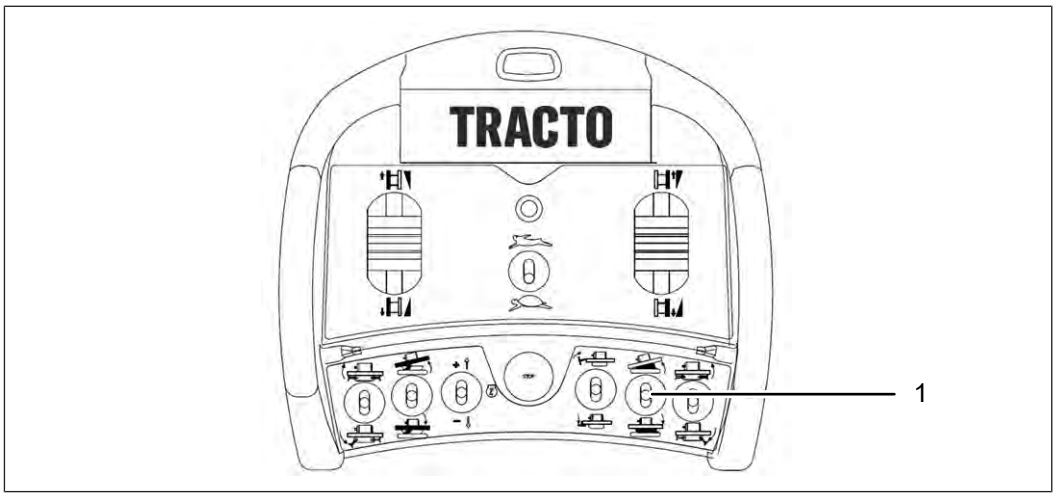


Fig. 5-18 Wireless drive remote control – flip lever rig boom

5.3.8 Traversing the machine

When traversing the machine, please observe the following safety instructions:

⚠ DANGER

Risk of injury due to moving machine!
It is prohibited to ride on the bore rig!



The moving machine can cause fatal injuries to you and other persons.

- When traversing the machine, make sure that the orange warning light on the machine is switched on.
- Maintain a safety distance of at least 5 m.
- Walk behind or diagonally behind the bore rig when traversing it.
- Ensure good visibility.
- Make sure that you can oversee the travel range.

NOTICE

Potential damage to hose and control lines!

When running over hydraulic hoses, drilling fluid hoses or control cables, use hose bridges to protect the hoses and cables against damage.

⚠ DANGER

Machine tipping over!



When driving the machine on ramps or slopes, there is a risk of the machine tipping over and crushing your body.

- Reduce the danger of the machine tipping over by lowering the stabilisers.
- Maintain a safety distance of at least 5 m!
- Be mindful of weight shifts when driving up the ramp!
- Observe the ramps' maximum inclination angle of 14°.
- Only traverse the machine in the lowest gear step.
  To do so, set the switch for the speed level to "tortoise".
- Traverse/park and operate the machine only up or down a slope.
  The max. permissible inclination on slopes is 20°.

Info!
Moving the machine from the operator seat is only permitted for aligning the machine. The function automatically stops after 10 seconds. Only after having moved the joysticks to their resting position you can execute the function again for maximally 10 seconds.

– Use the wireless drive remote control to traverse the machine.
– Check the ground of the operating site to ensure the required stability.
– Stop operating the machine from a wind speed of 33 m/s (wind force 12).
– Only traverse the GRUNDODRILL with the cab locked.

NOTICE

When manoeuvring or transporting the machine, please observe the following to avoid excessive wear of the crawler tracks:

- The rubber coating of the crawler tracks serves to protect sensitive surfaces (asphalt, paving etc.) and is subject to natural wear when traversing the machine with the crawler drive. Manoeuvring the machine on unstable ground (e.g. gravel, rock etc.) can lead to significantly increased wear.
- If possible, avoid pivot turning the machine during manoeuvring (opposed rotation of the crawler tracks). This is particularly important in case of high outside temperatures.
- If possible, transport the machine on a low loader (see also information regarding transport provided in the crawler track instructions).

1. Make the preparations starting in chapter 5.3.2, page 75.
2. Choose the desired direction of travel with the right (2) and left (1) flip lever. In order to drive the machine to the front, press both flip levers forward.
   ⇨ The horn will sound during travel.

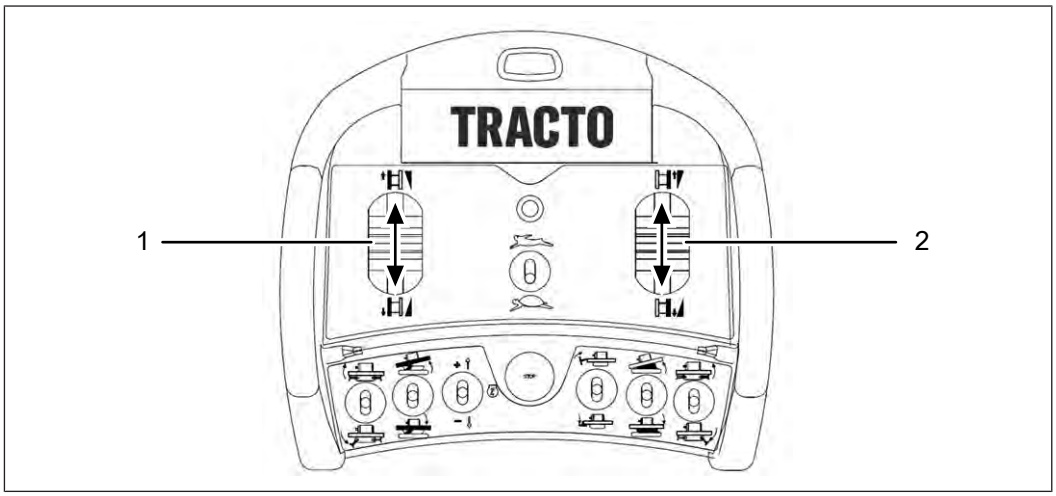


Fig. 5-19 Traversing the machine with the wireless drive remote control

5.3.9 Stopping the machine

1. Let go of the flip levers (1, 2) of the wireless drive remote control. They will automatically spring back into centre position.

   ⇨ The machine stops.

2. If you halt or park the machine on a sloping surface, lower the rear stabiliser. To do so, set the flip lever (4) on the wireless drive remote control down.

3. For machines equipped with an optional front stabiliser, also lower the latter. To do so, set the flip lever (3) on the wireless drive remote control down.

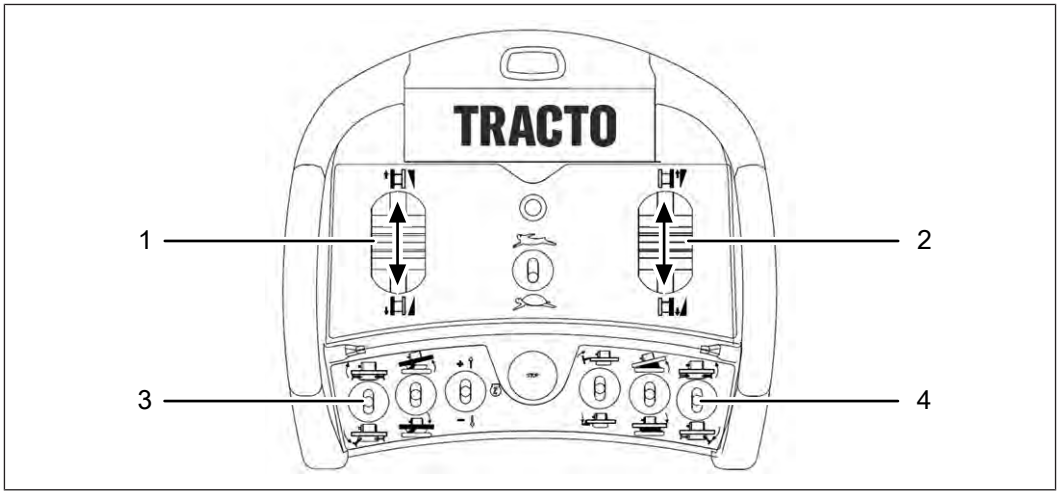
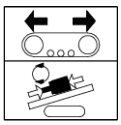


Fig. 5-20 Stopping the machine

5.4 Setting the machine up for operation



1. If necessary, switch over on the right joystick panel from bore mode to drive mode.
2. Drive the machine to the starting position at the entrance pit (chapter 5.3.8, page 85).

⚠ WARNING



Danger of crushing when raising and lowering the stabiliser!

- Keep a sufficient distance from the stabiliser!

3. Lower the rear stabiliser and the optional front stabiliser completely by pressing the corresponding button on the right joystick.

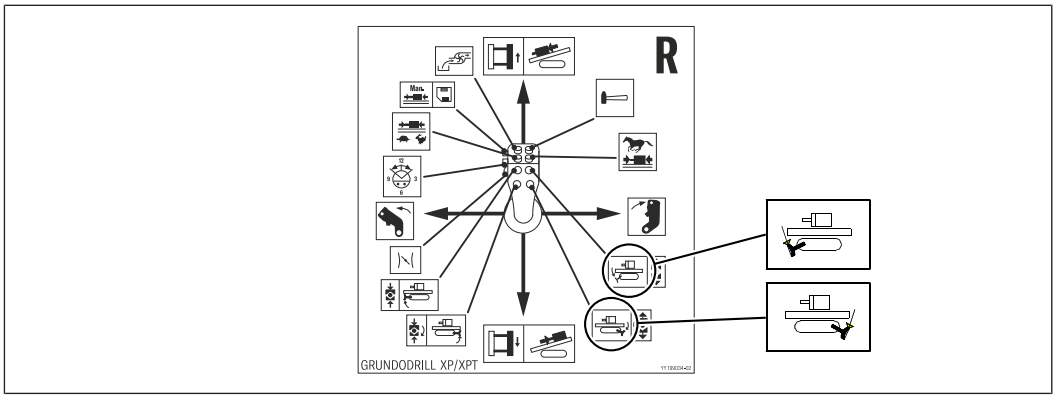


Fig. 5-21 Lowering the stabiliser

Info!

You can lift and lower the stabilisers by actuating the flip levers (1) and (2) on the wireless drive remote control.

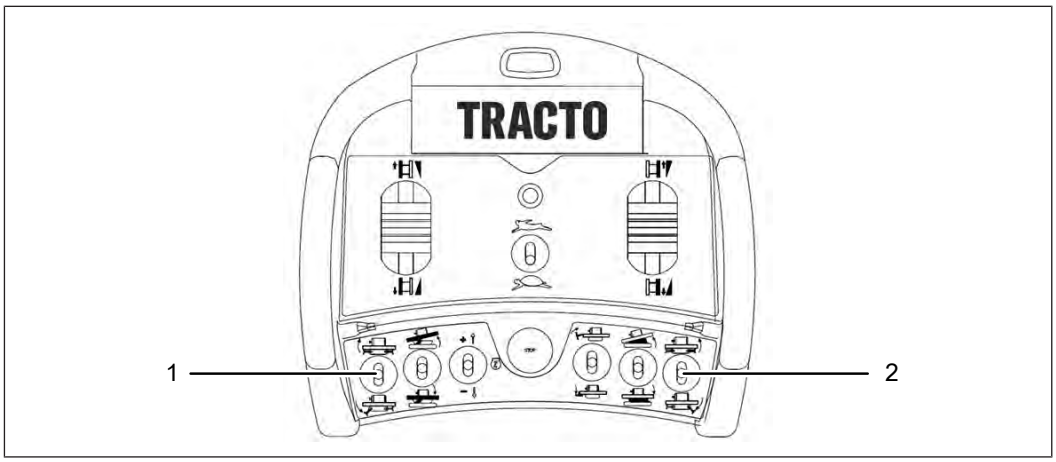


Fig. 5-22 Wireless drive remote control – flip lever stabiliser

4. Fold down the cab's footstep.

5.4.1 Lowering the anchor plate

Make the preparations starting in chapter 5.4, page 88.

⚠ WARNING



Lowering anchor plate!

Danger of crushing your feet.

- Wear foot protection.
- Keep a sufficient distance from the anchor plate.

Swivel the anchor plate manually downwards with the rotating device (1).

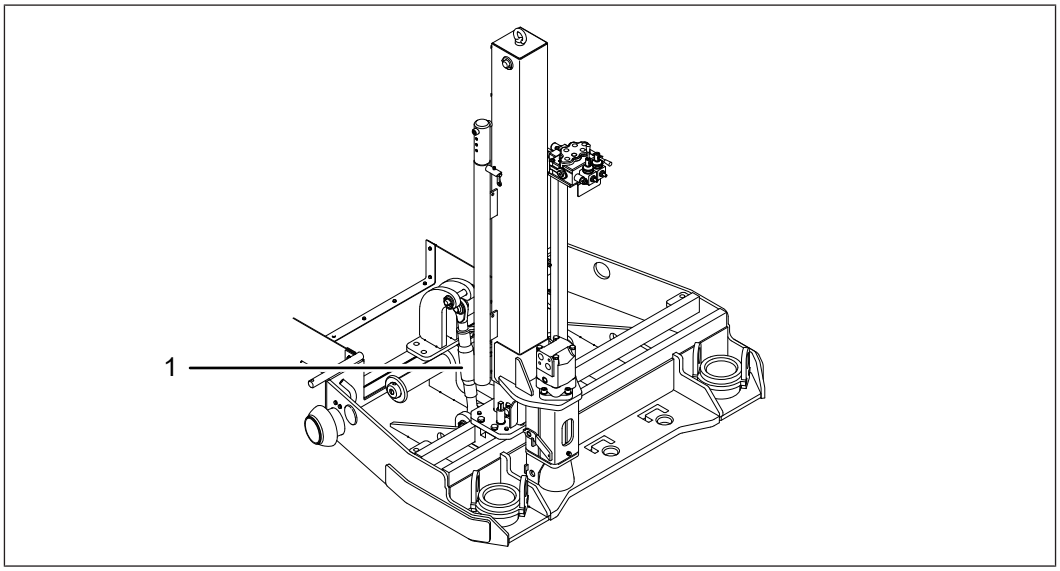


Fig. 5-23 Swivelling the anchor plate

5.4.2 Lowering the boom

⚠ WARNING



Danger of crushing under the lowering boom!

Keep a sufficient distance from the boom.

Align the rig boom so that the anchor plate rests on the ground flush and evenly (chapter 5.3.7, page 84).

Info!
You can lift and lower the rig boom by actuating the flip lever (1) on the wireless drive remote control.

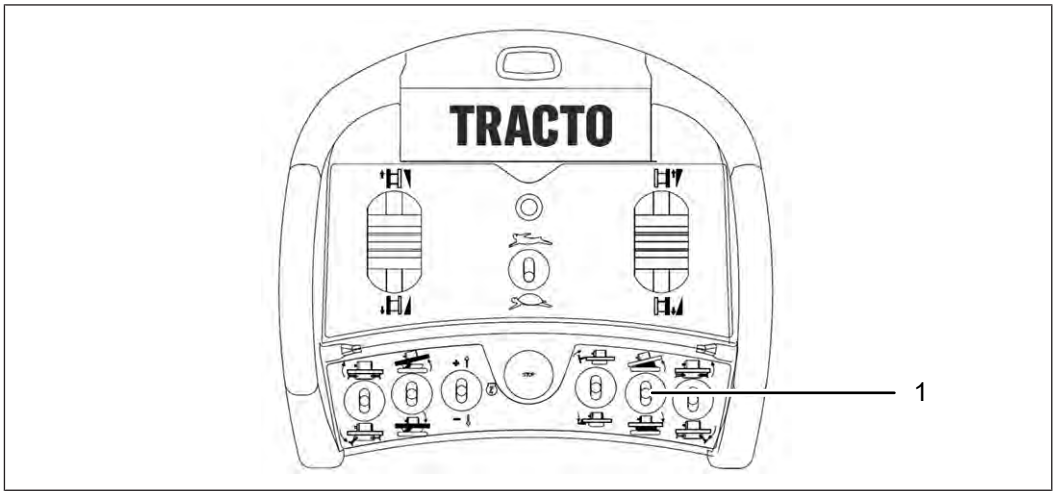


Fig. 5-24 Wireless drive remote control – flip lever rig boom

5.4.3 Switching off the machine



Turn the ignition key to "0" and remove it.

5.5 Installation of the electric shock protection device

5.5.1 Checking the electric shock warning device

Info!
The ignition must be switched on when checking the electric shock warning device.

The electric shock warning device is located in the cab.



Fig. 5-25 Electric shock warning device

1. Connect one cable of the testing device (1) to the grounding stake (4) and the other cable to an unpainted metal part of the machine (3).
   Make sure that the grounding stake does not touch the machine.
2. Switch on the ignition of the machine (chapter 6.4, page 213).
3. Press the button of the testing device.
   If the warning signal is triggered, the electric shock warning device (2) has passed the check.
4. Disable the alarm by pressing the reset button (5) on the electric shock warning device.

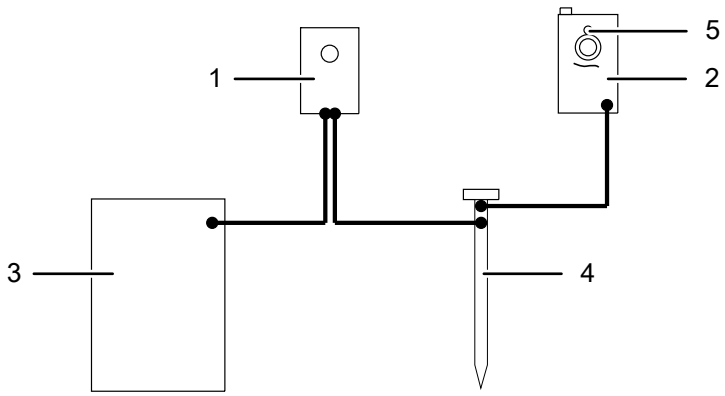


Fig. 5-26 Checking the electric shock warning device

5.5.2 Overview of the electric shock protection device

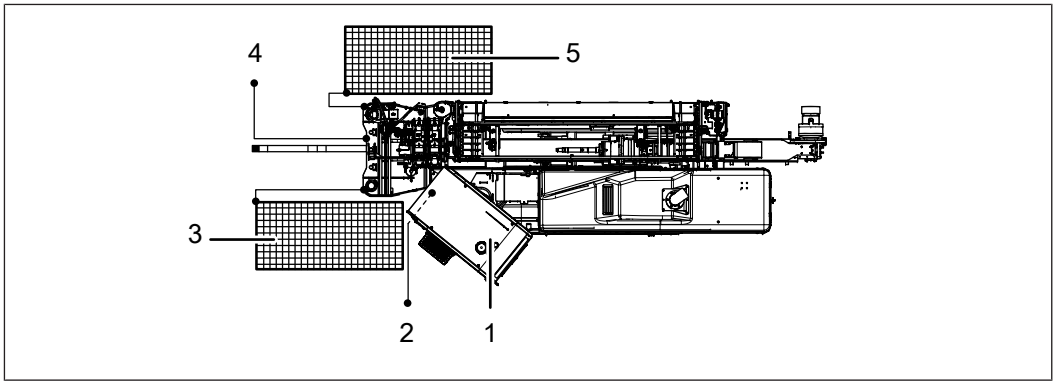


Fig. 5-27 Overview of the electric shock protection device

Tab. 5-1 Overview of the electric shock protection device

Item	Safety device	Function
1	Electric shock warning device	Emits a warning signal when bypassing live wires, i.e. when the machine has become a conductor.
2	Grounding stake of the electric shock warning device	Discharges electricity in case the machine has become a conductor due to work taking place near power cables. The electric shock warning device only works in connection with the grounding stake.
3, 4	Step grid / grounding mat	Discharge electricity to the ground. During works around the machine, the drilling personnel should stand on these mats. The second grounding mat (4) is optional.
5	Grounding cable with grounding stake	Discharges electricity from the machine.

5.5.3 Installing the electric shock protection device

After the machine has been set up for operation (chapter 5.4, page 88), install the electric shock protection device for the machine before anchoring the bore rig and starting any drilling operations.

⚠ DANGER



Risk of death due to electric shock!

If you hit a line while striking the grounding stake into the ground, there is a risk of death due to electric voltage.

- Wear the comprehensive protective equipment included in the scope of delivery of the electric shock warning device.
- **Do not move away!**
- Keep on standing with both feet on the ground until the current flow is interrupted and safe operating conditions are restored.
  If the current flow is not interrupted correctly,

⇨ an automatically resetting circuit breaker could supply the power cable with power or

⇨ the contact between the machine and the power cable might be re-established.

1. Drive the grounding stake of the electric shock warning device into the ground **at a distance of approx. 1.5 to 2 m from the machine and perpendicular to the bore path**.
   It is important to place the grounding stake in conductive soil! In case of extremely dry ground or tarmac first water the ground.

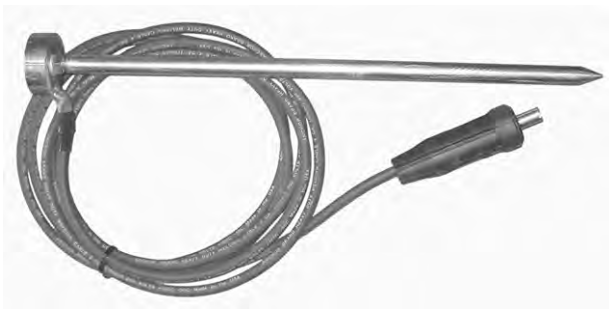


Fig. 5-28 Grounding stake with connected cable

⇨ If the grounding stake hits an electrical cable and electricity flows through both the machine and the ground, a warning signal will be emitted.

2. Connect the grounding stake to the grounding connection underneath the front of the cab (1).

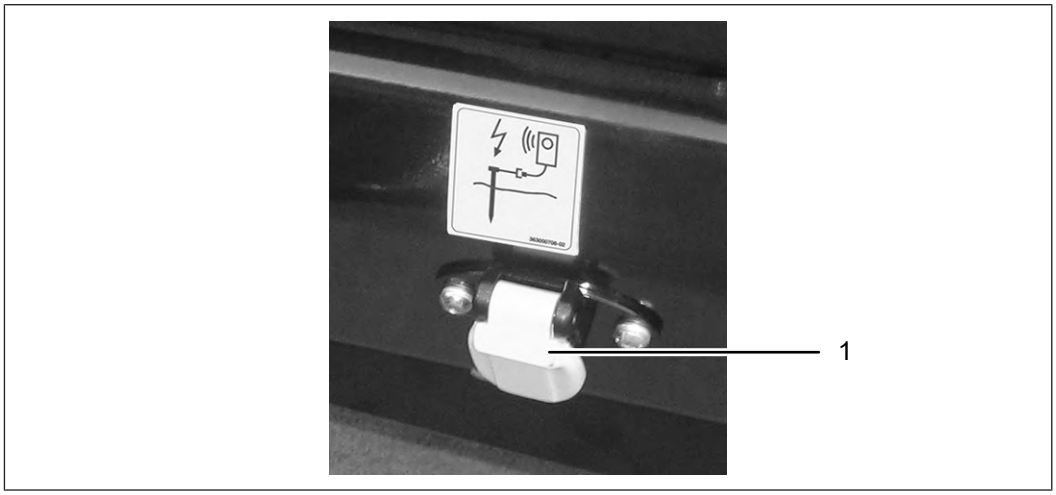


Fig. 5-29 Grounding connection underneath the cab

3. Lay out the grounding mats parallel to the machine and connect the cable to one of the sockets (1) at the machine. Optionally, a second grounding mat may be positioned on the other side of the machine.

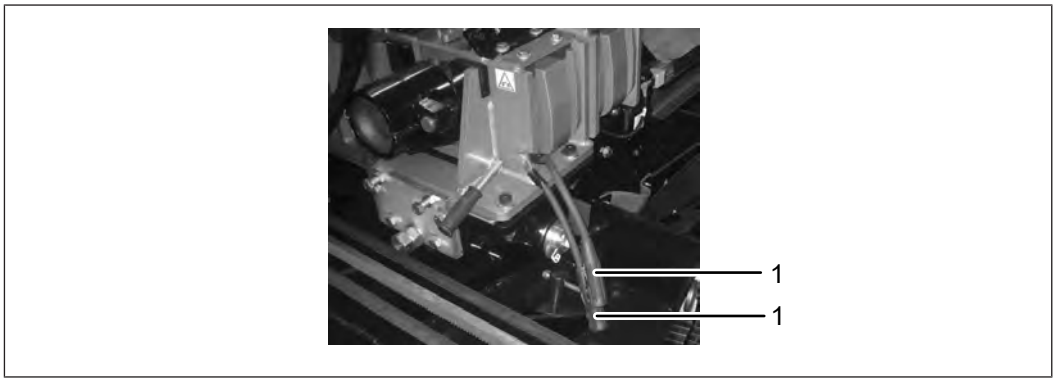
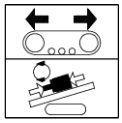


Fig. 5-30 Sockets for connecting the grounding mats

5.6 Anchoring the machine in the ground

5.6.1 Anchor boring rig – removing and applying the drill



1. Start the machine (chapter 5.3.2, page 75).
2. If necessary, switch over on the right joystick panel from bore mode to drive mode.
3. Switch on the anchor boring rig using the push button on the left joystick.

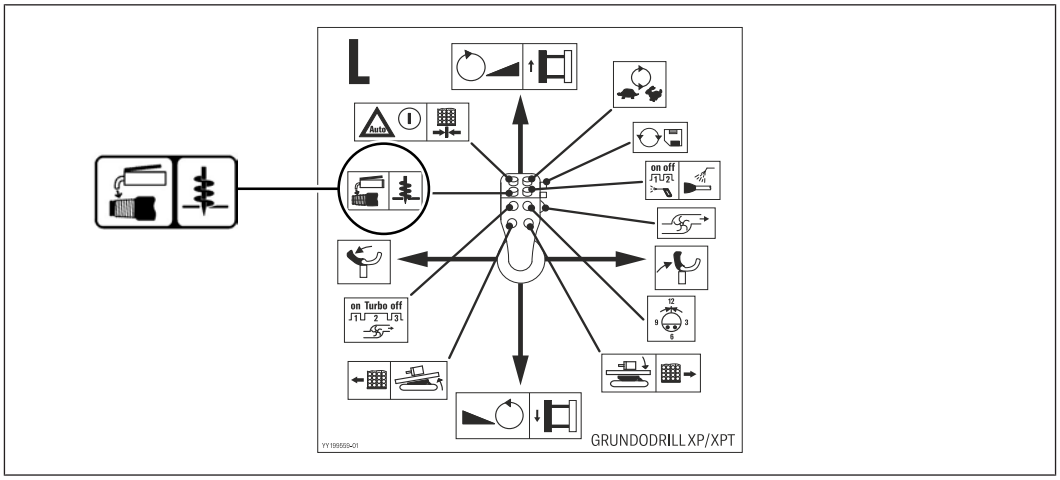


Fig. 5-31 Switching on the anchor boring rig

4. Turn the lock (2) of the drill up and remove the drill (1) from the holder (3).
5. Raise the anchor boring rig by pushing the hand lever >>Lift/lower anchor boring rig<< (4) upwards.

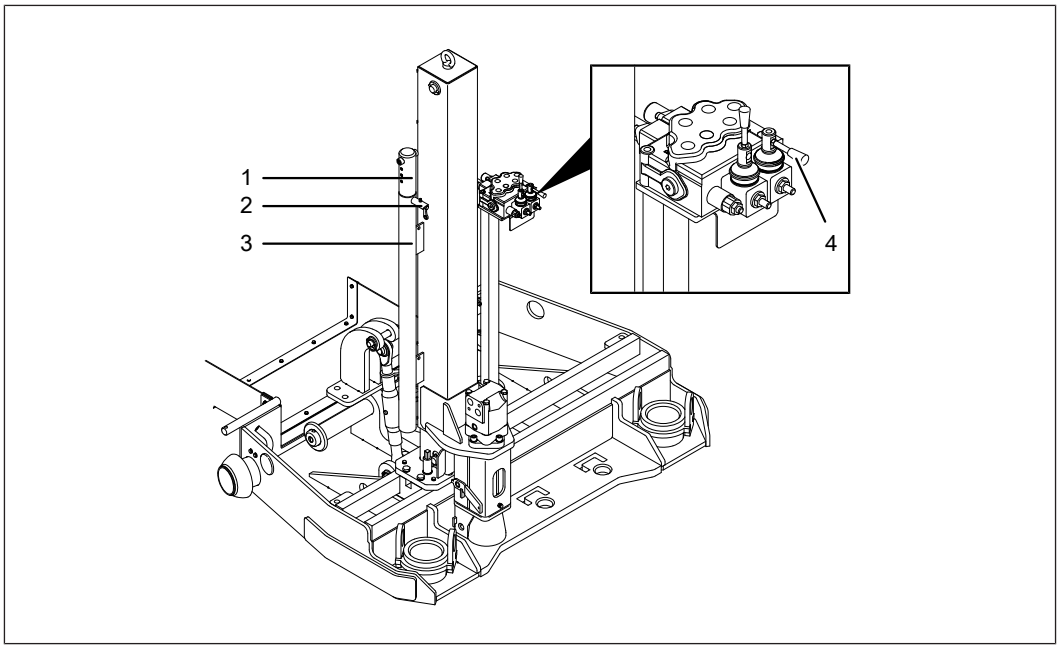


Fig. 5-32 Lifting/lowering the anchor boring rig

6. Fasten the drill (2) to the anchor boring motor (1) by means of the bayonet coupling.

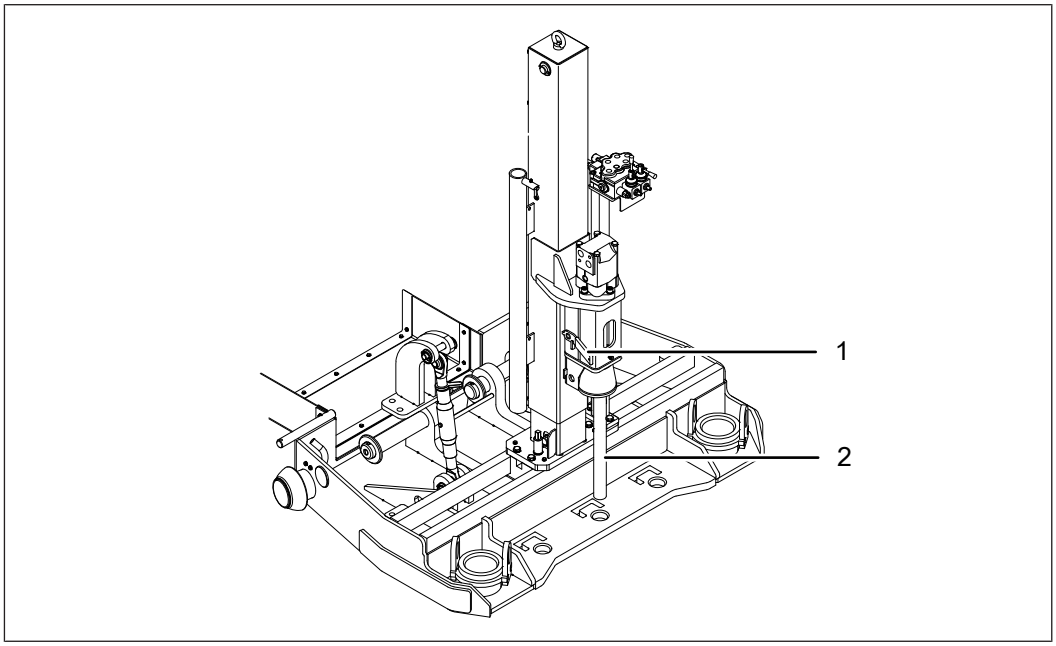


Fig. 5-33 Fixed drill

5.6.2 Positioning the anchor boring rig

Depending on ground resistance or adjacent service lines underground up to three anchors or positions can be provided with the anchor boring rig.

Push the anchor boring rig with the hand ratchet (1) over the provided mounting hole in the anchor plate.

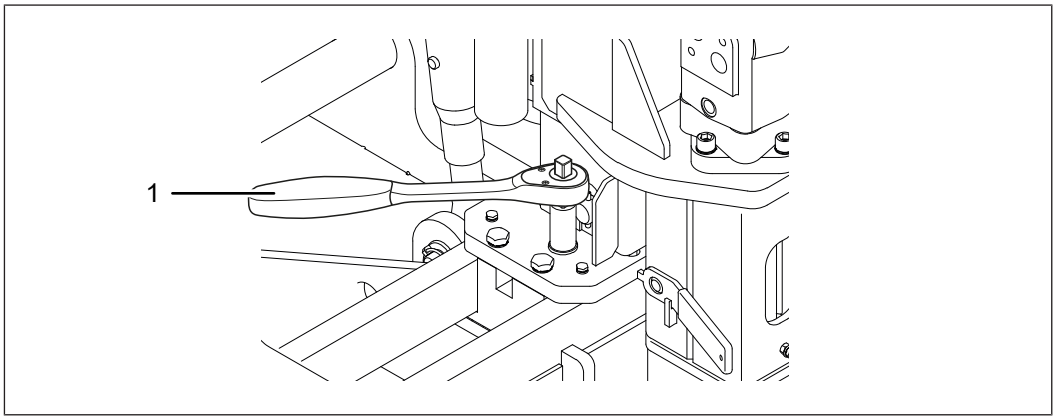


Fig. 5-34 Positioning the anchor boring rig

5.6.3 Anchor boring rig – drilling a hole and ramming in the earth stake

Before starting the anchoring process, make sure
- that the anchor plate lines up precisely with the ground.
- that there are no lines or cables in the anchoring area above- or underground.

⚠ DANGER

Rotating drill anchor!
In case your clothing comes into contact with the drill anchor, there is a risk that you will be pulled in.



- Wear tight-fitting clothing.

1. Drill the hole for the earth stake by simultaneously lowering the anchor boring rig and having the drill rotate.
   ⇨ To do so, push the hand lever >>Lift/lower anchor boring rig<< (2) down and simultaneously pull the hand lever >>Drive drill in/out<< (1) towards yourself.
2. Raise the anchor boring rig again by pushing the hand lever >>Lift/lower anchor boring rig<< (2) upwards.

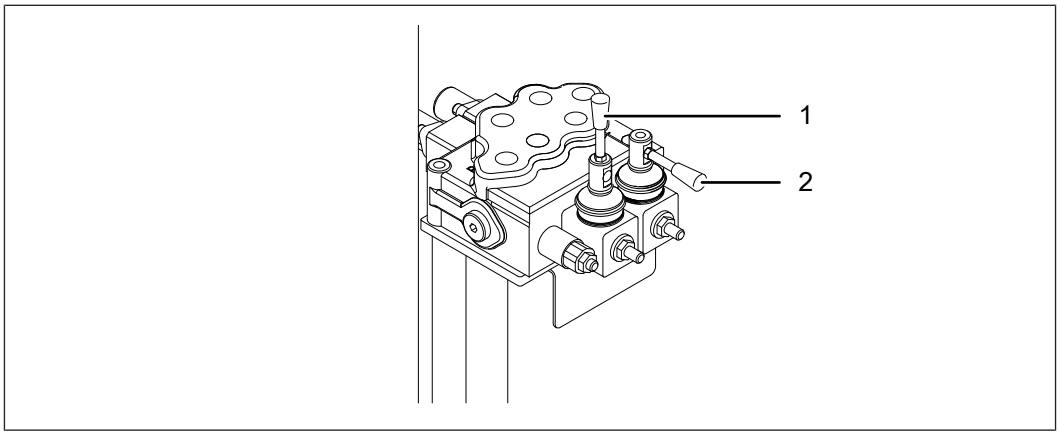


Fig. 5-35 Hand levers anchor boring rig

3. Disassemble the drill from the bayonet coupling of the anchor boring motor and put it aside.

4. Choose one of 4 earth stake types, depending on the application:
   - ⇨ short earth stakes (3) – for medium-hard to hard soil
   - ⇨ long earth stakes (4) – for medium-soft soil
   - ⇨ U-profile earth stakes (2) – for soft soil
   - ⇨ dowel earth stakes (1) – for asphalt

Info!
Only use the two dowel earth stakes in combination with a short earth stake as the dowel earth stakes cannot withstand thrust and tensile forces.

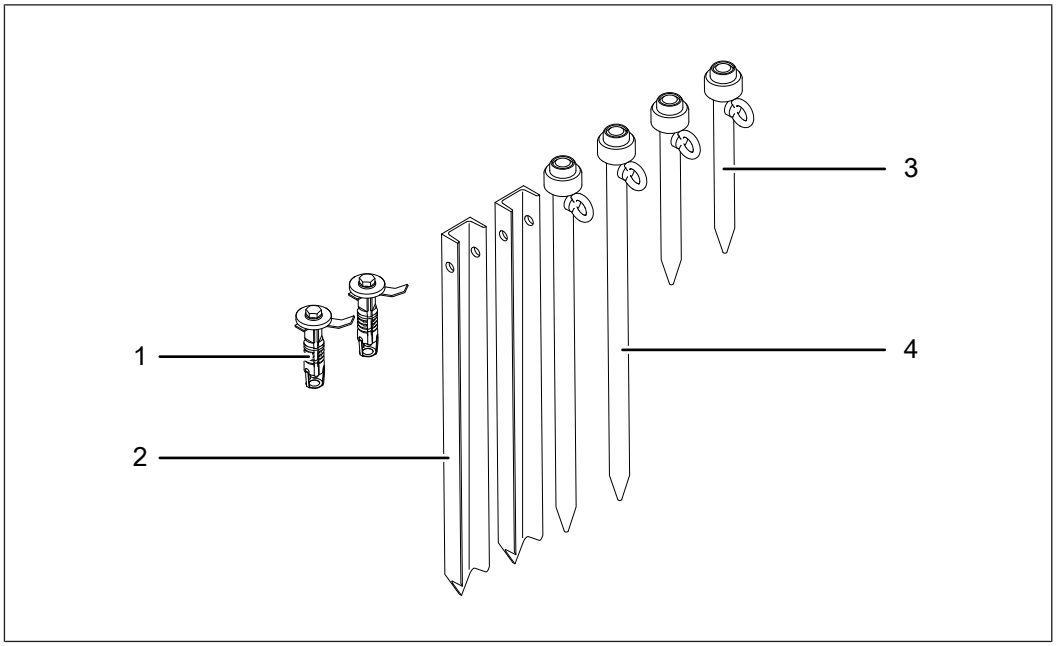


Fig. 5-36 Earth stakes

5. Insert the selected earth stake in the drilled hole and press it all the way into the ground using the anchor boring rig. To do so, push the hand lever >>Lift/lower anchor boring rig<< down.

Info!
Push the U-profile earth stakes into the ground through the U-shaped opening. Additionally fix the dowel earth stakes with the hand ratchet.

6. Raise the anchor boring rig again by pushing the hand lever >>Lift/lower anchor boring rig<< upwards.
7. Position the anchor boring rig above the next provided mounting hole in the anchor plate using the hand ratchet and repeat the work steps in point 1 to point 6.
8. After having pushed the final earth stake into the ground, put the drill back into the holder.

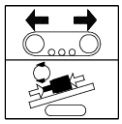
5.6.4 Positioning the anchor thrust unit (option)

Depending on ground resistance or adjacent service lines underground up to two anchors or positions can be provided with the anchor thrust unit.

NOTICE

When moving the anchor thrust unit with the safety rod, the anchor thrust unit's guide will be damaged.

- Disconnect the safety rod, which secures the anchor thrust unit during transportation.



1. If necessary, switch over on the right joystick panel from bore mode to drive mode.
2. Switch on the anchor thrust unit using the push button on the left joystick.

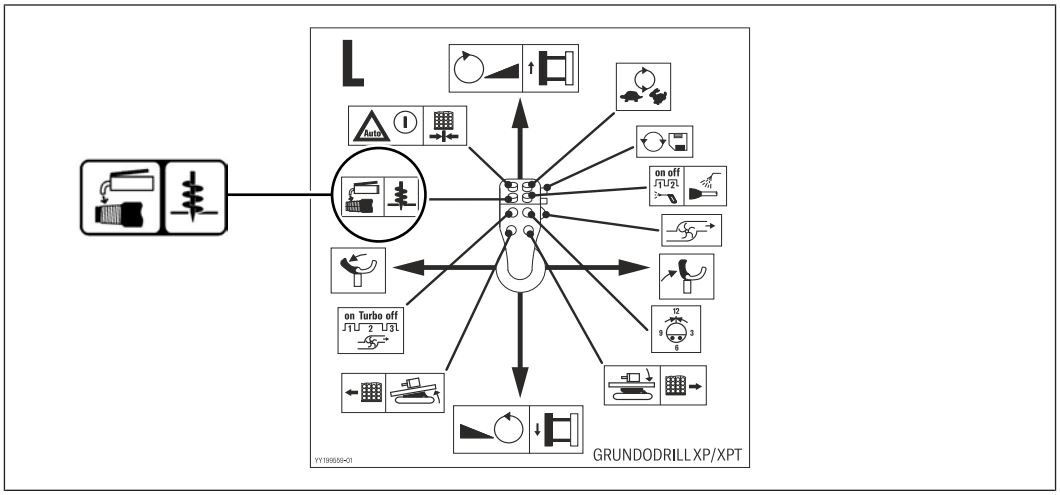


Fig. 5-37 Switching on the anchor thrust unit

Position the anchor thrust unit:

3. Pull up the bolt (3) of the anchor thrust unit and manually push the anchor thrust unit (2) into the first thrusting position.
4. Reinsert the bolt.
5. Raise the anchor thrust unit using the hand lever >>Lift/lower anchor thrust unit<< (1).

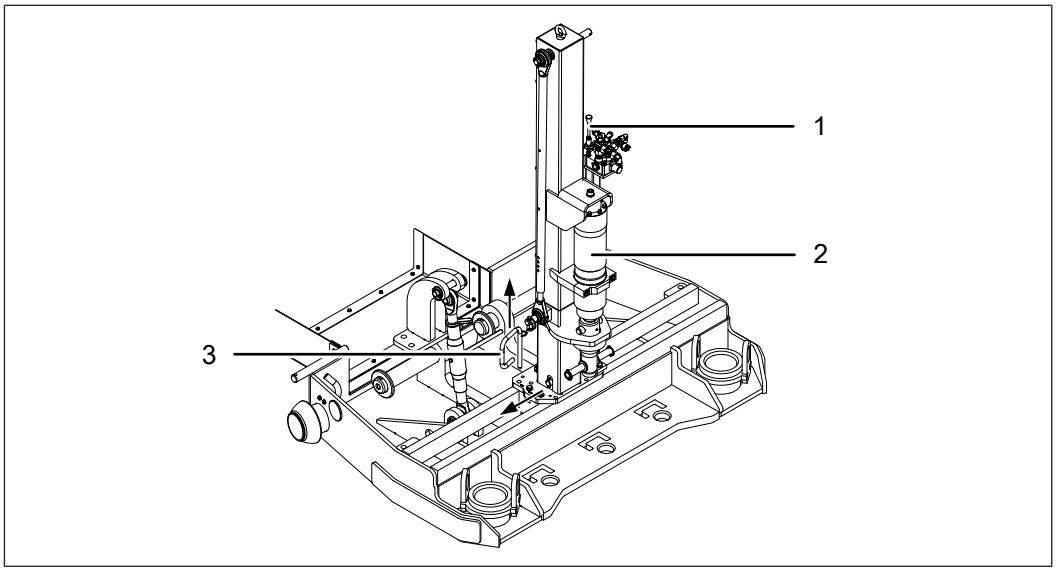


Fig. 5-38 Positioning the anchor thrust unit

5.6.5 Anchor thrust unit (option) – ramming in the thrust anchor

Before starting the anchoring process, please observe the following safety instructions:

- The anchor plate must line up precisely with the ground!
- Make sure that there are no lines or cables in the thrusting area above- or underground!

⚠ WARNING

High noise levels caused by anchor thrust unit!



- Wear ear protection!

1. Ram in the first thrust anchor:
   - ⇨ Guide the impact head (1) into the thrust anchor (2) opening.
   - ⇨ Then insert the entire unit in the first opening of the anchor plate.
   - ⇨ Completely lower the anchor thrust unit using the hand lever >>Lift/lower anchor thrust unit<<. The thrust anchor is driven into the ground all the way to the stop. In case of a higher resistance the percussive hammer will be switched on automatically.

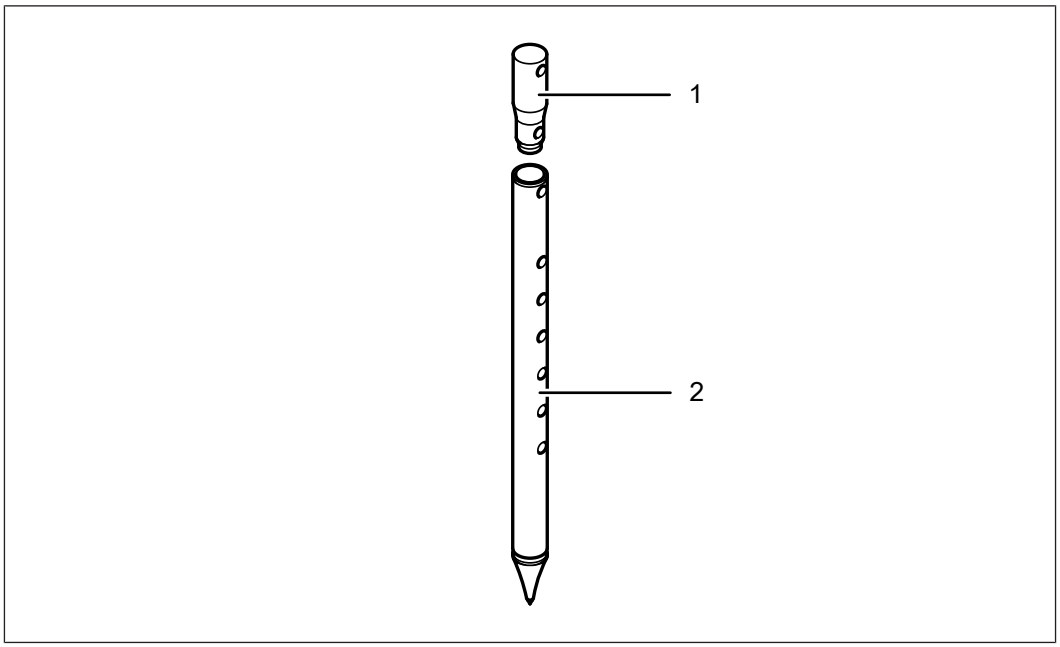


Fig. 5-39 Thrust anchor

2. Raise the anchor thrust unit using the hand lever >>Lift/lower anchor thrust unit<<.

5.6.6 Anchor thrust unit (option) – fixing the thrust anchor

Info!
The machine is only anchored correctly if the thrust anchors are bolted to the anchor plate!

1. Remove the impact head (1) from the thrust anchor (2).
2. Fasten the thrust anchor to the anchor plate:
   - ⇨ Turn the ring (3) until the bore holes in the ring and in the thrust anchor are aligned.
   - ⇨ Push the bolt (4) through the ring and the thrust anchor.
   - ⇨ Fix the bolt with the safety pin (5).

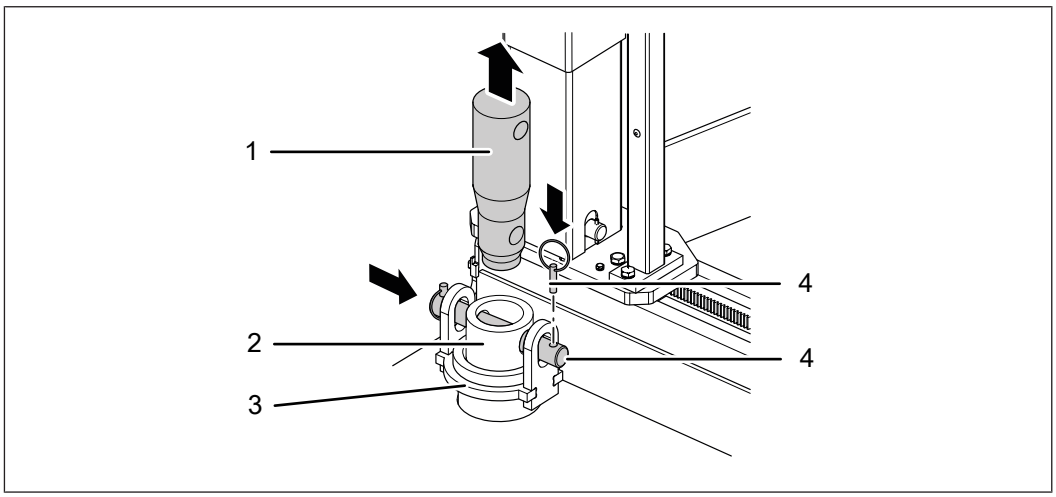


Fig. 5-40 Fastening the thrust anchor to the anchor plate (example)

3. Raise the anchor thrust unit using the hand lever >>Lift/lower anchor thrust unit<<.
4. To ram in the second thrust anchor, follow the work steps in chapter 5.6.5, page 101 and in this chapter.

5.7 Swinging the cab

1. Pull up the cab lock (1) on the cab floor.

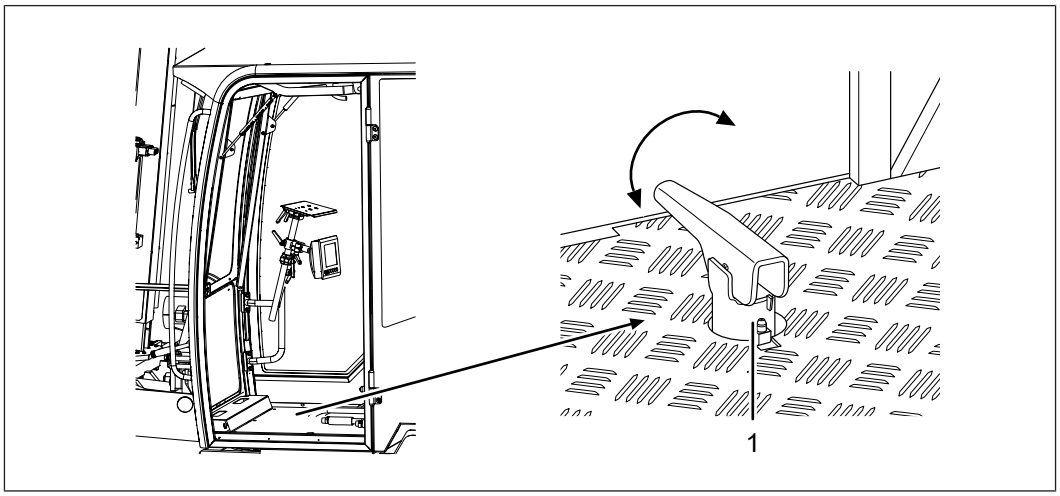


Fig. 5-41 Unlocking the cab

2. Manually swivel the cab.
   The cab can be swung out in 5 steps.
3. Fold the cab lock (1) back down in one of the 5 positions.

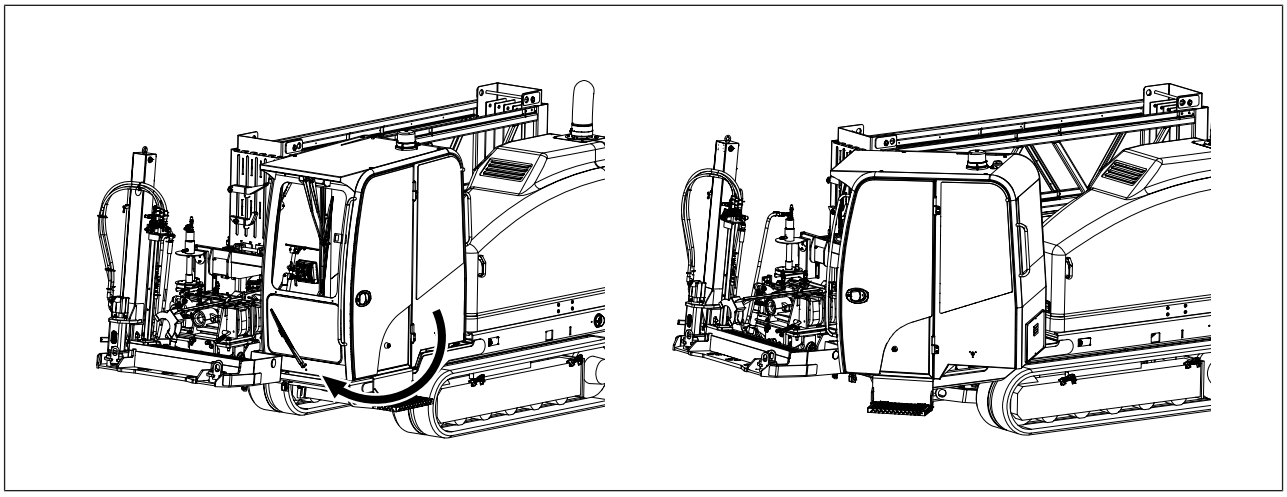


Fig. 5-42 Swinging the cab out

4. Fold down the cab's footstep.

5.8 Assembling transmitter and drill head in the transmitter housing (for DCI units)

5.8.1 Preparing the drilling lance (for jet bores)

The bore head assembly consists of a drill head, the transmitter housing and the transmitter.

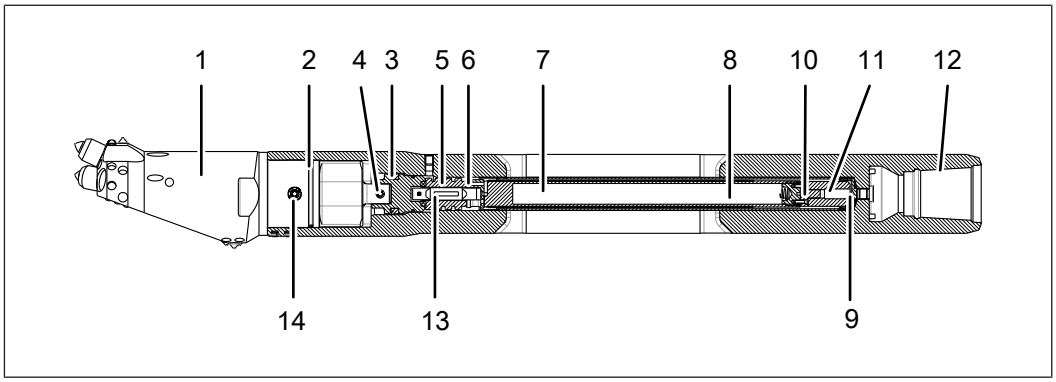


Fig. 5-43 Bore head assembly for jet bores

1	Drill head	8	Batteries (two)
2	Sealing ring	9	Screw connection
3	Red sealing ring	10	T-connection
4	Lock pin for anti-twist protection	11	Rear damper
5	Front damper	12	Transmitter housing
6	Locking mechanism	13	Anti-twist protection
7	Transmitter	14	Lock pins (inner/outer)

1. Check the sealing ring (2) and the red sealing ring (3) for wear and replace them if necessary.
2. Grease the drill head (1).
3. Open the screw connection (9) and insert two batteries (size C). Pay attention to the battery conditions and polarity!

Info!
Optionally a vibration absorber can be placed between the batteries.

4. Ensure the intactness of the sealing ring.
5. Retighten the screw connection (9).
6. Mount the damper at the rear (11) above the T-connection (10).
   Do not crush the damper!
7. Push the front damper (5) over the anti-twist protection (13).
8. Connect the anti-twist protection (13) to the drill head (1) using the lock pin (4).
9. Push the damper through the front (5).

10. Push the end of the anti-twist protection (13) into the transmitter lock (6). Observe the correct 12 o'clock position between transmitter and drill head.
11. Push the drill head (1) with the connected transmitter completely into the transmitter housing (12).
12. Lock the drill head (1) by means of the locking pins (14) fitted into one another.

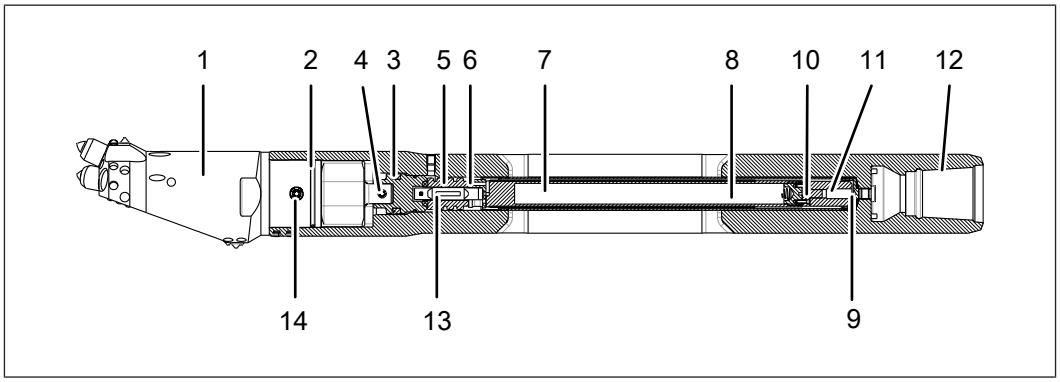


Fig. 5-44 Bore head assembly for jet bores

5.8.2 Checking the functioning of the transmitter

The functional check of the transmitter depends on the transmitter type.

Please read the manufacturer's instructions.

5.8.3 Calibrating the detection system

The calibration of the detection system can vary depending on the manufacturer. Please read the manufacturer's instructions.

Info!
During calibration please make sure that no cables, steel pipes or reinforced concrete are located in the ground and that there are no metal surfaces and high voltage lines nearby!
Otherwise incorrect calibration results could be determined!

5.9 Fitting the wire-controlled transmitter and drill head into the transmitter housing (for DIGITRAK units)

Info!
Information regarding the set-up of the drilling lance is provided in chapter 5.8, page 104 and in chapter 9.16, page 306.

5.9.1 Dismantling the battery-powered transmitter

Disassemble the battery-powered transmitter from the bore head assembly. Please proceed as follows:

1. Drive the lock pins (1) out of the drill head (2).
2. Pull the drill head with the connected transmitter (3) out of the transmitter housing (4).
3. Detach the transmitter from the drill head by pushing the anti-twist protection (5) out of the locking mechanism (6).

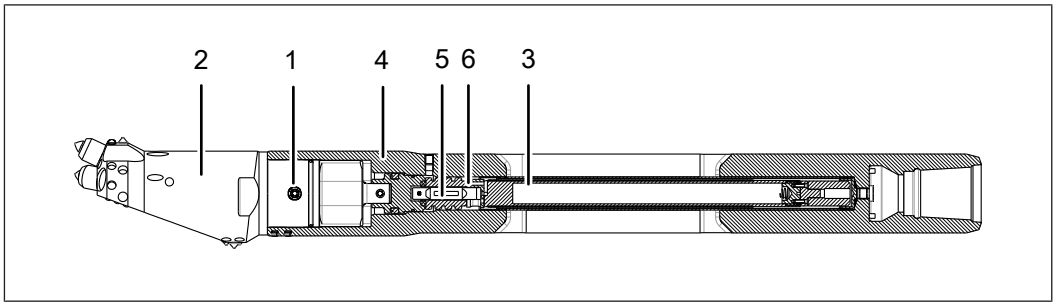


Fig. 5-45 Bore head assembly with battery-powered transmitter

4. Loosen the blind cap (1) with the seal (2) at the end of the bore head assembly. The cable is guided through this opening when installing the wire-controlled transmitter.

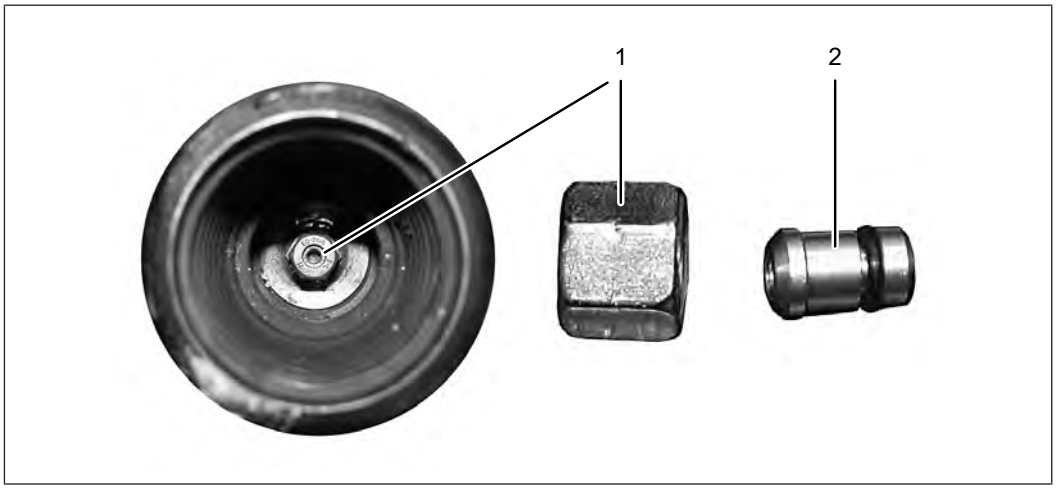


Fig. 5-46 Bore head assembly: Blind cap with seal

5.9.2 Installing the wire-controlled transmitter

The wire-controlled transmitter is ready-made by TRACTO-TECHNIK.

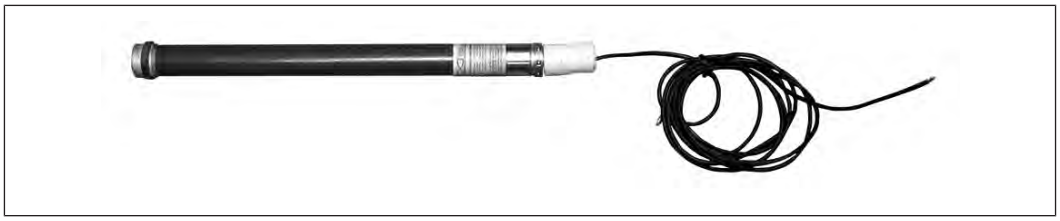


Fig. 5-47 Wire-controlled transmitter

Install the wire-controlled transmitter as follows:

1. Check the sealing rings (1, 2) of the drill head (3) for wear or cracks, and replace them if necessary.
2. Grease the seals (1) and (2).
3. Connect the anti-twist protection (4) to the drill head (3) using the lock pin (5).
4. Push the damper (6) over the anti-twist protection (4).
5. Connect the anti-twist protection (4) to the transmitter (7). Observe the correct 12 o'clock position between transmitter and drill head.

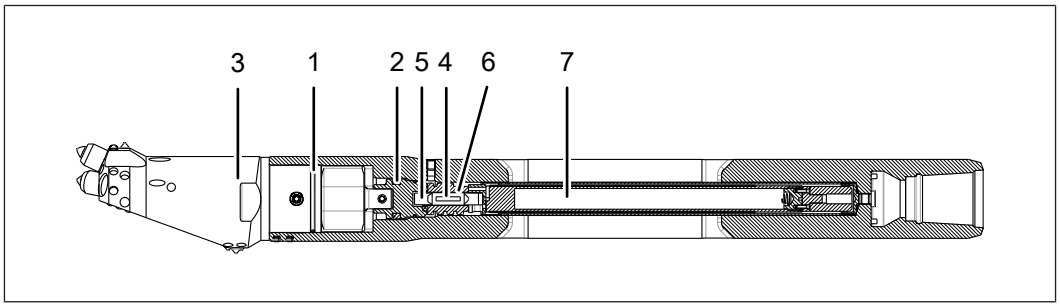


Fig. 5-48 Bore head assembly

6. Use the pull-in device to pull the transmitter cable from the drill head side through the rear opening of the bore head assembly.
7. Slide the sleeve (1), the seal (2), the pressure piece (3) and the screwing (4) onto the cable.

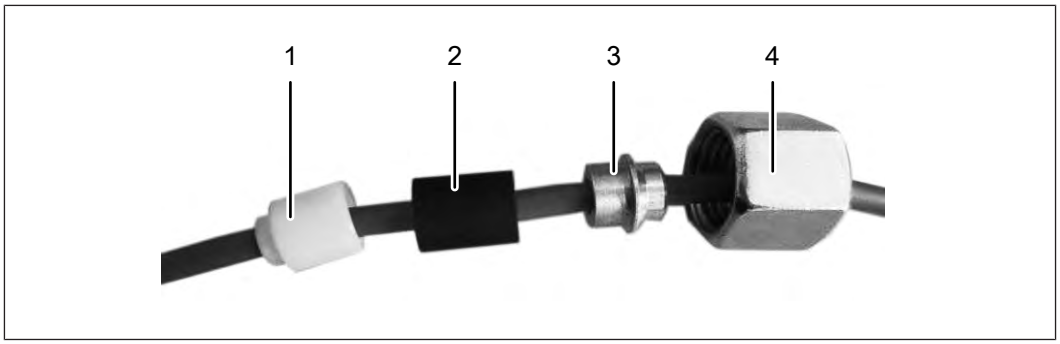


Fig. 5-49 Seal, pressure piece and screwing for cable

8. Push the drill head (1) with the connected transmitter (2) completely into the transmitter housing (3). Pull the cable carefully out of the bore head assembly until it is slightly tensioned.
9. Lock the drill head (1) by means of the lock pin (4).
10. Push the sleeve, seal and pressure piece (see above) over the cable into the opening of the bore head assembly and screw the screwing tight so that the connection is sealed.

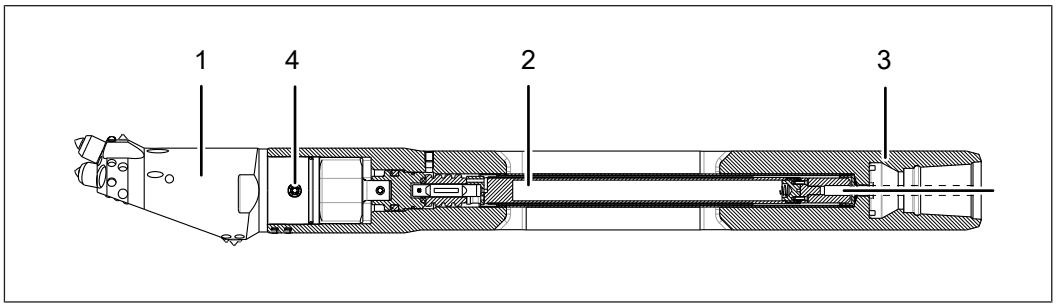


Fig. 5-50 Bore head assembly with wire-controlled transmitter

Then check the transmitter for proper functioning and calibrate the detection system as described in chapter 5.8.2, page 105 and chapter 5.8.3, page 105.

5.10 Converting the machine for wire-controlled drilling

Depending on the version the machine is already prepared for wire-controlled drilling. The necessary cable connection from the cab to the rotary swivel or the rotation motor is already available with these machines.

For the installation of the cable on machines delivered before June 2015 please contact the TRACTO-TECHNIK customer service (chapter 8, page 279).

For wire-controlled drilling you have to

- assemble the operating panels of the safety equipment
- assemble the cable drum on the energy chain
- mount the friction ring to the rotary swivel
- install the monitor and the power supply unit of the detection system

Requirements

- The cab is swivelled (chapter 5.7, page 103).
- All components and tools for the conversion are ready for use.
- The drill rod is unscrewed and removed from the rotary swivel.
- The rotary swivel is situated at the rear or in a readily accessible position.
- Located at the rotary swivel of the sub-saver is a bore hole for the cable feed-through.

5.10.1 Assembling the safety equipment for wire-controlled drilling

The safety equipment for wire-controlled drilling consists of:

- front operating panel (removable) (1) with locking switch (2)
- rear operating panel (removable) (3)
- safety door (4) made of plexiglass (already assembled)

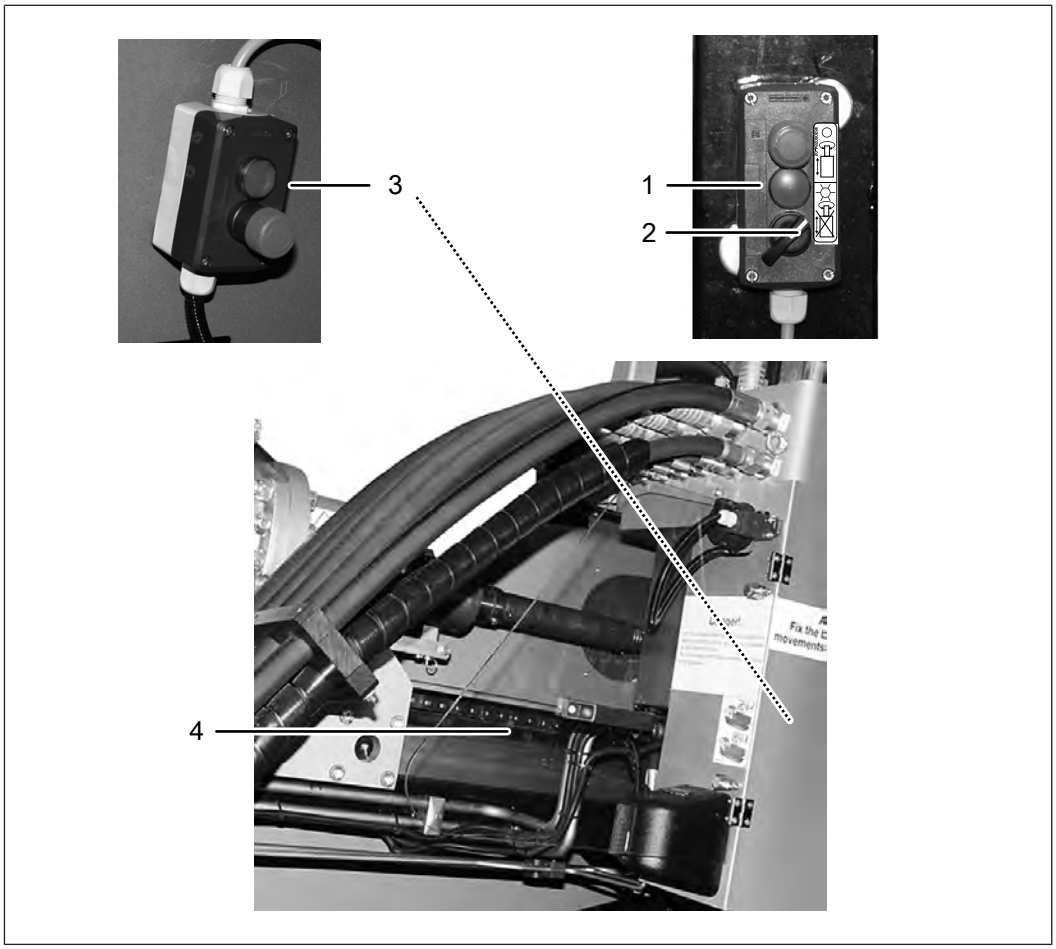


Fig. 5-51 Safety devices for wire-controlled drilling

Assembly

1. Assemble the rear and front operating panel in a way that you can reach the operating panels easily.
2. Disconnect plug (1) and socket (2) of the front control line and connect the plug of the front operating panel (3) with the front socket (2) of the control line.
3. Disconnect plug (4) and socket (5) of the rear control line and connect the plug of the rear operating panel (6) with the socket (5) of the control line.

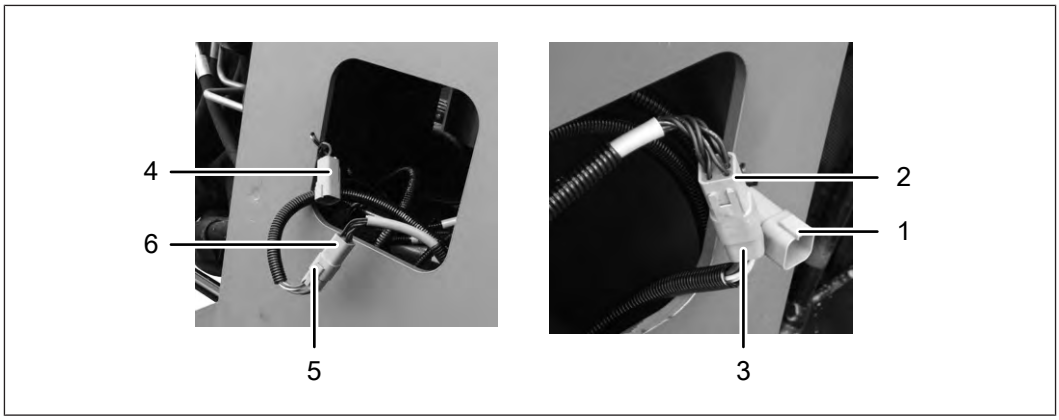


Fig. 5-52 Plug connections for wire-controlled drilling

Info!
With an open safety door or an activated locking switch all machine functions are disabled.

Info!
If you do not want to carry out a wire-controlled drilling operation, re-connect the plug and the socket of the front and rear control lines and disassemble the front operating panel.

5.10.2 Assembling the cable drum for wire-controlled drilling

The cable drum for wire-controlled drilling consists of:

– a metal plate (5), which is fastened to the energy chain with a U-bolt (4) and two hand screws (6), and
– a reel (7) with cable drum (1), which is fastened to the metal plate with two angled plates (3) and two hand screws (2).

NOTICE

Cable drum could be bent along with the energy chain.

- Do not assemble the cable drum too far at the rear.
- Assemble the cable drum in a way that the wire can be led vertically from the top of the drum through the bore hole in the plate.

⇨ The exact position can vary depending on the machine type.

1. First assemble the metal plate (5) with the U-bolt (4) to the energy chain using the two hand screws (6).
2. Then place the reel (7) with the cable drum (1) on the metal plate and fasten it using the angle plates (3) and hand screws (2).

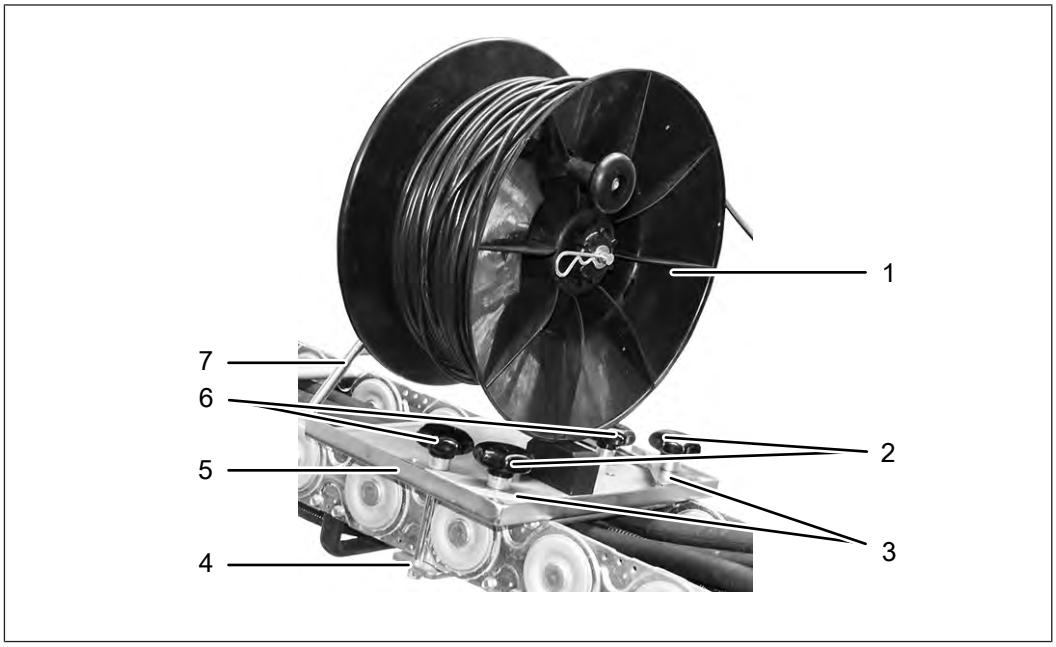


Fig. 5-53 Cable drum assembled

Exchanging the cable drum

You can exchange the cable drum by

1. pulling out the split pin (1)
2. removing the washer (2) and the drum
3. pushing on the new drum and also reattaching the washer
4. plugging the split pin back in.

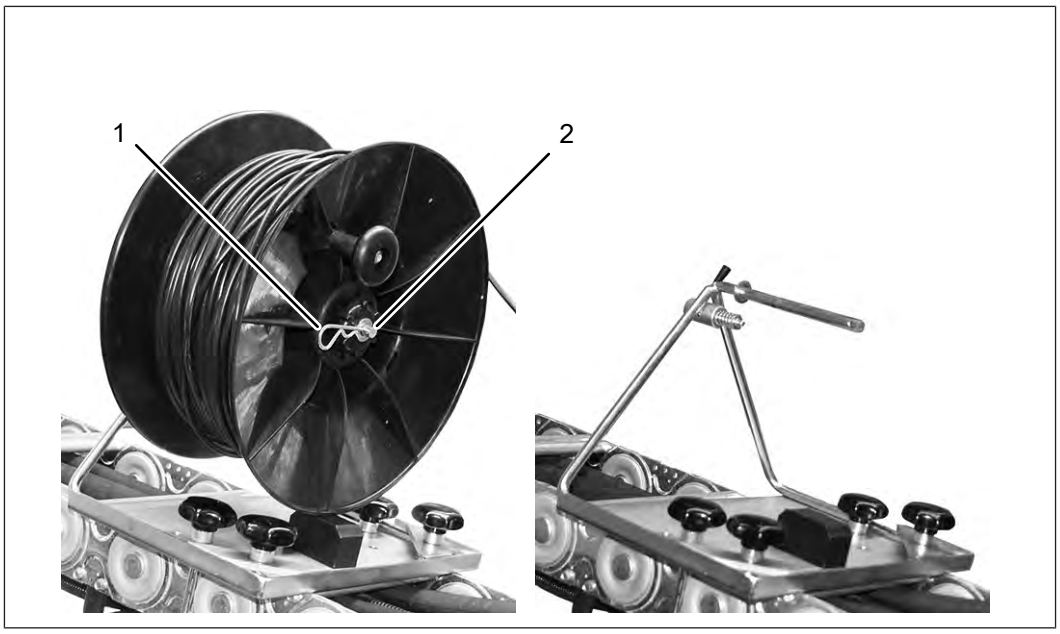


Fig. 5-54 Dismantling the cable drum

Locking the cable drum

You can lock the drum by means of a spring-loaded lever (1).

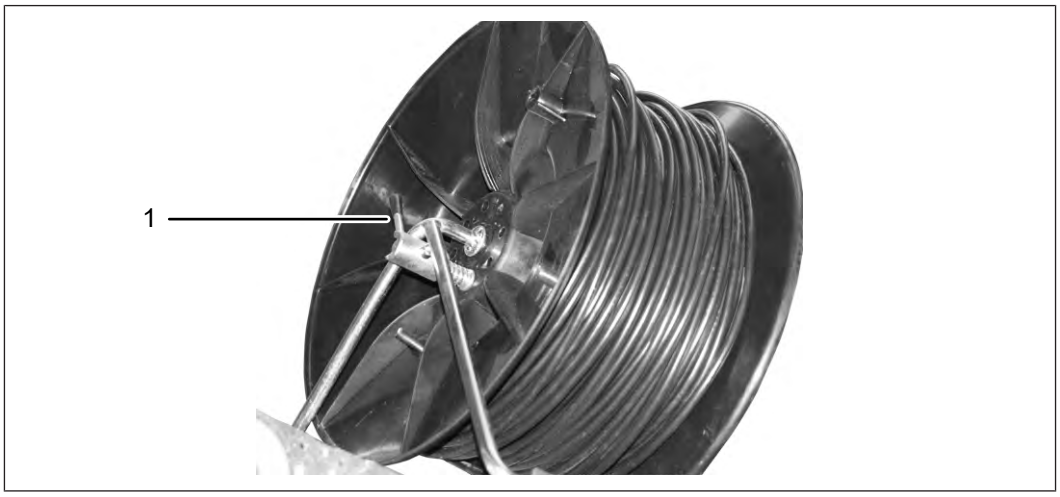


Fig. 5-55 Cable drum locked

5.10.3 Assembling the friction ring

The friction ring is assembled on the sub-saver and transfers the supply voltage from the bore rig via the cable to the transmitter and the signal from transmitter back to the bore rig.
It acts as a positive pole for the voltage. The drill rod acts as negative pole.

The machine's battery supplies the transmitter with 24 V. The friction ring consists of insulation and contact ring and is connected via a contact rail on the rotary swivel to the cable leading to the cab.

The following components are required for assembly:
- friction ring (1)
- contact rail (2) with fastening screws
- insulation piece (3) for the contact rail with fastening screws
- cable feed-through (4) with seal (5), pressure piece (6) and screw connection (7)

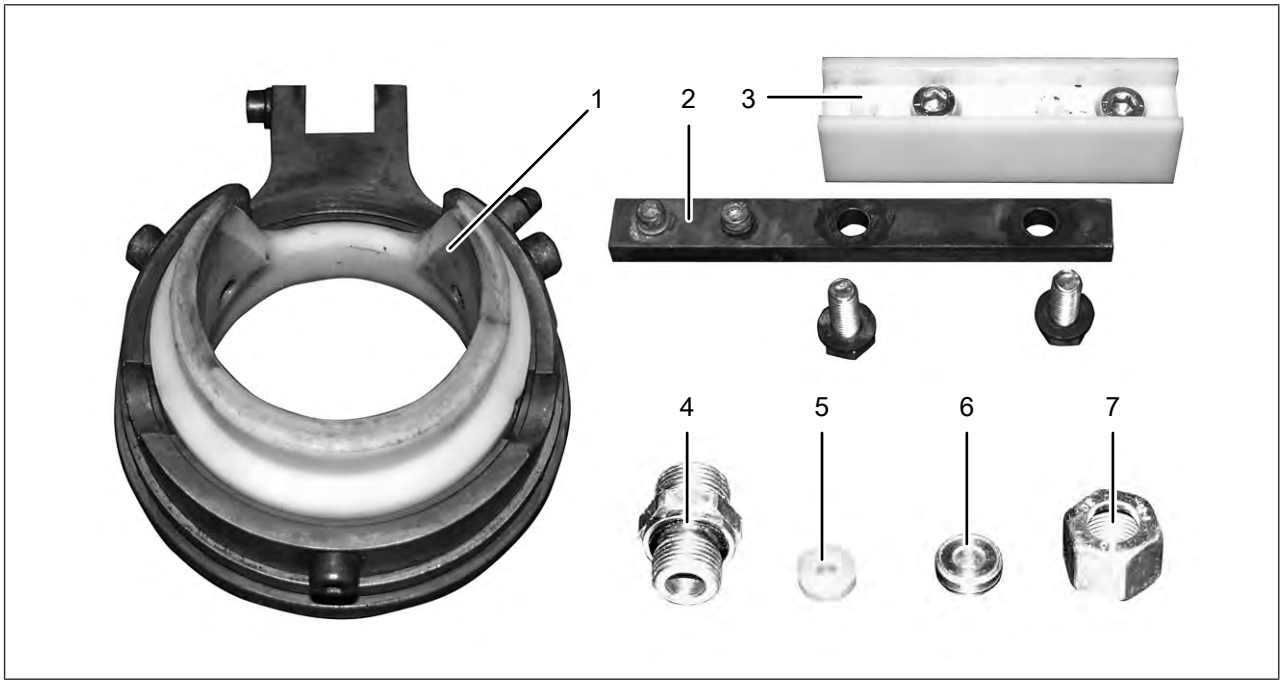


Fig. 5-56 Friction ring and assembly parts

⚠ DANGER



Draw-in and crush hazard due to unexpected machine movements!

- Before assembling the friction ring, switch off the engine and remove the ignition key.

Assemble the friction ring as follows:

1. Push the friction ring onto the sub-saver in a way that both screws (2) on the sub-saver fit into the grooves (1) of the friction ring insulation.

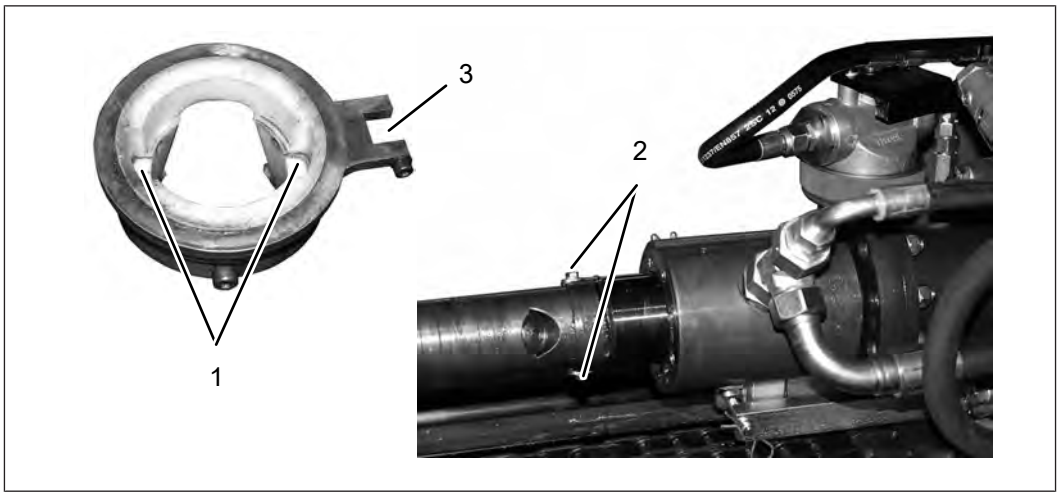


Fig. 5-57 Sub-saver and friction ring

⇨ The opening (3) for the contact rail points upwards.

2. Lock the friction ring by means of the lock pin (4).

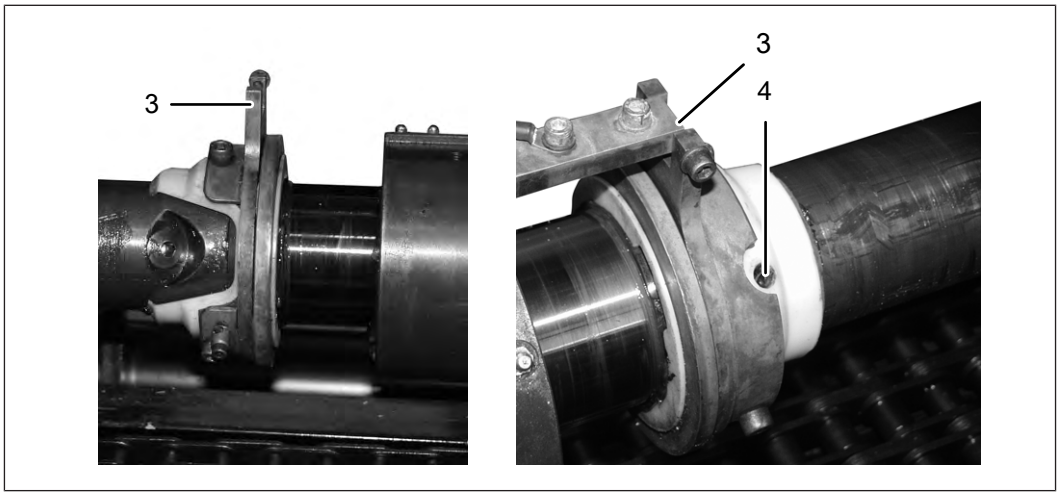


Fig. 5-58 Friction ring slid on

3. Unscrew the blind cap (1) from the sub-saver and screw the cable feed-through (2) into the sub-saver.

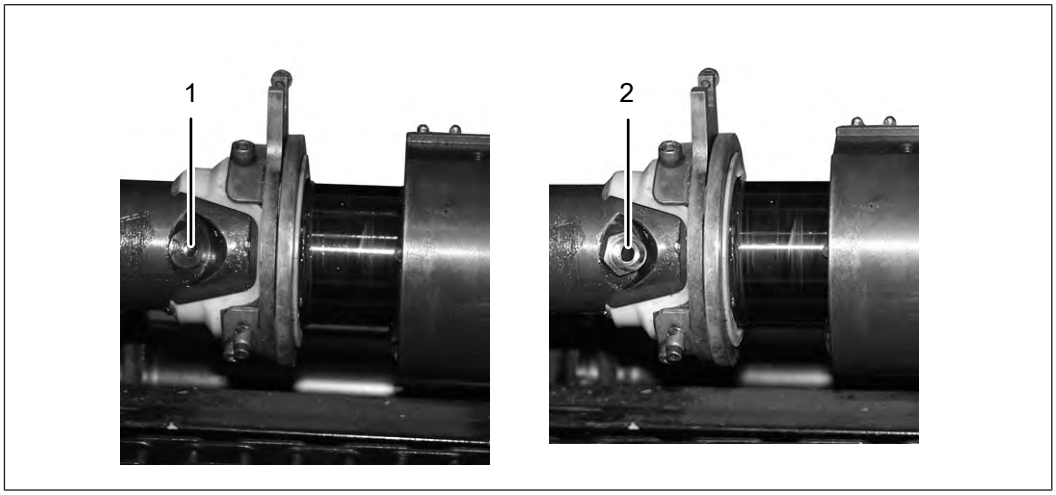


Fig. 5-59 Screwing in the cable feed-through

4. Mount the insulation piece (1) for the contact rail to the rotary swivel.

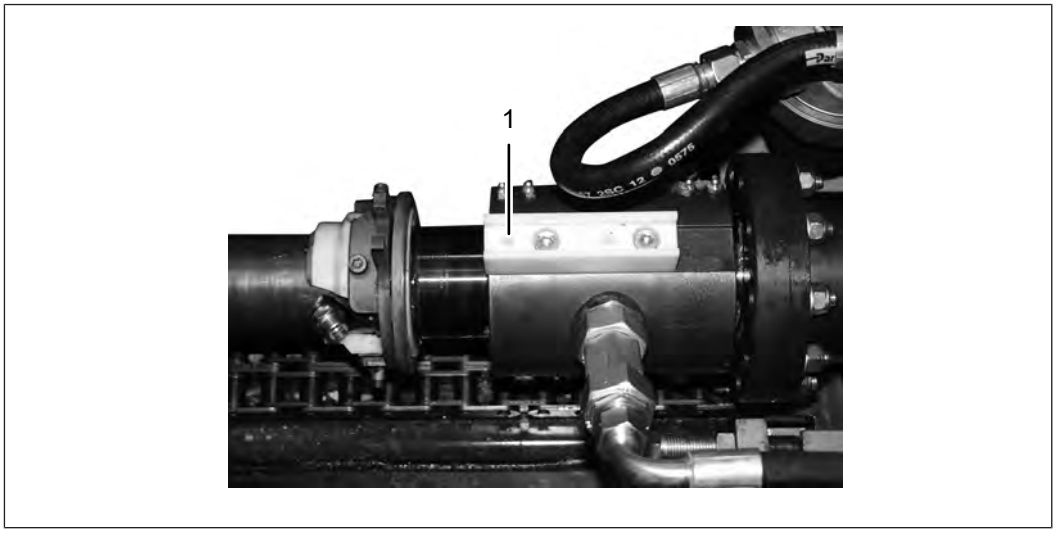


Fig. 5-60 Assembling the insulation piece

5. Screw the contact rail (1) to the insulation piece in a way that the end of the contact rail is located in the recess (2) of the friction ring. Depending on the length of the compensation piece between rotary swivel and friction ring, the contact rail can also be tightened with only one screw.

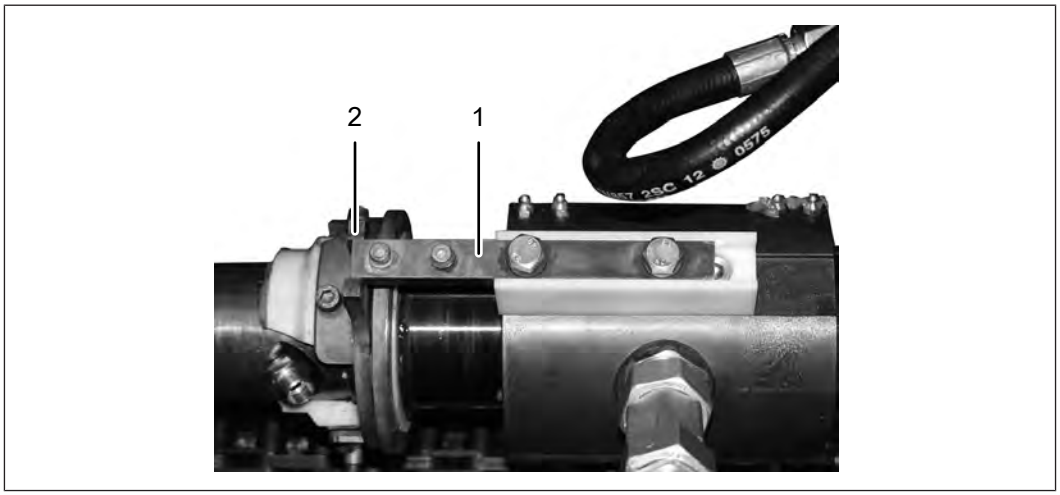


Fig. 5-61 Contact rail assembled

6. Connect the wire (1) coming from the cab to the contact rail.

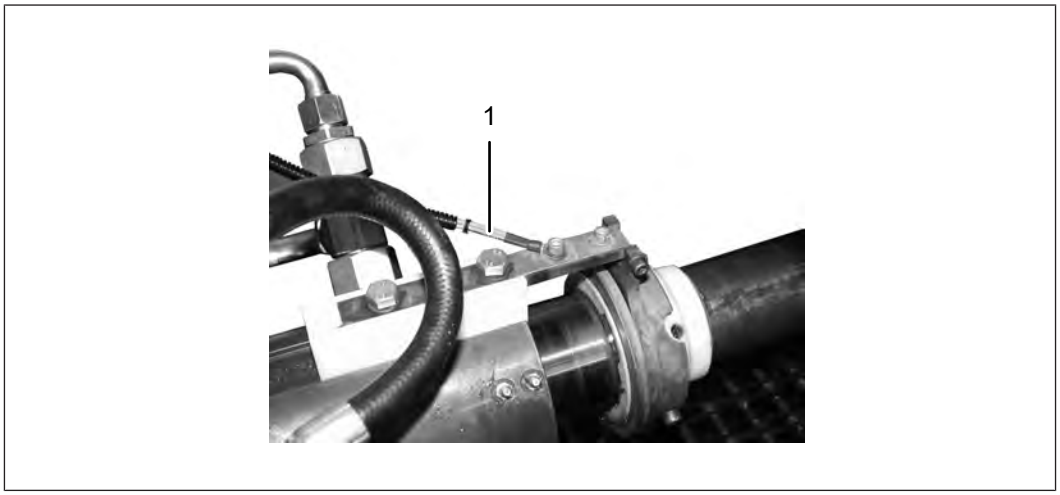


Fig. 5-62 Wire from cab connected

5.10.4 Assembling the monitor and the power supply unit for wire-controlled drilling

For wire-controlled drilling an additional monitor (1) and a power supply unit (3) are needed in the cab. This monitor and the corresponding power supply unit as well as the cables (2, 4) are included in the scope of delivery of the detection system (the precise version depends on the model).

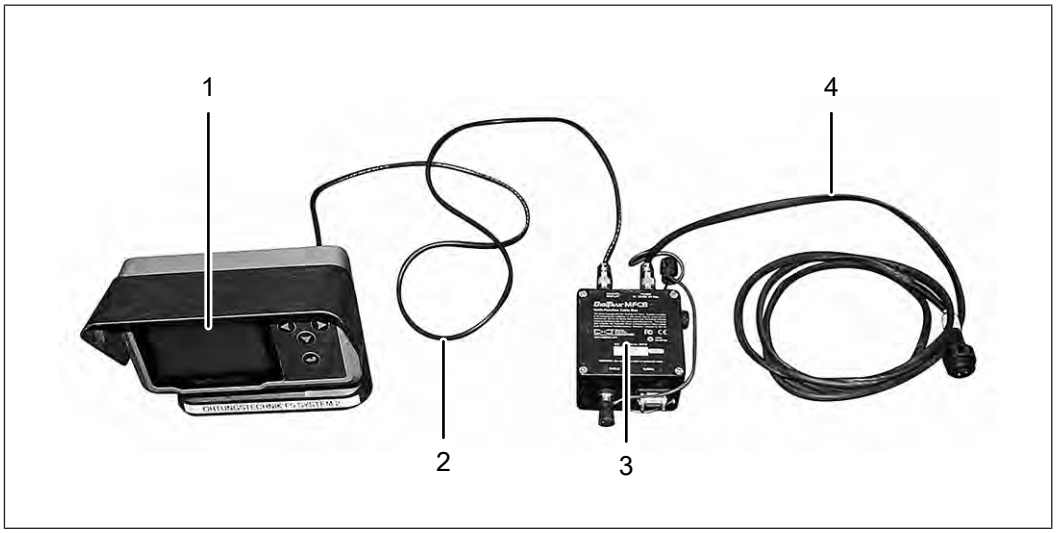


Fig. 5-63 Monitor and power supply unit for wire-controlled drilling

In order to assemble the monitor and the power supply unit for wire-controlled drilling inside the cab, please proceed as follows:

1. Position the monitor on the holder (1) inside the cab. The monitor will be held in place by magnetic feet.
2. Fasten the power supply unit (2) to the cab wall using the magnetic feet so that it does not disturb works inside the cab.

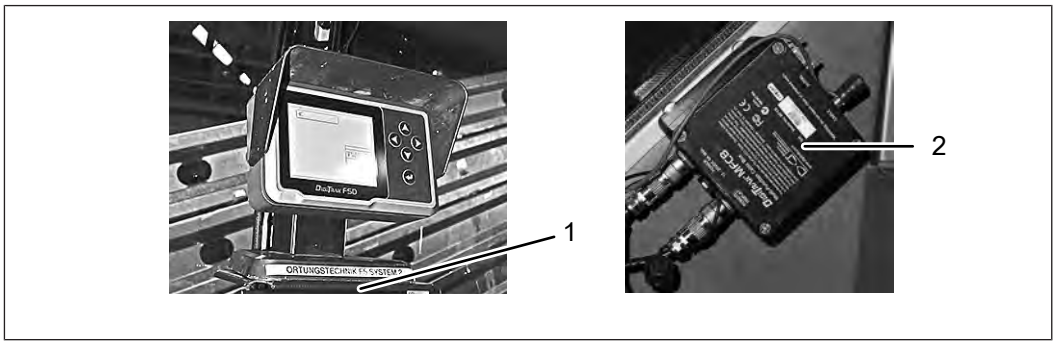


Fig. 5-64 Monitor and power supply unit assembled

3. Connect the monitor and the power supply unit with the corresponding cable (1).
4. Plug the cable for the voltage supply of the power supply unit into the lower right socket (2) of the panel behind the operator seat (chapter 6.2.15, page 201).

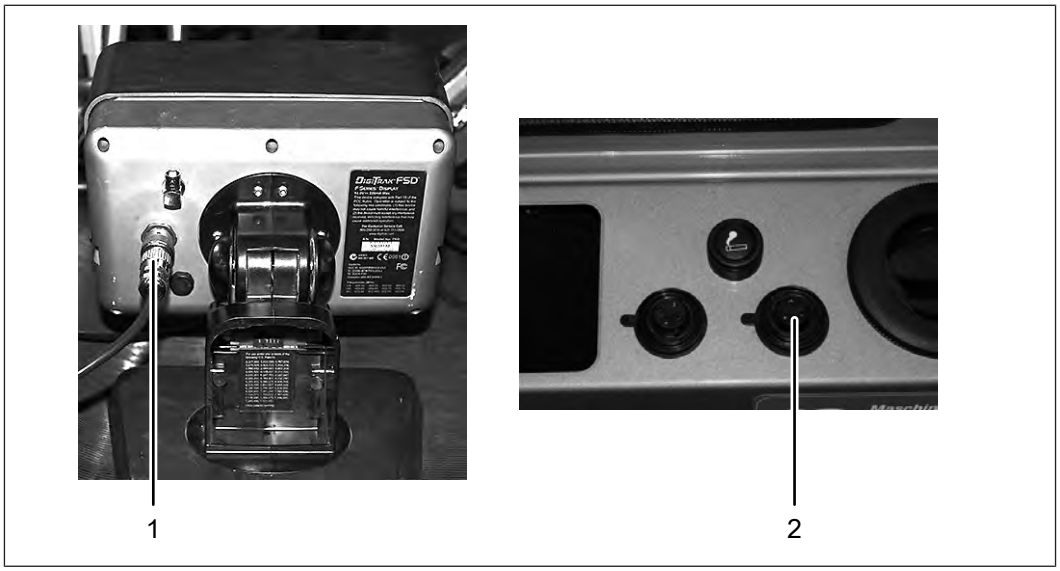


Fig. 5-65 Back of the monitor and panel

5.11 Connecting the drilling fluid system

The following drilling fluid mixing systems can be used with the machine:

- MA07-D
- MA07-E
- MA010-D

Connect the drilling fluid hose to the drilling fluid mixing system (1) and to the machine's suction connection (2).

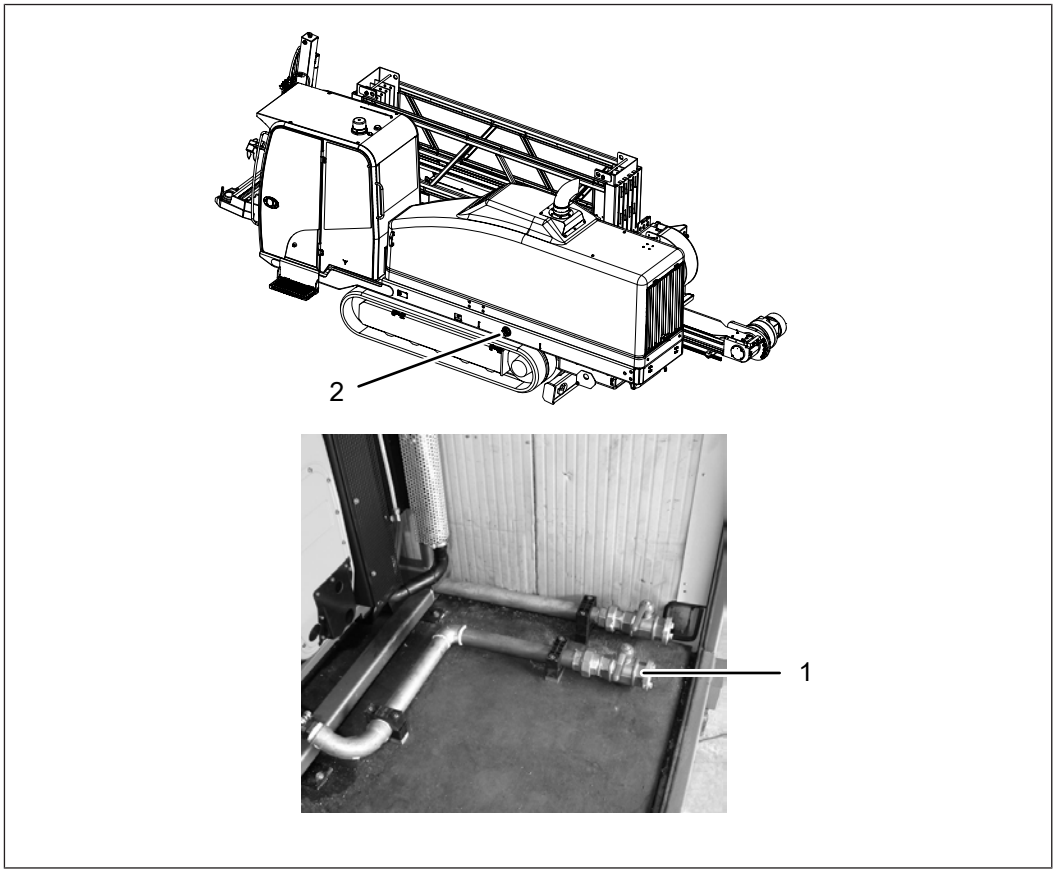


Fig. 5-66 Drilling fluid mixing system, connecting the supply connections

5.12 Connecting and using the high-pressure cleaner

NOTICE

Potential damage to the high-pressure cleaning pump due to particles in fresh water!

- Before filling up the fresh water tank, you have to make sure that the integrated water filter (4) at the fresh water connection (5) is free from dirt.

Info!

Relieve the water pressure on the quick connection before connecting the high-pressure cleaning gun.

– At the front connection, open the ball valve (1) next to the quick connection (2) for the high-pressure cleaner.

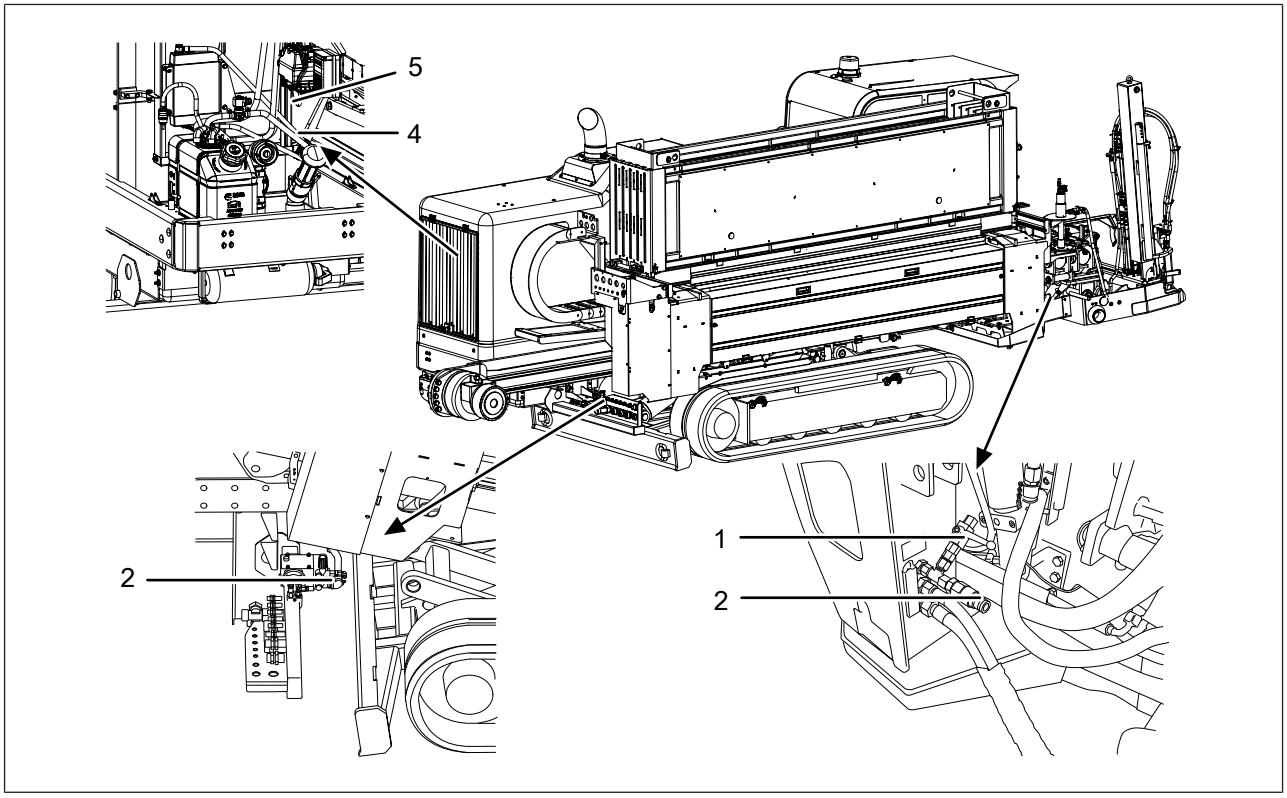


Fig. 5-67 Connecting the high-pressure cleaner

In order to use a high-pressure cleaning gun, connect the hose of the high-pressure cleaning gun to one of the two quick connections (2).

Actuate the push button on the left joystick to switch the high-pressure cleaner on or off:

- Pressing the button once and holding it switches the high-pressure cleaner into normal operation.
- Pressing the button twice switches the high-pressure cleaner into continuous operation.
- Pressing the button once and then releasing it switches the high-pressure cleaner off.

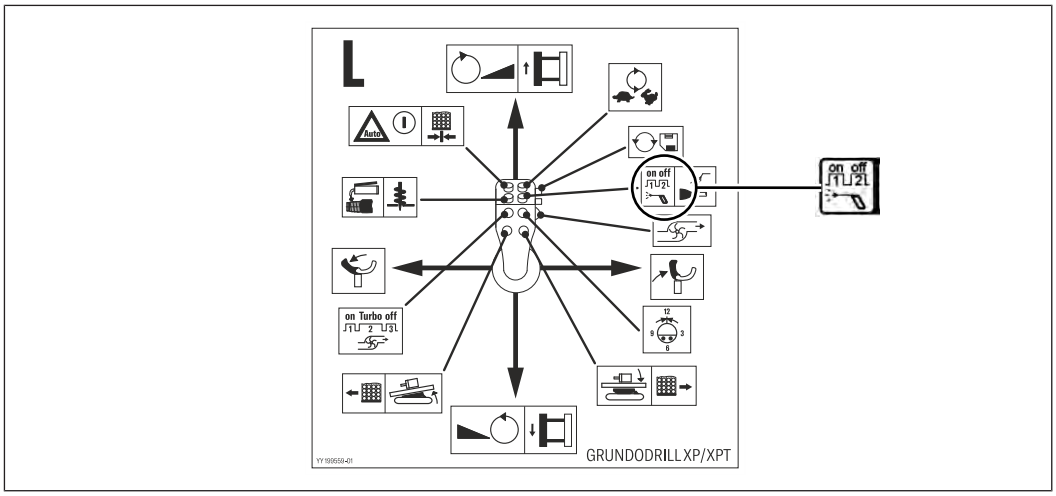


Fig. 5-68 Switching the high-pressure cleaner on or off

Info!
Information on cleaning the machine can be found in the "Cleaning" chapter.

5.13 Using the drilling fluid pump as a high-pressure cleaner (optional)

To use the drilling fluid pump as a high-pressure cleaner in combination with an optional large cleaning lance, please proceed as follows:

1. Disconnect the supply connection for the drilling fluid from the mixing system (see instructions for the mixing system).
2. Connect a fresh water hose (e.g. from a hydrant) to the machine's drilling fluid connection (1).

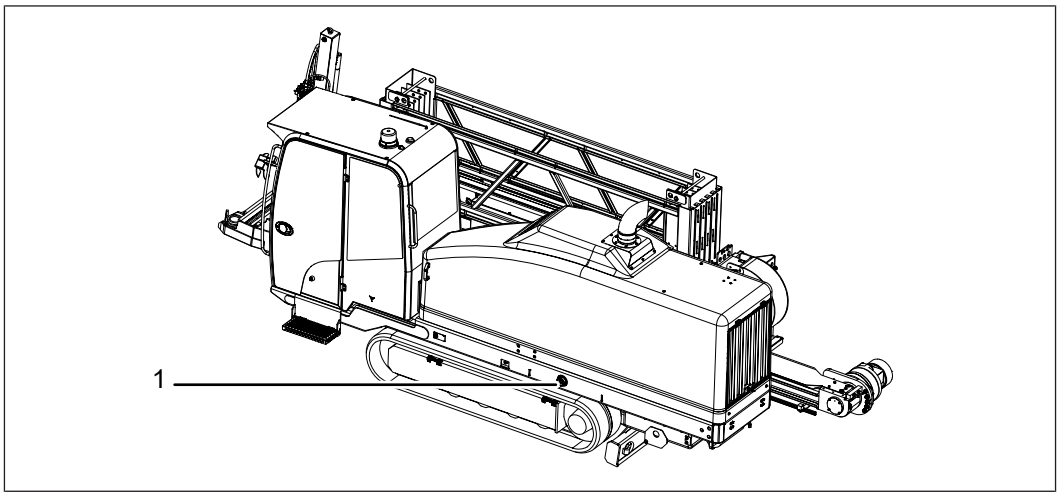
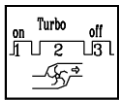


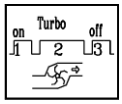
Fig. 5-69 Drilling fluid connection



3. Use the left joystick to set the potentiometer for the drilling fluid quantity to 5–10 %.



4. Switch on the drilling fluid pump on the left joystick by briefly pressing the push button.
5. Rinse the drilling fluid pump until only fresh water comes out of the rod.



6. Switch the drilling fluid off again by briefly pressing the push button on the left joystick.

7. Close the stop cock (1) for the drilling fluid to the rod at the rear of the machine.

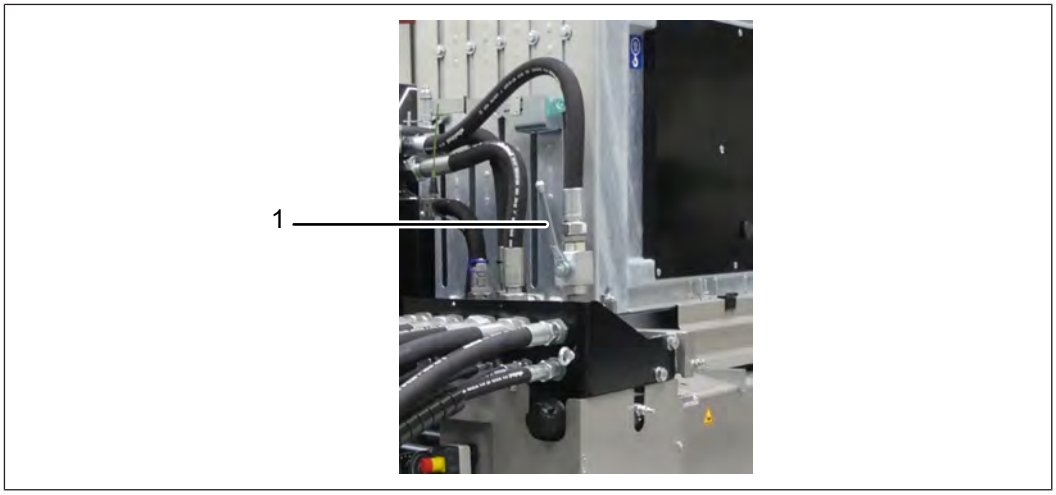


Fig. 5-70 Stop cock for drilling fluid to the rod

8. Connect the large cleaning lance with the corresponding high-pressure hose to the high-pressure connection (1) at the front of the machine.
9. Open the high-pressure stop cock (2).

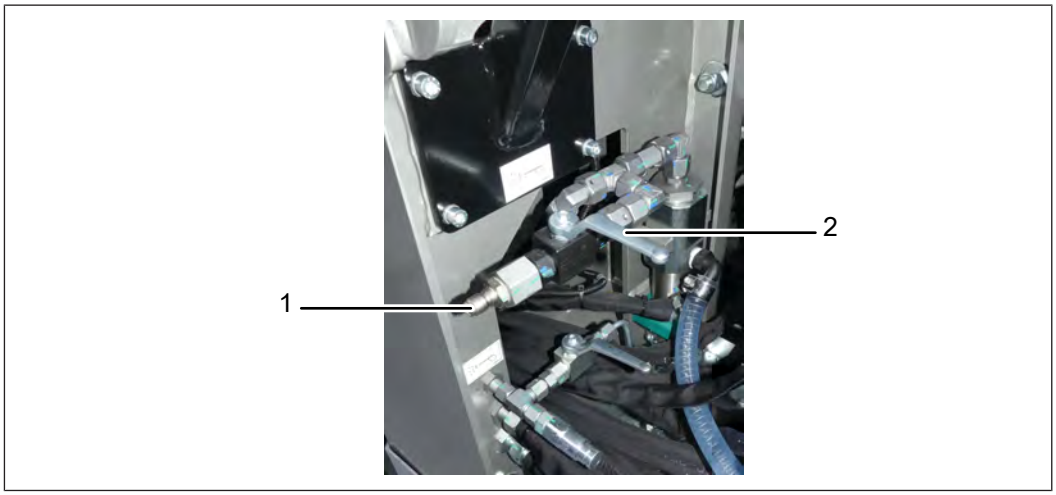


Fig. 5-71 High-pressure connection

10. Switch the drilling fluid pump back on to use the large cleaning lance as a high-pressure cleaner.

6.1 Safety instructions for operation

Observe the following safety information for a secure operation of the machine:

- Personnel working with the machine must have fully read and understood the instructions, especially the "Safety" chapter, before starting to operate the machine. It is too late during operation! This fact is particularly important for personnel only occasionally working on the machine, e.g. during set-up or maintenance work.
- Only qualified and trained personnel is allowed to work on the machine.
- New staff or personnel to be trained may only work on the machine under constant supervision of a qualified person.
- Observe the legal regulations valid at the application site regarding the minimum age of the personnel.
- Seal the working area off against unauthorized access.
- Always carry out a visual inspection of all hoses, lines and safety screws before starting the machine.
- Only work with the machine when you are fully concentrated!
- Immediately eliminate any impairments to safety.
- Only use oil and grease recommended by the manufacturer.
- Always operate the machine with the electric shock warning device installed.

Observe all information in chapter 2.3, page 7.

⚠ DANGER



Moving machine parts!

Risk of injury from draw-in and crushing.

- Keep away from movable parts.
- Never touch the rod while the rod or the rotational drive are rotating (neither during the clamping)!
- Only open the protective covers, doors etc. when the machine is switched off and at a complete standstill.
- In case of emergencies, immediately press the emergency stop button.

⚠ DANGER



Danger of electric shock caused by power cable damage!

Risk of injury due to electric shock upon contact with live parts.

- Always install the entire safety package before starting a drilling operation!
- When the acoustic warning signal can be heard, the operator MUST NOT UNDER ANY CIRCUMSTANCES leave the bore rig, the operator seat or the grounding mat until the power flow has been interrupted and safety is guaranteed.

⇨ **WARNING!** If the current flow is not interrupted correctly, an automatically resetting circuit breaker could supply the power cable with power or the contact between the machine and the power cable might be re-established.

⚠ WARNING



Risk of injury if personal protective equipment is not worn!

- Always wear your personal protective equipment, including ear protection and a work vest in fluorescent colours.
- During drilling, wear the comprehensive protective equipment included in the scope of delivery of the electric shock warning device.

The comprehensive personal protective equipment included in the scope of delivery of the electric shock protection device includes the following items:

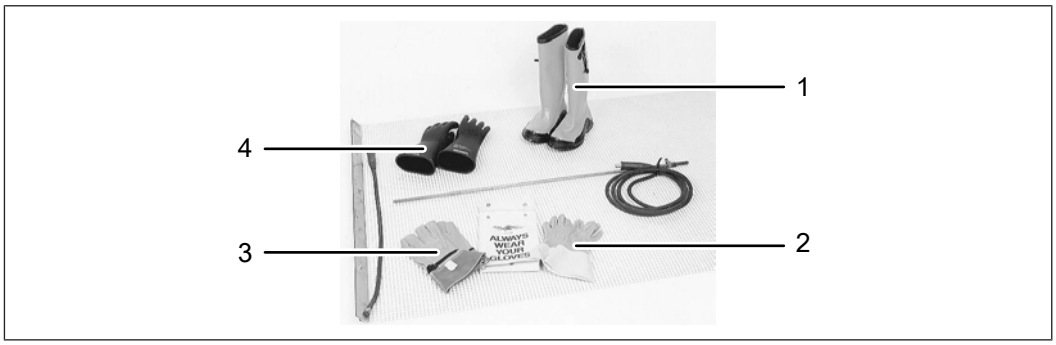


Fig. 6-1 Comprehensive personal protective equipment for electric shock protection device

1	Safety boots	3	Protective gloves GP 4
2	Inner gloves GL	4	Rubber gloves

Put on the three pairs of gloves in the following order:

– Inner gloves GL (2)
– Rubber gloves (4)
– Protective gloves GP 4 (3)

⚠ WARNING



Explosion hazard due to leaking battery fluid in the bore head assembly!

When exceeding the battery's maximum operating temperature indicated by the battery manufacturer, the battery may pass toxic gases into the sealed battery compartment and may explode.

- If you use lithium batteries for the detection system, make sure you avoid drilling conditions exceeding the manufacturer's recommended maximal operating temperature.
- Make sure that the maximum operating temperature indicated by the battery manufacturer is at least 100 °C.
- Follow all safety instructions from the battery manufacturer.
- If the overheating sensor goes black, the probe has exceeded the maximum temperature of 104 °C.
  Keep the battery end cap closed as toxic gases or dangerous chemicals could otherwise escape (see instructions provided by the manufacturer of the detection system).
- The detection system is not designed for use in areas with danger of explosions and must never be used near inflammable or explosive substances.
- Only use oil and grease recommended by the manufacturer to avoid overheating.

6.2 Operating elements and their functions

6.2.1 Main power switch

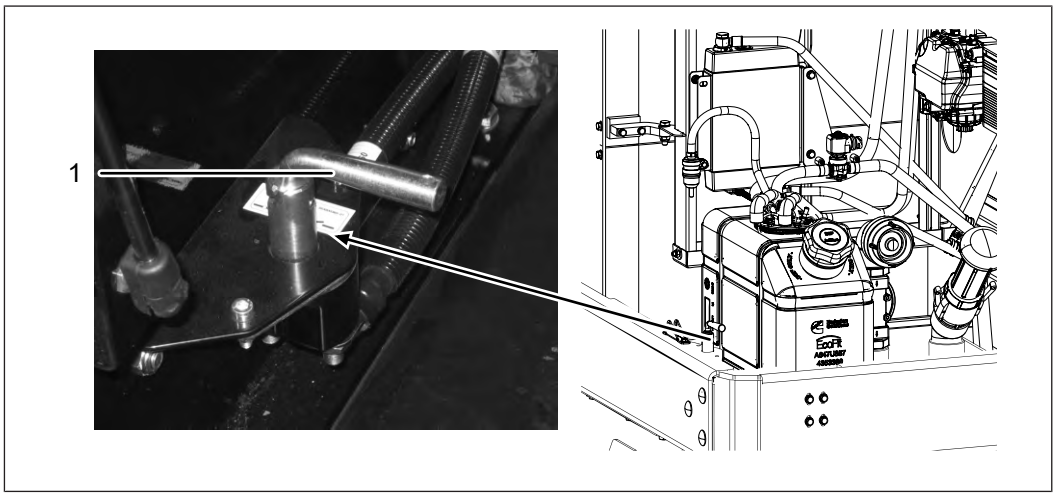


Fig. 6-2 Main power switch

The main power switch (1) is to be used for switch-off in case of maintenance activities, work on the control unit and after longer periods of non-use. It is not required for normal operation. The location of the main power switch is indicated by a corresponding sign (see chapter "Safety signs and labels").

NOTICE

Risk of data loss when switching the machine off at the main power switch!

If the machine was switched off at the main power switch, it may be necessary to reconfigure the sensors after a restart.

- Only switch off the machine by turning the ignition key.
- Never switch off the machine at the main power switch.
- After having stopped the engine by means of the ignition key, wait for at least 1 min and 40 s to allow for the DEF lines to be pumped out completely. Only then switch off the main power switch.

6.2.2 Wireless drive remote control

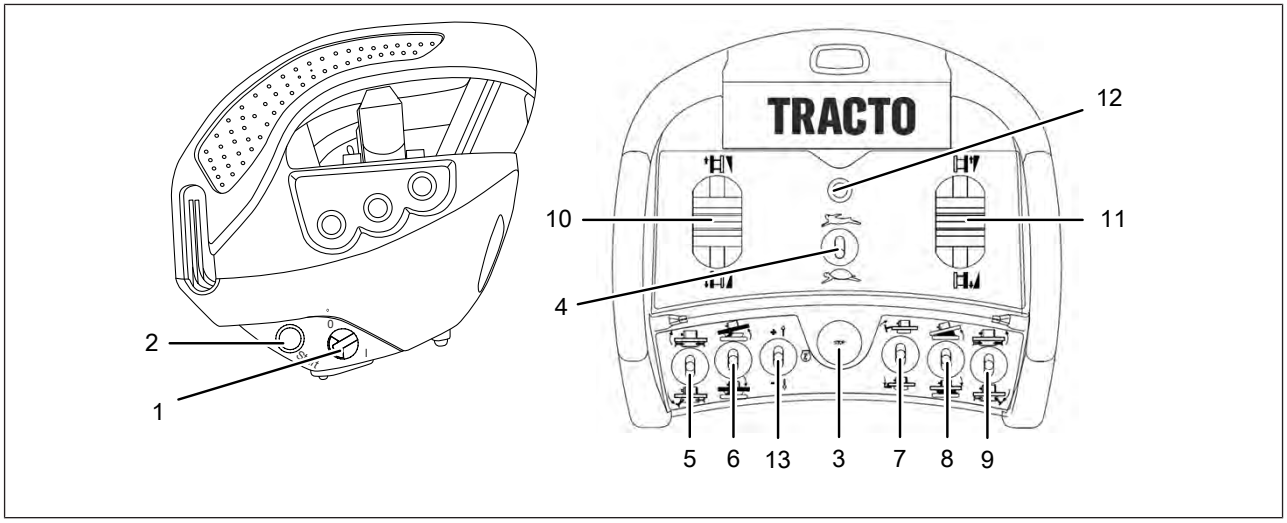


Fig. 6-3 Wireless drive remote control

Tab. 6-1 Operating elements on the wireless drive remote control

Pos.	Operating element	Function	
1	Main switch (key switch)	Switches the drive remote control on or off.	
2	Start, release, horn	Starts the machine.	Releases the drive remote control. Functions as a horn when the machine is running.
3	Emergency stop button	Switches the machine off in an emergency.	
4	Rapid motion tracks	Starts and stops the rapid motion for the tracks.	Tortoise -> rapid motion switched off Rabbit -> rapid motion switched on
5	Front stabiliser	Moves the front stabiliser up and down.	Down -> downwards Up -> upwards
6	-	Without function	
7	-	Without function	
8	Boom rear	Lifts and lowers the boom at the rear.	Down -> boom lowers at the rear Up -> boom rises at the rear
9	Rear stabiliser	Moves the rear stabiliser up and down.	Down -> downwards Up -> upwards
10	Left crawler tracks forward/backward	Drives the left crawler tracks.	To the front -> forward Into centre position -> stand-still To the rear -> backward
11	Right crawler tracks forward/backward	Drives the right crawler tracks.	To the front -> forward Into centre position -> stand-still To the rear -> backward
12	Green indicator light	Flashes when the machine is ready to start. Is switched off when the machine is running.	
13	Rotational speed	Adjustment of the diesel engine's rotational speed	

6.2.3 Wireless pit remote control

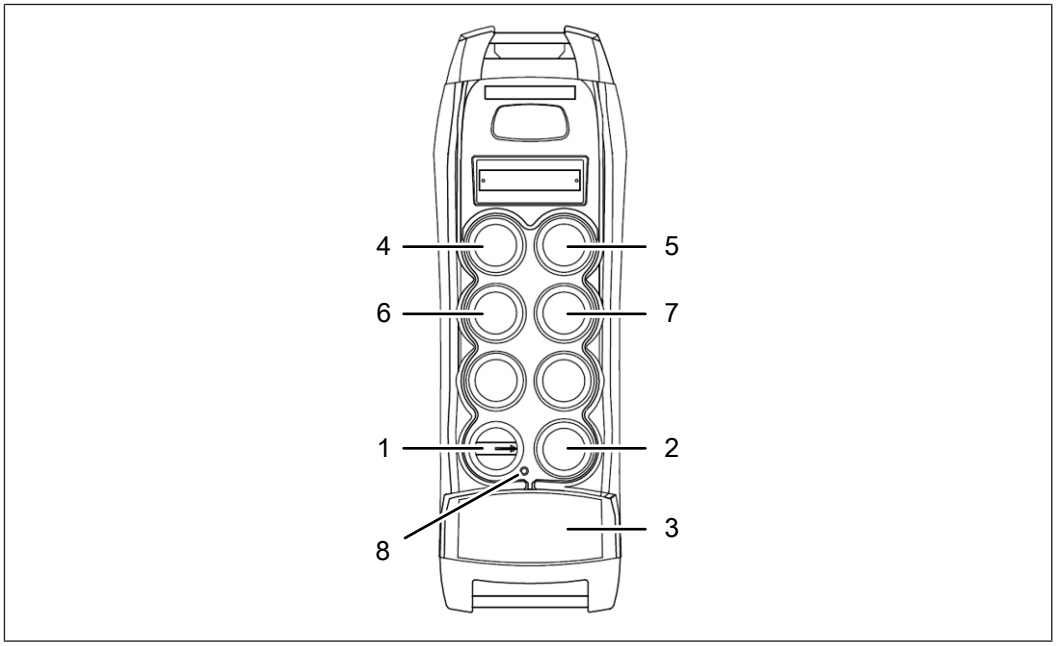


Fig. 6-4 Wireless pit remote control

Tab. 6-2 Operating elements and indicators at the wireless remote control for the pit

Item	Operating element/ indicator	Function
1	Main switch	Switches the wireless pit remote control on.
2	Start, horn	Enables the radio connection to the machine. Starts the machine. Functions as a horn when the machine is running.
3	Emergency stop button	Switches off the machine and the wireless remote control in an emergency.
4	Push button	Starts and stops counter-clockwise rotation at reduced speed.
5	Push button	Starts and stops clockwise rotation at reduced speed.
6	Push button	Reverses the thrust at reduced speed.
7	Push button	Advances the thrust at reduced speed.
8	Green indicator light	Flashes when the machine is ready to start. Is switched off when the machine is running.

6.2.4 Anchor boring rig

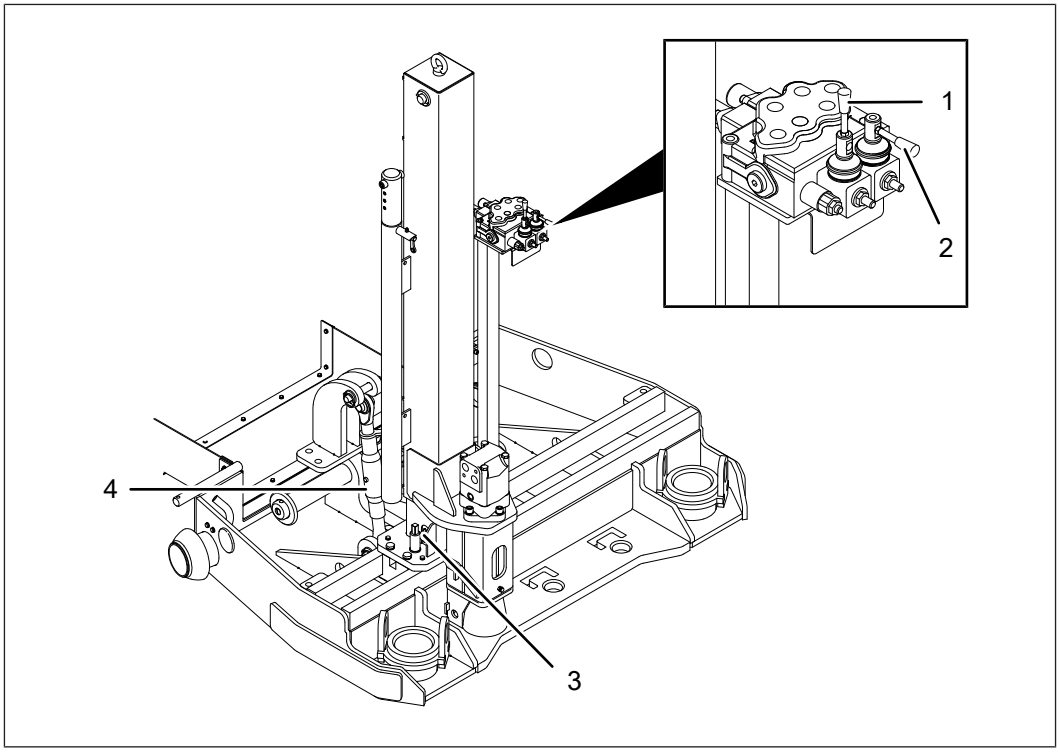


Fig. 6-5 Anchor boring rig

Tab. 6-3 Operating elements on the anchor boring rig

Item	Operating element	Function
1	Hand lever	Drive drill in /out Pressing the lever – > drives the drill out of the ground. Pulling the lever –> drives the drill into the ground.
2	Hand lever	Lifting/lowering the anchor boring rig Pressing the lever -> lowers the anchor boring rig Pulling the lever -> lifts the anchor boring rig
3	Hand ratchet	Serves for horizontal positioning of the anchor above the mounting hole.
4	Rotating device	serves to manually swivel the anchor plate

6.2.5 Anchor thrust unit (option)

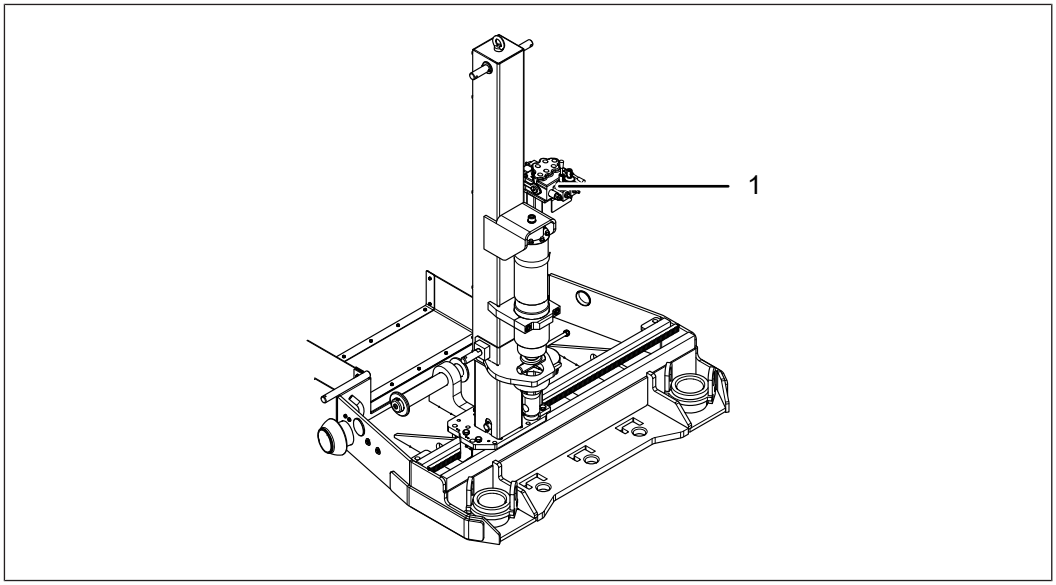


Fig. 6-6 Anchor thrust unit

Tab. 6-4 Operating elements on the anchor thrust unit

Item	Operating element	Function
1	Hand lever	Lifting/lowering the anchor thrust unit Pressing the lever -> lowers the anchor thrust unit Pulling the lever -> lifts the anchor thrust unit

6.2.6 Left joystick with panel

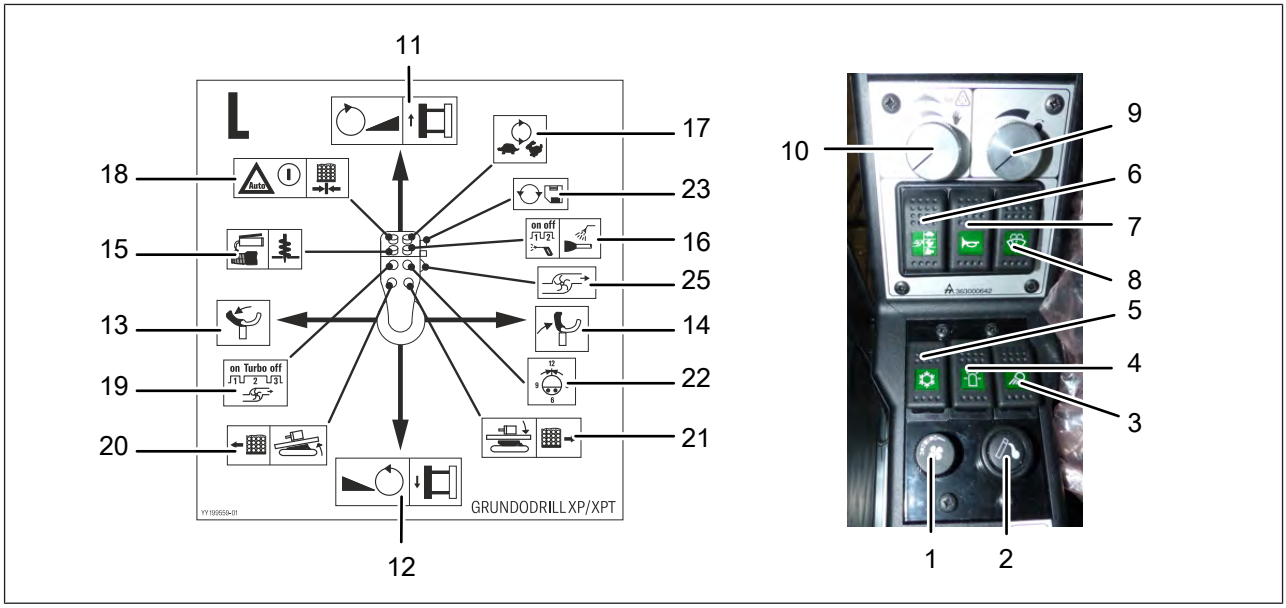


Fig. 6-7 Left joystick with panel

Tab. 6-5 Operating elements of the left joystick

Item	Operating element	Function
1	Step switch	Controls the ventilation in three steps.
2	Cigarette lighter	Also serves as a 24 V socket.
3	Flip switch	Switches the working lights on.
4	Flip switch	Switches on the warning light on the machine.
5	Flip switch	With activated ventilation: Switches the air conditioning on or off
6	Flip switch, 3-step	flow rate low (tortoise) or high (rabbit) or rock drilling (mountain) (only if equipped with P72 pump – optional)
7	Flip switch	Starts an acoustic warning signal.
8	Flip switch	Switches the lower windscreen wiper / washer water supply on and off
9	Rotary knob	Serves to set the rotation speed during automatic drilling.
10	Not assigned	
11	Joystick forwards	Bore mode: starts clockwise rotation. Drive mode: drives the left track forward
12	Joystick backwards	Bore mode: starts counter-clockwise rotation. Drive mode: drives the left track backward.
13	Joystick to the left	Opens the rod grippers.
14	Joystick to the right	Closes the rod grippers.
15	Front push button - top left	Bore mode: starts rod lubrication. Drive mode: starts the anchoring unit.

Item	Operating element	Function
16	Front push button - top right	Switches the high-pressure cleaner into normal operation when pressed once and held, switches to continuous operation when pressed twice and held, switches the high-pressure cleaner off when pressed once and then let go of.
17	Front push button - bottom right	Bore mode: switches rotation either to high torque (low speed) or to low torque (high speed).
18	Front push button - bottom left	in drilling mode on fully automatic machines: during pilot bore: single click: starts the fully automatic rod exchange double click: starts the fully automatic push operation in thrust mode during expansion: single click: starts the fully automatic rod exchange. double click: starts the fully automatic expansion. in drilling mode on semi-automatic machines: Starting position: Rod connection is located between the two clamping jaws during pilot bore: single click: starts the automatic rod break-away double click: starts the semi-automatic push operation during expansion: single click: starts the automatic rod break-away double click: starts the semi-automatic expansion Drive mode: moves the rod box into transport position
19	Top left push button	Bore mode: 1. brief actuation: The drilling fluid pump switches itself on. 2. first brief, then longer actuation: The drilling fluid pump switches into fast-fill mode. 3. repeated actuation: The drilling fluid pump switches itself off.
20	Bottom left push button	Bore mode: moves the rod box to the next bay in the direction of the bore axis. Drive mode: lifts the boom at the rear.
21	Bottom right push button	Bore mode: moves the rod box to the next bay in the direction of the magazine. Drive mode: lowers the boom at the rear.
22	Top right push button	Bore mode: sets the roll (probe's o'clock position)
23	Front right push button	only during manual operation: Pressed 1× -> maintains the currently selected speed Pressed 2×-> previously selected speed is reset (after stopping)
25	Setting wheel	Serves to set the drilling fluid quantity.

⚠ WARNING

Risk of injury due to unintentional joystick actuation!

When exiting the cab while the engine is running, there is a risk of actuating the left joystick unintentionally and thus initiating a machine movement. The machine movement could injure yourself or others.

- **Always** fold up the left joystick panel before exiting the cab.
  This disables all functions of both joysticks.

Info!
The air conditioning is designed for the climate zones in the European Union.
Run the air conditioning for 15 minutes at least once a month to prevent damage to the compressor.

Info!
When moving a joystick axis or actuating a joystick button while the ignition is being switched on, the actuated component will be disabled.
If, for example, the left joystick is pushed forward while the ignition is being switched on, the left track chain (in drive mode) or the rotation (in bore mode) cannot be controlled.

– To rectify the fault, switch off the ignition.
– Always set the ignition lock to the centre position when you switch off the ignition. This prevents the battery from being deeply discharged.
– Only switch the ignition back on when it is sure that, in doing so, no operating element is actuated.

Info!
Remove loads from the 24 V socket on the panel (pos. 2) when you have switched off the ignition. This prevents the battery from being deeply discharged.

6.2.7 Right joystick with panel

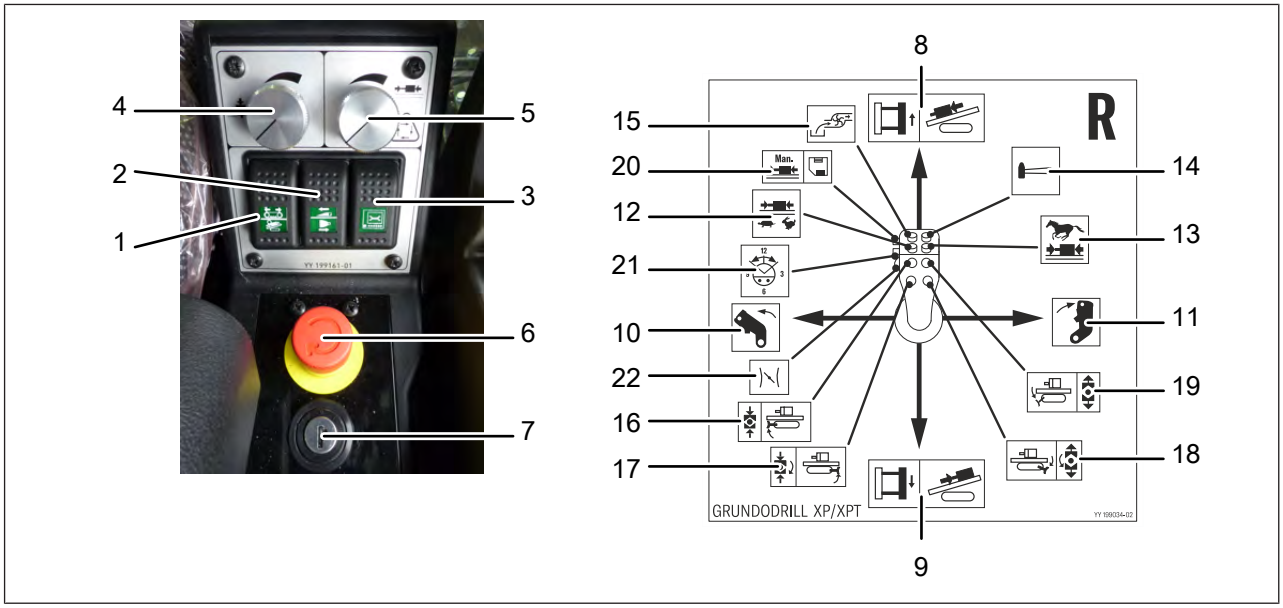


Fig. 6-8 Right joystick with panel

Tab. 6-6 Operating elements of the right joystick

Item	Operating element	Function
1	Flip switch	For switching over between bore mode and drive mode
2	Flip switch	For switching over between pilot bore and pull-in
3	Flip switch	For switching the service mode on / off
4	Rotary knob	Setting the maximum thrust force
5	Rotary knob	Setting the thrust speed in auto-bore and paddle mode
6	Emergency stop button	Shuts down the machine immediately.
7	Ignition lock	Serves to start and stop the engine.
8	Joystick forwards	Bore mode: advances the thrust rig. Drive mode: drives the right track forwards.
9	Joystick backwards	Bore mode: reverses the thrust rig. Drive mode: drives the right track backwards.
10	Joystick to the left	Swings the gripper arms towards the bore axis.
11	Joystick to the right	Swings the gripper arms towards the rod box.
12	Front push button - top left	The thrust is switched in two steps, either to high force and low speed (tortoise) or low force and high speed (rabbit).
13	Front push button - top right	Starts rapid motion for the thrust rig for as long as the button is pressed.
14	Front push button - bottom right	Starts the percussive hammer for as long as the button is pressed
15	Front push button - bottom left	Switches the mud pump on for as long as the button is pressed.

Item	Operating element	Function
16	Top left push button	Bore mode: closes the clamp. Drive mode: lifts the front stabiliser.
17	Bottom left push button	Bore mode: closes the break-away clamp Drive mode: lifts the stabiliser
18	Bottom right push button	Bore mode: opens the break-away clamp Drive mode: lowers the stabiliser
19	Top right push button	Bore mode: opens the clamp. Drive mode: lowers the front stabiliser.
20	Front left push button	Only in manual mode: Pressing 1× maintains the currently selected speed. Pressing 2× resets the previously chosen speed (after stopping).
21	Rear left push button	Only in manual mode: Pressing 2× starts paddle mode in pilot bore mode. Pressing 1× stops paddle mode and the sub-saver approaches the o'clock position it was in when the function was started. (When paddle mode is activated, pressing 2× stops the function immediately.)
22	Rotary knob	Determines the engine speed. After approx. 3 seconds without actuation the rotational speed automatically drops to idling.

Info!
In drive mode the left and right joysticks steer the crawler tracks:
- both joysticks forward => machine moves forward
- both joysticks back => machine moves backward

6.2.8 General explanations of the operating elements on the panel PC inside the cab

The panel PC inside the cab is equipped with a touch-sensitive monitor on which the individual screens are displayed. To execute a function or to change the screen, tap the corresponding touch surface.
To enter values, type them using the on-screen keyboard or use the >>+<< and >>-<< buttons.

The figure below illustrates the operating elements of the panel PC by taking the "Bore mode" screen as example.

Info!
You can find these operating elements and their respective functions in various screens.

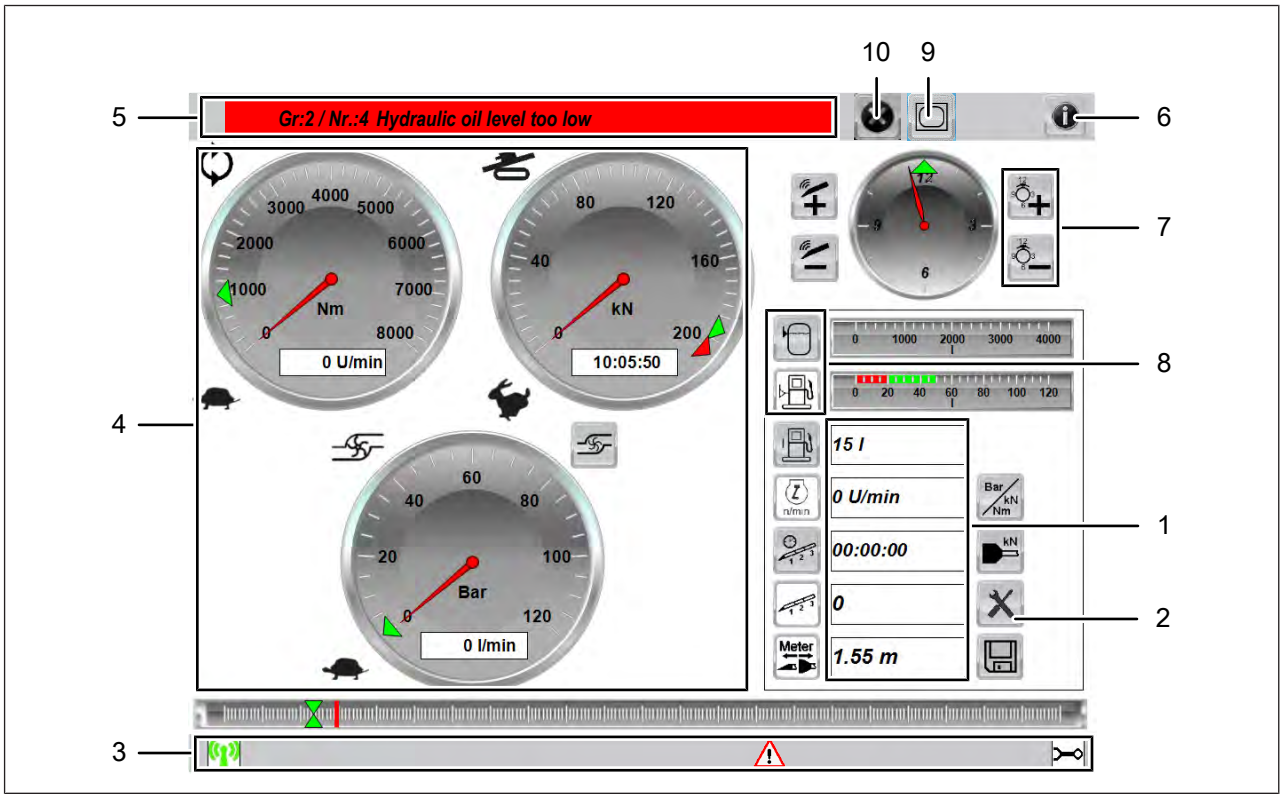


Fig. 6-9 Operating elements: "Bore mode" sample screen

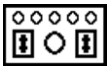
Tab. 6-7 Explanation of the operating elements of the panel PC (general)

Item	Operating element	Function
1	Text boxes	Indicate information or machine conditions. These text boxes cannot be edited.
2	Buttons	Symbols with a dark grey background are designed as buttons. You can tap these buttons to activate or deactivate the displayed function. After tapping a button, another screen may appear.
3	Status line	Indicates the current status of a function, e.g.: is displayed when the diesel tank is in reserve is displayed in emergency mode
4	Operating screens	Indicate the relevant information (e.g. pressure indication for the rotation in bar).
5	Message display	Indicates operating messages and faults.
6	>>General information<< button	indicates important telephone numbers and the software version; serves to open the accessories catalogue and to start the spare parts and service programme "Tractron"
7	>>+<< and >>-<< buttons	Use these buttons to increase or decrease a value. The changed value is adopted immediately.
8	Function indications	Symbols with a light grey background serve as function indicators and cannot be tapped.
9	>>Display fault text<< button	Tap this button to display the complete fault text.
10	>>Acknowledgement message<< button	Acknowledge the indicated fault by tapping this button.

6.2.8.1 Indications in the status line

The status line contains the current system condition of the machine illustrated by symbols. The following symbols can be displayed individually or in combination:

Tab. 6-8 Indications in the status line

Symbol	Meaning
	Mobile radio connection is being established (yellow) or has been established (green).
	Fault of the drilling fluid mixing system
	Diesel tank in reserve
	The remote control is connected.
	The preselected clock hour position will be approached.
	The paddle mode is activated.
	The memory function for thrust is activated.
	The automatic mode is activated.
	The emergency mode is activated.
	Automatic bay filling and emptying.
	The memory function for the rotation is activated.
	The bore data logging is activated.
	The tensile force measuring is activated.
	The high-pressure cleaner is activated.
	The service mode is released.

6.2.8.2 "Drive mode" screen

The drive mode is used for aligning the machine.

This screen appears if you set the rocker switch on the right joystick panel to drive mode.

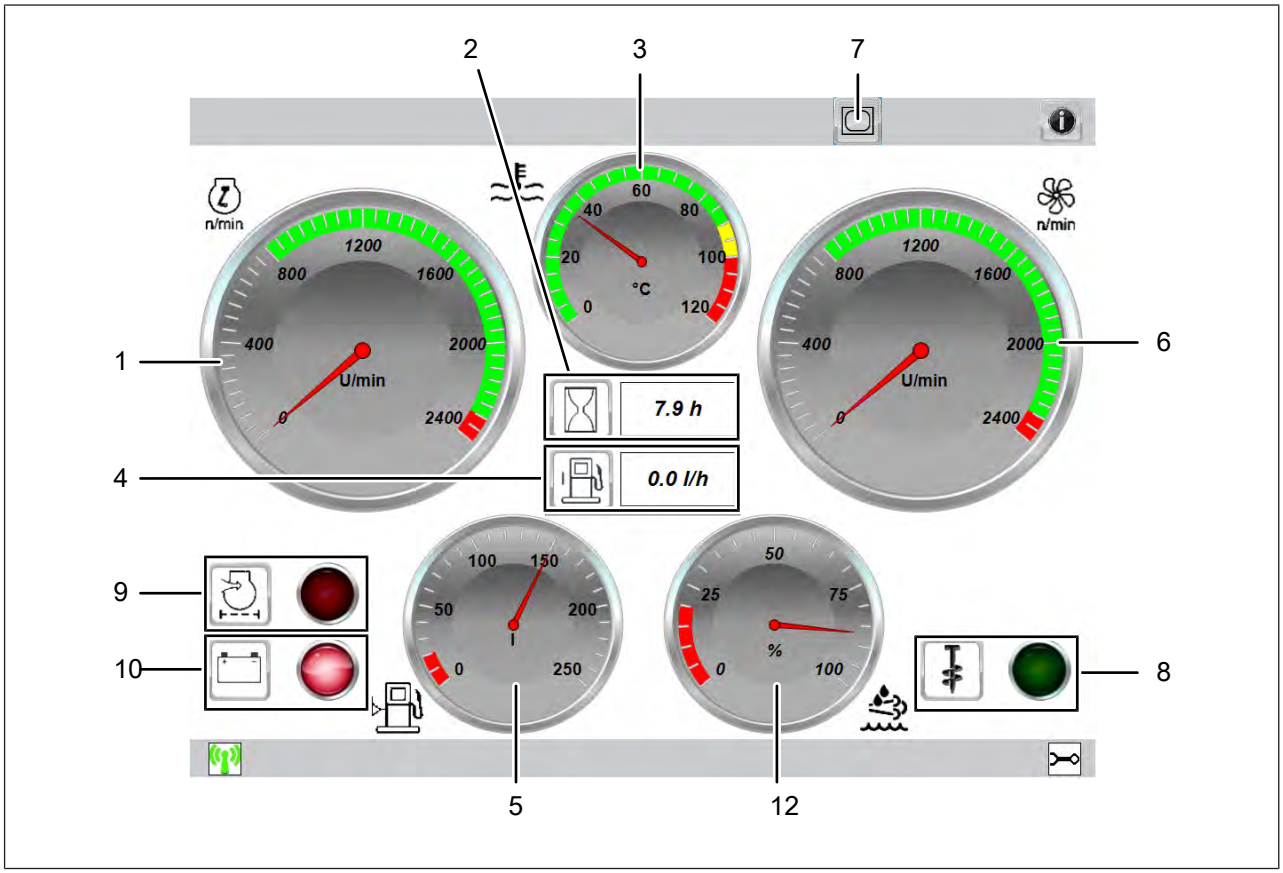


Fig. 6-10 "Drive mode" screen

Tab. 6-9 Indicators and operating elements of the "Drive mode" screen

Item	Operating element	Function
1	Engine speed	Indicates the engine speed.
2	Operating hours	Indicates the number of elapsed operating hours.
3	Coolant temperature diesel engine	Indicates the coolant temperature of the diesel engine.
4	Fuel consumption	Indicates the current diesel consumption in litres per hour.
5	Tank capacity	Indicates the current filling level of the diesel tank. The fault message "Diesel in reserve. Below minimal level in diesel tank." will appear in the message display. A corresponding symbol is displayed in the status line.
6	Rotational speed cooler	Indicates the rotational speed of the diesel engine fan.

Item	Operating element	Function
8	Switch anchoring unit on/off status indicator	By pressing the button on the left joystick the anchoring unit is switched on or off. The status indicator is illuminated in green when the anchoring unit is switched on.
9	Dirt indicator air filter	The status indicator is illuminated if the air filter of the diesel engine is dirty.
10	Alternator charging control status indicator	The status indicator is illuminated when the diesel engine is not running or when there is a fault in the alternator.
12	Diesel exhaust fluid tank level	Indicates how much DEF is left in the tank.

6.2.8.3 "Bore mode" screen (fully automatic mode)

This screen appears if you set the rocker switch on the right joystick panel to bore mode.

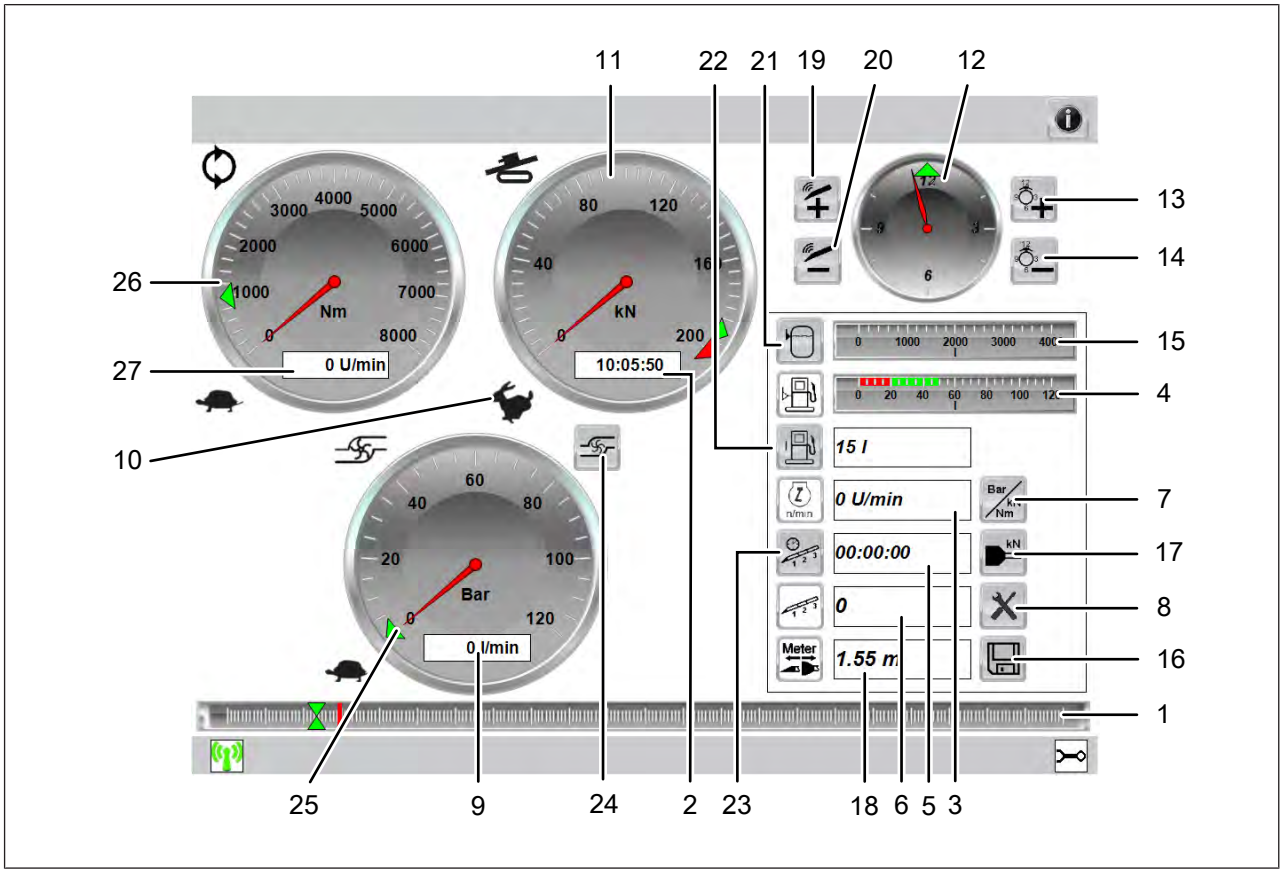
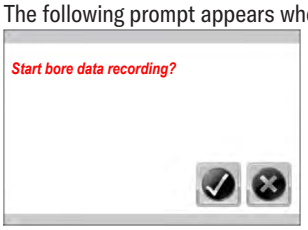


Fig. 6-11 "Bore mode" screen (fully automatic mode)

Tab. 6-10 Indicators and operating elements of the "Bore mode" screen

Item	Operating element	Function
1	Drag indicator thrust	Indicates the driving path of the thrust rig. The movement of the red bar carried out from right to left (or, in expanding mode, from left to right) allows to determine the approximate position and driving speed of the thrust rig. When the bar has arrived at the left edge, it will jump to the right and run from right to left again. The green triangle markers (drag indicators) are displayed automatically as soon as the thrust rig is retracted. The drag indicators move along with the red bar. When the thrust rig is retracted during the pilot bore, the drag indicator remains in the front position. During pull-in and expanding, the drag indicator marks the rear end position. This allows you to mark obstacles in the ground.
2	O'clock position	Indicates the time. Indicates the tensile force when the tensile force measuring system is connected.
3	Engine speed	Indicates the rotational speed of the diesel engine.
4	Diesel tank	Indicates the current filling level of the diesel tank. The fault message "Diesel in reserve. Below minimal level in diesel tank." will appear in the message display. A corresponding symbol is displayed in the status line.

Item	Operating element	Function
5	Thrust/pulling time	Indicates the time required for drilling and expanding/pull-in of each drill rod.
6	Rod counter	Indicates the number of rods inserted in the bore axis.
7	>>Units<< button	Converts the unit "bar" into "kN" for the thrust force and into "Nm" for the rotation torque.
8	>>Bore parameter settings<< button	Opens the "Bore parameter settings" screen (chapter 6.2.8.5, page 147).
9	Drilling fluid flow rate	Indicates the current flow rate for the drilling fluid pump.
10	Speed level of the thrust	If the tortoise appears, the slow thrust motion with high force is activated. If the rabbit appears, the quick thrust motion with low force is activated. If the horse appears, rapid motion for thrust is activated.
11	Force / pressure of the thrust	Force or pressure indication for the thrust in bar or kN The green marker indicates the position of the respective potentiometer.
12	Roll indication, approaching the o'clock position	The red indicator shows the current o'clock position of the drill head. The o'clock position is detected by a sensor in the rotation motor. For this reason, compare the displayed o'clock position regularly with the o'clock position of the detection system, and adjust it if necessary. The green marker can be used to set an o'clock position to be approached automatically.
13	>>Set o'clock position to be approached clockwise<< button	This button is used to set the o'clock position, which will be approached automatically, clockwise. This button is only displayed in pilot bore mode.
14	>>Set o'clock position to be approached counter-clockwise<< button	This button is used to set the o'clock position, which will be approached automatically, counter-clockwise. This button is only displayed in pilot bore mode.
15	Quantity indication drilling fluid tank	Indicates the current filling level of the drilling fluid tank.
16	>>Start / stop bore data recording<< button	Starts or stops bore data recording. The rod counter is set to 0 when starting. The following prompt appears when stopping:  Confirm the query by tapping the checkmark.
17	>>Tensile force measurement settings<< button	Opens the "Tensile force measurement settings" screen (chapter 6.2.8.15, page 166).
18	>>Rod length<< indication	Indication of the length of the inserted rods (in relation to 3 m) The background colour is green if the separation point of the rod connection is located between the clamp and break-away device.
19	>>Calibration detection system clockwise<< button	Calibrates the red position indication with the detection indication (roll details from detection system) clockwise.
20	>>Calibration detection system counter-clockwise<< button	Calibrates the red position indication with the detection indication (roll details from detection system) counter-clockwise.

Item	Operating element	Function
21	>>Quantity setting monitoring drilling fluid tank<< button	Opens the "Quantity setting monitoring drilling fluid tank" screen.
22	>>Reset day counter diesel<< button	Resets the indication for the diesel consumption.
23	>>Stored thrust times<< button	Opens the screen indicating the stored thrust and pulling times.
24	>>Pressure indication range switch-over<< button	Switches the pressure indication (25) over between 30 bar and 150 bar range.
25	Pressure indicator drilling fluid pump	Indicates the current drilling fluid pressure of the drilling fluid pump. Depending on the setting of the rocker switch (optional P72 pump only) on the left joystick panel, either rabbit, tortoise or rock will be displayed. If the rabbit appears, a high flow rate is activated. If the tortoise appears, a low flow rate is activated. If the rock appears, the rock drilling mode is activated. The green marker indicates the potentiometer position of the flow rate setting.
26	Torque / pressure of the rotation	Torque or pressure indication for the rotation of the rod in bar or Nm
27	Rpm rotation rod	Indicates the rotational speed of the rod in rpm.

6.2.8.4 "Bore mode" screen (semi-automatic mode)

This screen appears if you set the rocker switch on the right joystick panel to bore mode.

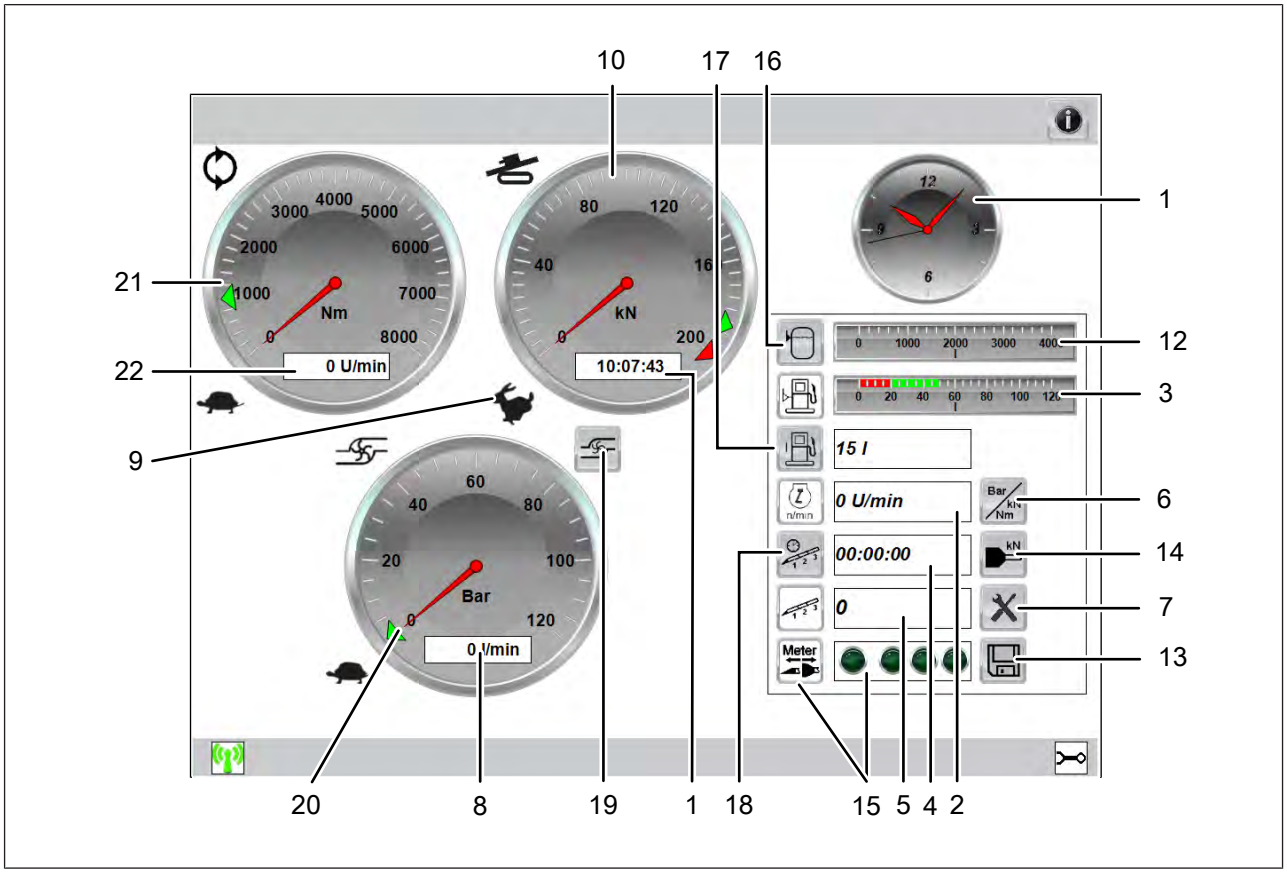


Fig. 6-12 "Bore mode" screen (semi-automatic mode)

Tab. 6-11 Indicators and operating elements of the "Bore mode" screen

Item	Operating element	Function
1	Clock	Indicates the time. Indicates the tensile force when the tensile force measuring system is connected.
2	Engine speed	Indicates the rotational speed of the diesel engine.
3	Diesel tank	Indicates the current filling level of the diesel tank. The fault message "Diesel in reserve. Below minimal level in diesel tank." will appear in the message display. A corresponding symbol is displayed in the status line.
4	Thrust/pulling time	Indicates the time required for drilling and expanding/pull-in of each drill rod.
5	Rod counter	Indicates the number of rods inserted in the bore axis.
6	>>Units<< button	Converts the unit "bar" into "kN" for the thrust force and into "Nm" for the rotation torque.
7	>>Bore parameter settings<< button	Opens the "Bore parameter settings" screen (chapter 6.2.8.5, page 147).
8	Drilling fluid flow rate	Indicates the current flow rate for the drilling fluid pump.

Item	Operating element	Function
9	Speed level of the thrust	If the tortoise appears, the slow thrust motion with high force is activated. If the rabbit appears, the quick thrust motion with low force is activated. If the horse appears, rapid motion for thrust is activated.
10	Force / pressure of the thrust	Force or pressure indication for the thrust in bar or kN The green marker indicates the position of the respective potentiometer.
12	Quantity indication drilling fluid tank	Indicates the current filling level of the drilling fluid tank.
13	>>Start / stop bore data recording<< button	Starts or stops bore data recording.
14	>>Tensile force measurement settings<< button	Opens the "Tensile force measurement settings" screen (chapter 6.2.8.15, page 166).
15	>>Thrust rig position<< indication	The status indicators are illuminated when the thrust rig is in the respective position. As soon as the break-away position is reached, the background of the symbol changes from white to green. from left to right: – front position – rod break-away position – switch-off for the rod arm – rear end position
16	>>Quantity setting monitoring drilling fluid tank<< button	Opens the "Quantity setting monitoring drilling fluid tank" screen.
17	>>Reset day counter diesel<< button	Resets the indication for the diesel consumption.
18	>>Stored thrust times<< button	Opens the screen indicating the stored thrust and pulling times.
19	>>Pressure indication range switch-over<< button	Switches the pressure indication (25) over between 30 bar and 150 bar range.
20	Pressure indicator drilling fluid pump	Indicates the current drilling fluid pressure of the drilling fluid pump. Depending on the setting of the rocker switch (optional P72 pump only) on the left joystick panel, either rabbit, tortoise or rock will be displayed. If the rabbit appears, a high flow rate is activated. If the tortoise appears, a low flow rate is activated. If the rock appears, the rock drilling mode is activated. The green marker indicates the potentiometer position of the flow rate setting.
21	Torque / pressure of the rotation	Torque or pressure indication for the rotation of the rod in bar or Nm
22	Rpm rotation rod	Indicates the rotational speed of the rod in rpm.

6.2.8.5 "Bore parameter settings" screen

This screen is displayed if you tap the >>Bore parameter settings<< button in the "Bore mode" screen (chapter 6.2.8.3, page 142).

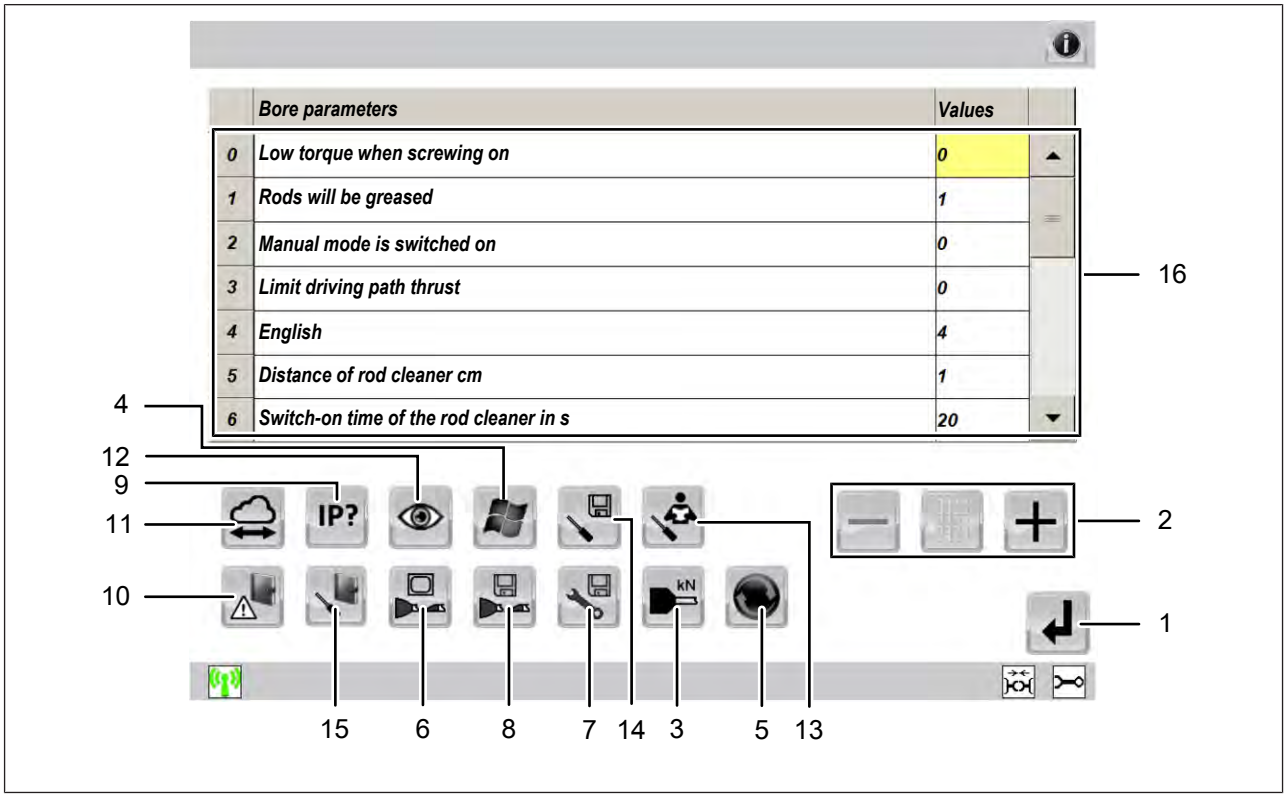


Fig. 6-13 "Bore parameter settings" screen

Tab. 6-12 Indicators and operating elements of the "Bore parameter settings" screen

Item	Operating element	Function
1	>>Back<< button	Returns you to the previous screen.
2	>>+<< and >>-<< buttons / >>on-screen keyboard<<	Use the >>+<< and >>-<< buttons to increase or decrease a value. The changed value is adopted immediately. Alternatively, you can tap the button for the on-screen keyboard and enter the value via the keyboard.
3	>>GRUNDOLOG III<< button	Opens the "GRUNDOLOG III" subroutine (chapter 6.2.9, page 179).
4	>>System<< button	Terminates the machine visualisation and displays the Windows interface. **Info!** This button is only visible if you are logged in to the system with a valid log number. The log number is changed daily. Contact your TRACTO-TECHNIK customer service (chapter 8, page 279) to obtain the latest log number.
5	>>Programme update<< button	Installs a programme update from a connected USB stick. **Info!** This button is only visible if you are logged in to the system with a valid log number. The log number is changed daily. Contact your TRACTO-TECHNIK customer service (chapter 8, page 279) to obtain the latest log number.

Item	Operating element	Function
6	>>Display bore data<< button	Displays the bore data in accordance with GW321 in the measuring values protocol (chapter 6.2.10, page 189).
7	>>Operating data<< button	Stores the operating data (e.g. log book, operating parameters) to a connected USB stick. **Info!** This button is only visible if you are logged in to the system with a valid log number. The log number is changed daily. Contact your TRACTO-TECHNIK customer service (chapter 8, page 279) to obtain the latest log number.
8	>>Store bore data<< button	Saves the bore data (all BDA, PDF and DAT files) to a connected USB stick.
9	>>VPN connection on/off<< button	establishes and terminates a VPN connection for remote maintenance
10	>>Error log book<< button	Opens the "Error log book" screen (chapter 6.2.8.18, page 171).
11	>>IP address<< button	reads and displays the dynamically assigned IP address
12	>>Remote access<< button	Shares the panel PC screen with the TRACTO-TECHNIK customer service for remote maintenance.
13	>>Read in operating parameters<< button	Transmits the operating parameters from the panel PC to the control unit and stores them there. **Info!** This button is only visible if you are logged in to the system with a valid log number. The log number is changed daily. Contact your TRACTO-TECHNIK customer service (chapter 8, page 279) to obtain the latest log number.
14	>>Read out operating parameters<< button	Reads out the operating parameters stored in the control unit, transmits them to the panel PC and stores them there. **Info!** This button is only visible if you are logged in to the system with a valid log number. The log number is changed daily. Contact your TRACTO-TECHNIK customer service (chapter 8, page 279) to obtain the latest log number.
15	>>Service log book<< button	Opens the "Service log book" screen (chapter 6.2.8.17, page 170). The service log book contains a documentation of the service work carried out on the machine.
16	Bore parameters/value	Indicates the current values of the respective bore parameters. To change a value, tap the respective input field in the "Values" column. Increase or decrease the value by using the on-screen keyboard or the >>+<< and >>-<< buttons.

Info!
If you are not logged in, you can only use the buttons 3, 6, 8, 9, 10, 11, 12 and 15.

To change a parameter, tap the respective input field in the "Values" column. Increase or decrease the value by using the on-screen keyboard or the >>+<< and >>-<< buttons.
The following bore parameters can be selected:

Tab. 6-13 Bore parameters – values[*)]

Line	Bore parameters
Line 0	High / reduced torque during screwing
Line 1	Auto-bore with/without rod lubrication
Line 2	Manual operation / emergency mode activated
Line 3	Limit driving path thrust / do not limit driving path thrust (wire-controlled drilling)
Line 4	German / English / special language
Line 5	Distance of rod cleaner cm Semi-automatic mode: Switch-off time of rod cleaner
Line 6	Switch-on time of the rod cleaner in s
Line 7	Adjustable angle in the paddle section
Line 8	Actuation of the clockwise rotation in paddle mode
Line 9	Actuation of the counter-clockwise rotation in paddle mode
Line 10	Switching from metric to imperial units
Line 11-13	Indications for TRACTO-TECHNIK service personnel only.
*) the bore parameters displayed depend on the selected rod	

6.2.8.6 "Service" screen

This screen appears if you press the >>Service<< button on the right joystick panel.

Info!
The "Service" screen allows you to open further screens. These are intended for checking the system status or changing the system parameters. During normal drilling operation, these screens are not required. Due to limited space, not all but only a few screens serving as examples will be presented in the following chapters.
If necessary, contact the TRACTO-TECHNIK customer service (chapter 8, page 279).

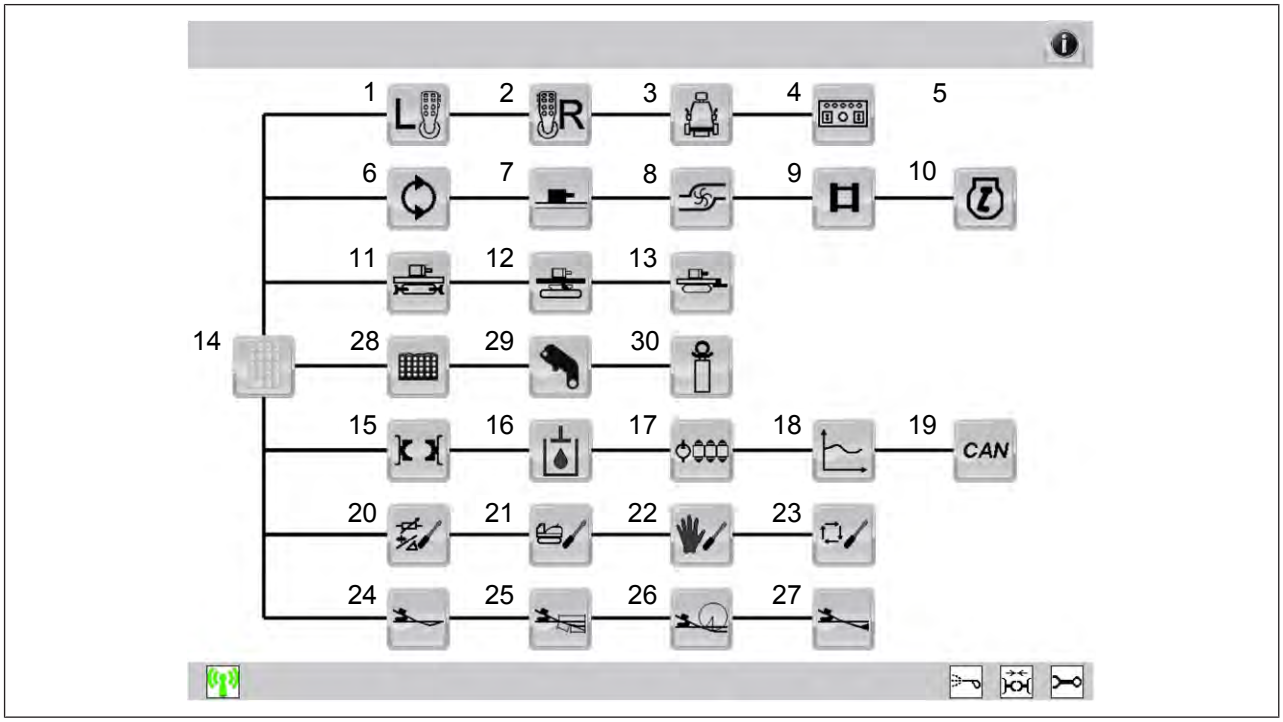


Fig. 6-14 "Service" screen

Tab. 6-14 Indicators and operating elements of the "Service" screen

Item	Operating element	Function
1	Joystick left	Opens a screen for a function check of the left joystick. Actuate an operating element on the left joystick to check for its function. If it is functioning properly, the respective LED indicator will be illuminated in green.
2	Joystick right	Opens a screen for a function check of the right joystick. Actuate an operating element on the right joystick to check for its function. If it is functioning properly, the respective LED indicator will be illuminated in green.
3	Operator seat	Opens a screen for a function check of the operator seat. Actuate an operating element on the operator seat to check for its function. If it is functioning properly, the respective LED indicator will be illuminated in green.
4	Remote control	Opens a screen for a function check of the remote control. Actuate an operating element on the operator seat to check for its function. If it is functioning properly, the respective LED indicator will be illuminated in green.

Item	Operating element	Function
5	Wireless drive/pit remote control (not depicted in the figure)	Opens a screen for a function check of the wireless drive/pit remote control. Actuate an operating element on the wireless drive/pit remote control to check for its function. If it is functioning properly, the respective LED indicator will be illuminated in green. **Info!** This button is only visible if the wireless drive remote control and/or wireless pit remote control is connected!
6	Rotation	Opens the "Rotation" screen (chapter 6.2.8.8, page 154).
7	Thrust	Opens a screen for a function check of the thrust.
8	Drilling fluid pump	Opens a screen for a function check of the drilling fluid pump.
9	Tracks	Opens a screen for a function check of the tracks.
10	Diesel engine	Opens a screen for a function check of the diesel engine.
11	Stabilisers	Opens a screen for a function check of the stabilisers.
12	Rig boom	Opens a screen for a function check of the rig boom.
13	Anchor plate	Opens a screen for a function check of the anchor plate.
14	Log number entry	Opens a screen for entering the log number. Without a valid log number only the digital conditions of the inputs and outputs will be visualised. Settings can only be made after a valid log number has been entered. **Info!** The buttons 21, 22, 23 are not available until you have logged in to the system with a valid log number. The log number is changed daily. Contact your TRACTO-TECHNIK customer service (chapter 8, page 279) to obtain the latest log number.
15	Clamping	Opens a screen for a function check of the clamping devices.
16	Hydraulic system	Opens a screen for a function check of the hydraulic system.
17	Auxiliary functions	Opens a screen for a function check of the auxiliary functions (chapter 6.2.8.7, page 153).
18	Valve check	Opens a screen for a function check of the valves.
19	CAN bus	Opens a screen for a function check of the CAN bus.
20	Sensor configuration	Opens a screen for configuring the sensors (chapter 6.2.8.19, page 172).
21	Operating parameters	Opens a screen for setting the general machine parameters.
22	Manual parameters	Opens a screen for setting the parameters for manual drilling operation.
23	Automatic parameters	Opens a screen for setting the parameters for automatic drilling operation.
24	Calculation bore length	Opens the screen for the calculation of the approximate bore length (chapter 6.2.8.11, page 160).
25	Calculation set-back length	Opens the screen for the calculation of the set-back (chapter 6.2.8.12, page 162).
26	Calculation bending radius	Opens the screen for the calculation of the bending radius (chapter 6.2.8.13, page 164).
27	Calculation expander parameters	Opens the screen for the calculation of the required fluid quantity and the expansion speed (chapter 6.2.8.14, page 165).

Item	Operating element	Function
28	Magazine	Opens a screen for a function check of the magazine.
29	Swivel arm (rod gripper)	Opens a screen for a function check of the swivel arm.
30	Lifting cylinder (magazine)	Opens a screen for a function check of the lifting cylinders.

6.2.8.7 "Service – Auxiliary functions" screen

Info!
Buttons and flip switches for changing parameters in this screen are only visible if you are logged in to the system with a log number valid for that day. Without a log number, only icons and values will be displayed and you cannot make any changes.
Contact your TRACTO-TECHNIK customer service (chapter 8, page 279) to obtain the latest log number.

This screen is displayed if you tap the >>Auxiliary functions<< button (16) in the "Service" screen (chapter 6.2.8.6, page 150).

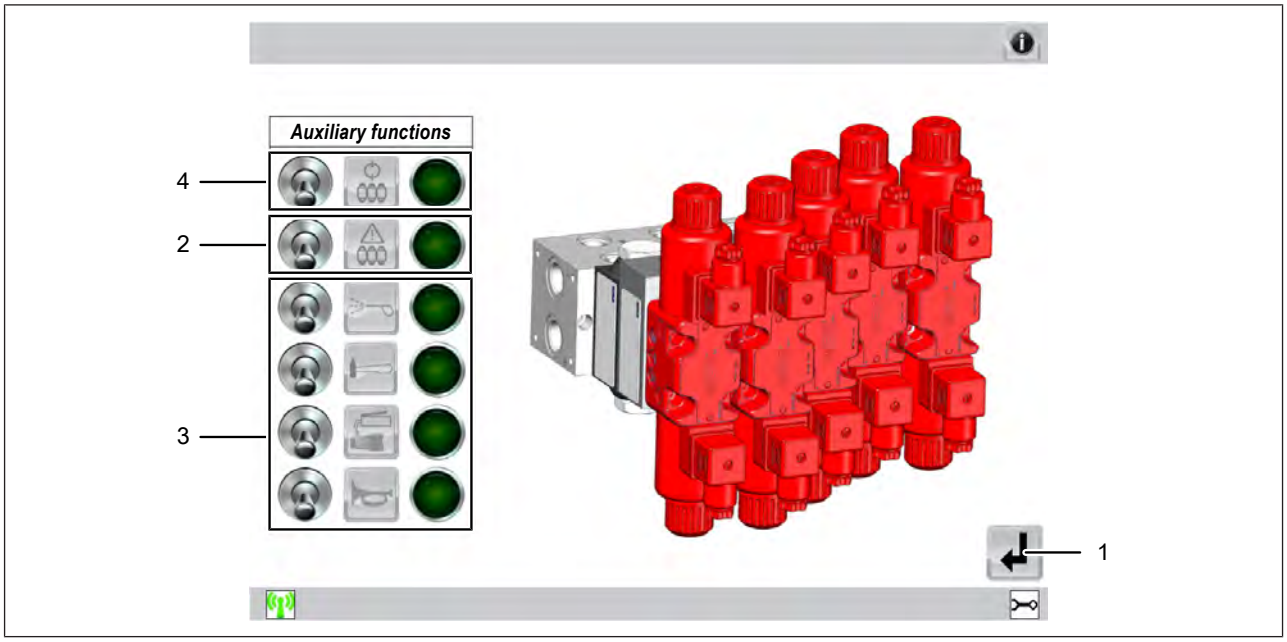


Fig. 6-15 "Auxiliary functions" screen

Tab. 6-15 Indicators and operating elements of the "Auxiliary functions" screen

Item	Operating element	Function
1	>>Back<< button	Returns you to the previous screen.
2	Setting of safety-relevant auxiliary functions	Tap the flip switch to activate the option of setting the safety-related auxiliary functions. The status indicator is illuminated if the setting option is activated. Tap the flip switch again to block the function.
3	Setting of other auxiliary functions	Tap the flip switch to activate the option of setting the other auxiliary functions. The status indicator is illuminated if the setting option is activated. Tap the flip switch again to block the function.
4	Setting of non-safety-relevant auxiliary functions	Tap the flip switch to activate the option of setting the non-safety-relevant auxiliary functions. The status indicator is illuminated if the setting option is activated. Tap the flip switch again to block the function.

6.2.8.8 "Service – Rotation" screen

The "Rotation" screen is displayed if you tap button 6 >>Rotation<< in the "Service" screen (chapter 6.2.8.6, page 150).
In the "Rotation" screen you can set the indicated functions manually.

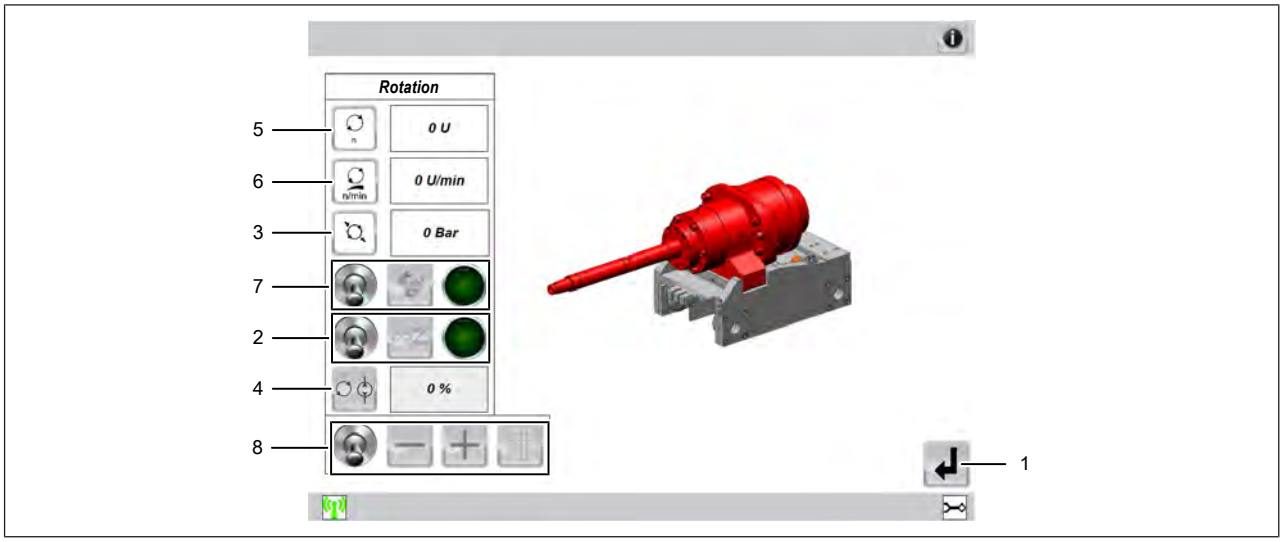


Fig. 6-16 "Rotation" screen

Info!
Buttons and flip switches for changing parameters in this screen are only visible if you are logged in to the system with a log number valid for that day. Without a log number, only icons and values will be displayed and you cannot make any changes.
Contact your TRACTO-TECHNIK customer service (chapter 8, page 279) to obtain the latest log number.

Tab. 6-16 Indicators and operating elements of the "Rotation" screen

Item	Operating element	Function
1	>>Back<< button	Returns you to the previous screen.
2	Release rotation (safety valve)	Releases the rotation pump (safety valve). The status indicator is illuminated in green if the release is activated.
3	Rotation pump pressure	Indicates the pressure of the rotation pump (in bar).
4	Rotation actuation	Indicates the actuation of the rotation pump.
5	Rod revolutions	Indicates the number of the revolutions of the rod.
6	Rod rpm	Indicates the rotational speed of the rod (in rpm).
7	Fast rotation mode (safety valve)	Indicates the position of the rotation valve. The status indicator is illuminated in green if the fast rotation mode is activated.

Item	Operating element	Function
8	>>Enable<< / >>+<< / >>-<< buttons/ >>on-screen keyboard<<	Use the >>+<< and >>-<< buttons to increase or decrease a value. The changed value is adopted immediately. Alternatively, you can press the button for the on-screen keyboard and enter the value via the keyboard.

6.2.8.9 "Service – Thrust" screen (fully automatic mode)

The "Thrust" screen is displayed if you tap button 7 >>Thrust<< in the "Service" screen (chapter 6.2.8.6, page 150).

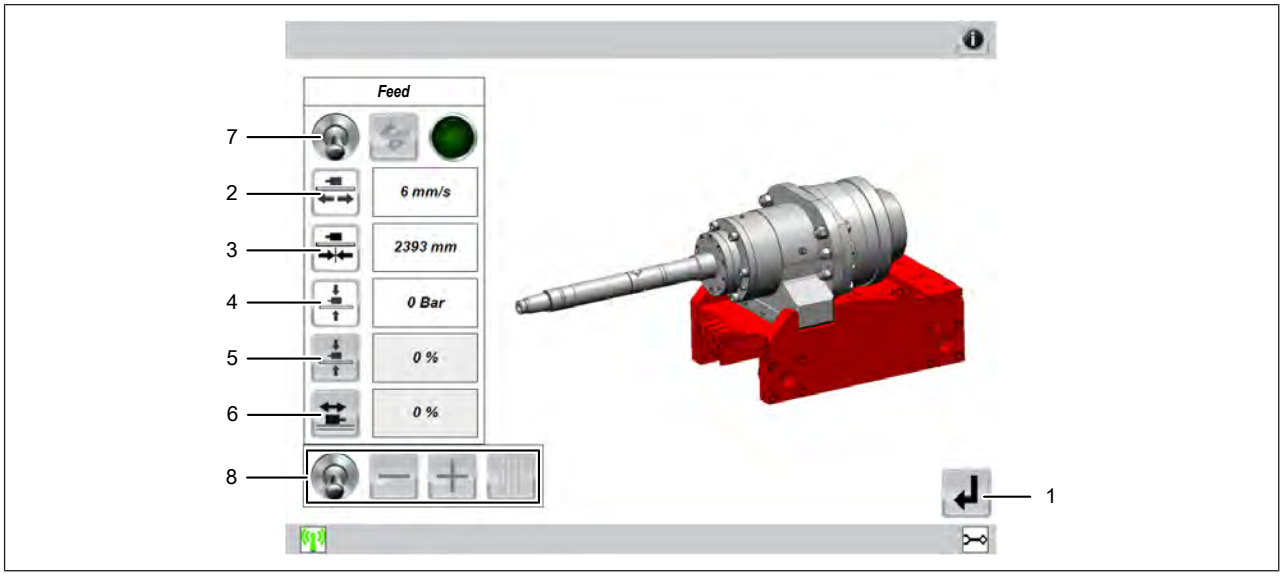


Fig. 6-17 "Thrust" screen

Info!
Buttons and flip switches for changing parameters in this screen are only visible if you are logged in to the system with a log number valid for that day. Without a log number, only icons and values will be displayed and you cannot make any changes.
Contact your TRACTO-TECHNIK customer service (chapter 8, page 279) to obtain the latest log number.

Tab. 6-17 Indicators and operating elements of the "Thrust" screen

Item	Operating element	Function
1	>>Back<< button	Returns you to the previous screen.
2	Thrust speed	Indicates the current thrust speed (in mm/s).
3	Bore drive position	Indicates the current position of the bore drive (in mm).
4	Thrust pressure of bore drive	Indicates the current thrust pressure of the bore drive (in bar).
5	>>Thrust pressure of bore drive<< button	Indicates the current actuation of the valve for pressure limitation of the thrust (in %).
6	>>Thrust speed of bore drive<< button	Indicates the current actuation of the valve for the thrust speed (in %).
7	Thrust step	Indicates the position of the thrust valve. The status indicator is illuminated if the fast thrust step is activated.

Item	Operating element	Function
8	>>Enable<< / >>+<< / >>-<< buttons/ >>on-screen keyboard<<	Use the >>+<< and >>-<< buttons to increase or decrease a value. The changed value is adopted immediately. Alternatively, you can press the button for the on-screen keyboard and enter the value via the keyboard.

6.2.8.10 "Service – Thrust" screen (semi-automatic mode)

The "Thrust" screen is displayed if you tap the >>Thrust<< button in the "Service" screen (chapter 6.2.8.6, page 150).

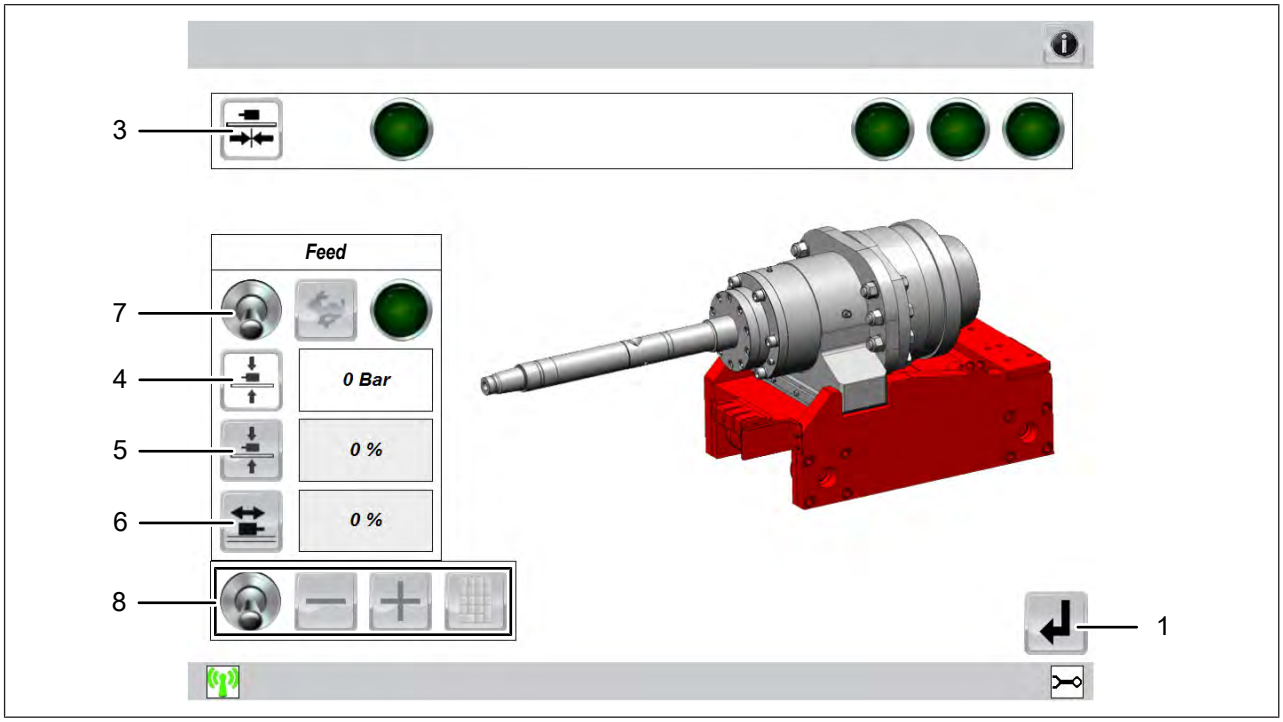


Fig. 6-18 "Thrust" screen (semi-automatic mode)

Info!
Buttons and flip switches for changing parameters in this screen are only visible if you are logged in to the system with a log number valid for that day. Without a log number, only icons and values will be displayed and you cannot make any changes.
Contact your TRACTO-TECHNIK customer service (chapter 8, page 279) to obtain the latest log number.

Tab. 6-18 Indicators and operating elements of the "Thrust" screen (semi-automatic mode)

Item	Operating element	Function
1	>>Back<< button	Returns you to the previous screen.
3	Position indicators thrust rig	Are illuminated when the thrust rig is in the respective position. from left to right: – front position – rod break-away position – switch-off for the rod arm – end position
4	Thrust pressure of bore drive	Indicates the current thrust pressure of the bore drive (in bar).
5	>>Thrust pressure of bore drive<< button	Indicates the current actuation of the valve for pressure limitation of the thrust.
6	>>Thrust speed of bore drive<< button	Indicates the current actuation of the valve for the thrust speed (in %).

Item	Operating element	Function
7	>>Enable thrust speed<< button	Enables the fast thrust speed. The status indicator indicates the actuation of the thrust valve.
8	>>Enable<< / >>+<< / >>-<< buttons/ >>on-screen keyboard<<	Use the >>+<< and >>-<< buttons to increase or decrease a value. The changed value is adopted immediately. Alternatively, you can press the button for the on-screen keyboard and enter the value via the keyboard.

6.2.8.11 "Service – Determining approx. bore length" screen

This screen is displayed if you tap the >>Calculation bore length<< button (24) in the "Service" screen.

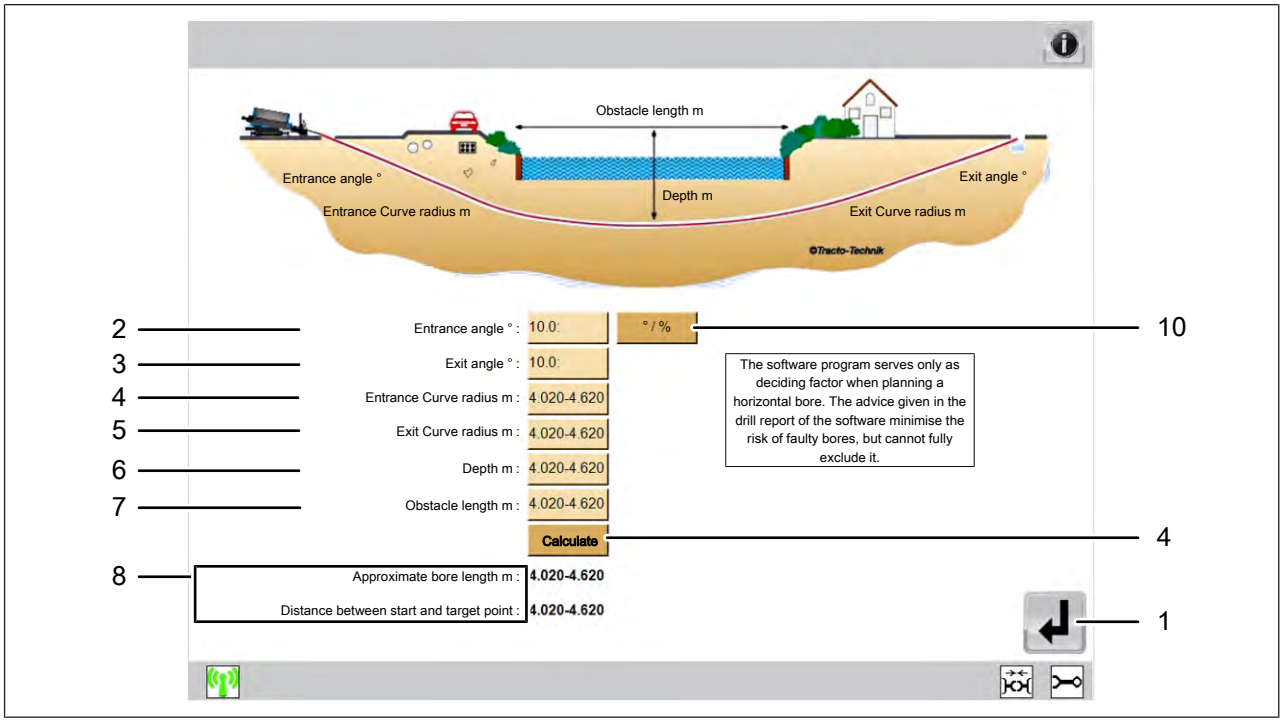


Fig. 6-19 "Determining appr. bore length" screen

Tab. 6-19 Indicators and operating elements of the "Determining approx. bore length" screen

Item	Operating element	Function
1	>>Back<< button	Returns you to the previous screen.
2	Entrance angle	Input field for the desired entrance angle of the bore (in °) The entrance angle is the angle in the starting pit at which the drill rod penetrates into the ground, angle between drill rod and ground surface.
3	Exit angle	Input field for the desired exit angle of the bore (in °) The exit angle is the angle in the target pit at which the drill rod exits from the ground, angle between drill rod and ground surface.
4	Curve radius	Input field for the curve radius in m upon entrance of the drill rod The minimum bending radius is specified by the drill rod manufacturer or product pipe manufacturer. Choose a higher value than indicated to prevent straining the rod or the product pipe too strongly.
5	Curve radius	Input field for the curve radius in m upon exit of the drill rod (see also input field 4)
6	Reference depth	Input field for the desired bore depth in m
7	Obstacle length	Input field for the distance (in m) which is to be bored in a straight line to avoid the obstacle
8	Bore length	Display of the calculated bore length and the distance between start and target point in m

Item	Operating element	Function
9	>>Calculate<< button	Tap this button to carry out calculations of the bore length and the distance between starting and target point on the basis of the previously defined inputs.
10	>>°/%<< button	Tap this button to switch over between degrees and percentage when entering the values for the entrance and exit angle.

6.2.8.12 "Service – Calculation of set-back length" screen

This screen is displayed if you tap the >>Calculation set-back length<< button (25) in the "Service" screen (chapter 6.2.8.6, page 150).

In this screen the value is calculated by which the machine is to be set back.

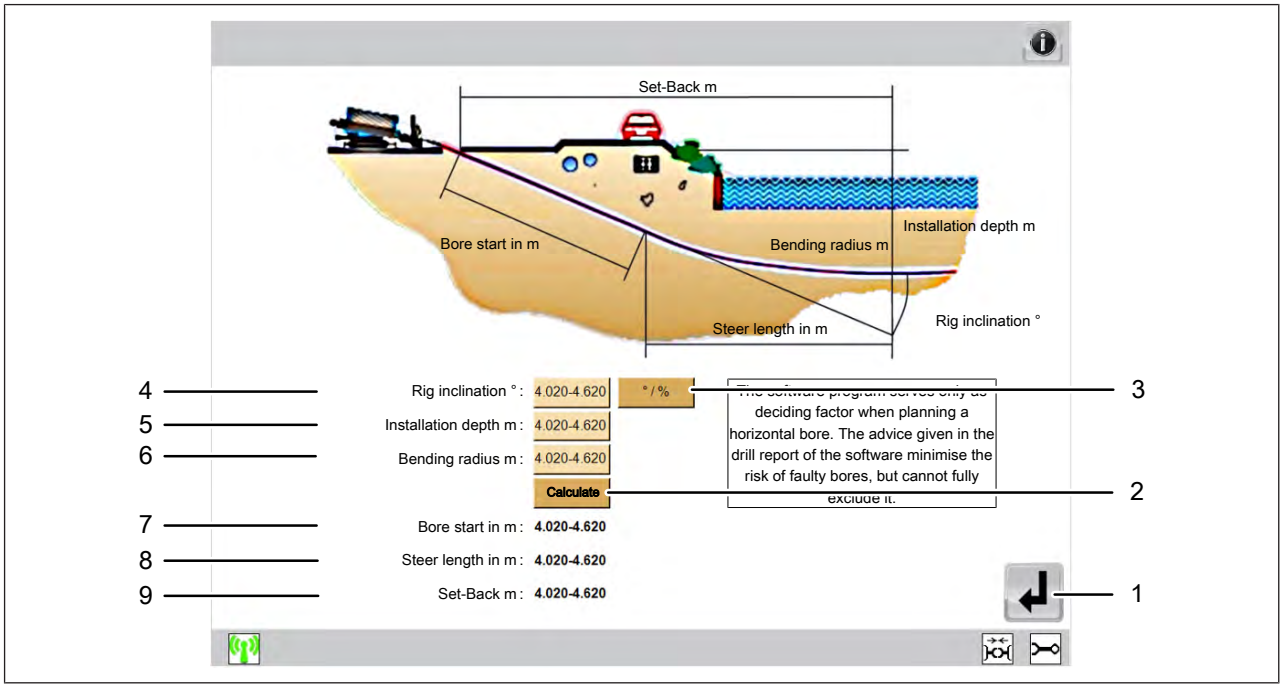


Fig. 6-20 "Calculation of set-back length" screen

Tab. 6-20 Operating elements of the "Calculation of set-back length" screen

Item	Operating element	Function
1	>>Back<< button	Returns you to the previous screen.
2	>>Calculate<< button	Tap this button to calculate the starting point of the bore, the steering length and the set-back value based on the previously defined inputs.
3	>>°/%<< button	Tap this button to switch over between degrees and percentage when entering the values for the rig boom inclination.
4	Rig boom inclination	Input field for the desired entrance angle of the bore (in °) The entrance angle is the angle in the starting pit at which the drill rod penetrates into the ground, angle between drill rod and ground surface.
5	Installation depth	Input field for the desired bore depth in m
6	Bending radius	Input field for the bending radius of the drill rod or the product pipe (in m) The minimum bending radius is specified by the drill rod manufacturer or product pipe manufacturer.
7	Bore start	Display of the length (in m) calculated for the straight bore in the rig boom's inclination angle

Item	Operating element	Function
8	Steer length	Display of the calculated steering length in m The steering length is the distance over which the drill rods have to be brought back from the inclined to horizontal position.
9	Set-back	Display of the calculated set-back length (in m) The set-back length is the length by which the machine has to be set back to prevent falling below the min. permissible bending radius of the bore path.

6.2.8.13 "Service – Bending radius conversion" screen

This screen is displayed if you tap the >>Calculation bending radius<< button (26) in the "Service" screen.

In this screen you can calculate how many degrees per meter rod are necessary to move the rod into horizontal position whilst observing the entered minimum bending radius.

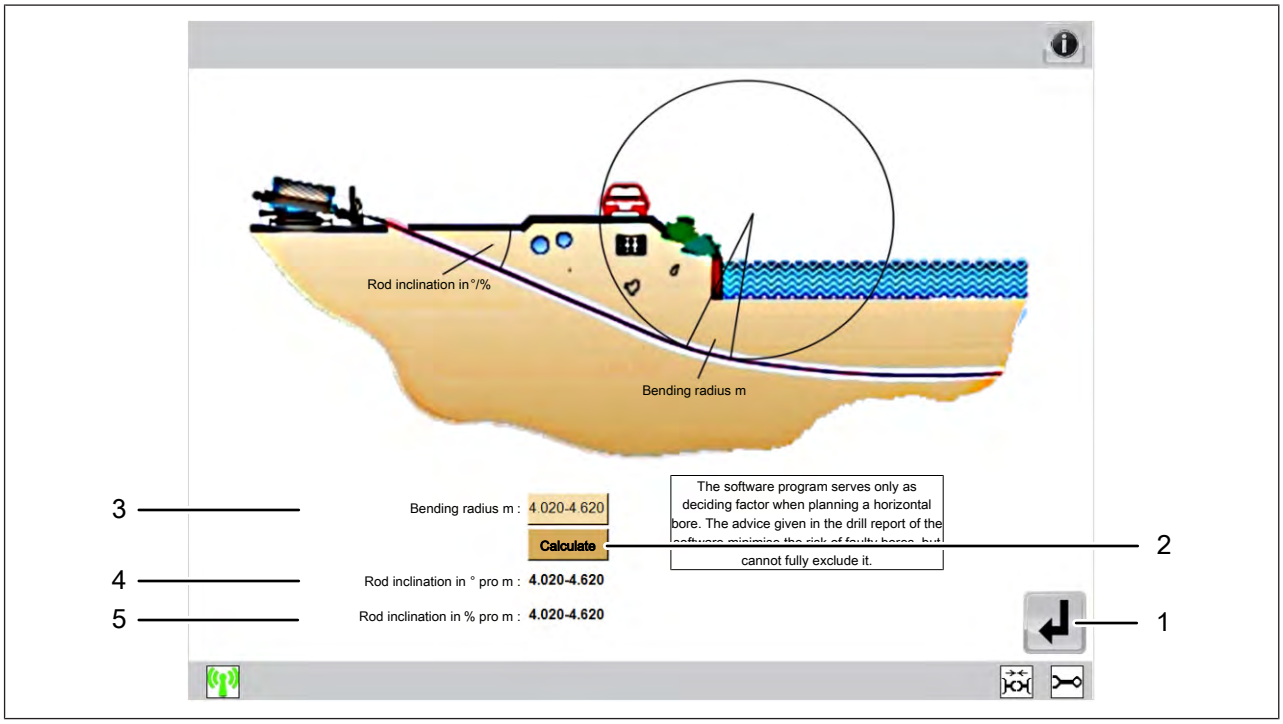


Fig. 6-21 "Bending radius conversion" screen

Tab. 6-21 Indicators and operating elements of the "Bending radius conversion" screen

Item	Operating element	Function
1	>>Back<< button	Returns you to the previous screen.
2	>>Calculate<< button	Tap this button to calculate the rod inclination on the basis of the previously defined inputs.
3	Bending radius	Input field for the bending radius of the drill rod or the product pipe (in m) The minimum bending radius is specified by the drill rod manufacturer or product pipe manufacturer. Choose a higher value than indicated to prevent straining the drill rod or the product pipe too strongly.
4	Rod inclination	Display of the calculated inclination angle (in °/m drill rod) required to reach the horizontal position
5	Rod inclination	Display of the calculated inclination angle (in %/m drill rod) required to reach the horizontal position

6.2.8.14 "Service – Calculation of expander parameters" screen

This screen is displayed if you tap the >>Calculation expander parameters<< button (27) in the "Service" screen (chapter 6.2.8.6, page 150).

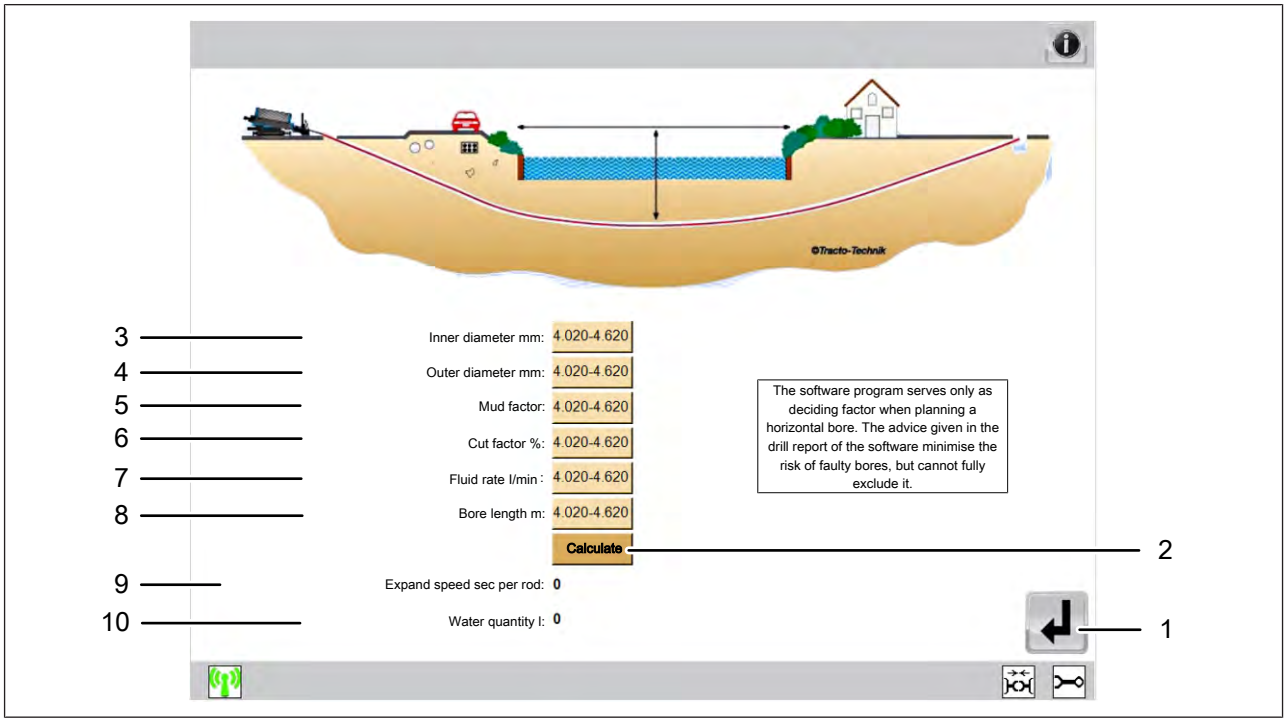


Fig. 6-22 "Calculation of expander parameters" screen

Tab. 6-22 Indicators and operating elements of the "Calculation of expander parameters" screen

Item	Operating element	Function
1	>>Back<< button	Returns you to the previous screen.
2	>>Calculate<< button	Tap this button to calculate the rod inclination on the basis of the previously defined inputs.
3	Inner diameter	Input field for the previous bore diameter (in mm)
4	Outer diameter	Input field for the currently intended outer diameter (in mm)
5	Mud factor	Factor or ratio between drilling fluid and drilling debris required to transport the debris out of the bore hole
6	Cut factor	Input field for the factor (in %) of the amount of earth cut by the expander head The remaining soil is displaced.
7	Flow rate	Input field for the desired flow rate of the drilling fluid pump (in l/min)
8	Bore length	Input field for the bore length (in m)
9	Expand speed	Display of the calculated pull-in speed (in s/rod)
10	Water quantity	Display of the required water quantity (in l)

6.2.8.15 "Settings for tensile force measurement" screen

This screen is displayed if you tap the >>Tensile force measurement settings<< button in the "Bore mode" screen (chapter 6.2.8.3, page 142).
Marking the line with the corresponding pipe diameter results in the maximum tensile force which is not to be exceeded during pipe installation. If the maximum tensile force is not adopted from the table, it can be entered manually using a numeric keypad by pressing the button beside the maximum tensile force indication.

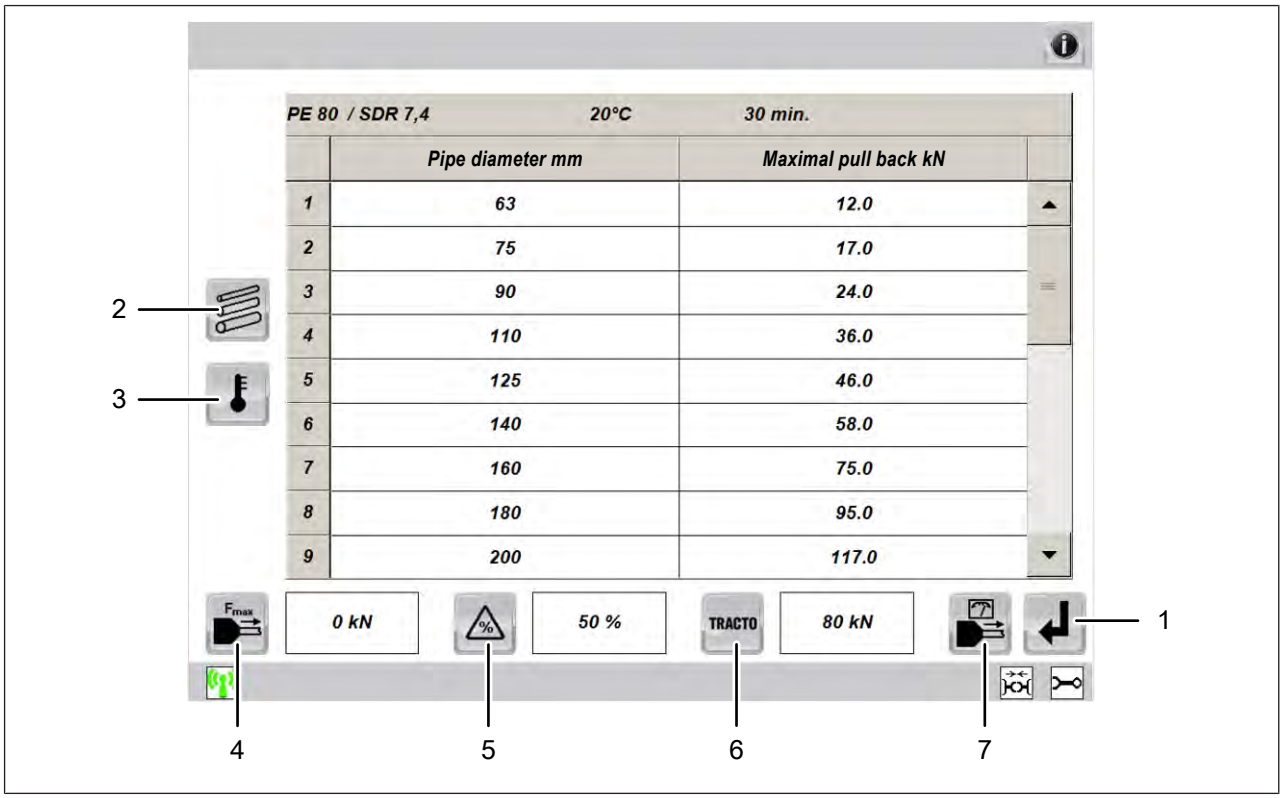


Fig. 6-23 "Tensile force measurement settings" screen

Tab. 6-23 Indicators and operating elements of the "Tensile force measurement settings" screen

Item	Operating element	Function
1	>>Back<< button	Returns you to the previous screen.
2	>>Select<< button	Selection from among the pipe types PE 80 SDR 7.4 / PE 80 SDR 11 / PE 100 SDR 11 and PE 100 SDR 17 SDR 17.6
3	>>Temperature<< button	Specification of the maximum tensile force for the ambient temperatures of 20 °C and 40 °C
4	>>Maximum tensile force<< button	Specification of the maximum tensile force for the selected pipe diameter
5	>>Percentage<< button	Stipulation of a warning range If the tensile force exceeds a percentage limit of the maximum tensile force, the operator is warned by way of an error message and a changing background colour of the tensile force indication. The background colour changes from green to yellow. Pulling the pipe with too much force would cause the background colour to change from yellow to red.

Item	Operating element	Function
6	>>Tensile force measuring body<< button	Switch-over between a measuring body of 80 kN, 150 kN and 400 kN
7	>>Measure<< button	Starts the tensile force measurement. Do not start a tensile force measurement before having entered the parameters.

6.2.8.16 Service interval display

Upon start-up of the machine, the following message will be displayed 50 hours before service is due:

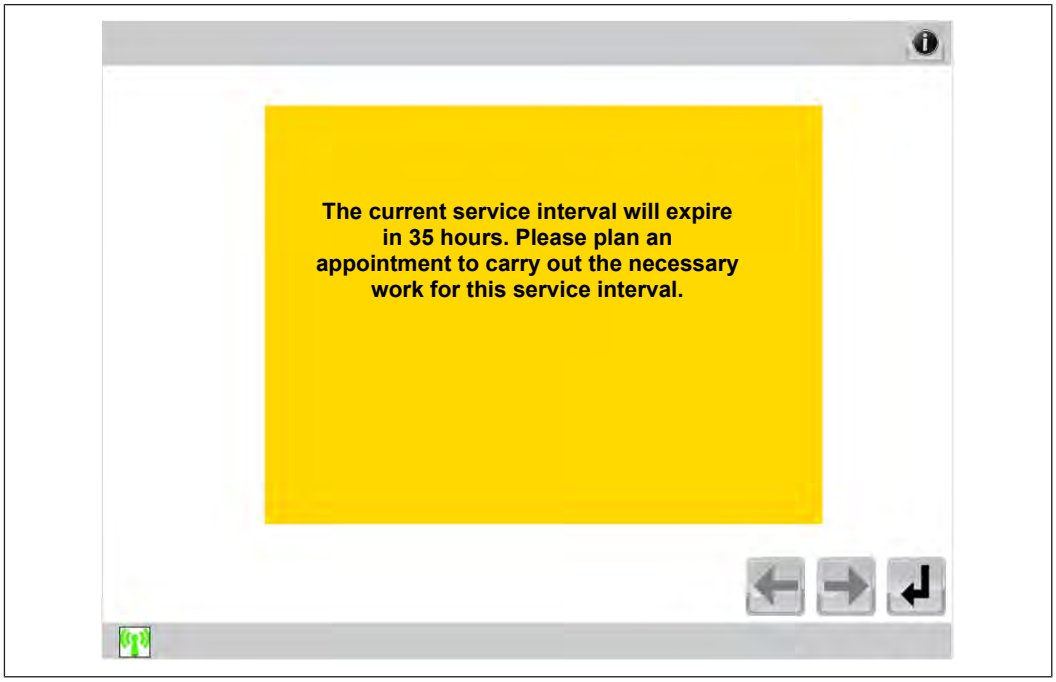


Fig. 6-24 Indication of service interval

After exceeding the service time, a warning will be displayed upon start-up of the machine:



Fig. 6-25 Service interval expired

Service is required once a defined number of operating hours has been exceeded. The number of operating hours can be set by the TRACTO-TECHNIK customer service, by an authorized dealer as well as by the operator himself. To adjust the service interval, first enter a five-digit service number. You can obtain it from your TRACTO-TECHNIK service.

1. Open the "Machine parameters" screen by tapping button 21 >>Operating parameters<< in the "Service" screen (chapter 6.2.8.6, page 150).
2. Select the parameter for the service interval in line 16 of the "Machine parameters" screen and press the plus button.

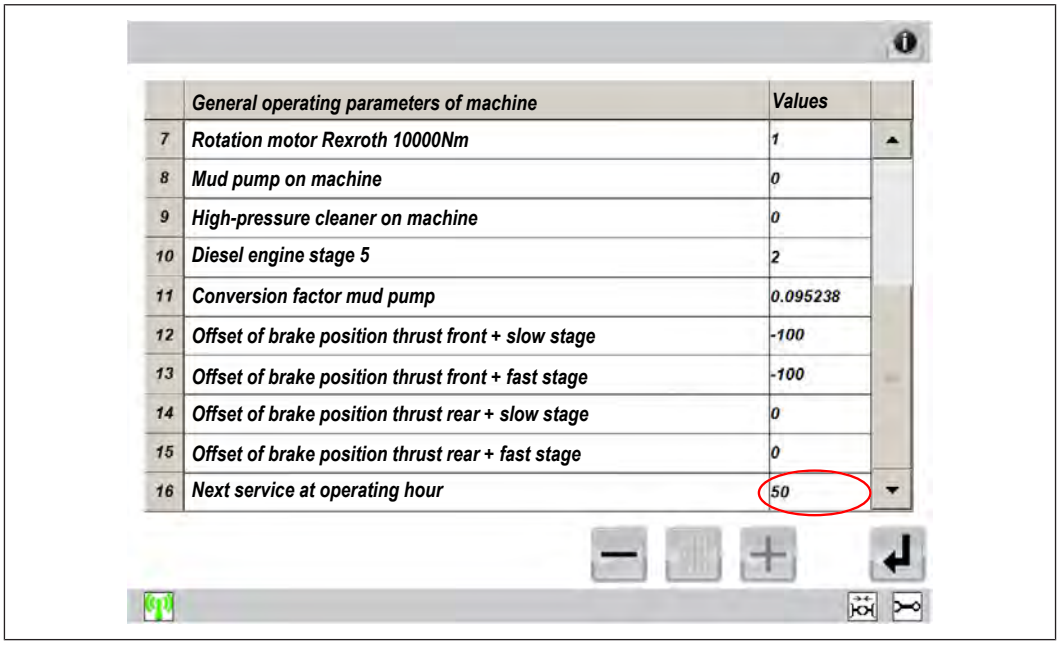


Fig. 6-26 "Machine parameters" screen

⇨ A window is displayed where you can enter the service number.

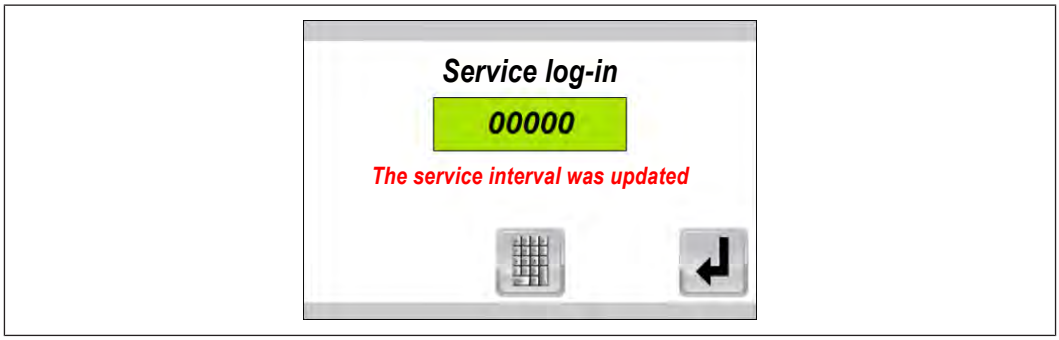


Fig. 6-27 Entry of the service number

3. Enter the service number assigned to you.
4. Enter the service interval.
   ⇨ The value is transferred to the service log book (chapter 6.2.8.17, page 170).

6.2.8.17 "Service log book" screen

The "Service log book" screen is displayed if you tap the >>Service log book<< button in the "Bore parameter settings" screen (chapter 6.2.8.5, page 147).

The service log book serves to enter the date, time and operating hours. Furthermore you can see who has carried out the last inspection.

The most recent entries are displayed first.

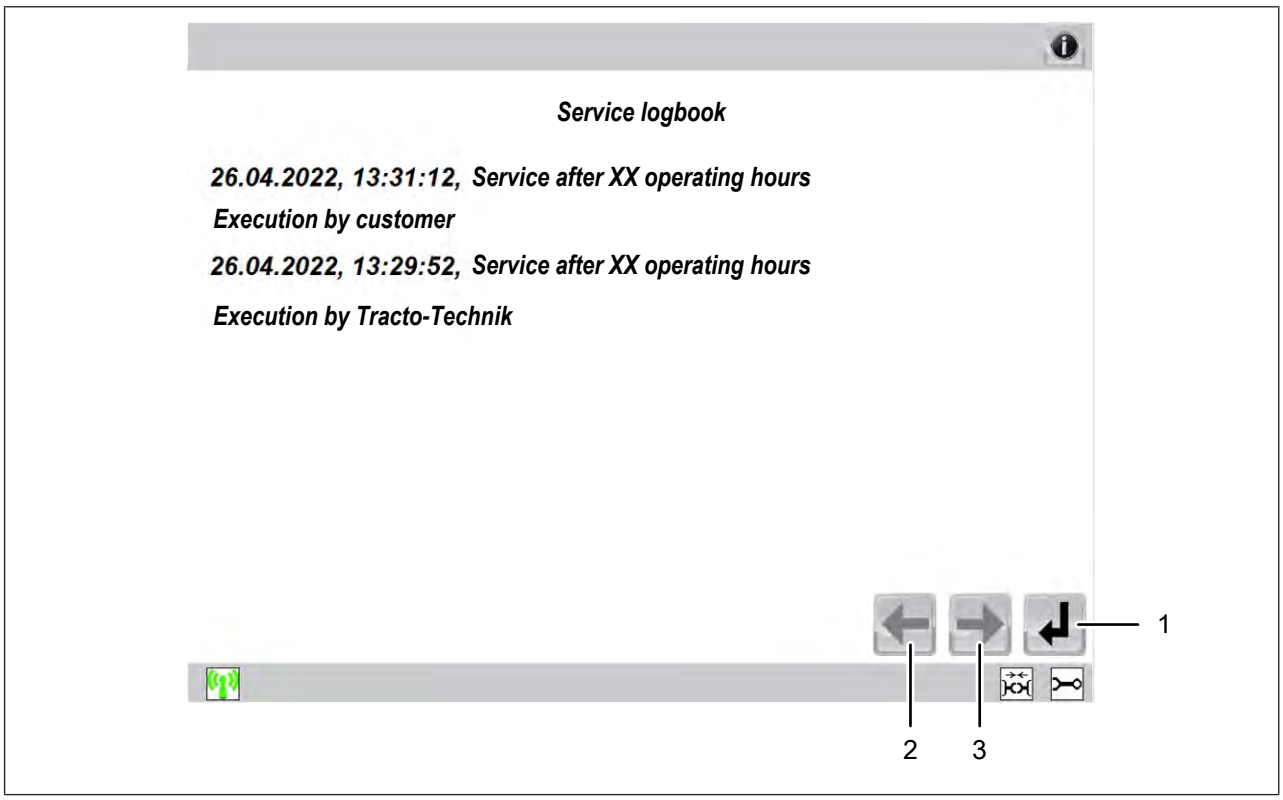


Fig. 6-28 "Service log book" screen

Tab. 6-24 Indicators and operating elements of the "Service log book" screen

Item	Operating element	Function
1	>>Back<< button	Returns you to the previous screen.
2	>>Previous<< button	Moves back to the previous page of the screen.
3	>>Next<< button	Moves forward to the next page of the screen.

6.2.8.18 "Error log book" screen

The "Error log book" screen is displayed if you tap the >>Error log book<< button in the "Bore parameter settings" screen (chapter 6.2.8.5, page 147).

Each log book entry contains the date and time at which the incident has occurred, the error group, the error number and a short text describing the error message.

The most recent entries are displayed first.

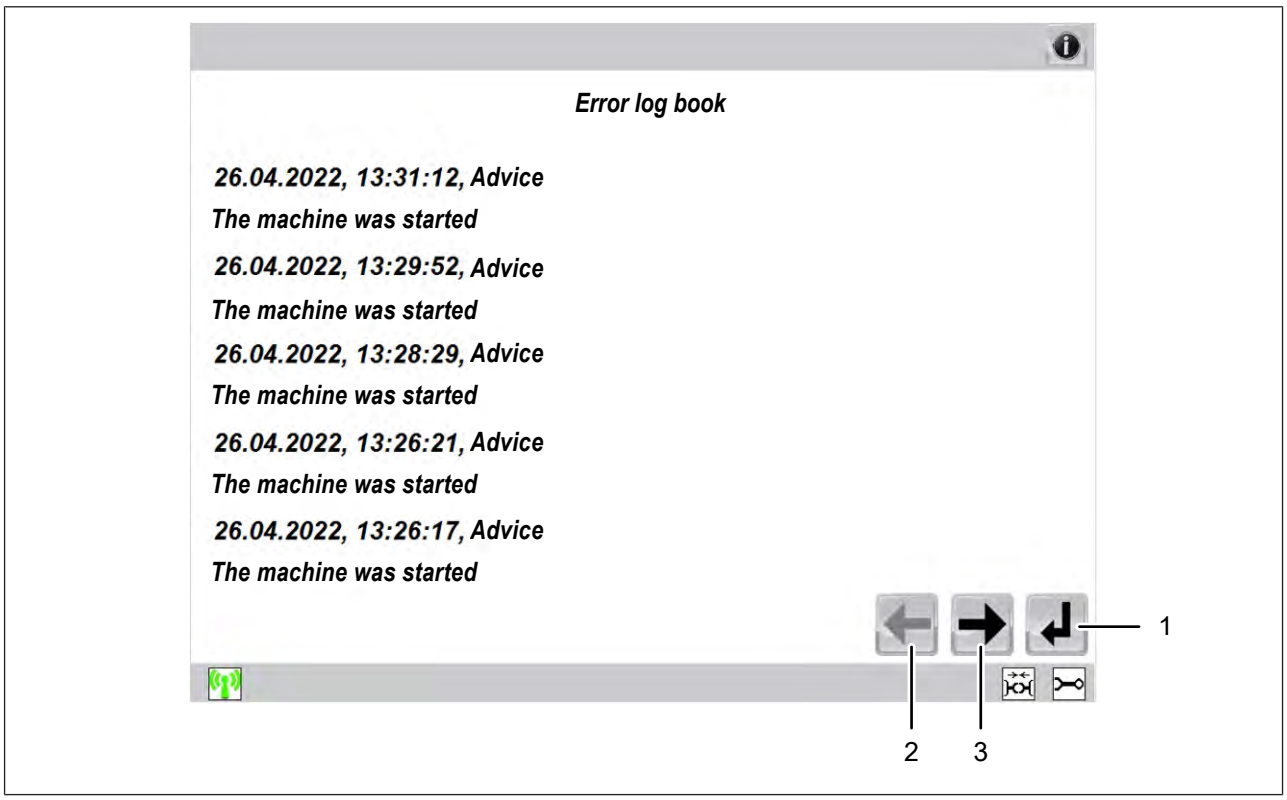


Fig. 6-29 "Error log book" screen

Tab. 6-25 Indicators and operating elements of the "Error log book" screen

Item	Operating element	Function
1	>>Back<< button	Returns you to the previous screen.
2	>>Previous<< button	Moves back to the previous page of the screen.
3	>>Next<< button	Moves forward to the next page of the screen.

6.2.8.19 "Sensor configuration" screen

The "Sensor configuration" screen is displayed if you tap button 20 >>Sensor configuration<< in the "Service" screen (chapter 6.2.8.6, page 150).

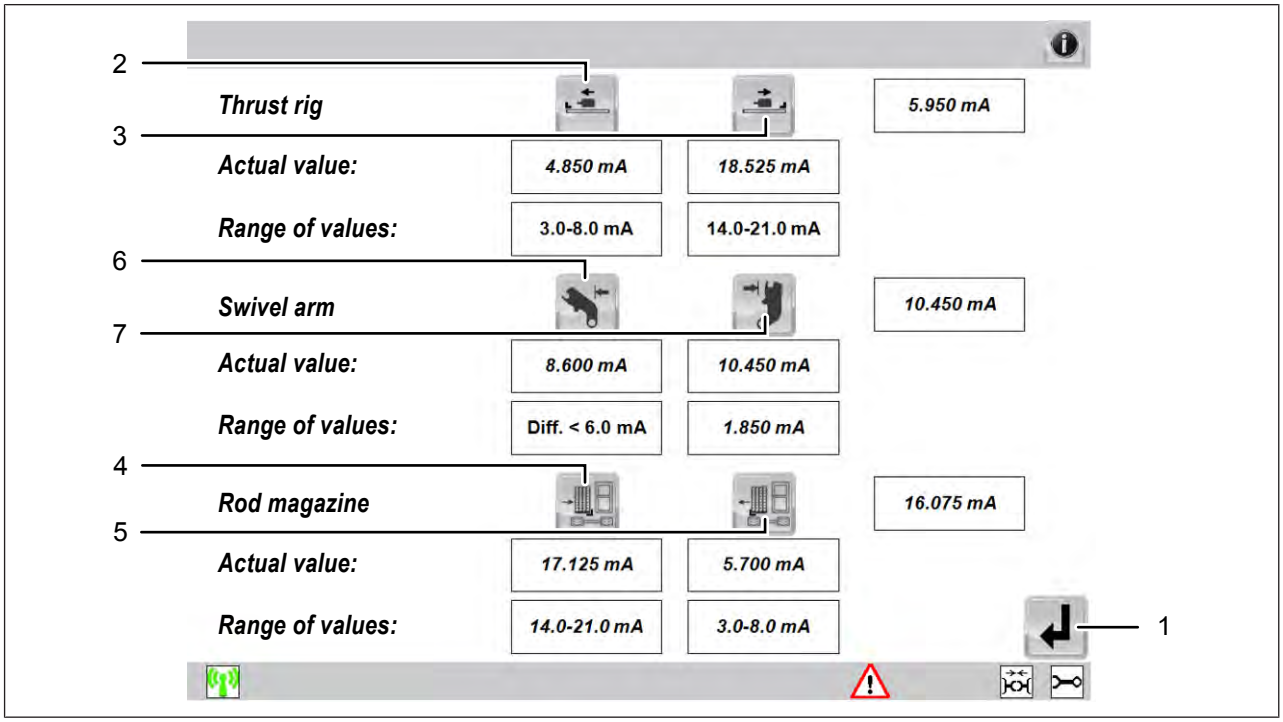


Fig. 6-30 "Sensor configuration" screen

Tab. 6-26 Indicators and operating elements of the "Sensor configuration" screen

Item	Operating element	Function
1	>>Back<< button	Returns you to the previous screen.
2	>>Front stop<< button	Adopts the current value for the thrust rig at the front stop.
3	>>Rear stop<< button	Adopts the current value for the thrust rig at the rear stop.
4	>>Left stop<< button	Adopts the current value for the rod magazine at the left, inner stop.
5	>>Right stop<< button	Adopts the current value for the rod magazine at the right, outer stop.
6	>>Swivel arm in bore axis<< button	Adopts the current value for the swivel arm in the bore axis.
7	>>Swivel arm underneath the bay<< button	Adopts the current value for the swivel arm underneath the bay.

NOTICE

Potential machine damage due to incorrectly set sensors!

- During start-up of the machine, it is necessary that you configure the sensors for the thrust rig, the rod magazine and the swivel arm.
- By opening the "Sensor configuration" screen, emergency mode is activated automatically.
- The functions are controlled by means of the joysticks.

In order to be able to notice a failure of the configured sensors, the stored values must be within a fixed tolerance range. If a stored value deviates from this range, an error message will be displayed. The tolerance ranges of the sensors are indicated below the current sensor values.

Tab. 6-27 Tolerance range of the sensors

thrust sensor:	front: 3.0-8.0 mA	rear: 14.0-20.0 mA
swivel arm:	underneath the bay: 4.0-8.0 mA	in the bore axis: 16.0-20.0 mA
magazine:	inside / bay 1: 3.0-8.0 mA	outside / bay 4, 5: 14.0-21.0 mA

Moreover, the system will check that the currently measured value of the sensors does not fall below or exceed the stored configuration values by a defined value (0.5 mA).

If, for instance, a configuration value of 5.5 mA was stored for the swivel arm underneath the bay, a fault will be displayed if the current measurement exceeds 5.5 mA - 0.5 mA = 5.0 mA.

Press the corresponding button on the display to adopt the value as soon as one of the positions mentioned above has been reached.

NOTICE

Potential machine damage due to incorrectly set sensors!

- The drives moved for configuration are driven against the stoppers. Before storing the individual positions, wait until the axes have been relieved of tension. You can recognize this if the values displayed on the right side of the menu no longer change.
- Having pressed the buttons, complete the configuration process by confirming the query.

To adopt the value, confirm the change of values in the query.
– Tap the >>OK<< button (1) to adopt the value or
– the >>Cancel<< button (2) to prevent adoption of the value.

The query prevents unintentional adjustment of the machine.

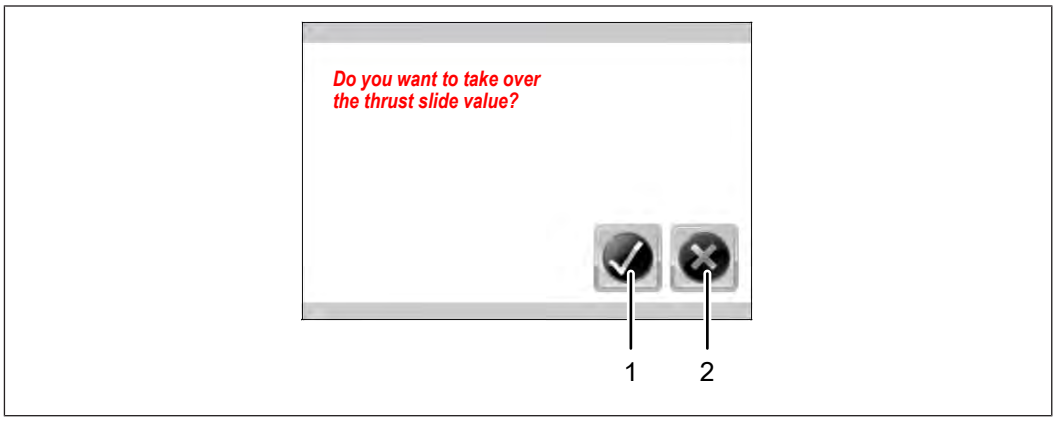


Fig. 6-31 Confirmation query

Described below you will find precise information on the configuration procedure for the sensors of the thrust rig and the rod magazine.

Info!
The thrust rig can only be configured in case of a fully automatic machine.

Thrust rig rear

1. Move the swivel arm underneath the magazine.
2. Open the "Sensor configuration" screen.
3. Move the thrust rig against the rear stop of the rig boom.
4. Save the position by pressing the >>Rear stop<< button (1).
   ⇨ The displayed value should be in the range between 14 mA and 21 mA.

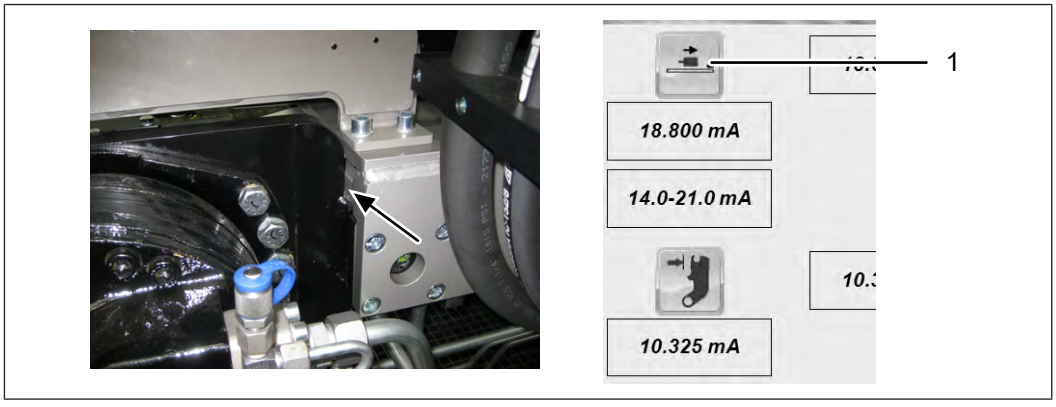


Fig. 6-32 Configuration "Thrust rig rear"

Thrust rig front

1. Move the thrust rig against the front stop of the rig boom.
2. Save the position by pressing the >>Front stop<< button (1).
   ⇨ The displayed value should be in the range between 3.0 mA and 8.0 mA.

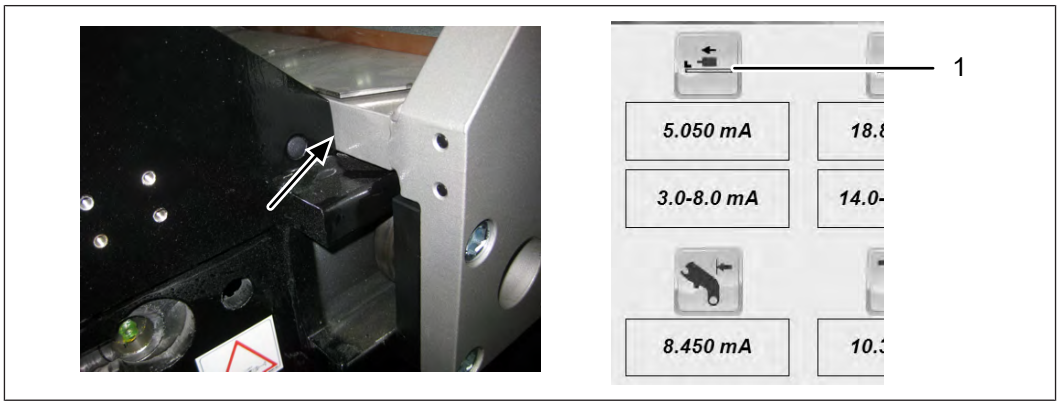


Fig. 6-33 Configuration "Thrust rig front"

Rod magazine (outer) right

1. Move the lifting cylinders into the upper end position.
2. Move the rod magazine all the way to the outer right stop.
3. Save the position by pressing the >>Right stop<< button (1).
   ⇨ The displayed value should be between 7000 and 9500 increments for semi-automatic machines, and between 14.0 mA and 21.0 mA for fully automatic machines.

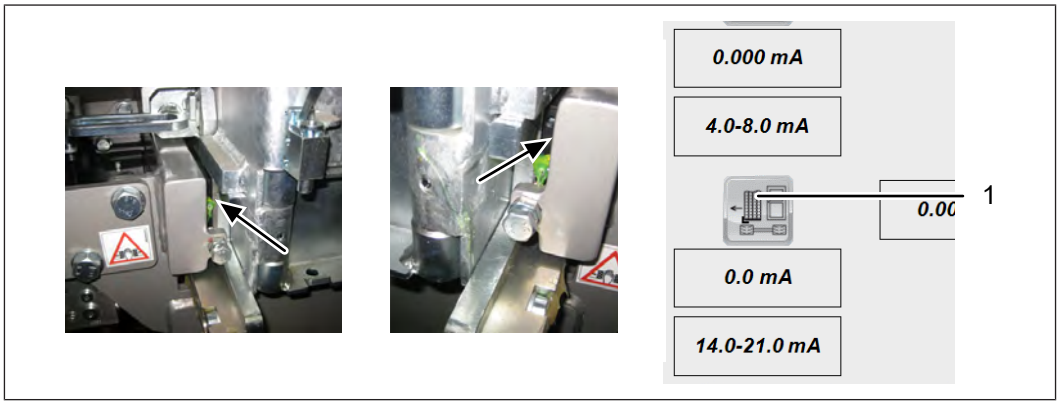


Fig. 6-34 Configuration "Rod magazine (outer) right"

Rod magazine (inner) left

1. Move the rod magazine all the way to the inner left stop.
2. Save the position by pressing the >>Left stop<< button (1).
   ⇨ The displayed value should be 0 increments for semi-automatic machines, and between 3.0 mA and 8.0 mA for fully automatic machines.

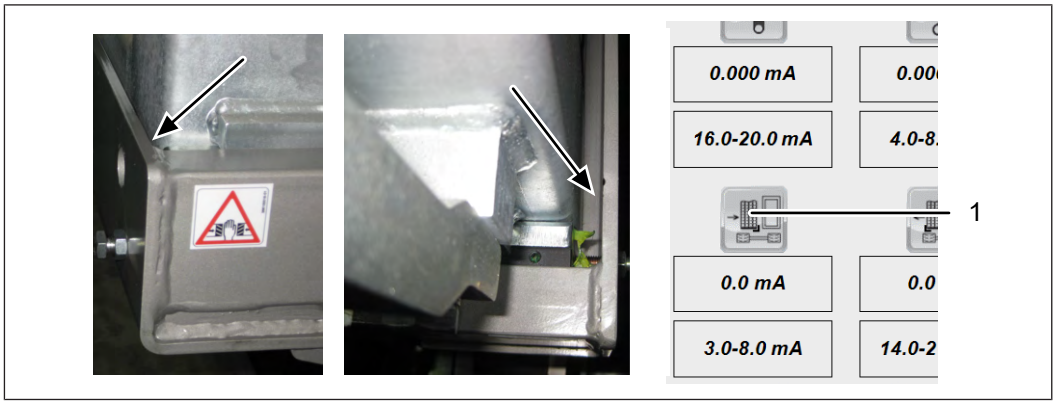


Fig. 6-35 Configuration "Rod magazine (inner) left"

Swivel arm underneath the bay

1. Move the thrust rig against the rear stop of the rig boom.
2. Move the swivel arm against the stop underneath the bay.
3. Store the position by pressing the >>Swivel arm underneath the bay<< button (1).
   ⇨ The displayed value should be in the range between 4.0 mA and 8.0 mA.

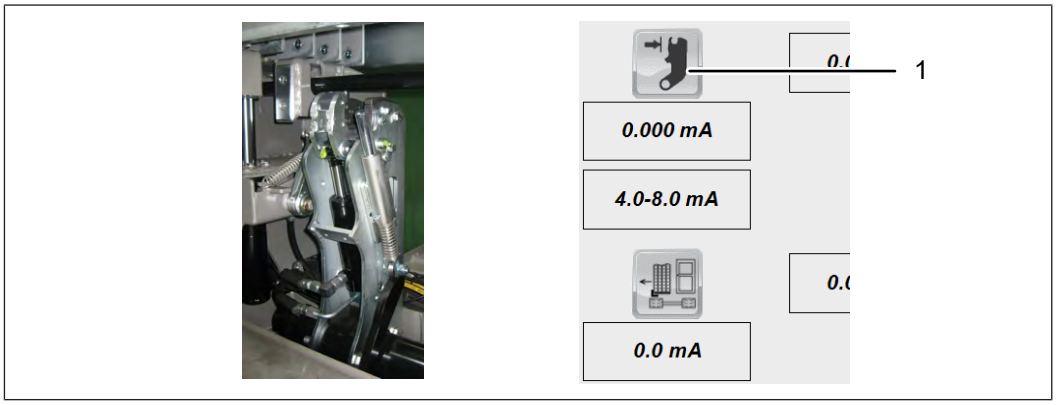


Fig. 6-36 Configuration "Swivel arm underneath the bay"

Swivel arm against stop in the bore axis

1. Move the swivel arm against the stop in the bore axis.
2. Store the position by pressing the >>Swivel arm in bore axis<< button (1).
   ⇨ The displayed value should be in the range between 16.0 mA and 20.0 mA.

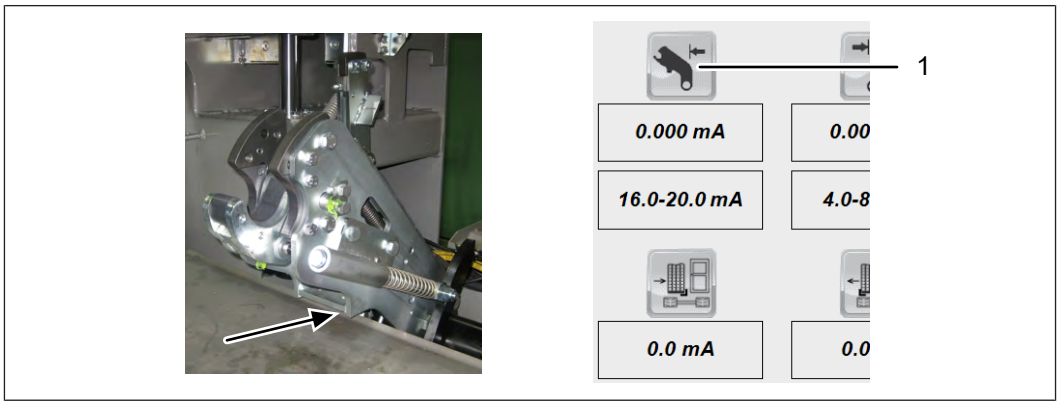


Fig. 6-37 Configuration "Swivel arm in bore axis"

6.2.8.20 "Version number" screen

The "Version number" screen is displayed if you tap the >>General information<< button in the headline of any other screen (chapter 6.2.8, page 137).



Fig. 6-38 "Version number" screen

Tab. 6-28 Indicators and operating elements of the "Version number" screen

Item	Operating element	Function
1	>>Back<< button	Returns you to the previous screen.
2	>>TRACTO<< button	Starts the spare parts and service programme "Tractron".
3	>>Accessories<< button	Calls up the accessories catalogue.

6.2.9 "Grundolog III" subroutine

This screen is displayed if you tap the >>Grundolog III<< button in the "Bore parameter settings" screen (chapter 6.2.8.5, page 147).

Using the current programme version you can create tensile force measurement protocols in the machine and send them directly via e-mail.

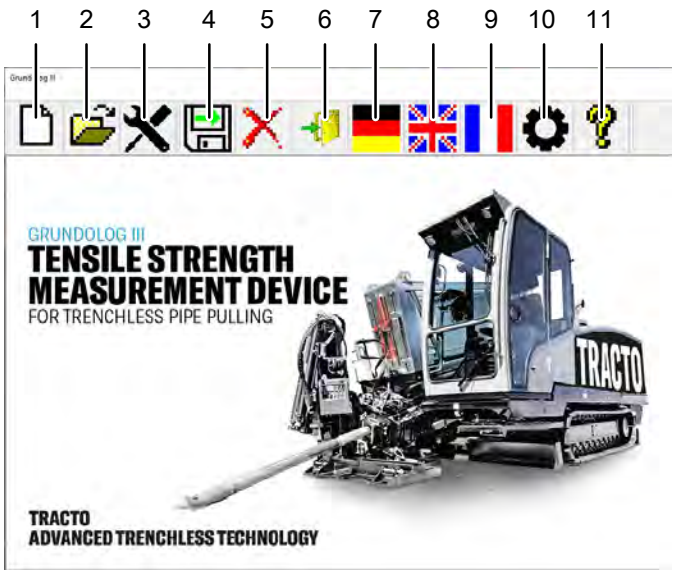


Fig. 6-39 "Grundolog III" screen

Tab. 6-29 Indicators and operating elements of the "Grundolog III" screen

Item	Operating element	Function
1	>>New<< button	Opens a screen for entering information about the construction site (chapter 6.2.9.1, page 180).
2	>>Open<< button	Opens a window for selecting stored DAT files (chapter 6.2.9.2, page 181). The files selected can then be opened.
3	>>Measuring body configuration<< button	Opens a screen for configuring the measuring body (chapter 6.2.9.3, page 184).
4	>>Save<< button	Saves the BDA data on a connected USB stick (chapter 6.2.9.4, page 185).
5	>>Delete<< button	Opens a window for selecting stored DAT files (chapter 6.2.9.5, page 186). The files selected can then be deleted.
6	>>Exit<< button	Terminates the "Grundolog III" subroutine.
7	>>German<< button	Changes the interface language of the programme to "German".
8	>>English<< button	Changes the interface language of the programme to "English".
9	>>French<< button	Changes the interface language of the programme to "French".
10	>>Options<< button	Opens a window for entering information and selecting output options (chapter 6.2.9.6, page 187).
11	>>Information<< button	Opens a window displaying programme information (chapter 6.2.9.7, page 188).

6.2.9.1 Reading out and creating tensile force data

Info!
Use the on-screen keyboard for entering figures and letters. To open it, press the >>ABC<< button in the bottom left corner of the screen.



Fig. 6-40 On-screen keyboard

Create a new file as follows:

1. Press the >>NEW<< button on the start screen.
   ⇨ A window is displayed where you can enter information about the construction site.

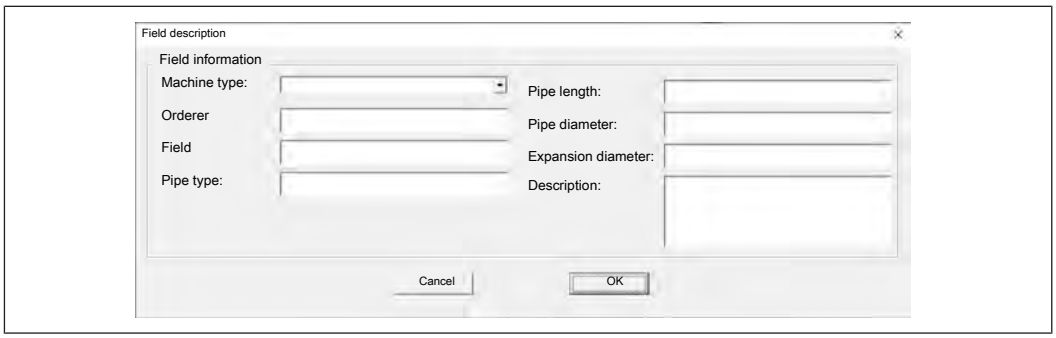


Fig. 6-41 Field description

2. Press the >>ABC<< button on the screen to display the keyboard below the window.
3. Press the input field you want to edit in the "Field information" window.
4. Enter the necessary information using the keyboard.
5. Finish the input by pressing the >>X<< in the top right-hand corner of the keyboard.
6. Press the >>OK<< button in the "Field description" window to save the data and prepare a PDF file to be sent via e-mail.

6.2.9.2 Opening tensile force data

If you press the >>Open<< button in the "Grundolog III" screen, the following window opens:

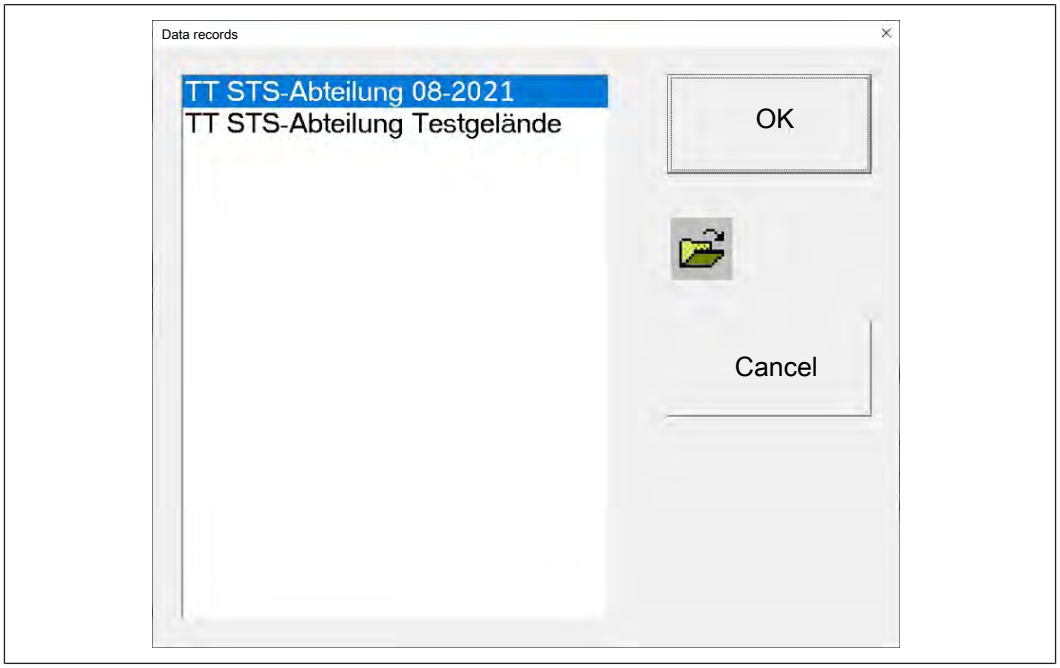


Fig. 6-42 Selecting the tensile force data

1. Tap the desired file to select it.
2. Press the >>OK<< button to display a window with the tensile force data.
   ⇨ Pressing the >>Cancel<< button returns you to the start screen.

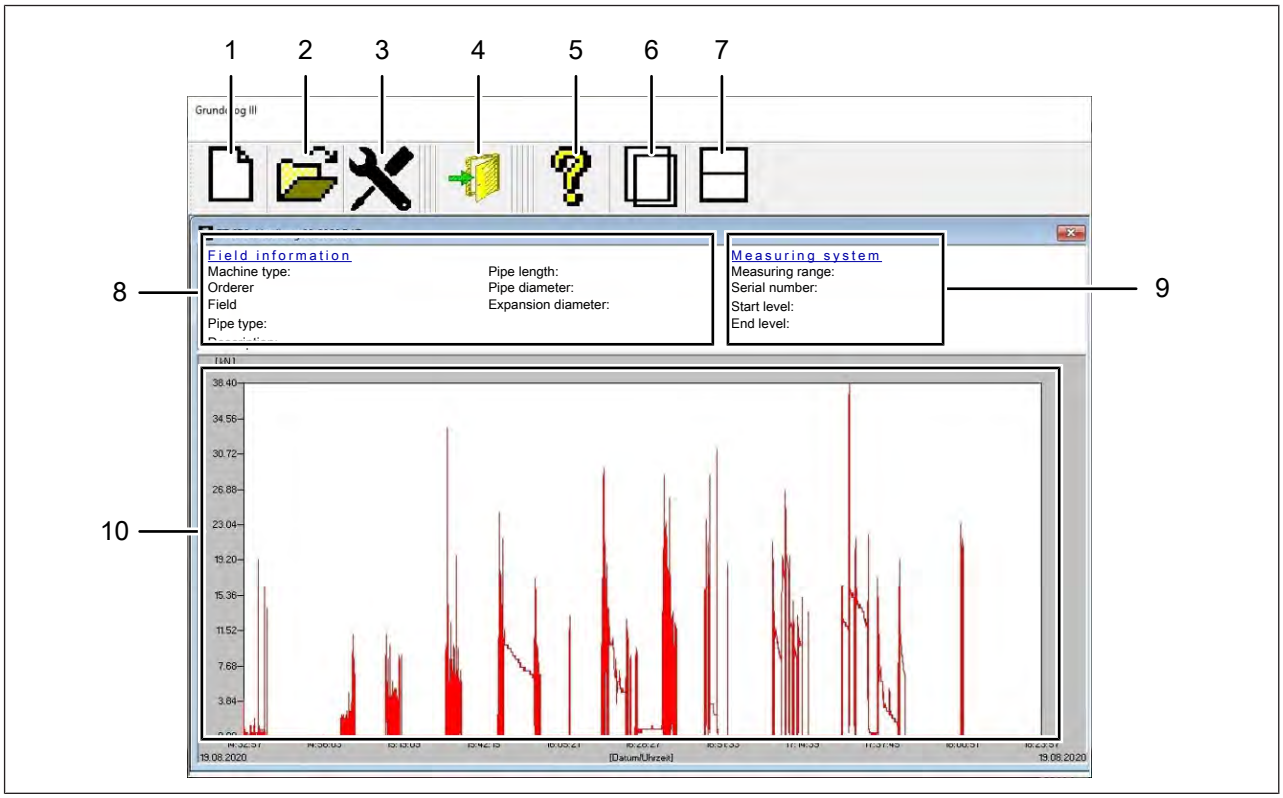


Fig. 6-43 Tensile force data

Tab. 6-30 Indicators and operating elements of the "Tensile force data" screen

Item	Operating element	Function
1	>>New<< button	Opens a screen for entering information about the construction site (chapter 6.2.9.1, page 180).
2	>>Open<< button	Opens the window for selecting stored DAT files (chapter 6.2.9.2, page 181). The files selected can then be opened.
3	>>Measuring body configuration<< button	Opens a screen for configuring the measuring body (chapter 6.2.9.3, page 184).
4	>>Exit<< button	Terminates the "Grundolog III" subroutine.
5	>>Information<< button	Opens a window displaying programme information.
6	>>Cascade<< button	Displays all opened windows in an overlapping arrangement.
7	>>Side-by-side<< button	Displays all opened windows in a side-by-side arrangement.
8	"Field information" area	Indicates the information entered for the construction site.
9	"Measuring system" area	Indicates the information entered for the measuring body.
10	Data area	Indicates the tensile force data as a graph.

"Send" option

If you press the optional >>Send<< button in the "Tensile force data" screen, a pop-up window with the following query opens:

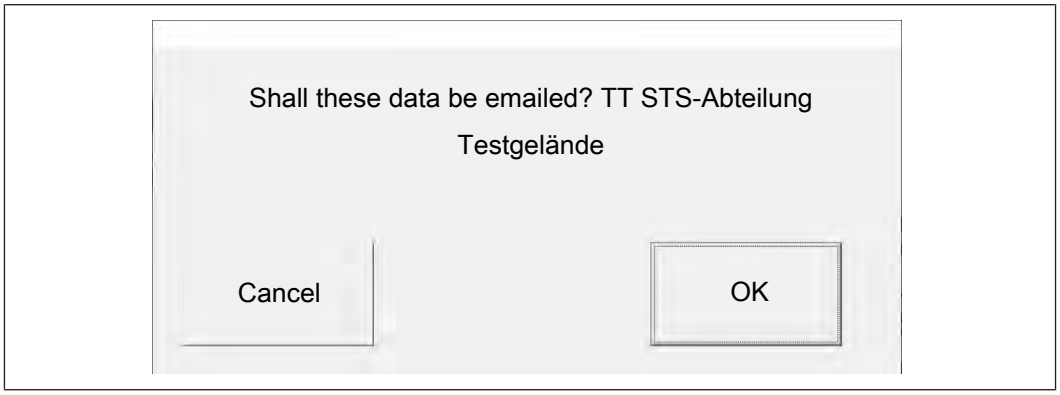


Fig. 6-44 Sending data

Press the >>OK<< button to send the selected tensile force data.

Pressing the >>Cancel<< button returns you to the window with the tensile force data.

6.2.9.3 Measuring body configuration

If you press the >>Measuring body configuration<< button in the "Grundolog III" screen, the following window opens:

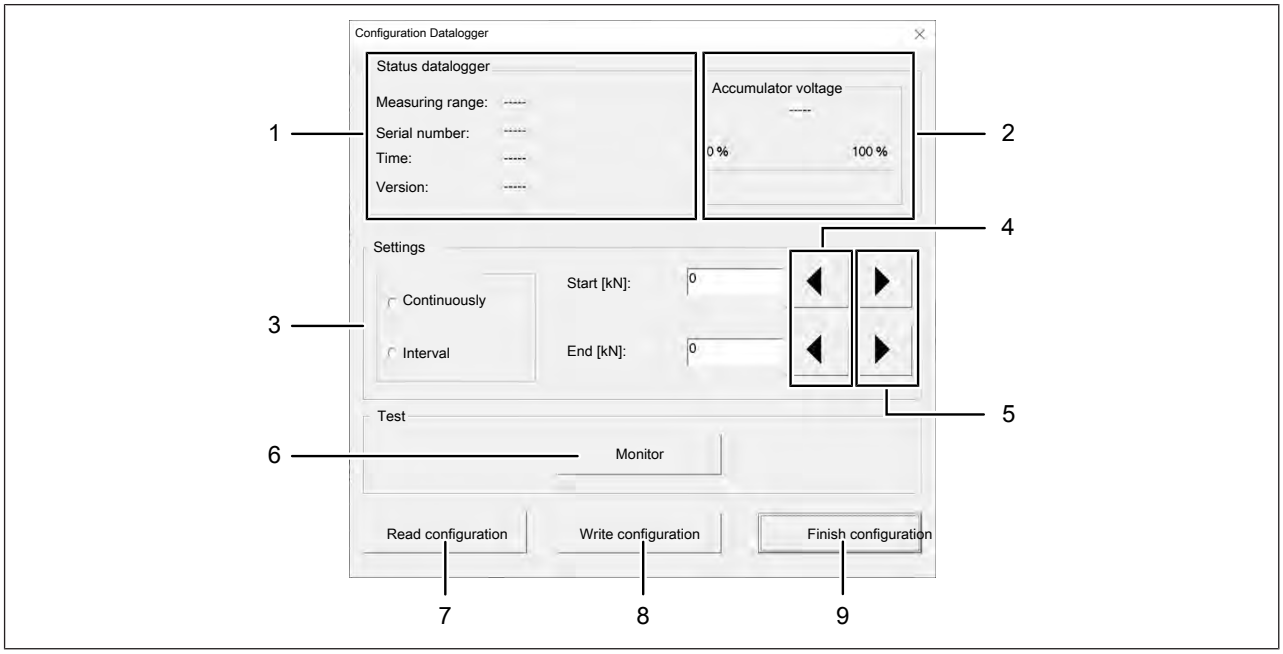


Fig. 6-45 Configuration Datalogger

Tab. 6-31 Indicators and operating elements of the "Configuration Datalogger" window

Item	Operating element	Function
1	"Status datalogger" area	Indicates the measuring range, serial number, time and version of the data logger after read-out of the configuration.
2	"Accumulator voltage" area	Indicates the battery voltage and the charging status in percentage.
3	"Settings" area	Select "Continuously" if tensile force measuring is to be carried out continuously from the start value. Choose "Interval" if tensile force measuring is to be carried out only in the range between "Start" and "End". "Start" indicates the start value for tensile force measurement. "End" indicates the stop value for tensile force measurement in "Interval" mode.
4	>>Arrow left<< button	Reduces the value in the field next to it by 1.
5	>>Arrow right<< button	Increases the value in the field next to it by 1.
6	>>Monitor<< button	Indicates the result of the data logger on the screen.
7	>>Read configuration<< button	Reads out the settings and configurations of the measuring body and displays them in the "Status datalogger" area.
8	>>Write configuration<< button	Writes the current settings into the measuring body and clears the memory.
9	>>Exit<< button	Returns you to the start screen of the "GRUNDOLOG III" subroutine.

6.2.9.4 Saving tensile force data

If you press the >>Save<< button in the "Tensile force data" screen, a pop-up window with the following query opens:

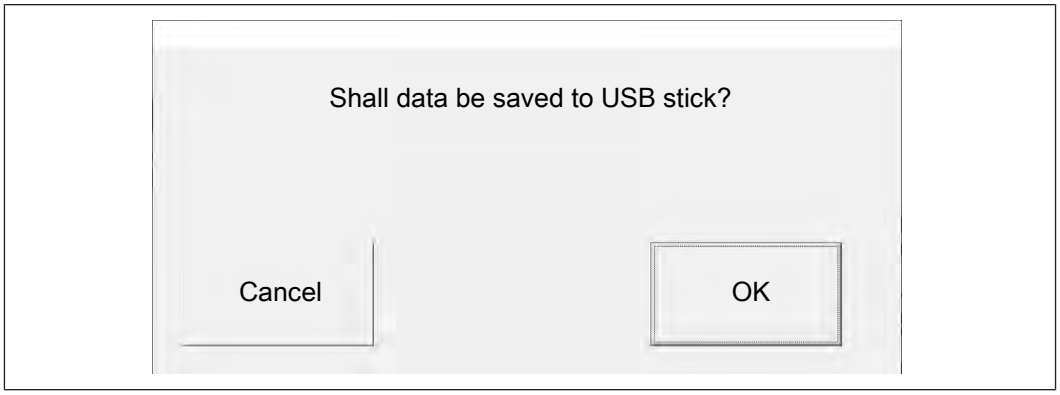


Fig. 6-46 Saving the tensile force data

Press the >>OK<< button to save all DAT and PDF files to a USB stick in the \\Project\Grundolog directory.

Pressing the >>Cancel<< button returns you to the window with the tensile force data.

6.2.9.5 Deleting tensile force data

If you press the >>Delete<< button in the "Grundolog III" screen, the following window opens:

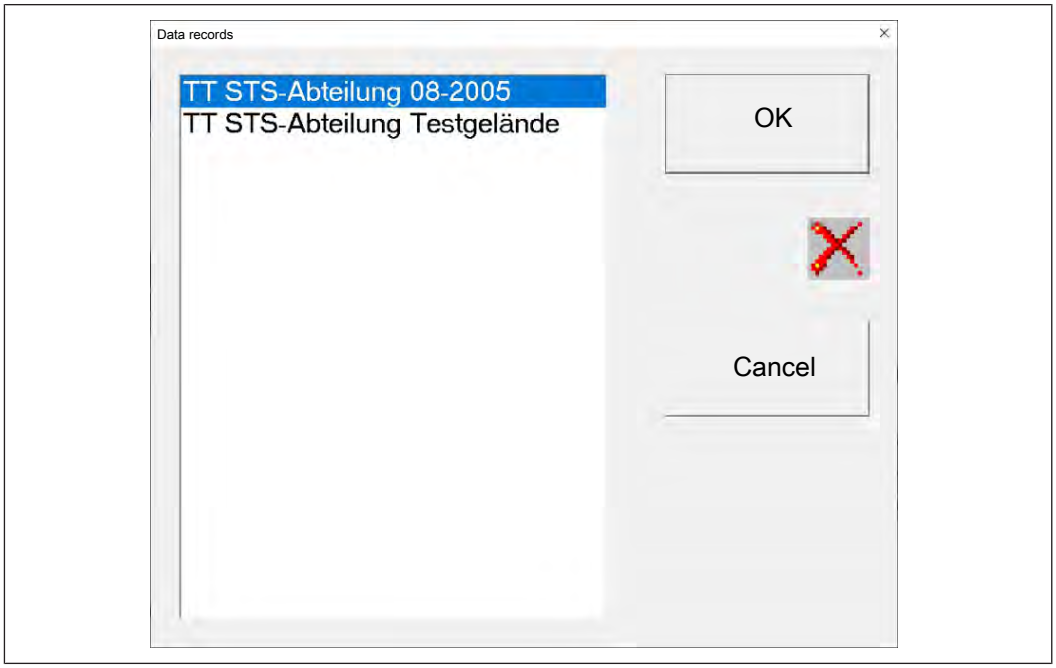


Fig. 6-47 Selecting tensile force data to be deleted

1. Tap the desired file to select it.
   ⇨ Tapping once again unselects the file.
2. Press the >>OK<< button to delete the selected data (DAT and PDF files).
   ⇨ Pressing the >>Cancel<< button returns you to the start screen.

6.2.9.6 Tensile force measurement – Options

If you press the >>Options<< button in the "Grundolog III" screen, the following window opens:

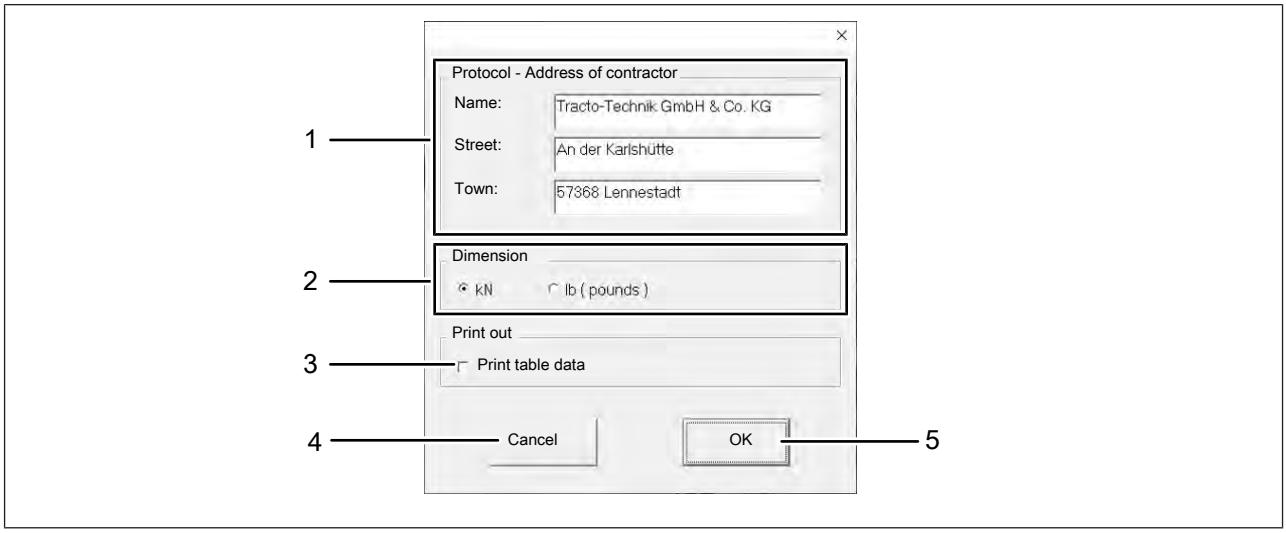


Fig. 6-48 Grundolog – Options

Tab. 6-32 Indicators and operating elements in the "Options" window

Item	Operating element	Function
1	"Protocol – Address of contractor" area	Tap the corresponding input field to enter the name, street and place using the on-screen keyboard. This information will be displayed in the document header of the printout (PDF file) afterwards.
2	"Dimension" area	Here you can select whether the output shall be in kN or lb.
3	Print table data	Tick this box to additionally print the data as a table.
4	>>Cancel<< button	Returns you to the start screen.
5	>>OK<< button	Applies the options and returns you to the start screen.

6.2.9.7 Grundolog III – Programme information

If you press the >>Information<< button in the "Grundolog III" or "Tensile force data" screen, the following window opens displaying information about the programme:



Fig. 6-49 Grundolog III – Programme information

Press the >>OK<< button to return to the previous screen.

6.2.10 "Bore data" subroutine

This screen is displayed if you tap the >>Display bore data<< button in the "Bore parameter settings" screen (chapter 6.2.8.5, page 147).

Using the current programme version you can create bore data protocols in the machine. Optionally, you can send the bore data protocols directly via e-mail

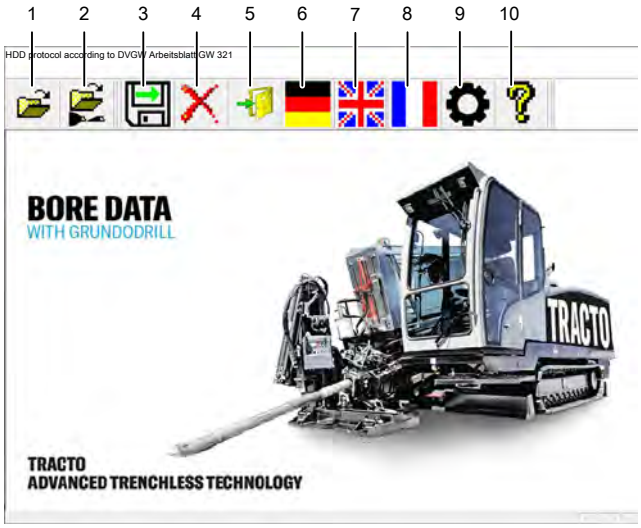


Fig. 6-50 "Bore data" screen

Tab. 6-33 Indicators and operating elements of the "Bore data" screen

Item	Operating element	Function
1	>>Open file<< button	Opens a window for selecting stored DAT files (chapter 6.2.10.1, page 190). The files selected can then be opened.
2	>>Open bore data<< button	Opens the window for selecting stored BDA files (chapter 6.2.10.2, page 192). The files selected can then be opened.
3	>>Save<< button	Saves the BDA data on a connected USB stick (chapter 6.2.10.4, page 195).
4	>>Delete<< button	Opens a window for selecting stored DAT files (chapter 6.2.10.5, page 195). The files selected can then be deleted.
5	>>Exit<< button	Terminates the "Bore data" subroutine.
6	>>German<< button	Changes the interface language of the programme to "German".
7	>>English<< button	Changes the interface language of the programme to "English".
8	>>French<< button	Changes the interface language of the programme to "French".
9	>>Options<< button	Opens a window for setting the output options (chapter 6.2.10.3, page 194).
10	>>Information<< button	Opens a window displaying programme information (chapter 6.2.10.6, page 196).

6.2.10.1 Opening bore data (DAT files)

If you press the >>Open file<< button in the "Bore data" screen, the following window opens:

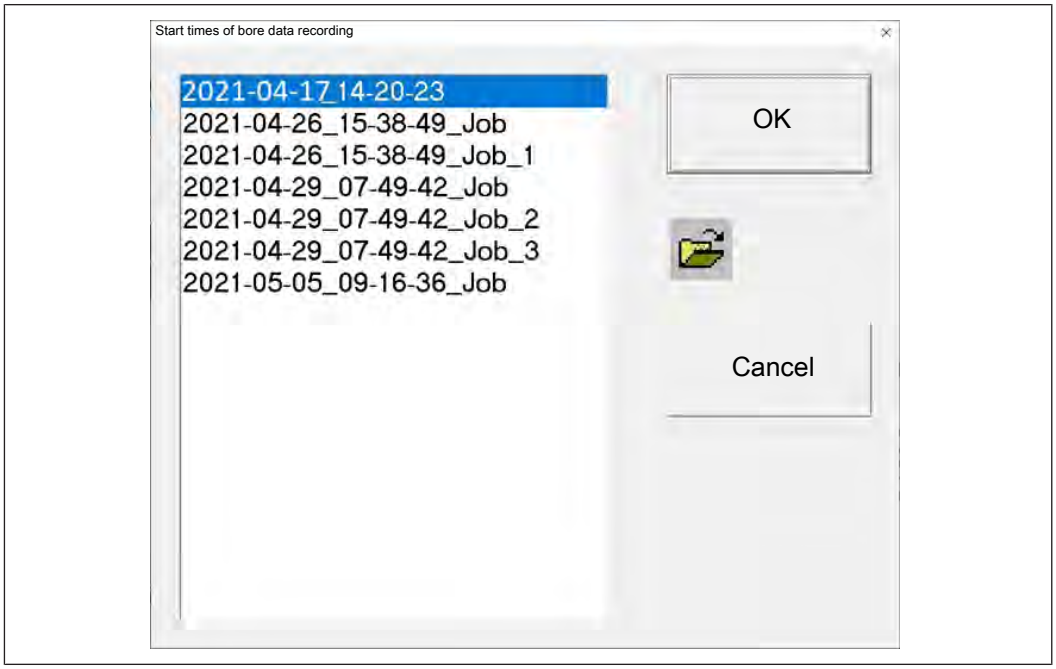
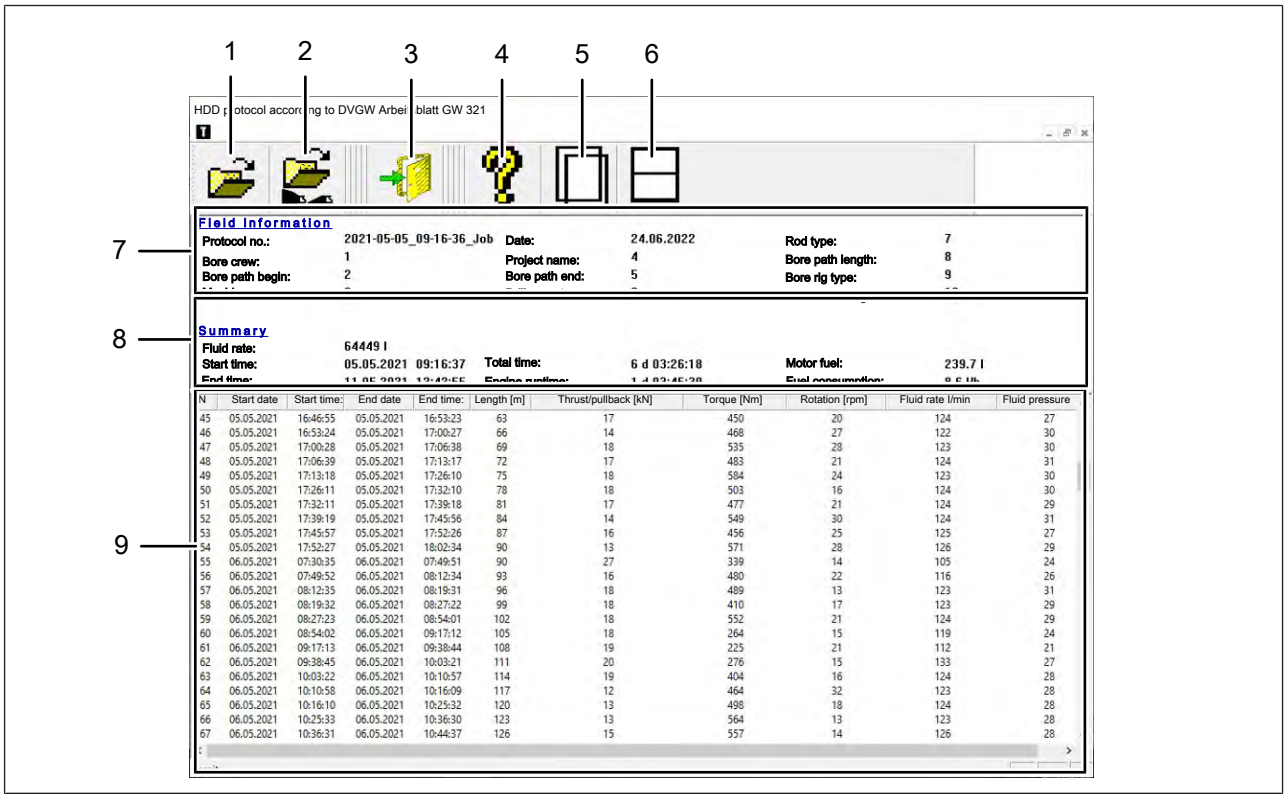


Fig. 6-51 Selecting bore data file

The file name is made up of the following:
year-month-day_hour-minute-second (e.g. 2013-07-17_14-20-23) and indicates the start time of recording.

1. Tap the desired file to select it.
2. Press the >>OK<< button to display the "Bore data protocol" window.
   ⇨ Pressing the >>Cancel<< button returns you to the start screen.



N	Start date	Start time:	End date	End time:	Length [m]	Thrust/pullback [kN]	Torque [Nm]	Rotation [rpm]	Fluid rate l/min	Fluid pressure
45	05.05.2021	16:46:55	05.05.2021	16:53:23	63	17	450	20	124	27
46	05.05.2021	16:53:24	05.05.2021	17:00:27	66	14	468	27	122	30
47	05.05.2021	17:00:28	05.05.2021	17:06:38	69	18	535	28	123	30
48	05.05.2021	17:06:39	05.05.2021	17:13:17	72	17	483	21	124	31
49	05.05.2021	17:13:18	05.05.2021	17:26:10	75	18	584	24	123	30
50	05.05.2021	17:26:11	05.05.2021	17:32:10	78	18	503	16	124	30
51	05.05.2021	17:32:11	05.05.2021	17:39:18	81	17	477	21	124	29
52	05.05.2021	17:39:19	05.05.2021	17:45:56	84	14	549	30	124	31
53	05.05.2021	17:45:57	05.05.2021	17:52:26	87	16	456	25	125	27
54	05.05.2021	17:52:27	05.05.2021	18:02:34	90	13	571	28	126	29
55	06.05.2021	07:30:35	06.05.2021	07:49:51	90	27	339	14	105	24
56	06.05.2021	07:49:52	06.05.2021	08:12:34	93	16	480	22	116	26
57	06.05.2021	08:12:35	06.05.2021	08:19:31	96	18	489	13	123	31
58	06.05.2021	08:19:32	06.05.2021	08:27:22	99	18	410	17	123	29
59	06.05.2021	08:27:23	06.05.2021	08:54:01	102	18	552	21	124	29
60	06.05.2021	08:54:02	06.05.2021	09:17:12	105	18	264	15	119	24
61	06.05.2021	09:17:13	06.05.2021	09:38:44	108	19	225	21	112	21
62	06.05.2021	09:38:45	06.05.2021	10:03:21	111	20	276	15	133	27
63	06.05.2021	10:03:22	06.05.2021	10:10:57	114	19	404	16	124	28
64	06.05.2021	10:10:58	06.05.2021	10:16:09	117	12	464	32	123	28
65	06.05.2021	10:16:10	06.05.2021	10:25:32	120	13	498	18	124	28
66	06.05.2021	10:25:33	06.05.2021	10:36:30	123	13	564	13	123	28
67	06.05.2021	10:36:31	06.05.2021	10:44:37	126	15	557	14	126	28

Fig. 6-52 Bore data protocol

Tab. 6-34 Indicators and operating elements in the "Bore data protocol" window

Item	Operating element	Function
1	>>Open file<< button	Opens the window for selecting stored DAT files (chapter 6.2.10.1, page 190). The files selected can then be opened.
2	>>Open bore data<< button	Opens the window for selecting stored BDA files (chapter 6.2.10.2, page 192). The files selected can then be opened.
3	>>Exit<< button	Terminates the "Bore data" subroutine.
4	>>Information<< button	Opens a window displaying programme information (chapter 6.2.10.6, page 196).
5	>>Cascade<< button	Displays all opened windows in an overlapping arrangement.
6	>>Side-by-side<< button	Displays all opened windows in a side-by-side arrangement.
7	"Field information" area	Indicates the information entered for the construction site.
8	"Summary" area	Displays additional analysis information.
9	Data area	Displays the recorded bore data.

If you press the >>Send<< button in the "Bore data protocol" window, a pop-up window with the following query opens:

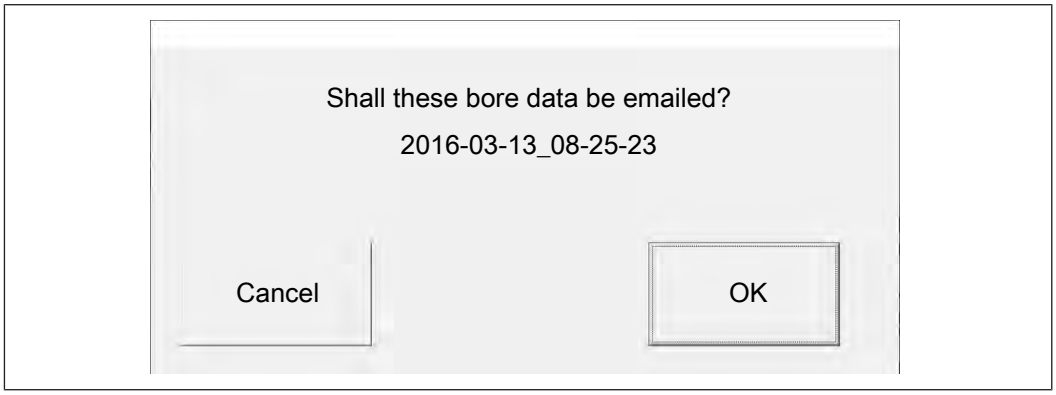


Fig. 6-53 Sending bore data

Press the >>OK<< button to send the selected bore data.

Pressing the >>Cancel<< button returns you to the "Bore data protocol" window.

6.2.10.2 Opening bore data (BDA files)

If you press the >>Open bore data<< button in the "Bore data protocol" window, the following window opens:

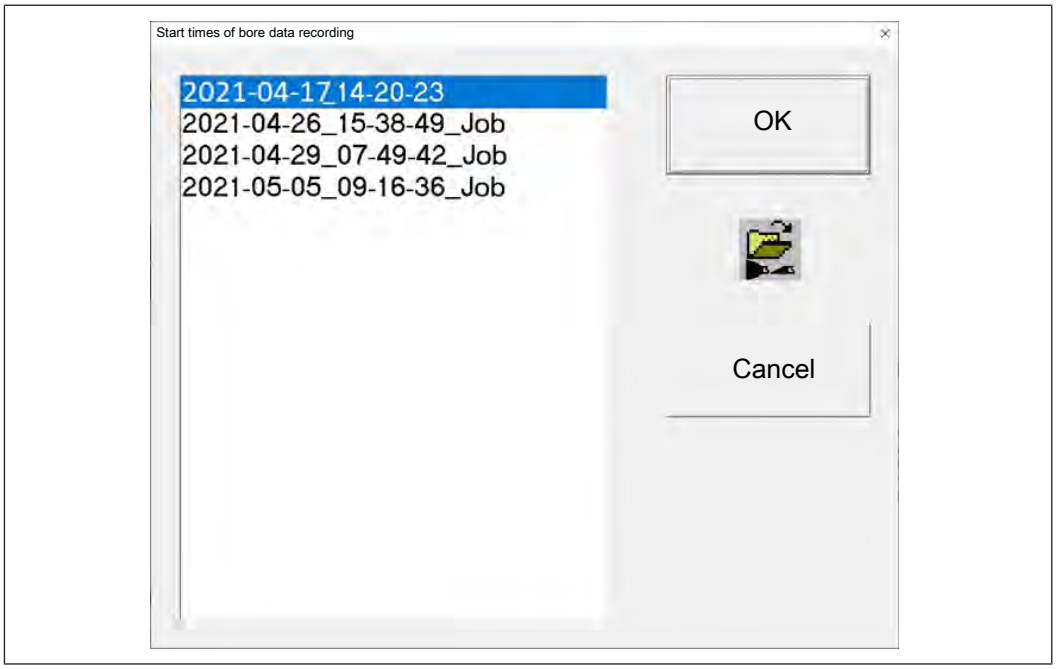


Fig. 6-54 Selecting bore data to be opened

The file name is made up of the following:
year-month-day_hour-minute-second (e.g. 2013-07-17_14-20-23) and indicates the start time of recording.

1. Tap the desired file to select it.
2. Press the >>OK<< button to display a window for entering information about the construction site.
   ⇨ Pressing the >>Cancel<< button returns you to the "Bore data protocol" window.

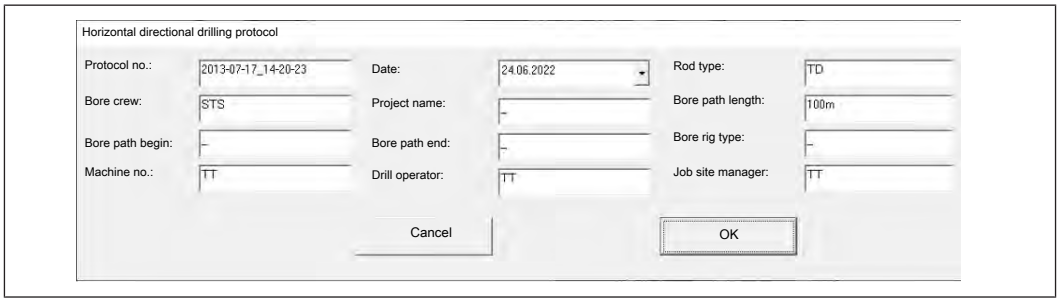


Fig. 6-55 Field description for bore data

3. Press the >>ABC<< button on the screen to display the keyboard below the window.
4. Press the input field you want to edit in the "Field description" window.
5. Enter the necessary information using the keyboard.
6. Finish the input by pressing the >>X<< in the top right-hand corner of the keyboard.
7. Press the >>OK<< button in the "Field description" window to save the data and prepare a PDF file to be sent via e-mail.

Info!
Use the on-screen keyboard for entering figures and letters. To open it, press the >>ABC<< button in the bottom left corner of the screen.



Fig. 6-56 On-screen keyboard

6.2.10.3 Bore data - Options

If you press the >>Options<< button in the "Bore data" screen, the following window opens:

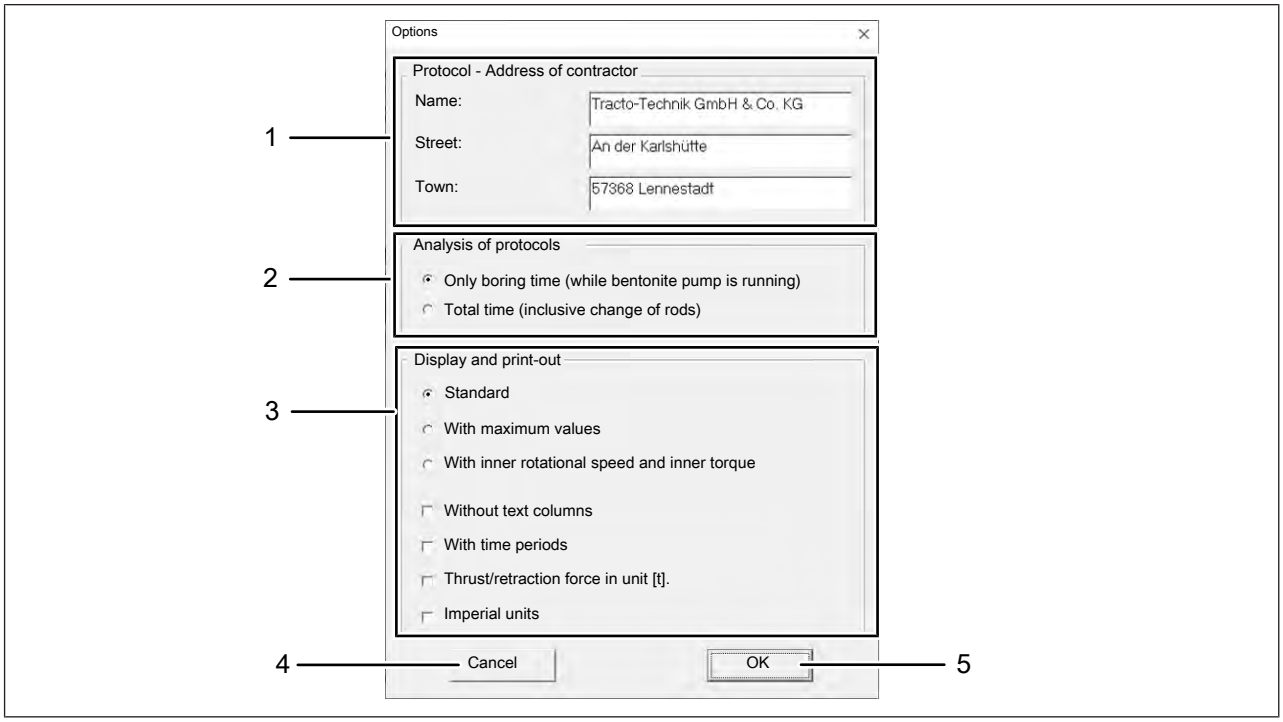


Fig. 6-57 Bore data - Options

Tab. 6-35 Indicators and operating elements in the "Options" window

Item	Operating element	Function
1	"Protocol – Address of contractor" area	Tap the corresponding input field to enter the name, street and place using the on-screen keyboard. This information will be displayed in the document header of the printout (PDF file) afterwards.
2	"Analysis of protocols" area	Select whether to analyse only the drilling process or the total time.
3	"Display and print-out" area	Select how to display and print out bore data. **Info!** The option "With inner rotational speed and inner torque" only applies to the GRUNDODRILL 18ACS and GRUNDODRILL 20ACS.
4	>>Cancel<< button	Returns you to the start screen.
5	>>OK<< button	Applies the options and returns you to the start screen.

6.2.10.4 Saving bore data

If you press the >>Save<< button in the "Bore data" screen, a pop-up window with the following query opens:

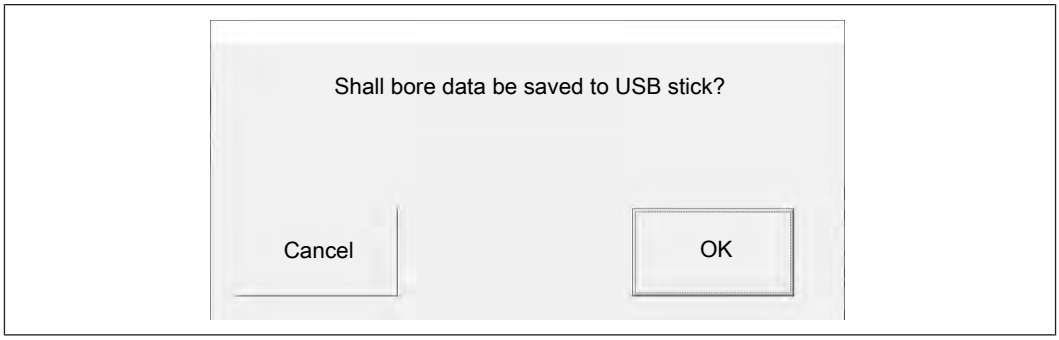


Fig. 6-58 Saving bore data

Press the >>OK<< button to save all DAT, BDA and PDF files to a USB stick in the \\Project\Bore_data directory.

Pressing the >>Cancel<< button returns you to the start screen of the "Bore data" subroutine.

6.2.10.5 Deleting bore data

If you press the >>Delete<< button in the "Bore data" screen, the following window opens:

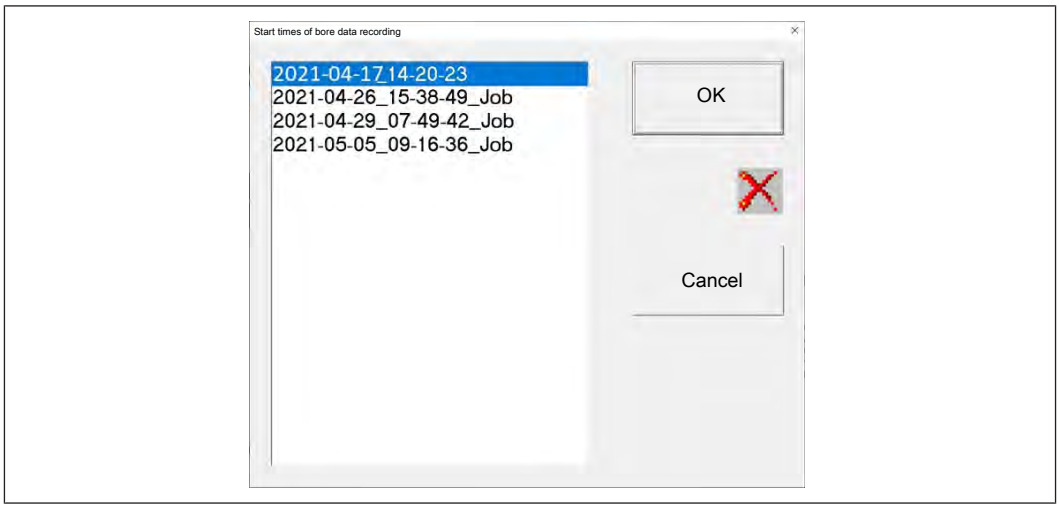


Fig. 6-59 Deleting bore data

1. Tap the desired file to select it.
   ⇨ Tapping once again unselects the file.
2. Press the >>OK<< button to delete the selected data (DAT, BDA and PDF files).
   ⇨ Pressing the >>Cancel<< button returns you to the start screen.

6.2.10.6 Bore data – Programme information

If you press the >>Information<< button in the "Bore data" or "Bore data protocol" screen, the following window opens displaying information about the programme:



Fig. 6-60 Bore data – Programme information

Press the >>OK<< button to return to the previous screen.

6.2.11 Warning messages and notifications

The status indicators for the diesel engine can be found on a panel in front of the right joystick.

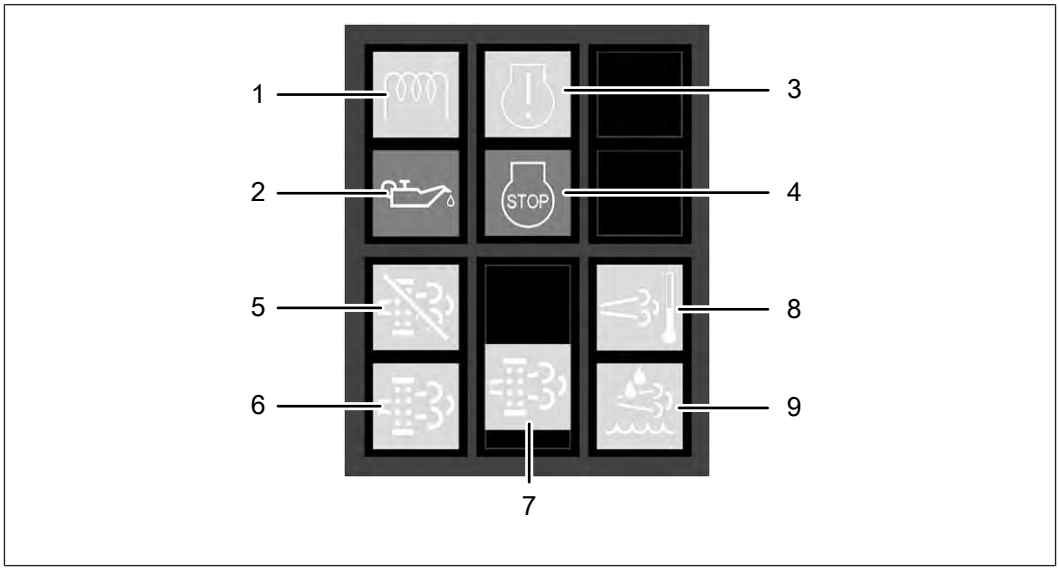


Fig. 6-61 Indicators diesel engine

Tab. 6-36 Indicators diesel engine

Item	Operating element	Meaning/function
1	"Pre-heating" lamp	Pre-heating process active
2	"Engine oil pressure" lamp	Oil pressure of the diesel engine too low
3	"Engine warning" lamp	Warning lamp diesel engine – non-critical error; maintenance may be required.
4	"Stop engine" lamp	Stop lamp diesel engine – critical error in the engine system; immediately stop the engine
5	"Cleaning of exhaust gas system disabled" lamp	Cleaning of exhaust gas system is switched off (switch 7) – neither automatic nor manual regeneration possible.
6	"Cleaning of exhaust gas system" lamp	Diesel particle filter sooted – no automatic cleaning of exhaust gas system possible; cleaning of exhaust gas system required.
7	"Cleaning of exhaust gas system" switch	– Button: start cleaning of exhaust gas system manually – when lamp 6 is illuminated. – Switch: lock / switch off cleaning of exhaust gas system – lamp 5 illuminated.
8	"Increased temperature exhaust gas system" lamp	Increased temperature in the exhaust gas system due to active cleaning – cleaning in progress.
9	"Low filling level DEF" lamp	DEF filling level too low – refill diesel exhaust fluid

6.2.12 Pressure relief high-pressure cleaning pump



Fig. 6-62 Pressure relief high-pressure cleaning pump

Tab. 6-37 Operating elements high-pressure cleaning pump

Item	Operating element	Meaning/function
1	Ball valve pressure relief high-pressure cleaning pump	Serves for pressure relief of the fresh water connection in case the high-pressure cleaning pump was switched on without previously connecting the high-pressure cleaning gun.

6.2.13 Operator seat

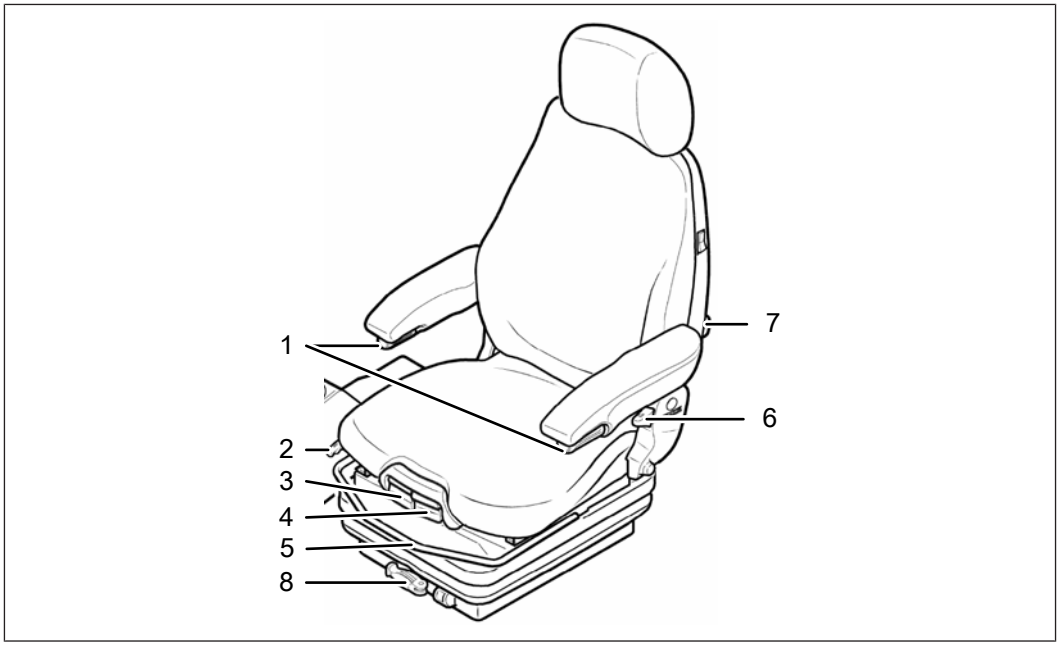


Fig. 6-63 Operator seat

Tab. 6-38 Operating elements at the operator seat

Item	Operating element	Function
1	Armrest adjustment	adjusts the inclination of the armrests.
2	Seat adjustment forward / backward	adjusts the seating surface and backrest in relation to the joysticks.
3	Seating surface adjustment forward / backward	adjusts the seating surface forward / backward.
4	Seat inclination adjustment	adjusts the inclination of the seat.
5	Seat adjustment forward / backward	adjusts the seat incl. joysticks forward / backward.
6	Backrest adjustment	adjusts the inclination of the backrest.
7	Lumbar support adjustment	adjusts the lumbar support.
8	Adjustment of weight-dependent seat suspension and seat height	Adjusts the seat suspension or the seat height (manually)

6.2.14 Further elements in the cab

The following operating elements are installed in the cab:

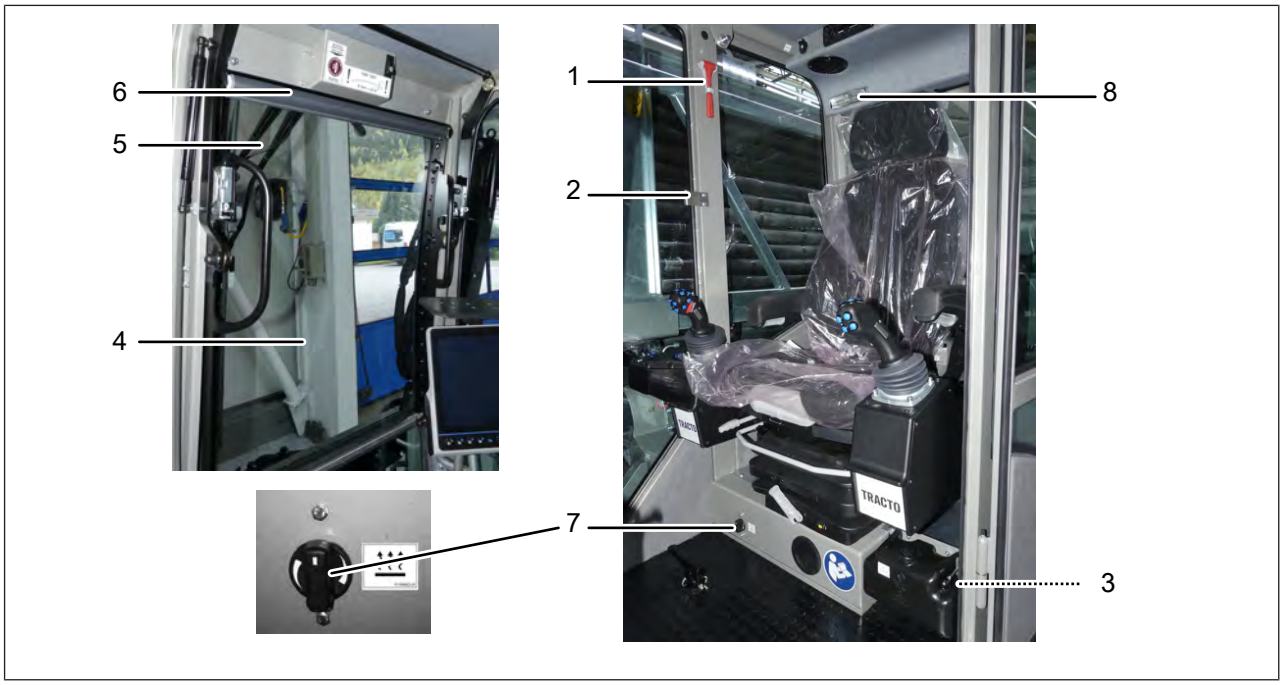


Fig. 6-64 Elements in the cab

Tab. 6-39 Elements in the cab

Item	Element	Meaning/function
1	Emergency hammer	For breaking the window pane at the front in an emergency in order to exit the cab
2	Walkie-talkie holder	For attaching a walkie-talkie
3	Door lock	For unlocking the opened cab door Pull at the ball handle to unlock the opened cab door.
4	Hinged slide window	Can be swivelled to a position underneath the cab roof.
5	Windscreen wiper	For cleaning the upper front window
6	Sunshade	To avoid visual impairment due to the sun
7	Heating controller	Switches on and regulates the heater if the ventilation is activated.
8	Interior lighting	Serves to illuminate the cab interior. You can switch the lamp on and off by shifting it sideways.

6.2.15 Connections behind the operator seat

Behind the operator seat you can find the following connections:

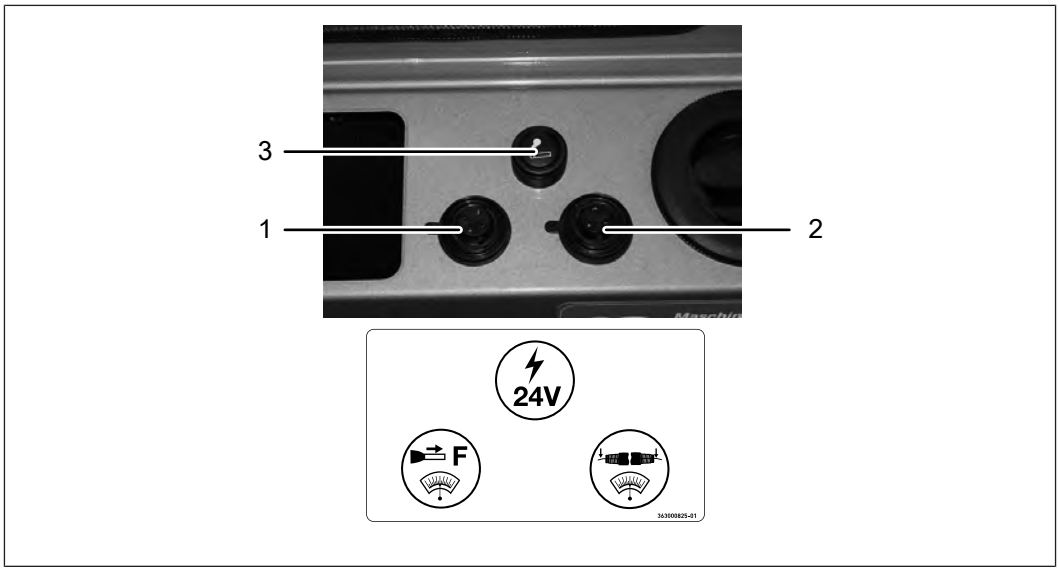


Fig. 6-65 Connections behind the operator seat

Tab. 6-40 Connections behind the operator seat

Item	Connection	Function
1	Connection tensile force measuring system	To connect the tensile force measuring system
2	Connection wire-controlled measuring system	To connect the wire-controlled measuring system
3	24 V connection	Cigarette lighter, for a 24 V power supply

6.2.16 Operating elements for the rod magazine

The additional operating panel for loading and unloading the rods is located to the left of the rod magazine near the control box.

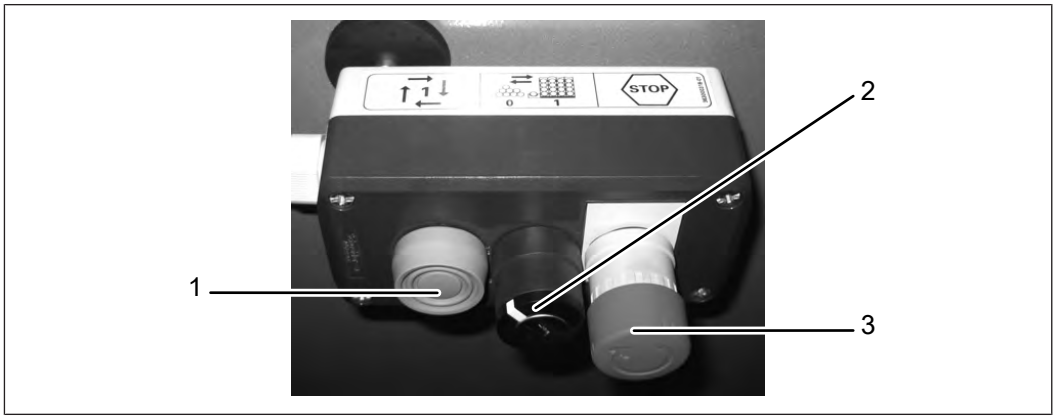


Fig. 6-66 Additional operating panel at rod magazine

Tab. 6-41 Operating elements and connections on the electric control box

Item	Operating element	Function
1	Push button	Serves to start loading or unloading of a rod (chapter 6.8, page 242)
2	Key switch	left: clearance for the insertion of rods centre position: no selection, no clearance right: clearance for taking out rods
3	Emergency stop button	Switches the machine off in an emergency

6.2.17 Operating panels for wire-controlled drilling



Fig. 6-67 Operating panels for wire-controlled drilling

Tab. 6-42 Operating elements for wire-controlled drilling

Item	Operating element	Meaning/function
1	Emergency stop operating panel front	Switches off the machine in an emergency.
2	>>Drilling functions locked<< indicator light	Is illuminated in red if the drilling functions are disabled.
3	Rotary switch	left: bore functions released. Right: bore functions blocked.
4	Emergency stop operating panel rear	Switches off the machine in an emergency.
5	>>Drilling functions locked / door open<< indicator light	Is illuminated in red when the safety door is open and thereby the drilling functions are locked.

6.2.18 Anti fixed drilling (anti-jamming function)

The anti-jamming function serves to reduce the thrust pressure if the rotation pressure exceeds 70 % of the maximum pressure. This prevents the rotation from coming to a standstill. As soon as the rotation pressure drops, the thrust pressure is increased again.

Switch the anti-jamming function on or off using the ball valve (1) that is located behind the protective cover below the rod box. The anti-jamming function is switched off when the lever is positioned vertically to the line.

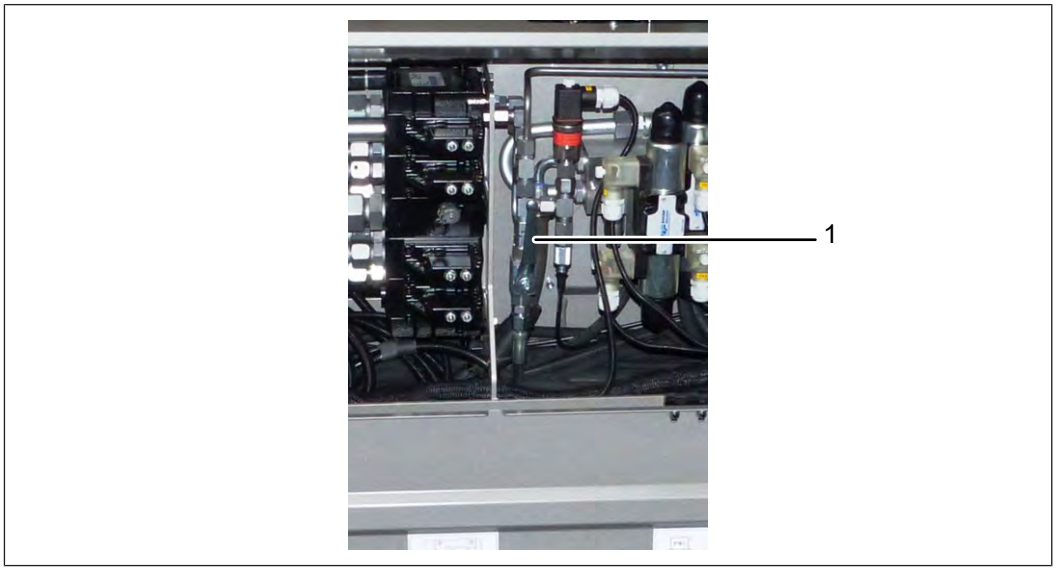


Fig. 6-68 Ball valve for setting the anti-jamming function

6.2.19 Emergency operation system with emergency hydraulic system and emergency mode

The emergency operation system consists of:

- emergency hydraulic system
- electrical emergency mode

The operating elements behind the protection cover underneath the rod box are meant for traversing the bore rig in case of a failure of the control unit (emergency hydraulic system).

Inside the switch cabinet there is a switch for activating the electrical emergency mode. This switch can be used for completing the drilling operation in case of a sensor system failure.

6.2.19.1 Emergency hydraulic system

The operating elements behind the protection cover underneath the rod box are meant for traversing the bore rig in case of a failure of the control unit (emergency hydraulic system).

NOTICE

Machine damage caused by collision of unmonitored movable parts!

If the bore rig is operated via the emergency hydraulic system, all functions can be carried out manually directly on the valves, even functions that could cause a damage! The individual functions are not monitored by the control unit. No locks are activated.

- Please contact the TRACTO-TECHNIK customer service before switching on and using the emergency hydraulic system.
- When operating the bore rig via the emergency hydraulic system, proceed with utmost caution to avoid uncontrolled machine movements.

⇨ The operator is responsible for any damage due to improper handling.

Make the following preparations for operating the emergency hydraulic system:

1. Open the padlocks of the cover (1) below the magazine and fold the flaps up and down.

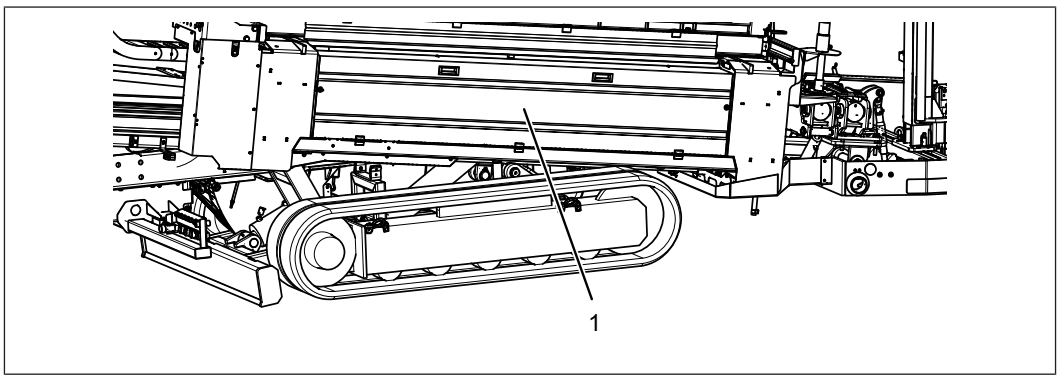


Fig. 6-69 Opening the protective cover

NOTICE

Regeneration of exhaust gas after-treatment inoperative at a standstill!

Due to the missing regeneration of the exhaust gas after-treatment at a standstill, the engine may be damaged.

- Make sure that the potentiometer used for emergency operation for the engine speed is at the left stop during normal operation. Otherwise, regeneration of the exhaust gas after-treatment cannot be activated during standstill.

2. Open the control box.
3. Set the desired rotational speed of the diesel engine at the potentiometer (1). The potentiometer is only enabled if the engine control is disturbed.

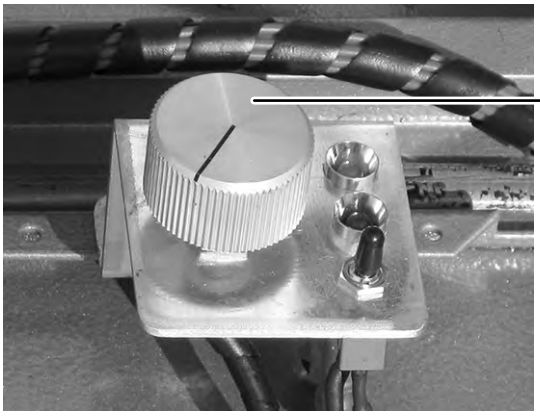


Fig. 6-70 Potentiometer for rotational speed in emergency mode

4. Release the emergency hydraulic system by pushing in the manual control (1) on the engine side of the machine at the release valve for the proportional functions, then turning it to the right and letting it engage.

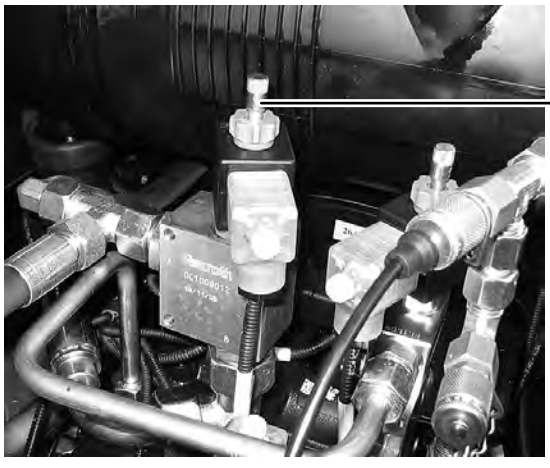


Fig. 6-71 Release valve for proportional functions

You can carry out the bore rig's hydraulic functions by using the manual controls on the valves. The manual controls are situated on top of the valves in the top row and below the valves in the lower row.

Each valve is clearly marked with a sign. The symbols on the signs correspond to those of the joysticks.

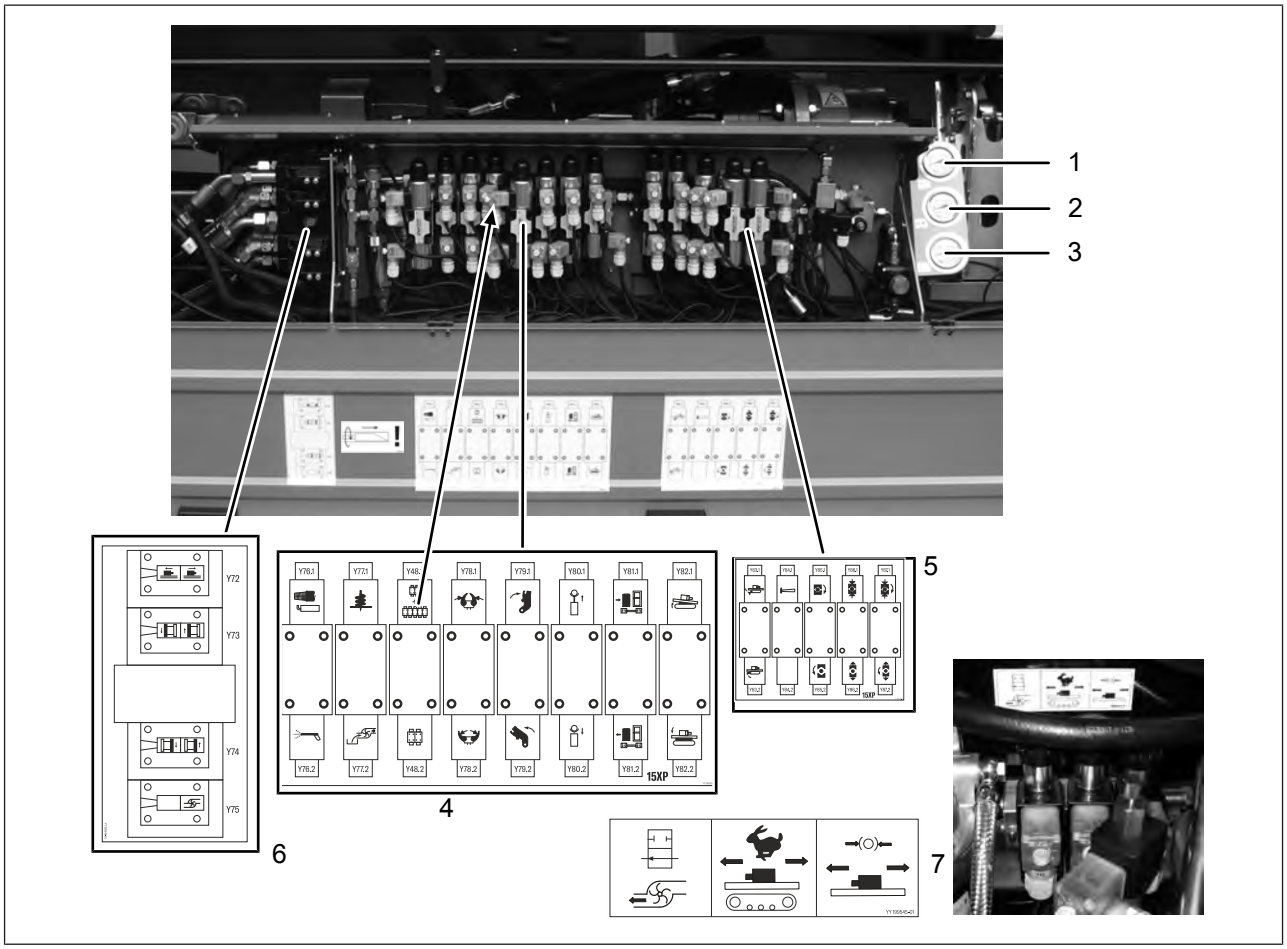


Fig. 6-72 Valves for the emergency hydraulic system

Tab. 6-43 Operating elements emergency hydraulic system

Item	Operating elements/ indicators	Function
1	Pressure gauge “Rotation” pressure	Pressure indication for rotation in bar
2	Pressure gauge "Thrust" pressure	Pressure indication for thrust in bar
3	Pressure gauge "Drilling fluid" pressure	Pressure indication for drilling fluid in bar

Item	Operating elements/ indicators	Function
4, 5	Valves with manual controls top and bottom	Auxiliary functions: To operate the depicted function, press the release valve (see arrow) on the left valve block (4) and simultaneously press the manual control of the desired valve. When the release valve is no longer operated, the emergency actuation is non-functional.
6	Manual controls	from top to bottom: Thrust carriage, left carriage chain, right carriage chain, drilling fluid pump For actuation, attach supplied operating lever to the corresponding section.
7	Valves with manual controls	Underneath the engine cover, from left to right: Manual control of the valves for – bentonite slide valve – 2nd step thrust and chassis (tracks) – thrust brake

Operating the emergency hydraulic system

Work with another person.

Setting the rotational speed

Note the following when setting the rotational speed:

The rotational speed of the diesel engine is set via the potentiometer on the right joystick. If the connection is interrupted, the rotational speed can be set at the potentiometer for emergency mode. The rotational speed will no longer be reduced, provided that no function is operated.

Rotation

1. Release the rotation by pressing in the manual control (1) of the release valve, turning it to the right and letting it engage.

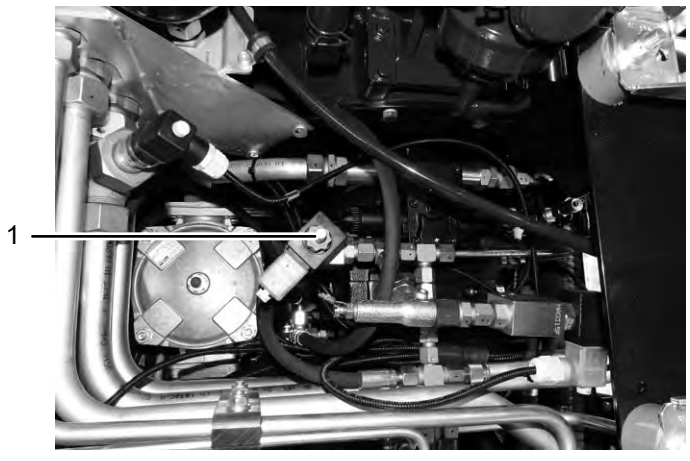


Fig. 6-73 Release valve rotation and selection of rotational direction

2. Manually start the rotation at the rotation pump.

3. Press button 1 to make the sub-saver rotate counter-clockwise. Press button 2 to make the sub-saver rotate clockwise.

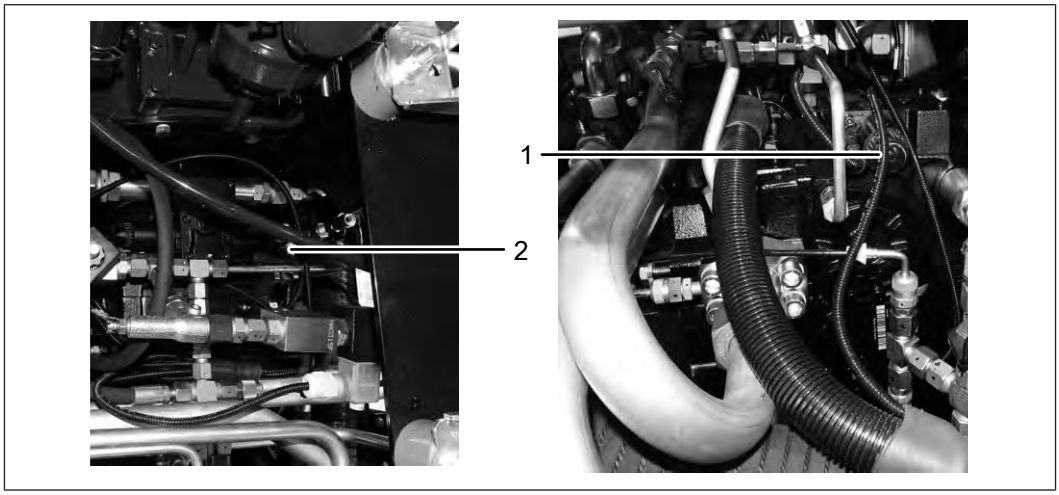


Fig. 6-74 Manual control rotation

4. Terminate the emergency mode of the rotation by turning the manual control of the release valve to the left.

Terminating the emergency hydraulic system

Once you have completed the operation via the emergency hydraulic system, turn the manual control (1) on the release valve to the left.



Fig. 6-75 Release valve for proportional functions

6.2.19.2 Emergency mode

Operating the emergency mode

The emergency mode allows the bore rig to be traversed and the bore to be completed in case of a sensor system failure.

NOTICE

Regeneration of exhaust gas after-treatment inoperative at a standstill!

Due to the missing regeneration of the exhaust gas after-treatment at a standstill, the engine may be damaged.

- Make sure that the potentiometer used for emergency operation for the engine speed is at the left stop during normal operation. Otherwise, regeneration of the exhaust gas after-treatment cannot be activated during standstill.

NOTICE

Machine damage caused by collision of unmonitored movable parts!

When the bore rig is operated in electrical emergency mode, all electrically controlled functions can be executed. However, the individual functions will not be monitored by the control unit. No locks are activated.
If the sensor system is switched off, incorrect handling may lead to damages to the machine.

- Please contact the TRACTO-TECHNIK customer service before switching off the sensor system.

⇨ The operator is responsible for any damage due to improper handling.

Enabling the emergency mode

To activate the emergency mode, please proceed as follows:

1. Open the "Bore parameter settings" screen (chapter 6.2.8.5, page 147).
2. Tap the input field in line 2 (arrow in the figure) and enter the value "1".
   ⇨ Emergency mode will be activated.
   ⇨ When emergency mode is switched on, a warning symbol () appears in the status bar.

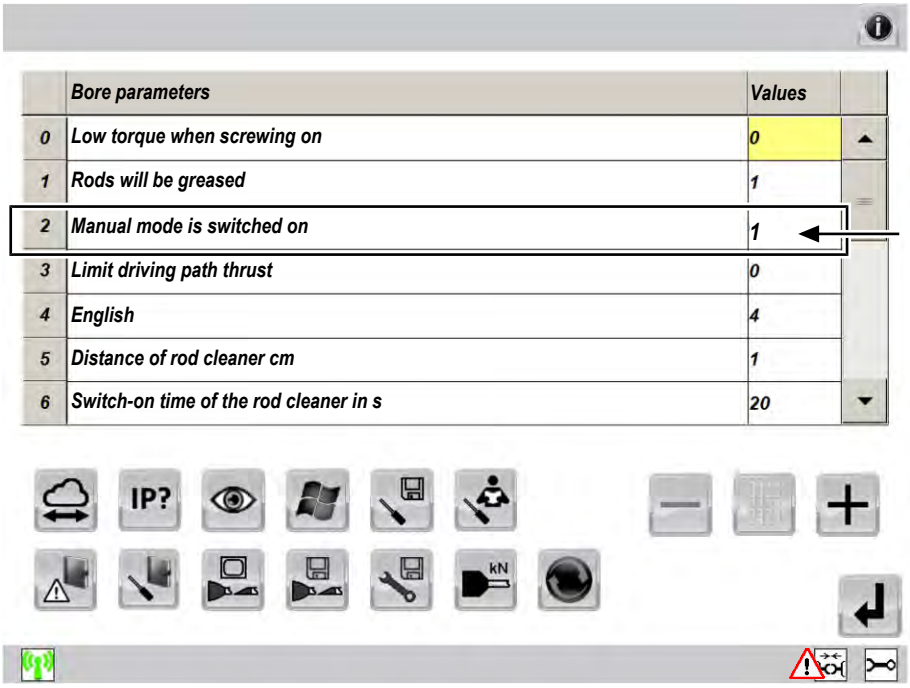


Fig. 6-76 "Bore parameter settings" screen – emergency mode

In case the "Bore parameter settings" screen does not work, activate the emergency mode as follows:

1. Use the corresponding key to open the protective flap for emergency mode (underneath the hydraulic oil cooler).
2. Push up the flip switch (1) for emergency mode.
   ⇨ The red LED (2) is illuminated.

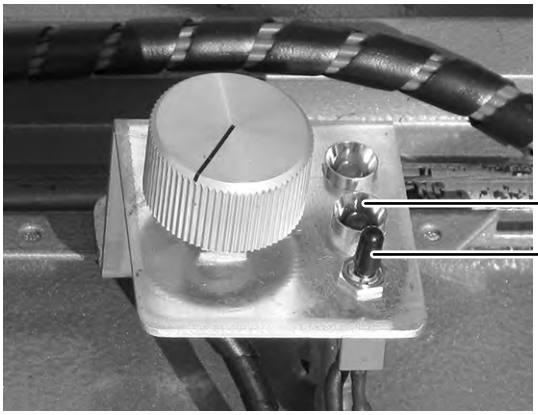


Fig. 6-77 Flip switch and LEDs for emergency mode

Terminating emergency mode

To end the emergency mode

– re-set the value in line 2 of the "Bore parameter settings" screen to "0" or
– switch the flip switch (1) down.
  The red LED (2) goes out.

6.3 Checks prior to start-up

⚠ WARNING



Risk of injury if personal protective equipment is not worn!

- Always wear your personal protective equipment, including ear protection and a work vest in fluorescent colours.
- During drilling, wear the comprehensive protective equipment included in the scope of delivery of the electric shock warning device.

Before starting the machine, ensure the following:

– The drill rods do not have any cracks and all sealing O-rings are available.
– The drilling fluid has been mixed and the drilling fluid mixing system is ready for operation.
– The engine is ready for operation (sufficient fuel, coolant, engine oil, hydraulic oil).
– All hoses are properly connected, fit tightly, are installed safely (hose bridges) and do not touch any hot parts.
– All electric cables are properly connected and safely installed without touching any hot parts.
– The bonnet is closed.
– All communication means (radio or hand signals) have been settled between the operator on site and the operator of the machine.
– The operating personnel wears their personal protective equipment (foot protection, hand protection, head protection, ear protection, protective clothing).
– All safety regulations have been observed.
– The electric shock protection device has been tested and is ready for operation.
– The detection system has been tested and is ready for operation
– Sufficient and clearly evident warning has been given that unauthorized access to the site, the drilling fluid mixing system and the machine is prohibited.

6.4 Start

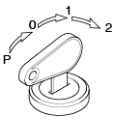
Conditions

- The machine is standing in starting position at the entrance pit and is anchored to the ground.
- The personnel has already been instructed and has completely read and understood these instructions, especially the "Safety" chapter.
- Suitable accessories are ready for use.
- Means of communication between entrance pit and target pit are ready for use.

Info!
When moving a joystick axis or actuating a joystick button while the ignition is being switched on, the actuated component will be disabled.
If, for example, the left joystick is pushed forward while the ignition is being switched on, the left track chain (in drive mode) or the rotation (in bore mode) cannot be controlled.

- To rectify the fault, switch off the ignition.
- Always set the ignition lock to the centre position when you switch off the ignition. This prevents the battery from being deeply discharged.
- Only switch the ignition back on when it is sure that, in doing so, no operating element is actuated.

1. Switch on the mixing system (see mixing system instructions).
2. Make sure that neither a joystick nor a joystick button was actuated.



3. Start the machine's drive engine by turning the ignition key (chapter 5.3.2, page 75).

NOTICE

Engine performance can deteriorate with prolonged idling!

- Only allow the engine to run at idle for a short time. If the idle time is too long, this may lead to a poor engine performance.

6.5 Connecting the first drill rod to the sub-saver

NOTICE

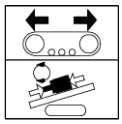
Oils and greases hazardous to the environment!



Danger of environmental pollution!

- Do not let oils and greases penetrate into the soil, waters or the sewage system.
- Dispose of used oil, oily cloths and empty hydraulic containers in an environmentally responsible way and according to the respective laws of your country, e.g. at collection points.

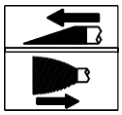
1. Always grease the drill rod threads!
   Avoid excessive grease on the drill rods. Prevent oils and greases from penetrating into the soil, water or sewage system.



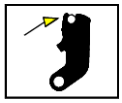
2. If necessary, switch over from drive mode to bore mode on the right joystick panel.



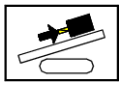
3. Set the engine speed to approx. 1,400 rpm via the potentiometer on the right joystick.



4. Switch over from pull-in to pilot bore on the right joystick panel.

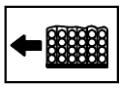


5. If necessary, swing the gripper arms into the rod retaining position by moving the right joystick to the right.





6. Completely reverse the thrust rig to the stop position by pulling the right joystick backwards.
   By pressing the >>Rapid motion on<< push button on the right joystick, you can quickly reverse the thrust rig.



7. Move the rod box to bay 1 by pressing the push button on the left joystick once. For this purpose, the hydraulic jacks are raised, the rod box is positioned and moved to the next bay.



Info!
To ensure an even wear of the drill rods, please start in turn with the outer and the inner bay.



8. Open the rod grippers for the drill rod so that the hydraulic jack can move down. To do so, push the left joystick to the left.
   Only let go of the joystick once the drill rod has been placed inside the rod grippers!



9. Close the rod grippers by pressing the left joystick to the right.



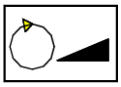
10. Then swing the gripper arms with the drill rod into the bore axis by pushing the right joystick to the left. The hydraulic jacks move upwards.

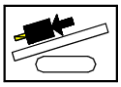
Info!
You can only swing the gripper arms into the bore axis when the thrust rig is completely reversed.

NOTICE

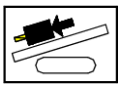
Possible damage to the threads due to too fast rotation or too high thrust speed!

- When screwing the sub-saver to the rods and the rods to each other, proceed slowly and with low thrust to avoid damaging the threads.





11. Switch on clockwise rotation by pushing the left joystick forward and holding it in this position.
Simultaneously push the right joystick forward to advance the thrust rig until the sub-saver and the first drill rod have been screwed together.



12. Push the right joystick forward to slowly advance the thrust rig until the front end of the drill rod rests inside the clamp.



13. Open the rod grippers by pushing the left joystick to the left and holding it in this position.
Then swing the gripper arms underneath the rod box by moving the right joystick to the right. **Only let go of the joystick once the drill rod has been placed inside the rod grippers!**

6.6 Pilot bore

⚠ DANGER

Rotating drill rod!

Contact with the rotating drill rod can lead to injuries or death!

- Only start drilling operation if there is nobody in the range of rotating parts.
- Only personnel required to operate the machine are allowed near the machine.
- Keep out of the danger area.
- Keep away from rotating parts.

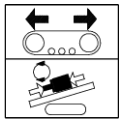
⚠ WARNING

Risk of injury due to unintentional joystick actuation!

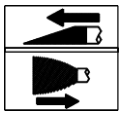
When exiting the cab while the engine is running, there is a risk of actuating the left joystick unintentionally and thus initiating a machine movement. The machine movement could injure yourself or others.

- **Always** fold up the left joystick panel before exiting the cab.
  This disables all functions of both joysticks.

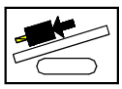
1. Attach a suitable drilling tool to the bore head assembly.



2. If necessary, switch over from drive mode to bore mode on the right joystick panel.



3. Switch over from pull-in to pilot bore on the right joystick panel.

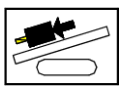


4. Push the right joystick forward to advance the thrust rig until the drill rod protrudes from the front of the clamp.
5. Screw the prepared bore head assembly with transmitter to the first drill rod manually using a suitable lifting device and an SW 55 open-ended spanner. The bore head assembly can then be additionally tightened via the clamp.

NOTICE

Potential damage to the drill rod if the bore head assembly is insufficiently secured!

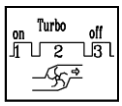
- Make sure that the threaded shoulders of the drill rod and the bore head assembly are adjacent to each other.



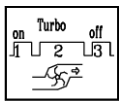
6. Push the right joystick forward to advance the thrust rig until the drill head reaches the ground.



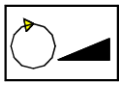
7. Set the potentiometer for the drilling fluid quantity on the left joystick to centre position.



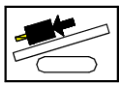
8. Switch on the drilling fluid pump on the left joystick by briefly pressing the push button.
9. Check whether drilling fluid exits from all nozzles of the drill head.



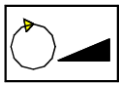
10. Switch the drilling fluid off again by briefly pressing the push button on the left joystick.

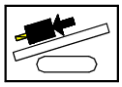


11. Push the left joystick forward to turn the drill rod exactly into "6 o'clock position".



12. Push the right joystick forward to advance the thrust rig until the bore tip has entered the ground by approx. 30–40 cm.
13. Only for optional P72 pump:
Leave the drilling fluid switched on.

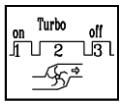




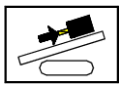
14. Switch on clockwise rotation by pushing the left joystick forward and holding it in this position.
At the same time, push the right joystick forward to drive the thrust rig forward until the drill rod has completely entered the ground, or until the thrust rig has driven to the front stopper.



Info!
This way the rod connection lies exactly between both clamps.



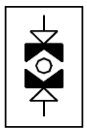
15. Switch the drilling fluid off again by briefly pressing the push button on the left joystick.



16. Pull the right joystick back to reverse the thrust rig by approx. 5 cm to enable length compensation of the sub-saver.



Info!
Now you can locate the drill head (see instructions provided by the manufacturer of the detection system).

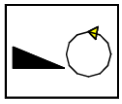


17. Close the clamp via the push button on the right joystick.



Info!
Temperature-related pressure drop possible.
When working, cooling of the hydraulic oil in the clamp cylinder can lead to a pressure drop in the clamp cylinder if the clamp cylinder is kept pressurised for a longer period of time.
In manual mode, actuate the clamp repeatedly to maintain the pressure.
In automatic mode, this is carried out automatically by the machine.

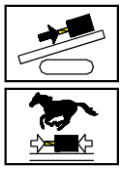
Info!
As soon as the clamp is closed, the valve for drilling fluid pressure relief will open automatically.



18. Fully unscrew the drill rod from the thrust rig or sub-saver counter-clockwise by pulling the left joystick back.



19. Switch on the rod lubrication as soon as the thread is positioned below the rod lubrication.



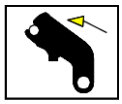
20. Completely reverse the thrust rig to the stop position by pulling the right joystick backwards.
By pressing the >>Rapid motion on<< push button on the right joystick, you can quickly reverse the thrust rig.

6.6.1 Adding further drill rods



1. Close the rod grippers by pressing the left joystick to the right.

Info!
The gripper arms can only be swivelled when the rod grippers are closed and the thrust rig is completely reversed.

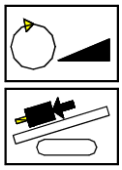


2. Then swing the gripper arms with the drill rod into the bore axis by pushing the right joystick to the left. The hydraulic jacks move upwards.

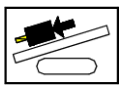
NOTICE

Possible damage to the threads due to too fast rotation or too high thrust speed!

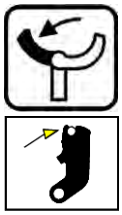
- When screwing the sub-saver to the rods and the rods to each other, proceed slowly and with low thrust to avoid damaging the threads.



3. Switch on clockwise rotation by pushing the left joystick forward and holding it in this position.
Simultaneously push the right joystick forward to advance the thrust rig until the sub-saver and the drill rod are screwed together.
4. Switch off the rotation by letting go of the left joystick.



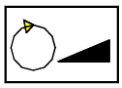
5. Push the right joystick forward to slowly advance the thrust rig until the front end of the drill rod rests inside the clamp.



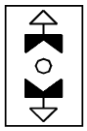
6. Open the rod grippers by pushing the left joystick to the left and holding it in this position.
Then swing the gripper arms underneath the rod box by moving the right joystick to the right. **Only let go of the joystick once the drill rod has been placed inside the rod grippers!**



7. Switch on the rod lubrication as soon as the thread is positioned below the rod lubrication.



8. Keep pushing both joysticks forward until the two drill rods are screwed together.
   Always screw on the rods with maximum torque.

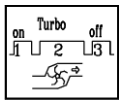


9. Close the clamp via the push button on the right joystick.

Straight bores



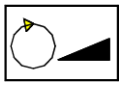
Info!
Only carry out the following working steps in case of straight bores!



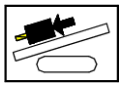
10. Switch on the drilling fluid pump on the left joystick by briefly pressing the push button.



11. If necessary, adjust the drilling fluid quantity via the potentiometer on the left joystick.



12. Switch on clockwise rotation by pushing the left joystick forward and holding it in this position.



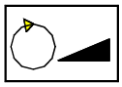
13. Push the right joystick forward to advance the thrust rig.

Correcting the drilling direction

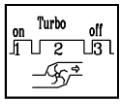
NOTICE

Potential rod damage when falling below the minimum bending radius!

- Observe the minimum bending radius of the drill rods used. The relevant information can be found in the technical data (chapter 3.3, page 55).



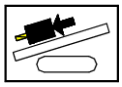
14. Push the left joystick gently forward to switch on clockwise rotation until the desired position is reached.
    Check the position using the detection system.
15. Afterwards, switch off the rotation by bringing the left joystick into centre position.



16. Switch on the drilling fluid pump on the left joystick by briefly pressing the push button.



17. If necessary, adjust the drilling fluid quantity via the potentiometer on the left joystick.



18. Push the right joystick forward to advance the thrust rig.

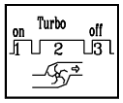
NOTICE

Potential rod damage if the percussive hammer is used improperly!

- Only use the percussive hammer when the rotation is switched off.
- The percussive hammer can only be switched on in combination with "thrust rig forward".
- Only switch on the percussive hammer in very hard grounds, e.g. stone inclusions.

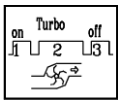


19. Switch on the percussive hammer (if necessary) by pressing the button on the right joystick panel and holding it.
20. After completion of the steering correction, switch the percussive hammer off by letting go of the button on the right joystick panel.

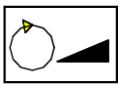


21. Switch the drilling fluid off again by briefly pressing the push button on the left joystick.
22. Stop the thrust of the thrust rig by letting go of the right joystick.
23. Locate the drill head (see instructions provided by the manufacturer of the detection system) and compare its position with the destined bore path (height and side position).
    In case of any deviations, carry out the required corrections again!

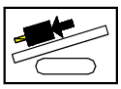
Continuing drilling operation



24. Switch on the drilling fluid pump on the left joystick by briefly pressing the push button.



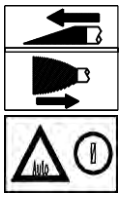
25. Switch on clockwise rotation by pushing the left joystick forward and holding it in this position.



26. Push the right joystick forward to advance the thrust rig and to drive the drill rod further into the ground.

Repeat this process until the pilot bore is completed.

6.6.2 Full-Auto mode during pilot bore



If the machine is in "pilot bore" mode (see rocker switch on the right joystick panel) and you press the push button for automatic drilling on the left joystick twice in quick succession, the thrust rig is driven forward to the stop, then the next rod comes to be screwed in place.
This process is repeated until it is terminated by pressing the push button on the left joystick once again or by leaving the operator seat.

⚠ DANGER

Risk of injury due to machine movements during auto-bore!

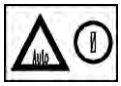
- Sit down on the operator seat to keep out of the machine's movement range.
- Remain seated until all working steps of the auto-bore have been completed.
- Make sure that nobody is standing in the machine's movement range.

Requirements

– The drilling fluid pump is switched on.
– The drilling fluid quantity is set.
– The screw connection between drill rod and sub-saver is situated precisely between the two clamp jaws.
This position is indicated by the rod length indicator in the "Bore mode" screen being highlighted in green.



1. Switch on fully automatic mode for pilot bore by double-clicking the push button for automatic drilling on the left joystick.
   ⇨ The thrust rig is driven forward to the stop.
   ⇨ The next drill rod comes to be screwed in place.
   ⇨ The rod connection is now situated exactly between the two clamp jaws.



2. The fully automatic mode for pilot bore can be interrupted by pressing the push button for automatic drilling on the left joystick again or by leaving the operator seat.

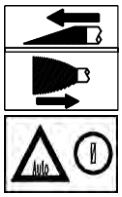
Note the following with regard to automatic mode for push operation:



Info!

– You can also change the settings for the rotation, thrust speed and flow rate during push operation.
– When automatic mode for push operation is switched on, it is not necessary to move the joysticks.
– Should the push head turn tight or get caught in the ground, reduce the thrust speed on the potentiometer of the right joystick panel or increase the engine speed using the potentiometer on the joystick.

6.6.3 Semi-Auto mode during pilot bore



If the machine is in "pilot bore" mode (see rocker switch on the right joystick panel) and you press the push button for automatic drilling on the left joystick twice in quick succession, the thrust rig is automatically driven forward to the stop.

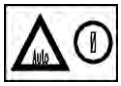
⚠ DANGER

Risk of injury due to machine movements during auto-bore!

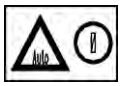
- Sit down on the operator seat to keep out of the machine's movement range.
- Remain seated until all working steps of the auto-bore have been completed.
- Make sure that nobody is standing in the machine's movement range.

Requirements

- The drilling fluid pump is switched on.
- The drilling fluid quantity is set.
- The screw connection between drill rod and sub-saver is situated precisely between the two clamp jaws.
  This position is indicated by the rod length indicator in the "Bore mode" screen being highlighted in green.



1. Switch on semi-automatic mode for push operation by double-clicking the push button for automatic drilling on the left joystick.
   ⇨ The thrust rig is driven forward to the stop.
   ⇨ The rod connection is now situated exactly between the two clamp jaws.



2. The semi-automatic mode for push operation can be interrupted by pressing the push button for automatic drilling on the left joystick again or by leaving the operator seat.

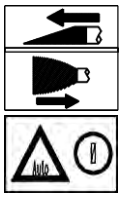
Note the following with regard to automatic mode for push operation:



Info!

- You can also change the settings for the rotation, thrust speed and flow rate during push operation.
- When automatic mode for push operation is switched on, it is not necessary to move the joysticks.
- Should the push head turn tight or get caught in the ground, reduce the thrust speed on the potentiometer of the right joystick panel or increase the engine speed using the potentiometer on the joystick.

6.6.4 Automatic rod exchange



If the machine is in "pilot bore" mode (see rocker switch on the right joystick panel) and you briefly press the push button for automatic drilling on the left joystick once, the sub-saver will be loosened, the thrust rig reversed, an additional rod inserted and screwed on.

⚠ DANGER

Risk of injury due to machine movements during auto-bore!

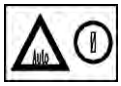
- Sit down on the operator seat to keep out of the machine's movement range.
- Remain seated until all working steps of the auto-bore have been completed.
- Make sure that nobody is standing in the machine's movement range.

Starting position

– The drilling fluid pump is switched off.
– The screw connection between drill rod and sub-saver is situated precisely between the two clamp jaws.
This position is indicated by the rod length indicator in the "Bore mode" screen being highlighted in green.

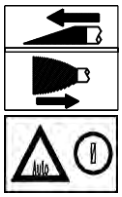


1. Switch on automatic rod exchange with a single click on the push button for automatic drilling on the left joystick.
   ⇨ The sub-saver is loosened.
   ⇨ The thrust rig is reversed.
   ⇨ The next drill rod comes to be screwed in place.



2. The automatic rod exchange can be interrupted by pressing the push button for automatic drilling on the left joystick again or by leaving the operator seat.

6.6.5 Automatic rod break-away or semi-automatic mode



If the machine is in "pilot bore" mode (see rocker switch on the right joystick panel) and you briefly press the push button for automatic drilling on the left joystick once, the sub-saver will be loosened and the thrust rig reversed.

⚠ DANGER

Risk of injury due to machine movements during auto-bore!

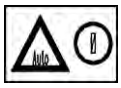
- Sit down on the operator seat to keep out of the machine's movement range.
- Remain seated until all working steps of the auto-bore have been completed.
- Make sure that nobody is standing in the machine's movement range.

Starting position

– The drilling fluid pump is switched off.
– The screw connection between drill rod and sub-saver is situated precisely between the two clamp jaws.
This position is indicated by the rod length indicator in the "Bore mode" screen being highlighted in green.



1. Switch on automatic rod break-away with a single click on the push button for automatic drilling on the left joystick.
   ⇨ The sub-saver is loosened.
   ⇨ The thrust rig is reversed.



2. Automatic rod break-away can be interrupted by pressing the push button for automatic drilling on the left joystick again or by leaving the operator seat.

6.7 Wire-controlled drilling

Depending on the soil conditions, depth, type and duration of the planned bore, it may be necessary to carry out the bore with a wire-controlled transmitter as the transmission power of the battery-powered transmitter inside the bore head assembly may be insufficient to transfer the data to the detection system.

Standard transmitters can be operated for about 18 h, other transmitters with higher power for about 35 h and transmitters with lithium-ion batteries for maximally 120 h. TRACTO-TECHNIK recommends wire-controlled drilling from bore depths of 20 m.

For wire-controlled drilling, the transmitter inside the bore head assembly is supplied with 24 V via a cable to increase the transmission power. The cable is guided through the drill rod and connected to the bore rig via a sliding contact. The cable must be extended with every added drill rod.
The cable is also used to send data regarding the inclination and o'clock position of the drill head back to the bore rig.
The direction and position of the drill head are measured with the detection system.

Normally the system for wire-controlled drilling is rented out to the customer.
All required parts, tools and consumables are provided by TRACTO-TECHNIK in a ready-packed crate.
All components are tested by TRACTO-TECHNIK before being sent out. Only use supplied components from TRACTO-TECHNIK. This ensures that wire-controlled drilling works as described in the following.

For wire-controlled drilling the bore head assembly and the bore rig have to be converted (chapter 5.9, page 106 and chapter 5.10, page 109).
The TRACTO-TECHNIK customer service (chapter 8, page 279) can assist you with the conversion.

Auto-bore is not possible with wire-controlled drilling.

At least three – preferably four – people are required for wire-controlled drilling:
- one operator inside the cab
- one person at the front of the bore rig for the cable connection
- one person at the rear of the bore rig for the operation of the cable pulling aid and the reel
- one person for locating the drill head with the detection system

Drilling takes about 10–15 minutes for each drill rod.

Info!
For bore lengths of up to 300 m please use a cable with a cross section of 6 mm^2, for longer bores use a cable with a cross section of 10 mm^2.

6.7.1 Pilot bore with wire-controlled drilling

Requirements

- The bore head assembly is equipped with a transmitter with cable (chapter 5.9, page 106).
- The bore rig is converted for wire-controlled drilling (chapter 5.10, page 109).
- The tools and consumables for wire-controlled drilling are ready for use.

NOTICE



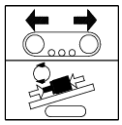
Oils and greases hazardous to the environment!

Danger of environmental pollution!

- Do not let oils and greases penetrate into the soil, waters or the sewage system.
- Dispose of used oil, oily cloths and empty hydraulic containers in an environmentally responsible way and according to the respective laws of your country, e.g. at collection points.

1. Always grease the drill rod threads!
   Avoid excessive grease on the drill rods. Prevent oils and greases from penetrating into the soil, water or sewage system.

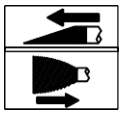
Operator on operator seat – inserting a rod



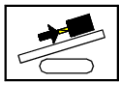
2. If necessary, switch over from drive mode to bore mode on the right joystick panel.



3. Set the engine speed to approx. 1,400 rpm via the potentiometer on the right joystick.

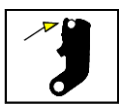


4. Switch over from pull-in to pilot bore on the right joystick panel.

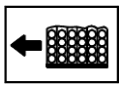




5. Completely reverse the thrust rig to the stop position by pulling the right joystick backwards.
   By pressing the >>Rapid motion on<< push button on the right joystick, you can quickly reverse the thrust rig.



6. If necessary, swing the gripper arms into the rod retaining position by moving the right joystick to the right.



7. Move the rod box to bay 1 by pressing the push button on the left joystick once.
   For this purpose, the hydraulic jacks are raised, the rod box is positioned and moved to the next bay.

Info!
To ensure an even wear of the drill rods, please start in turn with the outer and the inner bay.

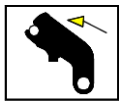


8. Open the rod grippers for the drill rod so that the hydraulic jack can move down. To do so, push the left joystick to the left.
   Only let go of the joystick once the drill rod has been placed inside the rod grippers!



9. Close the rod grippers by pressing the left joystick to the right.

Info!
You can only swing the gripper arms into the bore axis when the thrust rig is completely reversed.



10. Then, by pushing the right joystick to the left, swing the gripper arms with the drill rod into the bore axis until the rear operator can easily reach the drill rod. The hydraulic jacks move upwards.

⚠ DANGER



Draw-in and crush hazard due to unexpected machine movements!

- Switch off all bore rig movements while the cable is being pulled into the drill rod.

Front operator

11. Block the bore rig functions by turning the rotary switch on the front operating panel to the right.

Rear operator

12. Open the safety door.
13. Pull the cable from the cable drum through the cable feed-through on the metal plate and through the cable feed-through on the sub-saver (1) until it hangs out at the front of the sub-saver.

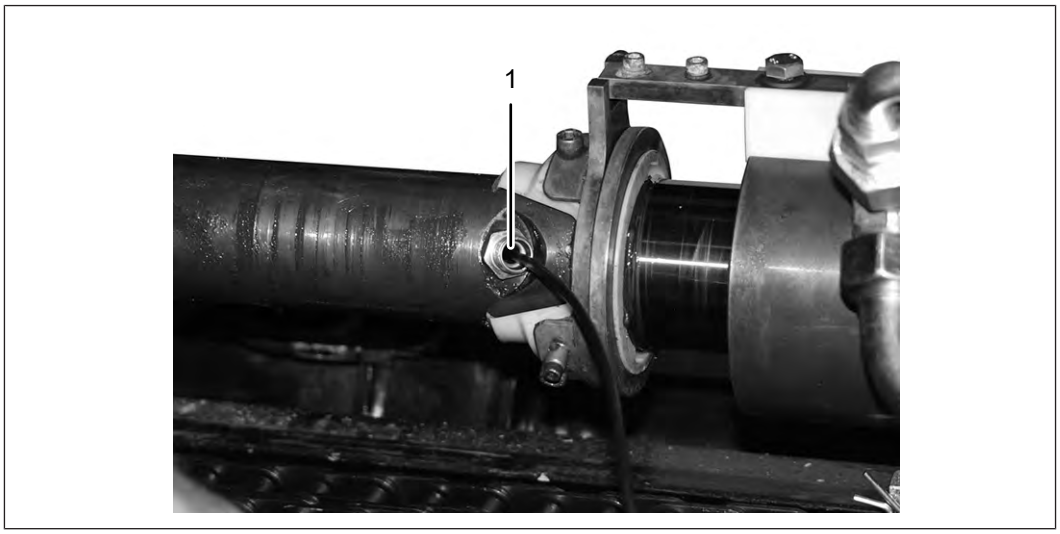


Fig. 6-78 Cable drawn-in

14. Push the cable pulling aid (fibre optic cable) from the rear through the drill rod.
15. Connect the cable to the cable pulling aid.

Front operator – connecting the cable

16. Use the cable pulling aid to pull the cable through the drill rod. The front end should protrude approx. 50 cm from the front of the drill rod.
17. Disconnect the cable pulling aid from the cable.
18. Connect the transmitter cable to the wire sticking out of the front of the drill rod.
    ⇨ Strip the end of the transmitter cable and slide a crimp connector onto the cable.



Fig. 6-79 Crimp connector on cable

⇨ Crimp the crimp connector onto the cable twice using the pliers. The second time, turn the pliers by 180°.



Fig. 6-80 Crimping the crimp connector

⇨ Cut off a piece of shrinking hose three times as long as the crimp connector and slide it onto the cable with the crimp connector.



Fig. 6-81 Sliding on the shrinking hose

⇨ Strip the end of the cable inside the drill rod and plug it into the crimp connector.

⇨ Firmly crimp the cable twice using the pliers. The second time, turn the pliers by 180°.



Fig. 6-82 Crimping the second cable

⇨ Slide the shrinking hose centrally onto the crimp connector.



Fig. 6-83 Sliding on the shrinking hose

⇨ Use a heat gun or soldering lamp to evenly shrink the shrinking hose until the adhesive exits on both sides of the shrinking hose.

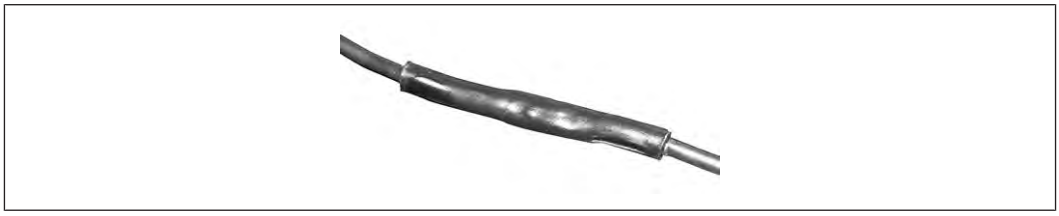


Fig. 6-84 Shrinking the shrinking hose

⇨ Let the shrinking hose cool down before proceeding.

19. Screw the prepared bore head assembly with transmitter manually onto the first drill rod. The bore head assembly can later be fixed additionally by means of the clamp.

Rear operator – tightening the cable

20. Pull the cable back on the screwing of the sub-saver and slightly straighten it.
21. Lock the cable drum.
22. Close the safety door.

Front operator

23. Release the bore rig functions by turning the rotary switch on the front operating panel to the left.

⚠ DANGER

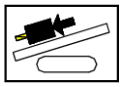
Rotating drill rod!

Contact with the rotating drill rod can lead to injuries or death!

- Only start drilling operation if there is nobody in the range of rotating parts.
- Only personnel required to operate the machine are allowed near the machine.
- Keep out of the danger area.
- Keep away from rotating parts.

Info!

Press one of the emergency stop buttons to immediately stop the machine in the event of an emergency.



24. Push the right joystick forwards to advance the thrust rig until the threading of the sub-saver is positioned inside the rod.

Front operator

25. Block the bore rig functions by turning the rotary switch on the front operating panel to the right.

Rear operator

26. Open the safety door and sever the cable approx. 50 cm behind the sub-saver.



Fig. 6-85 Cutting off the cable

27. Unlock the cable drum and reel in the remaining cable back onto the cable drum so the loose end cannot be drawn in.
28. Close the safety door.

Front operator

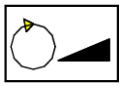
29. Release the bore rig functions by turning the rotary switch on the front operating panel to the left.

NOTICE

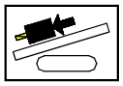
Possible damage to the threads due to too fast rotation or too high thrust speed!

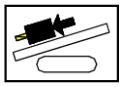
- When screwing the sub-saver to the rods and the rods to each other, proceed slowly and with low thrust to avoid damaging the threads.

Operator on operator seat



30. Switch on clockwise rotation by pushing the left joystick forward and holding it in this position.
Simultaneously push the right joystick forward to advance the thrust rig until the sub-saver and the first drill rod have been screwed together.



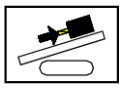


31. Push the right joystick forward to slowly advance the thrust rig until the front end of the drill rod rests inside the clamp.





32. Open the rod grippers by pushing the left joystick to the left and holding it in this position.
Then swing the gripper arms underneath the rod box by moving the right joystick to the right. **Only let go of the joystick once the drill rod has been placed inside the rod grippers!**



33. Completely reverse the thrust rig to the stop position by pulling the right joystick backwards.

Front operator

34. Block the bore rig functions by turning the rotary switch on the front operating panel to the right.

Rear operator

35. Open the safety door.
36. Slide the seal (1), the pressure piece (2) and the screwing (3) onto the cable. The pressure piece must be slid onto the cable with the conical side pointing towards the screwing.

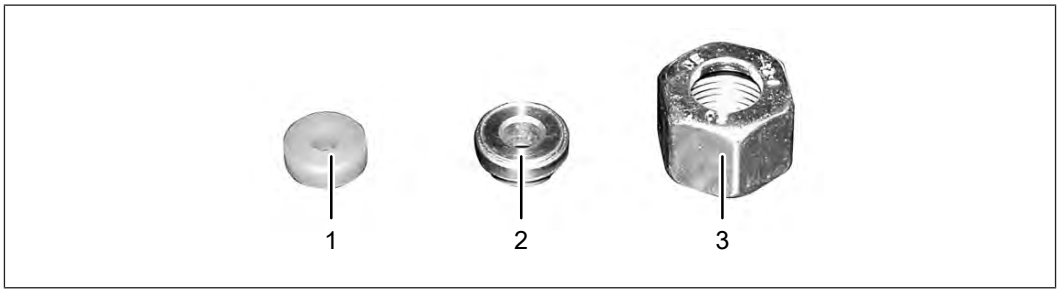


Fig. 6-86 Seal, pressure piece and screwing

37. Loosely wrap the cable end around the sub-saver once so that the cable cannot be pulled into the sub-saver by the drilling fluid flowing through.
38. Connect the stripped cable end to the friction ring (1; knurled-head screw or hexagon nut).

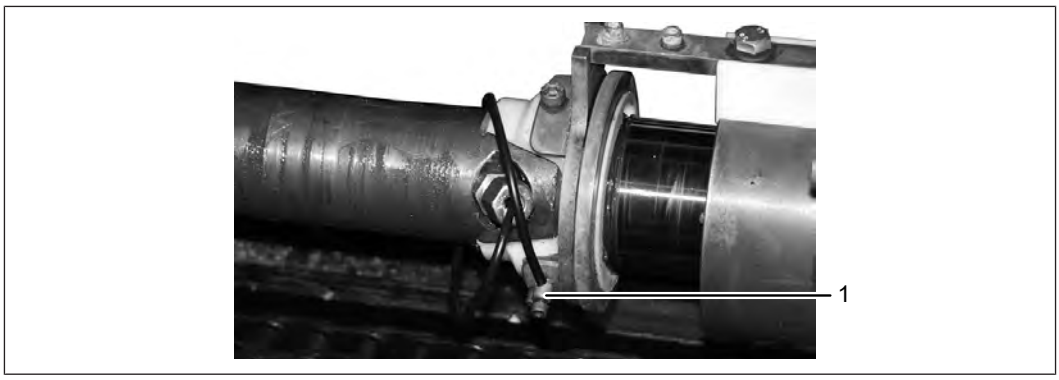


Fig. 6-87 Cable connected to friction ring

39. Close the safety door.

⚠ DANGER

Rotating drill rod!

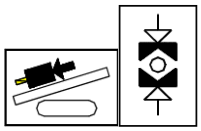
Contact with the rotating drill rod can lead to injuries or death!

- Only start drilling operation if there is nobody in the range of rotating parts.
- Only personnel required to operate the machine are allowed near the machine.
- Keep out of the danger area.
- Keep away from rotating parts.

Info!

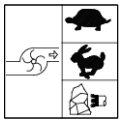
Press one of the emergency stop buttons to immediately stop the machine in the event of an emergency.

Operator on operator seat – pilot bore



40. Push the right joystick forward to advance the thrust rig until the drill head reaches the ground.
41. You can additionally clamp the drilling lance to hold it in place.

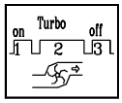
Checking the drill head nozzles



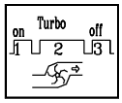
42. Only for optional P72 pump:
    Set the drilling fluid to tortoise (low flow rate) on the left joystick panel.



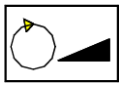
43. Set the potentiometer for the drilling fluid quantity on the left joystick to centre position.



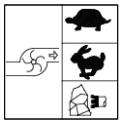
44. Switch on the drilling fluid pump on the left joystick by briefly pressing the push button.
45. Check whether drilling fluid exits from all nozzles of the drill head.



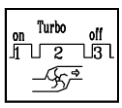
46. Switch the drilling fluid off again by briefly pressing the push button on the left joystick.



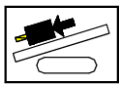
47. Push the left joystick forward to turn the drill rod exactly into "6 o'clock position".



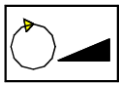
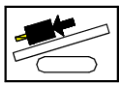
48. Only for optional P72 pump:
    Set the drilling fluid to tortoise (low flow rate) on the left joystick panel.



49. Switch on the drilling fluid pump on the left joystick by briefly pressing the push button.

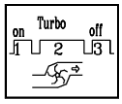


50. Push the right joystick forward to advance the thrust rig until the bore tip has entered the ground by approx. 30–40 cm.
51. Only for optional P72 pump:
    Leave the drilling fluid switched on.

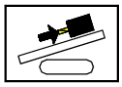



52. Switch on clockwise rotation by pushing the left joystick forward and holding it in this position.
    At the same time, push the right joystick forward to drive the thrust rig forward until the drill rod has completely entered the ground, or until the thrust rig has driven to the front stopper.

Info!
This way the rod connection lies exactly between both clamps.

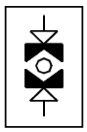


53. Switch the drilling fluid off again by briefly pressing the push button on the left joystick.



54. Pull the right joystick back to reverse the thrust rig by approx. 5 cm to enable length compensation of the sub-saver.

Info!
Now you can locate the drill head (see instructions provided by the manufacturer of the detection system).



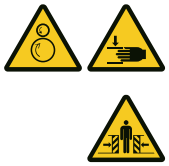
55. Close the clamp via the push button on the right joystick.

Info!
Temperature-related pressure drop possible.
When working, cooling of the hydraulic oil in the clamp cylinder can lead to a pressure drop in the clamp cylinder if the clamp cylinder is kept pressurised for a longer period of time.
In manual mode, actuate the clamp repeatedly to maintain the pressure.
In automatic mode, this is carried out automatically by the machine.

Info!
As soon as the clamp is closed, the valve for drilling fluid pressure relief will open automatically.

⚠ DANGER

Draw-in and crush hazard due to unexpected machine movements!



- Switch off all bore rig movements while the cable is being pulled into the drill rod.

Front operator

56. Block the bore rig functions by turning the rotary switch on the front operating panel to the right.

Front operator – disconnecting the cable

57. Disconnect the cable from the friction ring.
58. Open the cable screwing at the sub-saver to prevent the cable from being torn off while unscrewing the sub-saver.

Front operator

59. Release the bore rig functions by turning the rotary switch on the front operating panel to the left.

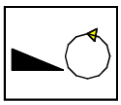
⚠ DANGER

Rotating drill rod!

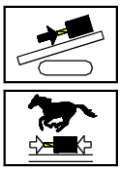
Contact with the rotating drill rod can lead to injuries or death!

- Only start drilling operation if there is nobody in the range of rotating parts.
- Only personnel required to operate the machine are allowed near the machine.
- Keep out of the danger area.
- Keep away from rotating parts.

Operator on operator seat – detaching the sub-saver from the rod



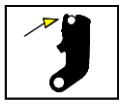
60. Fully unscrew the drill rod from the thrust rig or sub-saver counter-clockwise by pulling the left joystick back.
    ⇨ In doing so, the cable is pulled out of the sub-saver. The loose end of the cable is exposed at the front of the clamp.



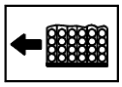
61. Completely reverse the thrust rig to the stop position by pulling the right joystick backwards.
    By pressing the >>Rapid motion on<< push button on the right joystick, you can quickly reverse the thrust rig.

6.7.2 Adding further drill rods during wire-controlled drilling

Operator on operator seat – inserting a rod



1. If necessary, swing the gripper arms into the rod retaining position by moving the right joystick to the right.



2. Move the rod box to bay 1 by pressing the push button on the left joystick once. For this purpose, the hydraulic jacks are raised, the rod box is positioned and moved to the next bay.

Info!
To ensure an even wear of the drill rods, please start in turn with the outer and the inner bay.

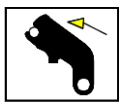


3. Open the rod grippers for the drill rod so that the hydraulic jack can move down. To do so, push the left joystick to the left.
Only let go of the joystick once the drill rod has been placed inside the rod grippers!



4. Close the rod grippers by pressing the left joystick to the right.

Info!
You can only swing the gripper arms into the bore axis when the thrust rig is completely reversed.



5. Then, by pushing the right joystick to the left, swing the gripper arms with the drill rod into the bore axis until the rear operator can easily reach the drill rod. The hydraulic jacks move upwards.

⚠ DANGER **Draw-in and crush hazard due to unexpected machine movements!**



- Switch off all bore rig movements while the cable is being pulled into the drill rod.

Front operator

6. Block the bore rig functions by turning the rotary switch on the front operating panel to the right.

Rear operator

7. Open the safety door.
8. Pull the cable from the cable drum through the cable feed-through on the metal plate and through the cable feed-through on the sub-saver (1) until it hangs out at the front of the sub-saver.

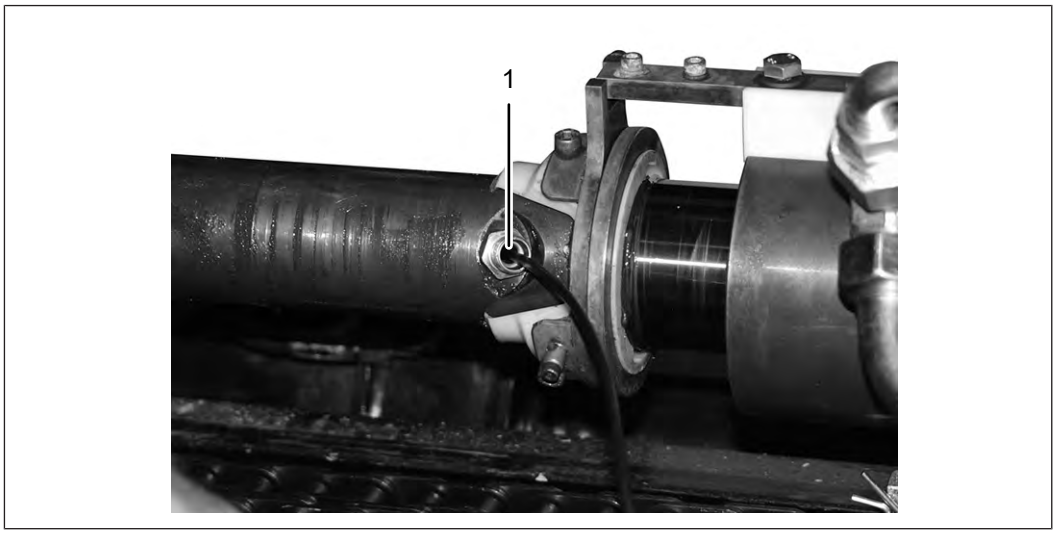


Fig. 6-88 Cable drawn-in

9. Push the cable pulling aid (fibre optic cable) from the rear through the drill rod.
10. Connect the cable to the cable pulling aid.

Front operator – connecting the cable

11. Use the cable pulling aid to pull the cable through the drill rod. The front end should protrude approx. 50 cm from the front of the drill rod.
12. Disconnect the cable pulling aid from the cable.
13. Connect the new and old cable by use of a crimp connector (chapter 6.7.1, page 227).
14. Wait until the shrinking hose has cooled down.

Rear operator – tightening the cable

15. Pull the cable back on the screwing of the sub-saver and slightly straighten it.
16. Lock the cable drum.
17. Close the safety door.

Front operator

18. Release the bore rig functions by turning the rotary switch on the front operating panel to the left.

⚠ DANGER

Rotating drill rod!

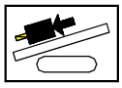
Contact with the rotating drill rod can lead to injuries or death!

- Only start drilling operation if there is nobody in the range of rotating parts.
- Only personnel required to operate the machine are allowed near the machine.
- Keep out of the danger area.
- Keep away from rotating parts.

Info!

Press one of the emergency stop buttons to immediately stop the machine in the event of an emergency.

Operator on operator seat



19. Press the right joystick forward to advance the thrust rig until the threading of the sub-saver fits into the rod and the pin of the new rod is seated in the rod ahead.

Rear operator

20. Open the safety door and sever the cable approx. 50 cm behind the sub-saver.



Fig. 6-89 Cutting off the cable

21. Unlock the cable drum and reel in the remaining cable back onto the cable drum so the loose end cannot be drawn in.
22. Close the safety door.

Front operator

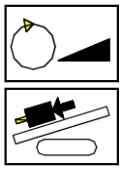
23. Release the bore rig functions by turning the rotary switch on the front operating panel to the left.

NOTICE

Possible damage to the threads due to too fast rotation or too high thrust speed!

- When screwing the sub-saver to the rods and the rods to each other, proceed slowly and with low thrust to avoid damaging the threads.

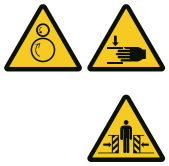
Operator on operator seat



24. Switch on clockwise rotation by pushing the left joystick forward and holding it in this position.
    Simultaneously push the right joystick forward to advance the thrust rig until the sub-saver, the first and the second drill rod are screwed together. Always screw on the rods with maximum torque.

⚠ DANGER

Draw-in and crush hazard due to unexpected machine movements!



- Switch off all bore rig movements while the cable is being pulled into the drill rod.

Front operator

25. Block the bore rig functions by turning the rotary switch on the front operating panel to the right.

Rear operator

26. Open the safety door.
27. Slide the seal (1), the pressure piece (2) and the screwing (3) onto the cable. The pressure piece must be slid onto the cable with the conical side pointing towards the screwing.

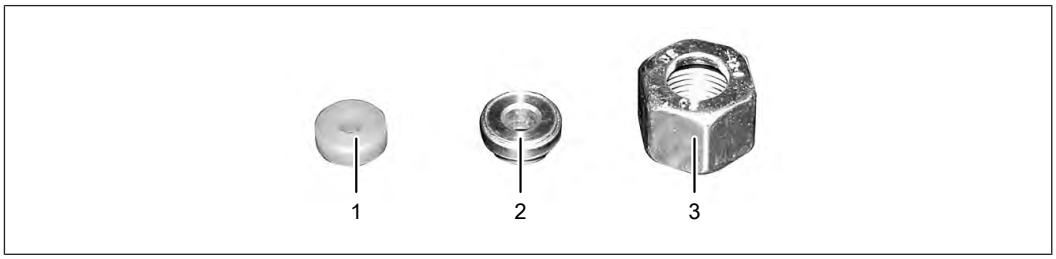


Fig. 6-90 Seal, pressure piece and screwing

28. Loosely wrap the cable end around the sub-saver once so that the cable cannot be pulled into the sub-saver by the drilling fluid flowing through.

29. Connect the stripped cable end to the friction ring (1; knurled-head screw or hexagon nut).

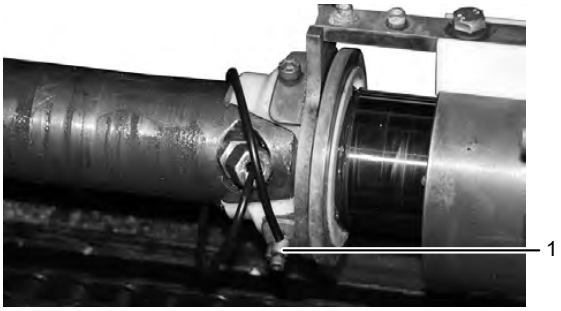


Fig. 6-91 Cable connected to friction ring

30. Close the safety door.

Front operator

31. Release the bore rig functions by turning the rotary switch on the front operating panel to the left.

⚠ DANGER

Rotating drill rod!

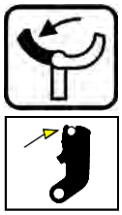
Contact with the rotating drill rod can lead to injuries or death!

- Only start drilling operation if there is nobody in the range of rotating parts.
- Only personnel required to operate the machine are allowed near the machine.
- Keep out of the danger area.
- Keep away from rotating parts.

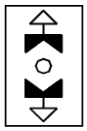
Info!

Press one of the emergency stop buttons to immediately stop the machine in the event of an emergency.

Operator on operator seat – continuing the bore



32. Open the rod grippers by pushing the left joystick to the left and holding it in this position.
Then swing the gripper arms underneath the rod box by moving the right joystick to the right. **Only let go of the joystick once the drill rod has been placed inside the rod grippers!**



33. Close the clamp via the push button on the right joystick.

34. Continue drilling until the rod connection is again situated between the two clamp jaws.

Repeat this process until the pilot bore has been completed.

6.8 Inserting and removing an additional rod into/from the rod box

A full rod box contains 60 type TD73 drill rods for a bore length of 180 m, or 70 type TD61 drill rods for a bore length of 210 m.

If a larger rod quantity is required, single drill rods may be added.
The weights for a full rod box and a single rod can be gathered from the technical data.

⚠ WARNING



Risk of injury if personal protective equipment is not worn!

- Always wear your personal protective equipment, including ear protection and a work vest in fluorescent colours.
- During drilling, wear the comprehensive protective equipment included in the scope of delivery of the electric shock warning device.

⚠ DANGER

Falling drill rods!

When inserting single drill rods into or removing them from the rod box there is a danger of the rods getting jammed and consequently of them falling out with a jerk upon loosening. There is a risk of injury due to jammed drill rods if the outer bay of the rod box is not empty.

- Make sure that the outer bay of the rod box is empty before adding or removing individual rods.

Info!
For re-loading the rod box use the rod changing system.

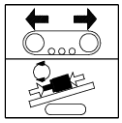
6.8.1 Inserting individual rods into the rod box

Requirements

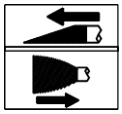
- The outer bay of the rod box is empty.
- At least one of the other bays of the rod box is not filled completely.
- The thrust rig is reversed.
- The grippers of the gripper arm are empty.
- The operating mode "pilot bore" has been selected (chapter 6.6, page 216).

Info!
It is more favourable for the rod box to be slightly aslant upon inserting single rods so that the new rods can slide on forward.

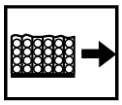
Preparation



1. If necessary, switch over from drive mode to bore mode on the right joystick panel.



2. Switch over from pull-in to pilot bore on the right joystick panel.



3. Move the rod box inwards so that the outer bay is positioned above the lifting cylinders.
4. Stop the machine.
5. Fold down the side cover (1) at the rod box and loosen the two M16 hexagonal screws (2) of the fold-out legs (3).
6. Fold the side cover back up.
7. Fold out the front and rear legs at the rod box and lock them in place (4).

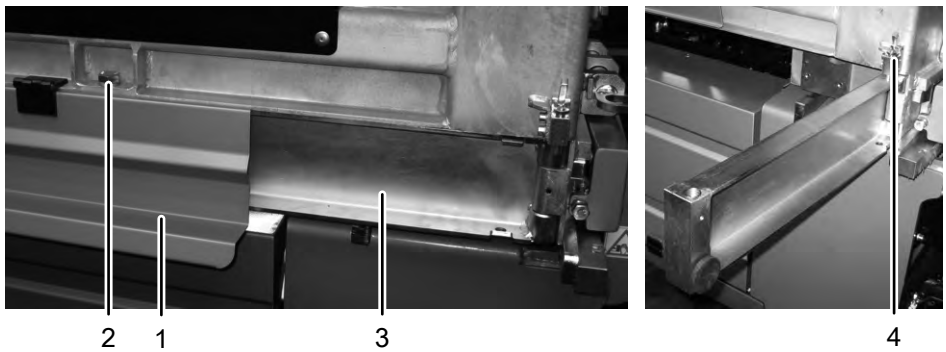


Fig. 6-92 Folding out the lateral legs of the rod box

8. Loosen the split pin with the bolt at the long loading aids (1) at the front of the rod box and remove the two loading aids.
   ⇨ Put the split pin back into its holder to prevent it from going missing.

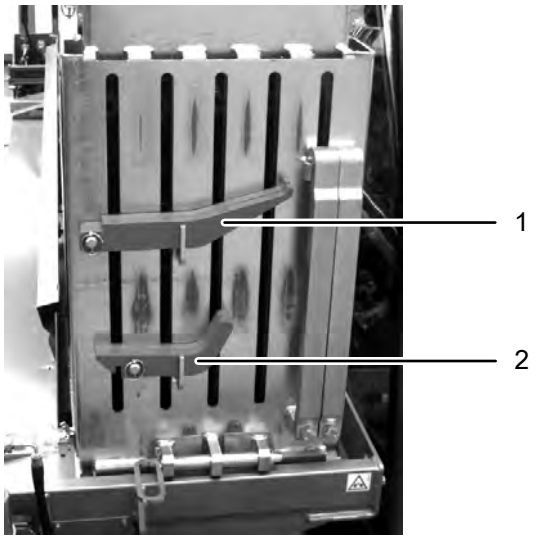


Fig. 6-93 Loading and unloading aids

9. Dismount the existing rod supports (2) by holding them with one hand and simultaneously folding up and pulling out the bolt (1) with the other.
10. Mount the loading aids (3) at the front and rear of the rod box by inserting them in the retainer with one hand and reinserting and folding down the bolt with the other.

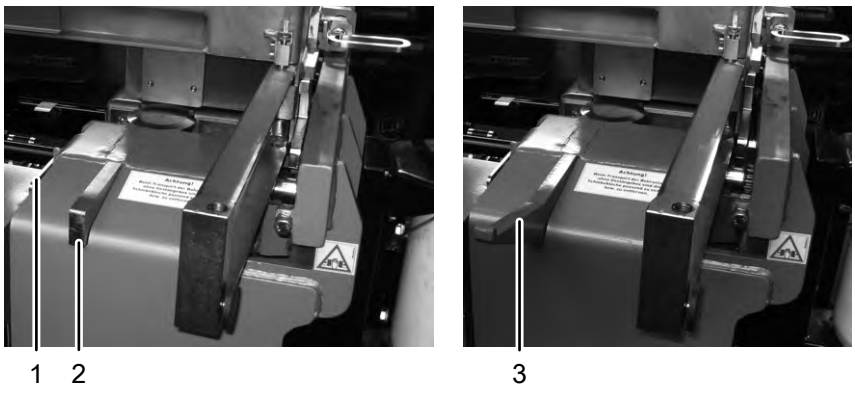


Fig. 6-94 Mounting the loading aids

11. Start the engine.

12. Turn the key switch (1) on the additional operating panel of the rod box to the right to switch on the insertion/removal automatism for single rods. Operation from the cab is deactivated.

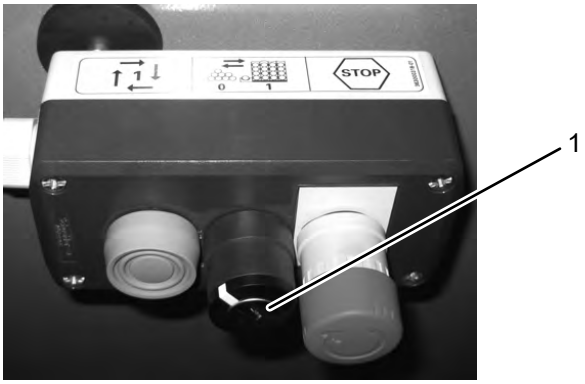


Fig. 6-95 Key switch for automatic rod feed and removal

⚠ DANGER

Crush hazard!

Danger of hand injuries when loading single rods.

- Wear hand protection.

Procedure

13. Place the new single rod onto the loading aids and roll it onto the lifting device.
14. If necessary, fold down the two lateral safeguards (1) on the rod box so that the new rod cannot roll away.



Fig. 6-96 Folding down the safeguards

15. Press the >>start automatic<< button (1) on the automatic rod feed and removal operating panel:



Fig. 6-97 Button for automatic rod feed and removal

⇨ The rod is automatically transported into the next empty bay. The operation is completed in the starting position.

⇨ The rod box moves back into the starting position so that the outer bay is situated above the lifting cylinders and the next rod can be inserted.

Repeat the steps 13 to 15 until all the desired single rods have been inserted.

Info!

- The >>start automatic<< button must be pressed for every single rod.
- The process is repeated until the bay is full. After that you continue with the next bay.
- The outer bay cannot be filled with single rods and must always remain empty during this procedure.

Terminating the automatism

Once all single rods are inserted:

- Switch the automatic rod feed and removal off again via the key switch of the additional operating panel.
- Dismount the loading aids and stow them away in the holder at the front of the rod box.
- Reassemble the rod supports.
- Fold the legs back inwards and fasten them in place.
- Fold the side cover on the rod box back down.

Continue with the pilot bore.

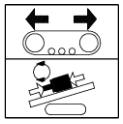
6.8.2 Removing single rods from the rod box

If, during the pilot bore, you notice that a rod is defective or worn, remove it from the rod box.
The weight of the single rods can be gathered from the technical data.

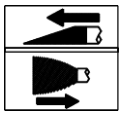
Requirements

- The outer bay of the rod box is empty.
- The thrust rig is reversed.
- The operating mode "expansion/pull-in mode" has been selected.

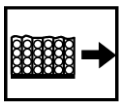
Preparation



1. If necessary, switch over from drive mode to bore mode on the right joystick panel.



2. Switch over from pilot bore to pull-in mode on the right joystick panel.



3. Move the rod box inwards so that the outer bay is positioned above the lifting cylinders.
4. Stop the machine.
5. Fold down the side cover (1) at the rod box and loosen the two M16 hexagonal screws (2) of the fold-out legs (3).
6. Fold the side cover back up.
7. Fold out the front and rear legs at the rod box and lock them in place (4).

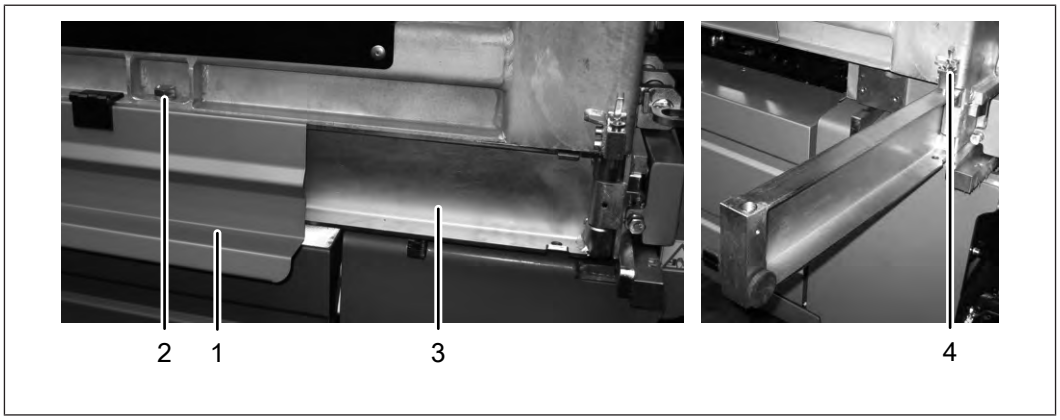


Fig. 6-98 Folding out the lateral legs of the rod box

8. Loosen the split pin with the bolt at the short unloading aids (2) at the front of the rod box and remove the two unloading aids.
   ⇨ Put the split pin back into its holder to prevent it from going missing.

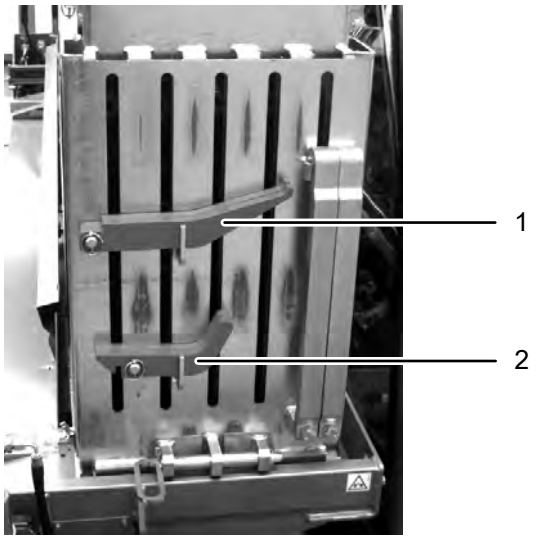


Fig. 6-99 Loading and unloading aids

9. Dismount the existing rod supports (2) by holding them with one hand and simultaneously folding up and pulling out the bolt (1) with the other.
10. Mount the two unloading aids (3) at the front and rear of the rod box by hooking them in on the front edge.

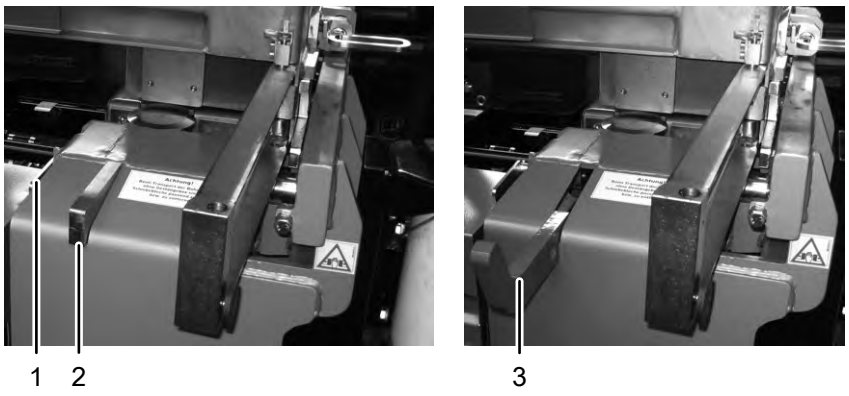


Fig. 6-100 Mounting the unloading aids

11. Start the engine.

12. Turn the key switch (1) on the additional operating panel of the rod box to the right to switch on the insertion/removal automatism for single rods. Operation from the cab is deactivated.

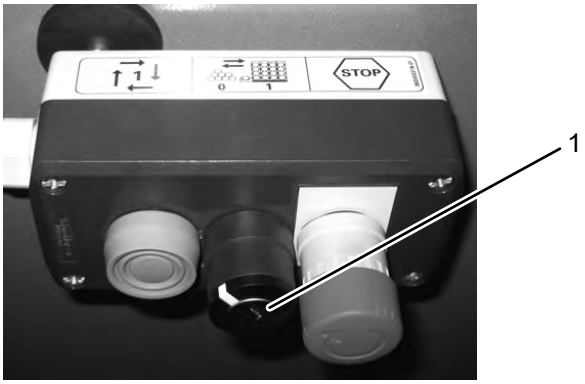


Fig. 6-101 Key switch for automatic rod feed and removal

Info!
The automatic rod feed and removal empties the rod box starting from the inner bay, i.e. first the inner bay is emptied, then the second, thereafter the third bay etc.

Procedure

13. Press the >>start automatic<< button (1):



Fig. 6-102 Button for automatic rod feed and removal

⇨ The rod box moves outward until the rod placed down rolls outward over the slant towards the edge of the unloading aids.
There the rod can be removed.

⇨ Afterwards the rod box moves back in towards the bay from which the rod has been removed.

⇨ The rod removal of one rod is now completed.

Once all single rods have been removed:

- Switch the automatic rod feed and removal off again via the key switch of the additional operating panel.
- Dismount the unloading aids and stow them away in the holder at the front of the rod box.
- Reassemble the rod supports.
- Fold the legs back inwards and fasten them in place.
- Fold the side cover on the rod box back down.

Continue with the pilot bore.

6.9 Exchanging the rod box



Info!
This chapter contains information on how to change the rod box.
Information regarding the number of drill rods per rod box, the weight of a full rod box and the weight of a drill rod can be found in the technical data (chapter 3.3, page 55).

⚠ WARNING



Crush hazard!

When attaching or detaching the chain strand and when guiding the rod box there is a hand crush hazard.

- Wear hand protection.

⚠ WARNING



Impact hazard due to the rod box hanging from the crane!

When guiding the rod box there is a risk of head impact due to the rod box hanging from the external lifting device.

- Wear head protection.

Requirements

- Drilling is finished or has not yet started.
- The machine is in transport position on a level surface.
  - The rig is aligned horizontally.
  - The rear and optional front stabiliser is lowered.
  - The anchor plate is raised.
- A sufficiently dimensioned external lifting device (e.g. crane) with a four-leg chain is provided to lift the rod box.
- Suitable squared timbers are available for storing the rod box.

6.9.1 Disassembling the rod box

1. Fold up the cover sheet under the rod box.

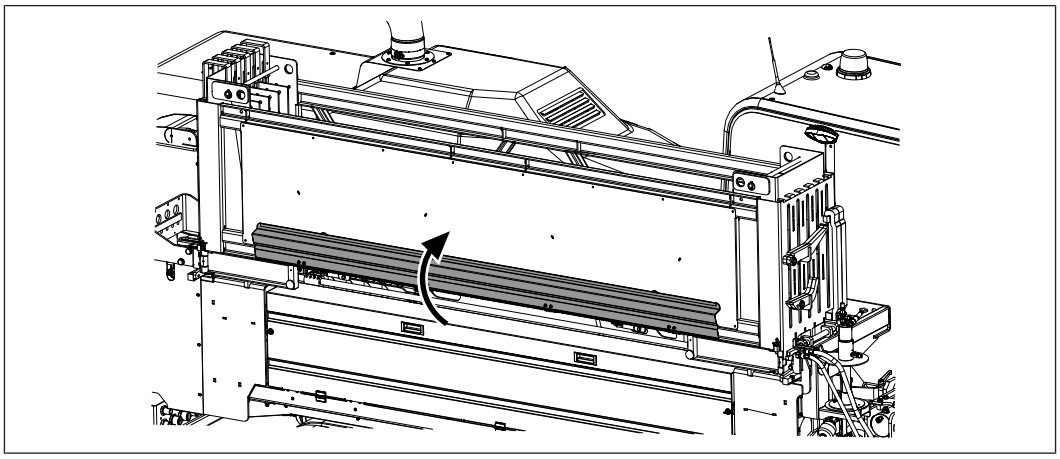


Fig. 6-103 Folding up the cover plate of the rod box

2. Detach the rod holding bars (1) from the rod box.
3. Insert the two rod holding bars from the outside under the rod box, push them through and pull the hooks into the connectors of the rod box.
4. Fasten the two rod holding bars with one screw (2) each on the outside of the rod box.

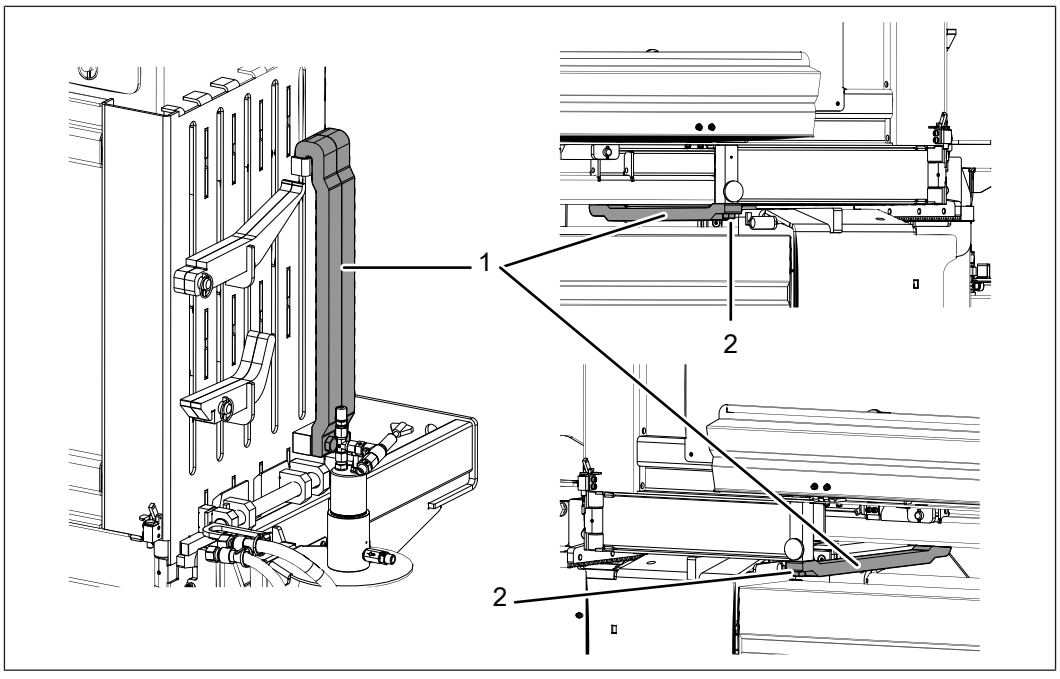


Fig. 6-104 Mounting the rod holding bars

5. Secure the rod box with the external lifting device from above using the outer attachment points.

6. Swing the sensor (1) for the bay fill level detection to the side and fix it in place.

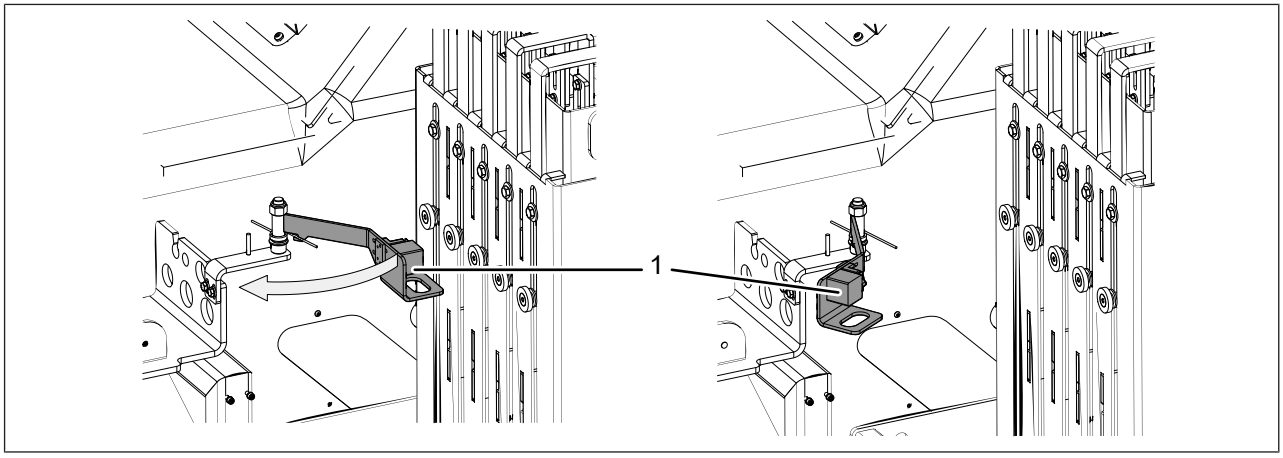


Fig. 6-105 Swinging out and fixing sensor for bay fill level detection

7. Remove the locks of the rod box at the front and rear:
   - ⇨ Remove the linchpin (1) from the bolt.
   - ⇨ Turn the handle (2) of the bolt counter-clockwise and pull out the bolt.

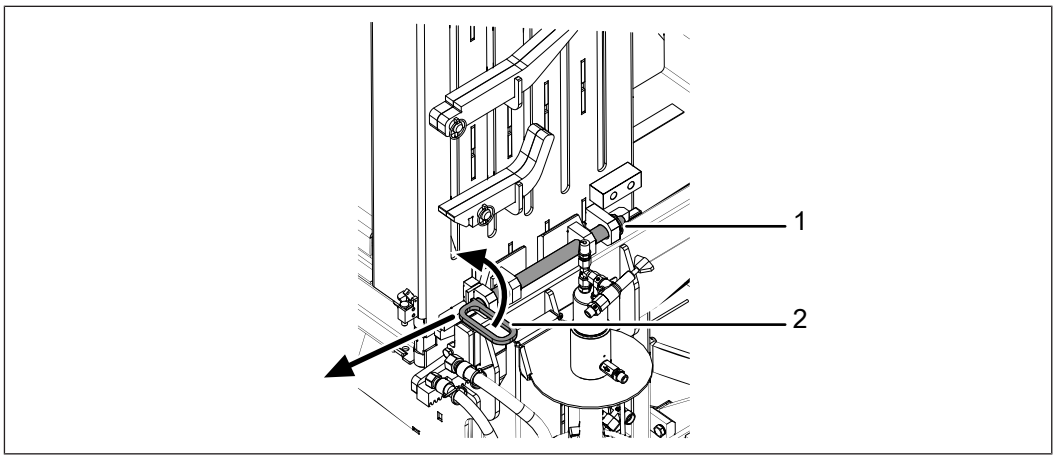


Fig. 6-106 Releasing the lock for the rod box (here: front)

⚠ DANGER

Suspended loads!



Risk of injury due to falling loads.

- Keep out of any suspended components.
- Keep third persons away from the danger area.

8. Lift the rod box with the external lifting device and place it on suitable square timbers on level, sufficiently firm ground.

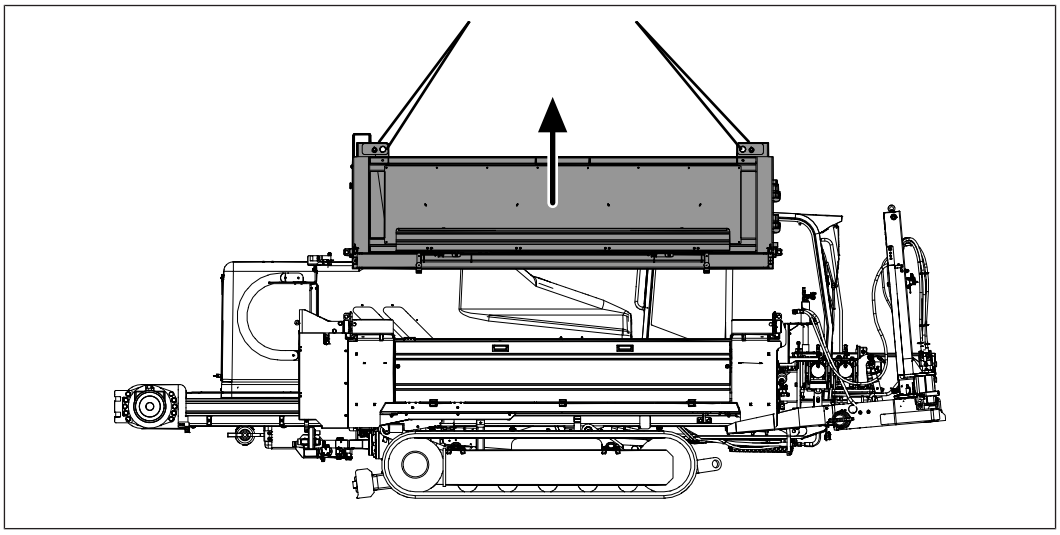


Fig. 6-107 Rod box lifted

6.9.2 Mounting the rod box

⚠ DANGER

Suspended loads!



Risk of injury due to falling loads.

- Keep out of any suspended components.
- Keep third persons away from the danger area.

1. When inserting the new rod box, make sure that the pusher plates are upright.
2. Lift the new rod box with the external lifting device and carefully lower it onto the front (1) and rear (2) panel of the machine.

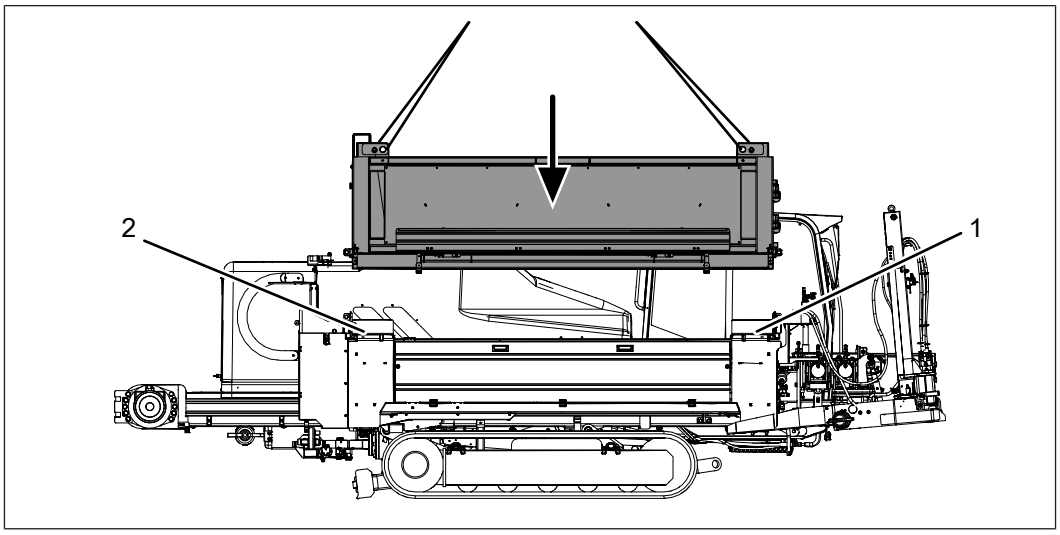


Fig. 6-108 Lowering the rod box

3. Place the rod box on the front and rear panel so that the rod box is positioned on the shifting plates (2), guided by the stop blocks (1).

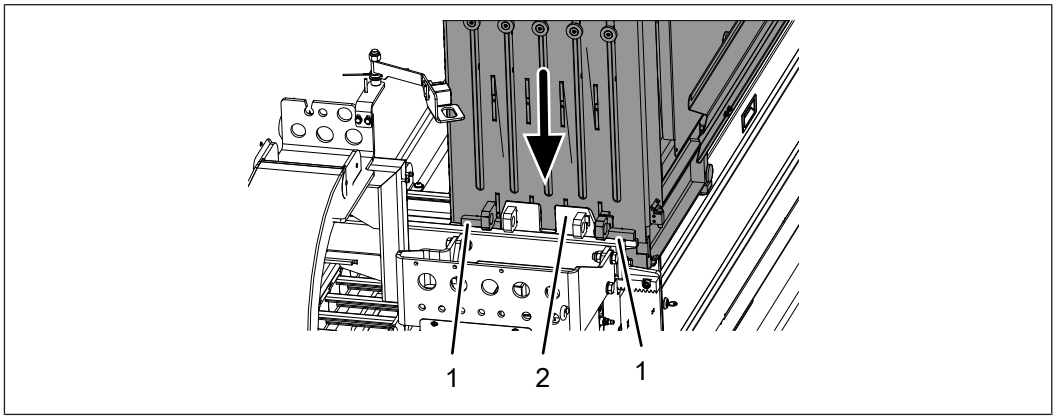


Fig. 6-109 Placing the rod box on the shifting plates

4. After positioning, ensure that the chain hoist of the lifting device is still tensioned so that the rod box does not fall off the machine.
5. Attach the locks of the rod box (1) at the front and rear:
   ⇨ Turn the lock for the rod box downwards to connect the rod box to the machine frame.
   ⇨ Secure the bolt with the linchpin (2).

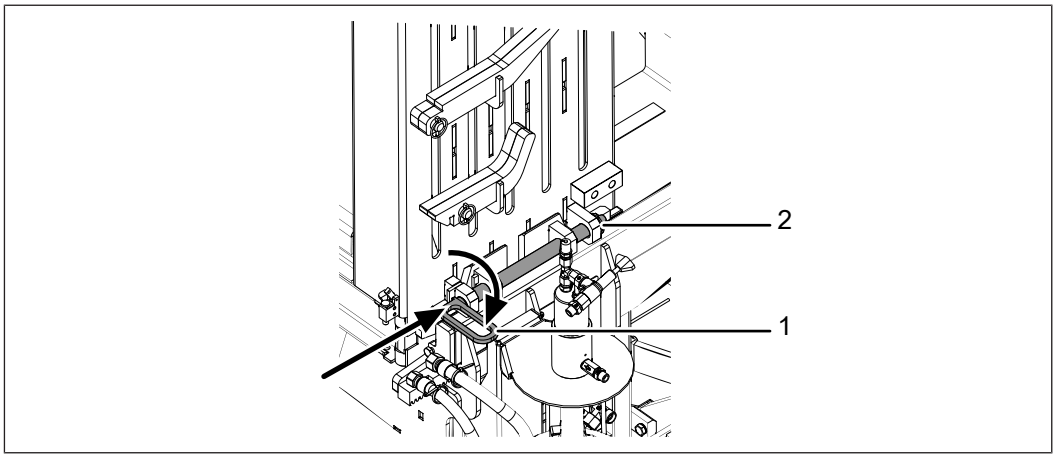


Fig. 6-110 Locking the rod box

6. Swing the sensor holder (1) back into the working position.

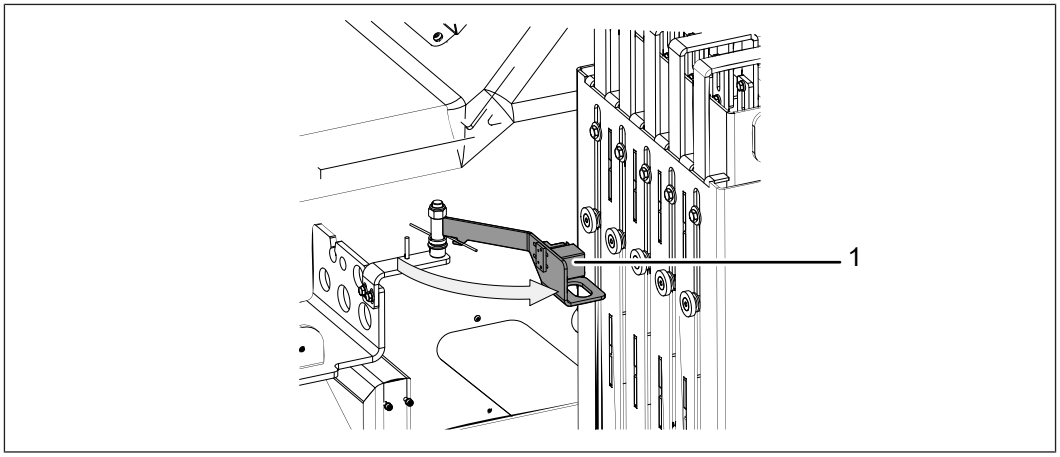
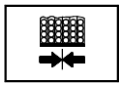


Fig. 6-111 Sensor for bay fill level detection back in working position

7. Detach the lifting device from the rod box.
8. Loosen the screws on both rod holding bars on the outside.
9. Release the two rod holding bars from the connectors of the rod box and pull out the rod holding bars.
10. Reattach the two rod holding bars to the parking position.
11. Fold the cover plate of the rod box back down.
12. Start the engine (chapter 5.3.2, page 75).



13. Drive the drill rod box into transport position by briefly pressing the button on the left joystick.
    The transport position has been reached when the hydraulic jacks are situated precisely between two rods and the lifting cylinders have been lowered.

6.10 Expansion/pull-in mode

Once the target pit is reached, the diameter of the created pilot bore may have to be enlarged to match the diameter of the product pipe to be installed. A change of tools is required for this purpose.

The drill head or rock drilling unit is replaced by an expander head (backreamer).

⚠ WARNING



Risk of injury if personal protective equipment is not worn!

- Always wear your personal protective equipment, including ear protection and a work vest in fluorescent colours.
- During drilling, wear the comprehensive protective equipment included in the scope of delivery of the electric shock warning device.

⚠ WARNING

Risk of injury due to unintentional joystick actuation!

When exiting the cab while the engine is running, there is a risk of actuating the left joystick unintentionally and thus initiating a machine movement. The machine movement could injure yourself or others.

- **Always** fold up the left joystick panel before exiting the cab.
  This disables all functions of both joysticks.

⚠ DANGER

Rotating drill rod!

Contact with the rotating drill rod can lead to injuries or death!

- Only screw the expander head to the drill rod by hand (or with a suitable tool and using a suitable lifting device).
- Only start expansion / pull-in mode if there is nobody in the range of rotating parts.
- Only personnel required to operate the machine are allowed near the machine.
- Keep out of the danger area.
- Keep away from rotating parts.

6.10.1 Tool change for expanding

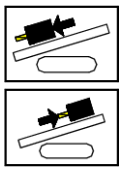
Info!
Since the selection of expander components depends very much on the application, please contact the TRACTO-TECHNIK customer service.

⚠ DANGER

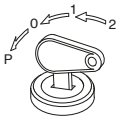
Pre-tensioned drill rod!

The drill rod can be pre-tensioned, twist all of a sudden and cause injuries!

- Before loosening the bore head assembly, relieve the pretension of the drill rod by pushing the thrust rig back and forth.



1. Move the thrust rig back and forth by pushing the right joystick forward and pulling it backward.



2. Set the ignition key on the operator seat to position "P".
3. Remain seated in the operator's seat with the left-hand joystick console folded down.

Info!
Always operate the machine with the wireless pit remote control when working in the target pit (chapter 5.3.5, page 79 and chapter 6.2.3, page 130).

Operator in the target pit

4. Detach the bore head assembly from the rod string.
5. Screw the prepared expander head onto the drill rod. Prevent dirt from reaching the screwed connections or drill rods.

6.10.2 Tool change for expanding after wire-controlled drilling

Info!
Since the selection of expander components depends very much on the application, please contact the TRACTO-TECHNIK customer service.

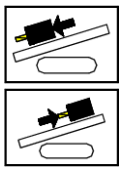
⚠ DANGER

Pre-tensioned drill rod!

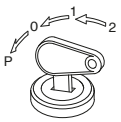
The drill rod can be pre-tensioned, twist all of a sudden and cause injuries!

- Before loosening the bore head assembly, relieve the pretension of the drill rod by pushing the thrust rig back and forth.

Front operator inside the cab



1. Move the thrust rig back and forth by pushing the right joystick forward and pulling it backward.



Rear operator

2. Set the ignition key on the operator seat to position "P".
3. Remain seated in the operator's seat with the left-hand joystick console folded down.
4. Loosen the cable from the friction ring.
5. Open the cable screwing on the sub-saver and pull the screwing, pressure piece and seal off the cable so that it does not get jammed when pulling out the drill rod.

Info!
Always operate the machine with the wireless pit remote control when working in the target pit (chapter 5.3.5, page 79 and chapter 6.2.3, page 130).

Operator in the target pit

6. Detach the bore head assembly from the rod string.
7. Sever the cable at the bore head assembly and pull the cable out of the drill rod towards the front.
8. Screw the prepared expander head onto the drill rod. Prevent dirt from reaching the screwed connections or drill rods.

6.10.3 Connecting the product pipe to the expander head

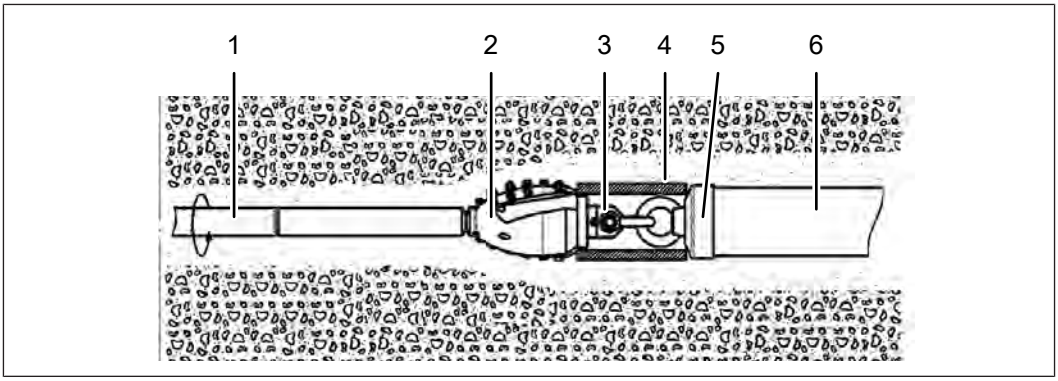


Fig. 6-112 Example set-up of drill rod with expander head and product pipe

1	Drill rods	4	Protective sleeve (PE pipe section, optional)
2	Expander head (backreamer)	5	Pipe puller
3	Swivel	6	Product pipe / line to be installed

1. Do not carry out this step unless you are using a PE pipe:
   Screw a suitable pipe puller firmly into the product pipe to be installed.
2. In the swivel area insert a PE pipe section as protective sleeve (recommended for larger pipe diameters). It prevents the bore hole from collapsing and thus the braking effect during pipe installation.
3. Connect the rear pulling lug of the swivel to the yoke of the pipe puller.
4. After completion of the work in the target pit, switch off both the machine and the wireless pit remote control by pressing the main switch.
5. Inform the operator at the machine that the machine can now again be started and operated from the operator seat.

Info!
If a protective sleeve is used, ensure that it is provided with an opening so you can access the connection point.

6.10.4 Expanding and installing the product pipe

1. Mount the rod wiper to the holder (1) in front of the rod guidance.

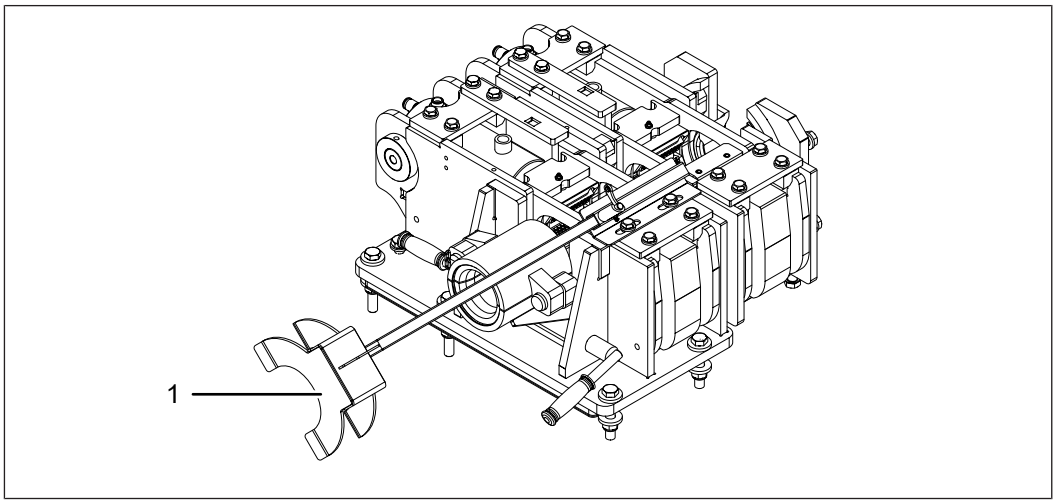
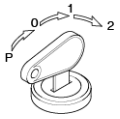
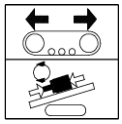


Fig. 6-113 Rod wiper



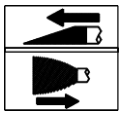
2. Start the machine's drive engine by turning the ignition key (chapter 5.3.2, page 75).



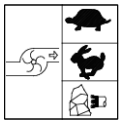
3. If necessary, switch over from drive mode to bore mode on the right joystick panel.



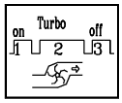
4. Set the engine speed to approx. 1,400 rpm via the potentiometer on the right joystick.



5. Switch over from pilot bore to pull-in mode on the right joystick panel.

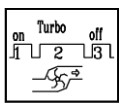


6. Only for optional P72 pump:
Set the drilling fluid to tortoise (low flow rate) on the left joystick panel.

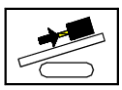


7. Switch on the drilling fluid pump on the left joystick by briefly pressing the push button.

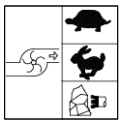
8. Check whether drilling fluid exits from all nozzles of the backreamer.



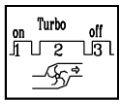
9. Switch the drilling fluid off again by briefly pressing the push button on the left joystick.



10. Reverse the thrust rig until the expander head abuts on the ground.
To do so, pull the right joystick backward.



11. Only for optional P72 pump:
Set the drilling fluid to rabbit (high flow rate) on the left joystick panel.



12. Switch on the drilling fluid pump on the left joystick by pressing and holding the push button.

⇨ This way the rod string is filled quickly.

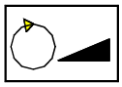


13. Adjust the drilling fluid pressure via the potentiometer on the left joystick.

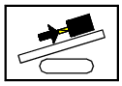
14. Check the pressure on the gauge in the "Bore mode" screen ("Bore mode" screen).
The pressure should be between 20 bar and 40 bar.



15. The expander diameter and the hardness of the ground are decisive for the rotation speed.
Increase the engine speed via the potentiometer on the right joystick until the maximum (approx. 2,000 rpm) is reached.



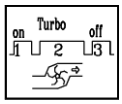
16. Switch on clockwise rotation by pushing the left joystick forward and holding it in this position.



17. Reverse the thrust rig until the first screw connection point of the drill rods is positioned precisely between the two clamp jaws.
To do so, pull the right joystick backward.
At the same time make sure that the rotation does not get caught and that the cuttings or rather drilling debris is mixed homogeneously when it is fed back.

Info!
The drilling mud on the drill rod will be removed by the rod wiper during pull-in.

18. Switch off the rotation by letting go of the left joystick.



19. Switch the drilling fluid off again by briefly pressing the push button on the left joystick.

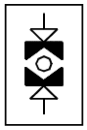
⚠ DANGER

Crush hazard at the clamp!



Your hands may be crushed when the clamping tongs close.

- Keep away from the clamp and break-away device and keep other persons away.



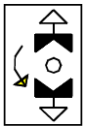
20. Close the clamp via the push button on the right joystick.

Info!
Temperature-related pressure drop possible.
When working, cooling of the hydraulic oil in the clamp cylinder can lead to a pressure drop in the clamp cylinder if the clamp cylinder is kept pressurised for a longer period of time.
In manual mode, actuate the clamp repeatedly to maintain the pressure.
In automatic mode, this is carried out automatically by the machine.

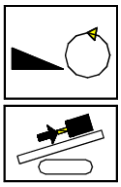
Info!
As soon as the clamp is closed, the valve for drilling fluid pressure relief will open automatically.



21. Close the break-away clamp by pressing the push button on the right joystick and holding it.
At the same time the break-away clamp is swivelled.



22. Open the break-away clamp by pressing the button on the right joystick and holding it.
At the same time the break-away clamp is swivelled back.



23. Switch on counter-clockwise rotation until the first drill rods have been unscrewed at the front inside the clamping tongs. To do so, pull the left joystick backward.
At the same time, reverse the thrust rig by approx. 2 cm by pulling the right joystick backward.

⚠ DANGER

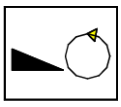
Crush hazard at the break-away clamp!



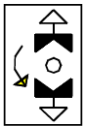
Your hands may be crushed when the break-away clamp closes.
- Keep away from the clamp and break-away device and keep other persons away.



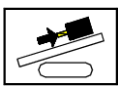
24. Close the break-away clamp by pressing the push button on the right joystick.



25. Pull the left joystick back to detach the sub-saver from the drill rod in a counter-clockwise rotation. Turn the sub-saver 1.5 rotations.
Then let go of the left joystick to stop counter-clockwise rotation.



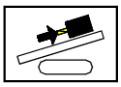
26. Open the break-away clamp by pressing the push button on the right joystick.



27. Reverse the thrust rig until the front part of the rod only rests in the rod support tray.
To do so, pull the right joystick backward.



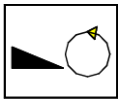

28. Then swing the gripper arms without the drill rod into the bore axis by pushing the right joystick to the left and holding it in this position.
At the same time, push the left joystick to the left to open the rod grippers.
Let go of the joysticks as soon as the gripper arms have reached their end position.



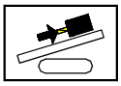
29. Reverse the thrust rig to the rod retainer mark by pulling the right joystick back.



30. Close the rod grippers by pressing the left joystick to the right.



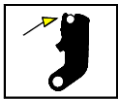
31. In order to completely loosen the screwing between drill rod and sub-saver, switch on counter-clockwise rotation by pulling the left joystick back.



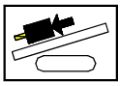
32. Completely reverse the thrust rig to the stop position by pulling the right joystick backwards.



Info!
The gripper arms can only be swivelled when the rod grippers are closed and the thrust rig is completely reversed.




33. Swing the gripper arms with the drill rod underneath the rod box by moving the right joystick to the right.
Swing the left joystick to the left to open the rod grippers until the drill rod has been pressed into the rod box by the hydraulic jacks.



34. Advance the thrust rig to the next drill rod by pushing the right joystick forward.

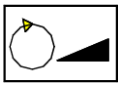
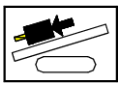


35. Switch on the rod lubrication as soon as the thread is positioned below the rod lubrication.

NOTICE

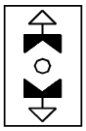
Possible damage to the threads due to too fast rotation or too high thrust speed!

- When screwing the sub-saver to the rods and the rods to each other, proceed slowly and with low thrust to avoid damaging the threads.

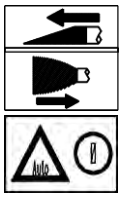
36. Switch on clockwise rotation by pushing the left joystick forward and holding it in this position.
Simultaneously push the right joystick forward to advance the thrust rig until the sub-saver and the rod are screwed together.

Info!
The sub-saver and the drill rod will be screwed together automatically with the predefined torque.



37. Close the clamp via the push button on the right joystick.
38. Proceed with the installation of the drill rods as described starting at point 11 until the rod box has been filled or the expansion is completed.

6.10.5 Fully automatic mode for expansion/pipe installation



If the machine is in "pull-in" mode (see rocker switch on the right joystick panel) and you press the push button for automatic drilling on the left joystick twice in quick succession, the processes of expanding and rod exchange will be carried out automatically.
This process is repeated until all rods have been pulled in or until it is terminated by pressing the push button on the left joystick once more or by leaving the operator seat.

⚠ DANGER

Risk of injury due to machine movements during auto-bore!

- Sit down on the operator seat to keep out of the machine's movement range.
- Remain seated until all working steps of the auto-bore have been completed.
- Make sure that nobody is standing in the machine's movement range.

Starting position

– The swivel arm is located underneath the bay.
– The disconnection point of the two last drill rods is situated between the break-away clamp and the clamp.
This position is indicated by the rod length indicator in the "Bore mode" screen being highlighted in green.

Before switching on automatic drilling, set the following parameters depending on the soil and tools:



1. Set the potentiometer for the speed of the rotation on the left joystick panel.



2. Set the traction speed at the potentiometer on the right joystick panel.



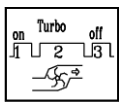
3. Set the potentiometer for the drilling fluid quantity on the left joystick panel.



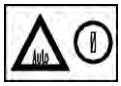
4. If required, readjust the engine speed via the potentiometer on the right joystick.



5. Switch on fully automatic mode for expansion / pipe installation by double-clicking the push button for automatic drilling on the left joystick.
   ⇨ Expansion and rod exchange will be carried out automatically until all drill rods have been pulled in.
   ⇨ The rod connection is now situated exactly between the two clamp jaws.



6. Switch the drilling fluid off again by briefly pressing the push button on the left joystick.



7. The automatic mode for expansion / pipe installation can be interrupted by pressing the push button for automatic drilling on the left joystick again or by leaving the operator seat.

Automatic rod cleaning

In the "Bore parameters" screen you can adjust the switch-on distance (1) of the rod cleaner during automatic pipe installation.

In the line below (2) you can define the time period for how long the rod cleaner will be switched on.

In the present example the rod cleaner would be switched on every 50 cm for a duration of 3 s during automatic pipe installation or expansion. Setting either of the two values to zero deactivates automatic rod cleaning.



If automatic rod cleaning is deactivated, you can manually activate it during automatic pipe installation by means of the button on the left joystick.

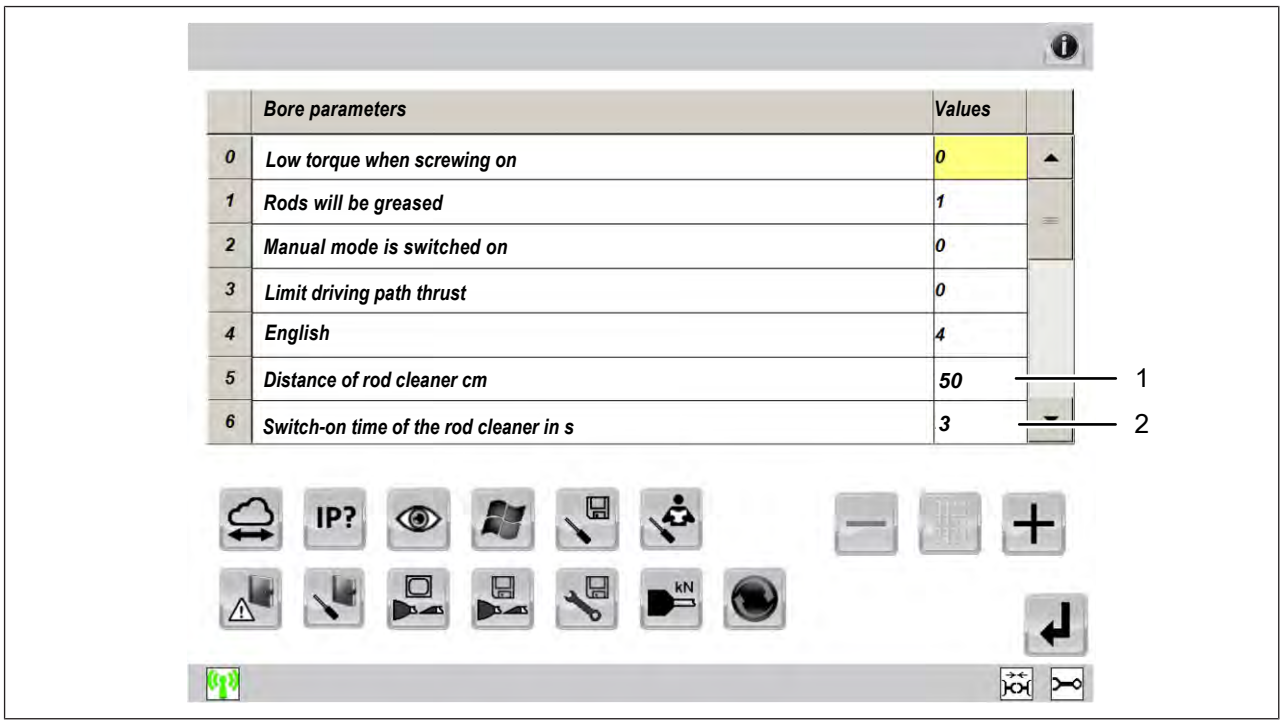


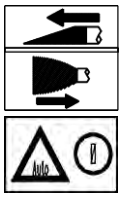
Fig. 6-114 "Bore parameters" screen (exemplary illustration)

Please note the following for automatic drilling in expansion mode:

Info!

- The rotational speed, traction speed and flow rate settings can also be altered during the expanding/pipe installation process.
- When auto-bore mode is switched on, it is not necessary to move the joystick!
- Should the expander head be stuck or get caught in the ground, reduce the traction speed via the potentiometer on the right joystick panel.
- Should the expander head be jammed tight, switch off auto-bore mode and proceed manually. The expander head must be pushed forward until it can rotate freely. Switch automatic drilling back on.
- If the rod connection cannot be detached, switch off automatic drilling and proceed manually.

6.10.6 Semi-automatic mode for expansion/pipe installation



If the machine is in "pull-in" mode (see rocker switch on the right joystick panel) and you briefly press the push button for automatic drilling on the left joystick once, a drill rod will be retracted automatically.

⚠ DANGER

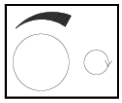
Risk of injury due to machine movements during auto-bore!

- Sit down on the operator seat to keep out of the machine's movement range.
- Remain seated until all working steps of the auto-bore have been completed.
- Make sure that nobody is standing in the machine's movement range.

Starting position

- The swivel arm is located underneath the bay.
- The disconnection point of the two last drill rods is situated between the break-away clamp and the clamp.
  This position is indicated by the rod length indicator in the "Bore mode" screen being highlighted in green.
- The drilling fluid pump is switched on.

Before switching the auto-bore on, set the following parameters depending on the soil and tools:



1. Set the potentiometer for the speed of the rotation on the left joystick panel.



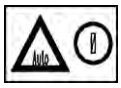
2. Set the traction speed at the potentiometer on the right joystick panel.



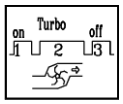
3. Set the potentiometer for the drilling fluid quantity on the left joystick panel.



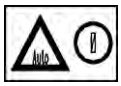
4. If required, readjust the engine speed via the potentiometer on the right joystick.



5. Switch on semi-automatic mode for expansion/pipe installation by double-clicking the push button on the left joystick.
   - ⇨ A drill rod will be retracted automatically.
   - ⇨ The rod connection is now situated exactly between the two clamp jaws.



6. Switch the drilling fluid off again by briefly pressing the push button on the left joystick.



7. The automatic mode for expansion / pipe installation can be interrupted by pressing the push button for automatic drilling on the left joystick again or by leaving the operator seat.

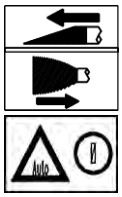
Please note the following for automatic drilling in expansion mode:



Info!

- The rotational speed, traction speed and flow rate settings can also be altered during the expanding/pipe installation process.
- When auto-bore mode is switched on, it is not necessary to move the joystick!
- Should the expander head be stuck or get caught in the ground, reduce the traction speed via the potentiometer on the right joystick panel.
- Should the expander head be jammed tight, switch off auto-bore mode and proceed manually. The expander head must be pushed forward until it can rotate freely. Switch automatic drilling back on.
- If the rod connection cannot be detached, switch off automatic drilling and proceed manually.

6.10.7 Automatic rod exchange during expansion/pipe installation



If the machine is in "pull-in" mode (see rocker switch on the right joystick panel) and you briefly press the push button for automatic drilling on the left joystick once, the rod connection will be loosened automatically, the drill rod placed back into the rod box and the sub-saver screwed onto the next drill rod. The remaining work must be carried out manually.

⚠ DANGER

Risk of injury due to machine movements during auto-bore!

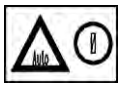
- Sit down on the operator seat to keep out of the machine's movement range.
- Remain seated until all working steps of the auto-bore have been completed.
- Make sure that nobody is standing in the machine's movement range.

Starting position

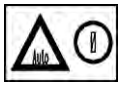
– The drilling fluid pump is switched off.
– The swivel arm is located underneath the bay.
– The disconnection point of the two last drill rods is situated between the break-away clamp and the clamp.
This position is indicated by the rod length indicator in the "Bore mode" screen being highlighted in green.



1. If required, readjust the engine speed via the potentiometer on the right joystick.

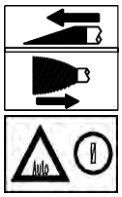


2. Switch on automatic rod exchange with a single click on the push button for automatic drilling on the left joystick.
   ⇨ The rod connection is loosened.
   ⇨ The drill rod is placed back into the rod box.
   ⇨ The sub-saver is screwed onto the next drill rod.



3. The automatic rod exchange can be interrupted by pressing the push button for automatic drilling on the left joystick again or by leaving the operator seat.

6.10.8 Automatic rod break-away or semi-automatic mode during expanding/pipe installation



If the machine is in "pull-in" mode (see rocker switch on the right joystick panel) and you briefly press the push button for automatic drilling on the left joystick once, a drill rod will be retracted automatically.

⚠ DANGER

Risk of injury due to machine movements during auto-bore!

- Sit down on the operator seat to keep out of the machine's movement range.
- Remain seated until all working steps of the auto-bore have been completed.
- Make sure that nobody is standing in the machine's movement range.

Starting position

– The drilling fluid pump is switched off.
– The swivel arm is located underneath the bay.
– The disconnection point of the two last drill rods is situated between the break-away clamp and the clamp.
This position is indicated by the rod length indicator in the "Bore mode" screen being highlighted in green.

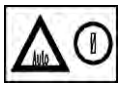


1. If required, readjust the engine speed via the potentiometer on the right joystick.



2. Switch on automatic rod exchange with a single click on the push button on the left joystick.

   ⇨ The rod connection is loosened.



3. The automatic rod exchange can be interrupted by pressing the push button for automatic drilling on the left joystick again or by leaving the operator seat.

6.11 Cleaning of the exhaust gas system

6.11.1 Description of lamps

Cummins diesel engines require only little or no operator intervention at all. The lamps for the cleaning process of the exhaust gas system light up to indicate the system status. Under certain circumstances it may be necessary to initiate a cleaning of the exhaust gas system manually.

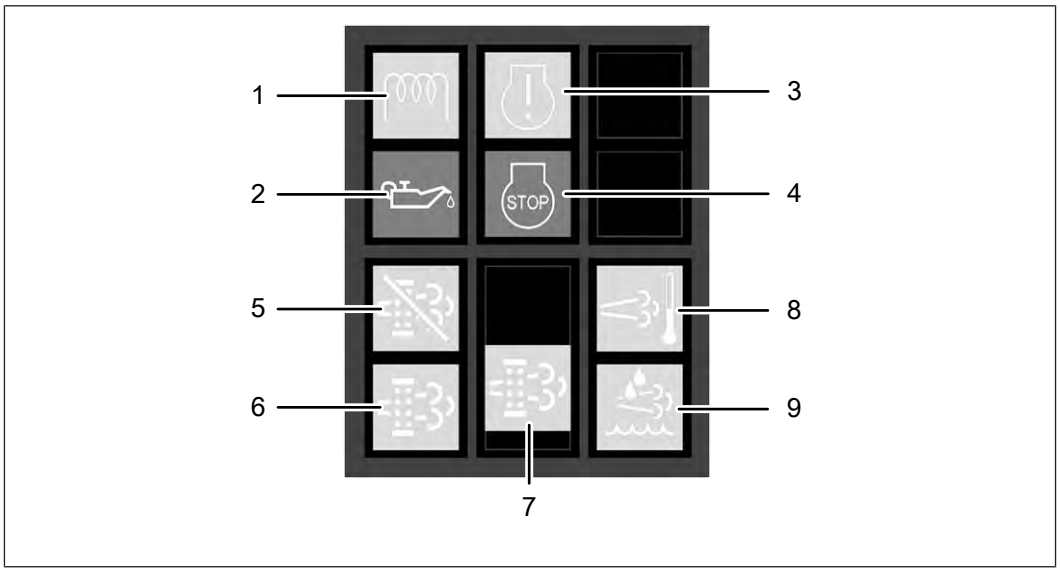


Fig. 6-115 Indicators diesel engine

Tab. 6-44 Indicators diesel engine

Item	Operating element	Meaning/function
1	"Pre-heating" lamp	Pre-heating process active
2	"Engine oil pressure" lamp	Oil pressure of the diesel engine too low
3	"Engine warning" lamp	Warning lamp diesel engine – non-critical error; maintenance may be required.
4	"Stop engine" lamp	Stop lamp diesel engine – critical error in the engine system; immediately stop the engine
5	"Cleaning of exhaust gas system disabled" lamp	Cleaning of exhaust gas system is switched off (switch 7) – neither automatic nor manual regeneration possible.
6	"Cleaning of exhaust gas system" lamp	Diesel particle filter sooted – no automatic cleaning of exhaust gas system possible; cleaning of exhaust gas system required.
7	"Cleaning of exhaust gas system" switch	– Button: start cleaning of exhaust gas system manually – when lamp 6 is illuminated. – Switch: lock / switch off cleaning of exhaust gas system – lamp 5 illuminated.
8	"Increased temperature exhaust gas system" lamp	Increased temperature in the exhaust gas system due to active cleaning – cleaning in progress.
9	"Low filling level DEF" lamp	DEF filling level too low – refill diesel exhaust fluid

Tab. 6-45 Lamps for the cleaning process of the exhaust gas system

Lamps	Meaning	Remedial action
8 illuminated	**Lamp for increased exhaust gas temperature (HEST)** – Is illuminated in case of an excessively high exhaust gas temperature during the cleaning of the exhaust gas system (regeneration).	Make sure that the exhaust pipe outlet is not directed at combustible or ignitable surfaces.
6 illuminated	**"Cleaning of exhaust gas system" lamp** – Is illuminated when the exhaust gas system cannot complete an automatic cleaning process.	Make sure that the switch for cleaning the exhaust gas system (regeneration) is not set to "disabled" and continue to work until you can carry out a stationary cleaning of the exhaust gas system (regeneration) in parking position.
3 + 6 illuminated – illuminated	**"Cleaning of exhaust gas system" lamp plus engine warning lamp** – If the exhaust gas system is not cleaned within an appropriate timeframe after the "Cleaning of exhaust gas system" lamp has lit up, the engine warning lamp will be illuminated as well and the engine power will be reduced significantly.	Park the GRUNDODRILL at a safe location and press the switch for cleaning the exhaust gas system (start regeneration). Once the cleaning process has been completed, the normal engine power will be restored.
6 flashing	**Flashing "Cleaning of exhaust gas system" lamp** – Flashes when stationary cleaning of the exhaust gas system has been triggered via the switch for cleaning the exhaust gas system (start regeneration). The lamp will continue to flash until the stationary cleaning process is completed.	As soon as the lamp has gone out, the operator can resume work as usual.
5 illuminated	**"Cleaning of exhaust gas system disabled" lamp** – Is illuminated when the switch for cleaning the exhaust gas system (regeneration) is set to "disabled" and prevents active cleaning.	This switch should only be used if high exhaust gas temperatures pose a risk. Excessive use of the switch in the "disabled" position results in a higher frequency of required stationary cleaning processes.

⚠ DANGER



Fire hazard due to inflammable materials near the exhaust pipe!

Inflammable materials near the exhaust pipe can ignite during cleaning of the exhaust gas system!

- Make sure that there are no inflammable particles in the ambient air (e.g. particles from a grain warehouse).

⇨ Otherwise, disable the combustion process by pressing the "Cleaning of exhaust gas system" switch.

Tab. 6-46 DEF lamps

Lamps	Meaning	Remedial action
9 illuminated	**DEF** lamp – Lights up in case of a low DEF filling level.	If necessary, refill the DEF tank.
3 + 9 illuminated – illuminated	**DEF lamp plus engine warning lamp** – Light up in case of a very low DEF filling level. If the tank is not re-filled immediately, the power will be decreased.	If necessary, refill the DEF tank. After re-filling the DEF tank the normal engine power will be restored.
3 + 9 illuminated – flashing	**Flashing DEF lamp plus engine warning lamp** – Light up when the DEF filling level is almost down to zero. If the tank is not re-filled immediately, the power will be decreased even further.	If necessary, refill the DEF tank. After re-filling the DEF tank the normal engine power will be restored.
3 + 4 + 9  illuminated – illuminated – flashing	**Flashing DEF lamp plus engine stop lamp** – Light up when the DEF level indicator has indicated zero for 30 minutes already. The engine power will be restricted to idling capacity.	Put down the GRUNDODRILL safely and refill the DEF tank. After re-filling the DEF tank the normal engine power will be restored.

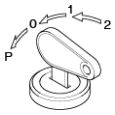
6.11.2 Starting the cleaning of the exhaust gas system manually

Carry out a manual cleaning of the exhaust gas system as follows:

1. Park the bore rig at a safe location with the exhaust pipe not pointing at any combustible surface.

2. Actuate the switch for cleaning the exhaust gas system.
   The "Cleaning of exhaust gas system" lamp flashes.
   Possibly the engine speed and turbocharger sounds increase. The HEST lamp could light up.
3. For reasons of safety, keep an eye on the machine and the surrounding area. If the machine needs to be used or moved, stop the stationary regeneration by actuating the gas adjustment.
   ⇨ When the cleaning process has been completed, the engine returns to its usual idle speed and the lamps (HEST and "Cleaning of exhaust gas system") go out.

6.12 Switching off the machine



Turn the ignition key to "0" and remove it.

Requirements

- The accessories have been disconnected from the machine.
- The footstep to the cab is folded in.
- All drill rods are stored in the rod box.
- The thrust rig has been brought into the front end position.
- The boom and the stabilisers are raised.

For disassembly and de-installation, loosen the anchoring device and lift the anchor plate.

7.1 Anchor thrust unit – removing the thrust anchor

1. Pull the safety pin (1) out of the bolt (2).
2. Pull the bolt out of the ring (3) and the thrust anchor (4).

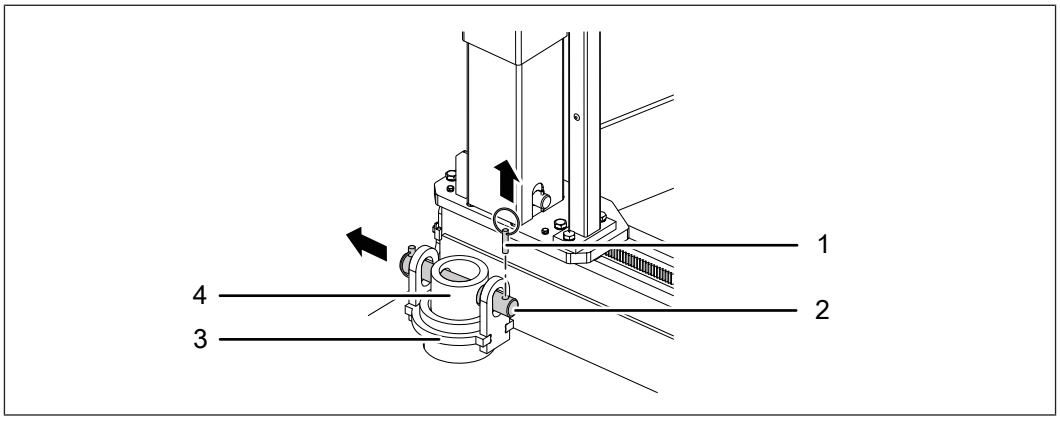


Fig. 7-1 Pulling out the bolt

3. Turn the ring (1) by approx. 90° (from the alignment direction) and attach the impact head (2).

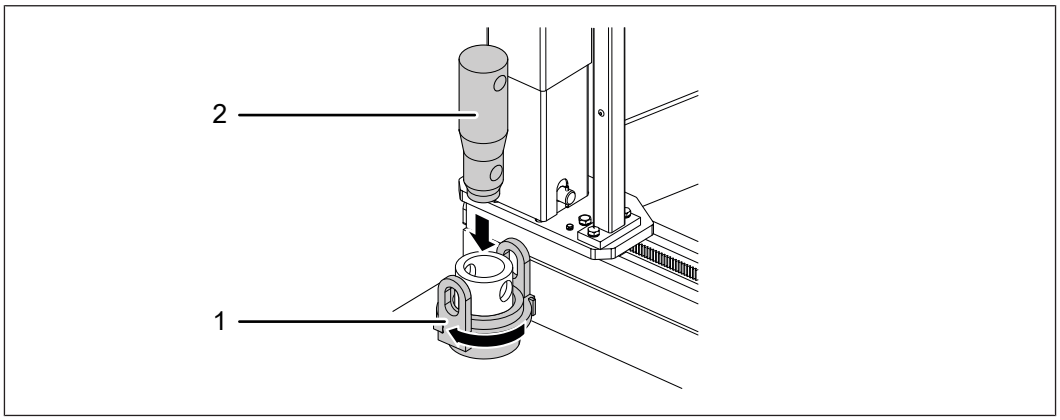


Fig. 7-2 Removing the bolt, attaching the impact head

4. Push the bolt (1) through the thrust anchor (2) and the impact head (3).
5. Fix the bolt with the safety pin (4).
6. Position the anchor thrust unit (1) above the thrust anchor (2) and lower the anchor thrust unit.
7. Insert the second bolt (3) and secure it with the linchpin (4).

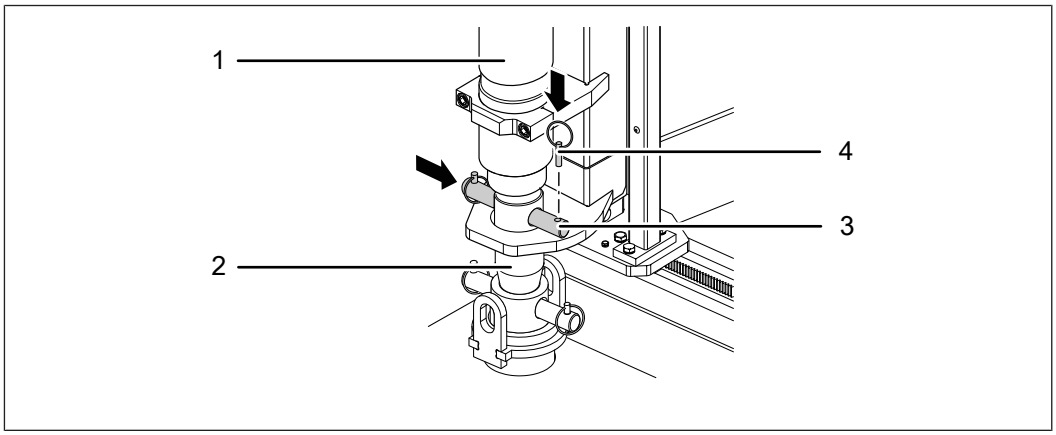


Fig. 7-3 Bringing the anchor thrust unit in position and lowering it, inserting second bolt

Info!
Only lift the anchor plate after the thrust anchors have been pulled out completely.

8. Raise the anchor thrust unit (1) until the thrust anchor (2) is exposed.

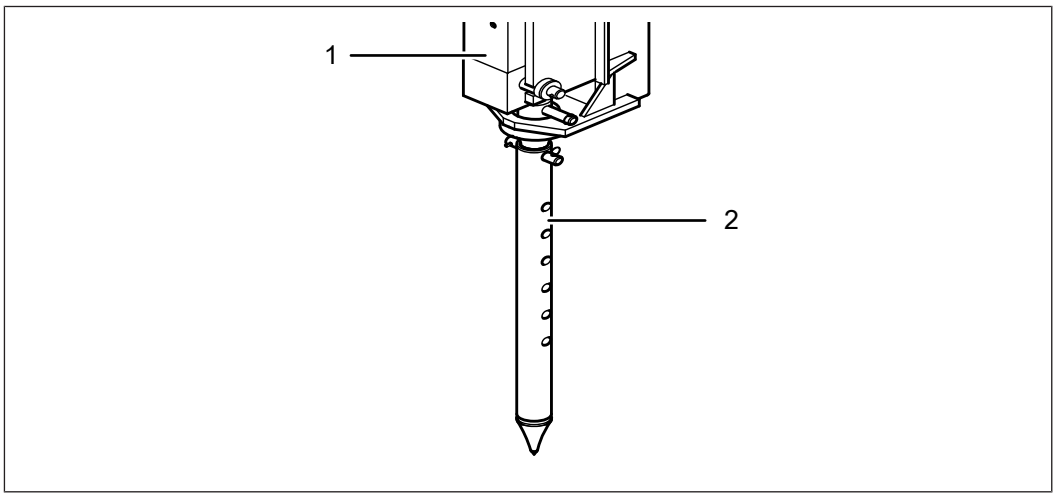


Fig. 7-4 Raising the anchor thrust unit

7.2 Anchor boring rig – removing the earth stake

1. Use the hand ratchet (1) to place the anchor boring rig above the earth stake you want to pull out of the ground.

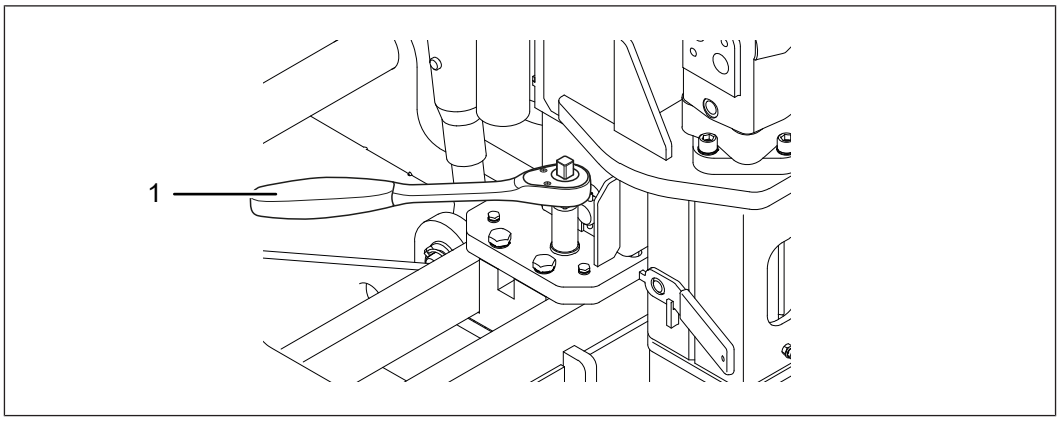


Fig. 7-5 Hand ratchet anchor boring rig

2. Lower the anchor boring rig by means of the hand lever >>Lift/lower anchor boring rig<< (1) until you can fix the eyelet of the earth stake in the bore hole of the anchor boring rig.

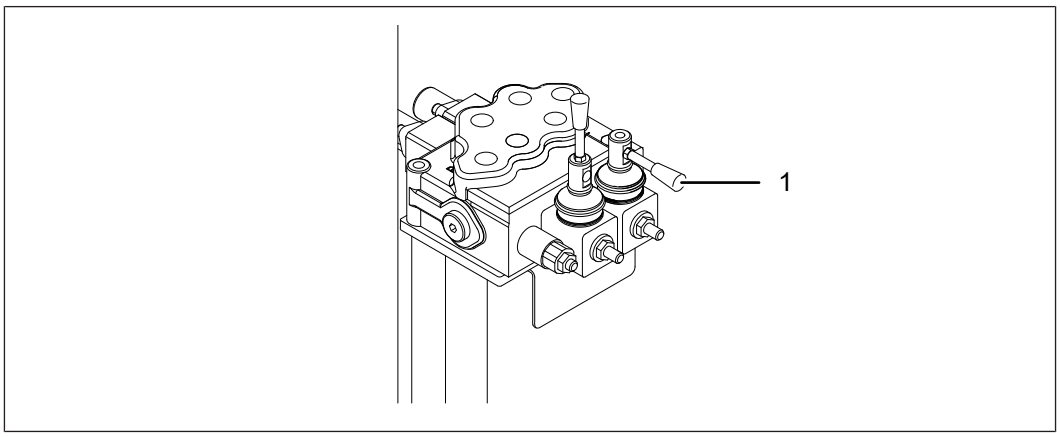


Fig. 7-6 Hand lever >>Lift/lower anchor boring rig<<

3. Use the bolt (1) to fasten the eyelet of the earth stake in the bore hole of the anchor boring rig.
4. Raise the anchor boring rig using the hand lever >>Lift/lower anchor boring rig<<until the earth stake has been pulled completely out of the ground.

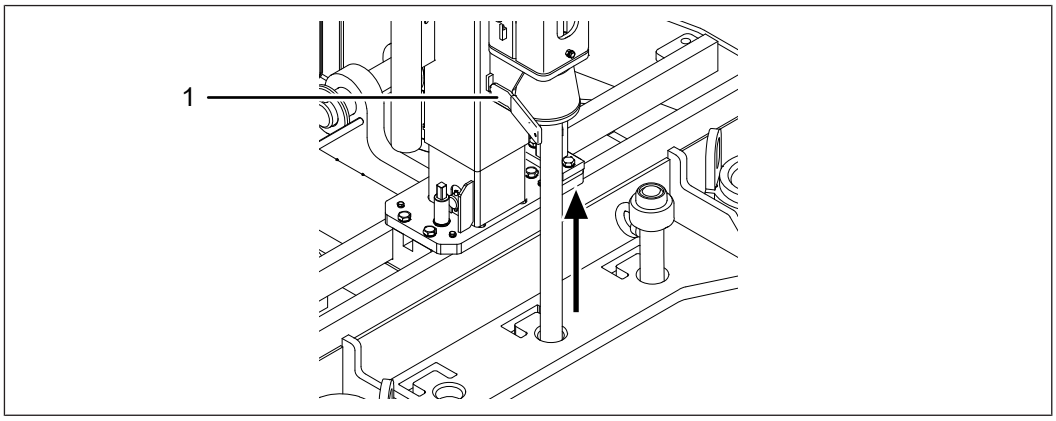


Fig. 7-7 Pulling out the earth stake

5. Dismantle the earth stake from the anchor boring rig.

Info!
Remove the dowel earth stakes by loosening the screws with the hand ratchet and striking a hammer on the screw head.
The dowel will then fold up and you can remove the dowel earth stake from the ground.

6. Repeat the work steps in point 1 to point 5 until all earth stakes have been pulled out of the ground.
7. Use the hand ratchet to move the anchor boring rig to the left (seen from the front) into transport position.
8. Having reached the transport position, lower the anchor boring rig all the way to the stop using the hand lever >>Lift/lower anchor boring rig<<.

8.1 Indication of errors and faults

All error messages are displayed on the "Error messages" screen at the panel PC.

"Error messages" screen

All relevant faults appear as a message in the head of the current screen. By pressing the  button you can open the "Error messages" screen. By pressing the  button you can acknowledge the displayed message.

Acknowledged error messages will only appear again after a restart of the machine. Nonetheless, this does not mean that the fault is no longer present!

All error messages are saved in the machine log book and can be looked up there.

The log book can store 500 messages. If this limit is reached, the oldest message will be deleted.

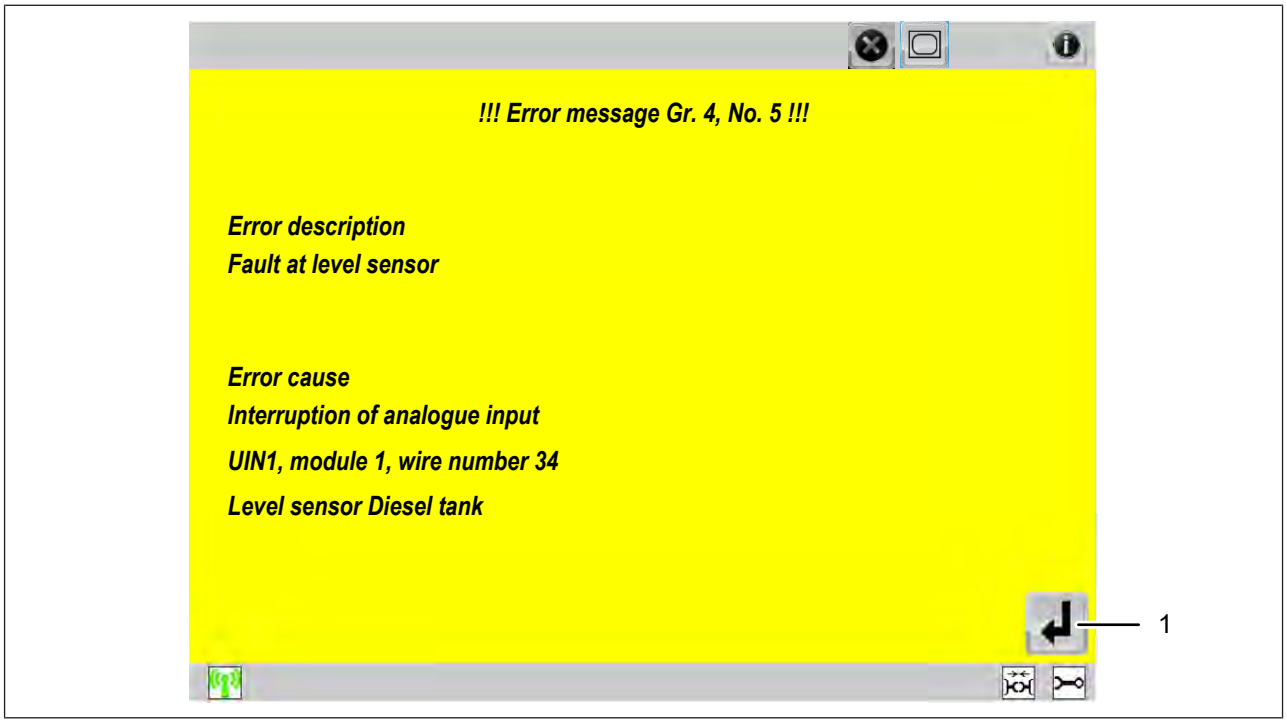


Fig. 8-1 "Error messages" screen

Via the >>Back<< button (1) you can go back to the initial screen.

Correct the fault according to Tab. 8-2 and acknowledge the error message or contact the TRACTO-TECHNIK customer service for support.

Tab. 8-1 TRACTO-TECHNIK customer service:

Germany: **TRACTO-TECHNIK GmbH & Co. KG** Tel.: +49 2723 808-0 www.tracto.com E-mail: info@tracto.com		
USA / Canada: **TT Technologies Inc.** Tel.: +1 630-851-8200 www.tttechnologies.com E-mail: info@tttechnologies.com	Switzerland: **TRACTO-TECHNIK Schweiz AG** Tel.: +41 79 820 3897 www.tracto-technik.ch E-mail: info@tracto-technik.ch	UK: **T.T. UK LTD** Tel.: +44 1234 342 566 www.tracto-technik.com.uk E-mail: info@tracto-technik.com.uk
France: **Tracto-Techniques S.a.r.l.** Tel.: +33 160 42 49 40 www.tracto-technik.fr E-Mail: info@tracto-technik.fr	Africa: **TRACTO-TECHNIK Afrique S.a.r.l.** Tel.: +212 5 37 40 13 63 / 64 www.tracto-technik.ma E-mail: info@tracto-technik.ma	Pacific Rim: **TRACTO-TECHNIK Australia Pty Ltd.** Tel: +61 7 3420 5455 www.tracto-technik.com.au E-mail: info@tracto-technik.com.au

8.2 Other faults and malfunctions

The following faults, which will not be indicated on the panel PC, can occur on the machine:

Tab. 8-2 Other faults and troubleshooting

Fault	Cause	Correction
Total failure of the hydraulic system	Defective hydraulic line, hose or connection in the system leading up to the hydraulic pump	Find the defective part in the system (also check the connections) and repair or replace it as needed.
	Defective hydraulic pump	Contact the TRACTO-TECHNIK customer service.
	Faulty electrical supply	Check the electrical supply and, if necessary, contact the TRACTO-TECHNIK customer service.
Decreasing or insufficient hydraulic pressure in the entire drilling system	Excessive hydraulic oil temperature, defective fan	Check the fan at the hydraulic oil cooler.
	Insufficient engine speed (depending on the system) of the drive unit	Check and adjust the rotational speed.
Leakage at hydraulic lines, hoses or screwed connections and fittings or coupling points	Threading subsidence or loosening of connections due to constant vibrations during machine operation	Re-tighten the leaking connections with appropriate tools.
	Dirt or foreign objects between the plug connections, wear is also possible	Clean the plug connections thoroughly, replace defective parts as needed.
	Worn or defective sealing rings (O-rings)	Check the sealing rings and replace them if required.
Total failure of the electric system	Cable crushed	Repair cable or replace if damage is great
	Defective fuse in the electrical control cabinet	Replace fuses.

Fault	Cause	Correction
Leakage at the drilling fluid rotary feed-through	Sealing of rotary joint defective	Contact the TRACTO-TECHNIK customer service
The sub-saver is not screwed firmly to the drill rod.	Worn threading.	Check the sub-saver and replace it if necessary.
Anchoring percussive hammer defective or lacking in performance	Defective component	Visually inspect and replace if necessary. Check nitrogen pressure.
Failure of individual auxiliary functions	Electric limit switch of the respective function defective	Swap the electric cable plug of the defective function with one in working order and try to narrow down and localize the fault via the control unit (upon consultation with the TRACTO-TECHNIK customer service).
	Defective electrical switches or operating levers	Check the switches by means of a measuring device (upon consultation with the TRACTO-TECHNIK customer service).
Vigorous lashing of the drilling fluid supply line, no pressure or low drilling fluid pressure at the drill rods	Drilling fluid mixture or drilling fluid of too high viscosity	Work with more water contents or check feed pressure of transfer pump (approx. 2 bar).
	Incorrect position or closing behaviour of the ball valves at the drilling fluid mixing system	Check the position and functioning of the ball valves (see instructions for the mixing system).
	Contamination due to gravel or wear on the suction / pressure valves of the feed pump	Gravel stuck to the valves' sealing surfaces can sometimes be removed by controlled blows of a rubber mallet onto the blind caps of the feed pump housing. Otherwise, disassemble the pump and remove the foreign objects manually. Replace defective valves. To do so, the pump has to be disassembled first.
	Worn seals of the feed pump	Check the seals and replace them if necessary.
	Hydraulic motor of the feed pump defective or insufficient hydraulic oil supply	Check the pressure at the measuring connection and, if necessary, contact the TRACTO-TECHNIK customer service.
	Icing inside the drilling fluid mixing system	Carefully defrost by use of a hot air blower or gas burner (see also chapter 9.20, page 316).
Failure of the control unit	Malfunctioning control system	Contact the TRACTO-TECHNIK customer service
Failure of the transmitter or receiver during drilling	Empty transmitter batteries or defective transmitter (check via receiver indication)	See instructions provided by the manufacturer of the detection system.
	Above- or underground electromagnetic or metal-related interferences.	Pull the bore head assembly/rock drilling unit back to a point where the measuring data was still correct. If necessary, exchange the probe for a more powerful one
	Empty receiver batteries (check via the receiver indication)	Replace batteries.

9.1 Safety instructions for maintenance and troubleshooting

⚠ DANGER

All maintenance, repair and troubleshooting activities involve an increased risk of accident!

- Only perform maintenance, repair and troubleshooting activities when the machine is shut down.
- Switch off the engine and remove the ignition key before starting maintenance, repair and troubleshooting activities.
- Interrupt the power supply by switching off the main power switch.

  ⇨The hydraulic lines are immediately depressurized.

⚠ WARNING

Risk of injury due to coolant spurting out during maintenance work on the air conditioning system!

Pressurized coolant can injure you when it spurts out.

- Have work on the air conditioning system carried out only by a specialist company or specially trained personnel.

NOTICE

Oils and greases hazardous to the environment!



Danger of environmental pollution!

- Do not let oils and greases penetrate into the soil, waters or the sewage system.
- Dispose of used oil, oily cloths and empty hydraulic containers in an environmentally responsible way and according to the respective laws of your country, e.g. at collection points.

– Carefully read all safety information contained in this manual before starting any maintenance work.
– Maintenance work must only be carried out by appropriately authorised personnel.
– By yourself, only perform the maintenance and adjustment works specified in this manual. For additional works contact the customer service of TRACTO-TECHNIK.
– If necessary, secure a large area around the maintenance zone.
– Clean the machine, in particular the connections and screw fittings, to remove oil, fuel and maintenance products before starting maintenance and repair work.
– Once the maintenance, repair and troubleshooting work is completed, reattach all safety devices and check them for proper functioning.
– Retighten any screw connections that have been loosened for maintenance, repair and troubleshooting activities.
– After completion of maintenance, remove the tools and repair materials from the operating site.

9.2 Safety instructions for work on the hydraulic system

Observe the following when working on the hydraulics and when handling hydraulic oil:

⚠ CAUTION



Contact with hydraulic oil!

Hydraulic oil is a chemical product which, in the case of skin contact over a longer time, may cause skin irritations or allergic reactions. In the case of eye contact, hydraulic oil may damage your eyes.

- When performing maintenance work on the hydraulics, wear protective goggles and gloves.
- Observe the safety precautions and regulations in the technical and toxicological data sheet from the hydraulic oil producer!

⚠ DANGER

Hydraulic oil spurting out!
Residual pressure between cylinder and check valve when the rig boom is inclined or the clamping mechanism closed, as well as at the stabilisers!

Pressurized hydraulic oil can injure you when spurting out.

- Never tighten pressurized screw fittings.
- Depressurize the hydraulic system before starting maintenance, servicing and repair work by switching off the machine!
- The air in the hydraulic oil tank is under pressure. Vent the tank by opening the cap of the filler neck to allow the air to escape. Close the cap again immediately afterwards.



- When carrying out maintenance work on the hydraulics, fire, open light and smoking are prohibited.
- Work on the hydraulic system may only be performed by persons with special skills and experience in the field of hydraulics.

Hydraulic hose lines

Observe the following when handling hydraulic hose lines:

- Hydraulic hose lines must not be extended.
- Make sure that the connections are correct.
- Comply with the minimum bending radius for hydraulic hose lines as specified by the manufacturer.
- Regularly check all lines, hoses and screw fittings for leakages and visible damage. Rectify the damage immediately.
- Replace defective hydraulic hose lines.
- Exchange hydraulic hoses after expiry of their period of use even if there are no visible safety-related deficiencies on the hose line.

– The maximum period of use of the hydraulic hose lines is 6 years, including a storage duration of 2 years maximum. Notwithstanding this, the period of use can be determined in accordance with available test results, particularly taking into account the operating conditions. Please note the manufacturer's label on the hydraulic hose lines (date of manufacture: quarter and year or month and year).

NOTICE



Environmental damage due to hydraulic oil!

Leaking hydraulic oil will pollute the environment.

- Make sure that the damage is quickly remedied. Hydraulic oil entering the soil requires immediate large-scale excavation of the contaminated ground.
- Dispose of used oil, oily cloths and empty hydraulic containers in an environmentally responsible way and according to the respective laws of your country, e.g. at collection points.
- Observe the safety precautions and regulations in the technical and toxicological data sheet from the hydraulic oil producer!

9.3 Safety instructions for work on the electrical system

⚠ DANGER

Danger due to electrical power!



Risk of injury due to electric shock upon contact with live parts.

- Switch off the machine before starting work on the electric system.
- Before carrying out any repair works on the electrical system, disconnect the ground cable from the battery of the drive unit or actuate the main power switch.
- Only allow skilled electricians or instructed persons working under the supervision of a skilled electrician to carry out work on the electrical system in accordance with the electrical engineering rules and regulations.

– Have the machine's electrical equipment checked by trained, skilled electricians regularly.
– Eliminate defects such as loose connections or scorched cables immediately.
– In the event of a short circuit, there is a sparking and fire hazard.
– Only use original fuses with the required current rating and tripping characteristic. When you replace a fuse, first search for the cause of the fault and remedy the fault before replacing the fuse.
– For work on live parts, use insulated tools only.
Work with another person who can switch off the machine via the main power switch in the event of an emergency.
– The battery voltage of the electrical system is 24 V.
– Do not disconnect any cables between the battery, regulator and alternator (e.g. by disconnecting the battery) while the diesel engine is running.
– Keep the battery clean and free from corrosion.
– Dispose of used batteries according to regulations.
– Switch off the main power switch when carrying out repairs (e.g. welding work) and when the machine is not operated for more than 2 days.

9.4 Checks by qualified persons

Have the whole machine checked by an authorised person at regular intervals.

Qualified persons are considered to be those persons that due to their technical training and professional expertise have sufficient knowledge about bore rigs. Furthermore, they must be familiar with the relevant national occupational safety and accident prevention regulations, directives and the generally accepted codes of practice, so that they are able to assess the condition of bore rigs with regard to safe operation.

The timeframes for the inspection must be defined by the machine operating company.

For further information please contact the TRACTO-TECHNIK customer service.

9.5 Maintenance intervals

The abbreviations in the table below have the following meaning:

the abbreviation:	means that the maintenance task has to be performed at the following intervals:
d	daily
w	weekly or after 50 operating hours
6m	every 6 months or every 500 operating hours
a	annually or every 1,000 operating hours

The time specifications are based on an 8-hour working day. If the given number of operating hours is exceeded during the corresponding period (e.g. shift work), reduce the interval accordingly.

Info!
Annual maintenance activities are to be carried out by TRACTO-TECHNIK service personnel.

Tab. 9-1 Maintenance intervals

Assembly group	Maintenance activity	Maintenance intervals				Further information
		d	w	6 m	a	
Safety devices	Functional check of the emergency stop buttons		X	X	X	prior to start-up, chapter 9.8.3, page 296
Safety devices	Functional check of the electric shock protection device		X	X	X	prior to start-up, chapter 9.8.2, page 296
Safety devices	Visual inspection of the electric shock protection device		X	X	X	chapter 9.8.1, page 296
Safety devices	Maintaining the fire extinguisher	according to the manufacturer's specifications or every 1000 operating hours				Further information can be found on the fire extinguisher itself.
Entire machine	Checking the safety signs and labels		X		X	chapter 9.8.4, page 296
Entire machine	General check-up			X		initially after 50 operating hours
Entire machine	Visual inspection for intactness		X	X	X	initially after 50 operating hours, then every 500 operating hours chapter 9.9, page 297
Entire machine	Visual inspection of the base frame				X	chapter 9.9, page 297
Entire machine	Checking the screw connections for tight fit*)	once after 20 operating hours, then according to manufacturer's specifications				chapter 9.9, page 297

Assembly group	Maintenance activity	Maintenance intervals				Further information
		d	w	6 m	a	
Entire machine	Visual inspection of the welded connections for intactness			X		initially after 50 operating hours, chapter 9.9, page 297
Entire machine	Check of hydraulic and electric lines for leak tightness and tight fit	X				
Entire machine	Cleaning	X				after every operation, chapter 10, page 319
Entire machine	Checking the rotational drive for functioning and leakages	X			X	
Entire machine	Gear oil pump rotational drive Cleaning the magnet in the suction line		X	X	X	initially after 50 operating hours, then every 500 operating hours
Entire machine	Checking the bearing rollers of the thrust rig for proper functioning				x	
Entire machine	Checking the tension of the feed chains and re-tensioning if necessary (sag in rig boom)		x	x	x	initially after 50 operating hours, then every 500 operating hours chapter 9.17, page 308
Entire machine	Checking the drives of the crawler tracks for gear oil leakages		x			
Entire machine	Checking the modem connection		x	x	x	
Entire machine	Replacing the dryer of the air conditioner				x	and after 2000 operating hours or every 24 months
Entire machine	Checking the screw connections on the cab swing bearing for tight fit**)			x	x	every 500 operating hours, chapter 9.9, page 297
Entire machine	Checking the rollers on the thrust rig for wear and tear and functioning			x		
Entire machine	Checking the screw connections of the tracks' guide rollers and drive wheels for tight fit			x		initially after 50 operating hours
Entire machine	Checking all lights and indicating instruments of the operating panels		x			
Entire machine	Checking the alignment of the rod box			x		initially after 50 operating hours
Entire machine	Checking the tension of the crawler tracks and re-tensioning if necessary*)		x	x	x	initially after 50 operating hours, then every 500 operating hours, chapter 9.18, page 309
Entire machine	Crawler tracks Checking the oil level			x		
Entire machine	Applying a sticker for the next maintenance			x	x	

Assembly group	Maintenance activity	Maintenance intervals				Further information
		d	w	6 m	a	
Hydraulic system	Changing the vent filter of the hydraulic tank*)				x	
Hydraulic system	Checking the valve blocks for tightness and the levers for proper functioning				x	
Hydraulic system	Checking the function and tightness of the hydraulic cylinders				x	
Hydraulic system	Checking the hydraulic oil filter (return-flow suction filter) via the error messages on the display	x				
Hydraulic system	Replacing the hydraulic oil filter*)			x	x	in case of dirt or fault indication
Diesel engine	Checking the fuel supply	X				chapter 5.3.1, page 73
Diesel engine	Checking the engine oil filling level	X				see the engine manufacturer's instructions
Diesel engine	Checking the ventilation of the drive engine for dirt and deposits at radiator and oil cooler*)		X	X	X	initially after 50 operating hours, then every 500 operating hours
Diesel engine	Replace filler filter for DEF container	every 2000 operating hours				see the engine manufacturer's instructions
Diesel engine	Replace filter for DEF container	every 2000 operating hours				see the engine manufacturer's instructions
Diesel engine	Checking the diesel engine cooling system for any leakages*)		x	x	x	initially after 50 operating hours, then every 500 operating hours
Diesel engine	Checking the diesel engine's cooling unit for dirt and cleaning if required			x	x	
Diesel engine	Checking the V-belt of the diesel engine for tension and cracks		x	x	x	initially after 25 operating hours see the engine manufacturer's instructions
Diesel engine	Renewing the closed crankcase ventilation	every 2000 operating hours				
Diesel engine	Checking the cables and connections of the diesel engine's electrical system		X			see the engine manufacturer's instructions
Diesel engine	Checking all hoses and hose connections of the diesel engine			X		see the engine manufacturer's instructions
Diesel engine	Changing the engine oil of the diesel engine*)			X		see the engine manufacturer's instructions
Diesel engine	Changing the engine oil filter of the diesel engine*)			X		see the engine manufacturer's instructions
Diesel engine	Changing the diesel prefilter and diesel main filter of the diesel engine*)			X		see the engine manufacturer's instructions

Assembly group	Maintenance activity	Maintenance intervals				Further information
		d	w	6 m	a	
Diesel engine	Exchanging the air filter of the diesel engine*)				X	see the engine manufacturer's instructions
Diesel engine	Changing the coolant (-36 °C)				X	see the engine manufacturer's instructions
Diesel engine	Checking the coolant level and antifreeze (-36 °C)	X				see the engine manufacturer's instructions
Diesel engine	Draining water from the water separator of the diesel prefilter*)			x	x	every 500 operating hours
Diesel engine	Checking the valve clearance of the diesel engine and adjusting if necessary*)	every 5000 operating hours				see the engine manufacturer's instructions
Drilling fluid pump	Checking the connections for tight fit*)				x	
Drilling fluid pump	Functional check of the pump			x		initially after 50 operating hours
Drilling fluid pump	Visual inspection of the pump for leakages	x			x	
Drilling fluid pump	Checking the plunger of the feed pump for grooves or excessive drilling fluid leakage and meanwhile emptying the collection container	x				
Drilling fluid pump	Checking the toothed belt tension of the drilling fluid pump		x	x	x	initially after 50 operating hours, then every 500 operating hours
Anchor thrust unit	Checking the nitrogen pressure of the percussive hammer and anchor thrust unit			x		
Drill rods	Checking the O-ring for intactness	X			X	chapter 9.11, page 302
	Visual inspection for intactness in terms of cracks, damages to threads, fissures, score marks, abrasion and distortion*)	X				
	Checking the outer diameters of the threaded connectors of the drill rods	at least once a year more frequently when drilling in abrasive soils				
Drill rods	Magnetic particle inspection for intactness in terms of cracks, damages to threads, fissures, score marks, abrasion and distortion*)			x		initially after 50 operating hours chapter 9.11, page 302

Assembly group	Maintenance activity	Maintenance intervals				Further information
		d	w	6 m	a	
Drill head	Visual inspection for wear	x			x	chapter 9.15, page 305
	Visual inspection of carbide inserts	x				All carbide inserts must be soldered.
	Checking the permeability of the drilling fluid nozzle	x			x	chapter 9.15, page 305
	Checking the drilling fluid nozzles for intactness	x				
	Checking the drill head retainer for any extreme lateral movements of the drill head	x				
	Visual inspection of locking pins and bore holes	x				
	Visual inspection of threaded connections including O-rings	x				
Transmitter housing	Visual inspection for intactness regarding damages to threads, damages to bore holes and locking pins, damages to the transmitter slots, fissures, scratches and abrasion		x			initially after 50 operating hours chapter 9.16, page 306
Detection system	Functional check*)		x	x	x	initially after 50 operating hours, then every 500 operating hours see instructions for the detection system
Expander head	Checking the permeability of the drilling fluid nozzles	x				chapter 9.14, page 304
	Visual inspection of the drilling fluid nozzles for intactness	x				
	Visual inspection of the entire expander head for wear	x				
	Visual inspection of threaded connections including O-rings	x				
Pipe puller	Functional check	x				chapter 9.12, page 302
	Visual inspection for intactness and, if necessary, replacement of the O-ring	x				
	Visual inspection of the yoke for intactness	x				

Assembly group	Maintenance activity	Maintenance intervals				Further information
		d	w	6 m	a	
Swivel	Visual inspection of the O-ring	x				chapter 9.13, page 303
	Functional check	x				
	Visual inspection for damage and wear	x				
	Visual inspection of the threads and plugs for damage				x	

*) according to maintenance and inspection programme

9.6 Designations and number of filters on the machine

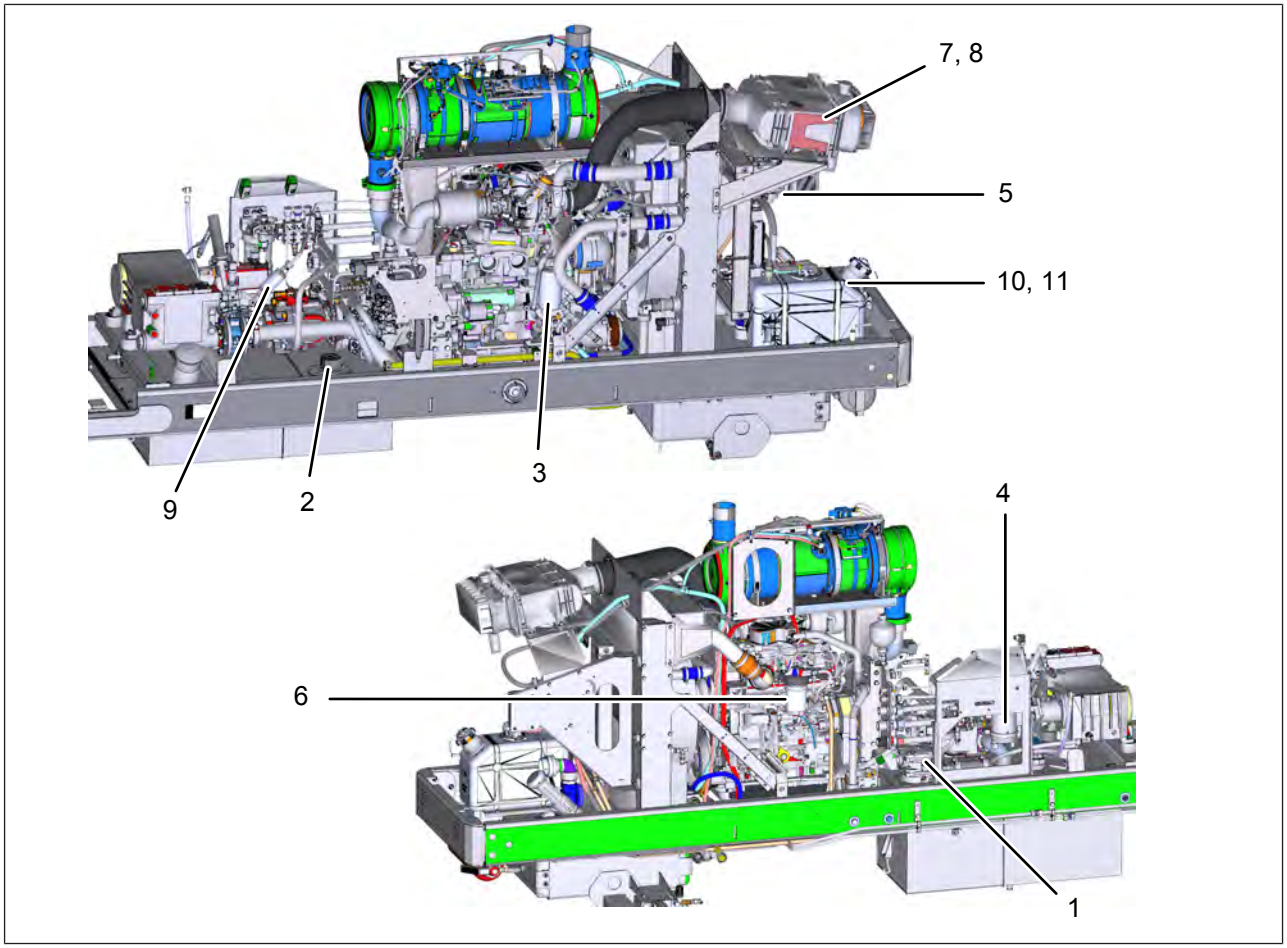


Fig. 9-1 Filters on the machine

Tab. 9-2 Filter designations and number

Item	Filter designation	Quantity
1	Hydraulic reverse motion suction filter	1
2	Hydraulic tank vent filter	1
3	Engine oil filter	1
4	Diesel pre-filter Stage V engine	1
5	Screen filter Stage V engine (DEF filter)	1
6	Diesel filter Stage V engine	1
7	Air filter PRI Stage V engine	1
8	Air filter Stage V engine	1
9	Line filter auxiliary functions	1
10	Filler filter for DEF tank, stage V engine	1
11	Filter for DEF tank, stage V engine	1

9.7 Lubrication intervals and check of operating supplies

The abbreviations in the table below have the following meaning:

the abbreviation:	means that the maintenance task has to be performed at the following intervals:
d	daily
w	weekly or after 50 operating hours
6m	every 6 months or every 500 operating hours
a	annually or every 1,000 operating hours

The time specifications are based on an 8-hour working day. If the given number of operating hours is exceeded during the corresponding period (e.g. shift work), reduce the interval accordingly.

Info!
Annual maintenance activities are to be carried out by TRACTO-TECHNIK service personnel.

Tab. 9-3 Lubrication intervals and check of operating supplies

Assembly group	Activity	Interval				Further information
		d	w	6m	a	
Drill rods	Lubricating the threading	x				chapter 9.11, page 302
Swivel	Lubricating the swivel	x				chapter 9.19, page 310
Pipe puller	Lubricating the threading	x				chapter 9.19, page 310
Entire machine	Lubricating the rotary swivel	X				grease three times daily chapter 9.19.1, page 311
Entire machine	Lubricating the locking flaps at the rod box		X			chapter 9.19.1, page 311
Entire machine	Lubricating the feed chain	X				chapter 9.19.3, page 314
Entire machine	Lubricating the crawler tracks' stabiliser cylinders		x			chapter 9.19.1, page 311
Entire machine	Lubricating the clamping mechanism		x			
Entire machine	Lubricating the tilt cylinders	monthly				
Entire machine	Lubricating the rod grippers		X			chapter 9.19.1, page 311
Entire machine	Lubricating the bearing of the rotational drive	X			X	before each application and 2–3 times daily during drilling as well as during the annual inspection
Entire machine	Greasing the rollers of the thrust rig	X			X	before every application, after every cleaning process and during the annual inspection
Entire machine	Thrust gear Changing gear oil			X		

Assembly group	Activity	Interval				Further information
		d	w	6m	a	
Entire machine	Changing the gear oil of the track-mounted undercarriage*)				X	see manufacturer's instructions
Entire machine	Check hydraulic oil level	x			x	chapter 5.3.1, page 73
Entire machine	Changing the hydraulic oil				x	every 1000 operating hours see oil manufacturer's instructions
Entire machine	Filtering the hydraulic oil		x	x		see oil manufacturer's instructions
Cab	Lubricating the swing bearing of the cab		x			chapter 9.19.1, page 311
Cab	Lubricating the guide rollers			x		initially after 50 operating hours
Drill head	Lubricating the drill head				x	chapter 9.19, page 310
Pump for high-pressure cleaner	Changing the gear oil*)		x	x	x	initially after 50 operating hours, then every 500 operating hours
Drilling fluid pump	Checking or exchanging the bushings and valves or piston seals	x				see manufacturer's instructions
Drilling fluid pump	Changing the gear oil*)		x		x	

*) according to maintenance and inspection programme

9.8 Maintaining the safety devices

9.8.1 Visual inspection of the electric shock protection device

1. Check the grounding cables for intact insulation, plugs and connections.
   ⇨ Replace defective grounding cables with new ones.
2. Check the step grid and grounding mats for intactness.
   ⇨ Replace the defective step grid or the defective grounding mat with a new one.
3. Check the grounding stake for intactness.
   ⇨ Replace the defective grounding stake with a new one.

9.8.2 Functional check of the electric shock protection device

Check the electric shock warning device as described in chapter 5.5.1, page 91.

9.8.3 Functional check of the emergency stop buttons

1. Start the engine (chapter 5.3.2, page 75).
2. Press one of the emergency stop buttons.
   ⇨ The engine must switch off.
3. Try to restart the engine.
   ⇨ It must be impossible to start the engine. The actuated emergency stop button is fully functional.
   ⇨ Keep the machine shut down if the emergency stop button is not functioning properly.
   ⇨ Have the fault rectified by a skilled electrician.
4. If the emergency stop button is fully functional, turn it clockwise to unlock it.
5. Repeat the functional check with all remaining emergency stop buttons on the machine and on the remote controls.

9.8.4 Checking the safety signs and labels

Check the safety signs and labels at the machine for completeness and legibility.

Renew illegible safety signs and labels.

9.9 Maintaining the machine

Visual inspection

Visually inspect the entire machine for intactness.

Check the angle rollers at the thrust rig for wear.

Keep the machine shut down if cracks or wear are visible. In this event return the machine to TRACTO-TECHNIK for maintenance.

Screw connections

Check the screw connections on the machine for tight fit.

Retighten any loosened screw connections before starting to operate the machine.

Pay particular attention to:
- all hydraulic screw connections
- the screw connections on the swing bearing of the cab
- the screw connections of the tracks' guide rollers and drive wheels
- the screw connections of the feed motor

Welded connections

Visually check the welded connections on the machine for their perfect condition.

Keep the machine shut down if cracks or wear are visible. In this event return the machine to TRACTO-TECHNIK for maintenance.

9.10 Maintaining the diesel engine

⚠ DANGER

Explosion hazard due to mixed fuel!



Do not mix petrol or diesel with alcohol or petrol containing ethanol ("gasohol").

NOTICE

Risk of damage to the fuel pump and the injection system.

- Make sure that the diesel fuel is free from water and dirt.

Info!
The diesel engine complies with the requirements of the Stage V exhaust emission standard.

– US EPA and EU legislation stipulate the usage of ULSD fuel.
– Only use diesel fuel ultra-low in sulphur (ULSD) with a max. sulphur content of 15 ppm.

NOTICE

Potential damage due to incorrect engine oil.

- Only use low-ash engine oil.

NOTICE

Use diesel exhaust fluid (e.g. AdBlue®) with API certification [American Petroleum Institute] according to DIN 70700, ISO 22241-1 and AUS-32.

This ensures the necessary purity and concentration of urea.

Info!
If you have any questions on the use of the correct diesel fuel, please contact the TRACTO-TECHNIK customer service.

9.10.1 Instructions on daily maintenance

Check the diesel engine
- for a sufficient level of all lubricants and liquids
- for leakages
- for loose or damaged parts
- for changes in the system behaviour
- for an unusual fuel smell
- for an unusual smell coming from electrical components (e.g. charred cables)
- for unusual noises

Carry out the checks daily in order to identify further necessary maintenance activities in time and thus to ensure optimum performance of the mechanical and electrical components of the diesel engine.

The following occurrences, types of damage, errors and faults require further maintenance activities:
- low lubricant pressure
- low supply voltage
- sudden change of engine power
- erratic or irregular reaction when actuating an operating element
- lighting up / permanent illumination of the warning lamps and indicators
- unusual cooling water or oil temperature
- unusual operating noise
- excessive development of smoke/exhaust gases
- excessive consumption of coolant, lubricants or fuel
- leakages in the area of the coolant, lubricants or fuel
- loose or damaged parts
- worn out or damaged drive belts
- worn out or damaged electrical components

Contact your TRACTO-TECHNIK customer service!

9.10.2 Engine operation at temperatures < 0 °C

NOTICE

At ambient temperatures of < 0 °C, use diesel fuel with a cetane number of at least 45.
At ambient temperatures of > 0 °C, use diesel fuel with a cetane number of at least 42.

Using diesel fuels with another cetane number may cause start-up difficulties, instability and excessive development of white smoke. In order to obtain a satisfactory operational behaviour even at low ambient temperatures, only use diesel fuel in accordance with the recommended cetane number.

Antifreeze

Use antifreeze complying with the requirements under ASTM 4985 (specification GNM6038M) or ASTM D6210. Reduce the maintenance intervals when using antifreeze with a low silicate content (e.g. according to ASTM D4985 (specification GNM6038M)).

Fill the cooling system with an equal quantity of high-quality water (low in calcium, magnesium, chloride and sulphate) and antifreeze. The details can be found in the table below.

Tab. 9-4 Water quality for mixing antifreeze

Substance	Quantity
Calcium and magnesium	max. 170 ppm as $CaCO_3$ + $MgCO_3$
Chloride	40 ppm as Cl
Sulphate	100 ppm as SO_4

Info!
If you have any questions on the use of the correct antifreeze, please contact the TRACTO-TECHNIK customer service.

9.10.3 Greasing oils

Only use high-quality and highly resistant SAE 10W-40 greasing oils complying at least with the CES 20081 standard (Cummins Engineering Standard) and the API classification CJ-4.

Tab. 9-5 Greasing oils – classification

Cummins Engineering Standard classification (CES)	American Petroleum Institute classification (API)	Comment
CES 20081	CJ-4/SL	Minimum required oil classification

Info!
Use a funnel with an angled tube or similar when topping up engine oil.

NOTICE

Potential engine damage due to incorrect greasing oil.

Greasing oils complying with the API classification CJ-4 do not necessarily meet the CES 20081 standard.

- Always make sure that the used greasing oil also meets the CES 20081 standard. Further details regarding the use of greasing oils in Cummins engines can be found in the latest version of the "Cummins Engine Oil Recommendations, Bulletin 3810340".

Info!
If you have any questions on the use of the correct greasing oil, please contact the TRACTO-TECHNIK customer service.

9.11 Maintaining the drill rods

1. Visually inspect the drill rods for intactness.
2. Perform a magnetic particle test on the drill rods at least once a year.
   ⇨ The drill rods must be free from cracks, deep notches, visible wear and distortions. The threads, too, must be free from wear.
   ⇨ In one or more of these cases, replace the respective drill rod(s) by a new one / new ones.
3. Check the outer diameters of the threaded connectors of the drill rods for wear at least once a year.
   ⇨ Replace the drill rod(s) affected by (a) new one(s) if the rod diameter falls below the permissible wear limits. Information regarding the wear limits can be found in the data sheet for the drill rod. If you have any questions, please contact the TRACTO-TECHNIK customer service.
4. Clean the threading of the drill rods if required and apply a sufficient amount of approved thread lubricant (chapter 9.19, page 310).
5. Make sure that the O-ring in the screw-in thread is available and undamaged.

9.12 Maintaining the pipe puller

Visually inspect the pipe puller. Check whether the clamping segments spread out during screwing.

The O-rings (2) must be available and undamaged.

The ring nut (1) must be undamaged and show no signs of corrosion.

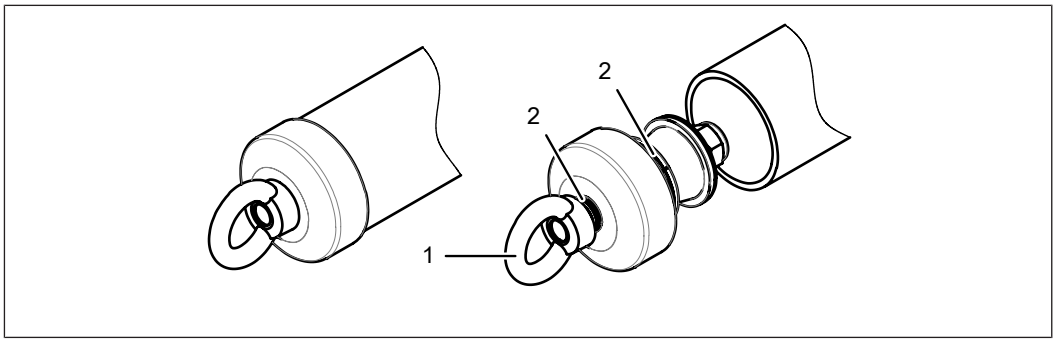


Fig. 9-2 Pipe puller

9.13 Maintaining the swivel

Visual inspection Check the swivel for damage and loose parts before every application. In case of visible damage to the lug (1) or loose screws, replace the affected components. Damages on the lug include corrosion, cracks or an ovally deformed mounting hole.

Lubrication Lubricate the swivel via the greasing nipple (2) directly after every application so that any dirt that might have entered is immediately pressed out again. If the lug can be rotated freely without any resistance before lubrication, the seal is defective. Replace the defective seal. Press grease into the greasing nipple until clean grease exits (see arrow).

Functional check Turn the lug by hand. It must be possible to turn the lug with an even force. If the lug gets jammed or makes noise when it is turned, do not use the swivel any longer. The lug may have an axial clearance of max. 0.5 mm and a radial clearance of max. 0.3 mm.

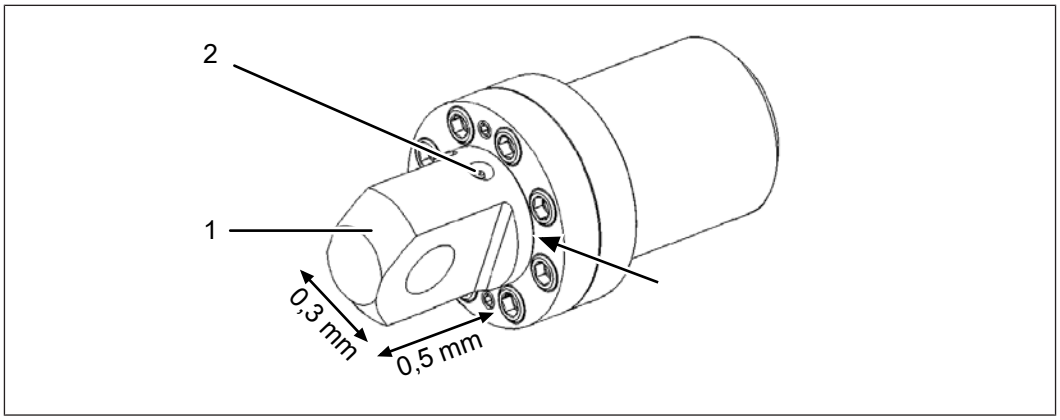


Fig. 9-3 Swivel

9.14 Maintaining the expander head

Check the entire expander head for intactness.

Furthermore, check the following at the expander head:
- the drilling fluid nozzles for intactness
- the permeability of the drilling fluid nozzles
- the threaded connection including the O-ring

Remove any burrs, thrown-up material and chippings.

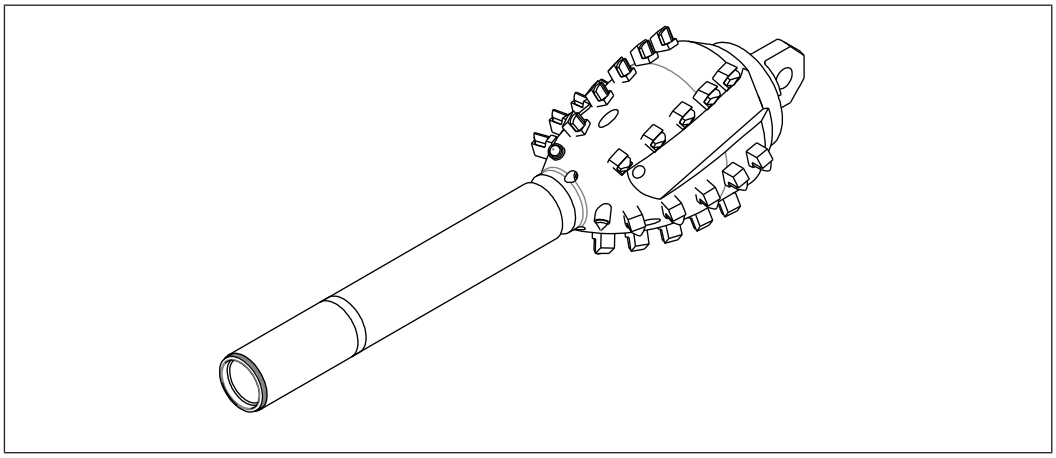


Fig. 9-4 Expander head for rinsing drilling (example illustration)

9.15 Maintaining the drill head

Check the entire drill head (2) for intactness.

Furthermore, check the following at the drill head:
- the O-ring of the nozzle fitting (1)
- the drilling fluid nozzles (4) for intactness
- the permeability of the drilling fluid nozzles
- the drill head retainer for extreme lateral movements
- the lock pins (3, 6)
- the bore holes for the drilling fluid feed-through for intactness
- the threaded connections including the O-rings
- the drill head sealing (5) for intactness

Remove any burrs, thrown-up material and chippings. Check that all bits are soldered.

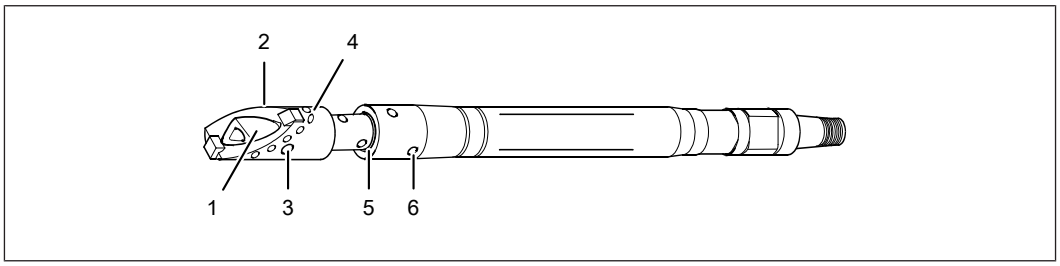


Fig. 9-5 Drill head

9.16 Maintaining the transmitter housing, transmitter and receiver

Visually inspect the transmitter housing, including the slots (2), the transmitter (1) and the receiver. Watch out for any damages and wear, fissures or abrasion.

Make sure that the threading, the bore holes and lock pins (3) of the transmitter housing are undamaged.

Carry out a functional check of transmitter and receiver according to the detection system manufacturer's instructions.

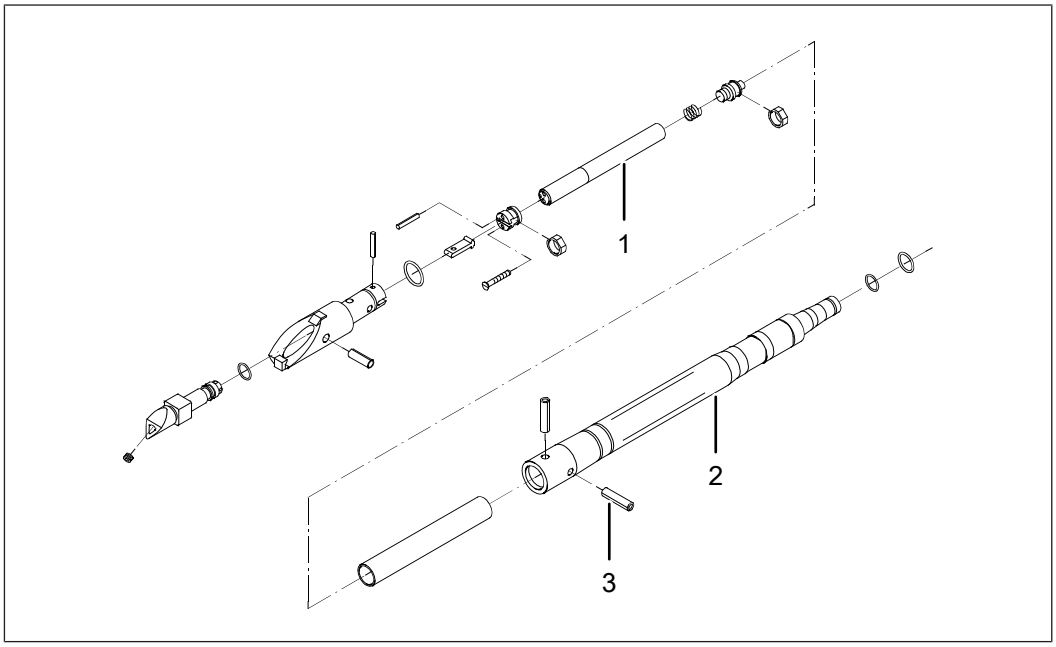


Fig. 9-6 Bore head assembly with transmitter housing and transmitter

Information regarding the structure of the bore head assembly, wherein the transmitter housing is integrated, can be found starting from chapter 5.8, page 104.

Check the batteries and the battery compartment as follows:

- To detach the battery cover, hold the transmitter to the metal housing into which the battery cover is screwed.
- Make sure that the threading of battery cover is free of dirt and rust.
- Check the O-ring of the battery cover for dirt and intactness to prevent the infiltration of humidity.
- Only use copper grease to lubricate the threading at the battery cover. When using another type of grease, the earthing contact of the batteries could be interrupted.
- Make sure that the spring of the battery cover is sufficiently pretensioned.
- Make sure that the battery's positive pole is intact.
- Check the transmitter function before every drilling task.
- Place the provided spring between the batteries to prevent any discharge due to vibrations.

9.17 Re-tensioning the feed chain

1. Loosen the counter nut (1).
2. Tension or relieve tension on the feed chain by turning the nuts (2).
3. Retighten the counter nut.

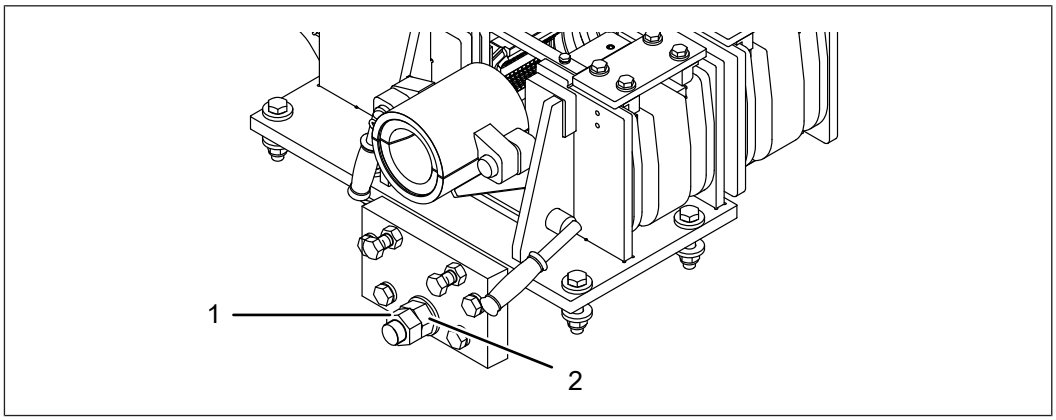


Fig. 9-7 Tensioning the feed chain

⇨ The bottom side of the chain must hang centrally and approx. 6 mm above the top edge of the rig boom when the rig is standing in the rear position (without tensile or thrust force).

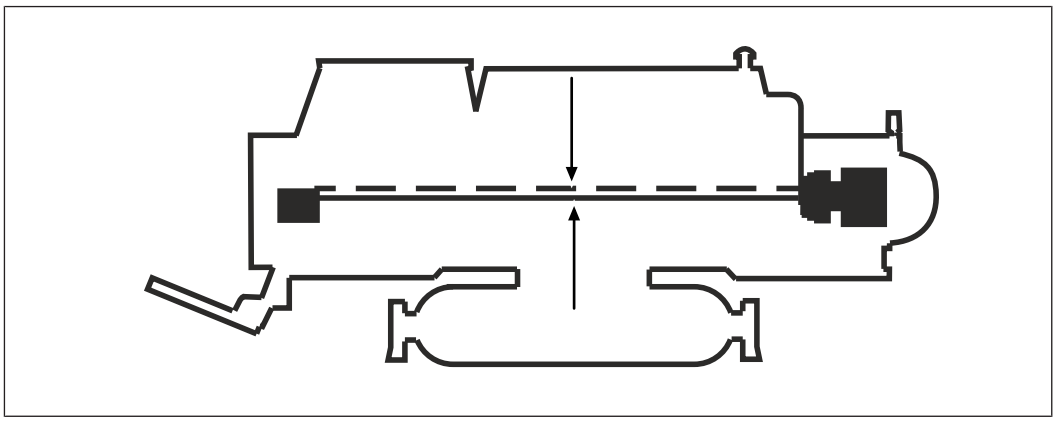


Fig. 9-8 Side view of the rig boom and feed chain

9.18 Retensioning the track chain

Info!
Also observe the operating manual from the manufacturer of the track-mounted undercarriage.

1. Use the stabiliser and the rig inclination to lift the track chains to a degree that the track chain is freely suspended.
   ⇨ To do so, lower the rear stabiliser by pressing the push button on the right joystick and swivel the anchor plate manually downwards with the rotating device.
2. Remove the cover.
3. Attach the grease gun to the nipple (1).
4. Press in as much grease until the track chain is tensioned properly.
   ⇨ The sag (3) between the lower rollers and the track chain must be approx. 15–25 mm.

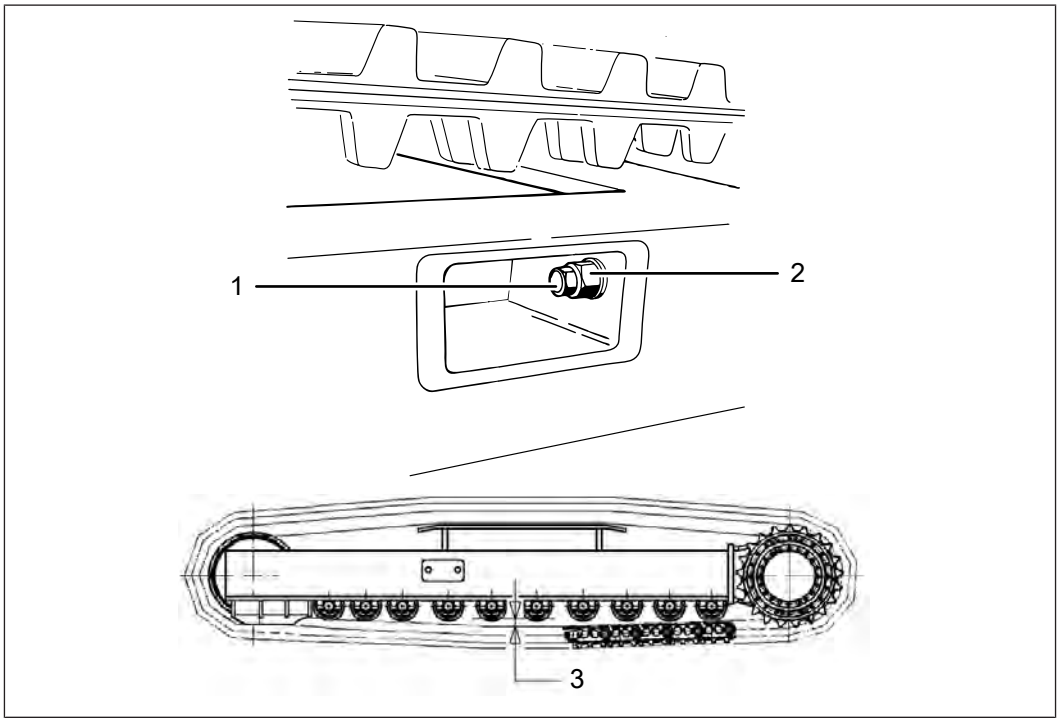


Fig. 9-9 Retensioning the track chain

5. If it is necessary to relieve the track chain (for example because too much grease has been pressed in), loosen the screw (2) on the grease nipple (1). Let the grease drain off until the chain has reached the necessary tension, then tighten the screw again.

9.19 Lubrication

NOTICE



Oils and greases hazardous to the environment!

Danger of environmental pollution!

- Do not let oils and greases penetrate into the soil, waters or the sewage system.
- Dispose of used oil, oily cloths and empty hydraulic containers in an environmentally responsible way and according to the respective laws of your country, e.g. at collection points.

Note to the following instructions for lubricating the machine:

– Thorough lubrication of the machine is required to ensure failure-free operation and avoids costly repairs. This is particularly true for the proper lubrication of all bearings.
– Carry out manual lubrication and all tasks necessary for lubrication when the machine is not running.
– Lubricate the bearings daily or within the given time schedules using the recommended lubricants.
– The recommended lubricants can be found in the lubricant table.
This recommendation does not exclude the use of third-party lubricants with the same characteristics.



Info!
Only use grease of the same type.

9.19.1 Lubrication points on the machine

The following lubrication points are located on the machine:

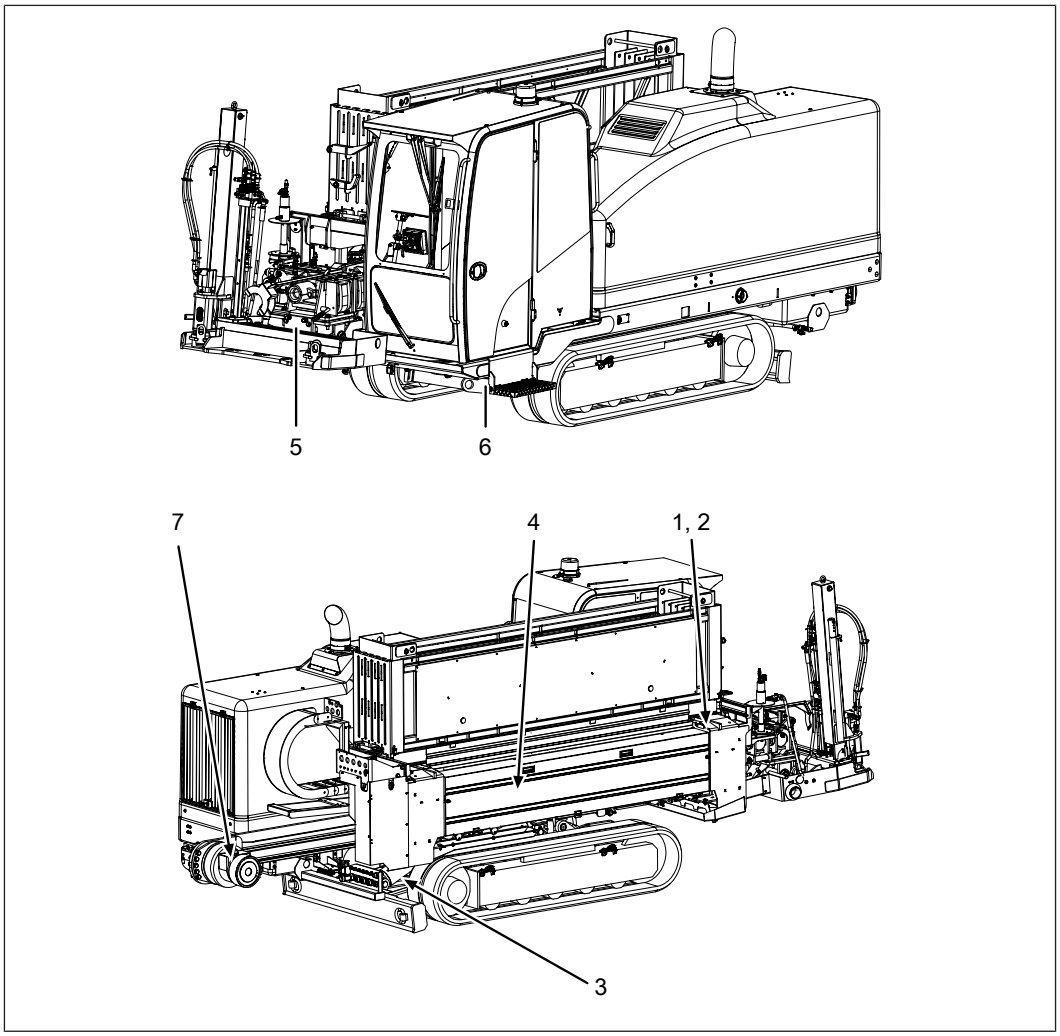


Fig. 9-10 Lubrication points on the machine

Tab. 9-6 Lubrication points on the machine

Item	Component	Number of lubrication points	Lubrication interval
1	Rod grippers	2 (one each)	weekly
2	Locking flaps magazine	2 (one each)	weekly
3	Stabiliser cylinders	2 rear, 2 front (optional)	weekly
3	Stabiliser cylinders	2	weekly
4	Tilt cylinders	1 front, 1 rear	monthly
5	Clamp	2	weekly
6	Swing bearing of the cab	1	weekly
7	Feed chain deflection	1 front, 1 rear	daily

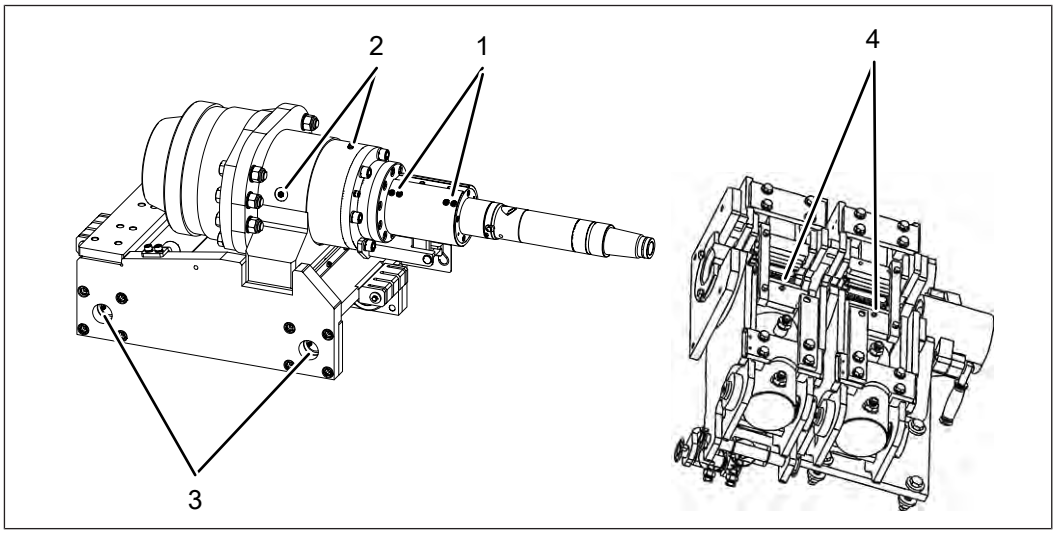


Fig. 9-11 Lubrication points on the thrust rig and the clamping tongs

Tab. 9-7 Lubrication points on the thrust rig and the clamping tongs

Item	Component	Number of lubrication points	Lubrication interval
1	Rotary swivel	4	daily ***) Info!**
2	Rotational drive bearing	2	daily
3	Combined rollers of the thrust rig (one each)	4	daily
4	Clamp jaws	2	weekly

***) Info!**
Carefully inject the grease into the grease nipples (1 stroke of the grease gun is usually sufficient). If the pressure is too high, the seals will be damaged and the rotary swivel will become leaky.

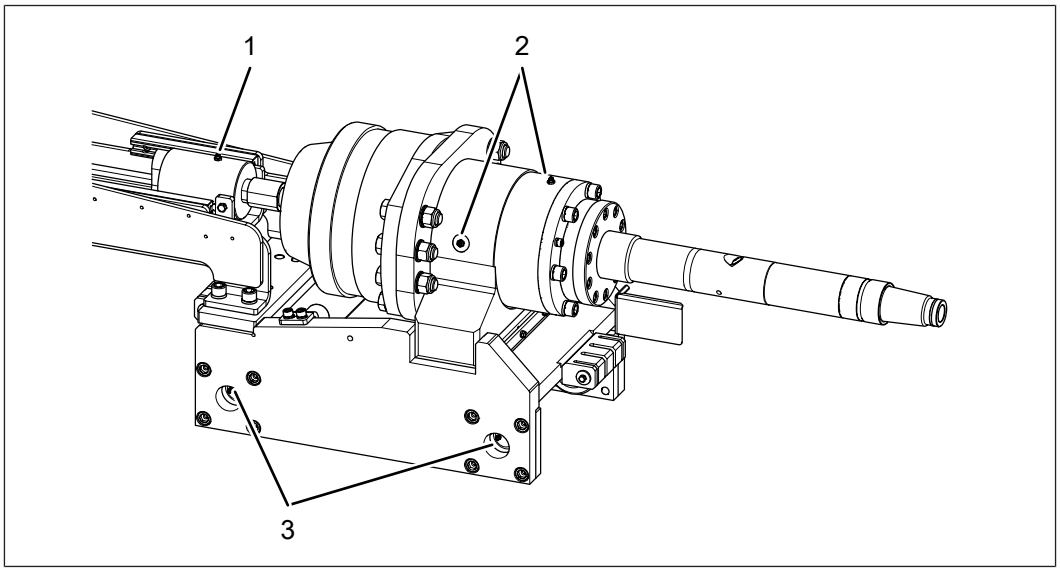


Fig. 9-12 Lubrication points on the thrust rig with Rotodisk

Tab. 9-8 Lubrication points on the thrust rig with Rotodisk

Item	Component	Number of lubrication points	Lubrication interval
1	Rotary joint	1	weekly
2	Rotational drive bearing	2	daily
3	Combined rollers of the thrust rig (one each)	4	daily

9.19.2 Lubricant and greasing oil tables

Tab. 9-9 Lubricant and greasing oil table

Component	Filling quantity	Designation
Crawler tracks per gearbox	1.3 l	SAE 80W/90
Hydraulic tank bore rig	100 l	Ultraplant ES 46[1]
Hydraulic tank bore rig	100 l	Ultramax HVLP 46 [1]
Engine oil for diesel engine	11–13 l	SAE 10W/40[2]
Pump for high-pressure cleaner	0.28 l	SAE 80W/90
Drilling fluid pump P62	6 l	SAE 80W/90
Drilling fluid pump P72	9 l	SAE 80W/90
[1] Optional hydraulic oil grade [2] Only use engine oil of API class CJ-4/SL or higher or CES-20081!		

Lubricants for accessories

Tab. 9-10 Lubricants for accessories

Component	Lubricant
Drill head retainer	Multi-purpose grease, lithium-based, NLGI 2, EP2
Lubricating the swivel	Multi-purpose grease, lithium-based, NLGI 2, EP2
Lubricating the threading of the pipe puller	Multi-purpose grease, lithium-based, NLGI 2, EP2
Greasing nipple rig boom	Multi-purpose grease, lithium-based, NLGI 2, EP2
Drill rod threading	Multi-purpose grease, lithium-based, NLGI 1

9.19.3 Lubricating the feed chain

NOTICE

Never grease the guide track of the thrust rig's sliding guide!

Otherwise dirt will be cling to the grease resulting in a quicker wear of the feed chain.

Lubricate the feed chain in the clamping area with chain spray (MKL-N, mineral oil basis) on a daily basis.

9.19.4 Adjusting the grease quantity of the rod lubrication

Info!
The exact quantity for rod lubrication can be adjusted via a setting screw.

1. Unlock the quantity setting unit by loosening the counter nut (1).
2. Adjust the screw (2) for the quantity setting:
   - ⇨ Turn the screw into the quantity setting unit to reduce the grease quantity.
   - ⇨ Turn the screw out to increase the grease quantity.
   - ⇨ An indication for an ideal grease quantity is the grease being shortly before exiting when screwing together the drills. However, it must not ooze out.
3. Retighten the counter nut.

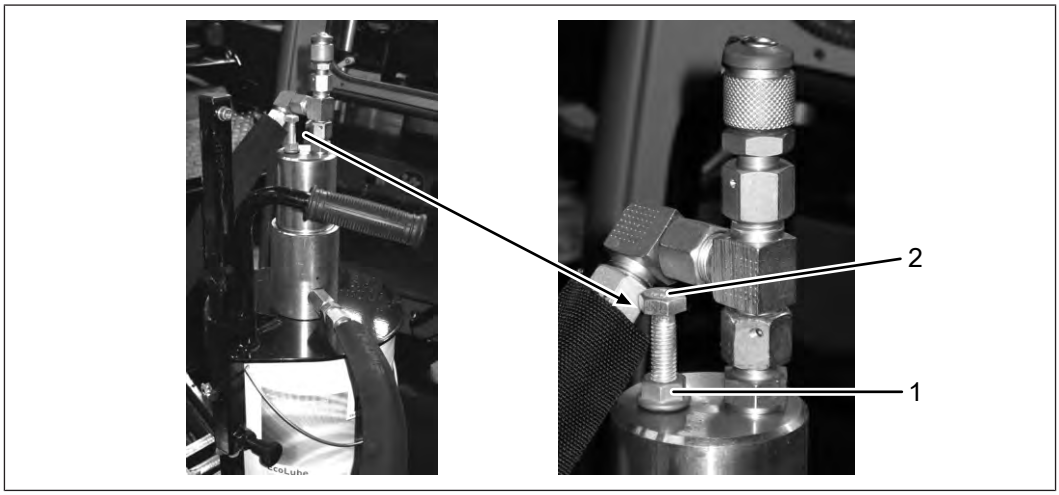


Fig. 9-13 Setting the drill rod greasing quantity

9.20 Frost protection measures

NOTICE

Engine damage due to non-approved antifreeze!

- Only use approved antifreeze for the diesel engine!
- Use ethanediol for the drilling fluid pump or the high-pressure cleaner.

Info!
Make sure that a drill rod is situated in the bore axis and rinse the bore rig with clean water before protecting the machine against frost!

Window cleaning unit

Fill an antifreeze agent suitable for de-icing car windows into the tank of the window cleaning unit (no ethanediol!). This will save you the trouble of manual ice scraping and prevents the window from freezing over again.

Engine cooling circuit

Check the antifreeze content in the cooling circuit of the diesel engine (see the engine manufacturer's instructions).

Water tank and high-pressure cleaner

Please proceed as follows to protect the water tank and the high-pressure cleaner against frost:

1. Empty the fresh water tank by opening the ball valve (1) at the drain (2) of the water tank.
2. When the tank is completely drained, close the ball valve.
3. Open the vent cap (3) and fill the water tank with approx. 3 litres of antifreeze.

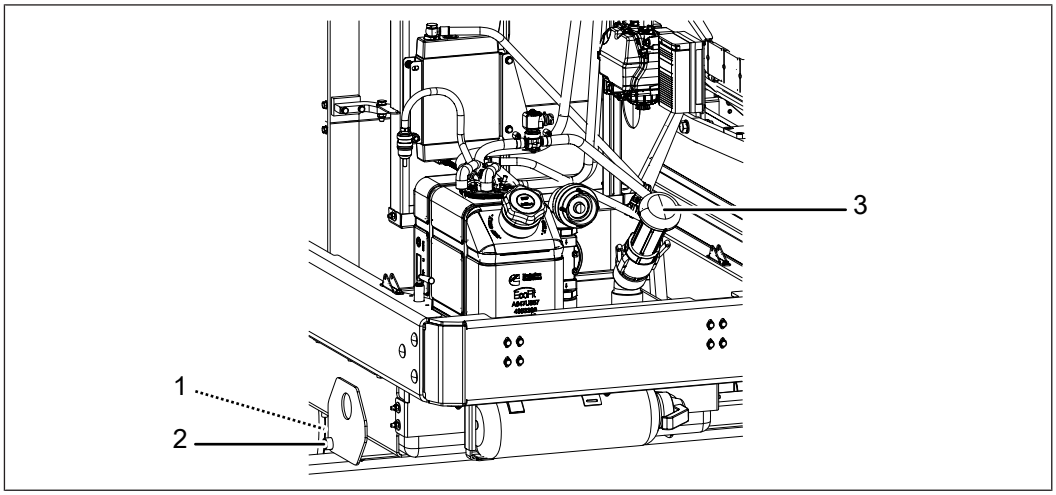


Fig. 9-14 Emptying the water tank

4. Operate the bore rig at idle speed. Start to operate the high-pressure cleaner via the left joystick until the antifreeze exits through the rod cleaning nozzle or the cleaning gun.

Drilling fluid pump

Please proceed as follows to protect the drilling fluid pump against frost and relief its pressure:

Info!
The antifreeze for the drilling fluid pump is sucked from the fresh water tank of the high-pressure cleaner.

1. Open the ball valve (2) for suction on the drilling fluid pump.
2. Close the ball valve (1) at the gate valve of the drilling fluid pump.
3. Take the transparent tube (3) and insert it into the opening of the antifreeze can.

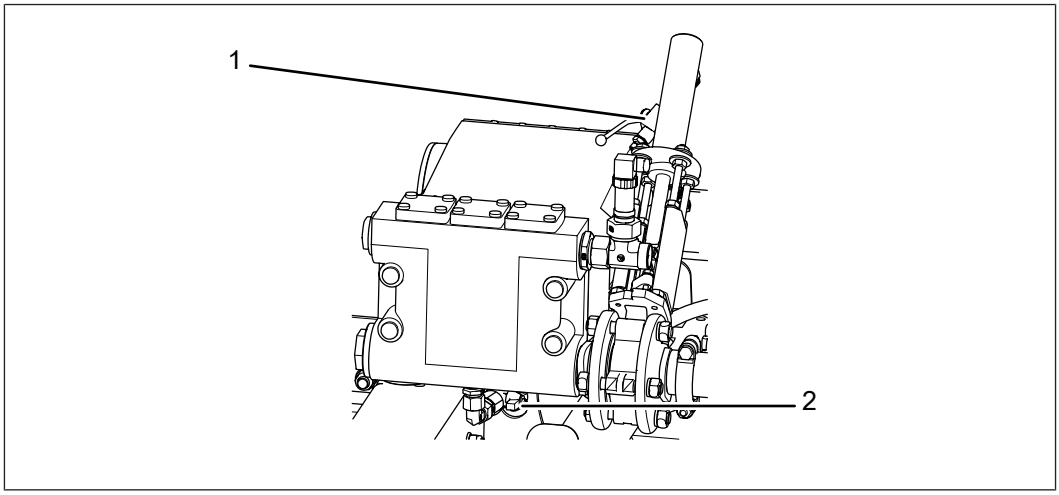


Fig. 9-15 Stop cocks of the drilling fluid pump

4. Start the machine.
5. Close the clamp via the button on the right joystick.
6. Set the potentiometer for the drilling fluid flow rate on the left joystick to a very low value.
7. Set the drilling fluid supply to the slow step on the left joystick (tortoise, only if equipped with drilling fluid pump P72).
8. Switch on the drilling fluid pump on the left joystick by pressing the button.
9. Let the pump run until antifreeze exits at the pump's pressure relief and the sub-saver.
10. Switch off the machine.
11. Immediately after switch-off, close the ball valve (2) for antifreeze suction at the drilling fluid pump.
12. Remove the transparent tube from the can and stow it safely.
13. Open the ball valve (1) at the gate valve of the drilling fluid pump.
14. If necessary, tilt the rig boom so that excess antifreeze can run off.
15. Collect the excess antifreeze in a suitable container. Depending on the degree of soiling, it can be used again.

Info!
If the rig does not have a high-pressure cleaner and fresh water tank, rinse the drilling fluid pump of the bore rig as follows:

1. Fill a bucket with antifreeze (approx. 25 litres).
2. Use the ball valve (1) to close the gate valve on the drilling fluid pump.
3. Open the ball valve (2) for antifreeze suction on the drilling fluid pump.
4. Connect one hose to the intermediate connection, directly behind the suction connection (1) of the drilling fluid pump and hook the other end of the hose into the bucket.
5. Set the potentiometer for the drilling fluid flow rate on the left joystick to a very low value.
6. Set the drilling fluid supply to the slow step on the left joystick (tortoise, only if equipped with drilling fluid pump P72).
7. Switch on the drilling fluid pump on the left joystick by pressing the button.
8. Let the pump run until antifreeze exits at the pump's pressure relief and the sub-saver.
9. Switch off the machine.
10. Immediately after switch-off, close the ball valve (2) for antifreeze suction at the drilling fluid pump.
11. Remove the transparent tube from the can and stow it safely.
12. Open the ball valve (1) at the gate valve of the drilling fluid pump.
13. If necessary, tilt the rig boom so that excess antifreeze can run off.
14. Collect the excess antifreeze in a suitable container. Depending on the degree of soiling, it can be used again.

Clean the machine after every application.

Requirement

The machine is switched off and the system depressurized.

Cleaning the machine

Clean the operating elements inside the cab with a cloth, never use a high-pressure cleaner.

Clean the operating elements on the panel with a cloth, never use a high-pressure cleaner.

Close all protective caps and doors of the machine!

Connect the high-pressure cleaner as described in chapter 5.12, page 121.

– Clean the machine with the high-pressure cleaner.
– Clean the drill rods and the tools with the high-pressure cleaner.

Cleaning the remote control

Clean the remote control with a cloth, never use a high-pressure cleaner.

Requirements

- The boom is raised.
- The stabilisers are resting on the ground horizontally.
- The machine is switched off.
- The hydraulic system is depressurized.

11.1 Storage conditions

Store the machine and the accessories under the following storage conditions:

- dry
- under roof
- storage temperature in accordance with the outside temperature

11.2 Storing hydraulic hoses

For the storage of hydraulic hoses and hose lines observe the following:

- Store the hoses in a cool, dry place with low dust levels by wrapping them in plastic packaging material.
- Avoid direct sunlight or UV irradiation.
- Shield nearby heat sources.
- Avoid storage temperatures below -10 °C for elastomers.
  The most favourable storage conditions are temperatures between +15 °C and +25 °C as well as a relative humidity below 65 %.
- Make sure that no ozone-generating lighting fixtures, e.g. fluorescent light sources, mercury vapour lamps, or electrical appliances with sparking are used in the immediate vicinity of the storage location.
- Store hose lines away from substances which could cause damage, e.g. acids, caustic solutions or solvents.
- Store hose lines free of tension and in a horizontal position.
- When storing in loops, observe the minimum bending radius.
- Observe the maximum storage time of 2 years for hose lines and 4 years for hydraulic hoses. Dispose of the hoses when this limit is exceeded.

11.3 Storing lubricants

Lubricants such as oils and grease should be stored in clean, closed containers so that dust and humidity cannot penetrate the storage area. Store the containers in a dry and cool place.

Prevent oils and greases from penetrating into the soil, water or sewage system.

12.1 Disposal of auxiliary material

NOTICE



Oils and greases hazardous to the environment!

Danger of environmental pollution due to oils or greases.

- Do not let oils and greases penetrate into the soil, waters or the sewage system.
- Dispose of used oil, oily cloths and empty hydraulic containers in an environmentally responsible way and according to the respective laws of your country, e.g. at collection points.

Information on the quantity and type of auxiliary materials used can be found in the technical data and in the safety data sheets.

12.2 Disposal of the machine

Prior to disassembly, shut down the machine and drain the diesel fuel and the hydraulic oil from the machine. Observe the applicable country-specific disposal regulations.

For disposal, dismantle the machine and separate the components into the individual material groups:

– plastics
– non-ferrous metals (e.g. copper scrap)
– electronic scrap
– steel

Dispose of the materials in accordance with your country-specific laws.

13.1 Checklist for construction site planning

Determine the date for the execution of the machine, intermediate and installation manholes / target pit whilst considering the aspects mentioned below.

Tab. 13-1 Checklist for construction site planning

		Comments
On-site conditions	Accessibility of the operating site	
	Ground conditions	
	Geological survey of the ground required	
	Obstacles in the intended bore path (foundations, pipes)	
	Plans of adjacent lines	
	Area for the installation of the product pipe	
	Determining the starting position in accordance with the technical parameters	
	Determining the location and excavation method for the working pits in accordance with the technical parameters	
	Determining the installation site for the drilling fluid system	Hoses and electrical cables must be long enough to reach the bore rig. It must be possible to re-fill the drilling fluid mixing system at the installation site.
	Minimum safety distance	
	Height difference between entry and exit point	
	Overlap minimum maximum	
Technical parameters	Length of the bore path	
	Clarifying the compliance with the min. permissible bending radius of the drill rods under on-site conditions	
	Determining the product pipe with regard to length, diameter and flexibility	
	Ordering the product pipe	
	Finding a water connection for the drilling fluid mixing system	
	Providing an additional lifting device if necessary	
	Planning transportation to the site	
	Determining the date for construction	

		Comments
Legal framework conditions	Local regulations (working hours, manhole arrangement, residential requirements), traffic regulations	
	Environmental requirements in the event of damage	
	Clarifying liability in case of work accidents	
	Clarifying liability in case of work deficiencies	
	Clarifying liability in case of environmental damage	
	Clarifying responsibilities for the disposal of potential residual water in manholes	
Official permits	Obtaining the required permits (traffic, Waterways and Shipping Office, excavation permit)	
Personnel	Assigning a site manager	
	Determining assistant workers	

13.2 Maintenance programme



The maintenance intervals are covered in this operating manual.
Non-compliance with the maintenance intervals invalidates any warranty claim!

The following form is used to document maintenance activities on the machine.

1. Perform the maintenance activities according to the table in chapter 9.5, page 287.
2. Fill in the date and operating hours of the inspection/repair performed.
3. Fill in the date or the operating hours of the next scheduled inspection.
4. Fill in the number of the company/department/representative in the "Plant" column:
   1 = Company headquarters Lennestadt
   2 = Customer centre Lennestadt
   3 = Assembly & Logistics
   4 = Customer centre Bakum
   5 = Customer centre Altbach
   6 = Customer centre Viernheim
   7 = Customer centre Golzow
   8 = Customer centre Erkrath
   9 = Customer centre Lützen
   10 = Customer centre Hamburg
   11 = Representative Bavaria
   12 = Maintenance/inspection/repair by the customer
5. Fill in your name and sign.

Tab. 13-2 Maintenance programme

Inspection/repair performed					Next inspection on/at	
Inspection date	Repair date	Operating hours	performed by (name/signature)	Plant	Date	Operating hours

13.3 Declaration according to EC Machinery Directive 2006/42/EC (reproduction of content)

DECLARATION OF CONFORMITY
TRANSLATION OF THE ORIGINAL
ACCORDING TO EC MACHINERY DIRECTIVE 2006/42/EC, ANNEX II, 1, A AND EC DIRECTIVE 2000/14/EC

WE HEREBY DECLARE THAT THE MACHINE

Product name:	Fluid-assisted HDD rig
Type:	GRUNDODRILL 15XPT
Serial number:	DRI....
Year of manufacture:	20..
complies with the following relevant provisions:	
Directive 2006/42/EC	as of 17/05/2006
Directive 2000/14/EC	as of 08/05/2000
	Sound power level L_{WA} 103 dB

APPLIED HARMONISED STANDARDS:

EN 16228-1:2014	EN 16228-3:2014

MANUFACTURER:

TRACTO-TECHNIK GmbH & Co. KG, Paul-Schmidt-Str. 2, 57368 Lennestadt, Germany

Authorised representative for the compilation of the technical documents:	Dipl.-Ing. Rouwen Homringhaus

Lennestadt, ...

_____

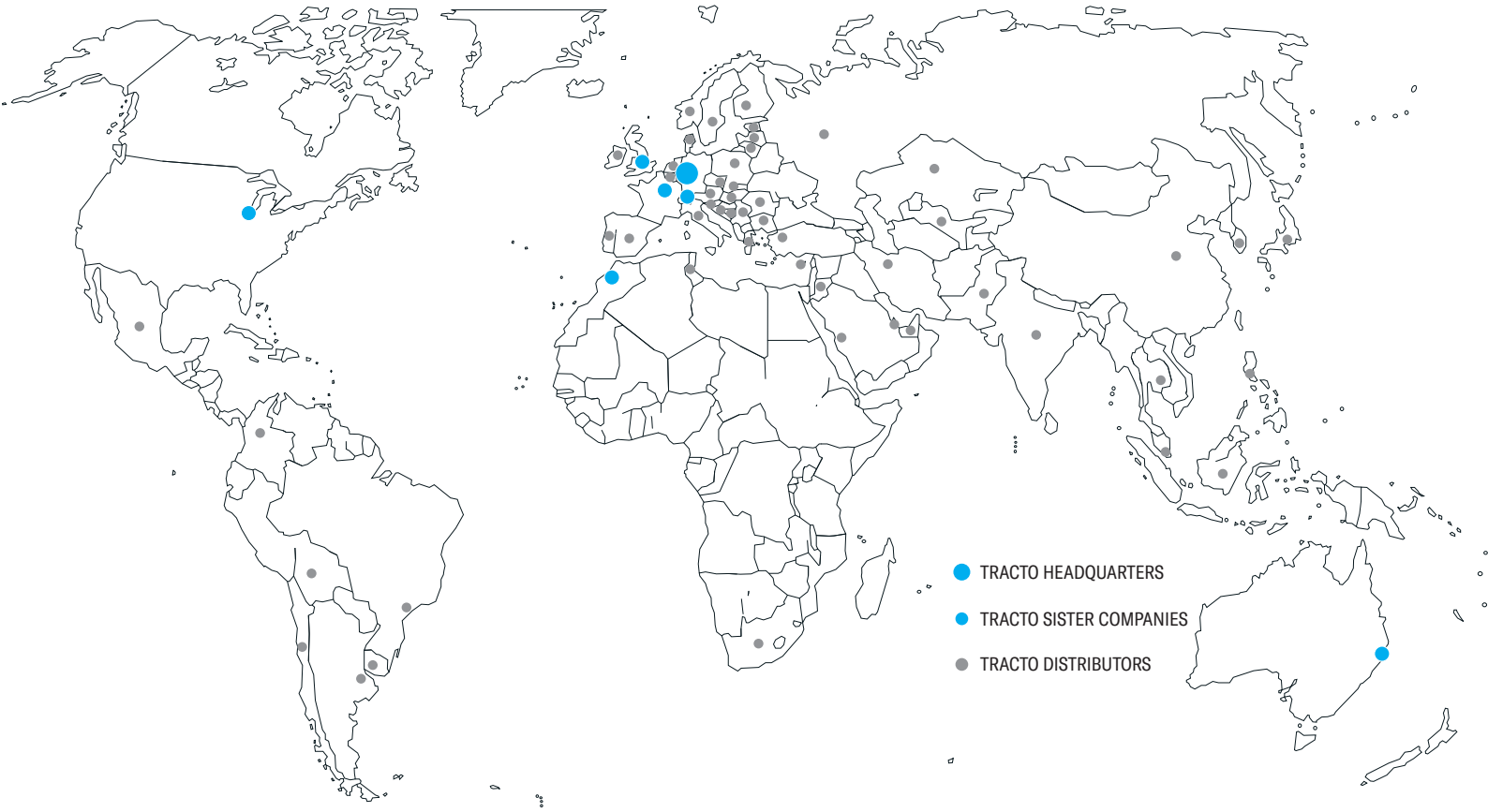
Dipl.-Ing. Meinolf Rameil, CTO

Please note: The declaration of conformity loses its validity if an alteration is made that has not previously been agreed on with the manufacturer.

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