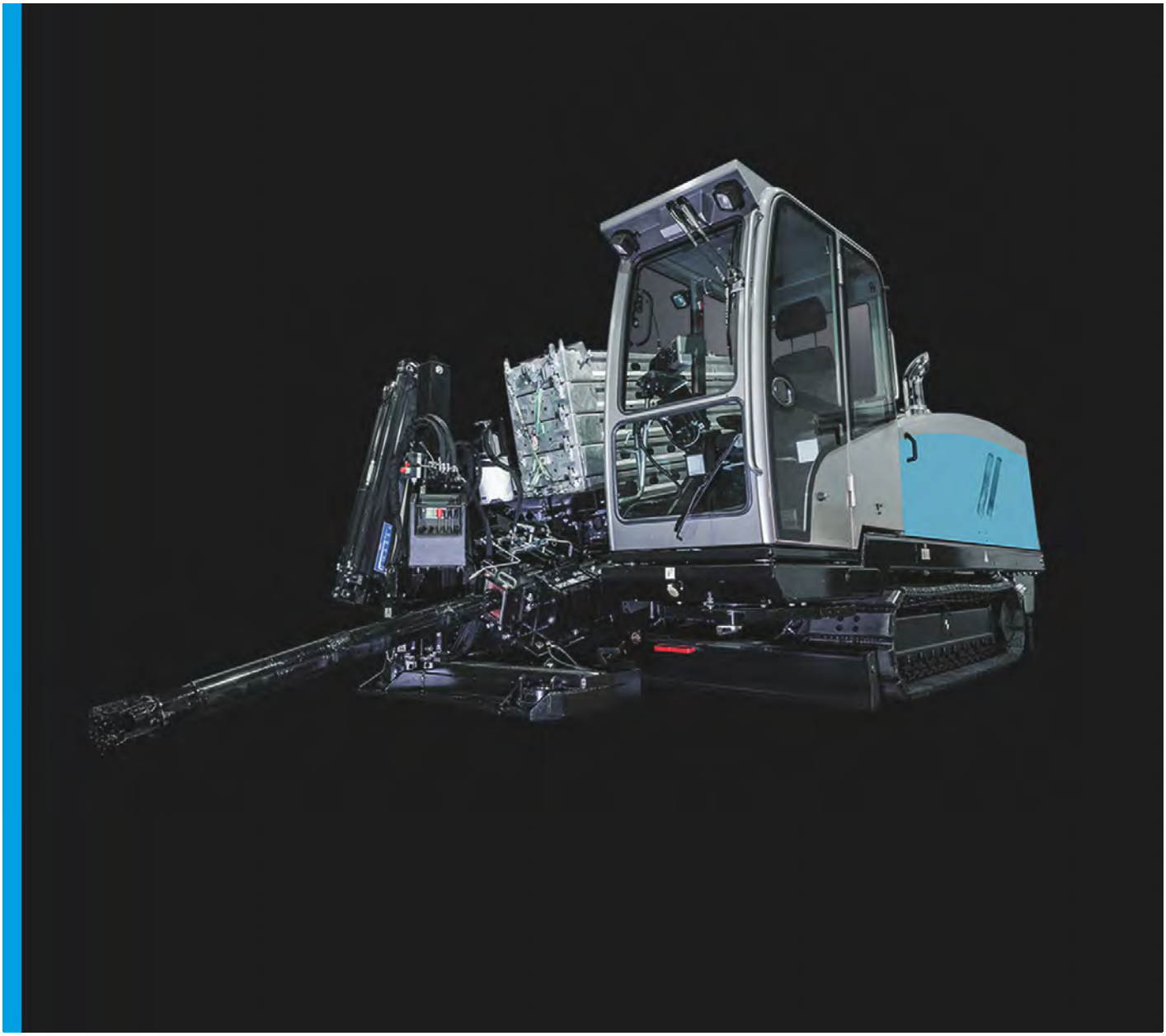
# GRUNDODRILL 18ACS Stage V

# HDD ROCK DRILL RIG

Translation of the
ORIGINAL INSTRUCTIONS



Version: 08/05/2025/38EN
Serial no.:

**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.



**Danger due to toxic substances!**
This sign indicates dangers caused by toxic 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 18ACS Stage V

comprising:

– bore rig with integrated drive unit
– rod box/stacking boxes
– roller chisel (drill head), expander head, transmitter, receiver
– twin tube rods (inner and outer drill rod)
– optionally: components for wire-controlled drilling

## 1.3 Nameplate

The nameplate is attached to the side of the machine:

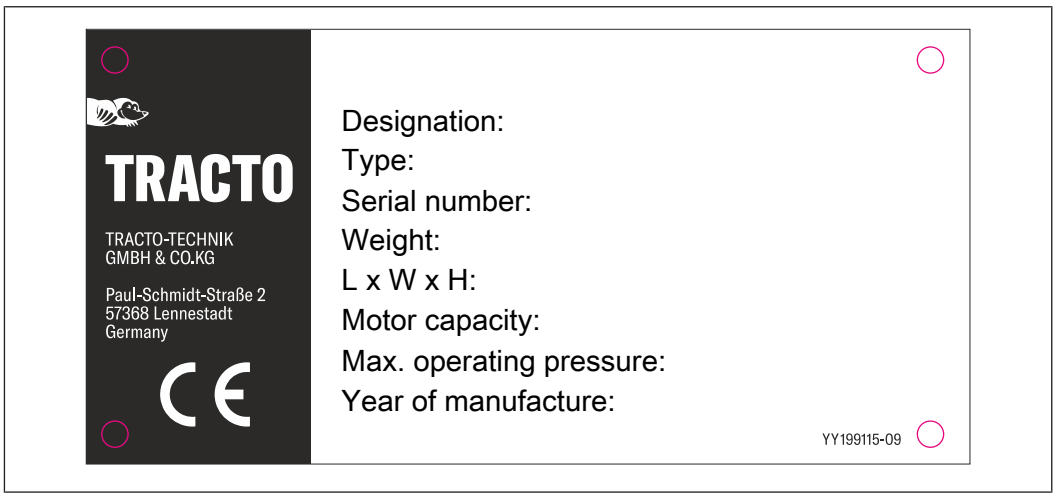



*Fig. 1-1 Nameplate*

# 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
- bores with alternating rock types

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.

Only personnel instructed by TRACTO-TECHNIK is permitted to operate the loading crane. Additionally, the national qualification requirements for crane operation must be met.

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 stabilisers 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
- using the loading crane for lifting stacking boxes other than those mentioned in chapter 3.3, page 59
- using the loading crane for lifting expander heads which are not in accordance with the permissible weights stated in chapter 3.3, page 59

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 rotating thrust rig. 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<br>– identify possible damage and recognize possible hazards relating to the machine |
| Industrial mechanic | – read and understand construction drawings<br>– carry out mechanical maintenance work<br>– ensure the functionality of mechanical components<br>– identify possible hazards when working with mechanical components |
| Skilled electrician | – read and understand electric circuit diagrams<br>– put electrical systems into service and maintain them<br>– wire switch and control cabinets<br>– install control software<br>– ensure the functionality of electrical components<br>– identify possible hazards when working with electrical and electronic systems |
| Hydraulic specialist | – read and understand hydraulic circuit diagrams<br>– put hydraulic systems into service and maintain them<br>– mount and disassemble hydraulic hoses<br>– ensure the functionality of hydraulic components<br>– 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 | | | |
| Operating the loading crane | 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 above the front window (example)*

*Tab. 2-3 Safety signs and labels above the front window*

| 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. **Note!** The precise labelling depends on the type of rod. |
| 2 |   (sample) | indicates the date for the next expert check |

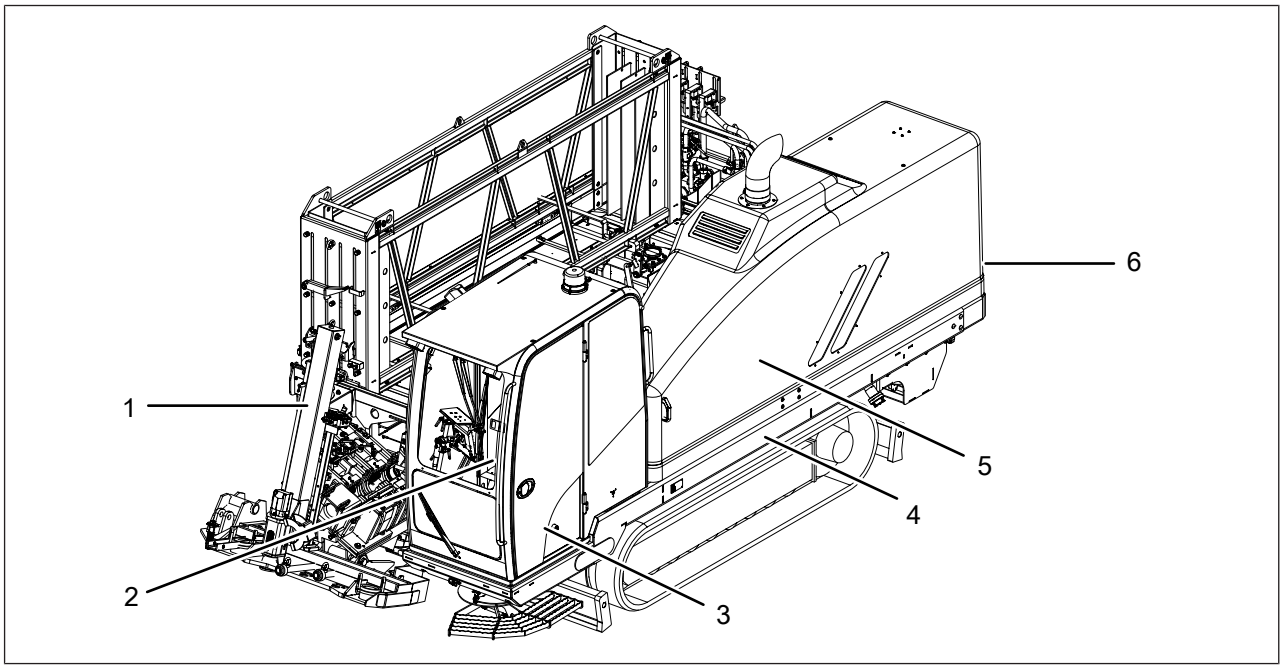
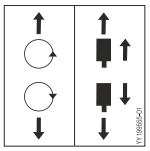
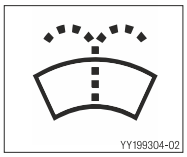
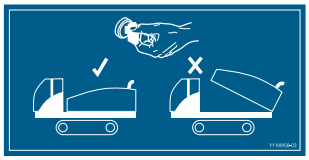
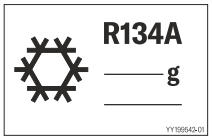



*Fig. 2-2 Safety signs and labels on the machine*

*Tab. 2-4 Safety signs and labels on the machine*

| Item | Safety signs, labels | Meaning |
|---|---|---|
| 1 |  | With anchor boring rig option enabled:<br>left: screw drill in or out<br>right: lift or lower anchoring unit |
| 2 |  | inside the cab under the left joystick panel:<br>indicates the filler neck of the windscreen washer fluid tank |
| 3 |  | in the cab:<br>diagnostic connector diesel engine |
| 4 |  | It is prohibited to stand in the danger area |
| 5 |  | at the bonnet:<br>only open the bonnet when the engine is not running,<br>otherwise there is a risk of injury. |

| Item | Safety signs, labels | Meaning |
|---|---|---|
| 6 |  | in the engine compartment:<br>indicates the type and quantity of coolant used by the air conditioner |

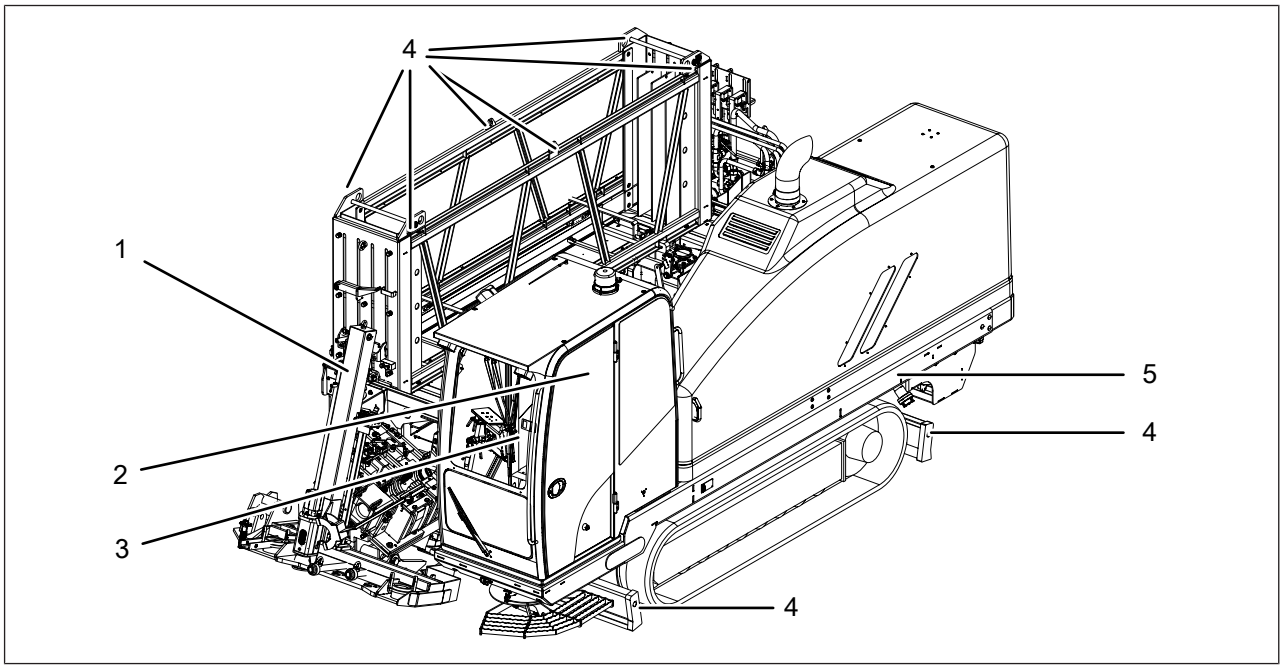
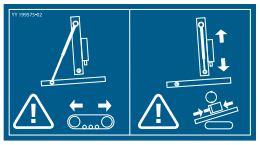
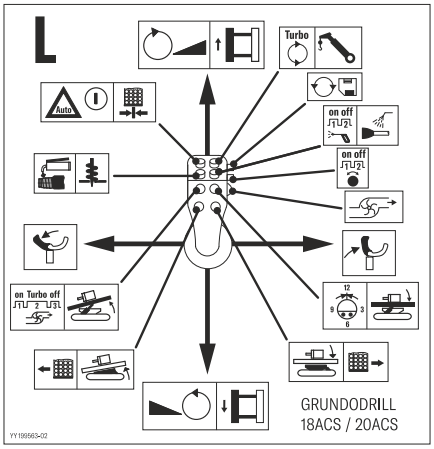
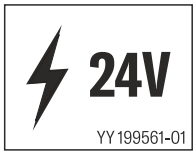



*Fig. 2-3 Safety signs and labels on the machine*

*Tab. 2-5 Safety signs and labels above the front window*

| Item | Safety signs, labels | Meaning |
|---|---|---|
| 1 |  | With anchor thrust unit option enabled:<br>Reposition the safety bar before using the anchor thrust unit. |
| 2 |  | Inside the cab:<br>indicates the functions of the operating elements on the left joystick |
| 3 |  | inside the cab on the right joystick panel:<br>indicates the 24 V socket |

| Item | Safety signs, labels | Meaning |
|---|---|---|
| 4 |  | Attachment point:<br>identifies the positions where lifting means can be attached for lifting the machine |
| 5 |  | indicates the supply connection for the drilling fluid |

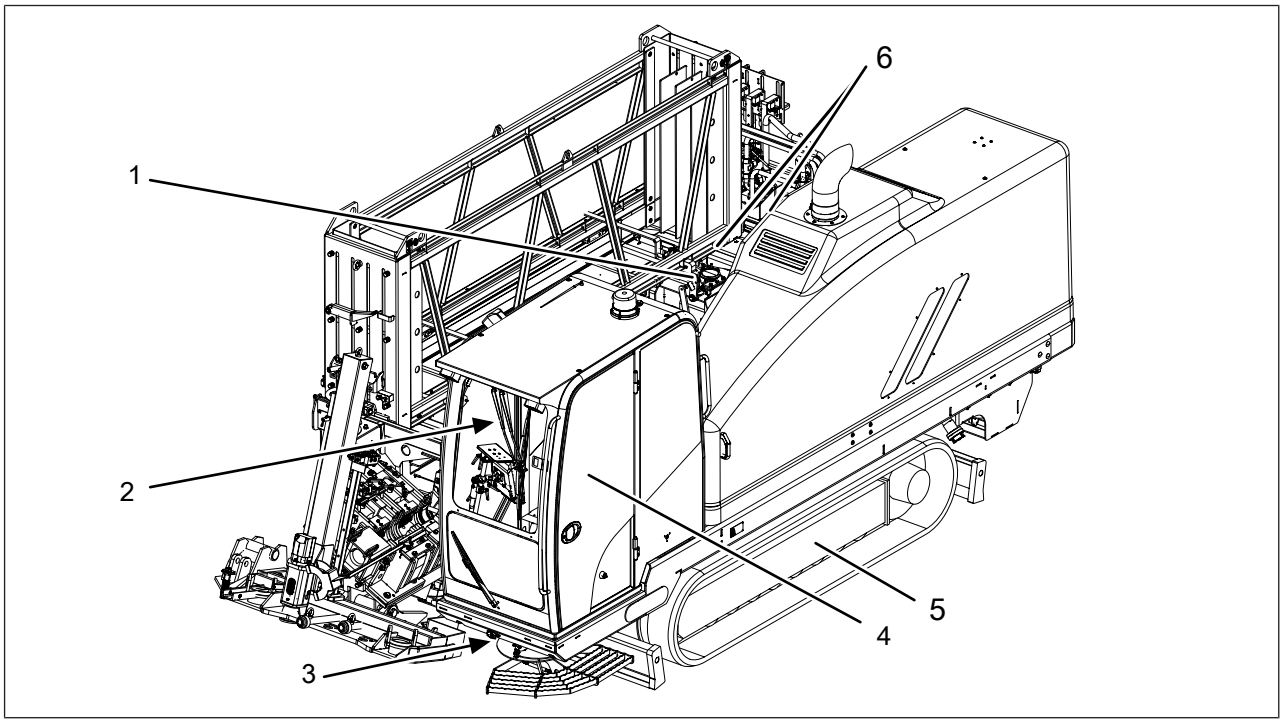
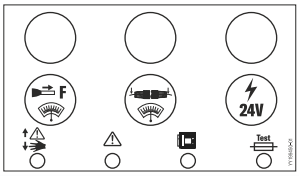
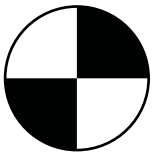



*Fig. 2-4 Safety signs and labels on the machine*

*Tab. 2-6 Safety signs and labels on the machine*

| Item | Safety signs, labels | Meaning |
|---|---|---|
| 1 | <br>Laser beams<br>Do not look into the beam.<br>Laser class 2 | on the thrust rig:<br>Danger due to laser beams<br><br>Lasers of class 2 only radiate in the visible range and produce no more than 1 milliwatt (mW) in continuous wave operation (longer-lasting beam). Looking directly into the beam will cause a strong blinding effect but will not cause any damages, even in case that optical aids are used. The reflexive closing of the eyelids must however not be withheld by force. |
| 2 |  | Window can also be used as an emergency exit |
| 3 |  | Lashing points (2 × each on the stabilisers)<br>indicates the lashing eyes for transport on a truck/trailer |
| 4 |  | Assignment of the electrical connections behind the operator seat in the cab (chapter 6.2.15, page 207) |

| Item | Safety signs, labels | Meaning |
|---|---|---|
| 5 |  | indicates the centre of gravity |
| 6 |  | Danger due to laser beams |

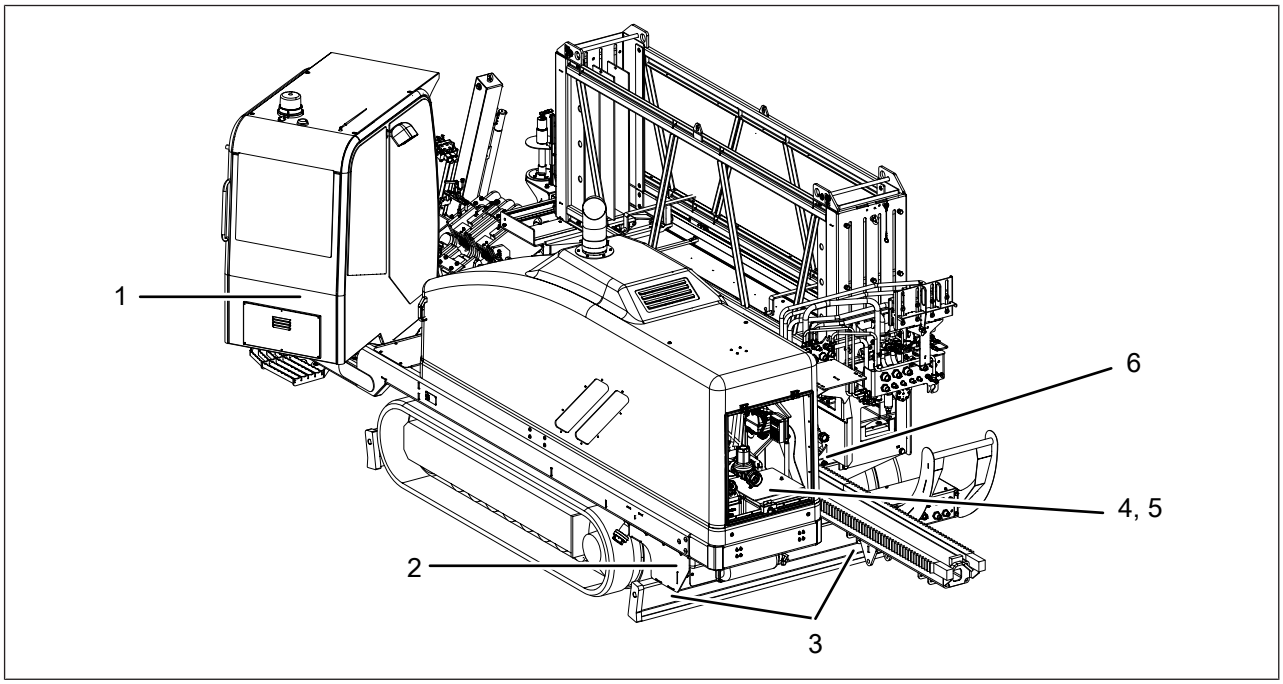
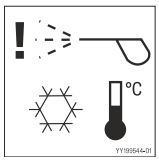
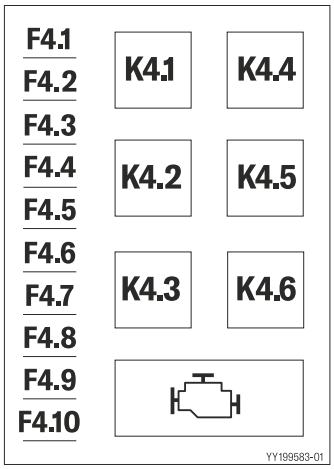



*Fig. 2-5 Safety signs and labels on the machine*

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

| Item | Safety signs, labels | Meaning |
|---|---|---|
| 1 |  | indicates the guaranteed sound power level outside the machine |
| 2 |  | indicates the drain tap for the fresh water tank |
| 3 |  | Lashing points (2 × each on the stabilisers)<br>indicates the lashing eyes for transport on a truck/trailer |
| 4 |  | indicates the connection to fill the fresh water tank<br><br>**Note!**<br>Make sure that the battery does not come into contact with water while filling up the fresh water tank. Otherwise the battery poles may corrode and thus cause a higher transition power. |

| Item | Safety signs, labels | Meaning |
|---|---|---|
| 5 |  | 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 cleaner. |
| 6 |  | Fuse and relay assignment:<br>F4.1 = 5 A = exhaust gas after-treatment – sensor system<br>F4.2 = --<br>F4.3 = 15 A = DEF[1)] hose heating<br>F4.4 = 15 A = DEF feed module - Heating<br>F4.5 = 15 A = exhaust gas after-treatment – sensor system<br>F4.6 = 5 A = Operating indicator (POI lamp)<br>F4.7 = --<br>F4.8 = --<br>F4.9 = --<br>F4.10 = --<br><br>relay:<br>K4.1 = exhaust gas after-treatment – sensor system<br>K4.2 = DEF feed module - Heating<br>K4.3 = DEF hose heating 1 (pressure line)<br>K4.4 = DEF hose heating 2 (return line)<br>K4.5 = DEF hose heating 3 (intake line)<br>K4.6 = Switch-on lock for starter motor<br>[1)] DEF = diesel exhaust fluid (e.g. AdBlue®) |

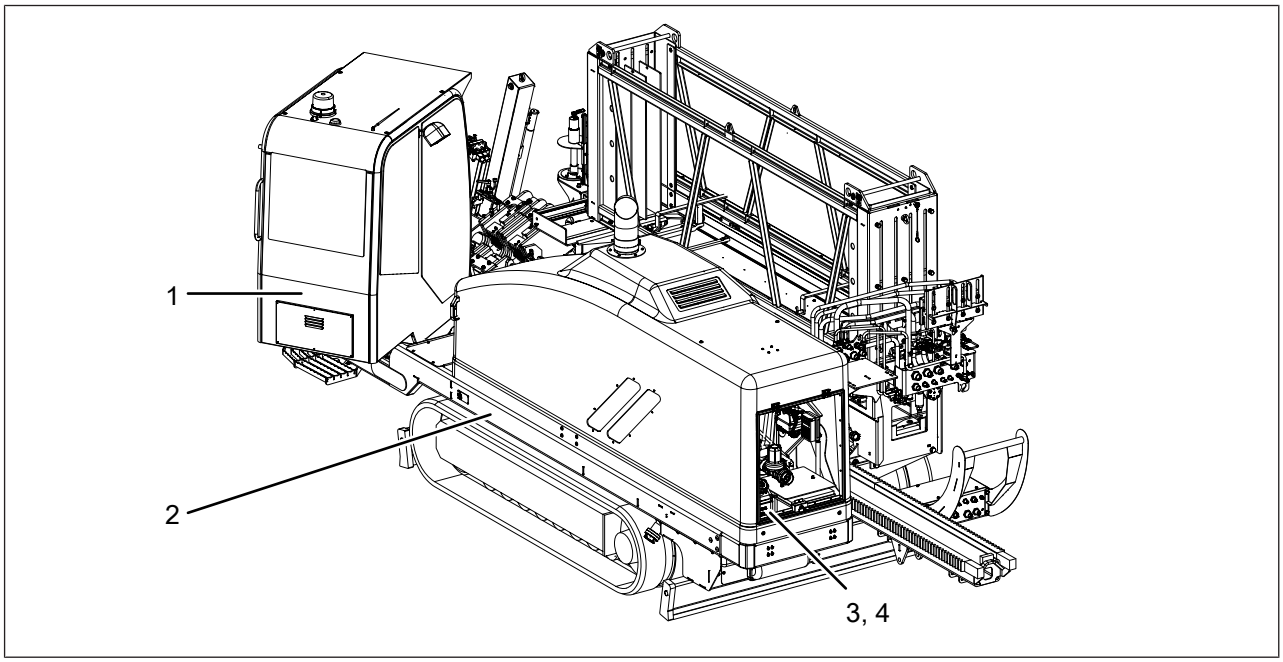
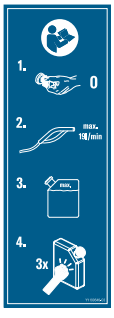



*Fig. 2-6 Safety signs and labels on the machine*

*Tab. 2-8 Safety signs and labels on the machine*

| Item | Safety signs, labels | Meaning |
|---|---|---|
| 1 |  | Wear ear protection!<br>Always wear ear protection during machine operation outside the cab. |
| 2 |  | At air and ground temperatures of approx. 0 °C and below there is a danger of the water freezing. This might destroy the drilling fluid pump. Protect it with antifreeze. |
| 3 |  | indicates the filler neck for the diesel exhaust fluid (DEF) |
| 4 |  | behind the tailgate at the DEF tank:<br>Instructions for filling the DEF tank |

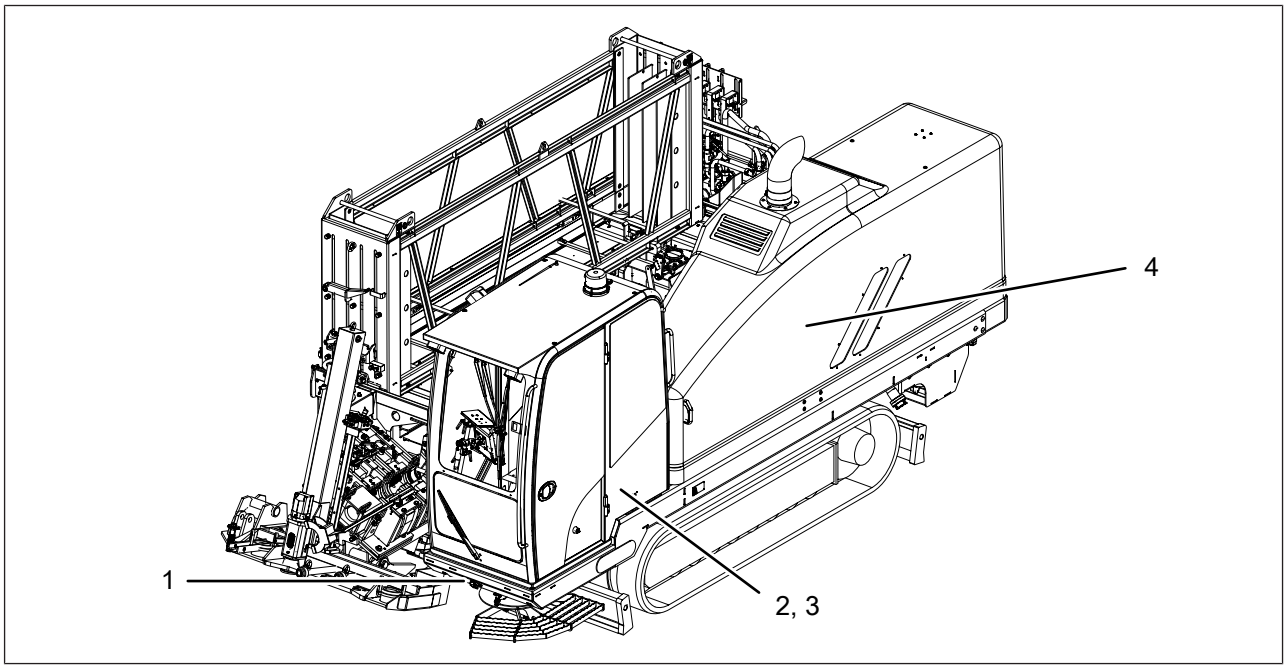
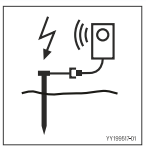
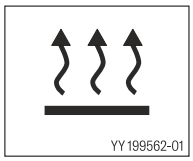
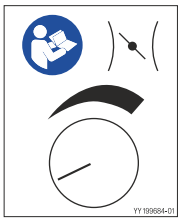



*Fig. 2-7 Safety signs and labels on the machine*

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

| Item | Safety signs, labels | Meaning |
|---|---|---|
| 1 |  | indicates the grounding connection for the power warning device (Zap-Alert) |
| 2 |  | in the cab:<br>indicates the control of the heat output in the cab |
| 3 |  | inside the cab:<br>Engine speed potentiometer<br>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. |
| 4 |  | in the engine compartment:<br>Only use permitted or approved types of hydraulic oil for the hydraulic system in order to prevent any damages to the hydraulic system.<br>**Note!** The precise labelling depends on the oil grade. |

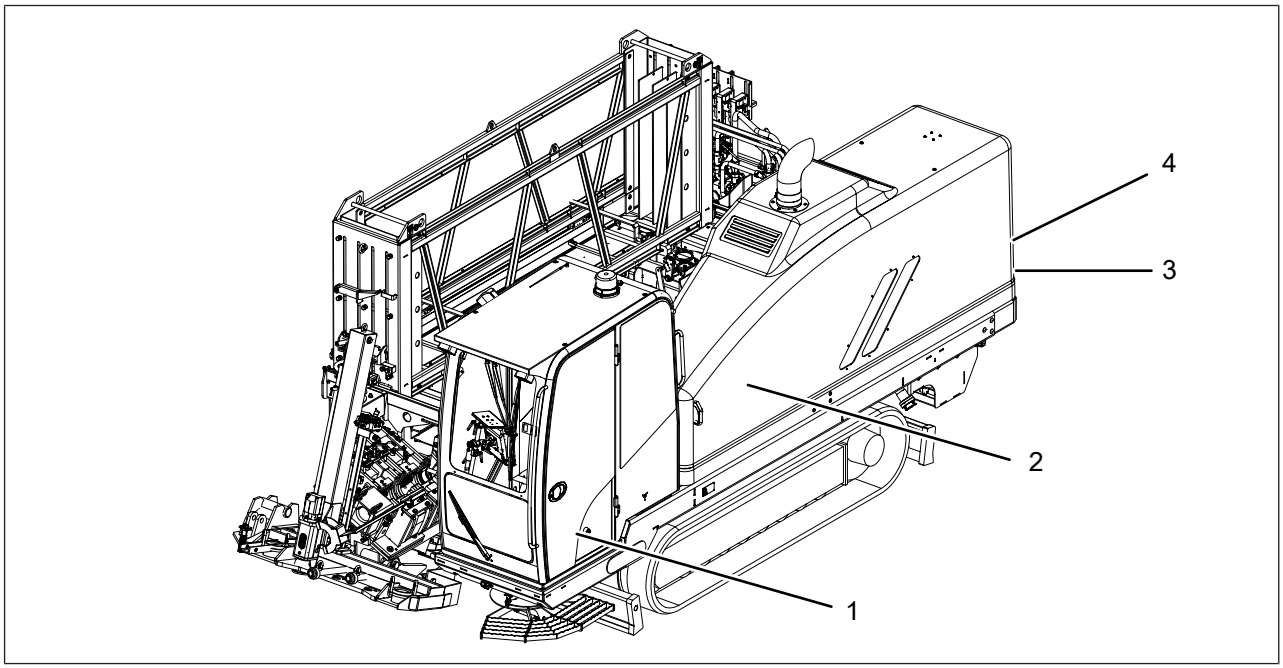
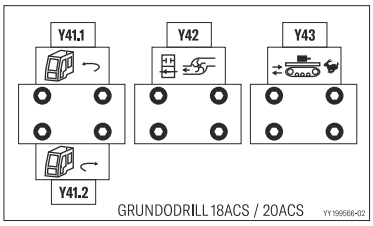
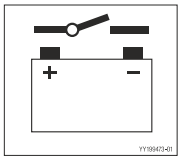
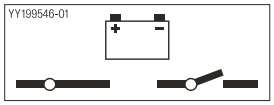
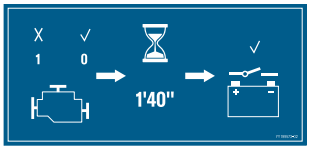



*Fig. 2-8 Safety signs and labels on the machine*

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

| Item | Safety signs, labels | Meaning |
|---|---|---|
| 1 |  | Read the instructions before using the machine. |
| 2 |  | Functions 3-valve manifold (brake ventilation; below the cover panel of the drive unit) |
| 3 |  | Indicates the battery isolating switch |
| 4 | <br> | in the engine compartment:<br>Switch position of the battery isolating switch<br><br>After having switched off the engine, wait for at least 1 min and 40 s before actuating the battery isolating switch. |

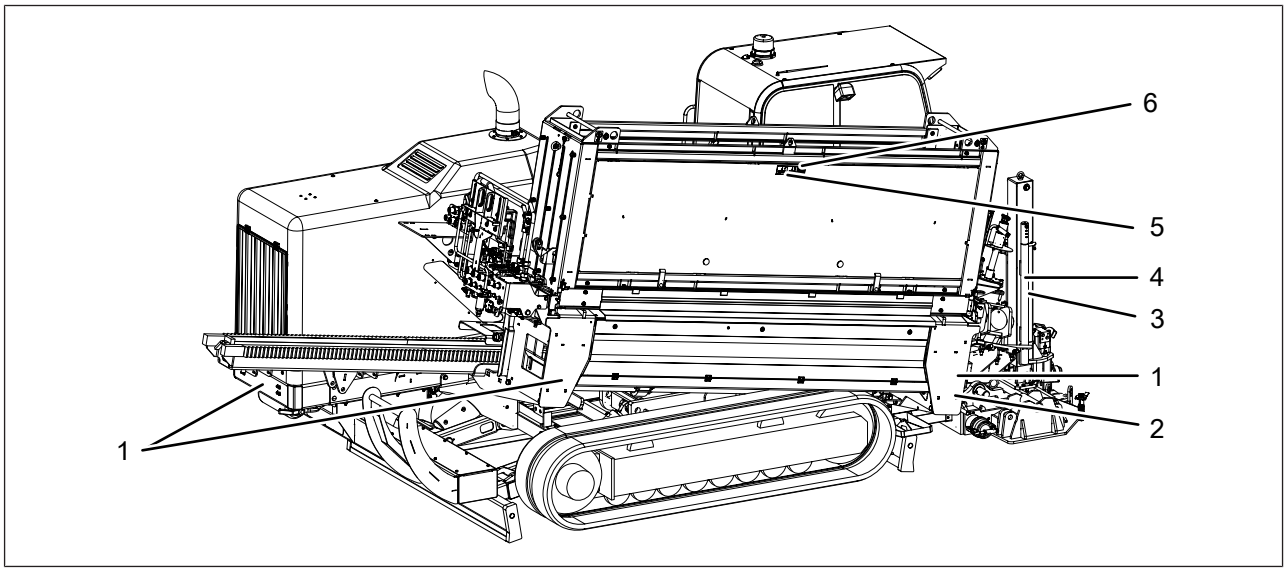
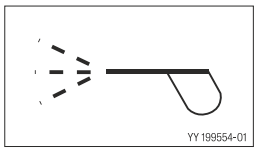
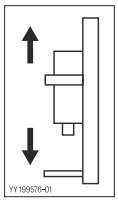



*Fig. 2-9 Safety signs and labels on the machine*

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

| Item | Safety signs, labels | Meaning |
|---|---|---|
| 1 |  | It is prohibited to stand in the danger area |
| 2 |  | indicates the connection for the high-pressure cleaner |
| 3 |  | With anchor thrust unit option enabled:<br>indicates the operating lever for the anchor thrust unit |
| 4 |  | Wear ear protection!<br>Wear ear protection while operating the anchor thrust unit.<br>(Applies only to machines with an anchor thrust unit.) |
| 5 |  | On both sides of the stacking boxes:<br>only lift the stacking boxes when empty |
| 6 |  | on both sides:<br>Weight of the rod box/stacking box |

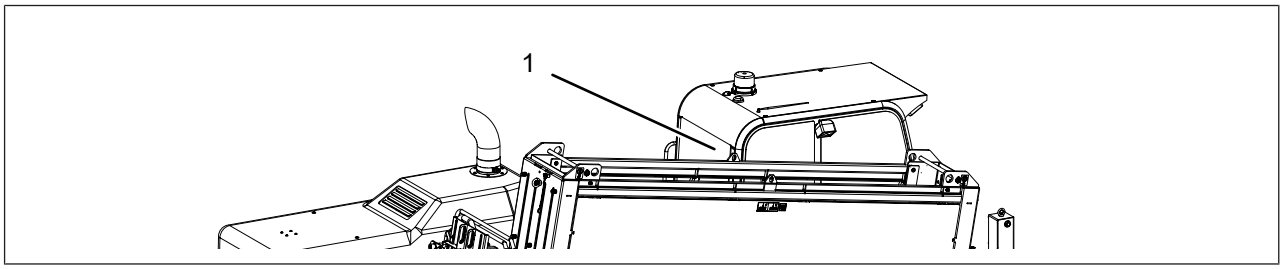
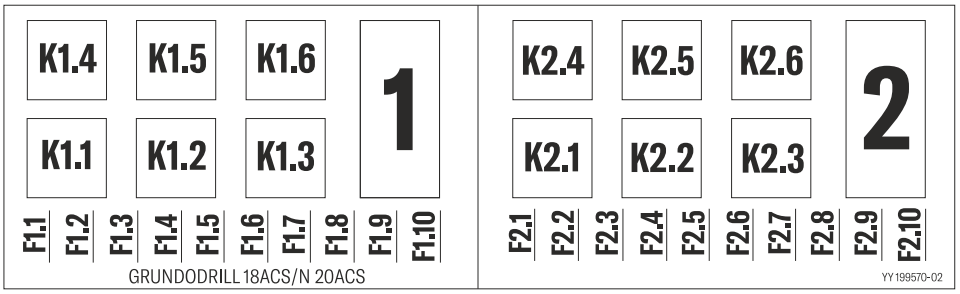



*Fig. 2-10 Safety signs and labels on the machine*

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

<table>
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<tr><td rowspan="3">1</td><td colspan="2">
</td></tr>
<tr><td colspan="2">inside the cab: Assignment of the relays and fuses:</td></tr>
<tr><td>Fuses:<br>F1.1 = lighting etc. loads in cab<br>F1.2 = remote control supply<br>F1.3 = engine control unit ignition voltage<br>F1.4 =<br>F1.5 = wire-controlled / tensile force supply<br>F1.6 = alternator charging control<br>F1.7 = radio / Zap-Alert supply<br>F1.8 = air conditioner supply<br>F1.9 = Visco fan supply<br>F1.10 =<br><br>Relays:<br>K1.1 = emergency stop opener for engine control unit<br>K1.2 = alternator charging control<br>K1.3 = ignition, seat monitoring<br>K1.4 = shutdown outputs, Can Bus modules<br>K1.5 = A/C system<br>K1.6 = auxiliary switch</td><td>Fuses:<br>F2.1 = CAN bus module drive supply<br>F2.2 = CAN bus module 1 magazine supply<br>F2.3 = CAN bus module 2 magazine supply<br>F2.4 = CAN bus module 3 magazine supply<br>F2.5 = ignition lock supply<br>F2.6 = steady plus control unit supply<br>F2.7 = steady plus engine control unit<br>F2.8 = rear on-board socket<br>F2.9 =<br>F2.10 = test fuse location<br><br>Relays:<br>K2.1 = seat monitoring<br>K2.2 = seat monitoring<br>K2.3 =<br>K2.4 =<br>K2.5 =<br><br>External relays:<br><br>K1.3e = ignition via emergency stop</td></tr>
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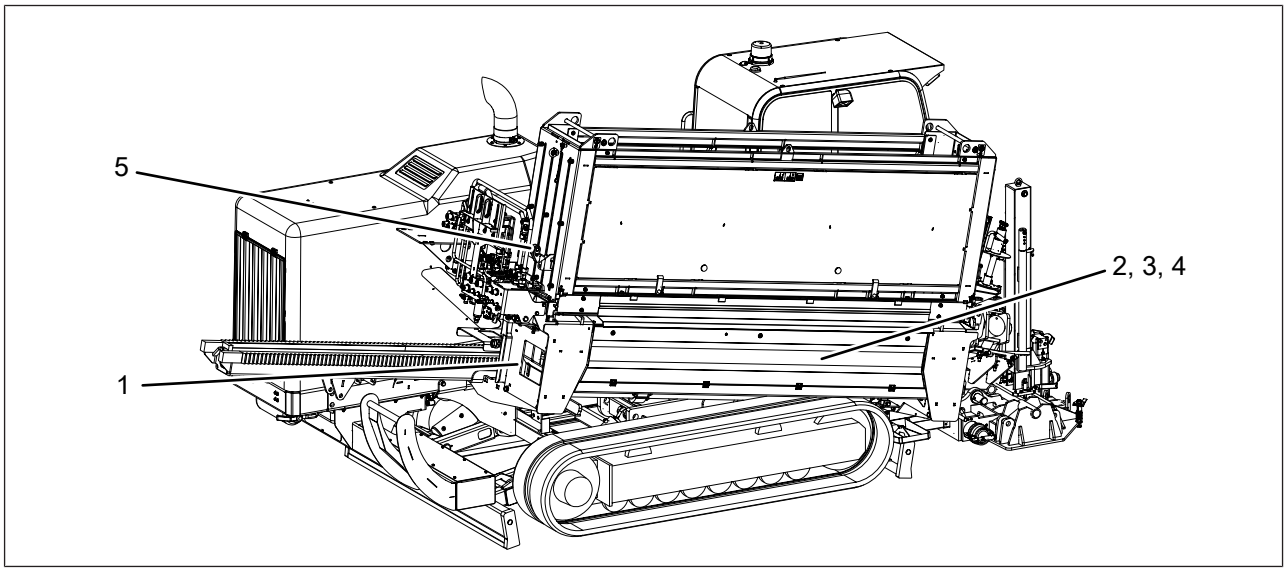
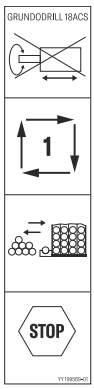
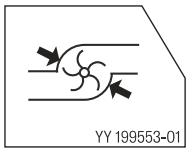
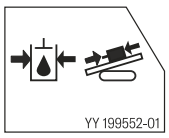
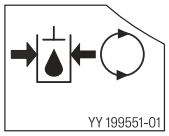
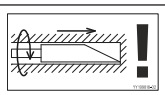



*Fig. 2-11 Safety signs and labels on the machine*

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

| Item | Safety signs, labels | Meaning |
|---|---|---|
| 1 |   | Operating elements for manual loading and unloading of the rod box/stacking box |
| 2 |   | under the flap:<br>Drilling fluid pressure |
| 3 |   | under the flap:<br>Thrust pressure |
| 4 |   | under the flap:<br>Rotation pressure |
| 5 |  | Ball valve for setting the anti-jamming function |

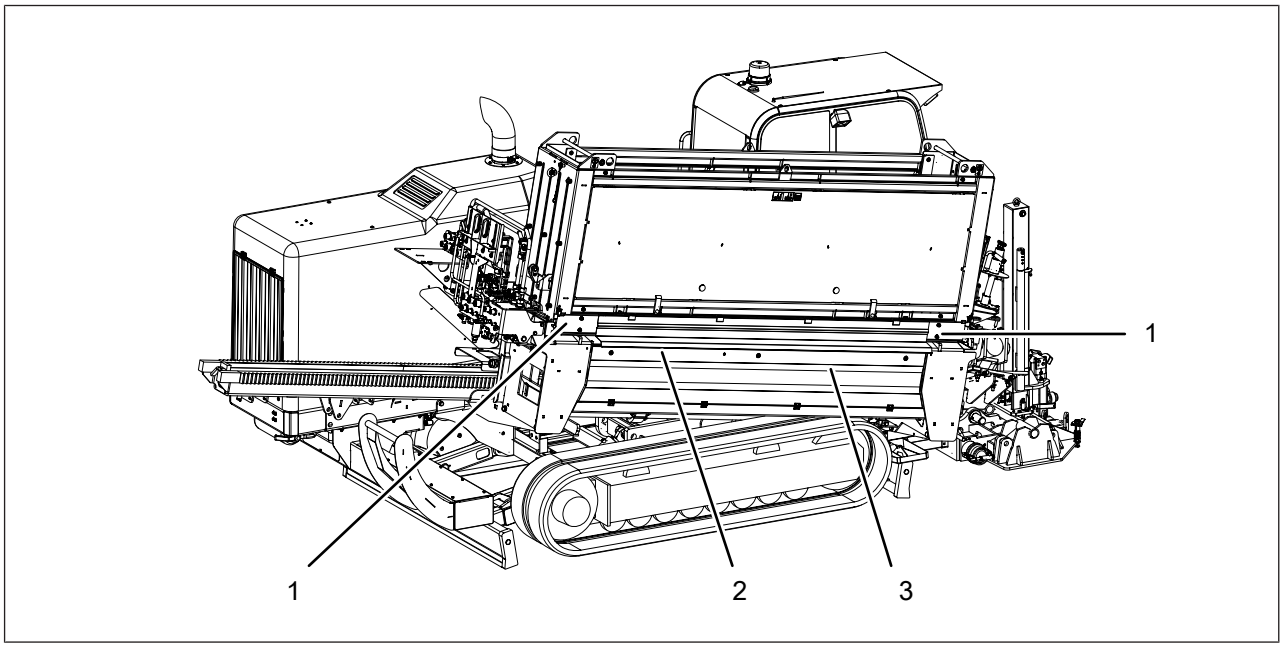
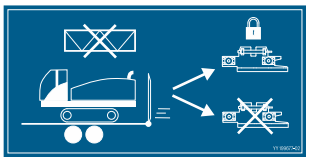
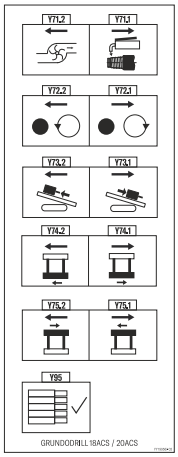
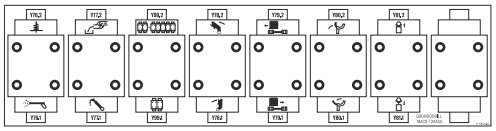



*Fig. 2-12 Safety signs and labels on the machine*

*Tab. 2-14 Safety signs and labels on the machine*

| Item | Safety signs, labels | Meaning |
|---|---|---|
| 1 |  | Secure or remove the pusher plates of the rod box/stacking boxes if you transport the machine without a rod box/ stacking boxes. |
| 2 |  | Functions 5-valve manifold (behind the protection cover of the emergency hydraulic system) |
| 3 |  | Functions 8-valve manifold (magazine; behind the protection cover of the emergency hydraulic system)<br>(left valve block) |

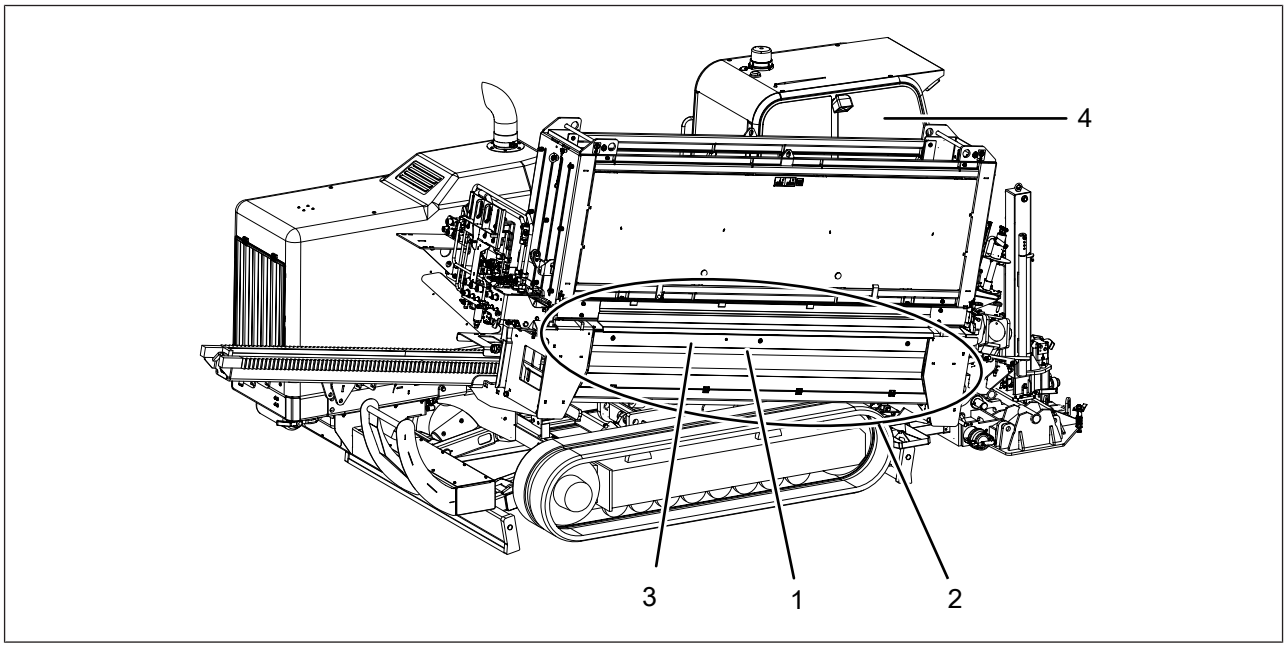
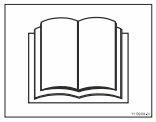
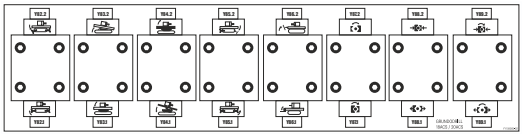
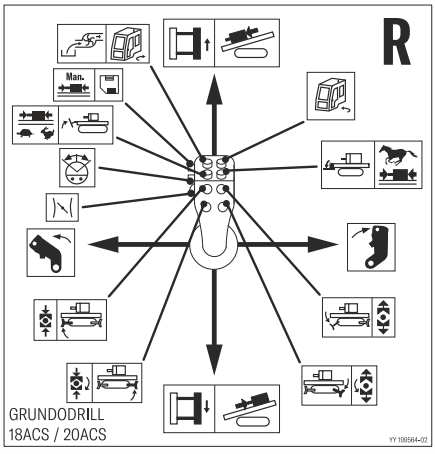



*Fig. 2-13 Safety signs and labels on the machine*

*Tab. 2-15 Safety signs and labels on the machine*

| Item | Safety signs, labels | Meaning |
|---|---|---|
| 1 |  | on the upper panel of the hydraulic unit and behind the casing on the documentation box:<br>indicates the compartment for machine documentation |
| 2 |  | Functions 8-valve manifold (auxiliary functions; behind the protection cover of the emergency hydraulic system) (right valve block) |
| 3 |  | Entering the area is prohibited |
| 4 |  | Inside the cab:<br>indicates the functions of the operating elements on the right joystick |

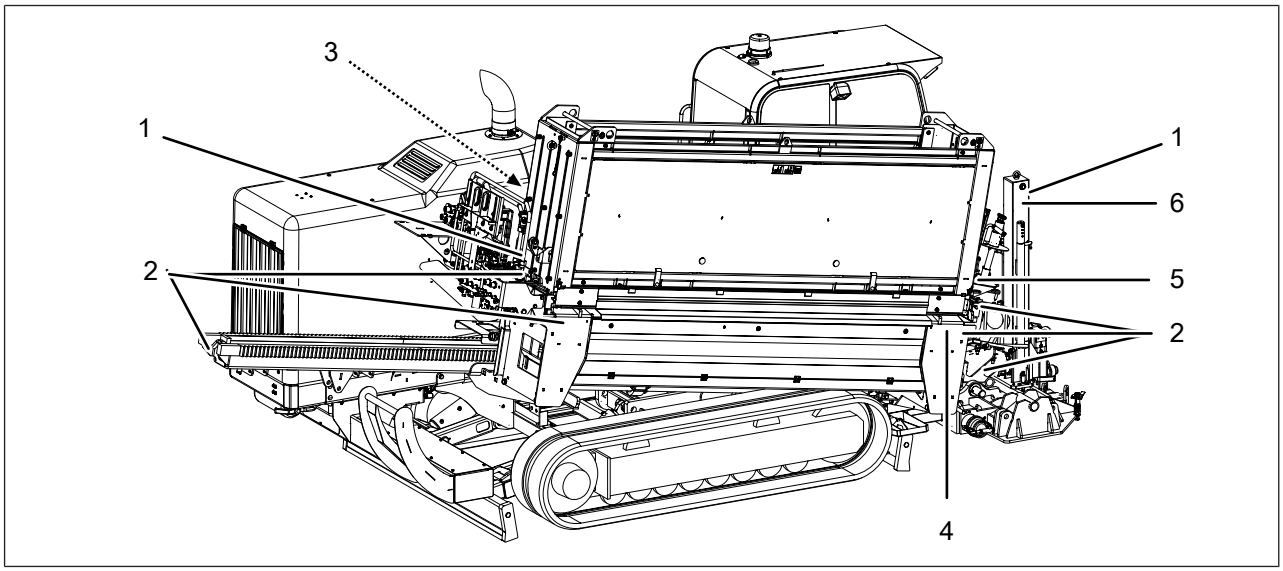
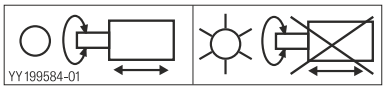
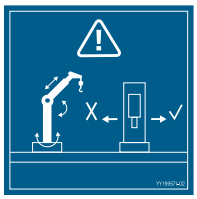
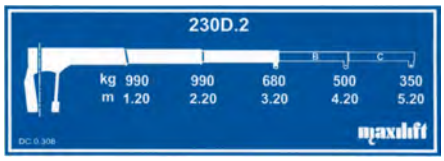



*Fig. 2-14 Safety signs and labels on the machine*

*Tab. 2-16 Safety signs and labels on the machine*

| Item | Safety signs, labels | Meaning |
|---|---|---|
| 1 |  | Draw-in hazard!<br>There is a danger of pulling-in at the rotational drive and the anchor boring rig (option). |
| 2 |  | Crush hazard!<br>There is a danger of crushing in the following places:<br>Clamping tongs, rod box/stacking boxes, rig, loading crane (option) |
| 3 |  | on the rotational drive:<br>indicates an important lubrication point |
| 4 |  | In the area of the loading crane:<br>Danger due to suspended loads! |
| 5 |  | on the front operating panel for wire-controlled drilling (optional):<br>indicates the operating elements of the operating panel |

| Item | Safety signs, labels | Meaning |
|---|---|---|
| 6 |  | Before using the loading crane (option), remove the anchor boring rig from the working area of the loading crane. |
| |  | on the loading crane (option):<br>indicates the load chart for the loading crane |

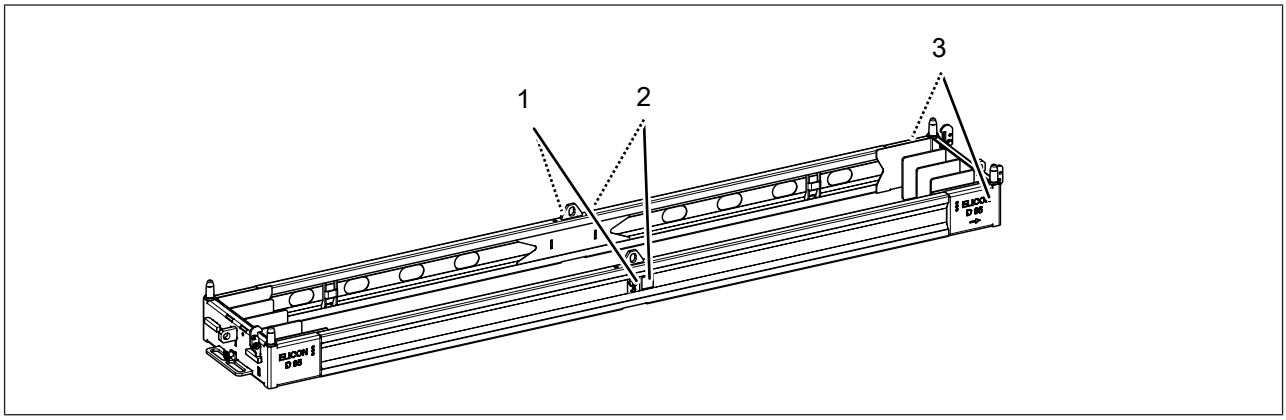



*Fig. 2-15 Stacking box (optional)*

*Tab. 2-17 Safety signs and labels on the stacking box (option)*

| Item | Safety signs, labels | Meaning |
|---|---|---|
| 1 |  | Indicates the attachment points for lifting the stacking box |
| 2 |  | Weight of stacking box |
| 3 |  | Warning of falling parts |

## 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.

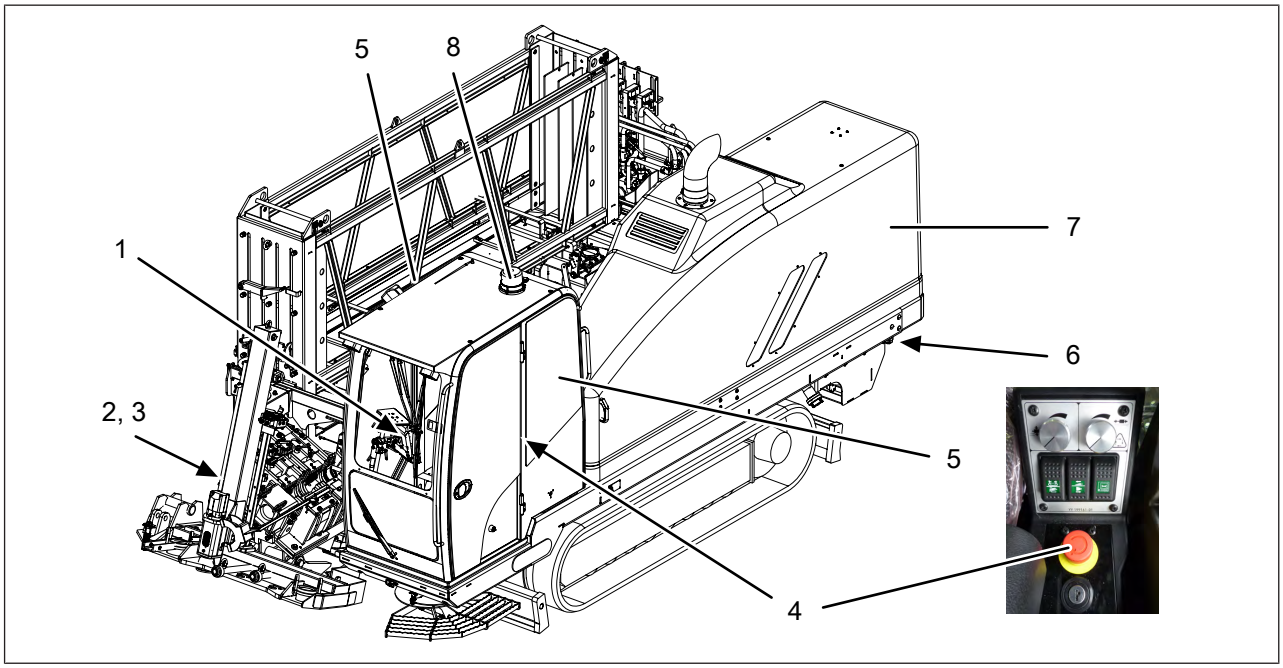



*Fig. 2-16 Safety devices at the machine*

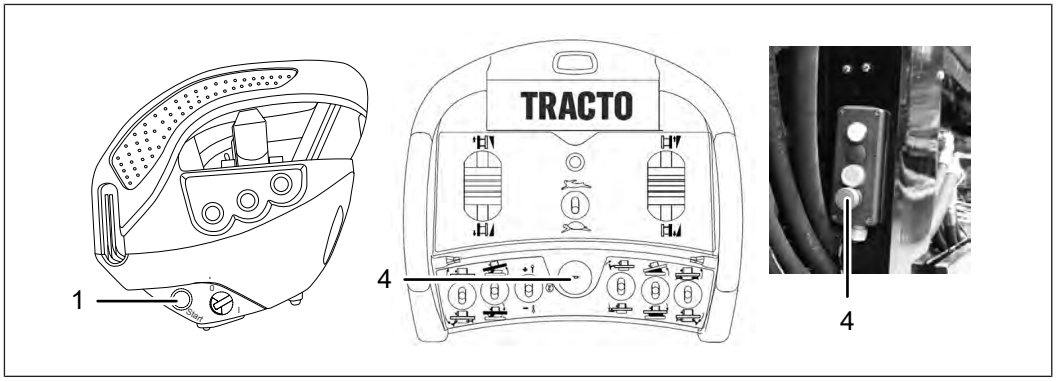



*Fig. 2-17 Emergency stop button on the remote control and on the operating panel for external magazine operation*

*Tab. 2-18 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 |

| Item | Safety device | Function |
|---|---|---|
| 4 | Emergency stop button | on the right joystick panel: Switches the machine off in an emergency. |
| 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 operating panel for external magazine operation
- 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 330. 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.

**Info!**
The emergency stop button on the operating panel of the loading crane only switches off the functions of the loading crane.
The machine's diesel engine remains in operation!

***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.

If leaks occur at the pressure relief, unscrew the screw connection (1) with the connected hose from the cover of the pressure relief and screw the plug (2) into the cover of the pressure relief.

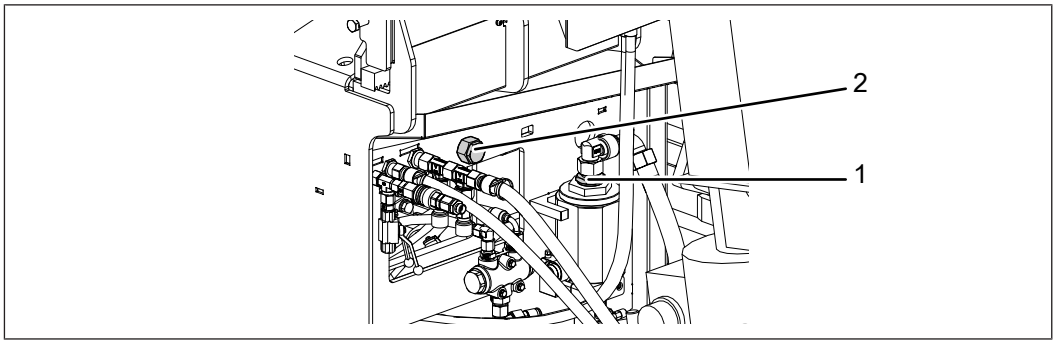



*Fig. 2-18 Plug for the cover of the drilling fluid pressure relief*

***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

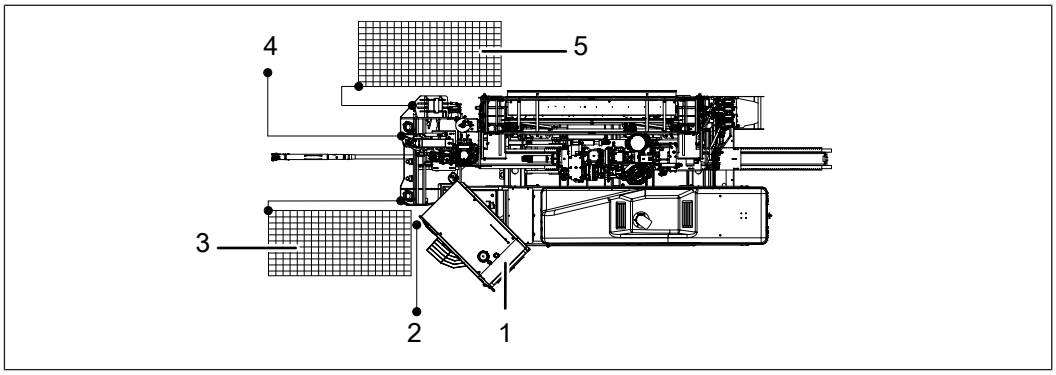



*Fig. 2-19 Electric shock protection*

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 102)!**

**⚠ 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.
- Reverse the roller chisel or 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 the fire brigade if the direct endangerment of persons cannot be immediately eliminated (e.g. by retracting the roller chisel).
- 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
- when inclining the boom
- when driving the stabilisers up and down
- when driving the anchor boring rig up and down
- when inclining the anchor plate

⇨ 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.

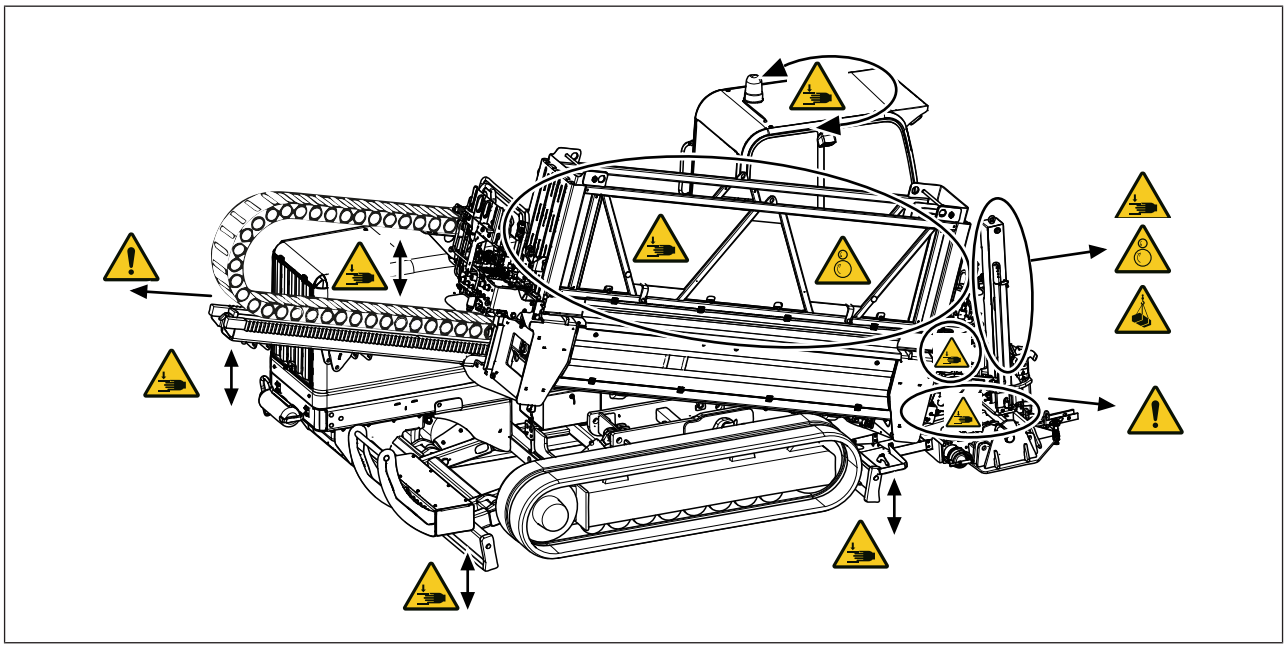


*Fig. 2-20 Danger areas at the machine*

**⚠ 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 90).

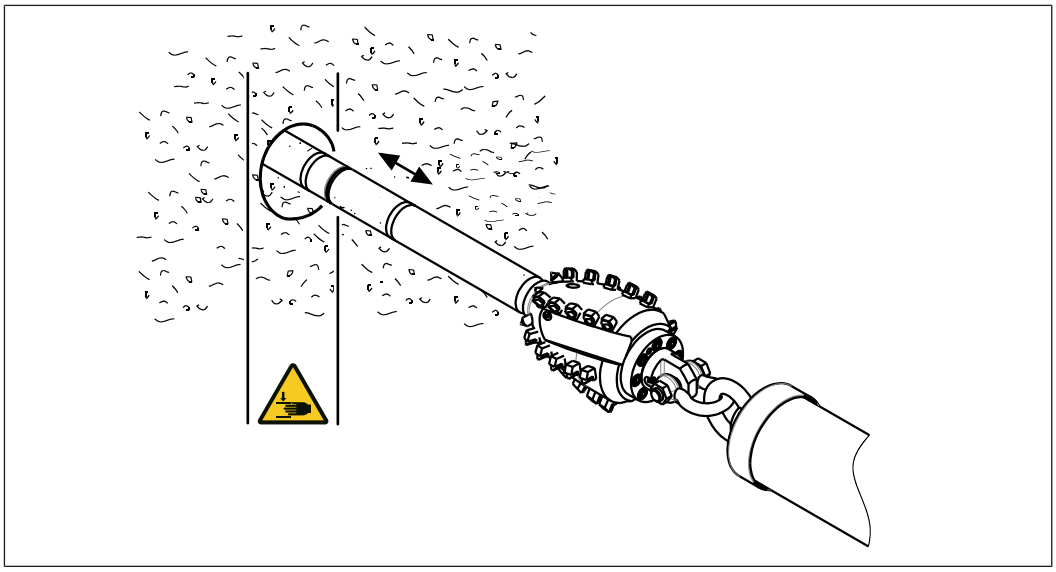


*Fig. 2-21 Danger area for crushing injuries*

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.

**⚠ DANGER**

**Danger due to suspended loads when operating the loading crane!**



You can be bumped by the load hanging on the loading crane.
The load may fall and injure you.

- Staying under a suspended load is prohibited.
- Keep out of the loading crane's swivel range.
- Adhere to the permissible load capacity of the loading crane.
- Wear head, hand and foot protection.

## 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 the fire brigade if the direct endangerment of persons cannot be immediately eliminated (e.g. by retracting the roller chisel).
- 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 42).
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.

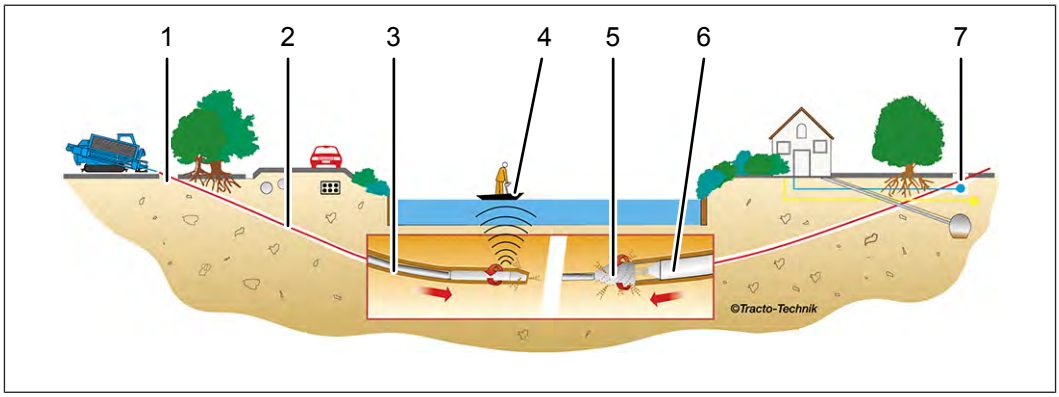



*Fig. 3-1 Construction site with entrance pit, target pit and drill rods*

| | | | |
|---|---|---|---|
| 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.

The twin tube rod (standard machine version) consists of an inner and an outer rod. The inner rod serves to carry out the actual drilling process. The outer rod serves to control the drilling direction. The outer rod protects the inner rod from damages and leads the drilling fluid towards the drill head in the front.

**Info!**
Optionally the standard drill rods (drill rods without inner rods) can be applied.

A loading crane can be used to change the stacking boxes, and to load the rod box/ the stacking boxes with individual drill rods or to unload individual drill rods. The single drill rods are added via the rod changing system. To do so, individual drill rods are taken out of the rod box/stacking box by means of rod grippers and swung into the bore axis. During a drill rod exchange, a laser is used to check whether the thrust rig is positioned at a sufficient distance from the drill rod so that the swivel arm can swing into the bore axis. Otherwise an error message will appear on the operating panel.

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.

Generally, a bentonite/water mixture is fed through the rod string to the roller chisel or drill head from an external drilling fluid system. This facilitates the drilling process and minimizes wear as drilling debris is discharged during the drilling process.
Moreover, purging is required to cool down the transmitter.

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 single drill rods are unscrewed in the clamping jaw, pulled back from the thrust rig and disconnected. The laser checks whether the thrust rig and the drill rods have been completely separated. Only then will the rod grippers grip the drill rod and swing it back beneath the rod box/stacking 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 18ACS
- mixing system with twin-tank system including drive unit for operation of the mixing system (MA07-D or MA010-D, not depicted)
- rod box or stacking boxes (optional, see chapter 3.3, page 59)

***Machine***

The machine consists of the following components:

- rig boom (1)
- stabilisers (2) with mounting points for transport eyelets / lifting eyes
- track-mounted undercarriage (3)
- rod box or stacking boxes (4, optional, not depicted)
- clamp and break-away device (5)
- rod changing system (6)
- emergency hydraulic system (7, behind the casing)
- anchor plate (8)
- energy chain (9)
- anchoring unit (10) (anchor thrust unit or anchor boring rig)
- electrical connection for remote control (11)
- loading crane (mounted at the front of the anchor plate, not depicted)

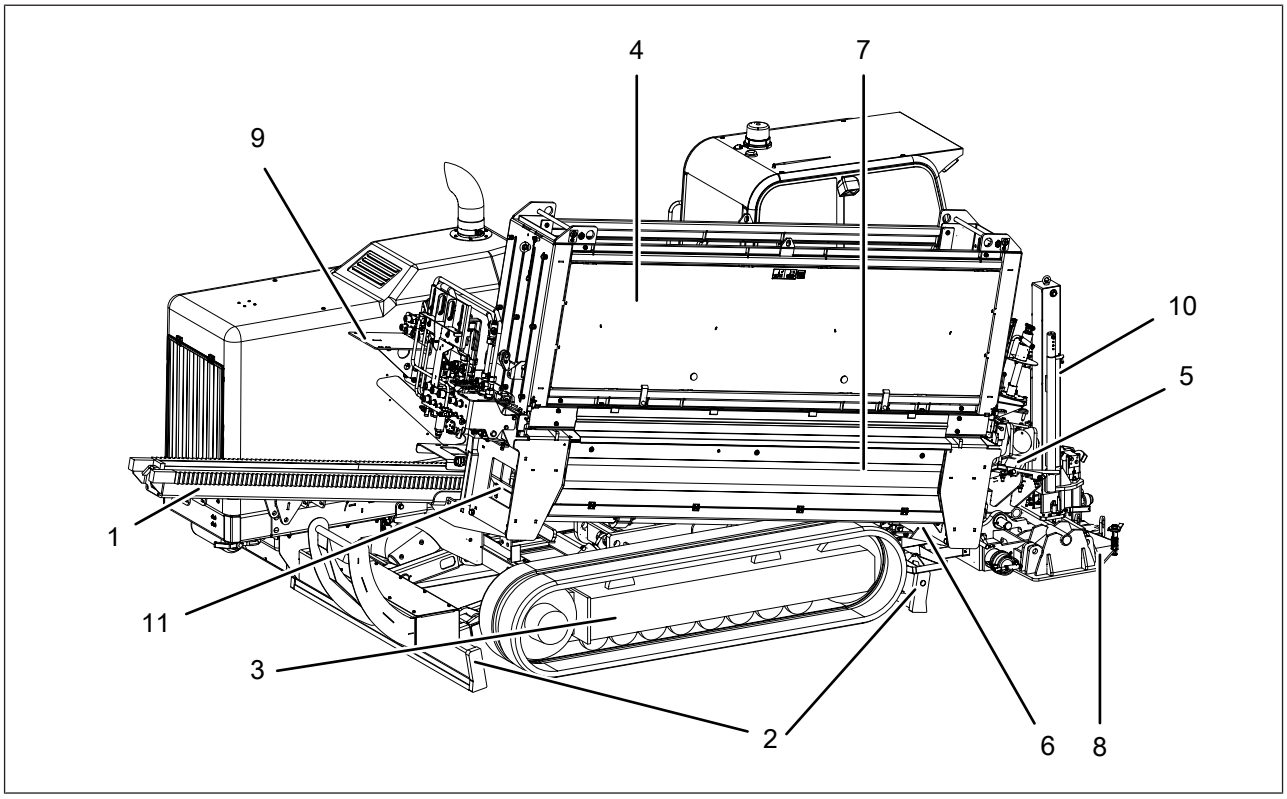



*Fig. 3-2 The machine and its main components*

**Info!**
The number of drill rods per stacking box varies depending on the type of rod (chapter 3.3, page 59).

- A maximum of 5 stacking boxes can be stacked on top of each other. Thus when using the drill rod TD73, for example, up to 75 drill rods can be used for the bore (chapter 3.3, page 59).
- If you require further drill rods, exchange the stacking boxes (chapter 6.9, page 250) or load further drill rods (chapter 6.12, page 285).
- Optionally, you can also use a rod box with standard rods.

Further machine components:

- rod lubrication (1)
- drain hose of the drilling fluid pressure relief (2)
- rod guidance with rubber washer for rod cleaning (3)
- cab (4)
- step grid (5)
- operating and control elements (6)
- mounting points for front (7) and rear (8) transport eyelets / lifting eyes
- suction connection for high-pressure feed pump (9)
- exhaust system (10)
- diesel engine with drive unit (11, behind the cover panel)
- air supply for diesel engine (12)

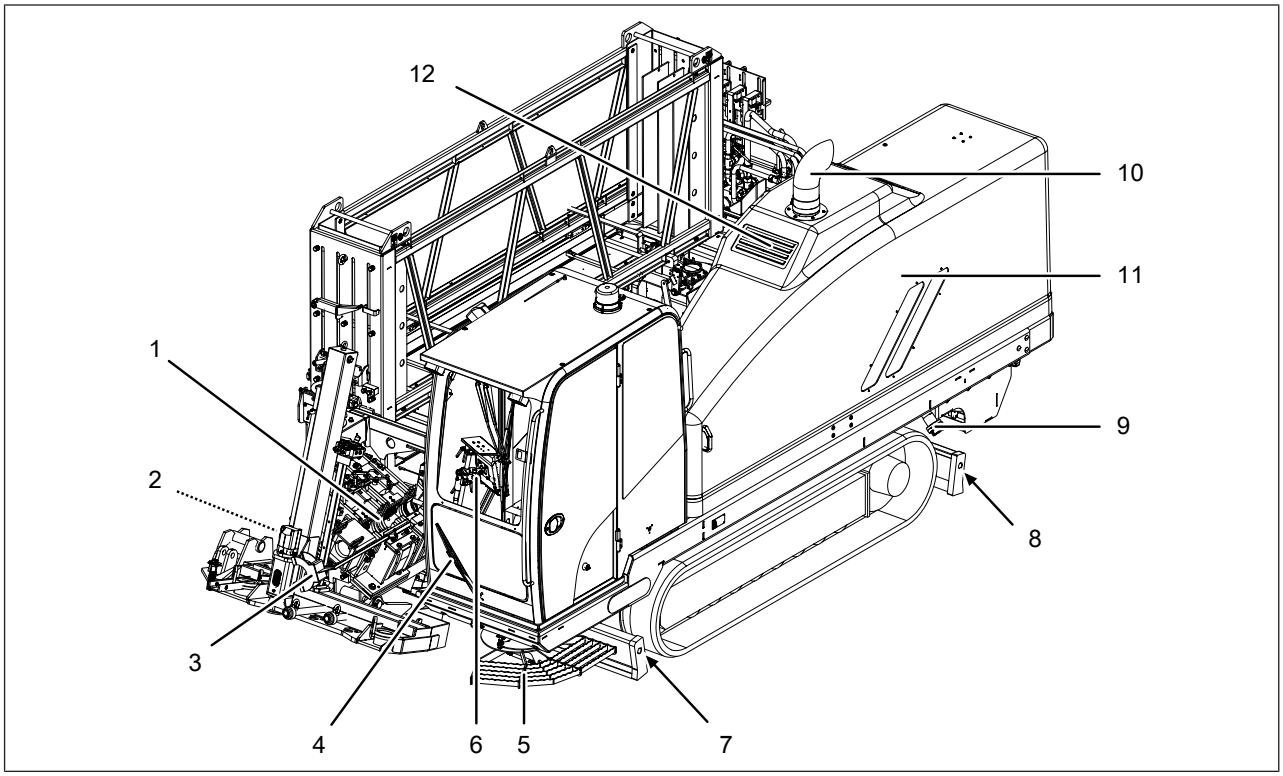



*Fig. 3-3 The machine and its main components*

Further machine components:

- LED working lights (1)
- electric shock warning device (2) in the cab
- hydraulic oil tank (3, behind the cover panel)
- fresh water tank (4)
- warning light (5)

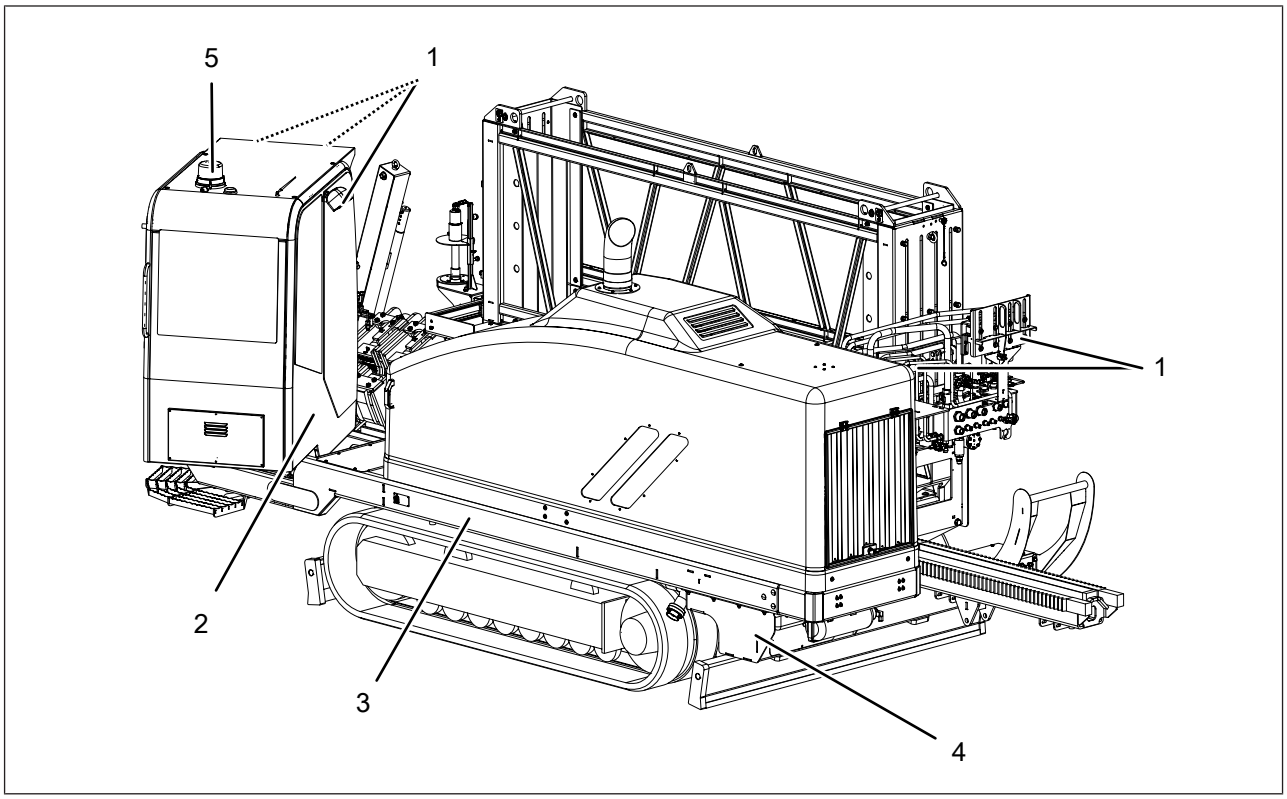



*Fig. 3-4 The machine and its main components*

***Thrust***

The following components belong to the thrust rig:

- double rotational drive (1)
- thrust drive (2)

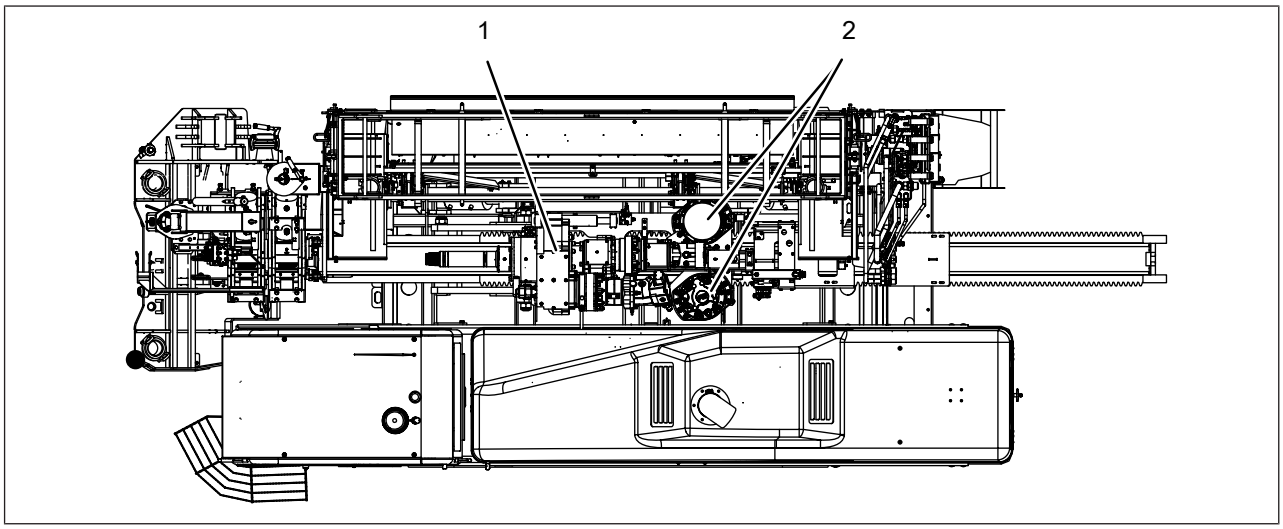



*Fig. 3-5 Thrust rig and rod changing system*

***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)
- suction connection for drilling fluid pump (5)
- fresh water supply connection with fresh water filter (6)
- filler neck for diesel exhaust fluid (DEF) (7)
- exhaust gas purification system (8)

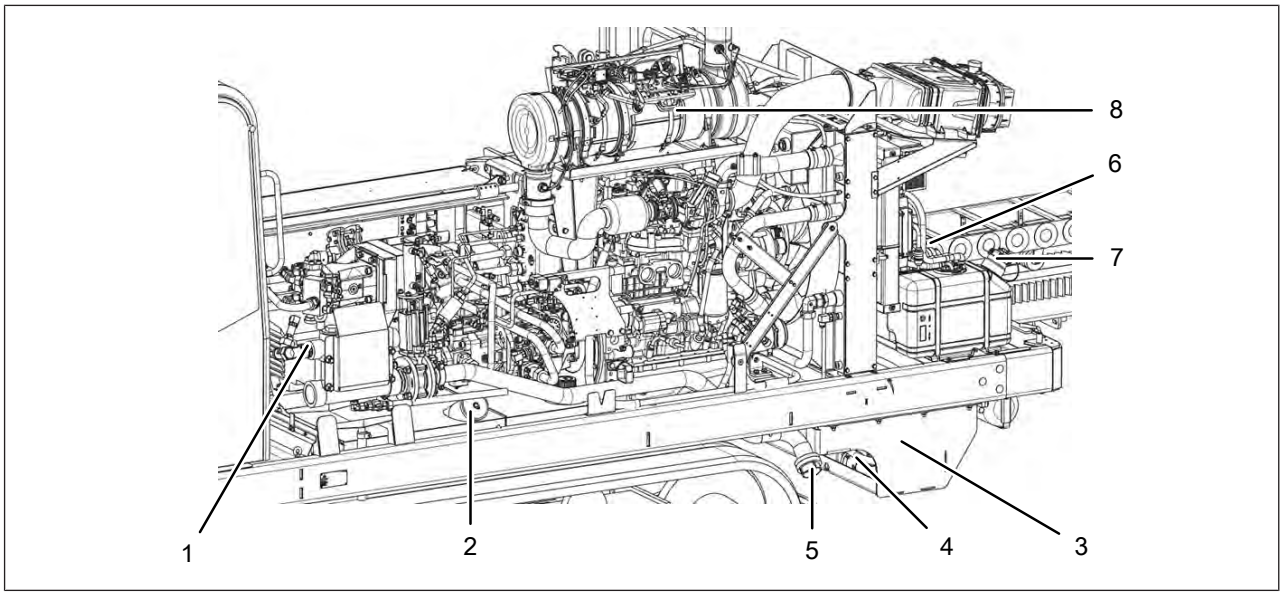



*Fig. 3-6 Drive unit*

***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)
- swivel device (4)

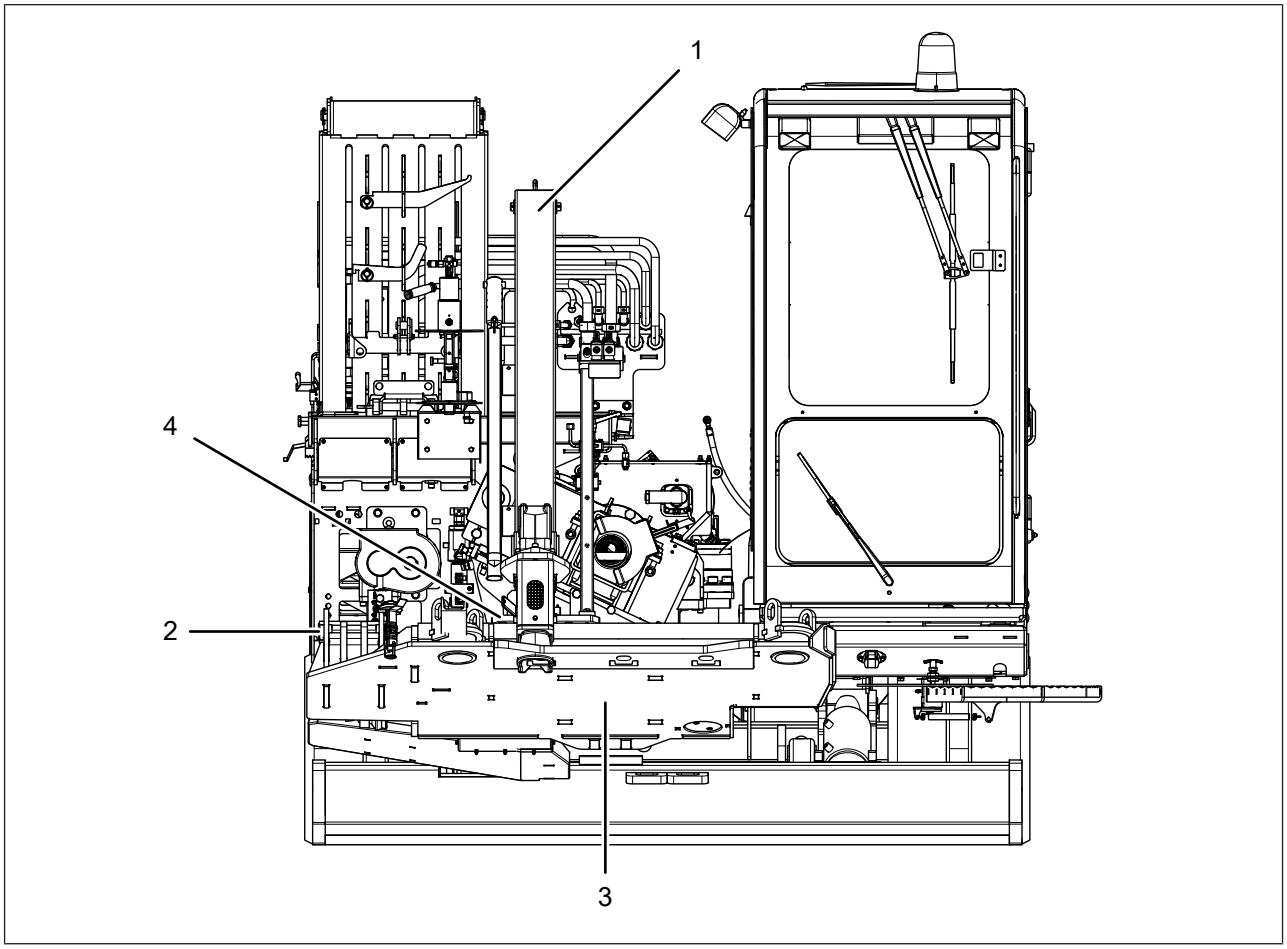



*Fig. 3-7 Anchoring unit*

***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)

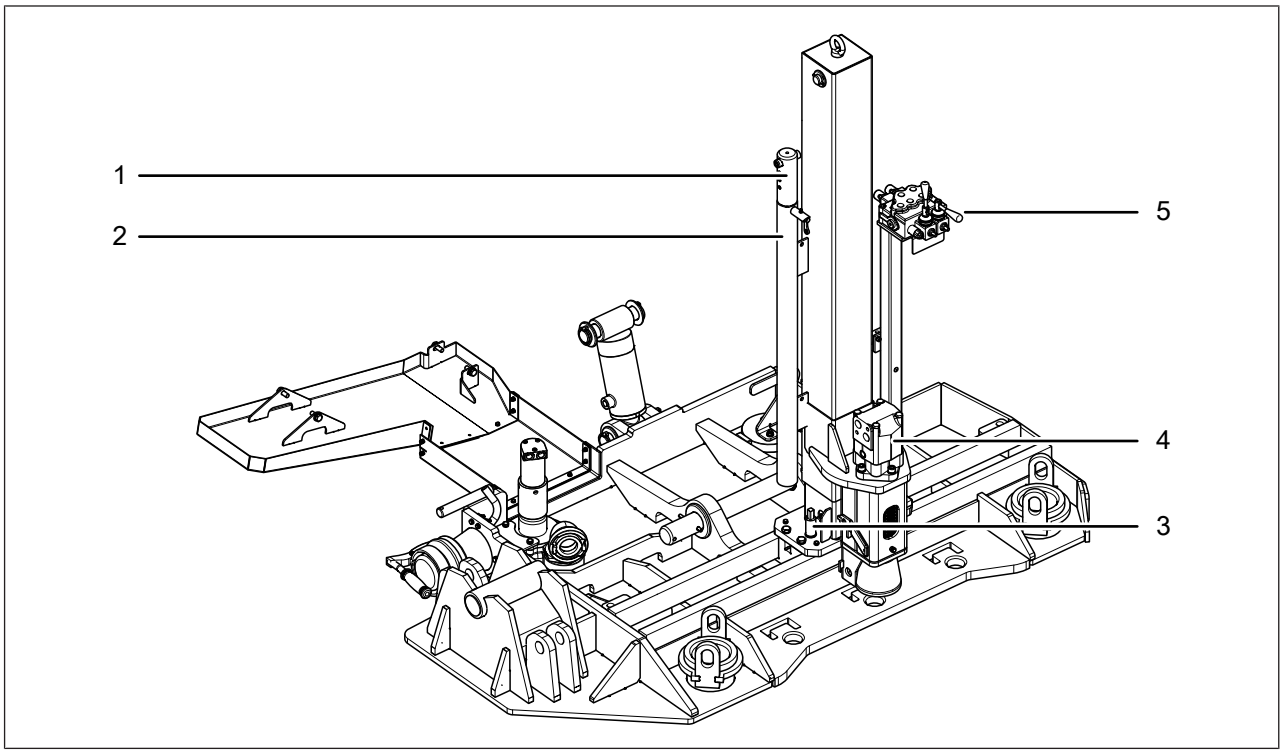



*Fig. 3-8 Anchor boring unit*

***Roller chisel, rock drilling unit***

The roller chisel (1) with rock drilling unit (2) serves to produce a pilot bore hole in rock formations. It is driven by means of the twin tube rods.

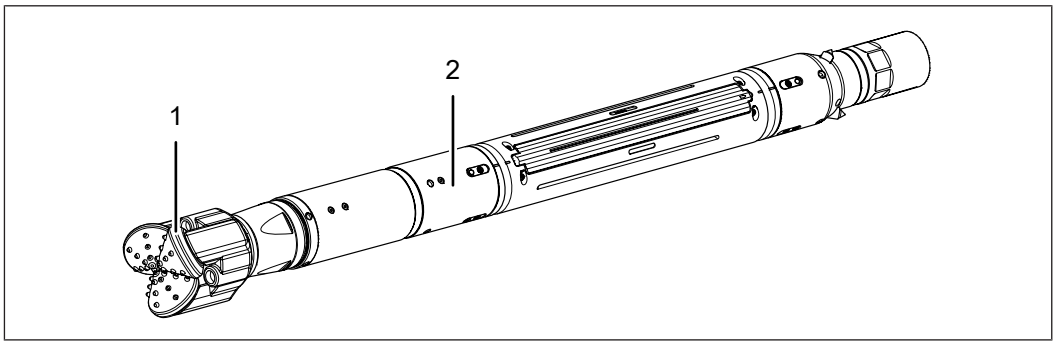



*Fig. 3-9 Roller chisel with rock drilling unit (example illustration)*

***Roller chisel, rock drilling unit, mud motor***

The roller chisel (1) with rock drilling unit (2) serves to produce a pilot bore hole in rock formations. The roller chisel is driven by means of a mud motor (3) in combination with the drilling fluid.

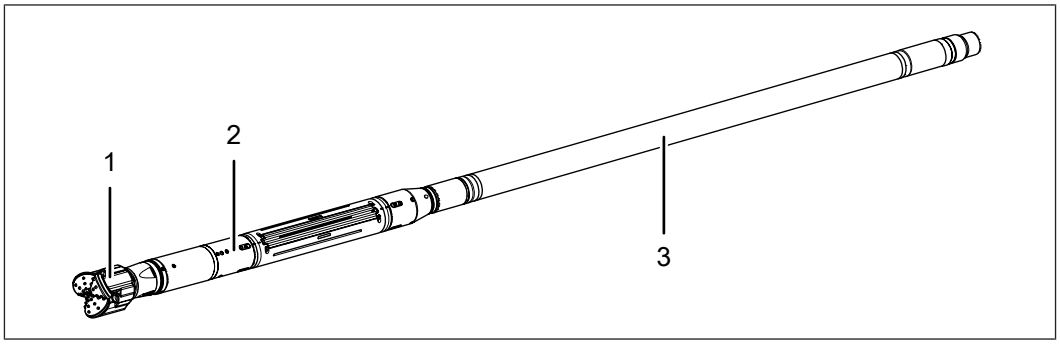



*Fig. 3-10 Roller chisel with rock drilling unit and mud motor (example illustration)*

**Info!**
The rock drilling unit in combination with the mud motor can only be used with drill rods of type TD82.

***Flush drilling with EL D101 rods***

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

For Elicon D101 rods, the transmitter housing is connected to the outer rod via the EL D101 socket to TD82 nipple adapter.

The angled surface of the drill head enables steering.

Additionally, the outer tube is equipped with a protection function and thus prevents a blockage of the drill head in hard rock and pebbled soils.

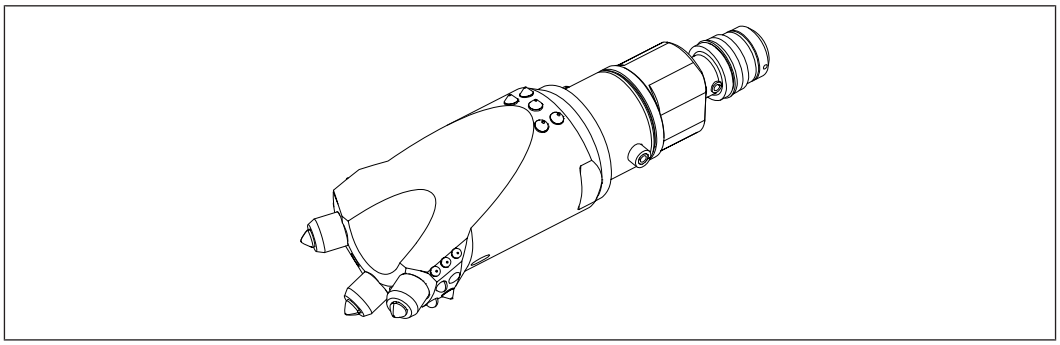


*Fig. 3-11 Rinsing drill head (example illustration)*

For flush drilling with EL D80, TD73 and TD82 rods, transmitter housings with matching threaded connections are available.

***Expander head***

The expander head serves to expand bore holes.

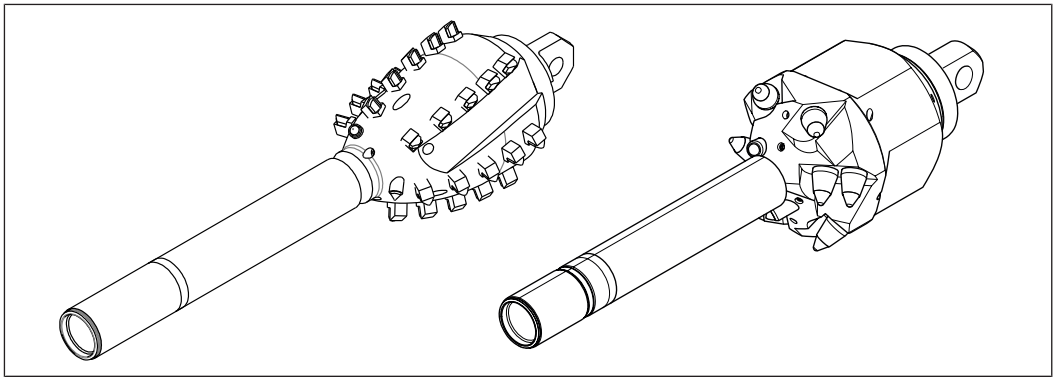


*Fig. 3-12 Expander head (example illustration, left: for rinsing drilling, right: for rock drilling)*

The expander head is screwed to the rod string in place of the rock drilling unit or 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.

***Rod adapter***

To connect a standard drill head or expander head with TD82 thread to the twin tube rods, an EL D101 socket (1, connection twin tube rod) to TD82 nipple (2, connection standard drill rod) rod adapter is available.

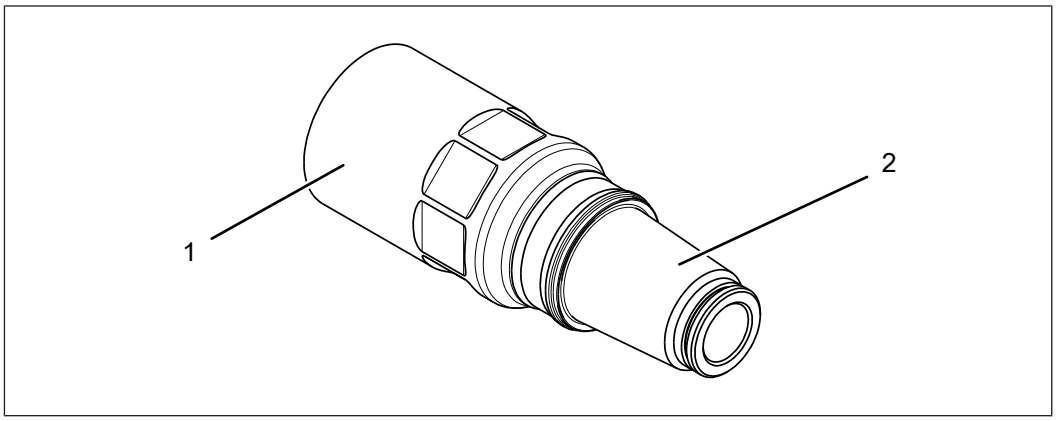



*Fig. 3-13 Rod adapter for connecting a standard drill head or expander head*

To connect an expander head with TD82 thread to EL D80 twin tube rods, an EL D80 socket to TD82 nipple rod adapter is available.

**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 313).

***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 rock drilling unit (chapter 5.8.2, page 117) 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.

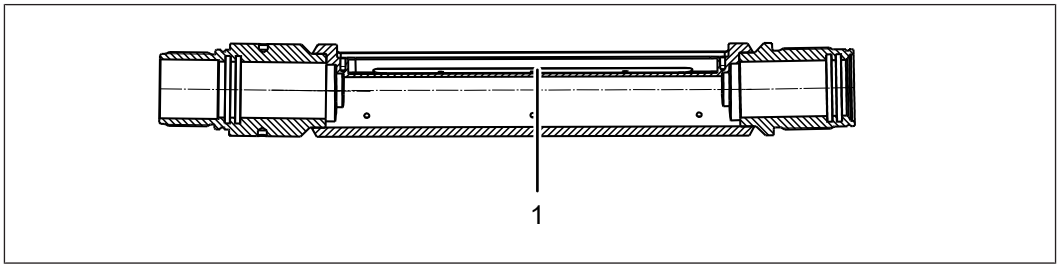



*Fig. 3-14 Transmitter housing of the rock drilling unit (example illustration)*




*Fig. 3-15 Monitor and receiver (example illustration)*

***Loading crane with operating panel***

To exchange the stacking boxes, a hydraulically operated loading crane with operating panel is available.

Additionally, the loading crane can be used to transport single drill rods when loading or unloading the rod box/stacking boxes.

**⚠ DANGER**

**Danger due to suspended loads when operating the loading crane!**



You can be bumped by the load hanging on the loading crane.
The load may fall and injure you.

- Staying under a suspended load is prohibited.
- Keep out of the loading crane's swivel range.
- Adhere to the permissible load capacity of the loading crane.
- Wear head, hand and foot protection.

**Info!**
Only personnel instructed by TRACTO-TECHNIK is permitted to operate the loading crane.
Additionally, the national qualification requirements for crane operation must be met.

**Info!**
Only use the loading crane when the anchor plate has been lowered.

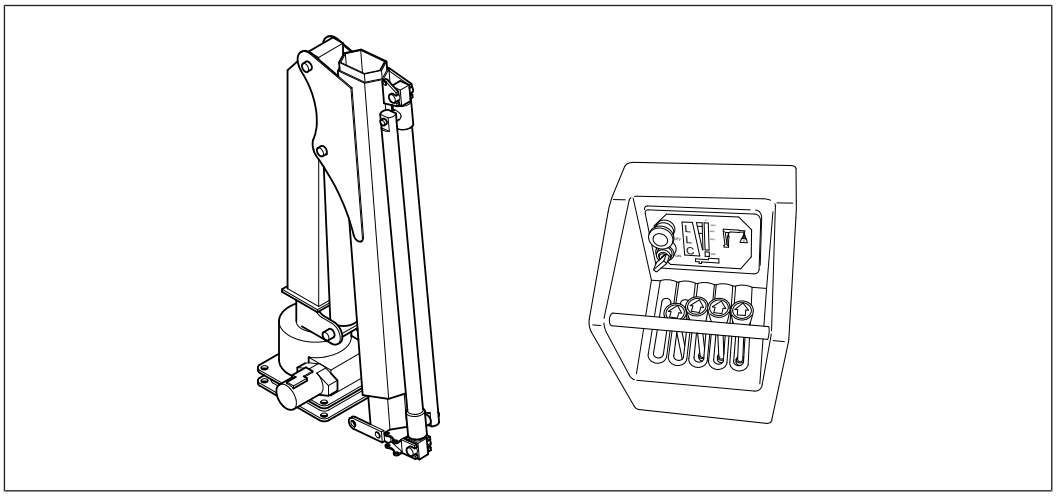


*Fig. 3-16 Loading crane with operating panel*

## 3.3 Technical data

*Tab. 3-1 Technical data – GRUNDODRILL 18ACS*

| Parameter | Additional information | Value |
|---|---|---|
| Designation | | GRUNDODRILL 18ACS |
| Transport position | length<br>width<br>height | 6,700 mm<br>2,350 mm<br>2,620 mm |
| Working position | length<br>width<br>height | 7,150 mm<br>3,050 mm<br>3,150 mm |
| Machine weight | incl. rod box and drill rods, filled hydraulic and diesel tanks (filled fresh water tank, with loading crane) | 16,300 kg |
| | without rod box and drill rods, incl. filled hydraulic and diesel tanks (filled fresh water tank, with loading crane) | 11,680 kg |
| **Tank levels** | | |
| Diesel tank | capacity | 180 l |
| DEF tank | capacity | 18.9 l |
| Fresh water tank | capacity | 105 l |
| Hydraulic tank | capacity | filling quantity approx. 100 l<br>(max. tank capacity 114 l) |
| **Bore Data** | | |
| Max. thrust force | | 180 kN |
| | for EL D80 (twin tube rods) | 160 kN |
| Max. tensile force | | 180 kN |
| | for EL D80 (twin tube rods) | 160 kN |
| Thrust speed | | 36 m/min |
| Max. torque (static) | TD73 (standard rod) | 7500 Nm |
| | TD82 (standard rod) | 10000 Nm |
| | EL D80 (twin tube rods) | 5500 Nm |
| | EL D80 (inner rod) | 1200 Nm |
| | EL D95 (twin tube rods) | 7500 Nm |
| | EL D95 (inner rod) | 2500 Nm |
| | EL D101 (twin tube rods) | 7500 Nm |
| | EL D101 (inner rod) | 2500 Nm |

| Parameter | Additional information | Value |
|---|---|---|
| Max. rotational speed (outer rod) | TD73 (standard rod) | 200 rpm |
| | TD82 (standard rod) | 180 rpm |
| | EL D80 (twin tube rods) | 200 rpm |
| | EL D95 (twin tube rods) | 200 rpm |
| | EL D101 (twin tube rods) | 200 rpm |
| Max. rotational speed (inner rod) | EL D80 (twin tube rods) | 405 rpm |
| | EL D95 (twin tube rods) | 350 rpm |
| | EL D101 (twin tube rods) | 320 rpm |
| Drill rod TD73 | pilot bore diameter | 115 mm |
| | drill rod diameter | 73 / 63.5 mm |
| | effective length | 3000 mm |
| | weight | 42 kg |
| | bending radius | 55 m |
| | max. expansion diameter (depending on the soil) | 600 mm |
| | max. outer pipe diameter (depending on the soil) | 500 mm |
| | max. bore length (depending on the soil) | 400 m |
| Drill rod TD82 | pilot bore diameter | 140/170 mm |
| | drill rod diameter | 82 mm |
| | effective length | 3000 mm |
| | weight | 46 kg |
| | bending radius | 60 m |
| | max. expansion diameter (depending on the soil) | 600 mm |
| | max. outer pipe diameter (depending on the soil) | 500 mm |
| | max. bore length (depending on the soil) | 400 m |
| Drill rod EL D80 ACS | pilot bore diameter | flush drilling: 140 mm<br>rock drilling: 5.5" (139.7 mm) |
| | drill rod diameter | 81 / 68 mm |
| | effective length | 3,000 mm |
| | Weight | 59.2 kg |
| | bending radius | 35 m |
| | max. expansion diameter (depending on the soil) | 355 mm |
| | max. outer pipe diameter (depending on the soil) | 250 mm |
| | max. bore length (depending on the soil) | 200 m |

| Parameter | Additional information | Value |
|---|---|---|
| Drill rod EL D95 ACS | pilot bore diameter | 165 mm |
| | drill rod diameter | 98 mm |
| | effective length | 3,000 mm |
| | Weight | 80.3 kg |
| | bending radius | 55 m |
| | max. expansion diameter (depending on the soil) | 600 mm |
| | max. outer pipe diameter (depending on the soil) | 500 mm |
| | max. bore length (depending on the soil) | 400 m |
| Drill rod EL D101 ACS | pilot bore diameter | 165 mm |
| | drill rod diameter | 101 / 93 mm |
| | effective length | 3,000 mm |
| | Weight | 86 kg |
| | bending radius | 55 m |
| | max. expansion diameter (depending on the soil) | 600 mm |
| | max. outer pipe diameter (depending on the soil) | 500 mm |
| | max. bore length (depending on the soil) | 400 m |
| **General** | | |
| Max. detection depth (depending on the system) | | 3–22 m |
| Max. drilling fluid flow rate | steplessly adjustable | 400 l/min |
| Max. drilling fluid pressure | | 90 bar |
| Hydraulic power rotation circuit | at 360 bar | 200 l/min |
| Hydraulic power circuit 2 (drilling fluid and auxiliary functions) | at 300 bar | 160 l/min |
| Max. hydraulic pressure | counter-clockwise rotation | 405 bar |
| Max. travel speed | 1. step | 1.3 km/h |
| | 2. step | 2.2 km/h |
| Rig inclination | | 0–30° |
| Max. inclination during operation | to all sides | 6° |
| Max. inclination when traversing | to all sides (depending on the soil) | 20° |
| Emission sound pressure level $L_{pA}$ [1)] | measured 0.8 m ±0.05 m above the centre of the seating surface of the driver's seat in accordance with ISO 11201 | 77 dB |
| | uncertainty $K_{pA}$ | 3 dB |
| Guaranteed sound power level $L_{WAd}$ [1)] | as defined in 2000/14/EC | 104 dB |

| Parameter | Additional information | Value |
|---|---|---|
| Permissible temperature range | | -10 °C to +45 °C |
| Highest permissible wind speed | under operating conditions | < wind force 12 (33 m/s) |
| Max. ground pressure | under operating conditions | 8.46 N/cm$^2$<br>(with EL D80 ACS rods) |
| Working lights, 3 lights on the cab | illuminance | 40 lx together |
| 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 |
| **Engine** | | |
| 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 | at 2,200 rpm | 536 Nm |
| | at 1,300 rpm (economy mode) | 743 Nm |
| Consumption | at 2,200 rpm | 212 g/kWh |
| Starting unit | | 24 V DC |

[1] 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.

*Tab. 3-2 Technical data of the loading crane (option)*

| Parameter | Range | Load capacity |
|---|---|---|
| Permissible load capacity at range | 1.2 m<br>2.2 m<br>3.2 m | max. 990 kg<br>max. 990 kg<br>max. 680 kg |

*Tab. 3-3 Technical data of the stacking boxes (optional)*

| Stacking box | Number of rods | Weight of stacking box | Weight of rods | Total weight | Max. number of stacking boxes | Total weight per stack |
|---|---|---|---|---|---|---|
| TD82 | 15 | 112 kg | 46 kg | 802 kg | 4 | 3,208 kg |
| TD73 | 15 | 110 kg | 42 kg | 740 kg | 5 | 3,700 kg |
| EL D95 ACS | 8 | 92 kg | 80.3 kg | 734.4 kg | 5 | 3,672 kg |
| EL D101 ACS | 8 | 98 kg | 86 kg | 786 kg | 5 | 3,930 kg |

*Tab. 3-4 Technical data of the rod boxes (optional)*

| Rod box | Number of rods | Weight of the rod box | Weight of rods | Total weight (full rod box) |
|---|---|---|---|---|
| TD82 | 70 | 475 kg | 46 kg | 3,695 kg |
| TD73 | 75 | 545 kg | 42 kg | 3,695 kg |
| EL D80 ACS | 70 | 475 kg | 59.2 kg | 4,619 kg |
| EL D95 ACS | 40 | 486 kg | 80.3 kg | 3,698 kg |
| EL D101 ACS | 40 | 480 kg | 86 kg | 3,920 kg |

**NOTICE**

**Potential machine damage due to incorrect rods!**

- For each rod type, install the corresponding conversion kit and adjust the drilling parameters in the "Bore parameter settings" screen.
- Contact your TRACTO-TECHNIK customer service if you want to change the rod type (chapter 8, page 313).

## 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 12°.
- 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/ stacking boxes***

**Info!**
If you transport the machine without a rod box/stacking boxes, there is a danger of the pusher plates of the rod box/stacking boxes 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.

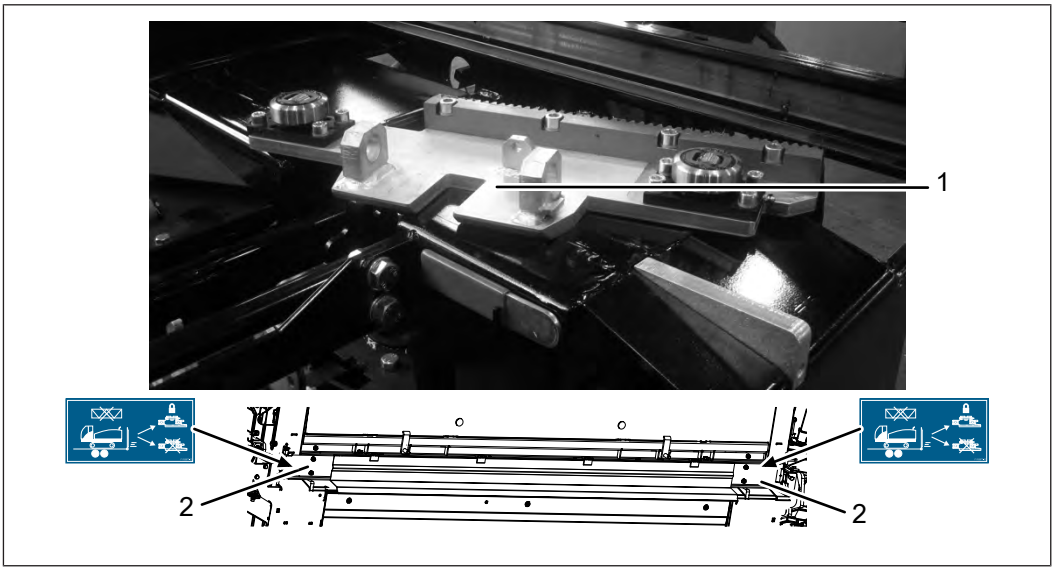



*Fig. 4-1 Pusher plates below the rod box and sticker*

**NOTICE**

**Potential machine damage due to incorrect approach position of the rod box/stacking boxes!**

- 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.
- Before traversing the machine, secure the loading crane as indicated in the figure below.
- 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.

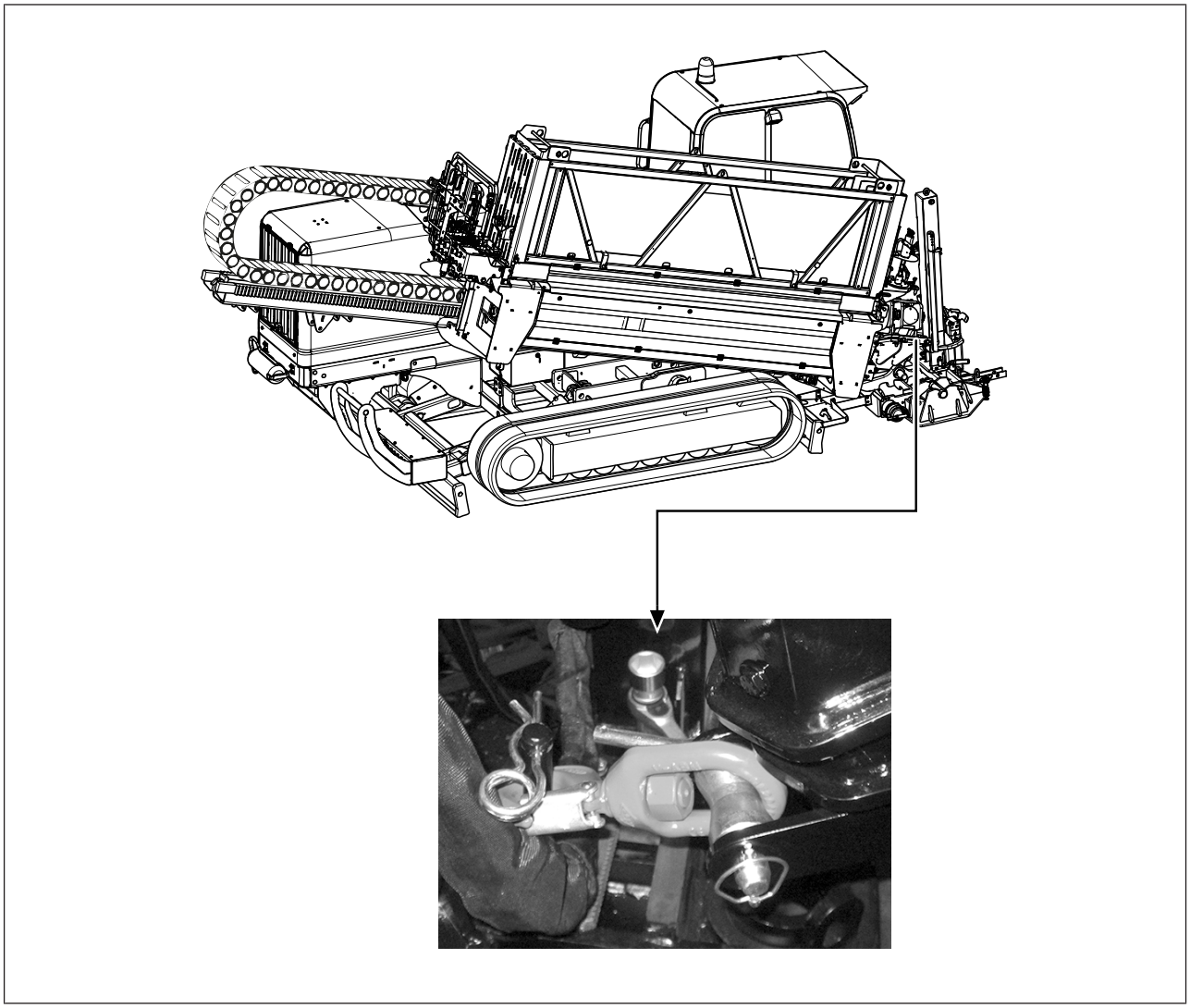


*Fig. 4-2 Securing the loading crane before traversing the machine*

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.

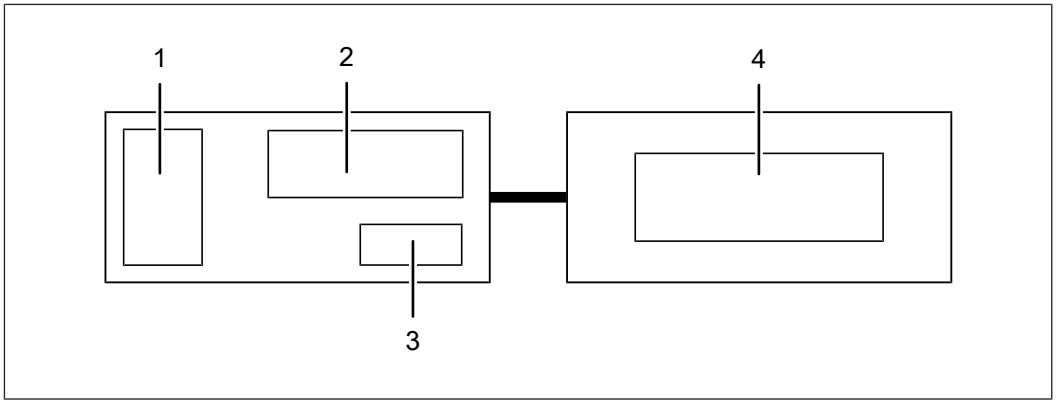



*Fig. 4-3 Example set-up on the truck or trailer*

| | | | |
|---|---|---|---|
| 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 59).
2. Make sure that the trailer is properly connected to the towing vehicle.
3. Start the machine (chapter 6.4, page 220).
4. Check the thrust rig. It must be fully advanced. If necessary, advance the thrust rig.
5. Check whether the rod box/stacking boxes are in transport position. If necessary, move the rod box/stacking boxes 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 90).
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 83).
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 12°.
- 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. 1,400 rpm via the flip lever (3) of the wireless drive remote control.
12. Lift the front and rear stabiliser by pushing the flip levers (1), (2) on the wireless drive remote control upwards.

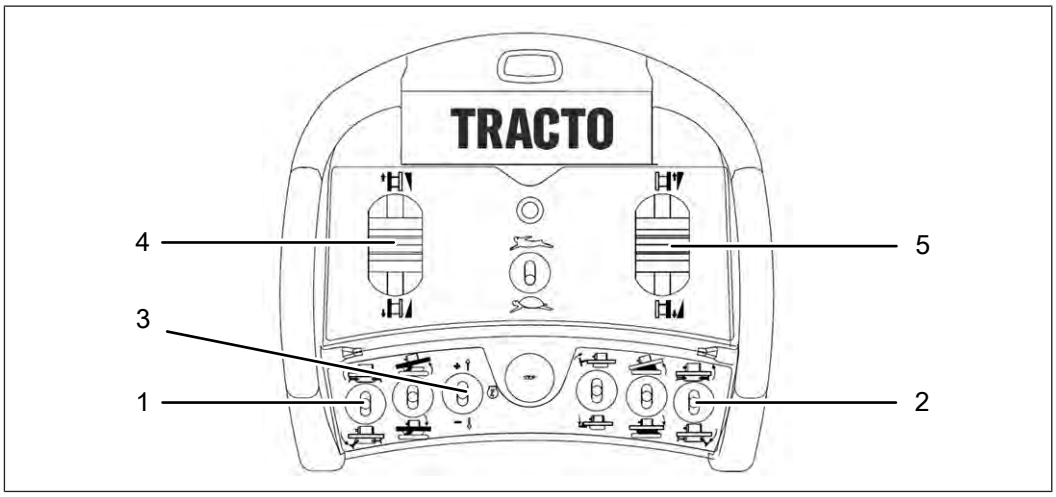



*Fig. 4-4 Control – speed, stabilisers, traversing*

13. Traverse the machine onto the trailer using the two flip levers (4, 5).
14. 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!

15. Lower the front and rear stabiliser. To do so, press the flip levers (1) and (2) downwards.
16. Switch off the orange warning light on the machine cab using the switch on the left joystick panel.
17. 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 the four transport eyelets to the stabilisers (two each at the front and rear stabiliser, (1), (4)) using one chain hoist (2), (5) each.

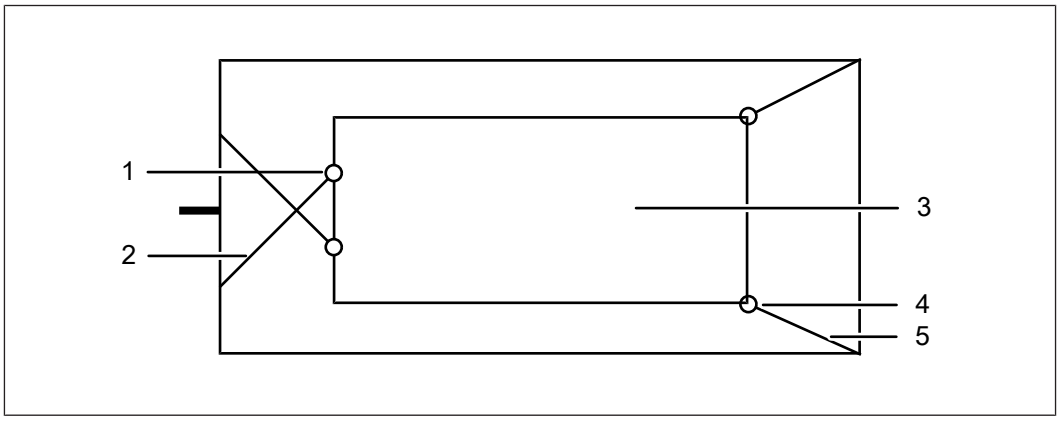



*Fig. 4-5 Standard fastening on the truck or trailer*

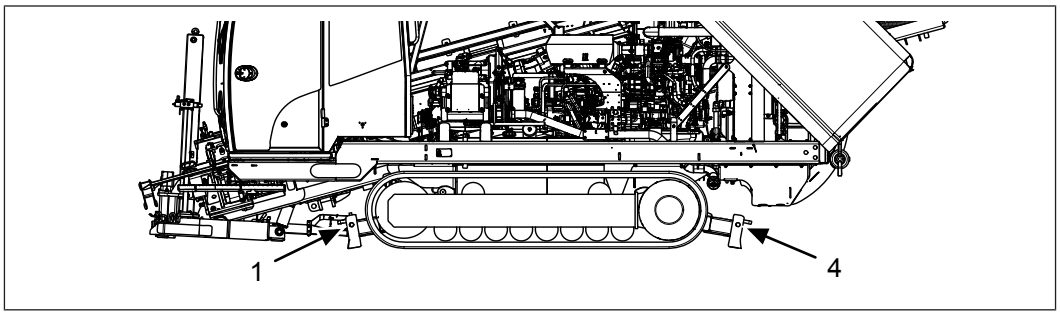



*Fig. 4-6 Lashing eyes*

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.
3. Fasten the two rod holding bars (1) with one M12 x 35 DIN 933 screw (2) and one M12 Nord-Lock washer each to the hole on the opposite side of the machine (chapter 6.9, page 250).

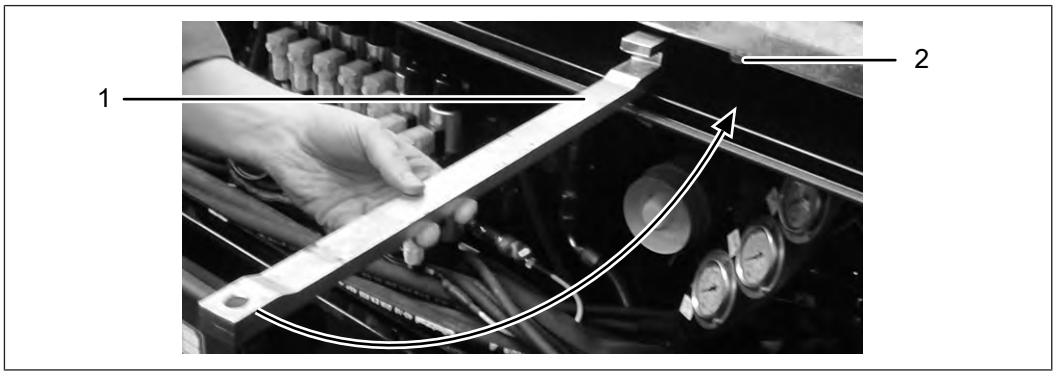



*Fig. 4-7 Mounting a rod holding bar*

4. Brace the stacking boxes with tension straps (1) (chapter 6.9, page 250).

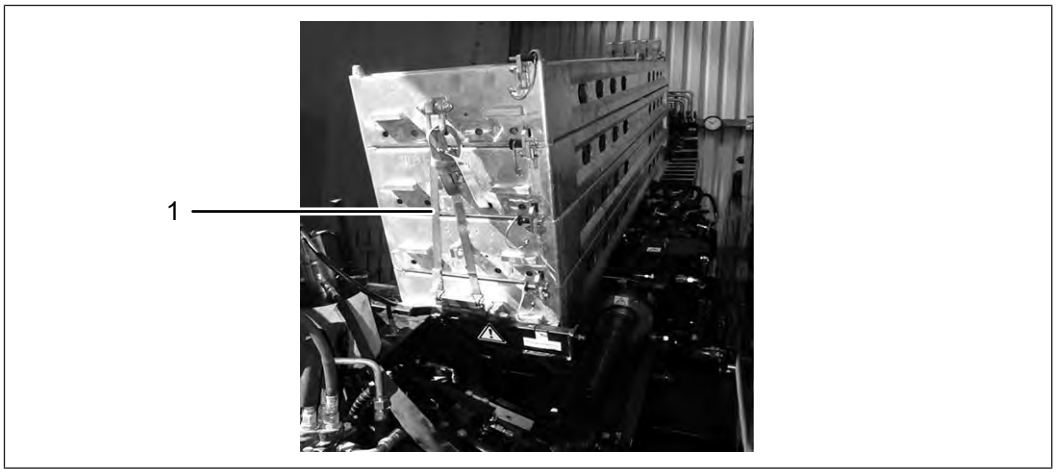



*Fig. 4-8 Bracing the stacking boxes with tension straps*

**⚠ 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.

5. 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 12°.
- 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 220).
5. Enable the wireless drive remote control (chapter 5.3.5, page 90).
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. 1,400 rpm via the flip lever (3) of the wireless drive remote control.
8. Lift the front and rear stabiliser by pushing the flip levers (1), (2) on the wireless drive remote control upwards.

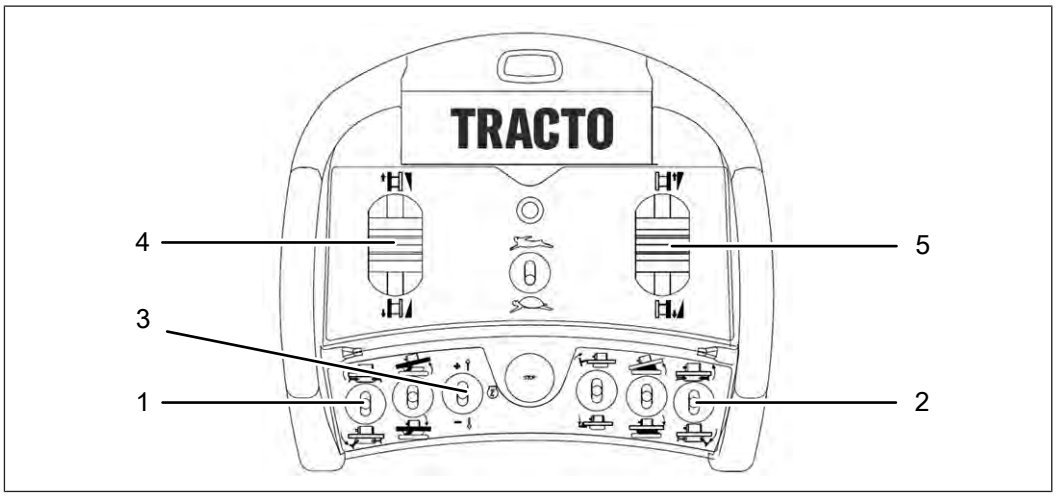



*Fig. 4-9 Control – speed, stabilisers, traversing*

9. 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 313).
- 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.
- Using the lashing eyes of the crawler tracks for lifting the machine is prohibited!
- Disassemble or remove the rod box/stacking boxes before lifting (chapter 6.11.1, page 274 and chapter 6.9, page 250).
- 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.
- The minimum width of the lifting beam is 3400 mm. The minimum distance between the lifting beam and the footprint of the machine is 3,600 mm.
- Use lifting means of sufficient length so that the machine hangs balanced in the crane.
- Make sure that the lifting means are intact.

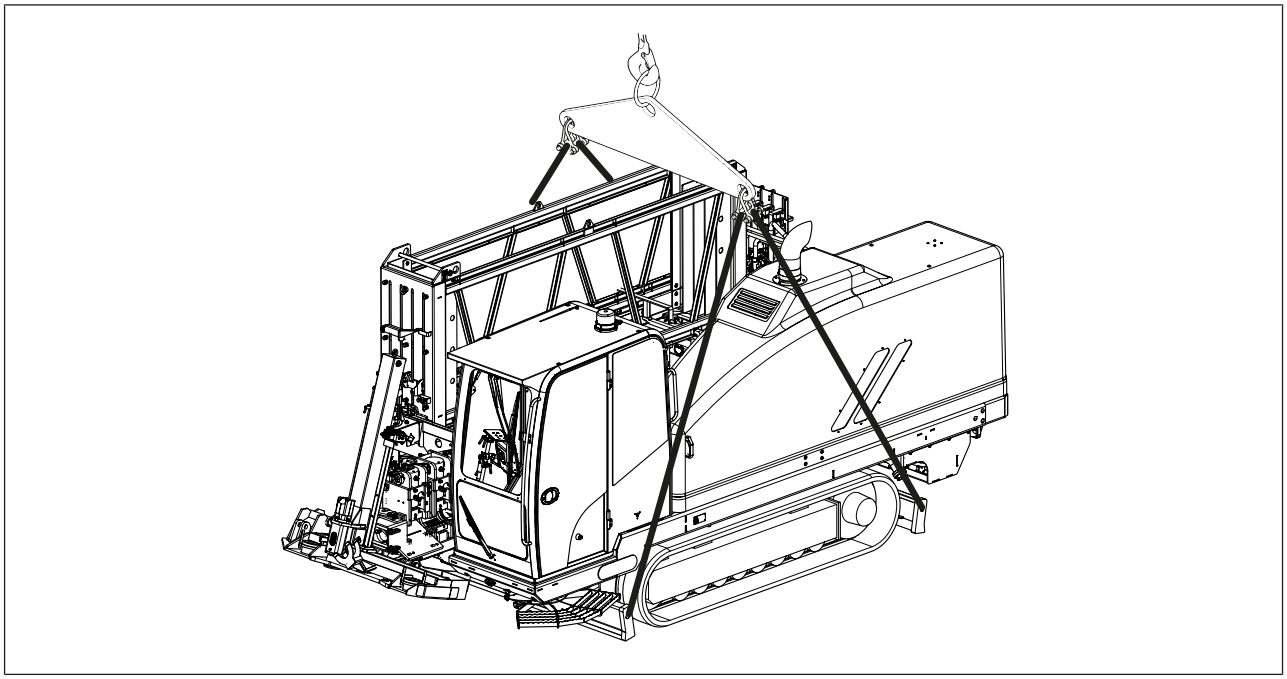


*Fig. 4-10 Lifting the machine with a crane (example illustration)*

**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.

- Only use Starpoint ring screws type VRS-M36 (1) with a nominal load capacity of 7000 kg (cross load). Please also observe the instructions of the lifting means.
- Only lift the machine if the ring screw threads and the threaded holes in the stabilisers are intact and free from corrosion! The exact procedure for the application of Starpoint ring screws type VRS-M36 (1) may vary.
- Contact the TRACTO-TECHNIK customer service (chapter 8, page 313).

2. Screw one Starpoint ring screw type VRS-M36 (1) (nominal load capacity 7000 kg) into each of the four lateral threaded bores of the stabilisers.

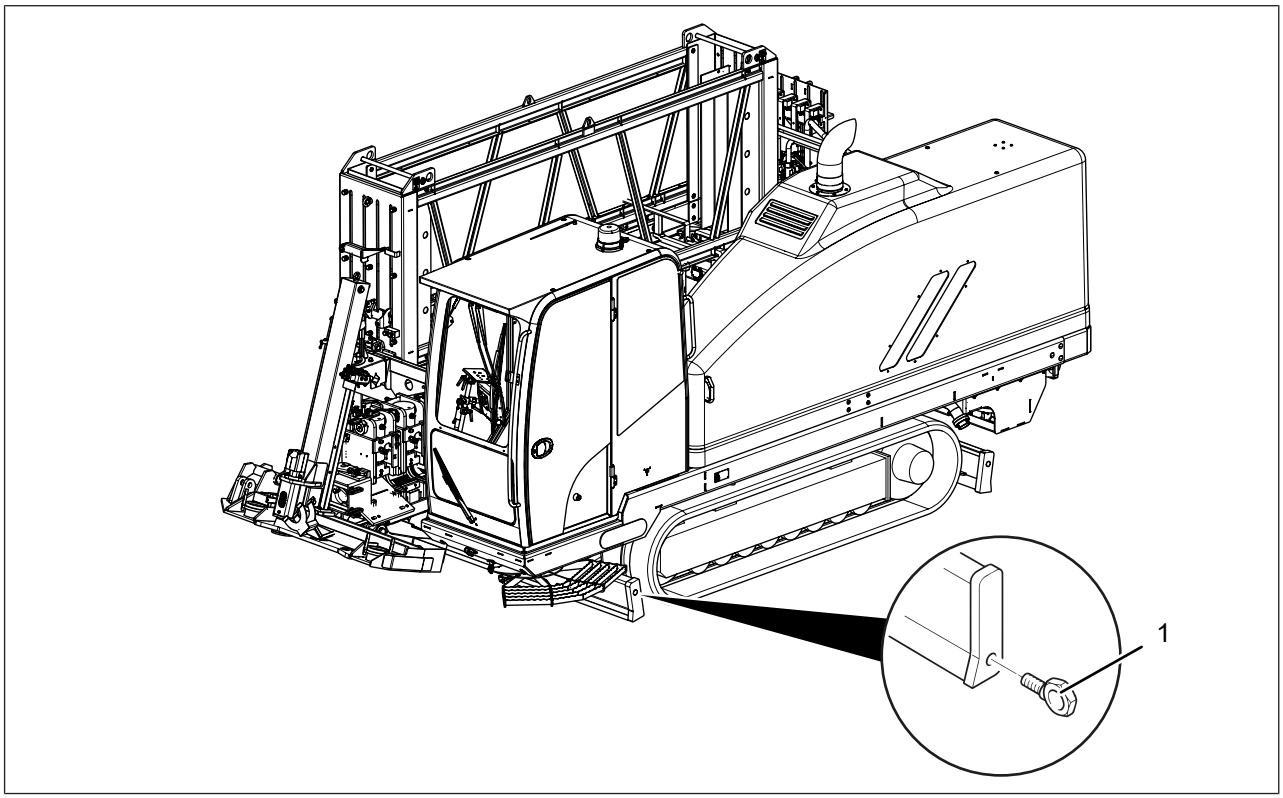



*Fig. 4-11 Screwing in Starpoint ring screws*

**⚠ 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.

3. Have lifting means with a nominal load capacity of at least 7,000 kg ready.
4. Fasten the shorter lifting means (1) to the front Starpoint ring screws and the longer ones (2) to the rear Starpoint ring screws. Fasten the other ends of the lifting means to the lifting beam (3).
5. Slowly lift the machine.
6. Make sure that the machine is hanging precisely balanced.
7. Transport the machine slowly and carefully.

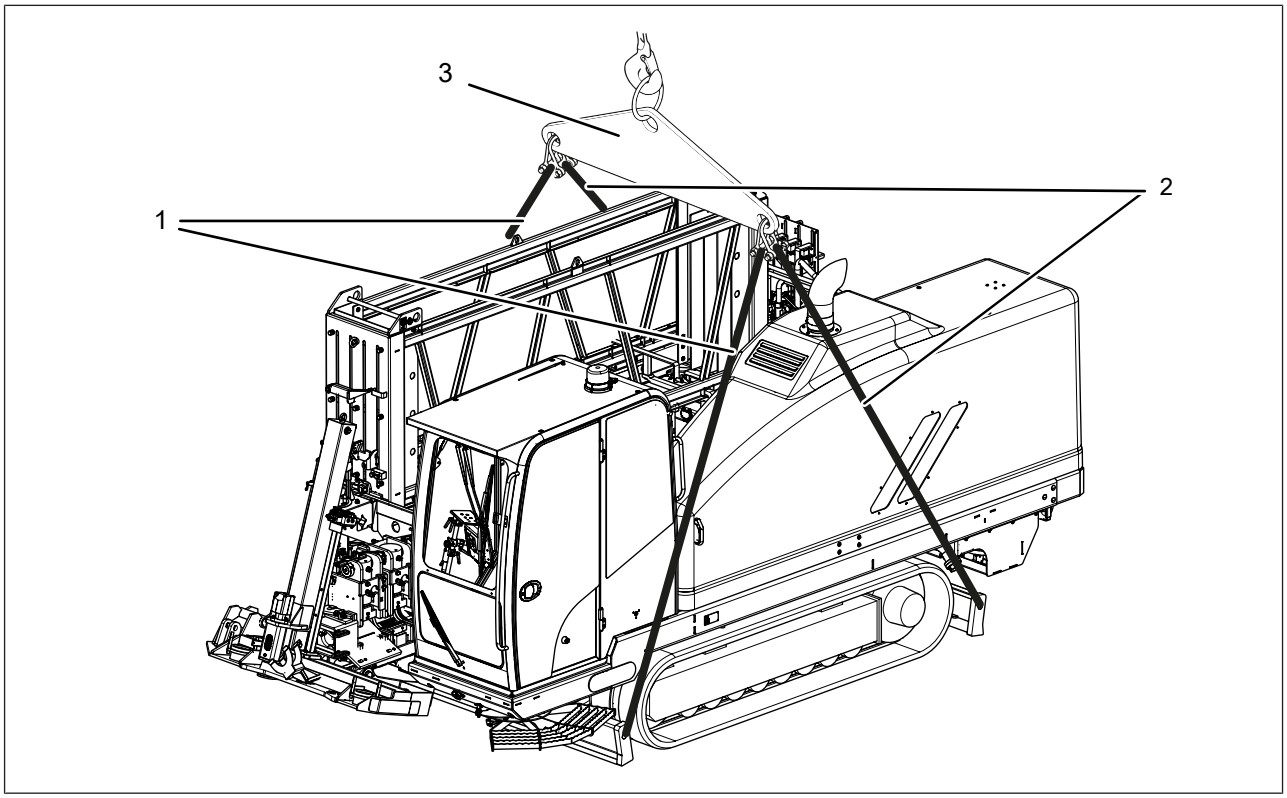



*Fig. 4-12 Attaching the lifting means to the lifting beam and transport eyelets*

## 4.3 Towing the machine

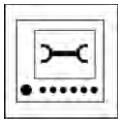
When towing the machine, please observe the following safety instructions:

- Only use sufficiently dimensioned towing means!
- Only connect the towing means to the transport eyelets of the front stabiliser.
- 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!

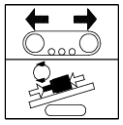
Do not tow the machine unless it has broken down and is getting in the way in the working area or it is situated in a danger area.

**Info!**
If the drive engine cannot be started, release the mechanical brake of the crawler drive before towing.
Please contact the TRACTO-TECHNIK customer service.

1. Start the machine (chapter 5.3.2, page 86).



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:

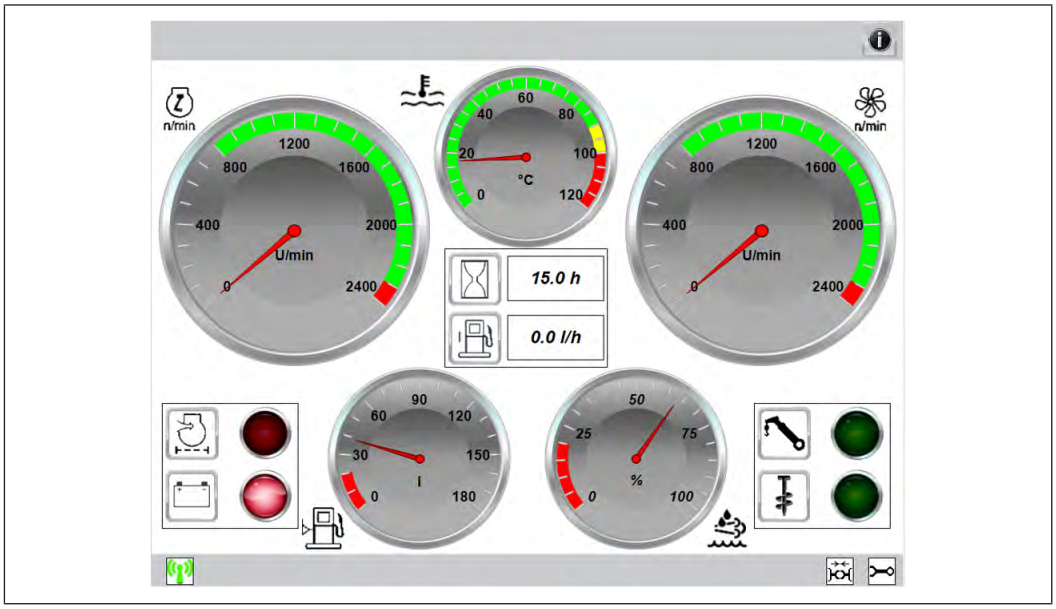
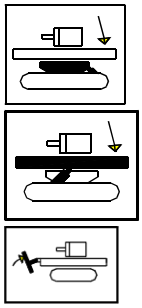



*Fig. 4-13 "Drive mode" screen*



4. Set the engine speed to approx. 1,400 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. Swing the anchor plate into top position by pressing the push button on the right joystick.

7. Connect a sufficiently dimensioned towing means (1, e.g. chain, rope) to the two transport eyelets on the front stabiliser.

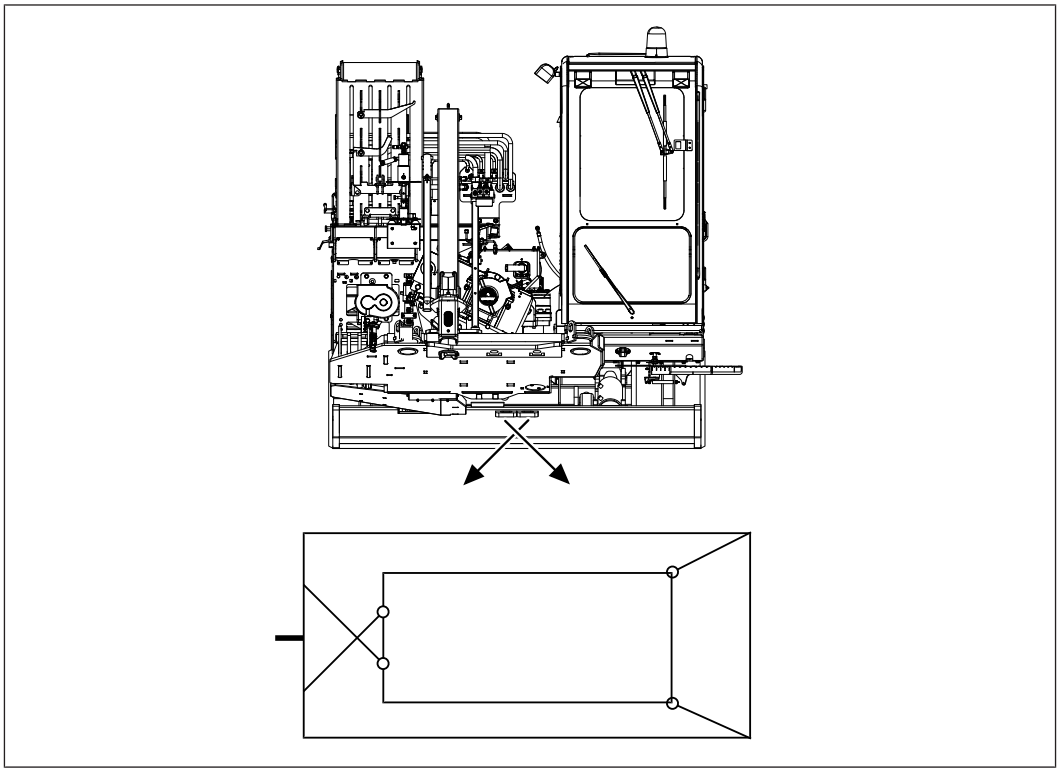


*Fig. 4-14 Attaching the towing means (example illustration)*

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.

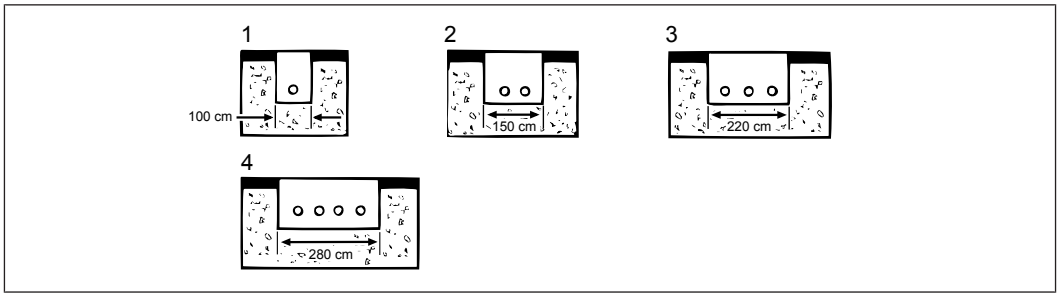



*Fig. 5-1 Example cross-section of a starting or target pit (outer pipe diameter 100 mm)*

### 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.

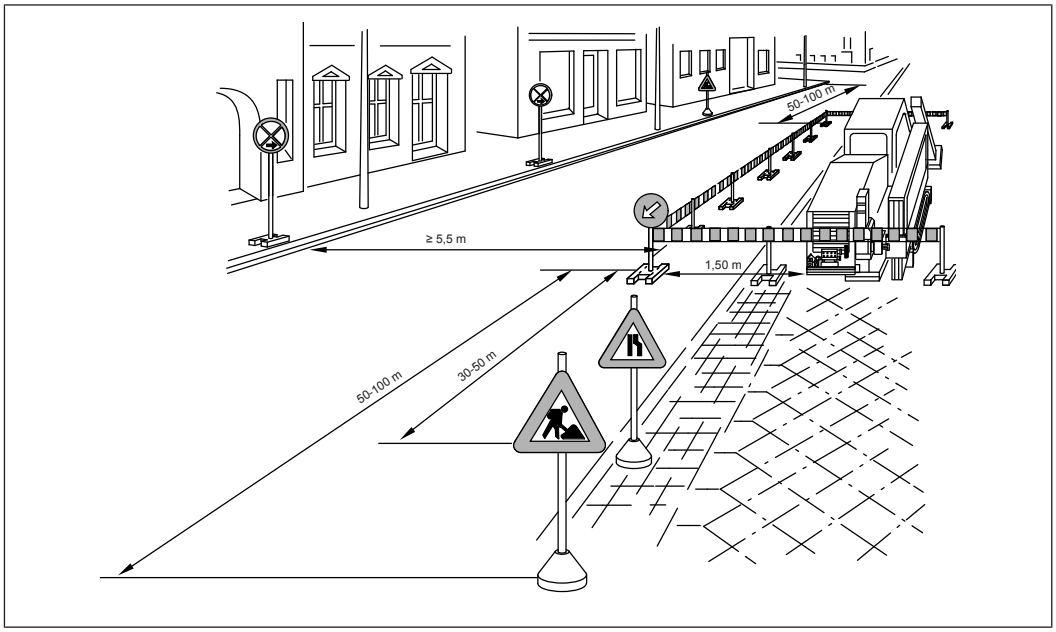



*Fig. 5-2 Example for securing pits*

## 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.

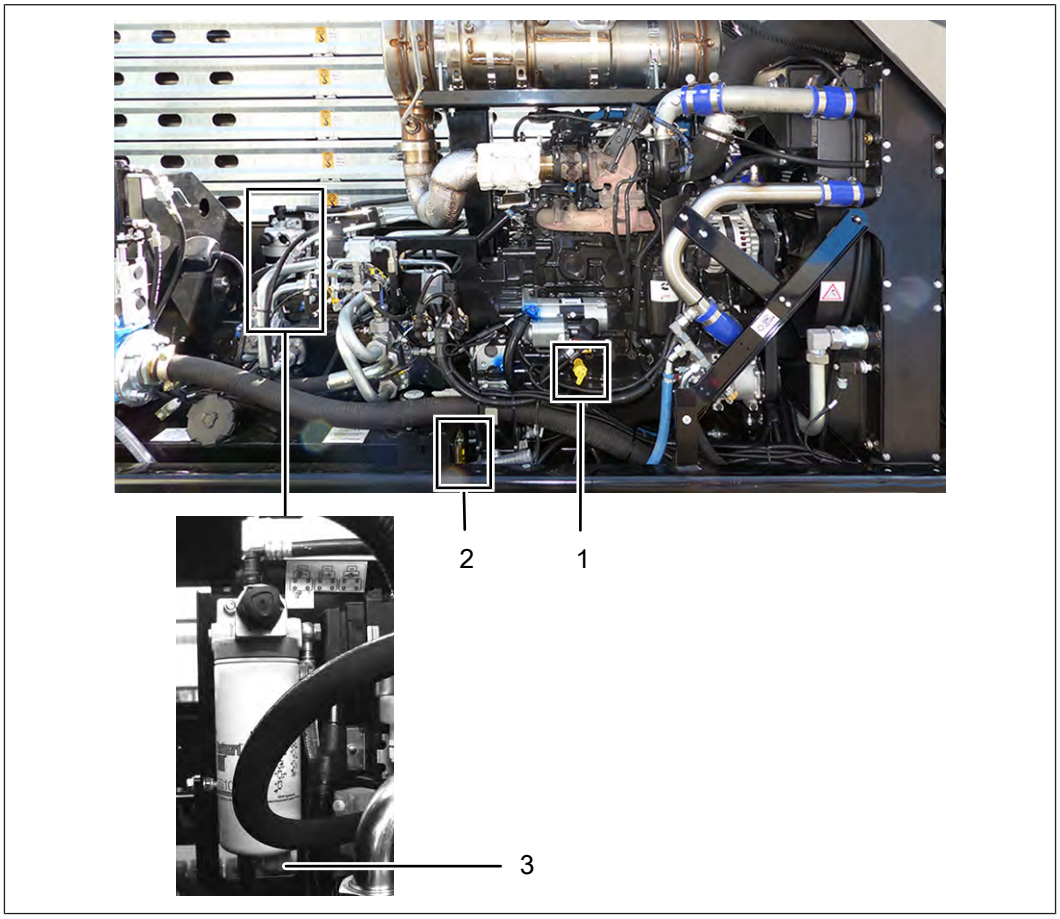



*Fig. 5-3 Checks prior to start-up*

Make sure that the "Cleaning of exhaust gas system" warning indicator (1) is not illuminated. Otherwise start to clean the exhaust gas system manually (chapter 6.14.2, page 306).

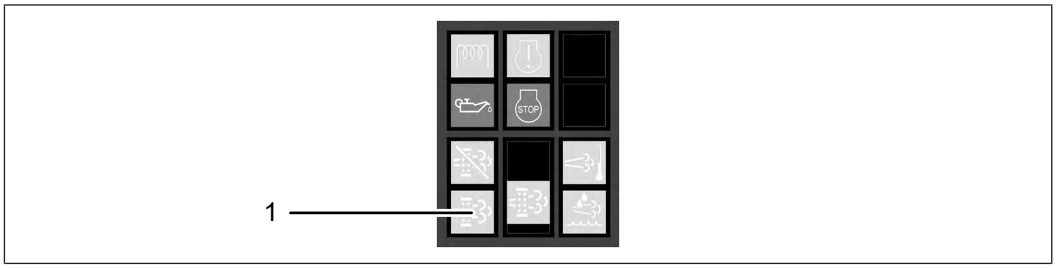



*Fig. 5-4 "Cleaning of exhaust gas system" warning indicators*

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).

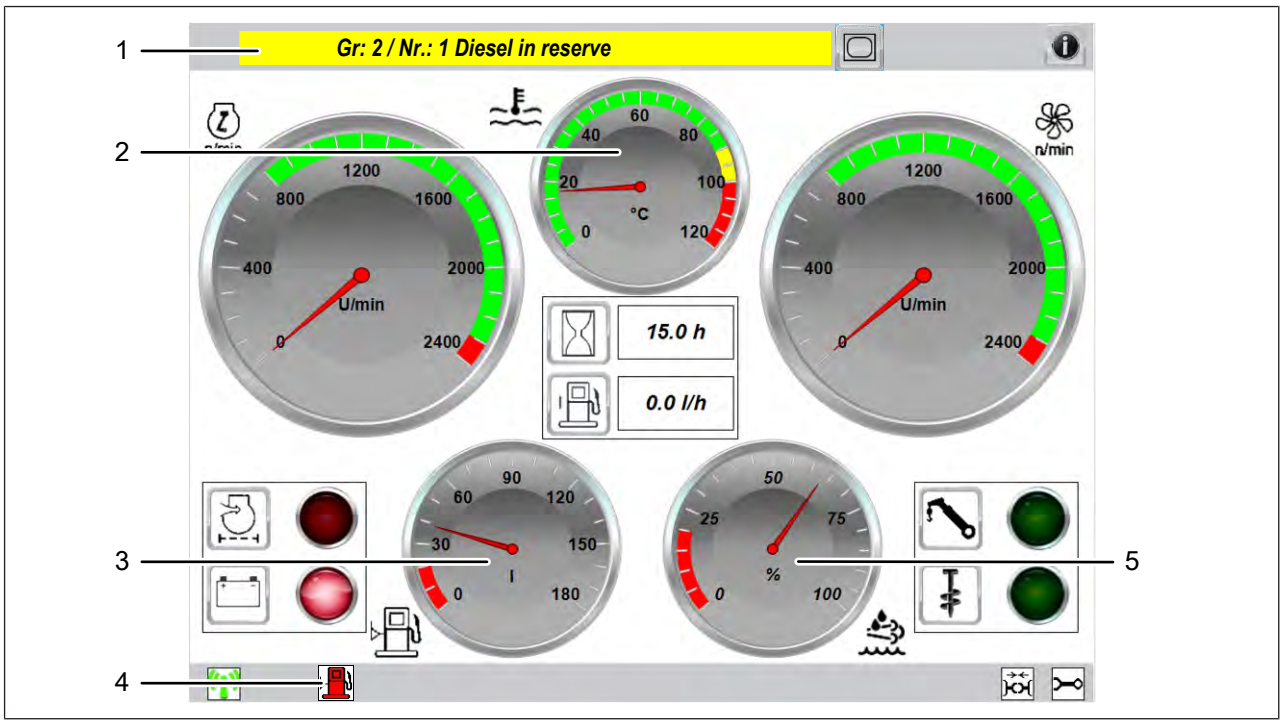



*Fig. 5-5 Checks while starting to operate*

***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.

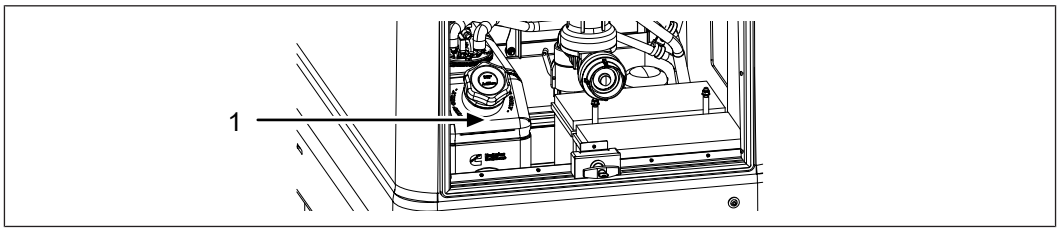
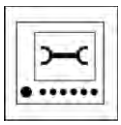
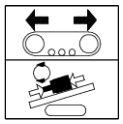



*Fig. 5-6 DEF tank*

### 5.3.2 Starting the engine



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

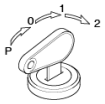


2. If necessary, switch over on the right joystick panel from bore mode to drive mode.

**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:

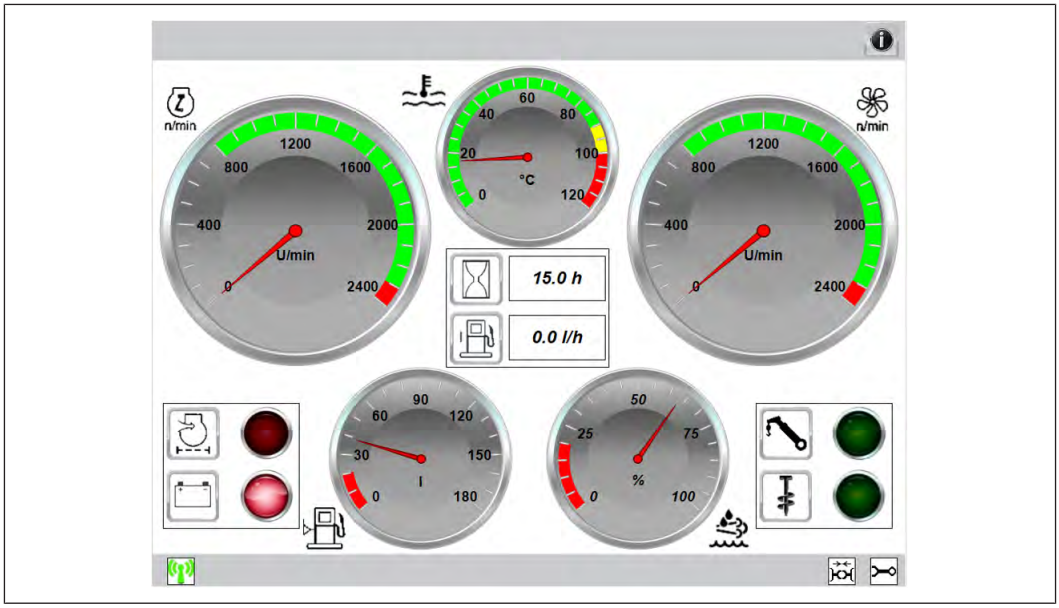



*Fig. 5-7 "Drive mode" screen*

If a machine error occurs, an error message will appear in the message display (chapter 8.1, page 313).

**NOTICE**

**Engine performance can deteriorate with prolonged idling!**

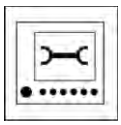
- Only allow the engine to run at idle for a short time. If the idle time is too long, this may lead to a poor engine performance.

### 5.3.3 Performing calculations

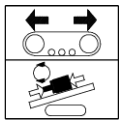
If necessary, perform the calculations required for a precise planning of the drilling (place of installation of the machine, bending radius of the drill rod etc.).

Refer to the screens starting in chapter 6.2.8.9, page 168.

### 5.3.4 Preparing the machine for traversing



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.

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

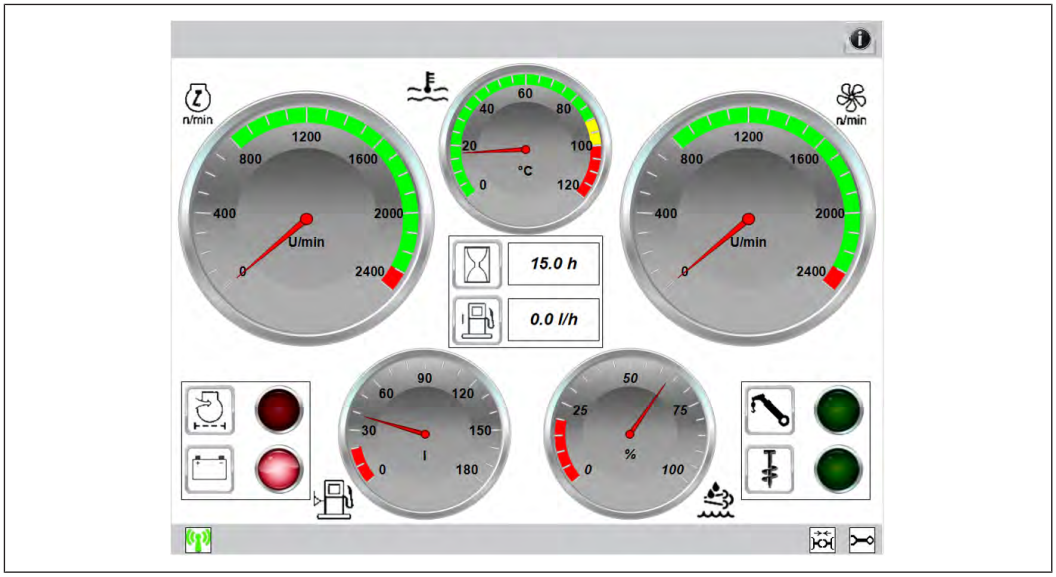



*Fig. 5-8 "Drive mode" screen*

For traversing the machine, the cab and the rod box/stacking boxes must be in transport position and the step grid must be swung in.

**⚠ CAUTION**

**Impact hazard! Swivelling cab!**

- When swivelling the cab make sure that no other person is put at risk.

**NOTICE**

**Risk of damage if the auxiliary footstep is mounted while swivelling the cab inwards!**

- Before swivelling the cab inwards, make sure that the auxiliary footstep for changing the stacking boxes is removed.



3. If the cab is not in transport position, swivel it into transport position by pressing and holding the button on the right joystick.

⇨ The following prompt appears on the screen:

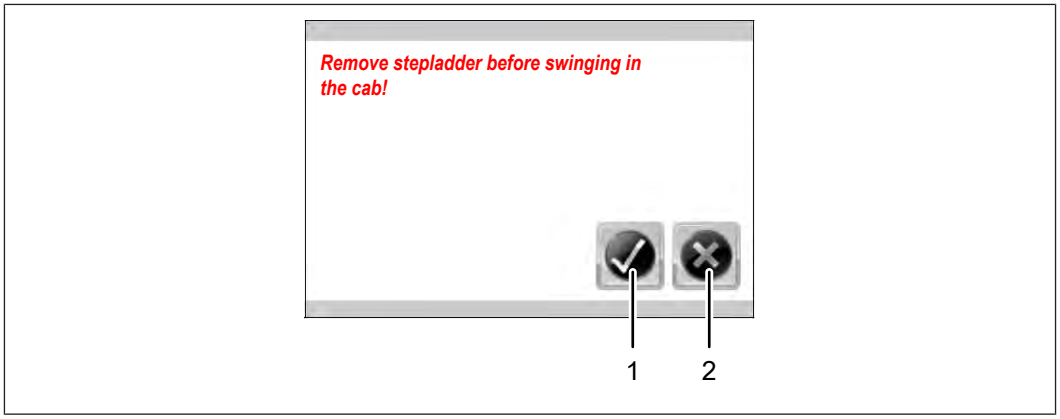



*Fig. 5-9 Prompt "swinging in the cab"*

4. Confirm the swivelling operation on the screen by closing the pop-up message with >>OK<< (1). Press >>Cancel<< (2) if the auxiliary footstep is still mounted.

   ⇨ Swivelling is started as soon as >>OK<< is pressed.

5. Hold the button on the right joystick until the cab has reached the transport position.

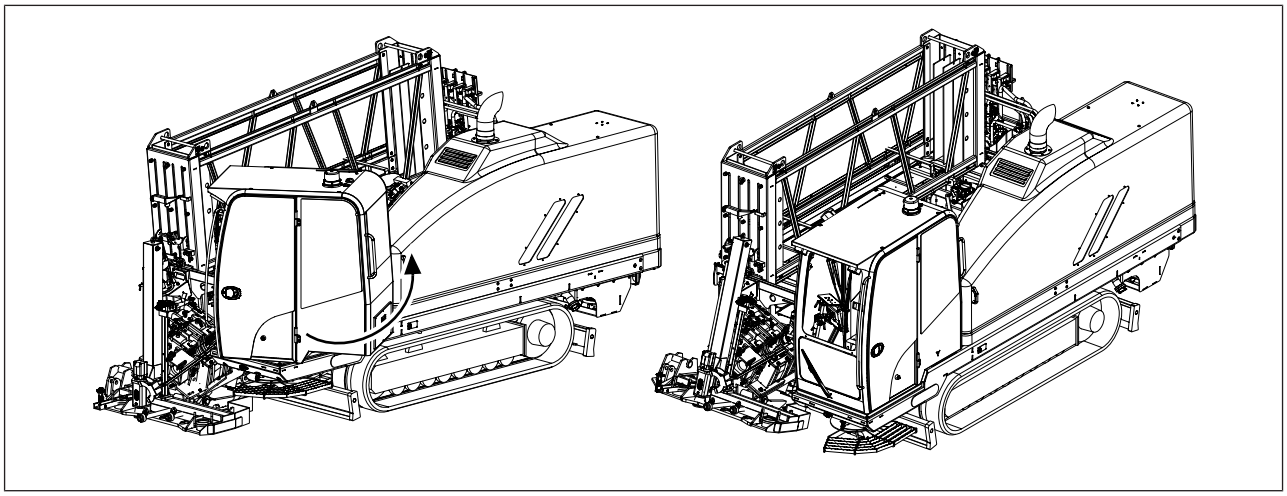
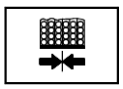


*Fig. 5-10 Swinging the cab in transport position*



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



7. Press the push button on the left joystick to move the rod box/stacking boxes in transport position.

8. Swing the step grid in before traversing the machine (chapter 6.2.17, page 209).

### 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 141)
- a wireless pit remote control only for safe retrofitting of the drilling tools inside the target pit (chapter 6.2.3, page 142)

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

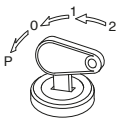
The operating element first activated has priority over the others. Whether the operating elements at the seat or in the wireless remote control are used depends on the position of the ignition key.

**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 140).

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***

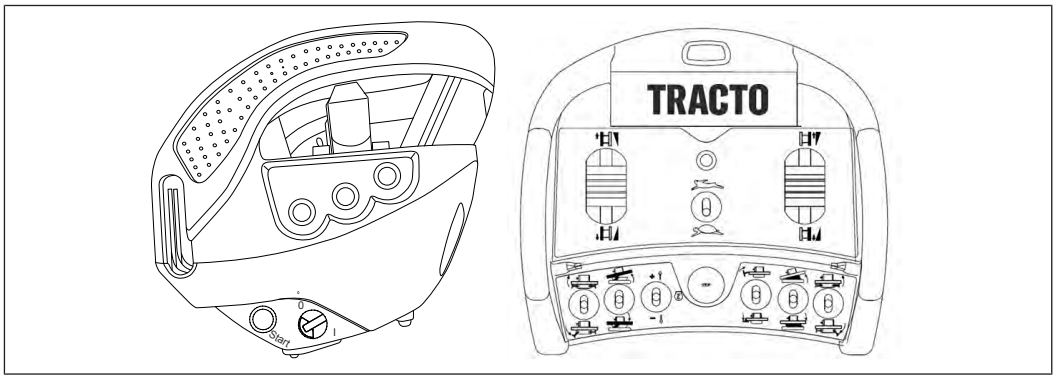



*Fig. 5-11 Wireless drive remote control*

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 141.

Observe the safety information in chapter 5.3.8, page 96 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 / the stacking boxes are in transport position.
- The ignition key is in position "P".
- The operator seat in the cab is unoccupied.

***Operating with wireless drive remote control***

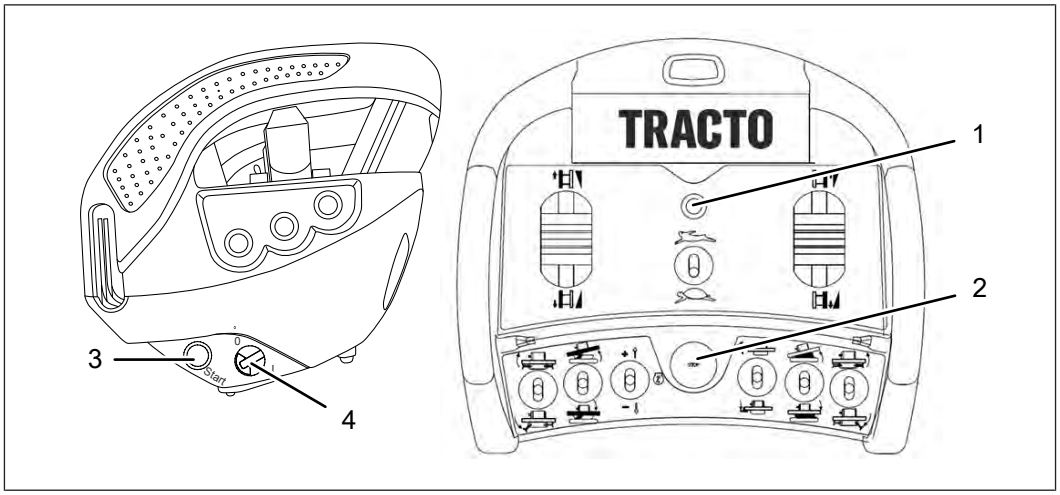



*Fig. 5-12 Wireless drive remote control*

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***

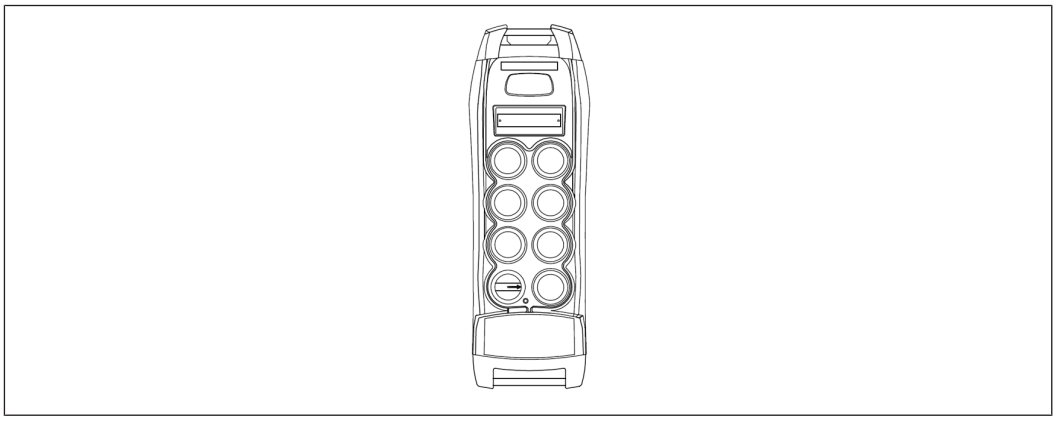


*Fig. 5-13 Wireless pit remote control*

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 142.

**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.

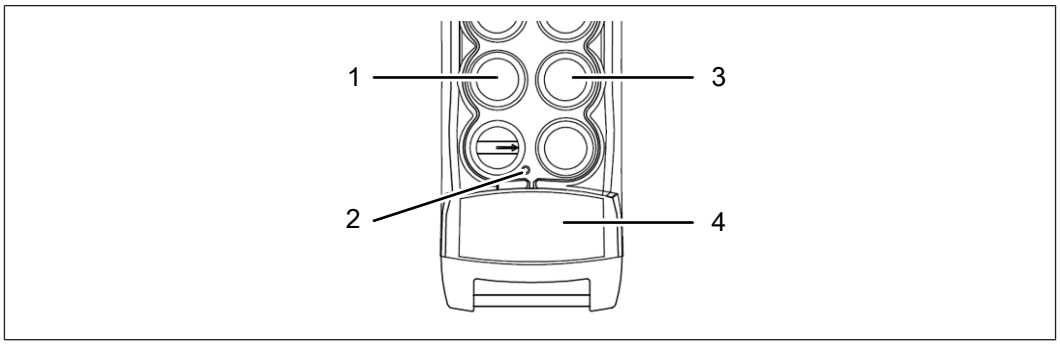



*Fig. 5-14 Wireless pit remote control*

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 86.

**⚠ WARNING**



**Danger of crushing when raising and lowering the stabilisers!**

- Keep a sufficient distance from the stabilisers!

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

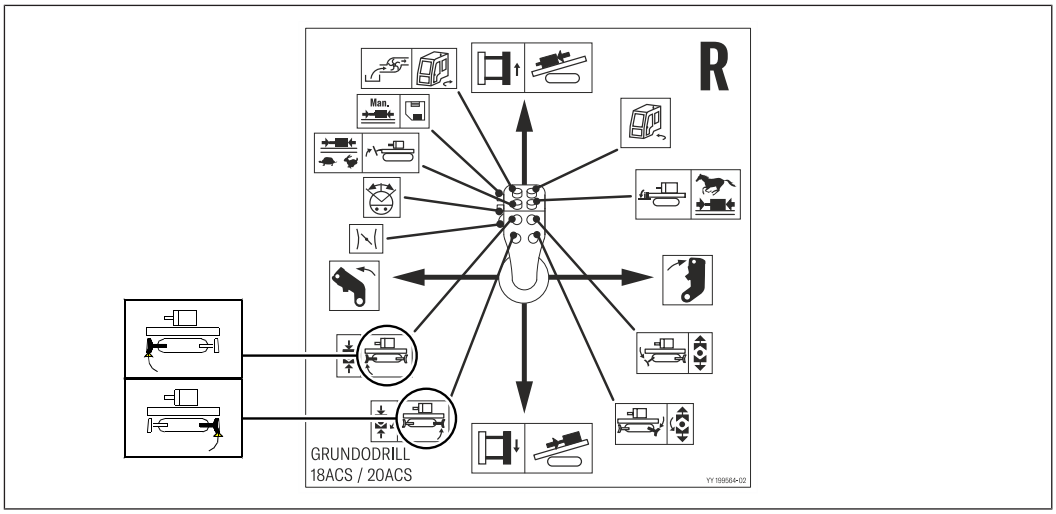



*Fig. 5-15 Lifting the stabilisers*

**Info!**
When the wireless drive remote control is connected, the joysticks inside the cab are rendered inoperable.
You can raise and lower the stabilisers by pushing the flip levers (1), (2) on the wireless drive remote control upwards.

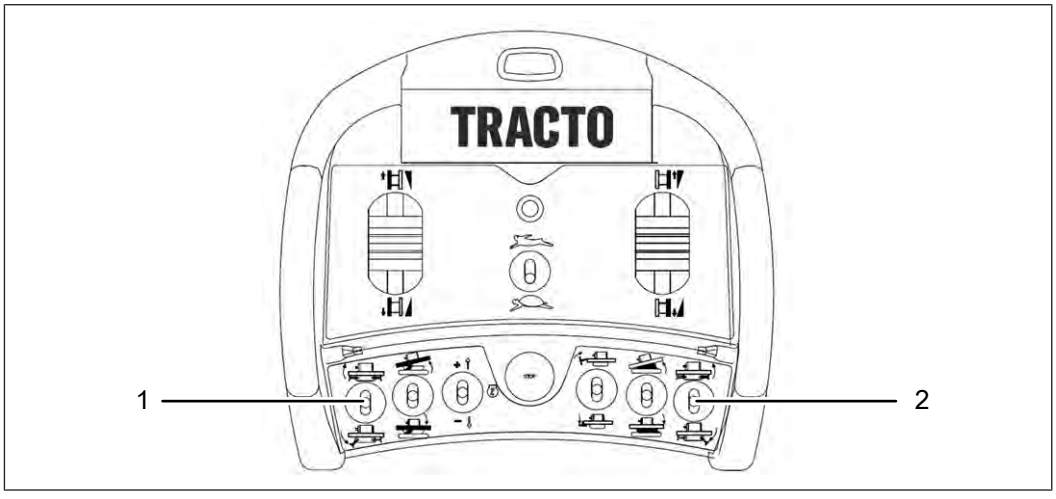



*Fig. 5-16 Wireless drive remote control – flip levers for stabilisers*

### 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 86.
2. Align the rig boom horizontally by pressing the corresponding buttons on the left joystick.

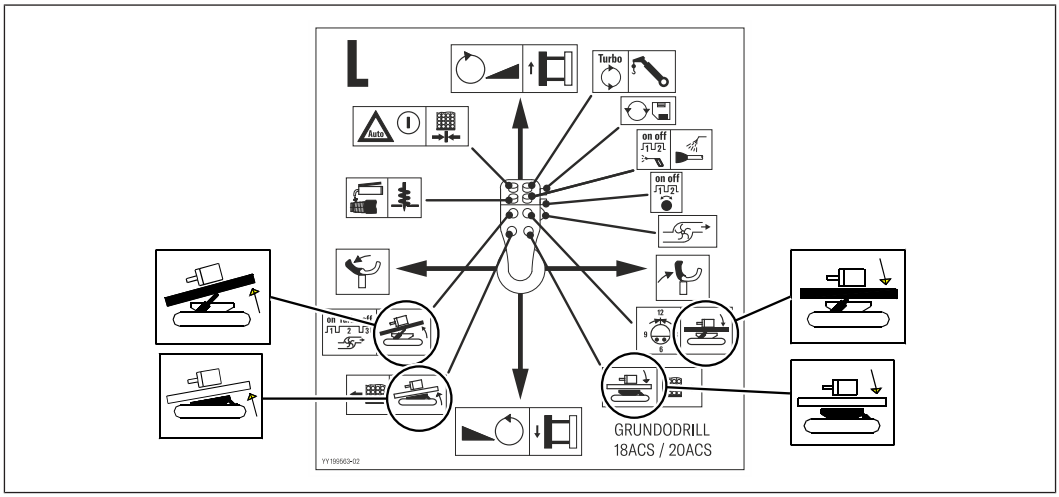



*Fig. 5-17 Aligning the rig boom horizontally*

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

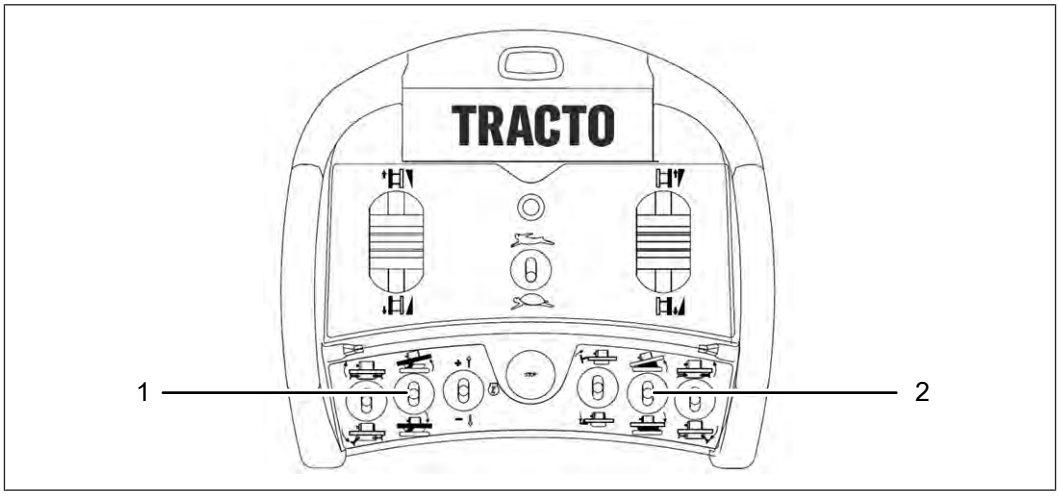



*Fig. 5-18 Wireless drive remote control – flip lever rig boom*

### 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.
- Before traversing the machine, secure the loading crane as indicated in the figure below.
- 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.

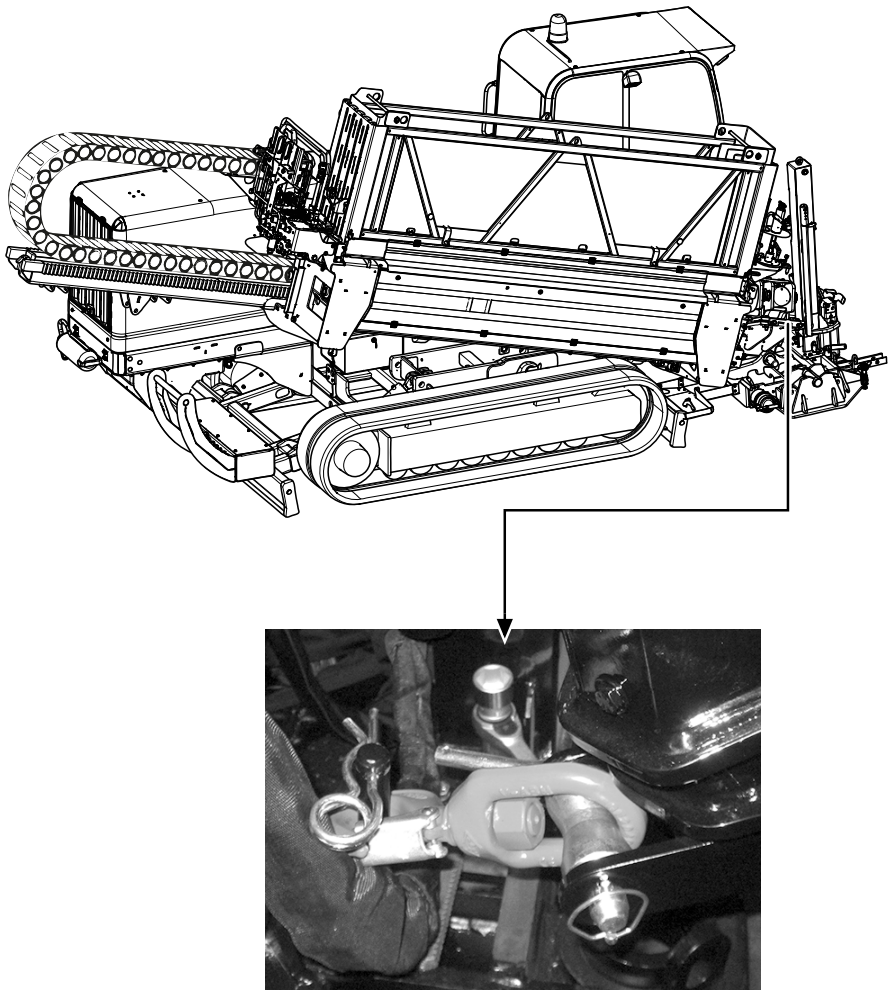


*Fig. 5-19 Securing the loading crane before traversing the machine*

**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 12°.
- 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 86.
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.

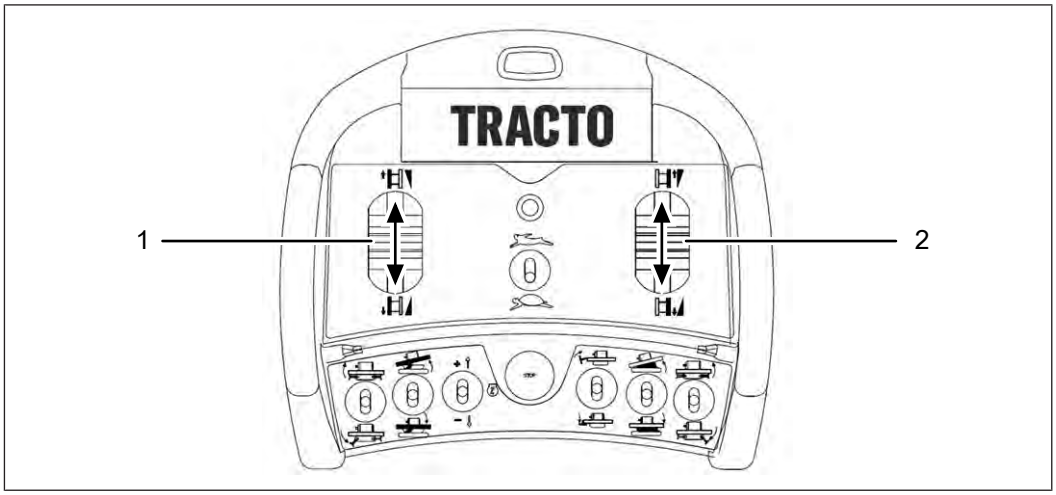



*Fig. 5-20 Traversing the machine with the wireless drive remote control*

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 stabilisers. To do so, set the flip levers (3) and (4) on the wireless drive remote control down.

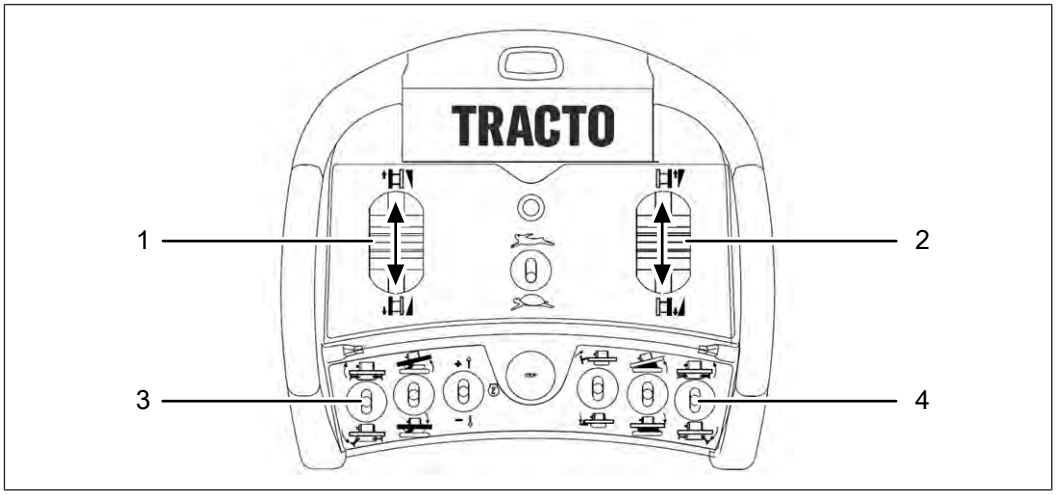
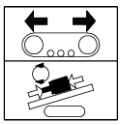



*Fig. 5-21 Stopping the machine*

## 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 96).

**⚠ WARNING**



**Danger of crushing when raising and lowering the stabilisers!**

- Keep a sufficient distance from the stabilisers!

3. Lower the rear and front stabiliser completely by pressing the buttons on the right joystick.

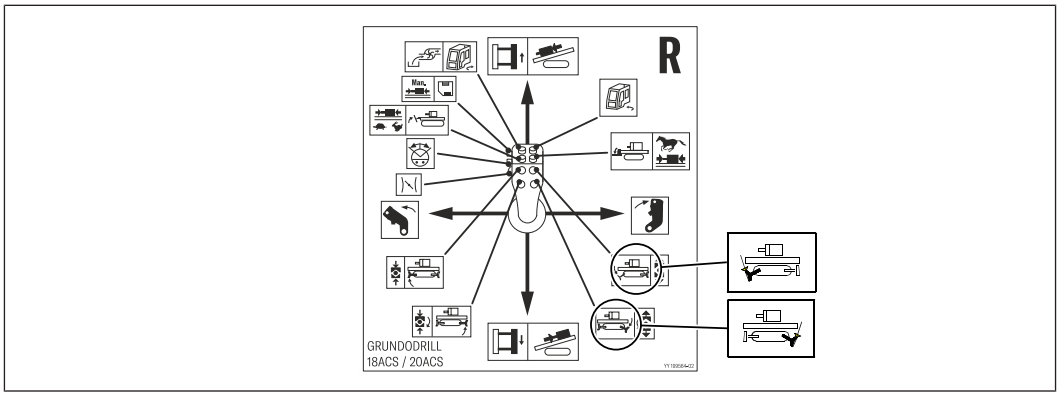



*Fig. 5-22 Lowering the stabilisers*

**Info!**

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

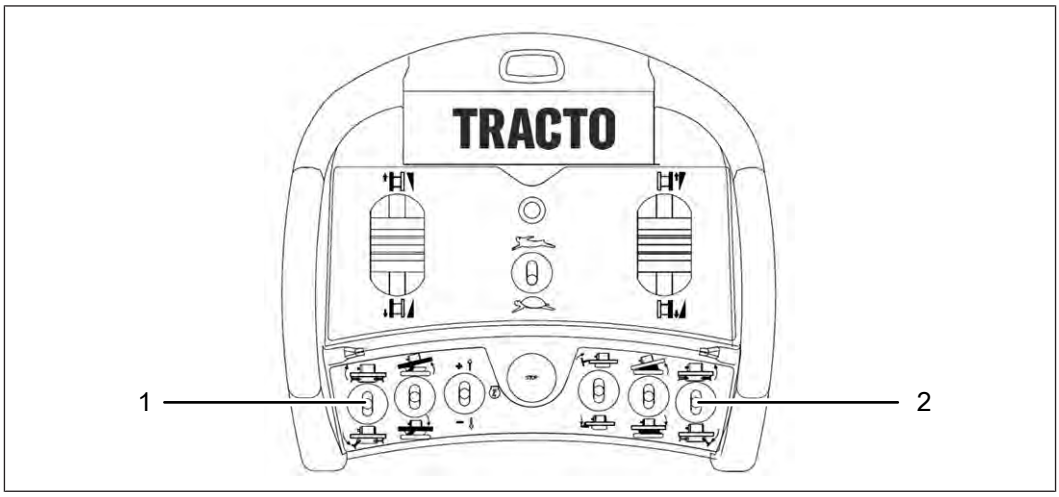



*Fig. 5-23 Wireless drive remote control – flip levers for stabilisers*

4. Swing out the cab step grid (chapter 6.2.17, page 209).

### 5.4.1 Lowering the anchor plate

Make the preparations starting in chapter 5.4, page 99.

**⚠ WARNING**

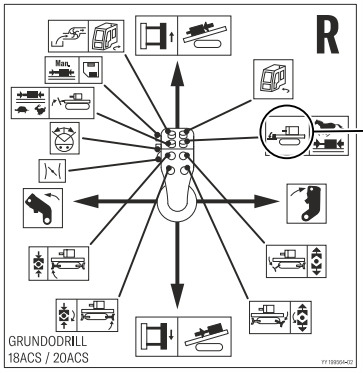


**Lowering anchor plate!**

Danger of crushing your feet.

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

1. Lower the anchor plate by pressing the push button on the right joystick.
2. Once you let go of the push button, the anchor plate stops.




**Info!**
You can align the anchor plate by actuating the flip lever (1) on the wireless drive remote control.

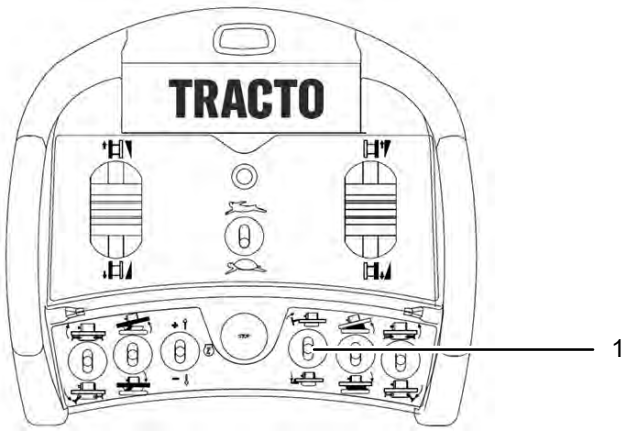



*Fig. 5-24 Wireless drive remote control – flip lever for anchor plate*

The anchor plate may need some fine adjustment.

### 5.4.2 Lowering the boom

**⚠ WARNING**

**Danger of crushing under the lowering boom!**



Keep a sufficient distance from the boom.

**NOTICE**

**Risk of collision between loading crane and rod box/upper stacking box**

If the inclination angle of the rig exceeds > 20°, the rod box/upper stacking box may hit the loading crane when the latter is in transport position.

- Rotate the loading crane by 90° before tilting the rig by an angle of more than 20°.

Align the rig boom so that the anchor plate rests on the ground flush and evenly (chapter 5.3.7, page 95).

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

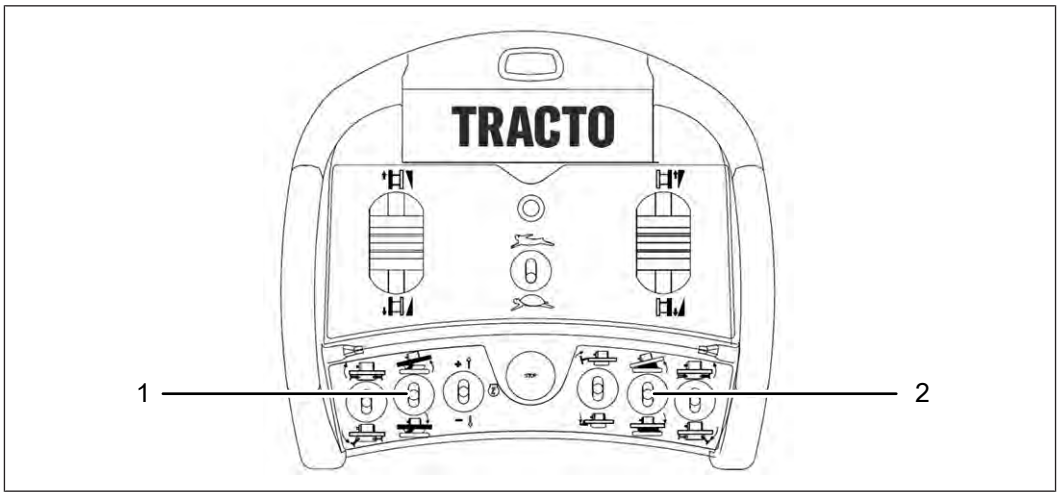



*Fig. 5-25 Wireless drive remote control – flip lever rig boom*

### 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. 5-26 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 220).
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.

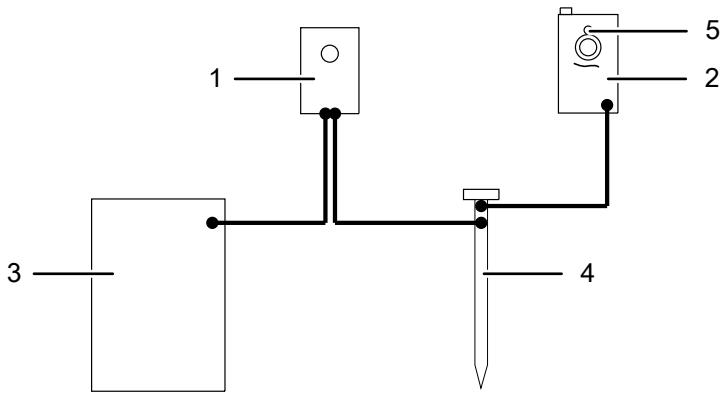



*Fig. 5-27 Checking the electric shock warning device*

## 5.5.2 Overview of the electric shock protection device

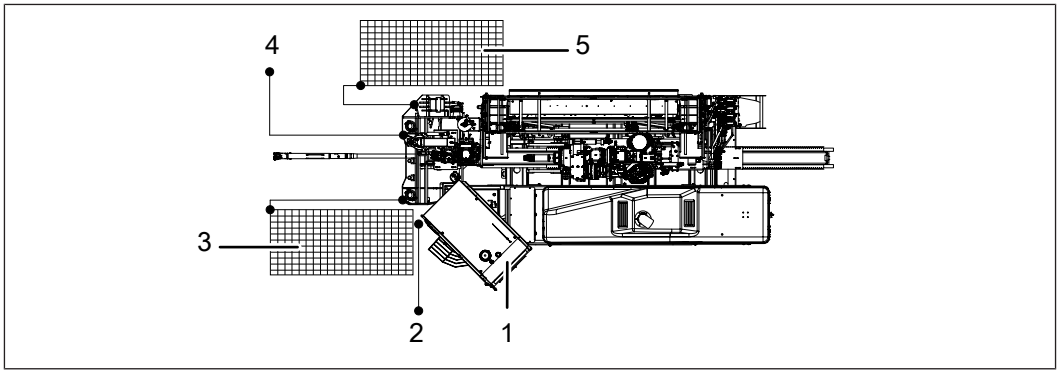



*Fig. 5-28 Overview of the electric shock protection device*

*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.<br>The electric shock warning device only works in connection with the grounding stake. |
| 3, 4 | Step grid / grounding mat | Discharge electricity to the ground.<br>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 99), 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.

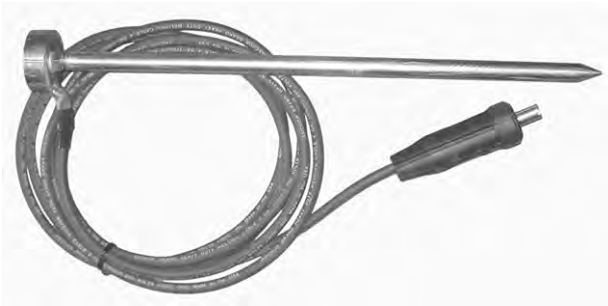


*Fig. 5-29 Grounding stake with connected cable*

⇨ 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).

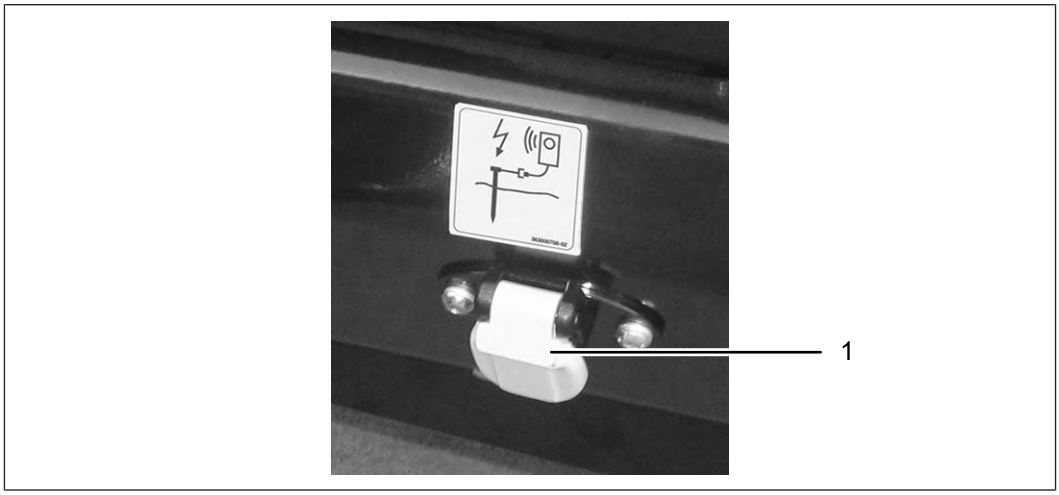



*Fig. 5-30 Grounding connection underneath the cab*

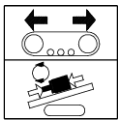
3. Lay out the grounding mats parallel to the machine and connect the cable to one of the sockets (1) at the machine. Optionally, a second grounding mat may be positioned on the other side of the machine.




*Fig. 5-31 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 86).
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.

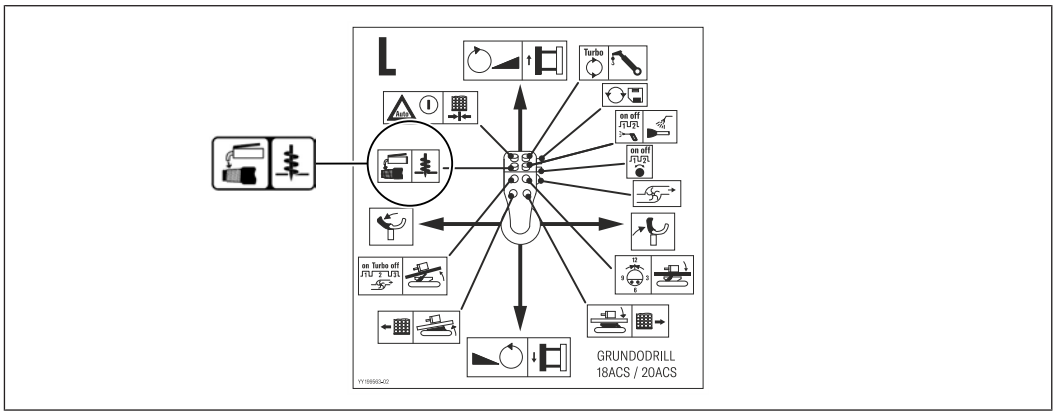



*Fig. 5-32 Switching on the anchor boring rig*

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.

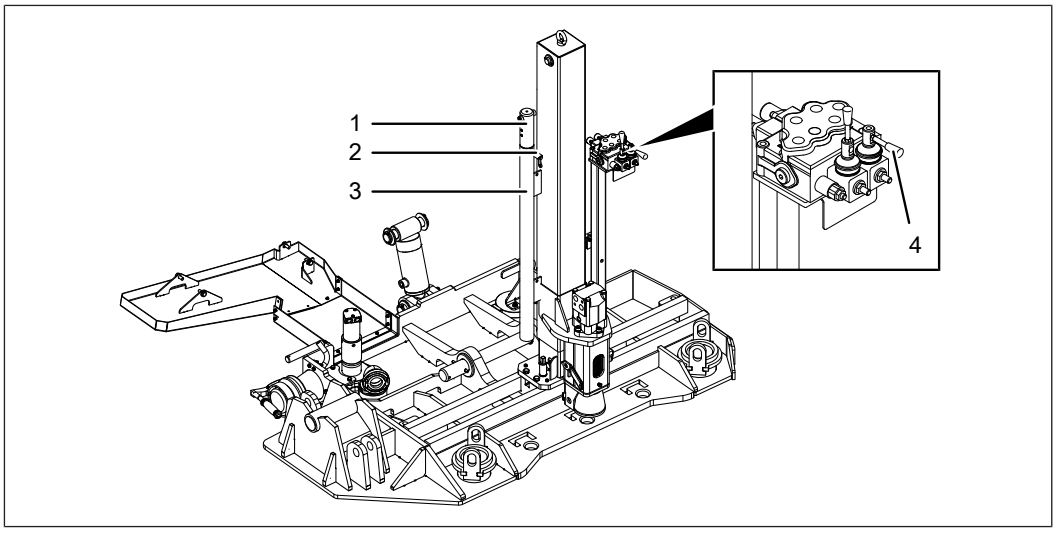



*Fig. 5-33 Lifting/lowering the anchor boring rig*

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

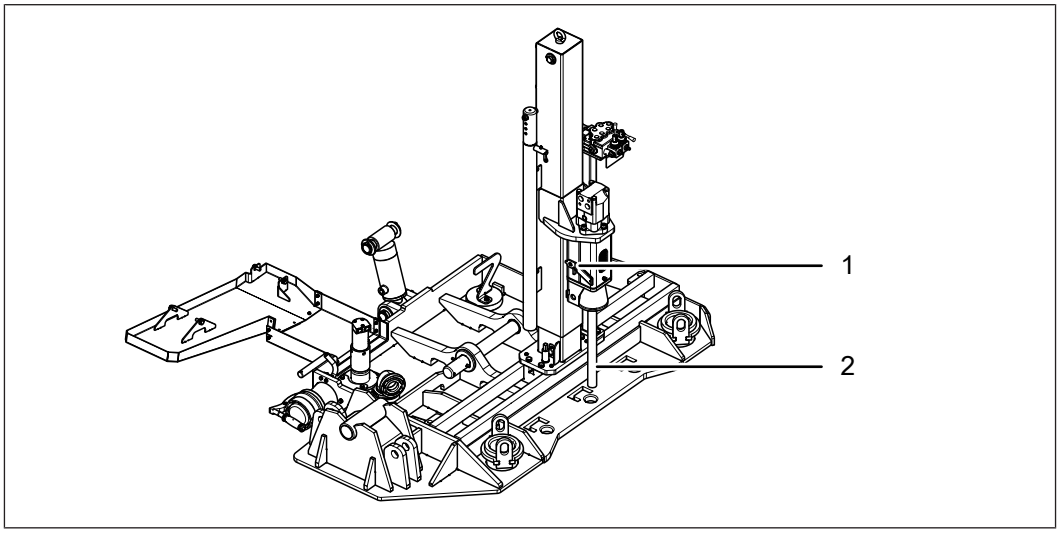



*Fig. 5-34 Fixed drill*

### 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.

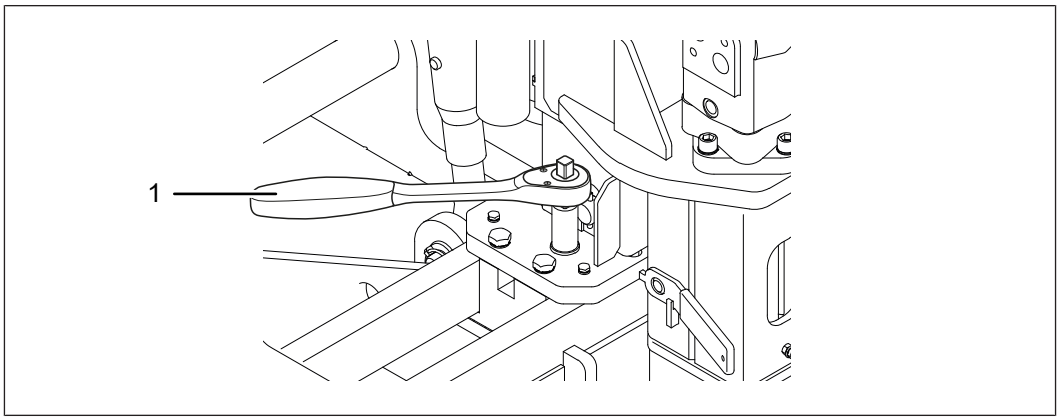



*Fig. 5-35 Positioning the anchor boring rig*

### 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.

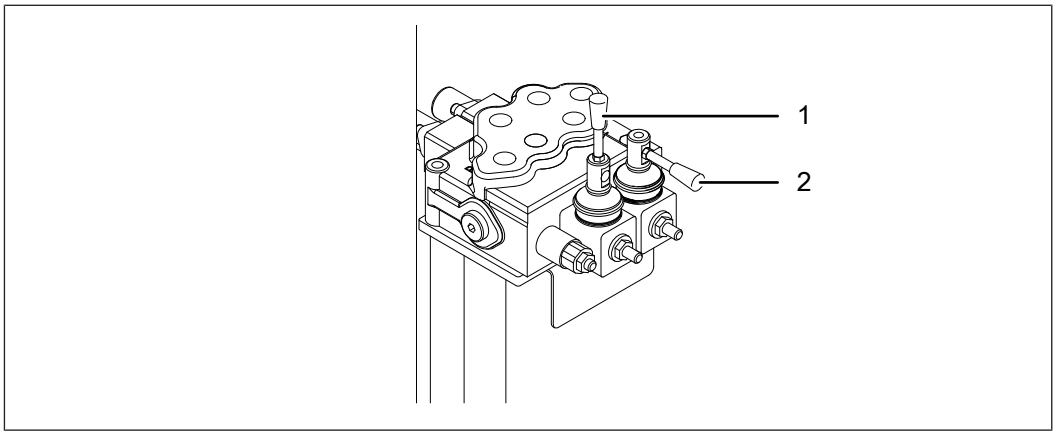



*Fig. 5-36 Hand levers anchor boring rig*

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.

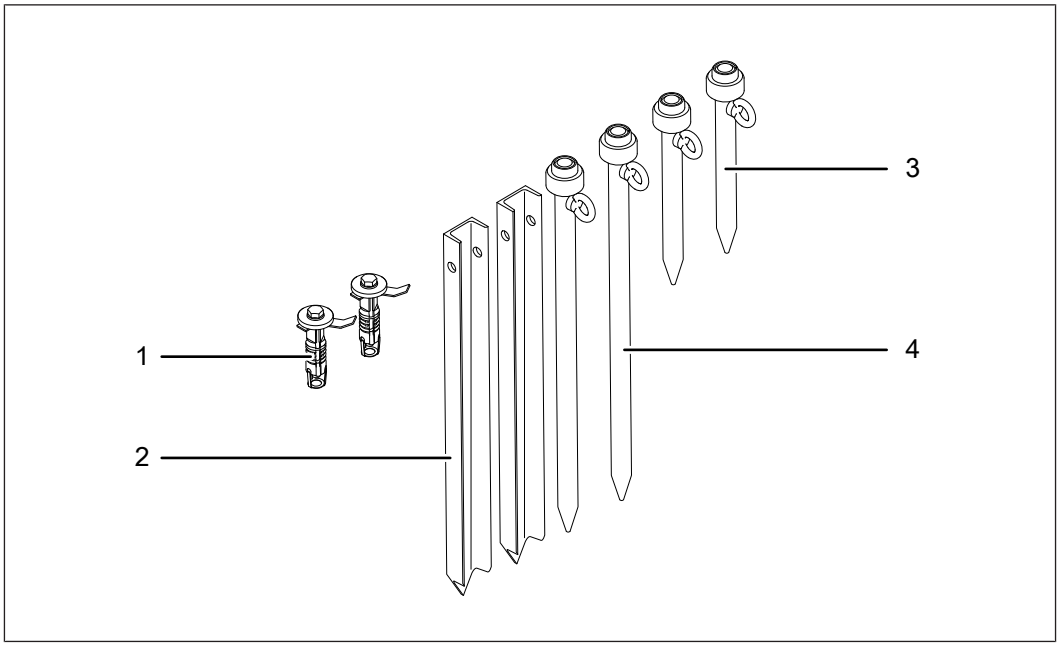



*Fig. 5-37 Earth stakes*

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.

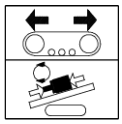
## 5.6.4 Positioning the anchor thrust unit (option)

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.

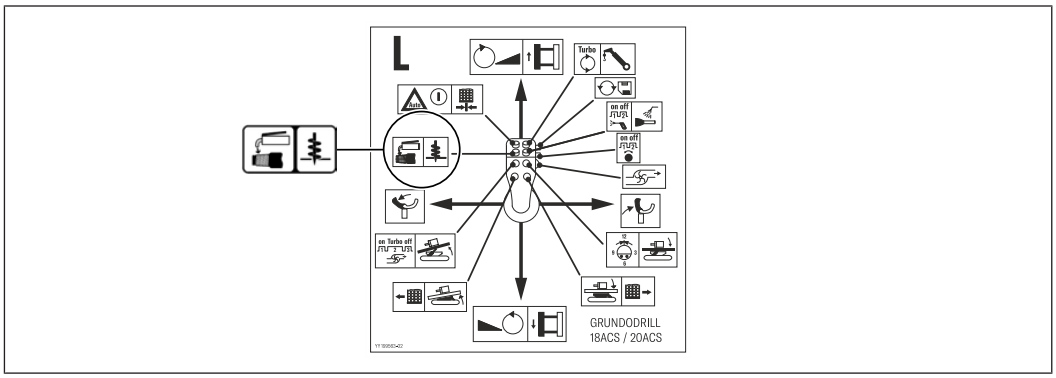



*Fig. 5-38 Switching on the anchor thrust unit*

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).

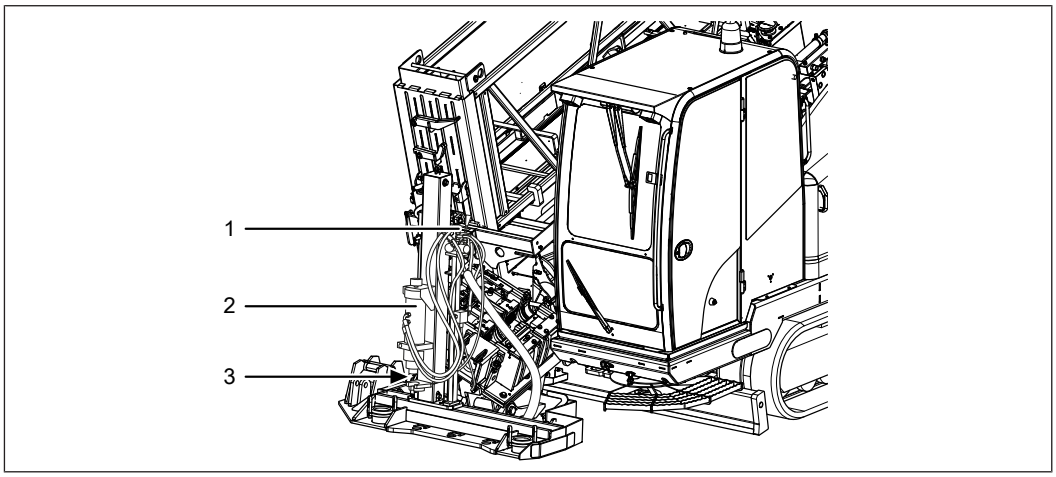



*Fig. 5-39 Positioning the anchor thrust unit*

### 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.

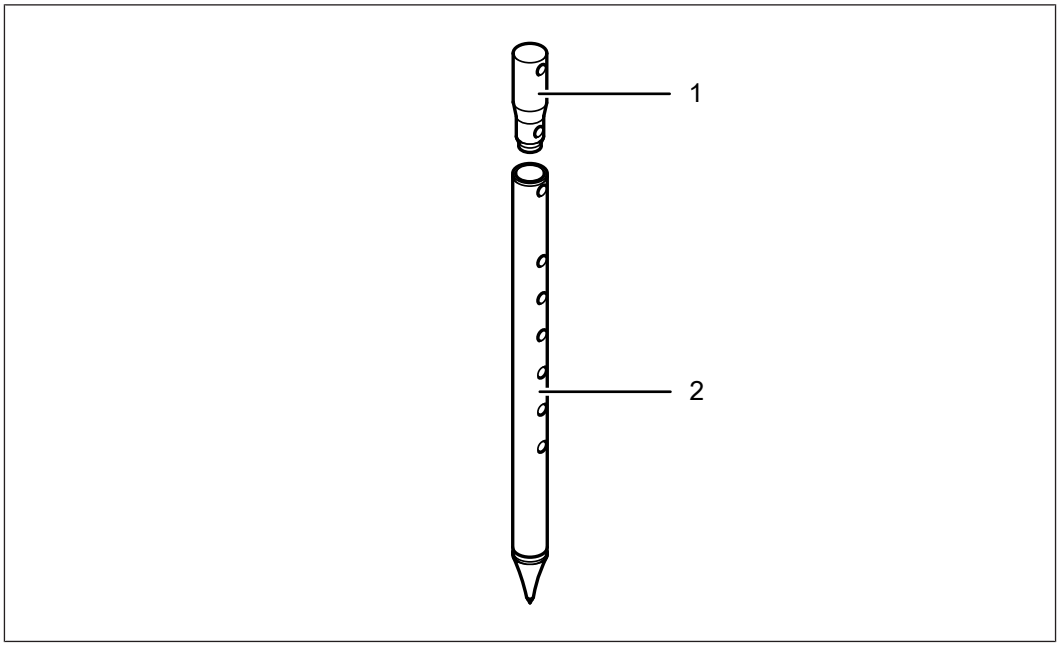



*Fig. 5-40 Thrust anchor*

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).

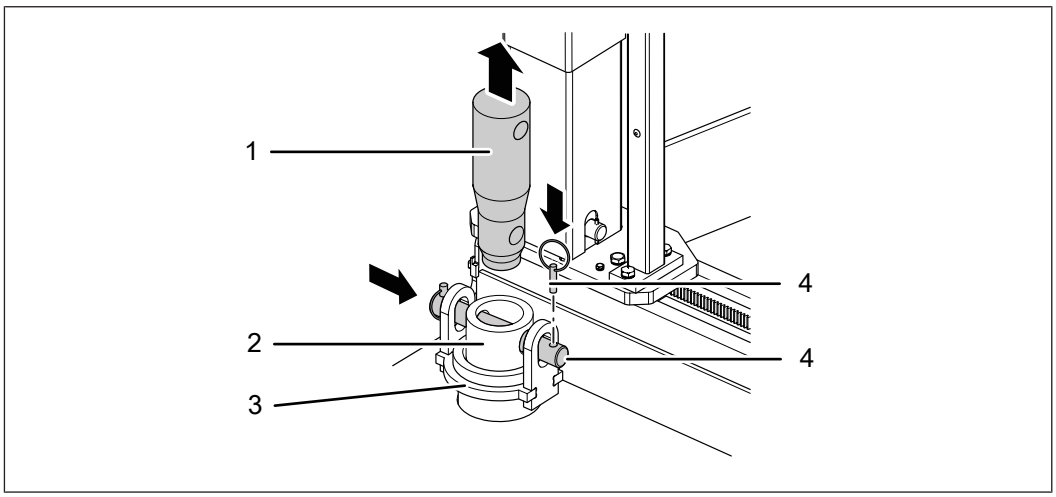
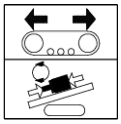



*Fig. 5-41 Fastening the thrust anchor to the anchor plate (example)*

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 111 and in this chapter.

## 5.7 Swinging the cab



1. Swing the step grid at the cab out in accordance with chapter 6.2.17, page 209.
2. If necessary, switch over on the right joystick panel from bore mode to drive mode.

**⚠ CAUTION**

**Impact hazard! Swivelling cab!**

- When swivelling the cab make sure that no other person is put at risk.

3. Swing the cab in drilling position by pressing the button on the right joystick.

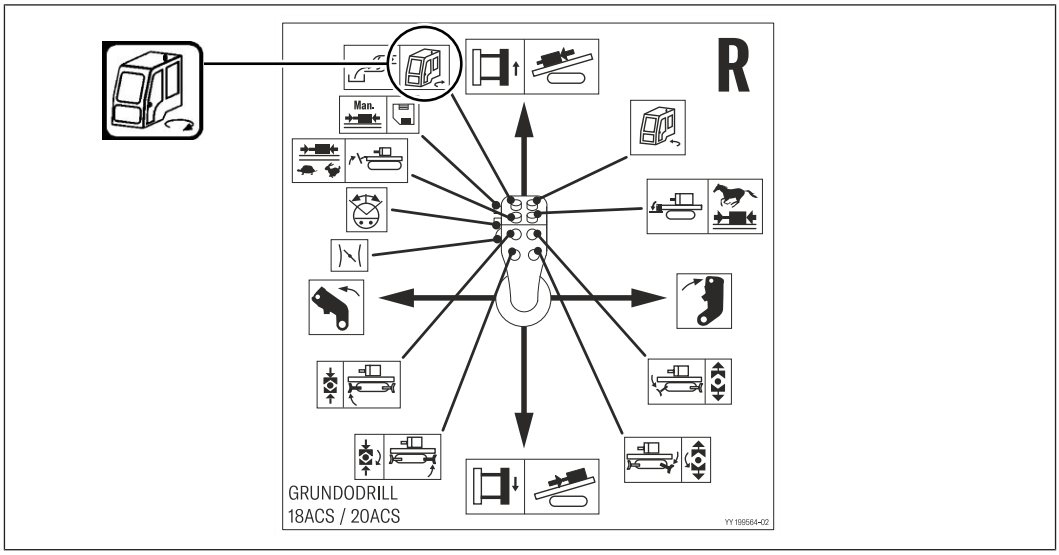



*Fig. 5-42 Swinging the cab*

The cab can be swung out steplessly. Let go of the button once the cab has reached the desired position.

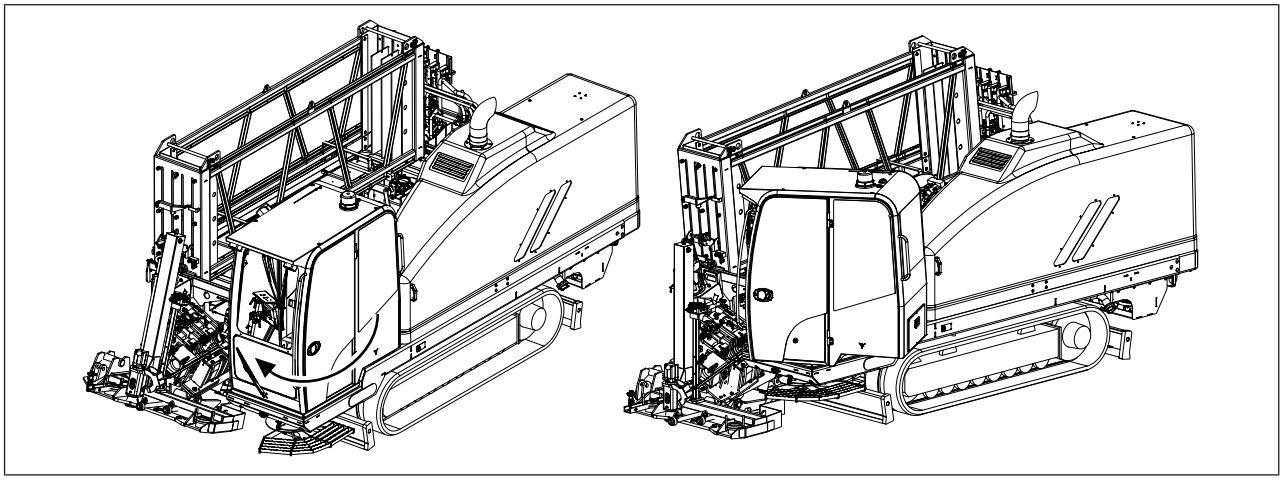


*Fig. 5-43 Cab in drilling position (right)*

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

**Info!**
This chapter applies to bores with battery-powered transmitter for:
- bore head assemblies of jet bores
- rock drilling units in case of rock drilling

The flex rod does not fit into the rod box/stacking box. Therefore, place it into the clamping device manually.

### 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.

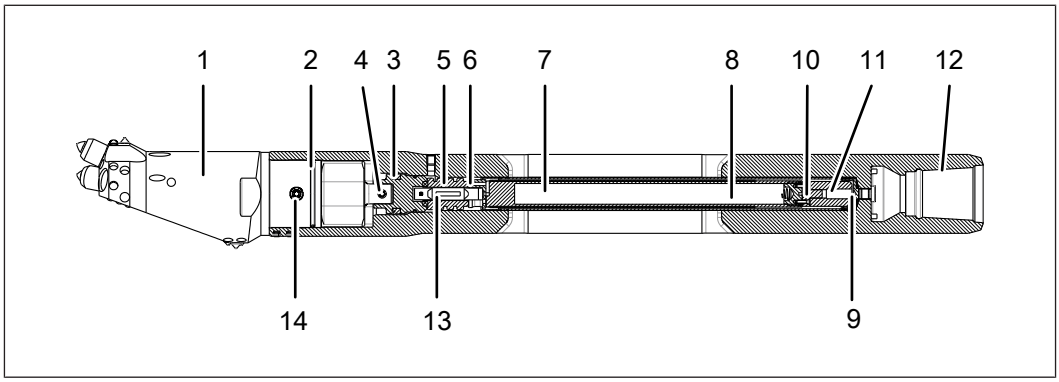



*Fig. 5-44 Bore head assembly for jet bores*

| | | | |
|---|---|---|---|
| 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.

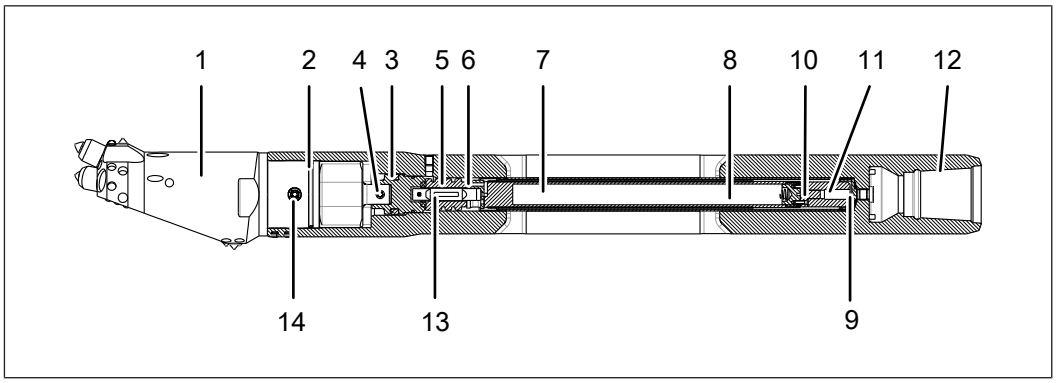



*Fig. 5-45 Bore head assembly for jet bores*

## 5.8.2 Preparing the transmitter for the rock drilling unit with roller chisel

***Components of the rock drilling unit***

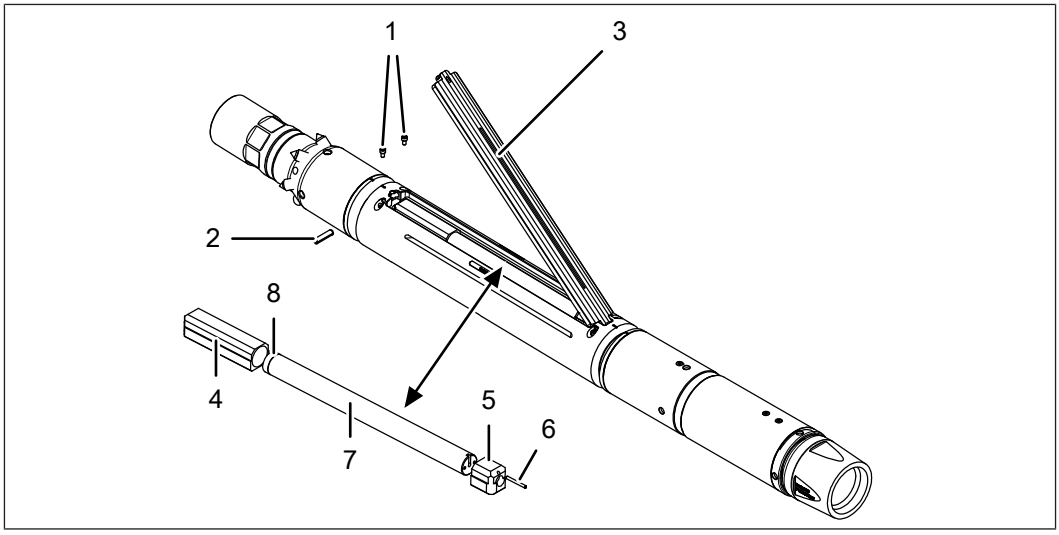



*Fig. 5-46 Rock drilling unit with transmitter*

| | | | |
|---|---|---|---|
| 1 | Safety screws for flap cover lock pin | 5 | Front probe holder |
| 2 | Lock pin for flap cover rock drilling unit | 6 | Anti-twist protection |
| 3 | Flap cover rock drilling unit | 7 | Transmitter |
| 4 | Rear probe holder | 8 | Screw connection battery compartment |

To prepare the transmitter and the rock drilling unit, proceed as follows:

1. Remove the two safety screws (1) for the lock pin (2) of the flap cover (3) on the cover end marked with "=>".
2. Drive out the lock pin (ø 10 mm) using a suitable tool.
3. Open the flap cover.
4. Pay attention to the battery conditions and correct polarity! Open the screwing of the transmitter's battery compartment (8) and insert two or four batteries (size C) depending on the model.
5. Ensure the intactness of the seal rings.
6. Close the screwing of the battery compartment tight again.
7. Insert the transmitter (7) into the two probe holders (4, 5).
   - ⇨ In doing so, make sure that the transmitter is in 12 o'clock position by inserting the anti-twist protection (6) from the front through the lock pin opening of the front probe holder (5) into the probe guidance of the transmitter (front).
   - ⇨ The locking pin will only fit into the probe guidance when the transmitter is in 12 o'clock position.

**Info!**
When operating the transmitter with four batteries, replace the rear probe holder (4) by a second front probe holder (5).

8. Insert the mounted transmitter into the rock drilling unit.
9. Close the flap cover.
10. Reinsert the lock pin for the flap cover.
11. Secure the lock pin of the flap cover with the two screws.
12. Screw the roller chisel (1) onto the rock drilling unit (2).

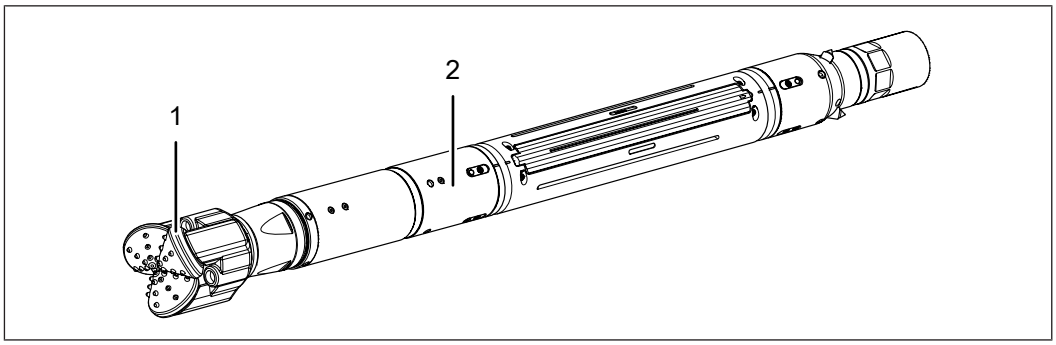



*Fig. 5-47 Roller chisel with rock drilling unit*

13. Screw the complete rock drilling unit onto the first drill rod.

### 5.8.3 Checking the functioning of the transmitter

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

Please read the manufacturer's instructions.

### 5.8.4 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 115 and in chapter 9.17, page 340.

### 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).

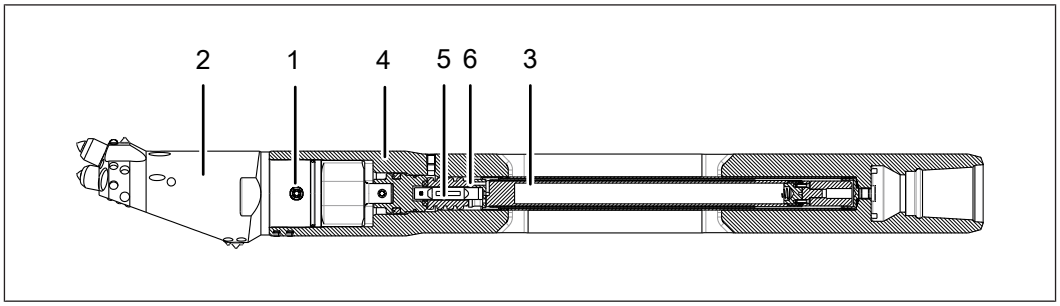



*Fig. 5-48 Bore head assembly with battery-powered transmitter*

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.

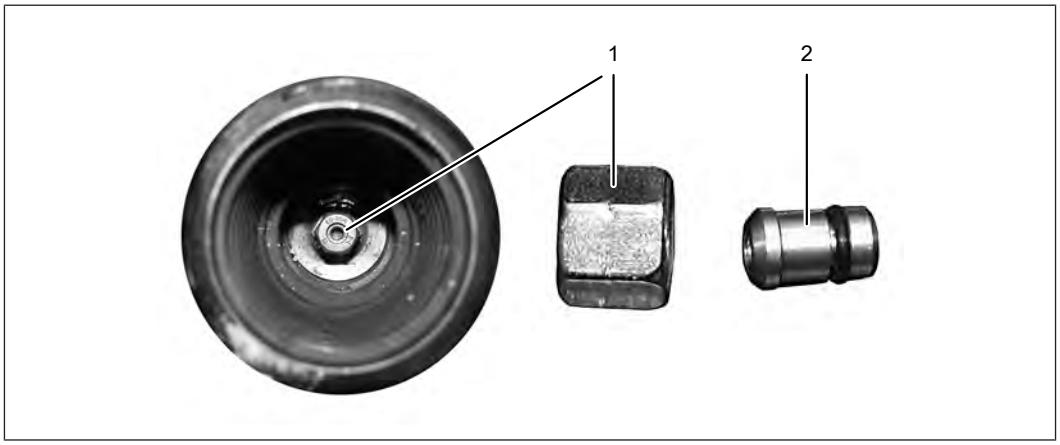



*Fig. 5-49 Bore head assembly: Blind cap with seal*

### 5.9.2 Installing the wire-controlled transmitter

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

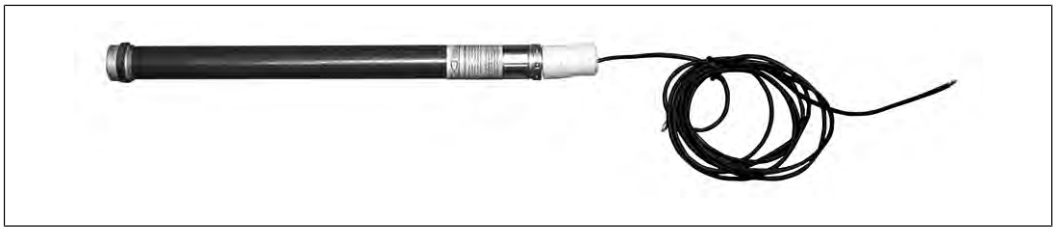


*Fig. 5-50 Wire-controlled transmitter*

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.

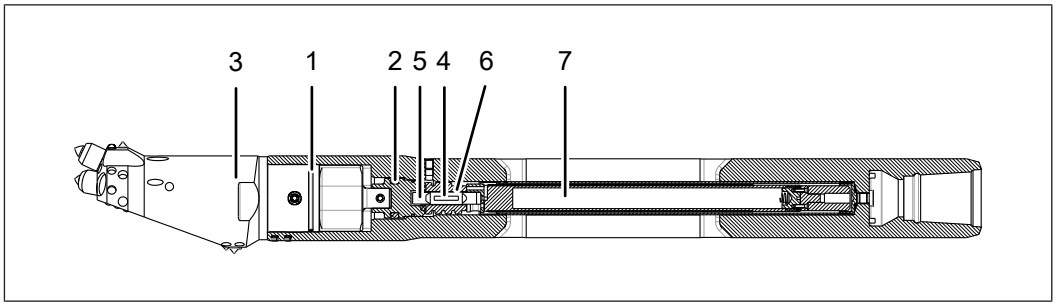



*Fig. 5-51 Bore head assembly*

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.

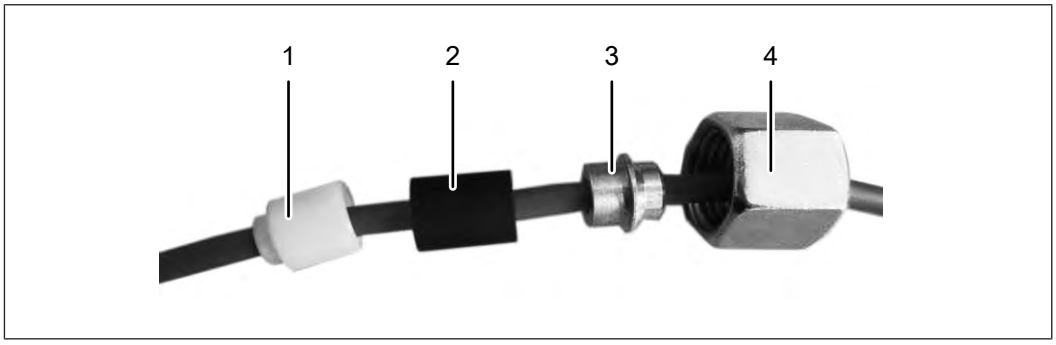



*Fig. 5-52 Seal, pressure piece and screwing for cable*

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.

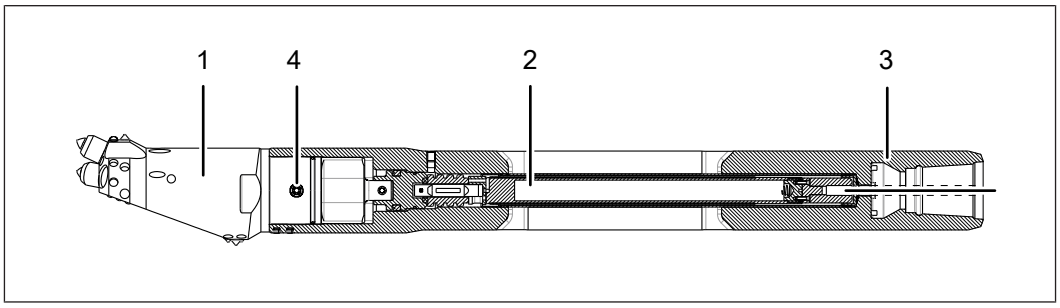



*Fig. 5-53 Bore head assembly with wire-controlled transmitter*

Then check the transmitter for proper functioning and calibrate the detection system as described in chapter 5.8.3, page 118 and chapter 5.8.4, page 118.

## 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 313).

***Machines with double rotation motor***

For wire-controlled drilling with machines equipped with a double rotation motor you have to assemble:

- the working platform and the operating panels of the safety equipment (chapter 5.10.1, page 123)
- the protection wall (chapter 5.10.2, page 125)
- the cable drum on the protection wall (chapter 5.10.4, page 127)
- the monitor and the power supply unit of the detection system (chapter 5.10.5, page 129)

***Requirements***

- The cab is swivelled (chapter 5.7, page 113).
- All components and tools for the conversion are ready for use.
- The conversion set "Wire-controlled drilling" (art. no. 298118) at the rotational drive is installed (chapter 5.10.3, page 126).

5.10.1 Assembling the safety equipment for wire-controlled drilling

The safety equipment for wire-controlled drilling consists of:

- front operating panel (removable) (2) with locking switch (3)
- rear operating panel (removable) (1, 4)
- protection wall with slide door (5) made of Plexiglas
- working platform (7) with ladder (6) and railing (8)

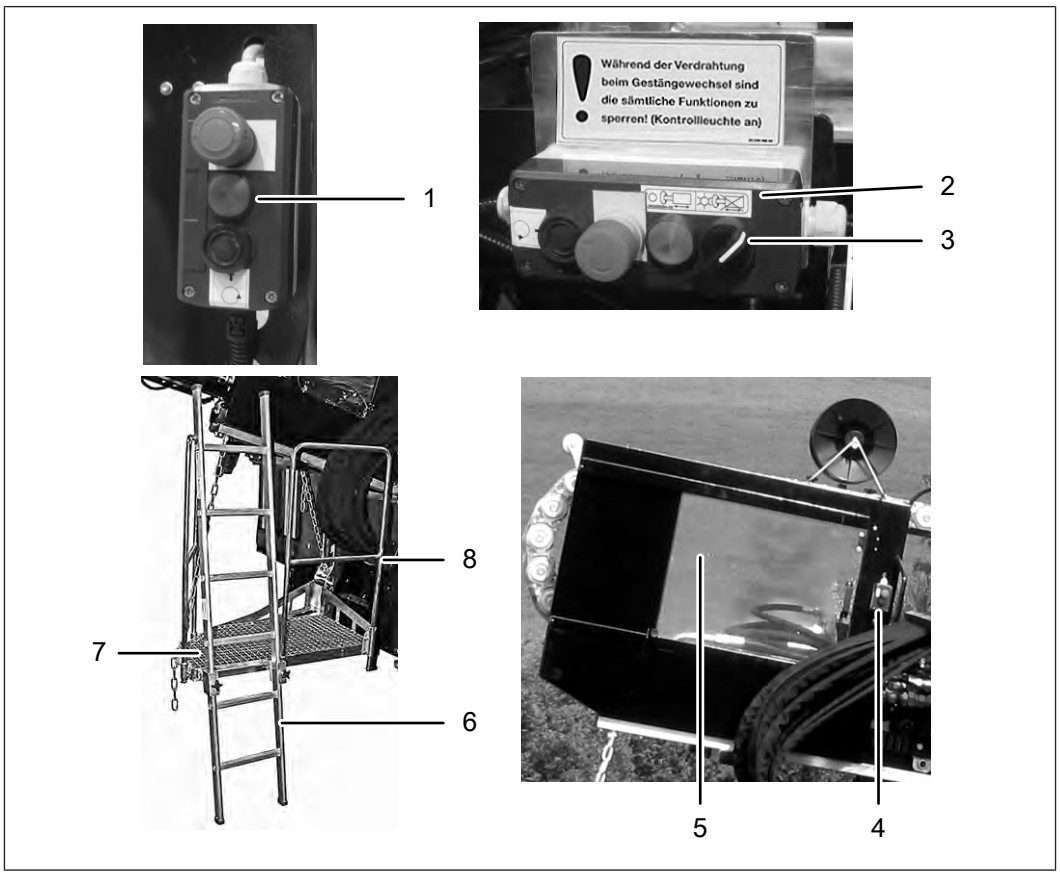



*Fig. 5-54 Safety equipment for wire-controlled drilling*

***Assembly of the working platform***

1. Hook the swing arms (4) of the working platform into the holder (2) using the bolt and secure the bolt (1, 3) with the safety split pin.
2. Hook the working platform into the swing arms using the bolt and secure the bolt (1, 3) with the safety split pin.

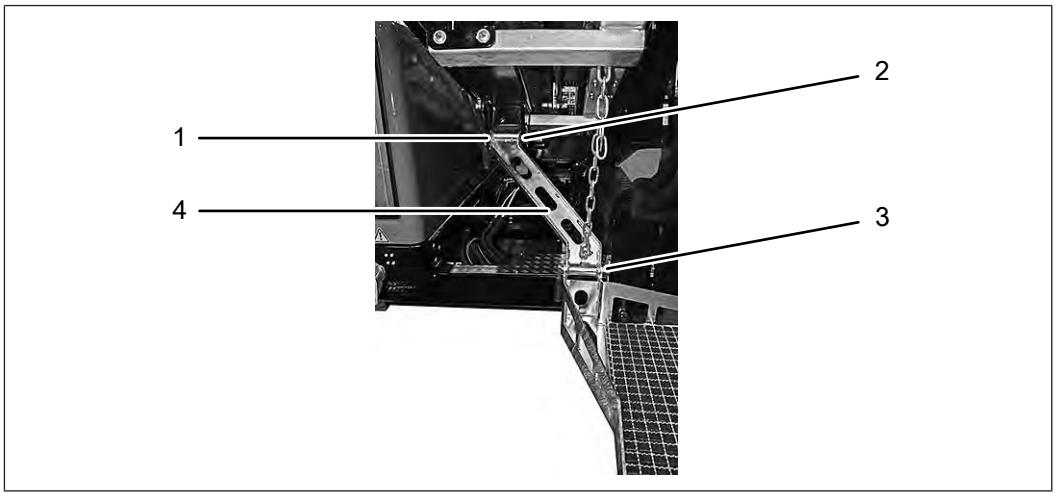



*Fig. 5-55 Bolts and safety split pins of the swing arms and the working platform*

3. Hook the chains (1) of the working platform into the eyelet of the GRUNDODRILL using the shackles so that the working platform hangs horizontally.

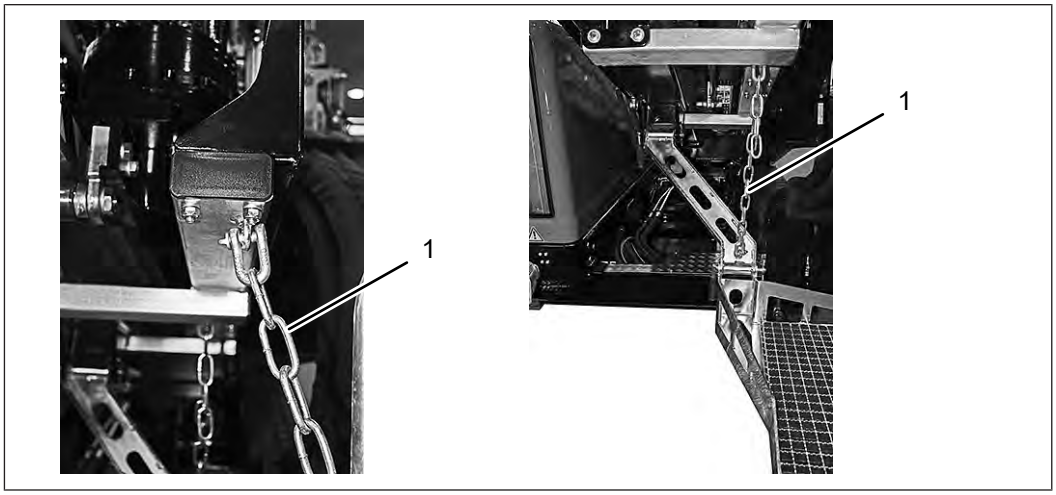



*Fig. 5-56 Hooking in the chains*

4. Hook the left railing in and screw it tight.
5. Hook the right railing in.

**⚠ WARNING**

**Fall hazard!**



Fall hazard when railing is open!

- Close the right railing after entering the working platform!

6. Hook the ladder of the working platform in and screw it tight.

7. Connect the plug of the front operating panel (4) with the socket of the control line (3).
8. Connect the plug of the rear operating panel (1) with the socket of the control line (2).

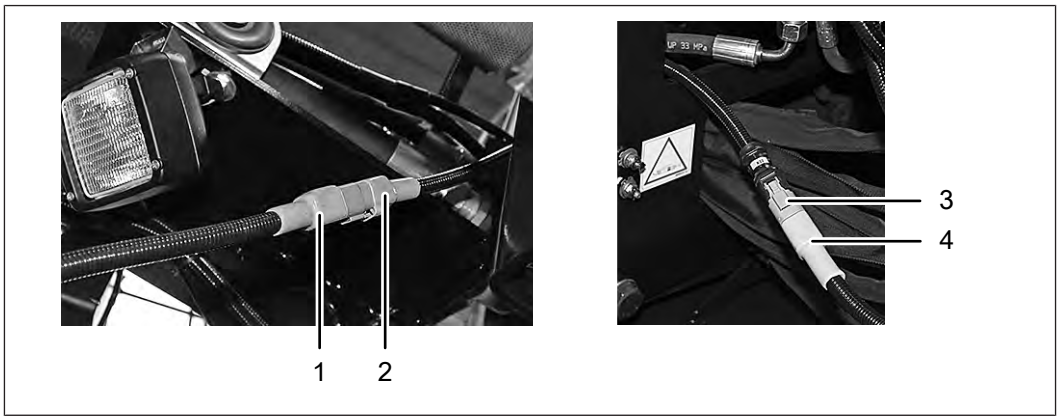



*Fig. 5-57 Plug connections for wire-controlled drilling*

With an open protection door at the rear or an activated locking switch all machine functions are disabled.

**Info!**
For transporting/traversing the GRUNDODRILL dismantle the working platform and re-connect the plug and the socket of the front and rear control lines.
The protection wall and the operating panels remain mounted even if you do not drill with wire control.

### 5.10.2 Mounting the protection wall with slide door

The protection wall with slide door is delivered assembled. For assembly, insert the frame beams into the retainers below the rig boom and screw them with the four supplied hexagonal screws and nuts.

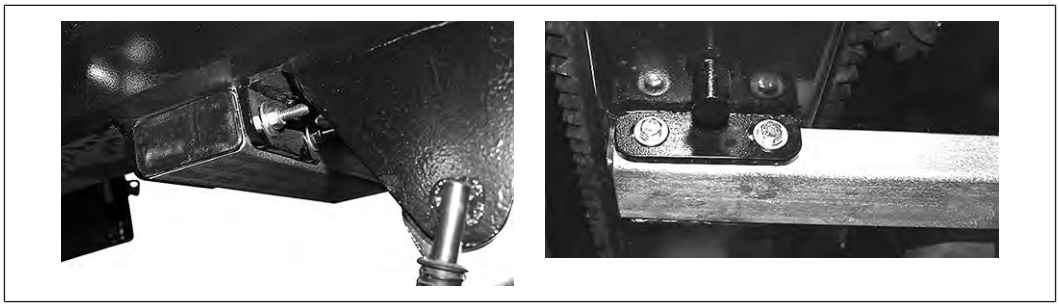


*Fig. 5-58 Retainers for the protection wall below the rig boom*

For the assembly of the protection wall, contact the TRACTO-TECHNIK customer service (chapter 8, page 313).

### 5.10.3 Assembling the conversion set "Wire-controlled drilling"

The conversion set "Wire-controlled drilling" (part no. 298118) replaces the hydraulic hose between the Rotodisk and the sub-saver.

The conversion set consists of:

- a hollow shaft with cable feed-through (2)
- a friction ring (1)
- a hydraulic hose (3)

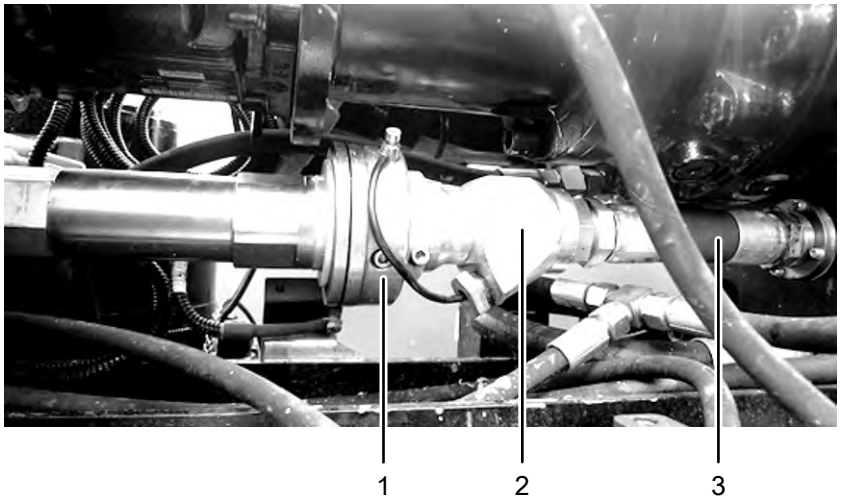



*Fig. 5-59 Conversion set "Wire-controlled drilling"*

For the assembly of the conversion set, contact the TRACTO-TECHNIK customer service (chapter 8, page 313).

5.10.4 Assembling the cable drum for wire-controlled drilling

The cable drum for wire-controlled drilling consists of:

- a metal plate (2), which is fastened to the protection wall with three screws (3, 4) and
- a reel (5) with cable drum (1), which is fastened to the metal plate with two angled plates and two screws.

1. Mount the metal plate to the protection wall.
2. Place the cable drum on the metal plate as depicted below and screw down the hand screws using the angle plates.

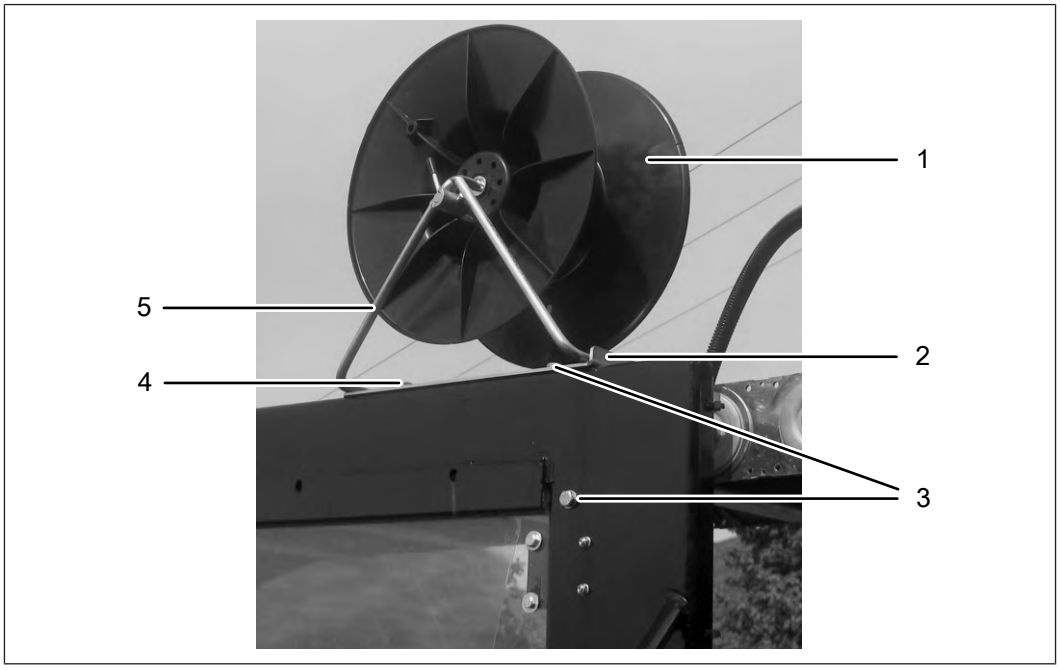



*Fig. 5-60 Cable drum assembled*

***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.

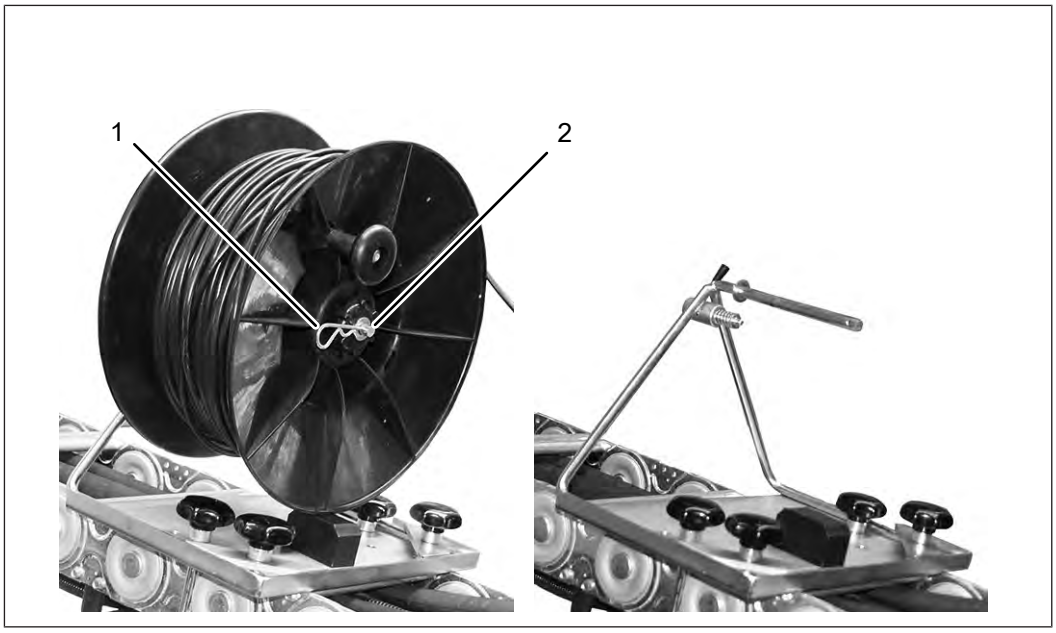



*Fig. 5-61 Dismantling the cable drum*

***Locking the cable drum***

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

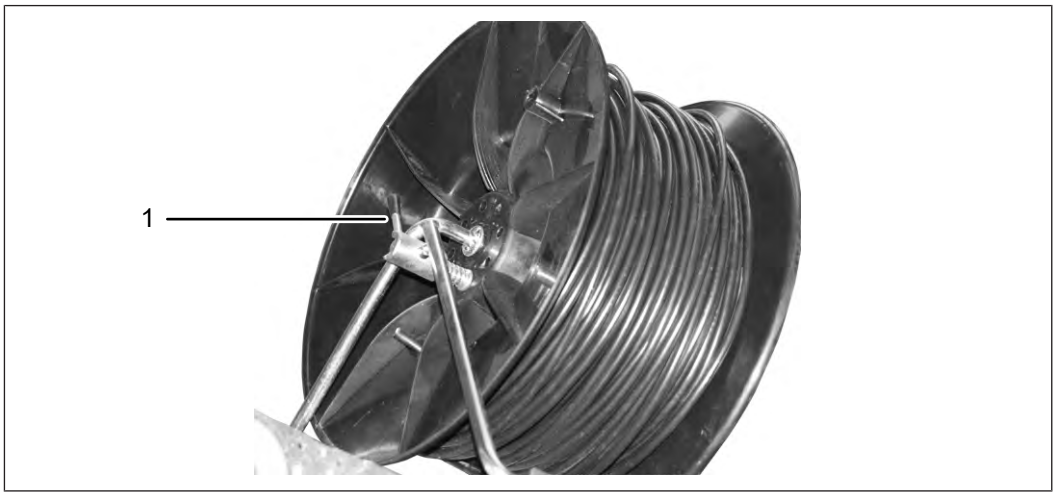



*Fig. 5-62 Cable drum locked*

5.10.5 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).

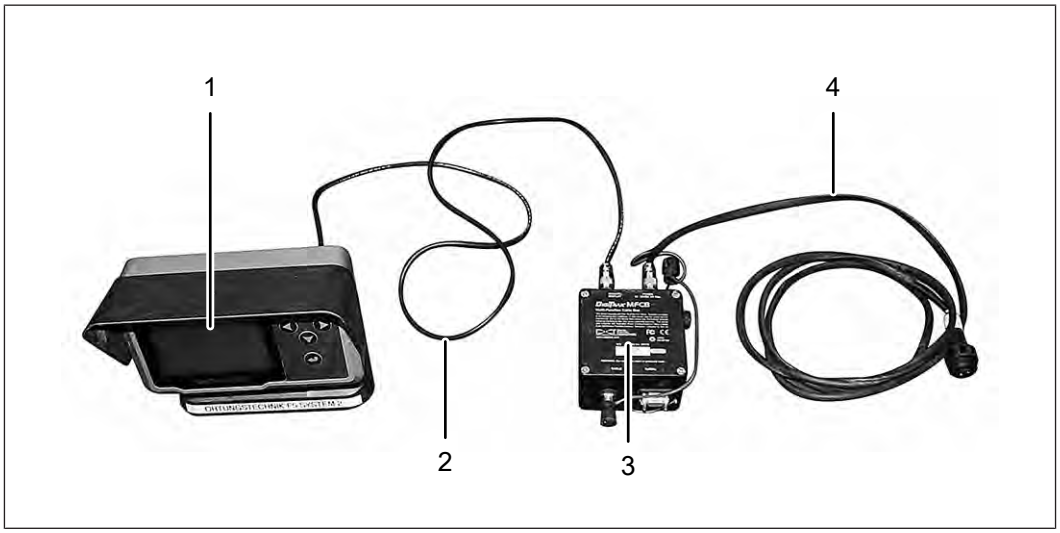



*Fig. 5-63 Monitor and power supply unit for wire-controlled drilling*

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.

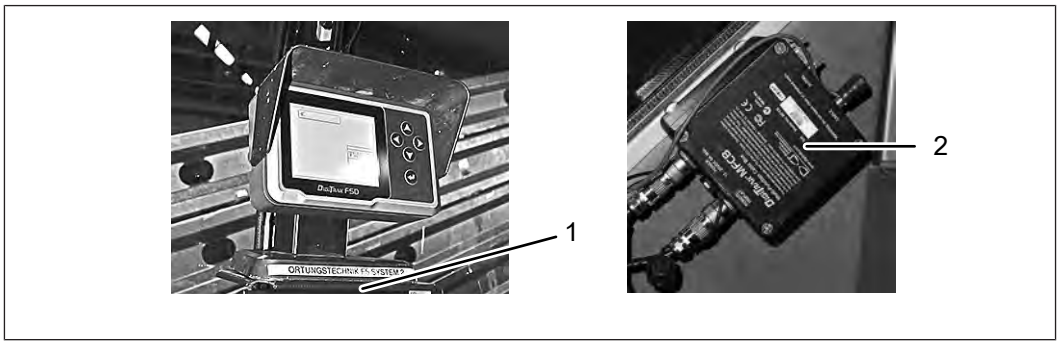



*Fig. 5-64 Monitor and power supply unit assembled*

3. Connect the monitor and the power supply unit with the corresponding cable (1).
4. Plug the cable for the voltage supply (2) of the power supply unit into the middle upper socket of the panel behind the operator seat (chapter 6.2.15, page 207).

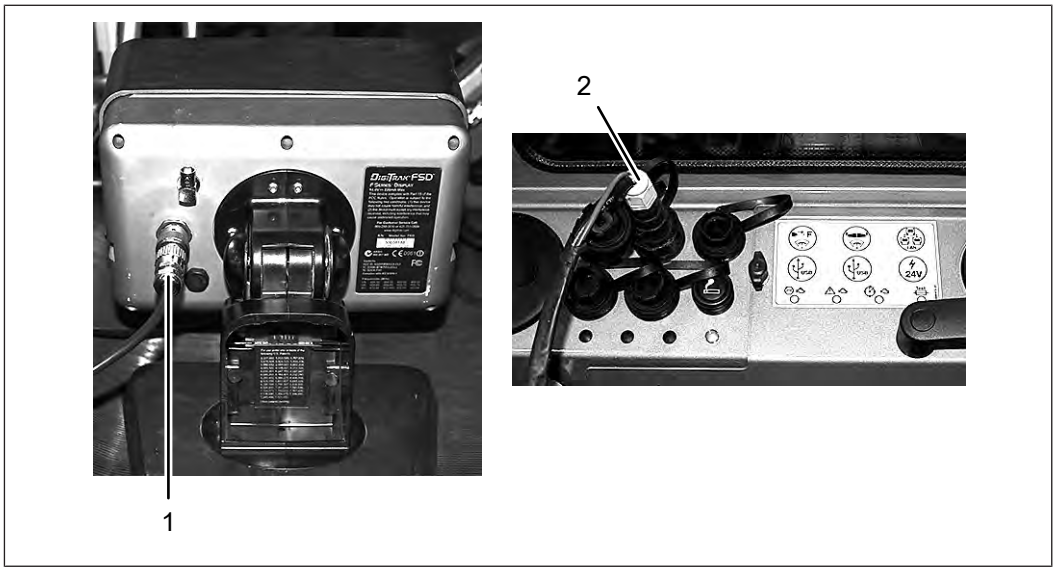



*Fig. 5-65 Back of the monitor and panel*

## 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).

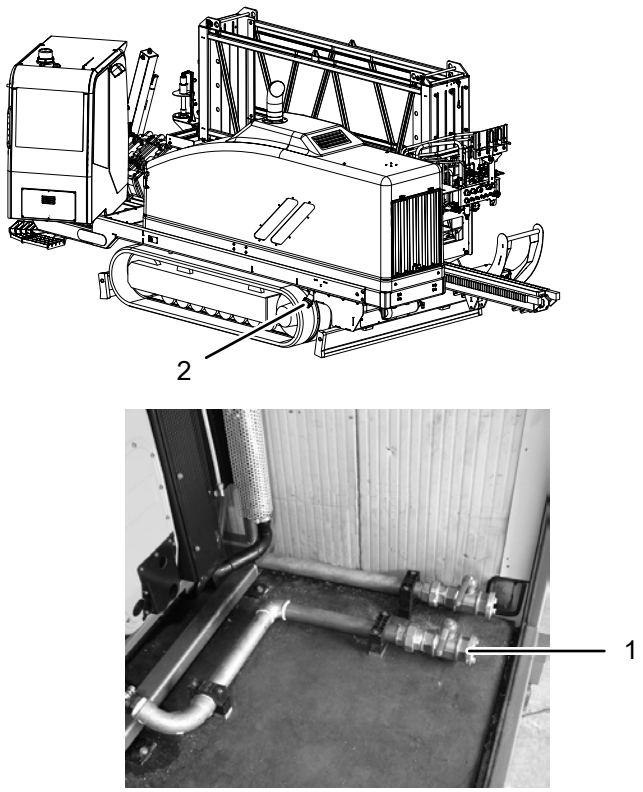



*Fig. 5-66 Drilling fluid mixing system, connecting the supply connections*

## 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.

**NOTICE**

**Corrosion of the battery terminals and increased transition power due to water on the battery!**

- Make sure that the battery does not come into contact with water while you are filling the fresh water tank.

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

– Open the ball valve (1) next to the quick connection of the rod cleaning nozzle (2).

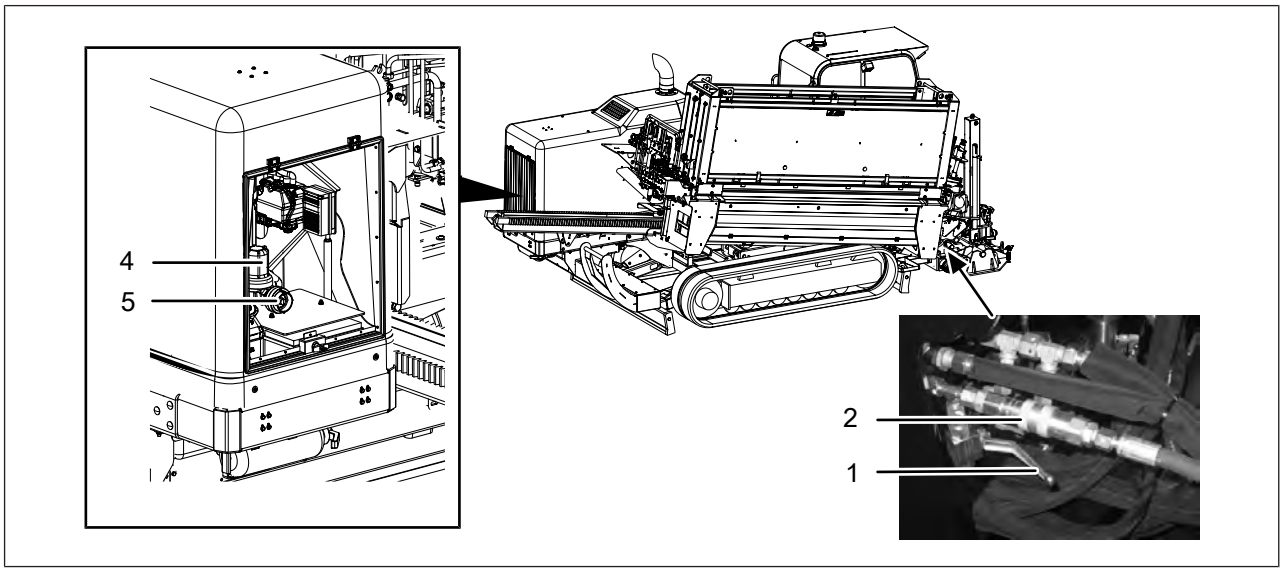



*Fig. 5-67 Connecting the high-pressure cleaner*

In order to use a high-pressure cleaning gun, connect the hose of the high-pressure cleaning gun to the quick connection of the rod cleaning nozzle (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.

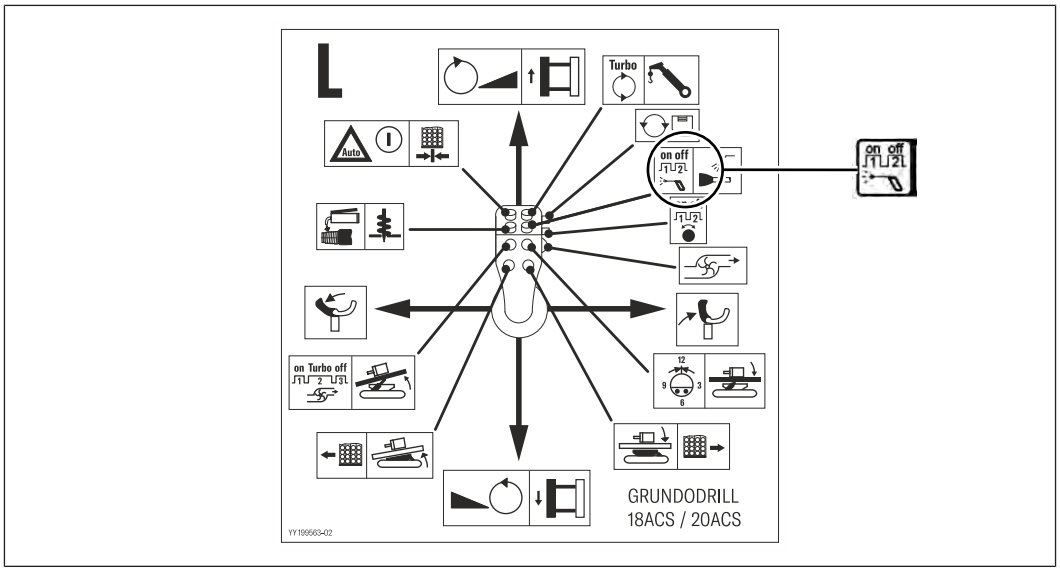



*Fig. 5-68 Switching the high-pressure cleaner on or off*

**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).

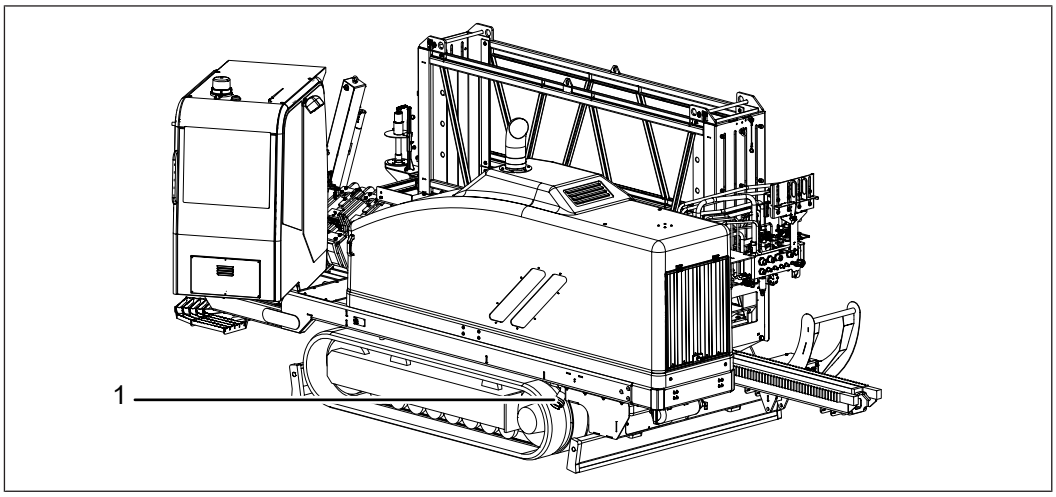
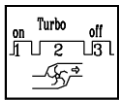


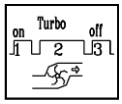

*Fig. 5-69 Drilling fluid connection*



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.

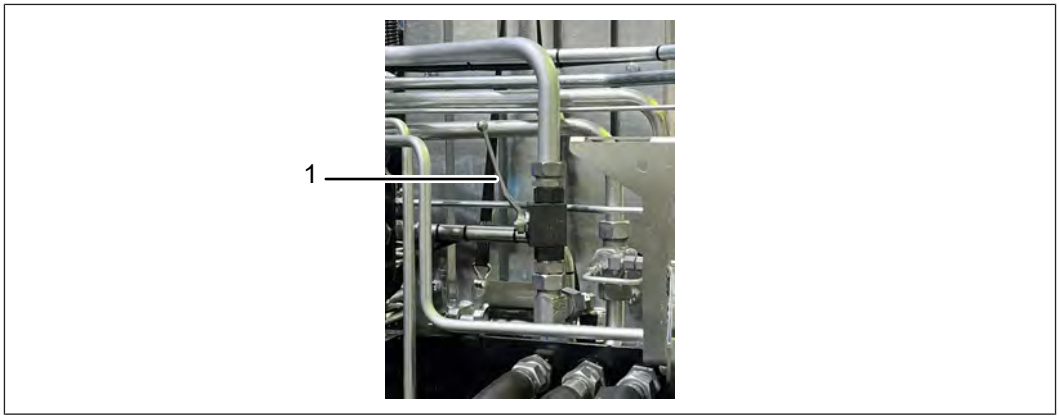



*Fig. 5-70 Stop cock for drilling fluid to the rod*

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).

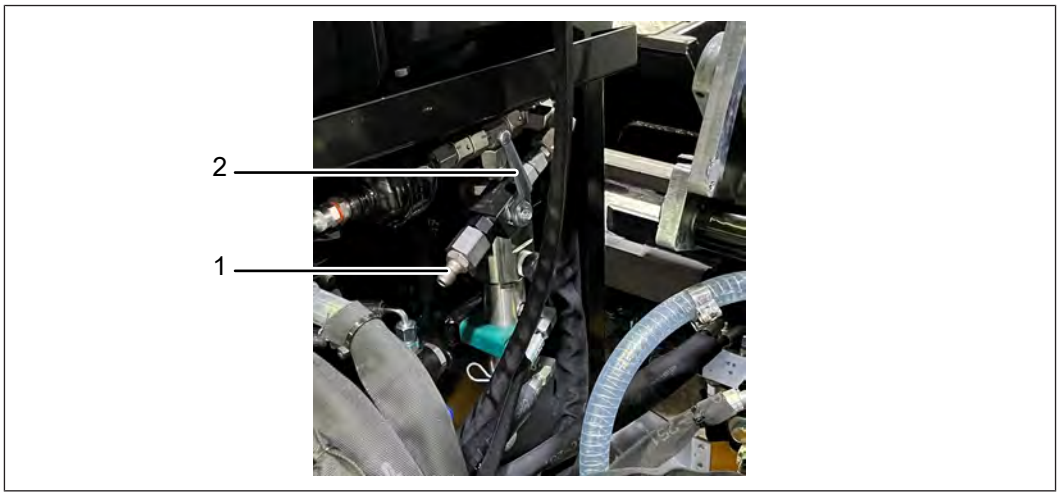



*Fig. 5-71 High-pressure connection*

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

## 5.14 Connecting and using the (optional) mud pump

The purpose of the mud pump is to pump the bore mud out of the anchor plate.

1. Connect a hose with a DIN 4307 rigid C-coupling to the quick connection (1) of the mud pump.
2. Install the other end of the hose into the bore hole.

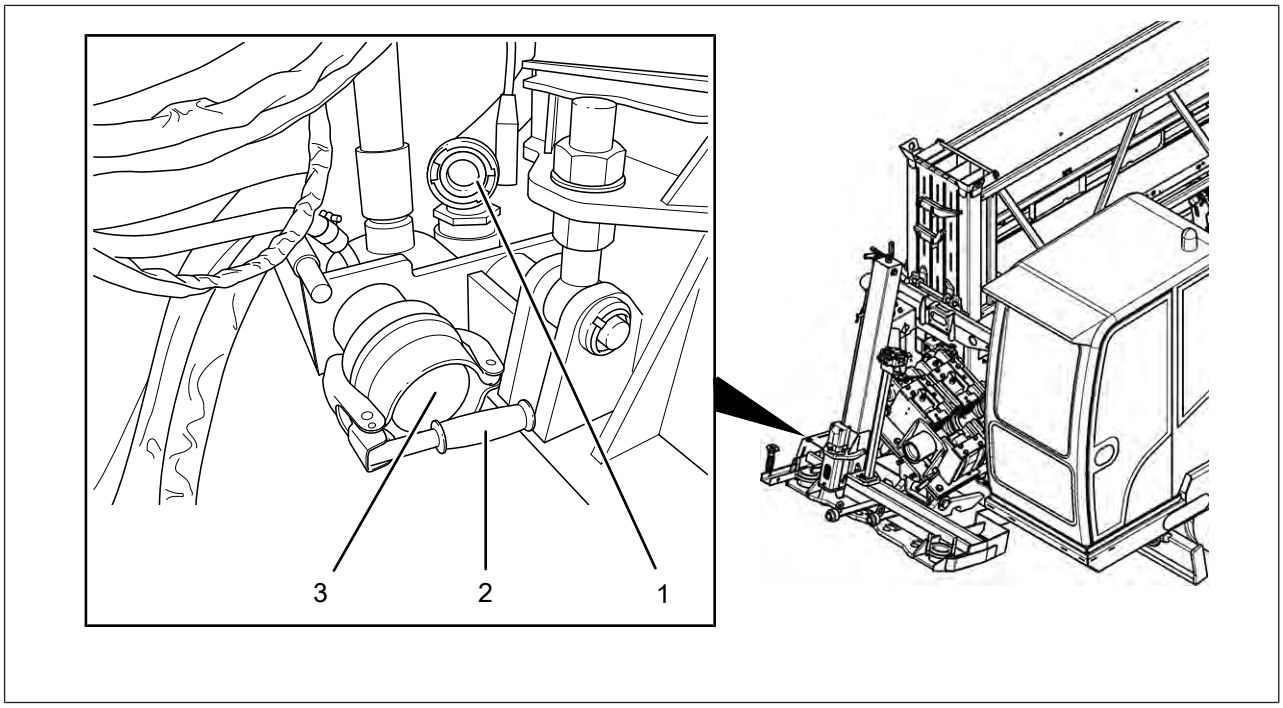



*Fig. 5-72 Connecting the mud pump, cleaning the anchor plate*

***Cleaning the anchor plate***



1. To clean the anchor plate, open the cover (3) using the lever (2).
2. Switch on the mud pump to pump out the bore mud. To do so, keep the push button on the right joystick pressed.
3. After cleaning close the opening of the anchor plate with the cover.
4. Lock the cover with the lever.

## 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:

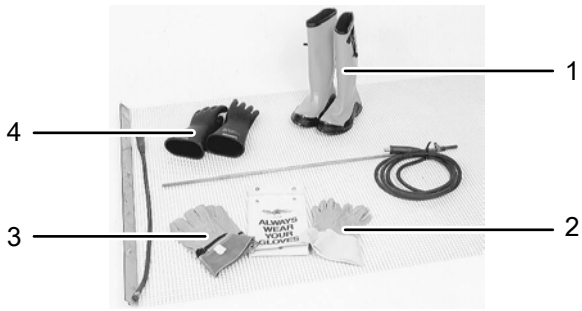



*Fig. 6-1 Comprehensive personal protective equipment for electric shock protection device*

| | | | |
|---|---|---|---|
| 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

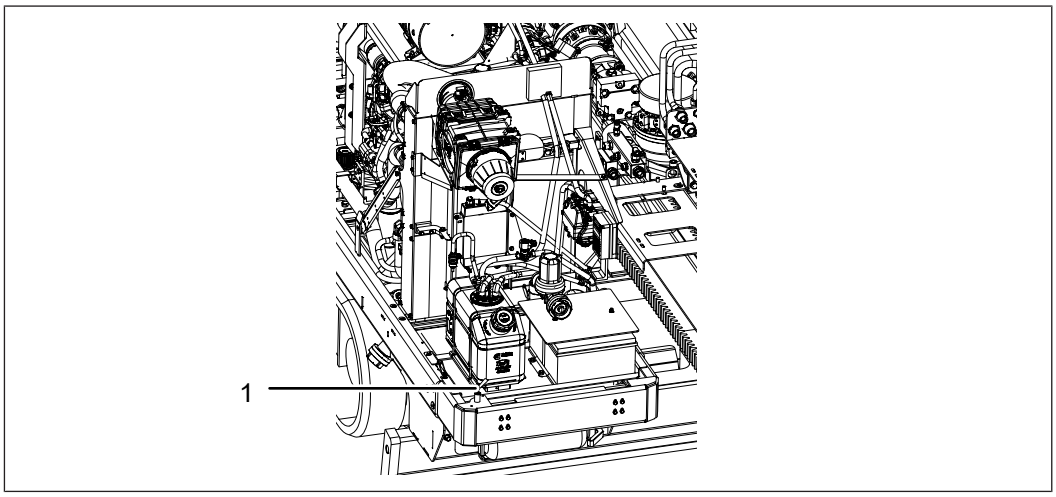



*Fig. 6-2 Main power switch*

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

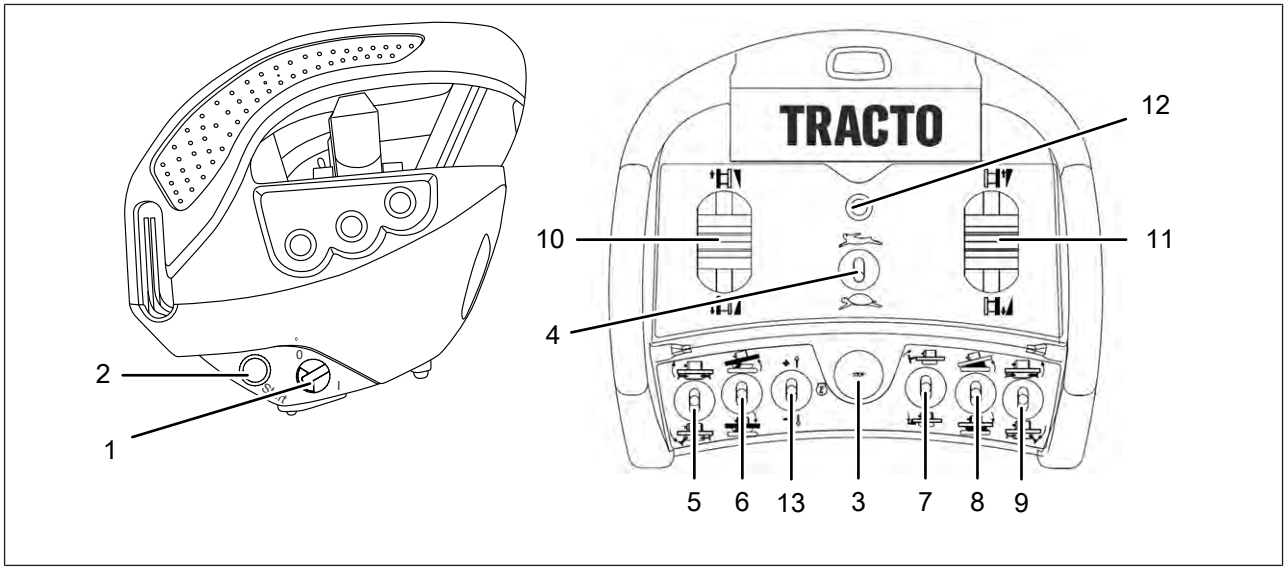



*Fig. 6-3 Wireless drive remote control*

*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.<br>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<br>Rabbit -> rapid motion switched on |
| 5 | Front stabiliser | Moves the front stabiliser up and down. | Down -> downwards<br>Up -> upwards |
| 6 | Boom front | Lifts and lowers the boom at the front. | Down -> boom lowers at the front<br>Up -> boom rises at the front |
| 7 | Lower/lift anchor plate | Lifts and lowers the anchor plate. | Down -> anchor plate lowers<br>Up -> anchor plate rises |
| 8 | Boom rear | Lifts and lowers the boom at the rear. | Down -> boom lowers at the rear<br>Up -> boom rises at the rear |
| 9 | Rear stabiliser | Moves the rear stabiliser up and down. | Down -> downwards<br>Up -> upwards |
| 10 | Left crawler tracks forward/backward | Drives the left crawler tracks. | To the front -> forward<br>Into centre position -> stand-still<br>To the rear -> backward |
| 11 | Right crawler tracks forward/ backward | Drives the right crawler tracks. | To the front -> forward<br>Into centre position -> stand-still<br>To the rear -> backward |

| Pos. | Operating element | Function |
|---|---|---|
| 12 | Green indicator light | Flashes when the machine is ready to start.<br>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

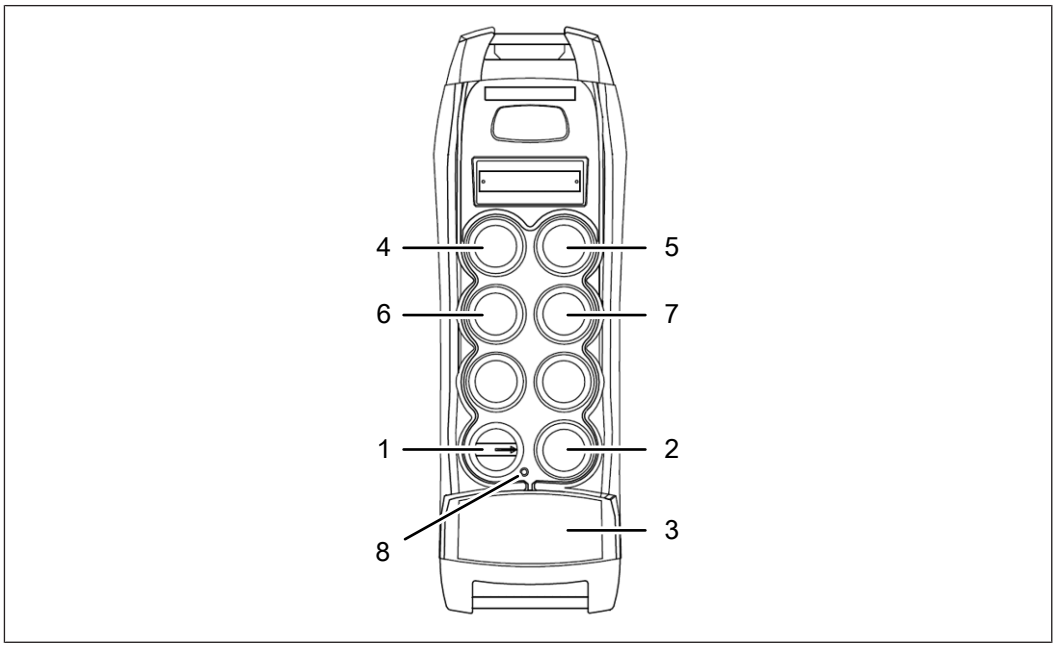



*Fig. 6-4 Wireless pit remote control*

*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.<br>Starts the machine.<br>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.<br>Is switched off when the machine is running. |

## 6.2.4 Anchor boring rig

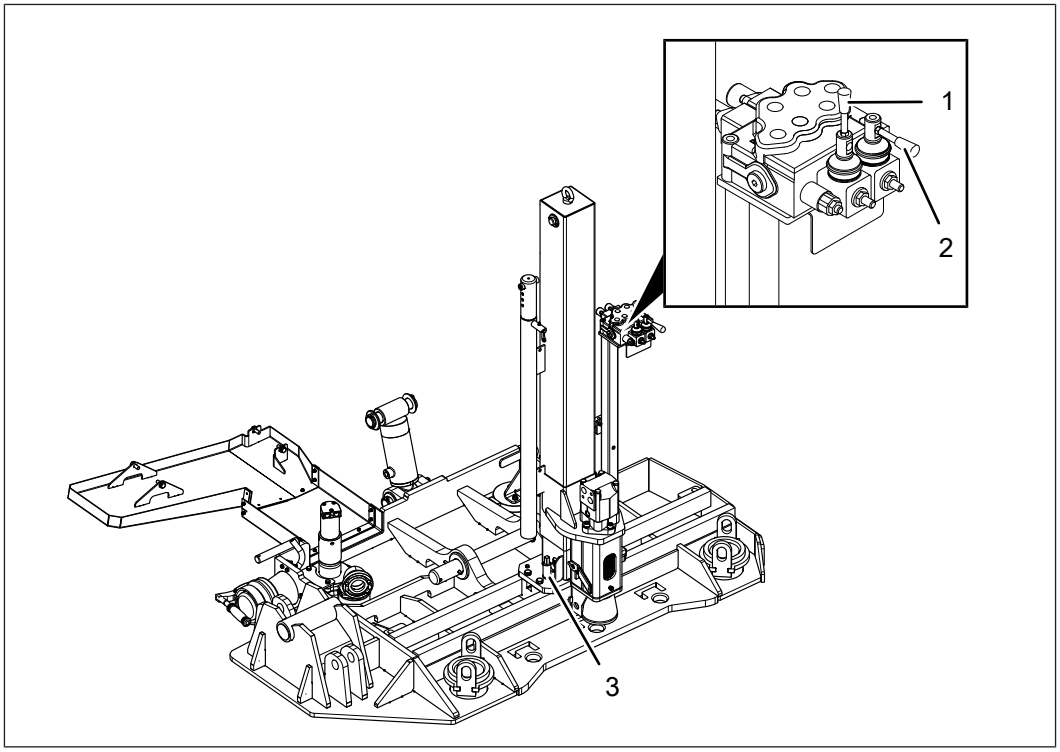



*Fig. 6-5 Anchor boring rig*

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

| Item | Operating element | Function |
|---|---|---|
| 1 | Hand lever | Drive drill in /out<br>Pressing the lever – > drives the drill out of the ground.<br>Pulling the lever –> drives the drill into the ground. |
| 2 | Hand lever | Lifting/lowering the anchor boring rig<br>Pressing the lever -> lowers the anchor boring rig<br>Pulling the lever -> lifts the anchor boring rig |
| 3 | Hand ratchet | Serves for horizontal positioning of the anchor above the mounting hole. |

### 6.2.5 Anchor thrust unit (option)

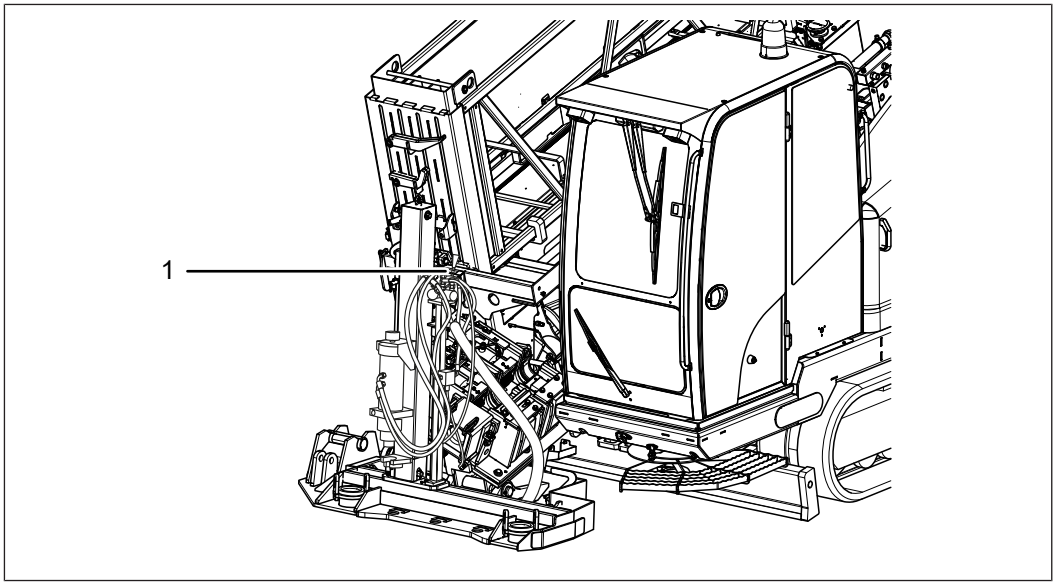



*Fig. 6-6 Anchor thrust unit*

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

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

## 6.2.6 Left joystick with panel

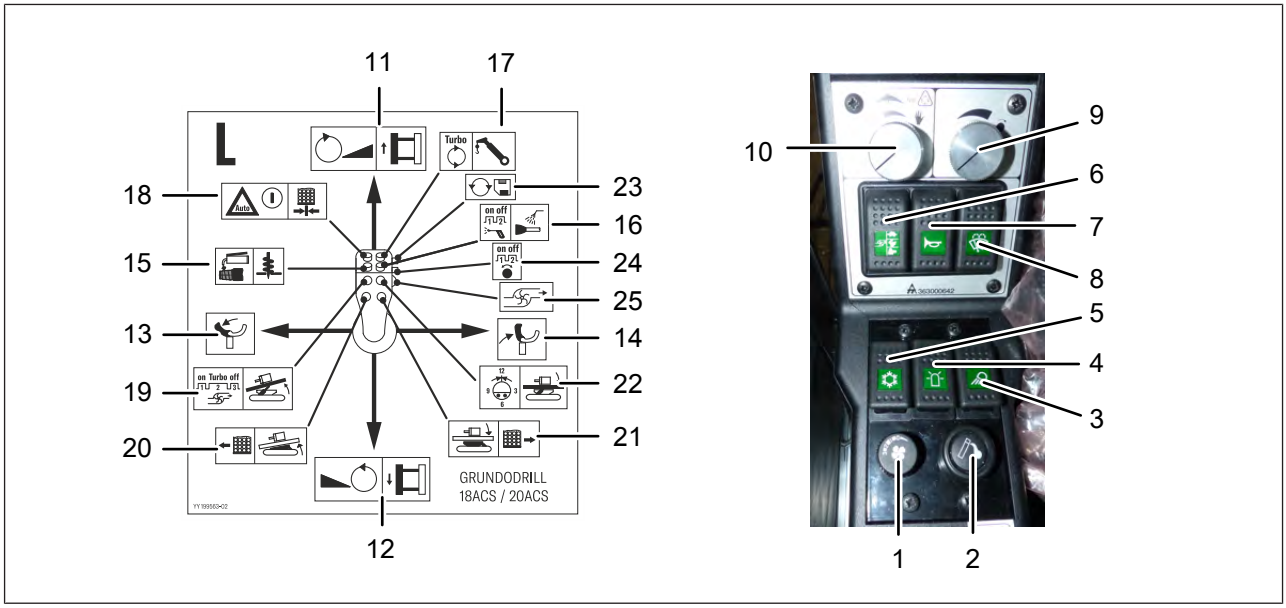



*Fig. 6-7 Left joystick with panel*

*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:<br>Switches the air conditioning on or off |
| 6 | Flip switch, 3-step | Flow rate low (tortoise) or high (rabbit) or rock drilling (mountain) |
| 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 | Auto-bore:<br>Inner rotation<br>0–100% -> Increase speed via pump at max. torque |
| 10 | Rotary knob | Outer rotation<br>Auto-bore:<br>0–50% -> Increase speed via pump at max. torque<br>50–100% -> Increase speed via motor at decreasing torque<br>Manual mode:<br>0–100 % -> Increase speed, reduce torque for outer rotation. |
| 11 | Joystick forwards | Bore mode: starts clockwise rotation.<br>Drive mode: drives the left track forward |

| Item | Operating element | Function |
|---|---|---|
| 12 | Joystick backwards | Bore mode: starts counter-clockwise rotation.<br>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.<br>Drive mode: starts the anchoring unit. |
| 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,<br>switches the high-pressure cleaner off when pressed once and then let go of. |
| 17 | Front push button - bottom right | Bore mode:<br>- pilot bore: maximum torque with low speed<br>- expanding: low torque with higher speed<br>Drive mode: enables crane operation |
| 18 | Front push button - bottom left | Bore mode (double click): starts/stops auto-bore or push mode.<br>Drive mode: moves the rod box/stacking boxes into transport position. |
| 19 | Top left push button | Bore mode:<br>1. brief actuation: The drilling fluid pump switches itself on.<br>2. first brief, then longer actuation: The drilling fluid pump switches into fast-fill mode.<br>3. repeated actuation: The drilling fluid pump switches itself off.<br>Drive mode: The boom lowers at the front. |
| 20 | Bottom left push button | Bore mode: moves the rod box/stacking boxes to the next bay in the direction of the bore axis.<br>Drive mode: lifts the rig boom at the rear. |
| 21 | Bottom right push button | Bore mode: moves the rod box/stacking boxes to the next bay in the direction of the magazine.<br>Drive mode: lowers the rig boom at the rear. |
| 22 | Top right push button | Bore mode: sets the roll (probe's o'clock position).<br>Drive mode: lifts the boom at the front. |
| 23 | Front right push button | pressing once: stores the current rotational speed / speed for the outer rotation<br>After pressing the button, the selected function is actuated with the set value without having to deflect the joystick. Reaching the disconnection point of the rod connection switches off the memory function.<br>Pressing again switches off the memory function.<br>Pressing twice (in quick succession) switches off the memory function with the previously selected rotational speed/speed. |
| 24 | Rear right push button | switches the rotation of the inner rod on or off<br>Regulate the rotation speed using the inner rotation potentiometer. |
| 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

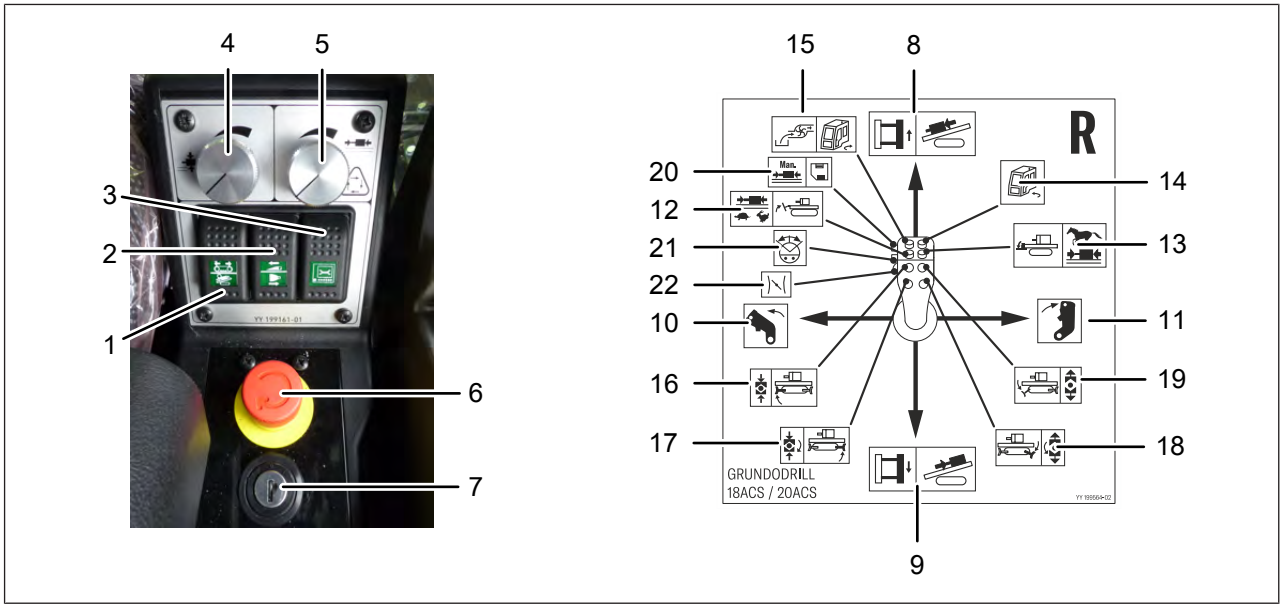



*Fig. 6-8 Right joystick with panel*

*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.<br>Drive mode: drives the right track forwards. |
| 9 | Joystick backwards | Bore mode: reverses the thrust rig.<br>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/stacking boxes |
| 12 | Front push button - top left | Bore mode: The thrust switches in two steps: either to high force and low speed (tortoise) or low force and high speed (rabbit).<br>Drive mode: lifts the anchor plate. |
| 13 | Front push button - top right | Bore mode: starts rapid motion for the thrust rig.<br>Drive mode: lowers the anchor plate for as long as the button is pressed. |
| 14 | Front push button - bottom right | Swings the cab inwards into transport position. |

| Item | Operating element | Function |
|---|---|---|
| 15 | Front push button - bottom left | Bore mode: switches the mud pump on for as long as the button is pressed<br>Drive mode: swings the cab outwards into bore position |
| 16 | Top left push button | Bore mode: closes the clamp.<br>Drive mode: lifts the front stabiliser. |
| 17 | Bottom left push button | Bore mode: closes the break-away clamp<br>Drive mode: lifts the stabiliser |
| 18 | Bottom right push button | Bore mode: opens the break-away clamp<br>Drive mode: lowers the stabiliser |
| 19 | Top right push button | Bore mode: opens the clamp.<br>Drive mode: lowers the front stabiliser. |
| 20 | Front left push button | Pressing once: stores the current thrust speed<br>After pressing the button, the selected function is actuated with the set value without having to deflect the joystick. Reaching the disconnection point of the rod connection switches off the memory function.<br>Pressing again switches off the memory function.<br>Pressing twice (in quick succession) switches off the memory function with the previously selected rotational speed/speed. |
| 21 | Rear left push button | Bore operation during pilot bore:<br>The drill head swings between e.g. the 10 o'clock and the 2 o'clock position. While turning to the right, the rig will drive forward a short distance (all speeds and angles can be adjusted). |
| 22 | Rotary knob | Determines the engine speed.<br>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.

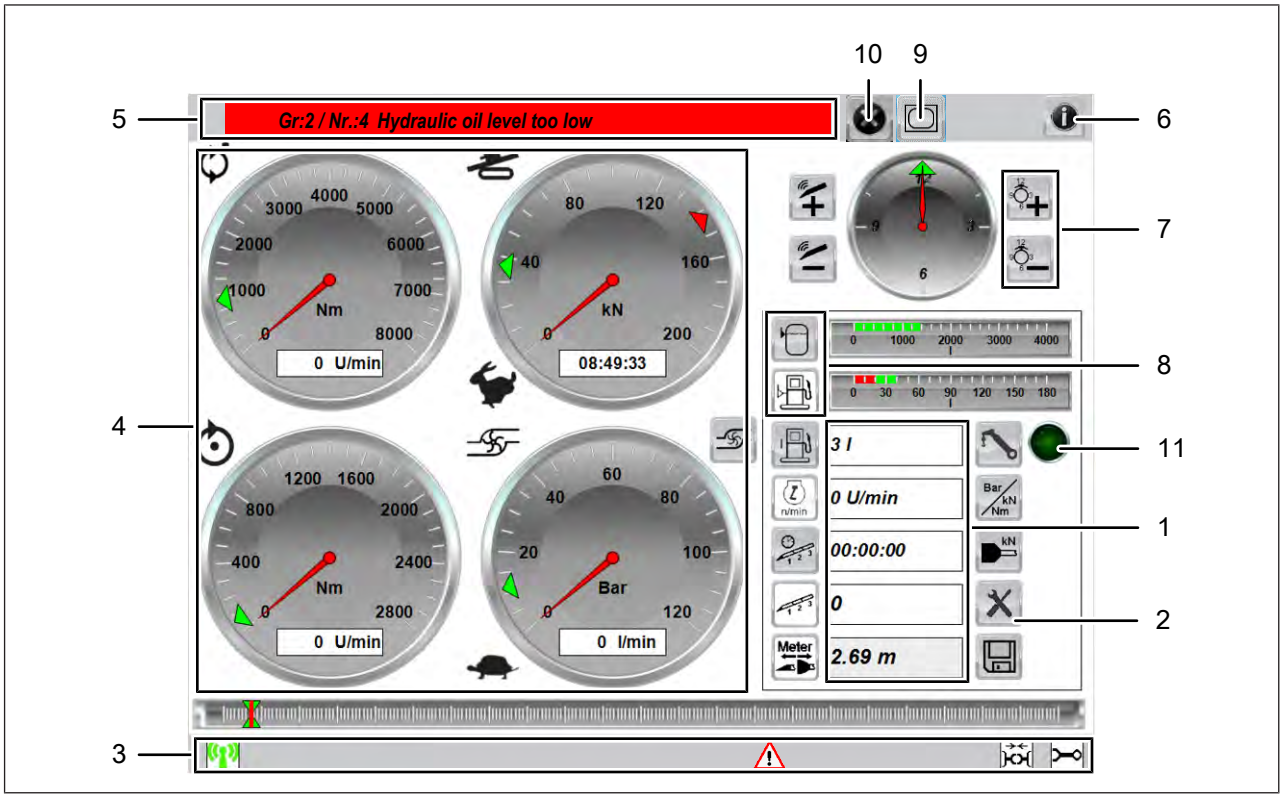



*Fig. 6-9 Operating elements: "Bore mode" sample screen*

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

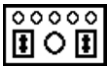
| Item | Operating element | Function |
|---|---|---|
| 1 | Text boxes | Indicate information or machine conditions.<br>These text boxes cannot be edited. |
| 2 | Buttons | Symbols with a dark grey background are designed as buttons. You can tap these buttons to activate or deactivate the displayed function. After tapping a button, another screen may appear. |
| 3 | Status line | Indicates the current status of a function, e.g.:<br>is displayed when the diesel tank is in reserve<br>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. |

| Item | Operating element | Function |
|---|---|---|
| 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. |
| 11 | Status display | The status indicator is illuminated in green if the respective function is activated or pressed. |

### *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. |
|  | The rotation of the inner rod is activated. |
|  | The rod exchange is released. |
|  | The memory function for the rotation of the outer rod 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.

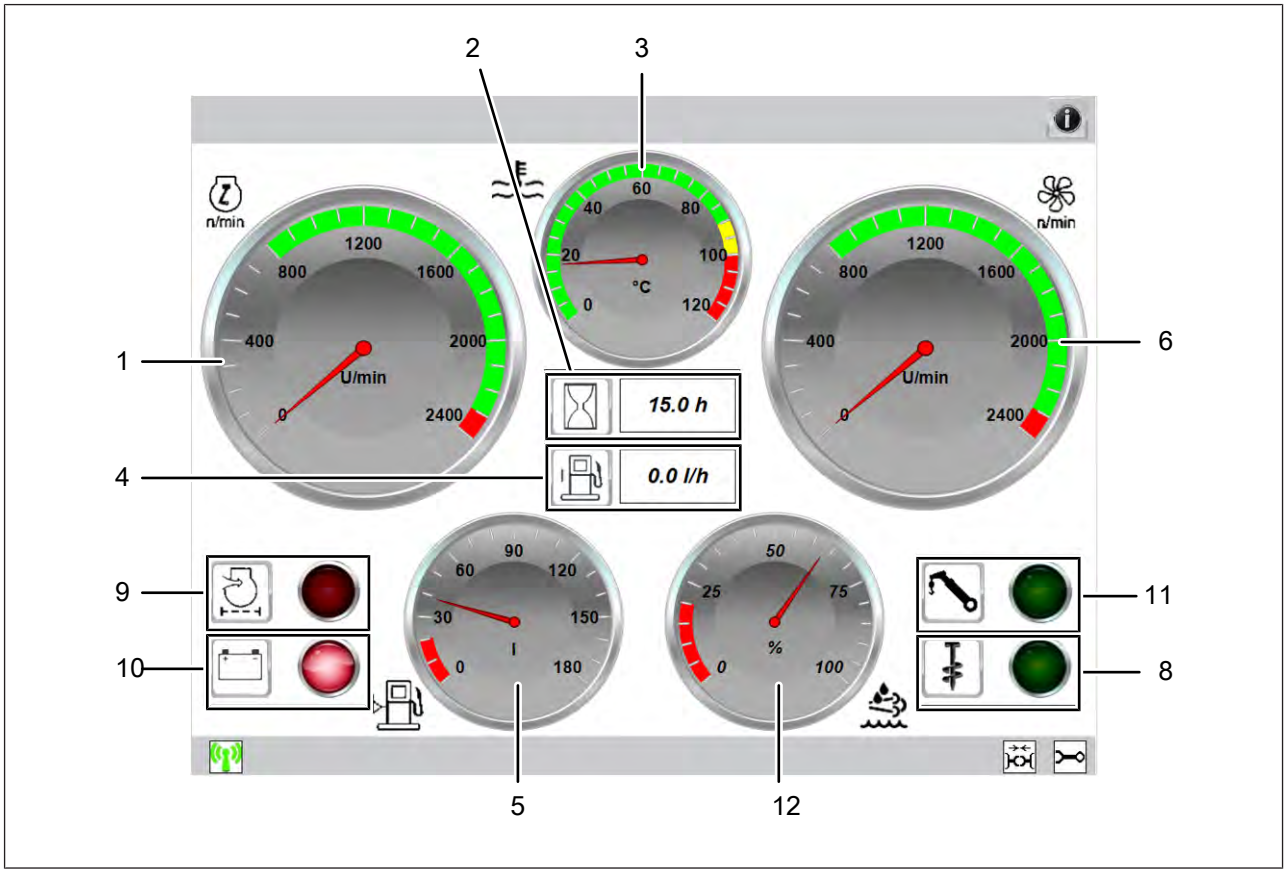



*Fig. 6-10 "Drive mode" screen*

*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.<br>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. |
| 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. |

| Item | Operating element | Function |
|---|---|---|
| 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. |
| 11 | Loading crane switched on/off status indicator | By pressing the push button on the left joystick the loading crane is switched on or off. This status indicator is illuminated in green if the loading crane is switched on. |
| 12 | Diesel exhaust fluid tank level | Indicates how much DEF is left in the tank. |

### *6.2.8.3 "Bore mode" screen*

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

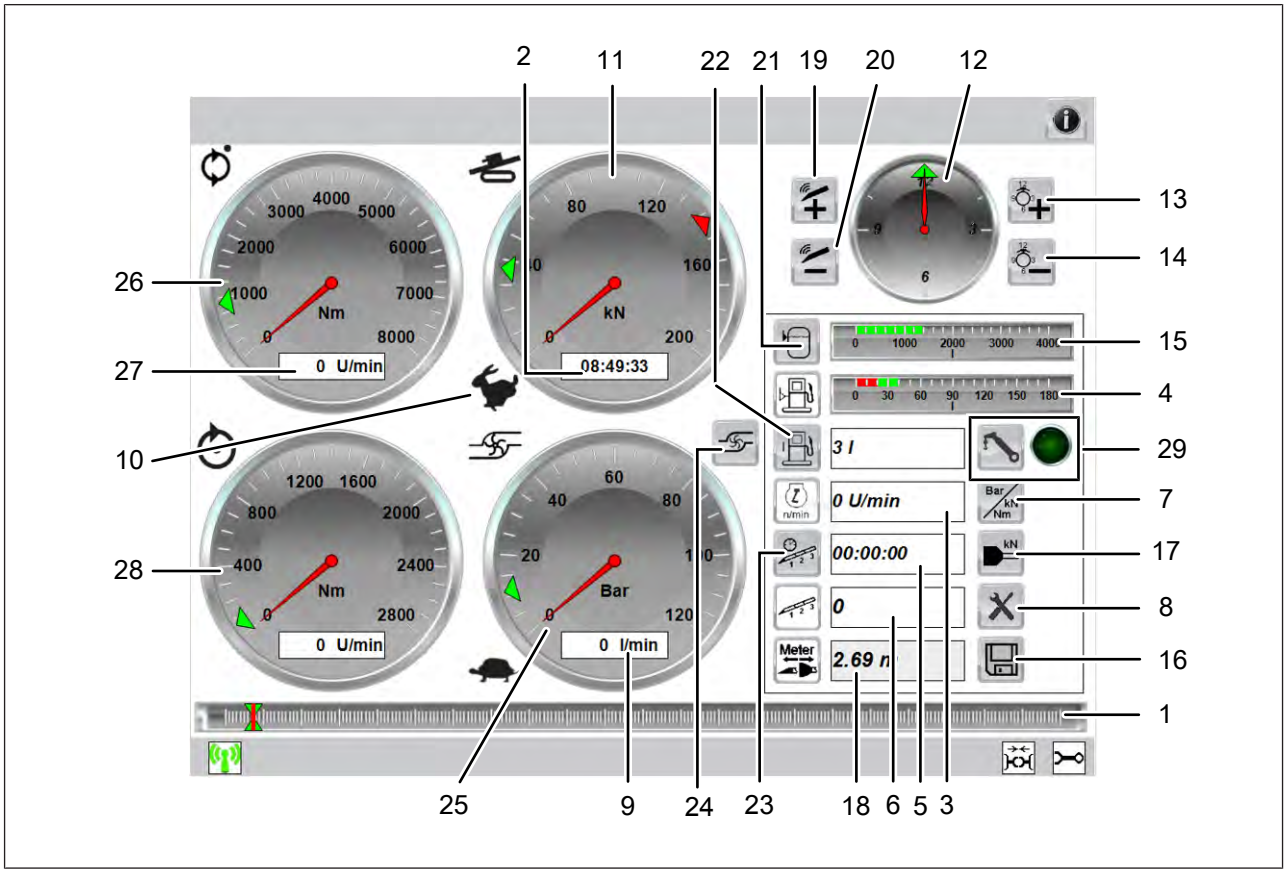
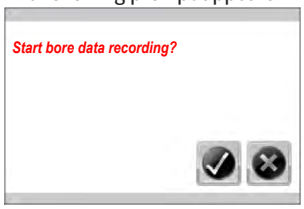



*Fig. 6-11 "Bore mode" screen (fully automatic mode)*

*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.<br>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.<br>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.<br>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.<br>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.<br>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 6.2.8.4, page 158). |
| 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.<br>If the rabbit appears, the quick thrust motion with low force is activated.<br>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<br>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.<br>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.<br>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.<br>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.<br>The rod counter is set to 0 when starting.<br>The following prompt appears when stopping:<br><br>Confirm the query by tapping the checkmark. |
| 17 | >>Tensile force measurement settings<< button | Opens the "Tensile force measurement settings" screen (chapter 6.2.8.13, page 173). |
| 18 | >>Rod length<< indication | Indication of the length of the inserted rods (in relation to 3 m)<br>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. |

| Item | Operating element | Function |
|---|---|---|
| 20 | >>Calibration detection system counter-clockwise<< button | Calibrates the red position indication with the detection indication (roll details from detection system) counter-clockwise. |
| 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 120 bar range. |
| 25 | Pressure indicator drilling fluid pump | Indicates the current drilling fluid pressure of the drilling fluid pump.<br>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.<br>If the rabbit appears, a high flow rate is activated.<br>If the tortoise appears, a low flow rate is activated.<br>If the rock appears, the rock drilling mode is activated.<br>The green marker indicates the potentiometer position of the flow rate setting. |
| 26 | Torque / pressure of the outer rotation | Torque or pressure indication for the rotation of the outer rod in bar or Nm<br>The arrow indicates the speed setting of the potentiometer. |
| 27 | Rotational speed outer rod | Indicates the rotational speed of the outer rod in rpm. |
| 28 | Torque / pressure and speed of rotation inner rod | Indicates the current torque / pressure in bar or Nm as well as the speed in rpm for the rotation of the inner drill rod.<br>The arrow indicates the speed setting of the potentiometer.<br>**Note!**<br>This indication is only visible when using Elicon D80 and D101 drill rods. |
| 29 | >>Loading crane switched on/ off<< button | Switching on the loading crane:<br>- in drive mode: using the front button at the bottom right of the left joystick<br>- in bore mode: using the "loading crane" button in the drilling menu<br>(The loading crane is operated using the operating levers at the loading crane.)<br>This status indicator is illuminated in green if the loading crane is switched on. |

### *6.2.8.4 "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 155).

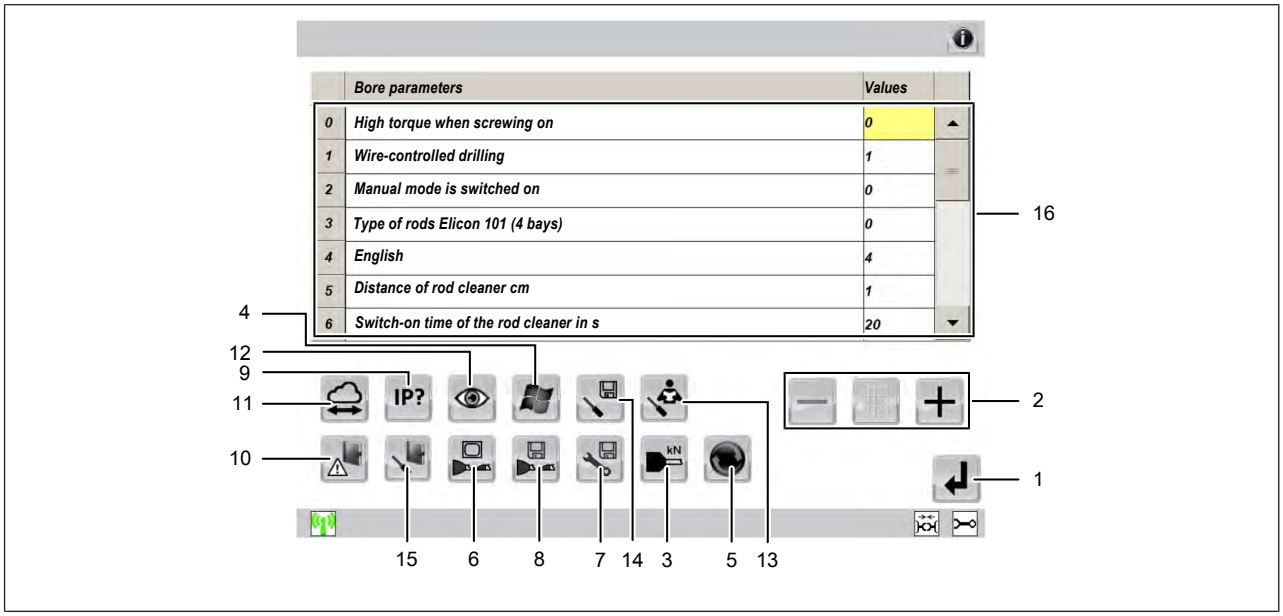



*Fig. 6-12 "Bore parameter settings" screen*

*Tab. 6-11 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.<br>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 185). |
| 4 | >>System<< button | Terminates the machine visualisation and displays the Windows interface.<br>**Info!**<br>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 313) to obtain the latest log number. |
| 5 | >>Programme update<< button | Installs a programme update from a connected USB stick.<br>**Info!**<br>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 313) to obtain the latest log number. |
| 6 | >>Display bore data<< button | Displays the bore data in accordance with GW321 in the measuring values protocol (chapter 6.2.10, page 195). |

| Item | Operating element | Function |
|---|---|---|
| 7 | >>Operating data<< button | Stores the operating data (e.g. log book, operating parameters) to a connected USB stick.<br>**Info!**<br>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 313) 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 6.2.8.16, page 177). |
| 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.<br>**Info!**<br>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 313) 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.<br>**Info!**<br>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 313) to obtain the latest log number. |
| 15 | >>Service log book<< button | Opens the "Service log book" screen (chapter 6.2.8.15, page 176).<br>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.<br>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. 6-12 Bore parameters – values*[*)]

| Line | Bore parameters |
|---|---|
| Line 0 | High / reduced torque during screwing |
| Line 1 | Operation with/without rod lubrication |
| Line 2 | Operation with/without wire-controlled drilling |
| Line 3 | Manual operation / emergency mode activated |
| Line 4 | Determining the rod type:<br>– Elicon D80...<br>– Elicon D95...<br>– Elicon D101...<br>– TwinDrive 82...<br>– TwinDrive 73...<br><br>**Info!**<br>Contact the TRACTO-TECHNIK customer service before changing the rod type (chapter 8, page 313)! |
| Line 5 | German / English / special language |
| Line 6 | Distance of rod cleaner cm |
| Line 7 | Switch-on time of the rod cleaner in s |
| Line 8 | Adjustable angle in the paddle section |
| Line 9 | Actuation of the clockwise rotation in paddle mode |
| Line 10 | Actuation of the counter-clockwise rotation in paddle mode |
| Line 11 | Switching from metric to imperial units |
| Line 12 | Step counter automatic loading / unloading |
| Line 13 | Step counter automatic screwing |
| Line 14 | Step counter automatic rod exchange |
| [*)] the bore parameters displayed depend on the selected rod | |

*6.2.8.5 "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 313).

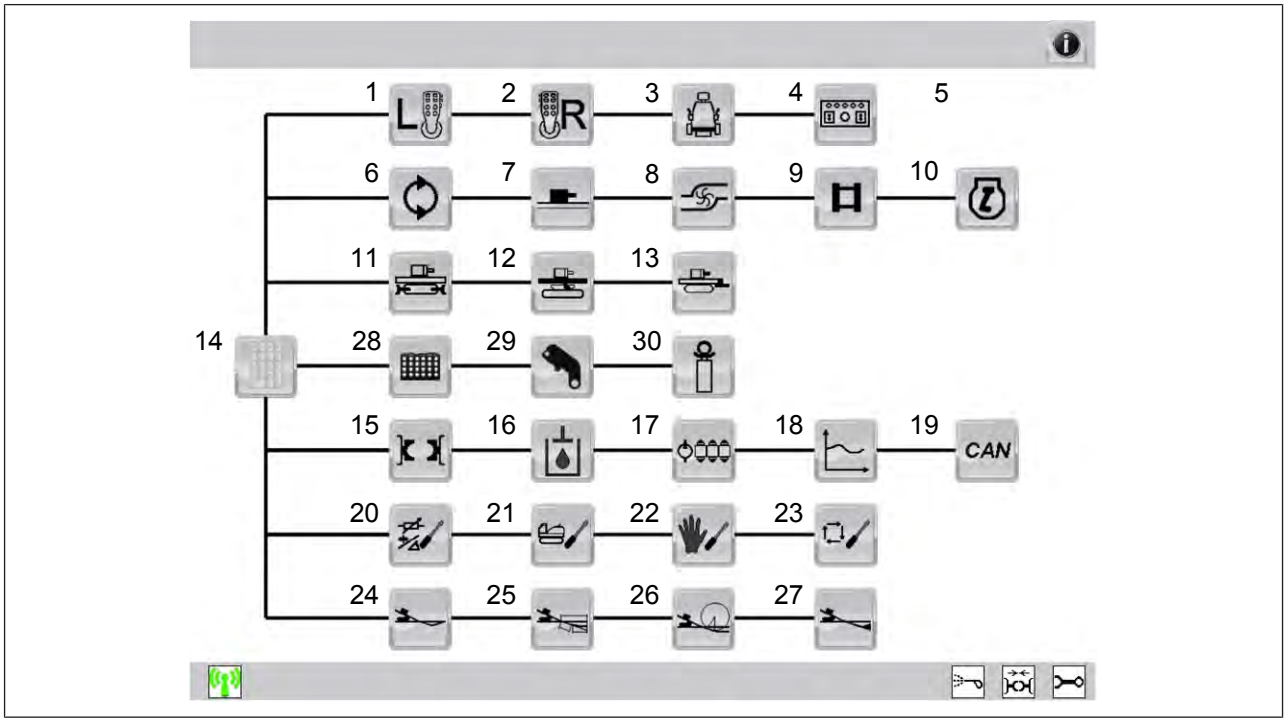



*Fig. 6-13 "Service" screen*

*Tab. 6-13 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.<br>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.<br>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.<br>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 |
|---|---|---|
| 4 | Remote control | Opens a screen for a function check of the remote control.<br>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. |
| 5 | Wireless drive/pit remote control<br>(not depicted in the figure) | Opens a screen for a function check of the wireless drive/pit remote control.<br>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.<br>**Info!**<br>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 6.2.8.7, page 165). |
| 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.<br>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.<br>**Info!**<br>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 313) 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 6.2.8.6, page 164). |
| 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 6.2.8.17, page 178). |
| 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 6.2.8.9, page 168). |
| 25 | Calculation set-back length | Opens the screen for the calculation of the set-back (chapter 6.2.8.10, page 169). |
| 26 | Calculation bending radius | Opens the screen for the calculation of the bending radius (chapter 6.2.8.11, page 171). |
| 27 | Calculation expander parameters | Opens the screen for the calculation of the required fluid quantity and the expansion speed (chapter 6.2.8.12, page 172). |

| 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. |

### *6.2.8.6 "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 313) to obtain the latest log number.

This screen is displayed if you tap the >>Auxiliary functions<< button (16) in the "Service" screen (chapter 6.2.8.5, page 161).

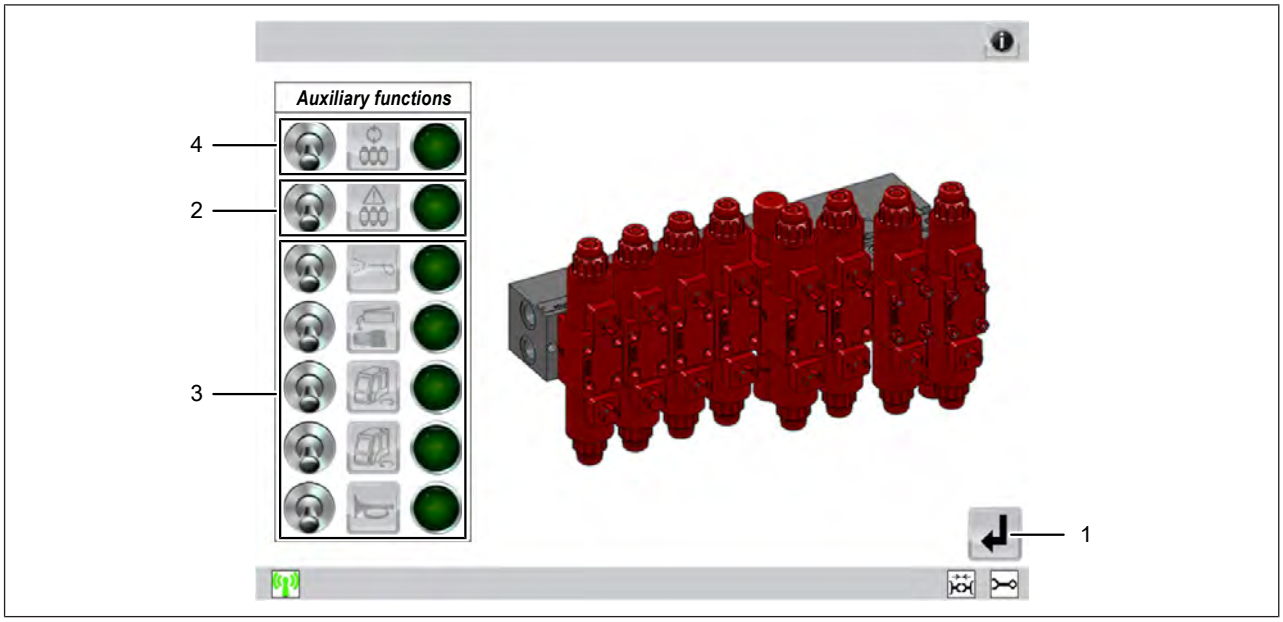



*Fig. 6-14 "Auxiliary functions" screen*

*Tab. 6-14 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.<br>The status indicator is illuminated if the setting option is activated.<br>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.<br>The status indicator is illuminated if the setting option is activated.<br>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.<br>The status indicator is illuminated if the setting option is activated.<br>Tap the flip switch again to block the function. |

### *6.2.8.7 "Service – Rotation" screen*

The "Rotation" screen is displayed if you tap button 6 >>Rotation<< in the "Service" screen (chapter 6.2.8.5, page 161).

In the "Rotation" screen you can set the indicated functions manually.

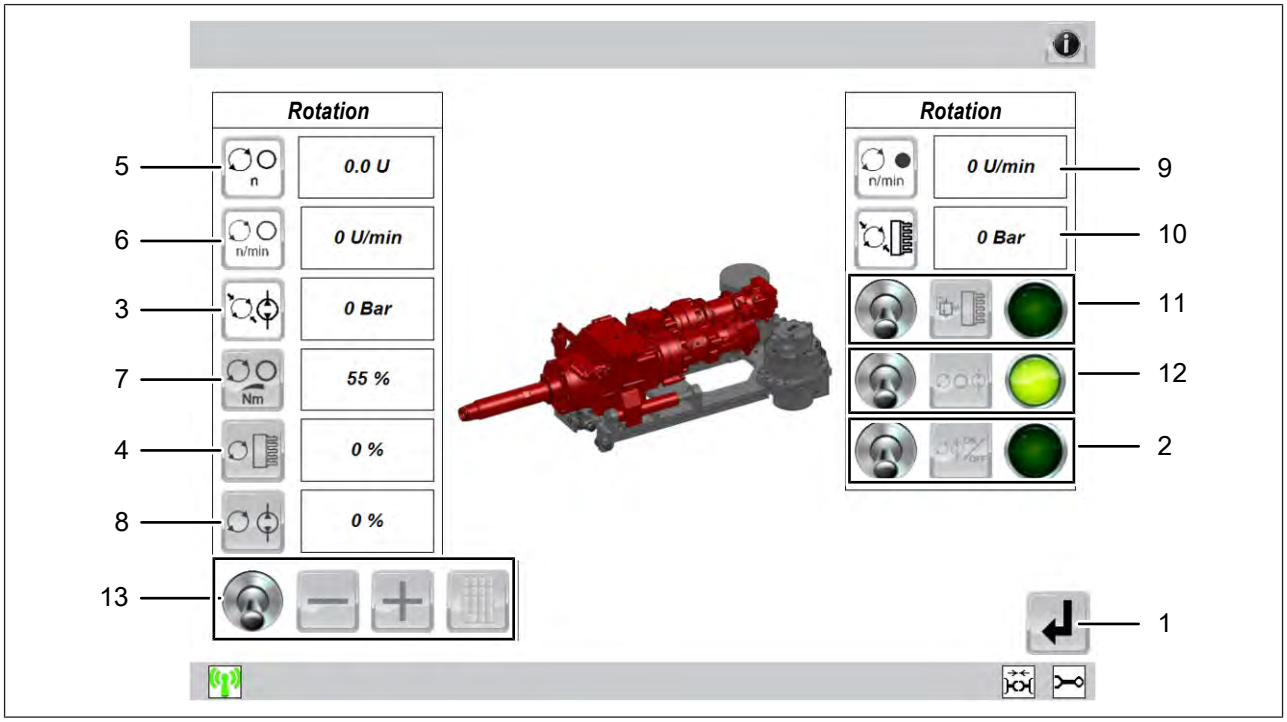



*Fig. 6-15 "Rotation" screen*

**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 313) to obtain the latest log number.

*Tab. 6-15 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).<br>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 | Actuation proportional valve of rotation | Indicates the actuation of the proportional valve for the rotation (in %). |
| 5 | Rotations outer rod | Indicates the number of the revolutions of the outer rod. |
| 6 | Rotational speed outer rod | Indicates the rotational speed of the outer rod (in rpm). |

| Item | Operating element | Function |
|---|---|---|
| 7 | Torque adjustment | Changes the torque of the outer rod (in %). |
| 8 | Actuation pump or displacement | Indicates the actuation of the pump or the displacement of the pump (in %). |
| 9 | Rotational speed inner rod | Indicates the rotational speed of the inner rod (in rpm). |
| 10 | Actuation pressure proportional valve of rotation | Indicates the hydraulic pressure of the proportional valve for the rotation (in bar). |
| 11 | Release pressure limitation proportional valve of rotation | Releases the pressure limitation for the proportional valve of the rotation.<br>The status indicator is illuminated in green if the release is activated. |
| 12 | Switch valve actuation rotation pump / proportional valve | Activates the switch valve for actuating the rotation pump or the proportional valve.<br>Tap the button to the left of the status indicator repeatedly to switch between actuation of the pump and the proportional valve.<br>The status indicator is illuminated in green if the actuation is enabled. |
| 13 | >>Enable<< / >>+<< / >>-<< buttons/ >>on-screen keyboard<< | Use the >>+<< and >>-<< buttons to increase or decrease a value. The changed value is adopted immediately.<br>Alternatively, you can tap the button for the on-screen keyboard and enter the value via the keyboard. |

### *6.2.8.8 "Service – Thrust" screen*

The "Thrust" screen is displayed if you tap button 7 >>Thrust<< in the "Service" screen (chapter 6.2.8.5, page 161).

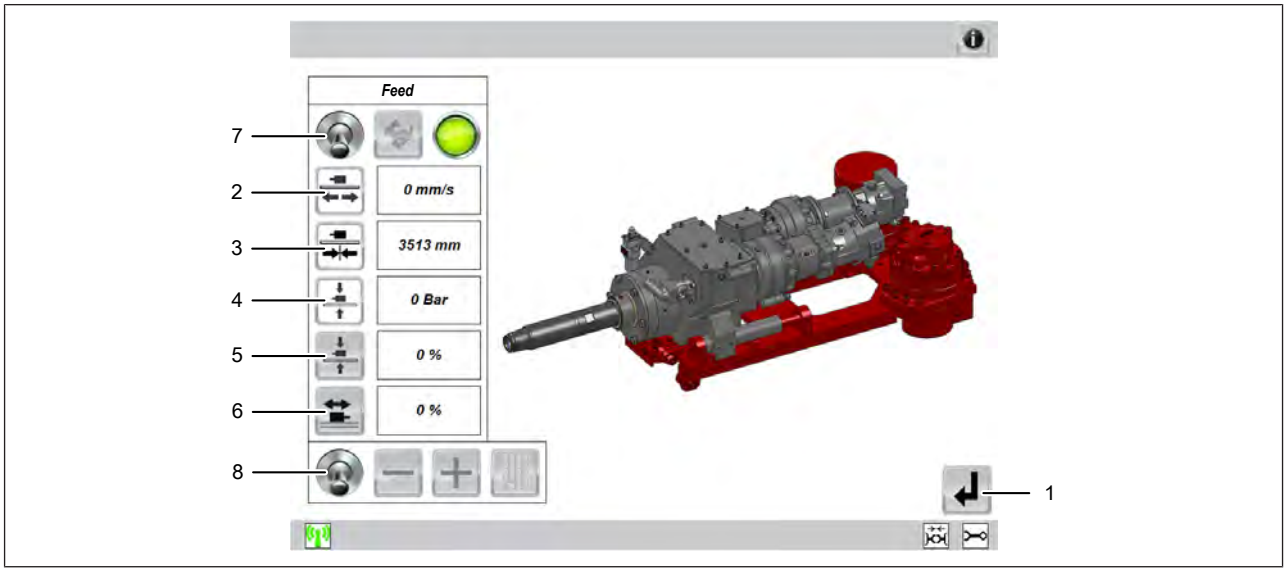



*Fig. 6-16 "Thrust" screen*

**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 313) to obtain the latest log number.

*Tab. 6-16 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 | >>Enable thrust speed<< button | Enables the fast thrust speed.<br>The status indicator indicates the actuation of the thrust valve. |

### *6.2.8.9 "Service – Determining approx. bore length" screen*

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

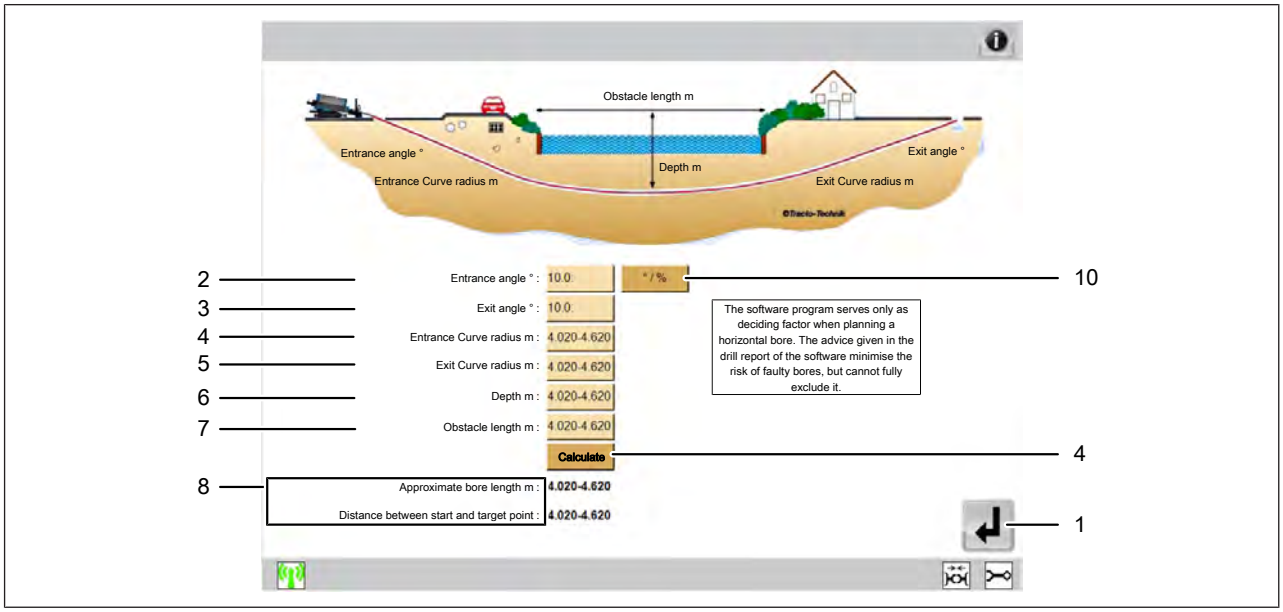



*Fig. 6-17 "Determining appr. bore length" screen*

*Tab. 6-17 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 °)<br>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 °)<br>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<br>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 |
| 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. |

### *6.2.8.10 "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 6.2.8.5, page 161).

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

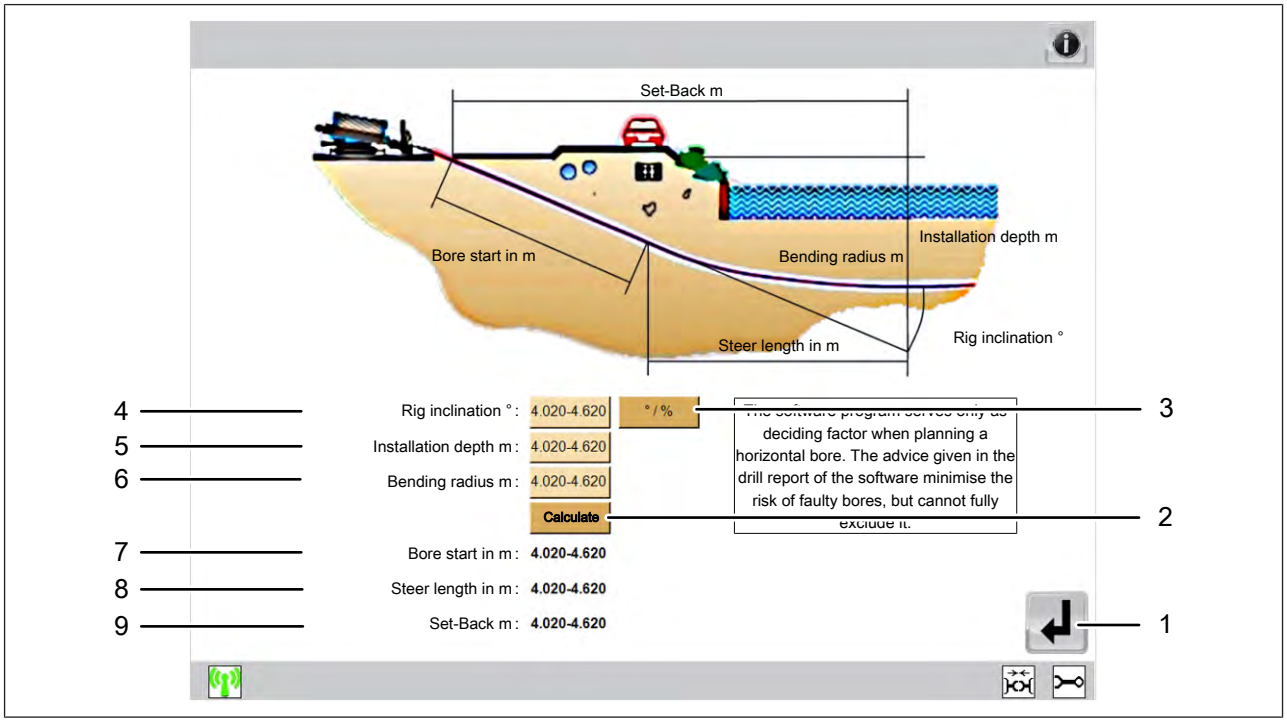



*Fig. 6-18 "Calculation of set-back length" screen*

*Tab. 6-18 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 °)<br>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)<br>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<br>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)<br>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. |

### *6.2.8.11 "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.

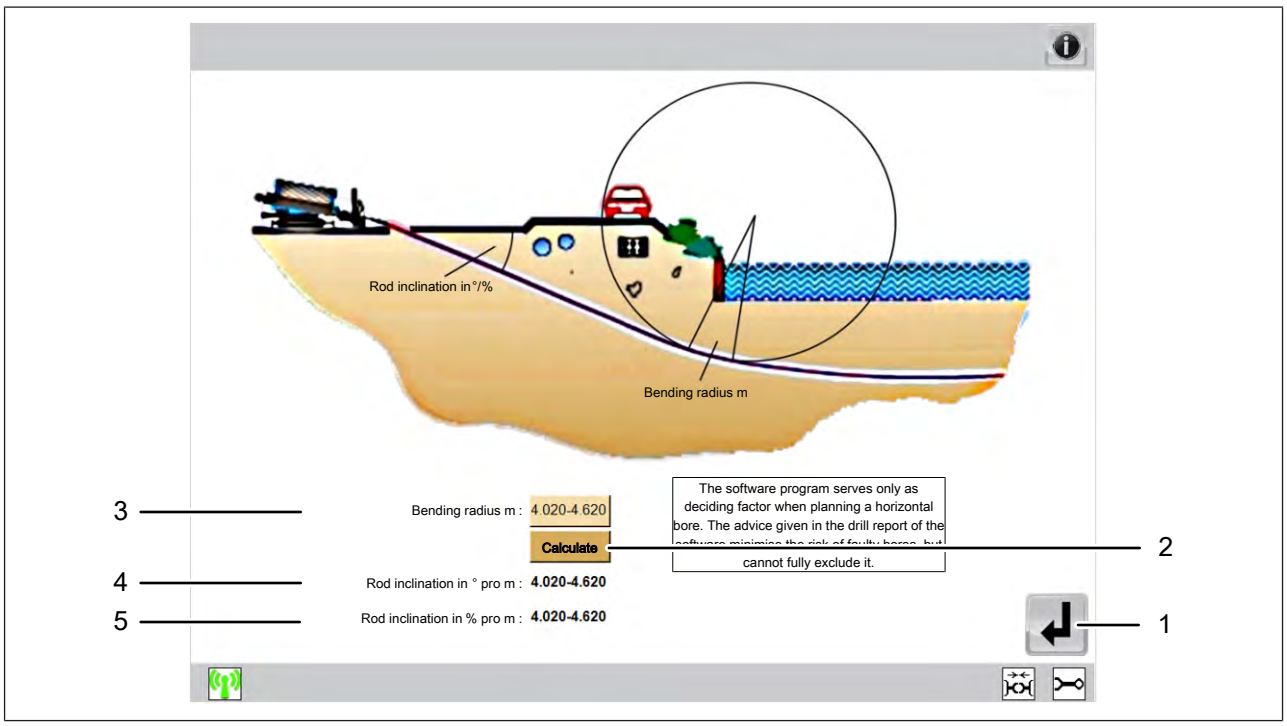



*Fig. 6-19 "Bending radius conversion" screen*

*Tab. 6-19 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)<br>The minimum bending radius is specified by the drill rod manufacturer or product pipe manufacturer.<br>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 |

### *6.2.8.12 "Service – Calculation of expander parameters" screen*

This screen is displayed if you tap the >>Calculation expander parameters<< button (27) in the "Service" screen (chapter 6.2.8.5, page 161).

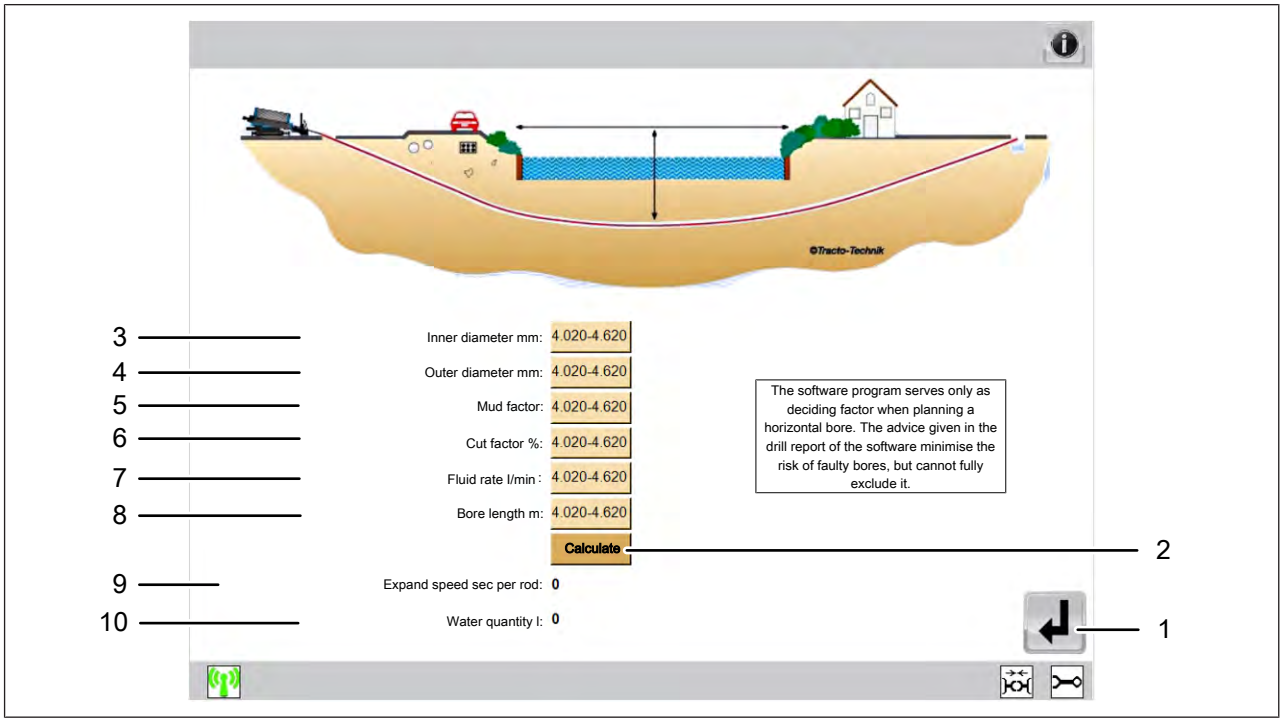



*Fig. 6-20 "Calculation of expander parameters" screen*

*Tab. 6-20 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<br>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) |

### *6.2.8.13 "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 155).
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.

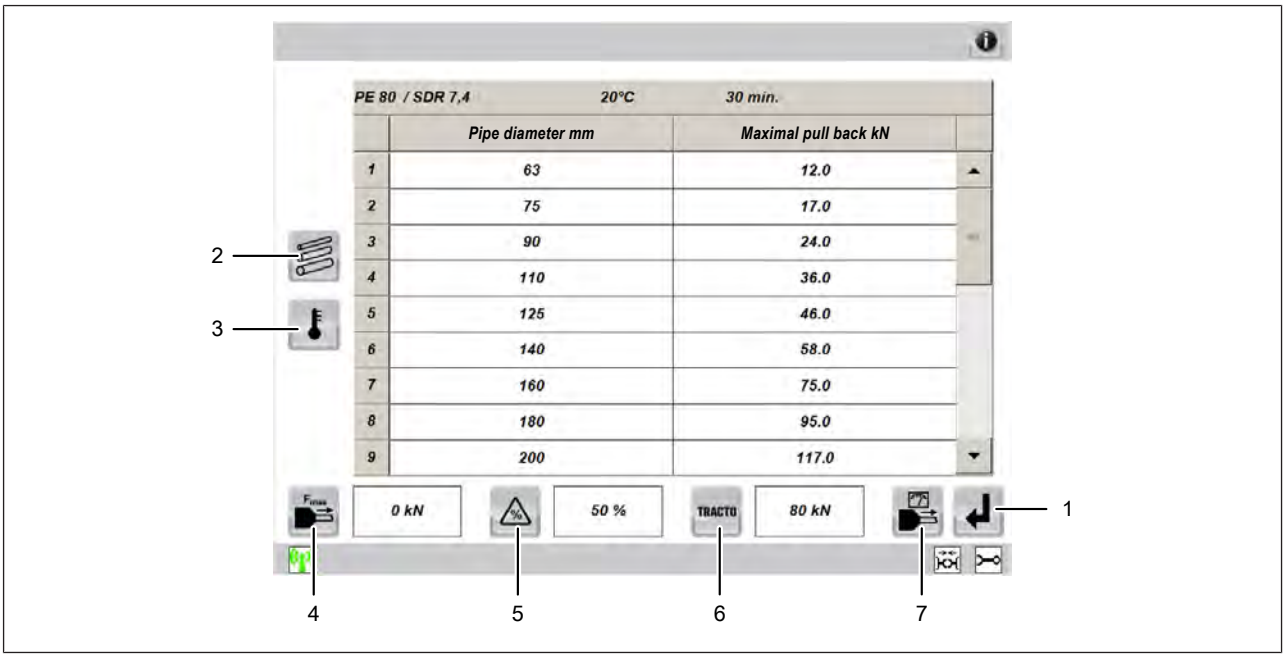



*Fig. 6-21 "Tensile force measurement settings" screen*

*Tab. 6-21 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<br>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. |
| 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.<br>Do not start a tensile force measurement before having entered the parameters. |

### *6.2.8.14 Service interval display*

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

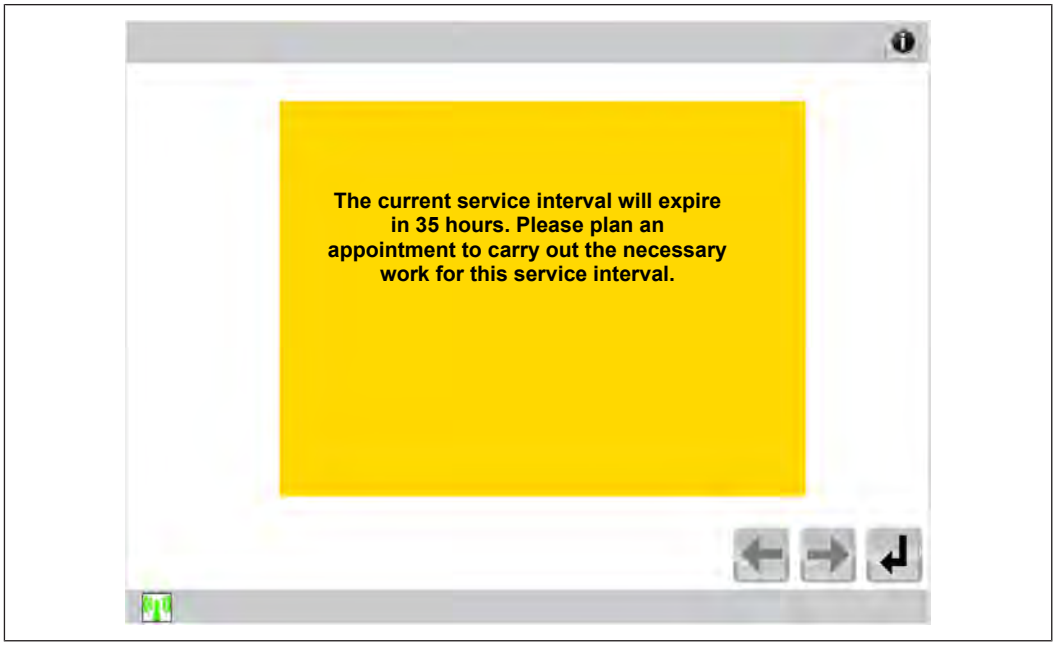



*Fig. 6-22 Indication of service interval*

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




*Fig. 6-23 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 6.2.8.5, page 161).
2. Select the parameter for the service interval in line 16 of the "Machine parameters" screen and press the plus button.

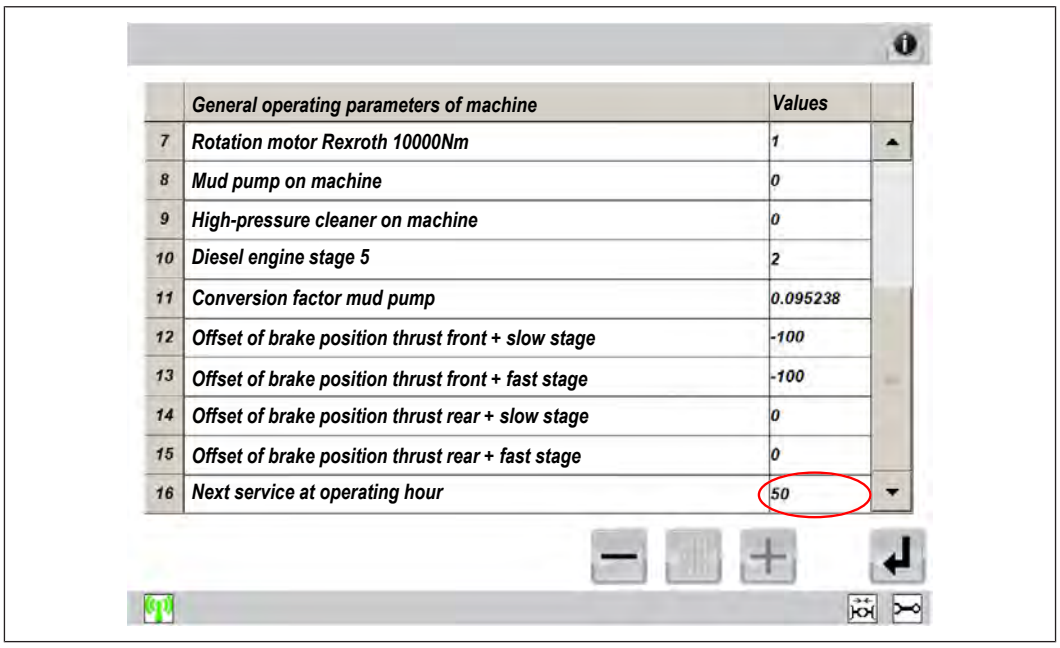



*Fig. 6-24 "Machine parameters" screen*

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

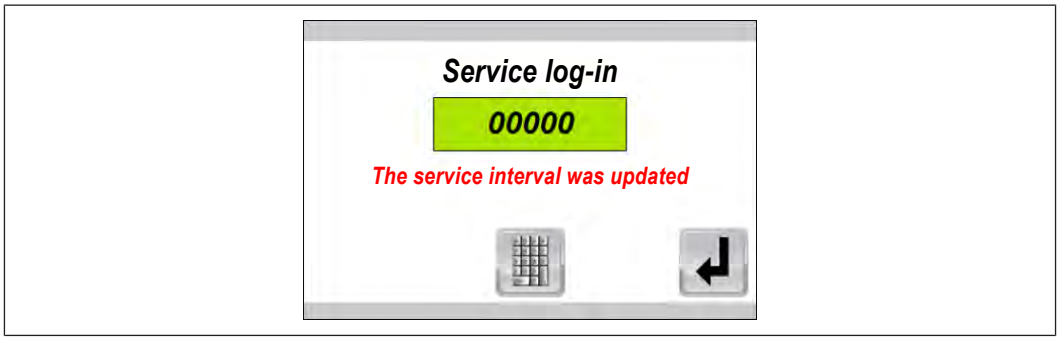



*Fig. 6-25 Entry of the service number*

3. Enter the service number assigned to you.
4. Enter the service interval.
   ⇨ The value is transferred to the service log book (chapter 6.2.8.15, page 176).

### *6.2.8.15 "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 6.2.8.4, page 158).

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.

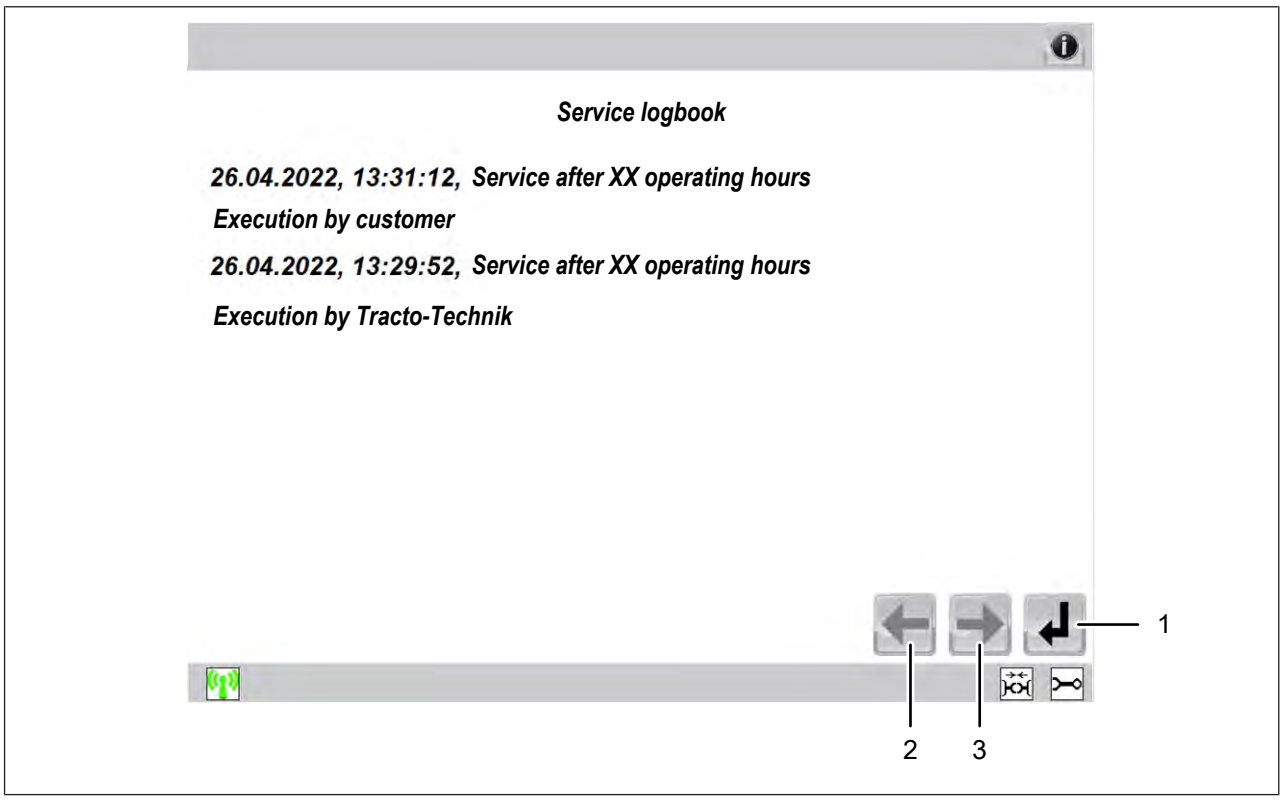



*Fig. 6-26 "Service log book" screen*

*Tab. 6-22 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. |

### *6.2.8.16 "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 6.2.8.4, page 158).

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.

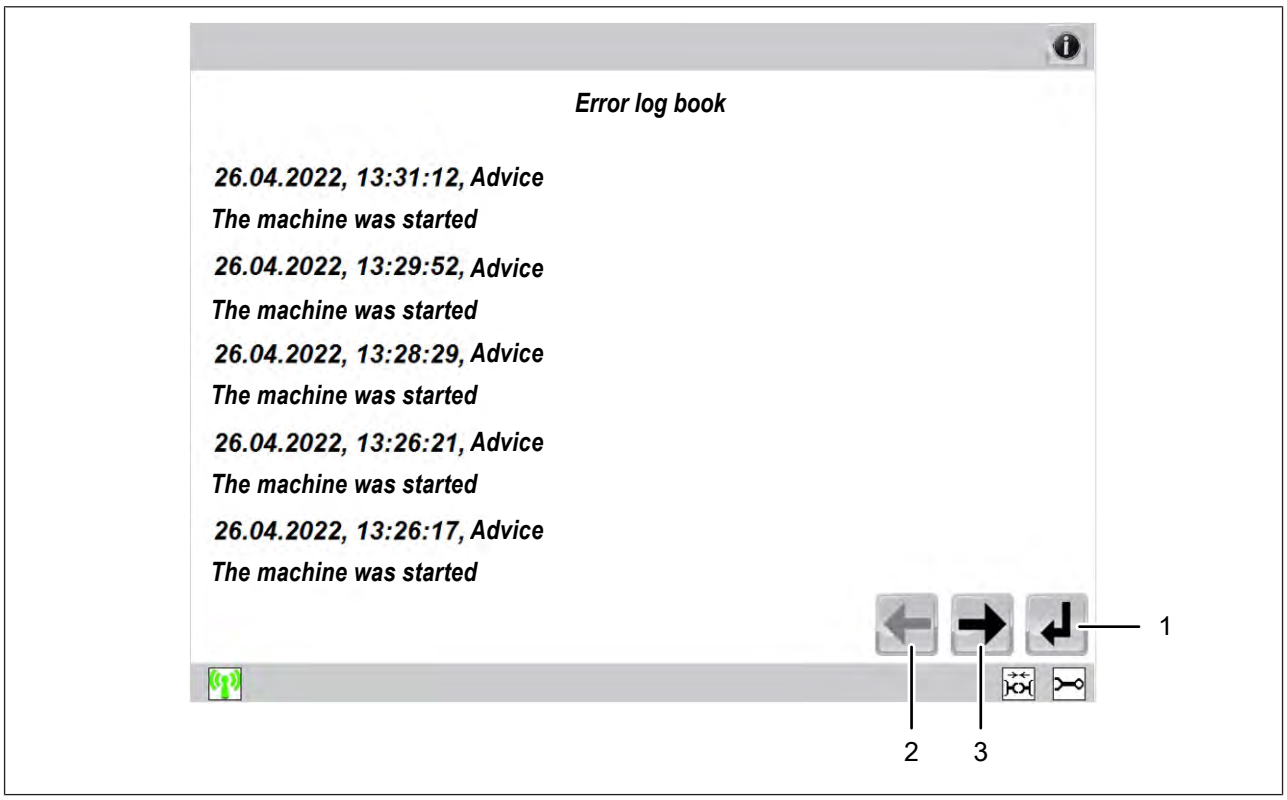



*Fig. 6-27 "Error log book" screen*

*Tab. 6-23 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. |

### *6.2.8.17 "Sensor configuration" screen*

The "Sensor configuration" screen is displayed if you tap button 20 >>Sensor configuration<< in the "Service" screen (chapter 6.2.8.5, page 161).

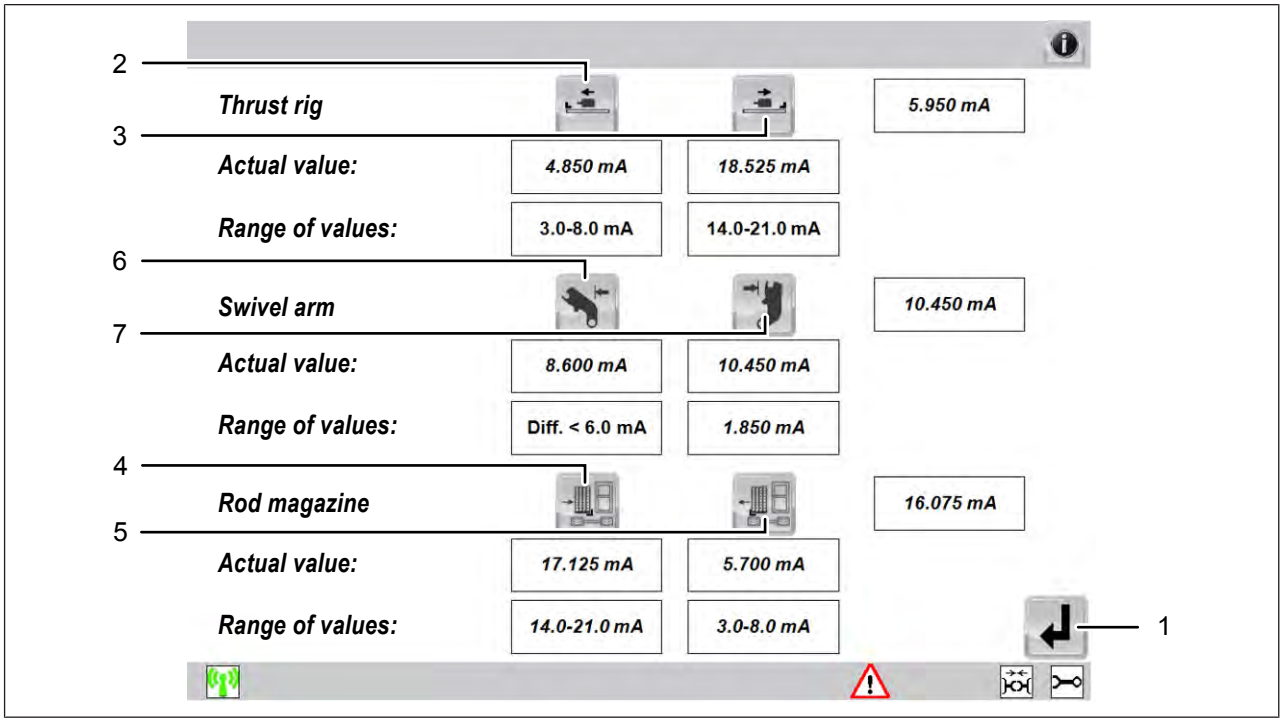



*Fig. 6-28 "Sensor configuration" screen*

*Tab. 6-24 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.

The following movements are carried out in emergency mode during configuration of the sensors:

– the thrust rig is moved to the front and rear stop position
– the rod magazine is moved to the outer and inner removal position
– the swivel arm is moved under the bay and into the bore axis

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. 6-25 Tolerance range of the sensors*

| | | |
|---|---|---|
| thrust sensor: | front: 3.0-8.0 mA | rear: 14.0-20.0 mA |
| swivel arm: | difference between the position underneath the bay and the bore axis position:<br>< 3.0 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.

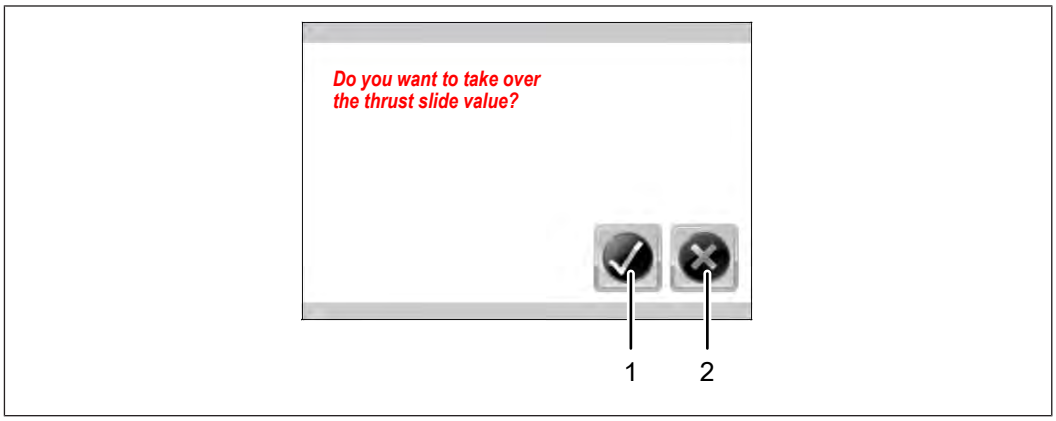



*Fig. 6-29 Confirmation query*

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

***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.

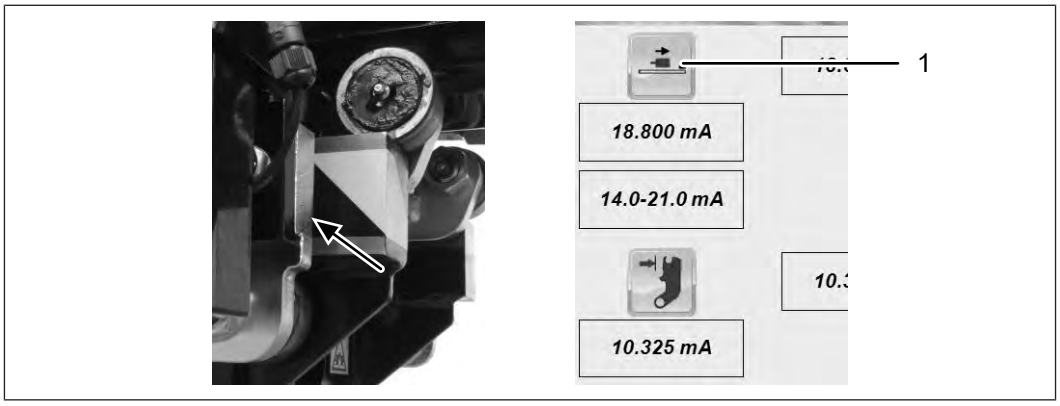



*Fig. 6-30 Configuration "Thrust rig rear"*

***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.

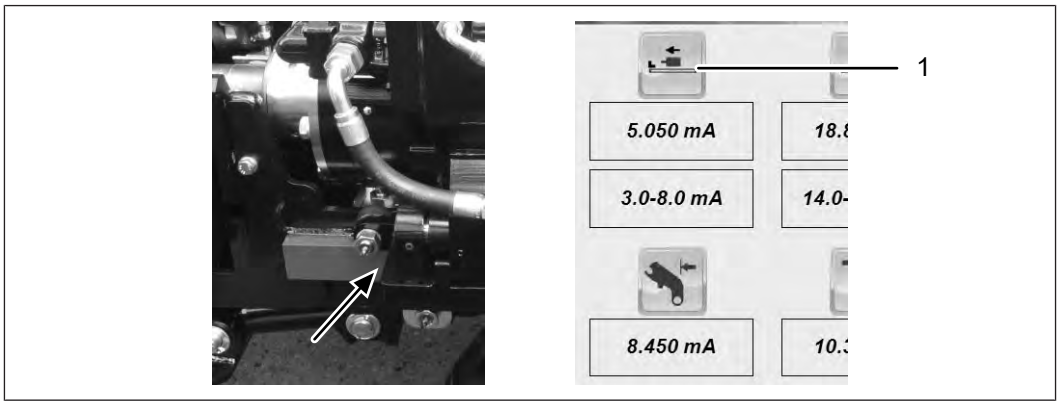



*Fig. 6-31 Configuration "Thrust rig front"*

***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 in the range between 3.0 mA and 8.0 mA.

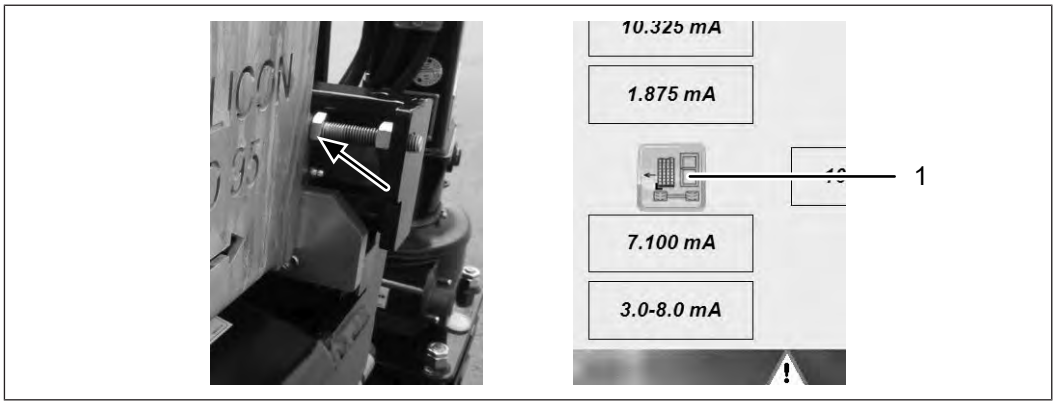



*Fig. 6-32 Configuration "Rod magazine (outer) right"*

***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 in the range between 14 mA and 21 mA.

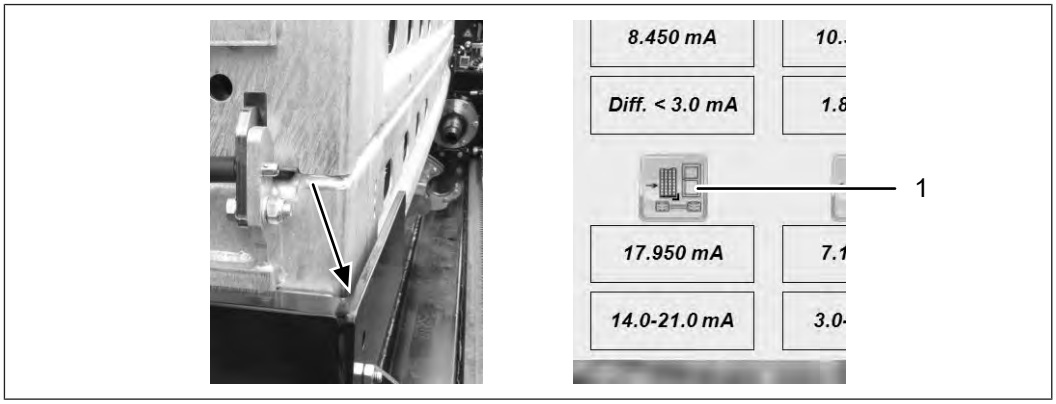



*Fig. 6-33 Configuration "Rod magazine (inner) left"*

***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).

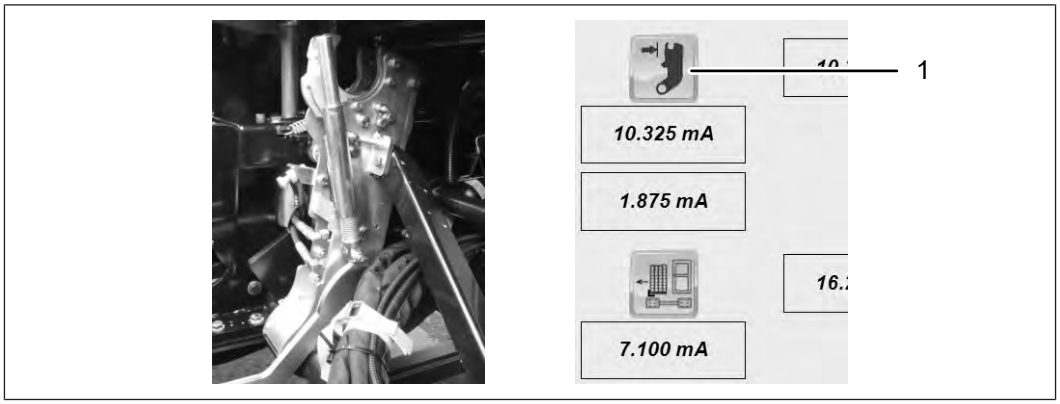



*Fig. 6-34 Configuration "Swivel arm underneath the bay"*

***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 difference between the position values in the bore axis and underneath the bay should be less than 3.0 mA.

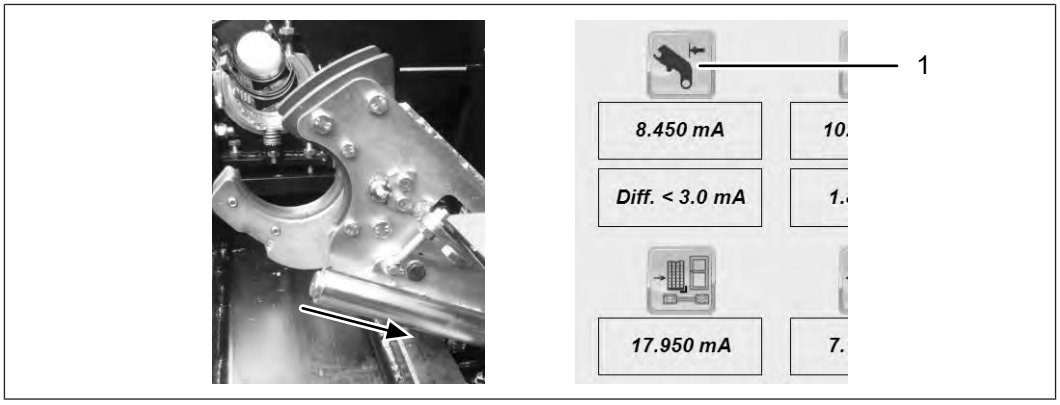



*Fig. 6-35 Configuration "Swivel arm in bore axis"*

### *6.2.8.18 "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 149).

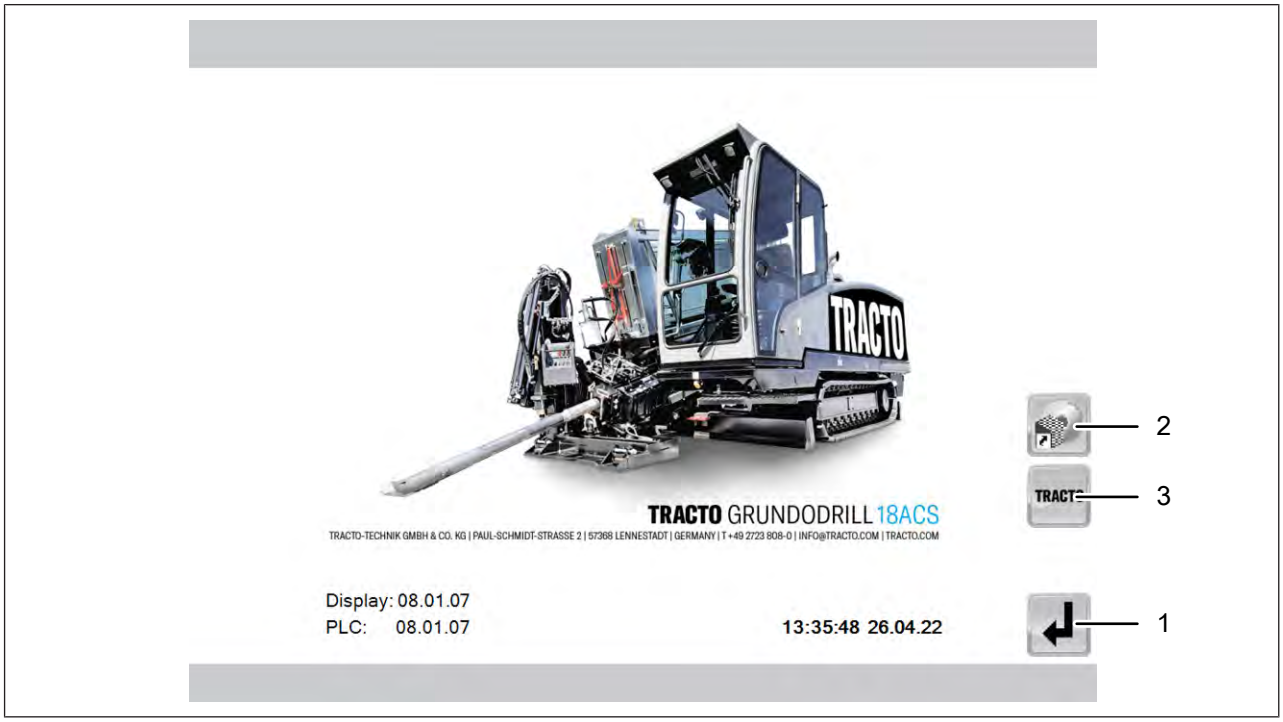



*Fig. 6-36 "Version number" screen*

*Tab. 6-26 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 6.2.8.4, page 158).

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

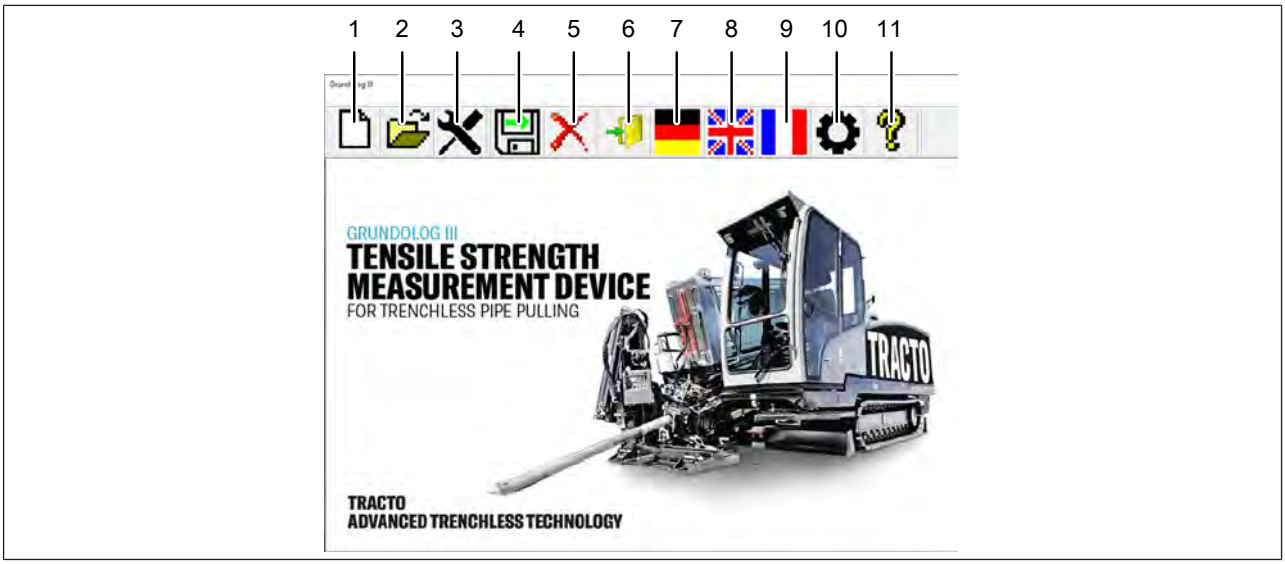



*Fig. 6-37 "Grundolog III" screen*

*Tab. 6-27 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 186). |
| 2 | >>Open<< button | Opens a window for selecting stored DAT files (chapter 6.2.9.2, page 187).<br>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 190). |
| 4 | >>Save<< button | Saves the BDA data on a connected USB stick (chapter 6.2.9.4, page 191). |
| 5 | >>Delete<< button | Opens a window for selecting stored DAT files (chapter 6.2.9.5, page 192).<br>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 193). |
| 11 | >>Information<< button | Opens a window displaying programme information (chapter 6.2.9.7, page 194). |

### *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. 6-38 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.

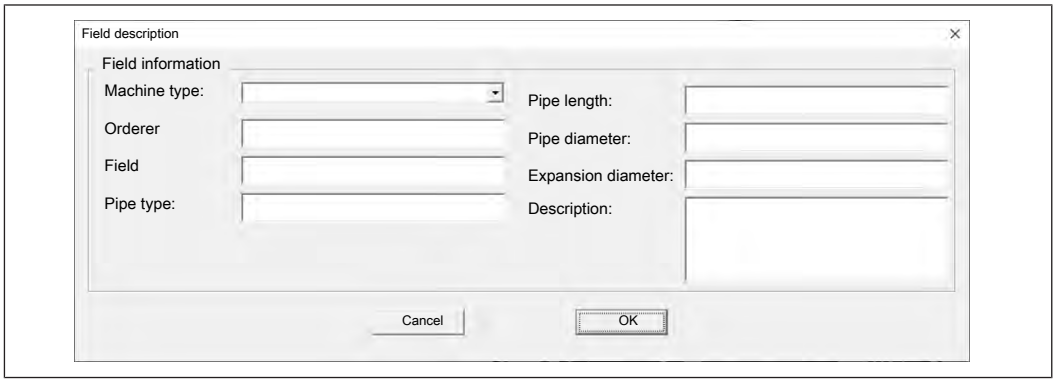



*Fig. 6-39 Field description*

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:

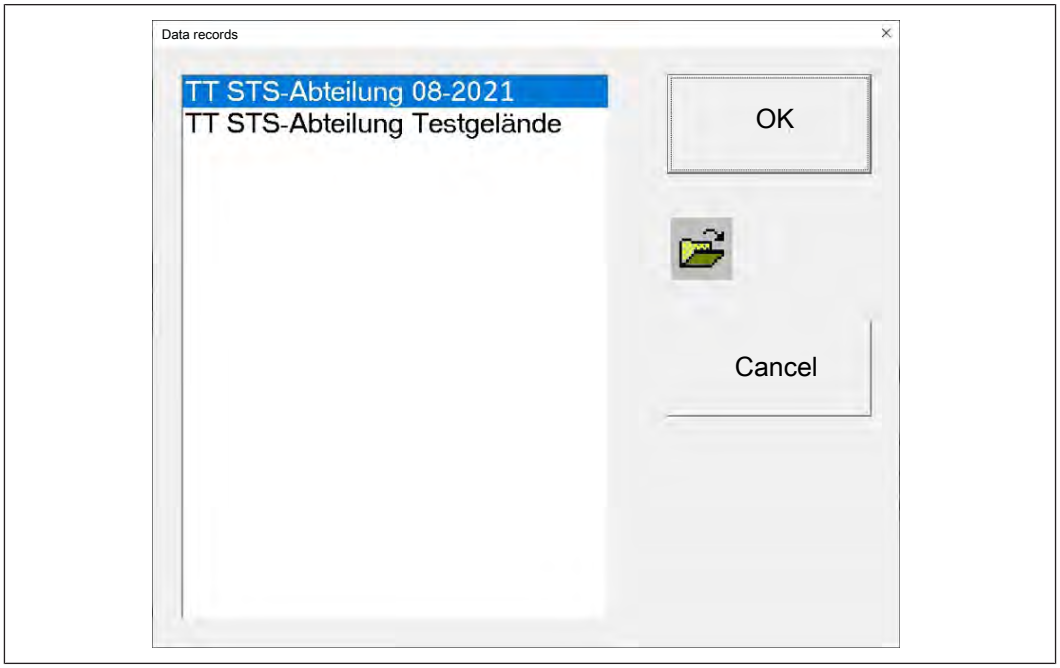



*Fig. 6-40 Selecting the tensile force data*

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.

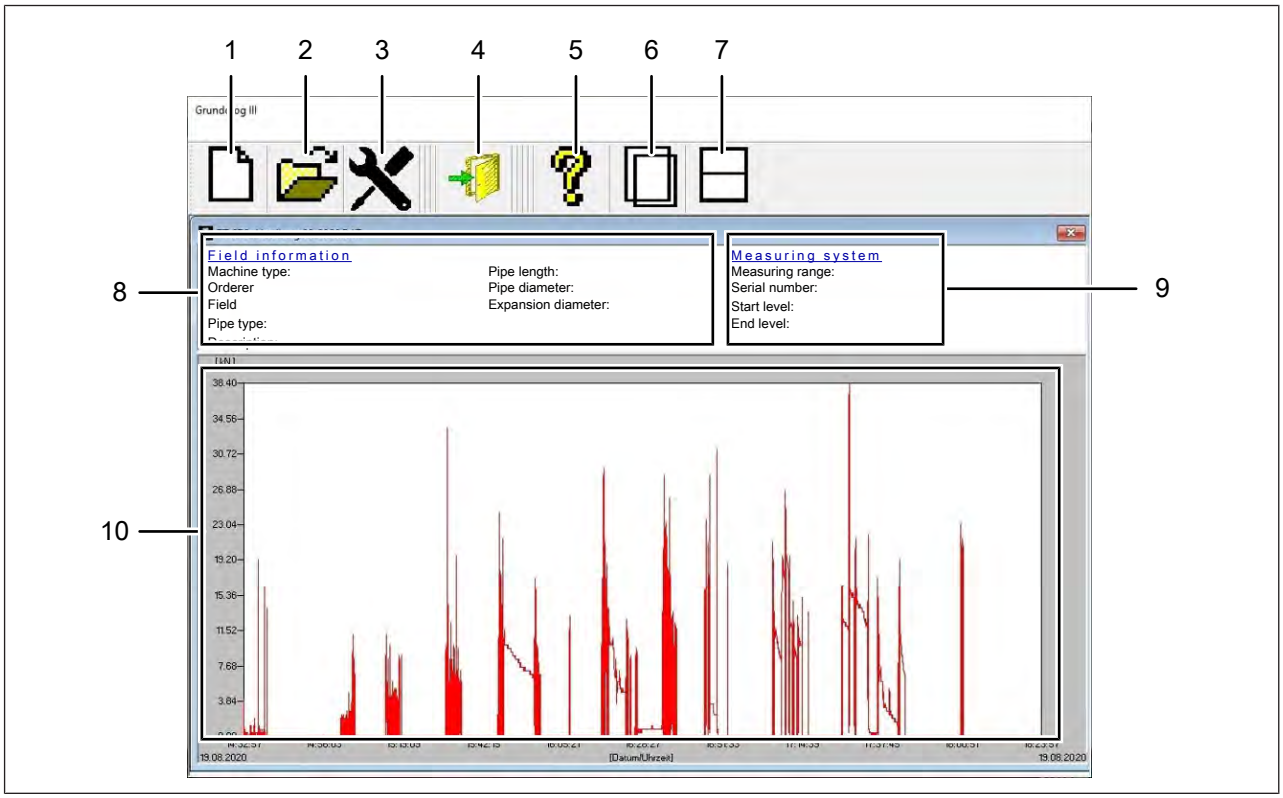



*Fig. 6-41 Tensile force data*

*Tab. 6-28 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 186). |
| 2 | >>Open<< button | Opens the window for selecting stored DAT files (chapter 6.2.9.2, page 187).<br>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 190). |
| 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:

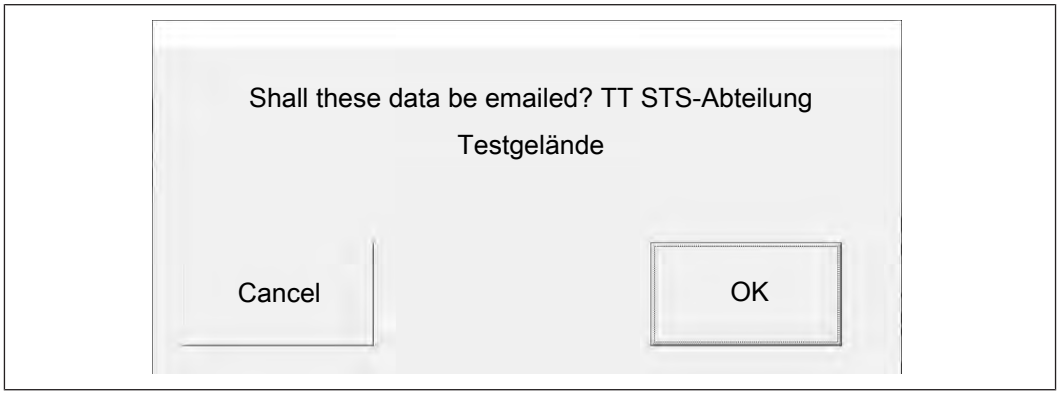



*Fig. 6-42 Sending data*

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:

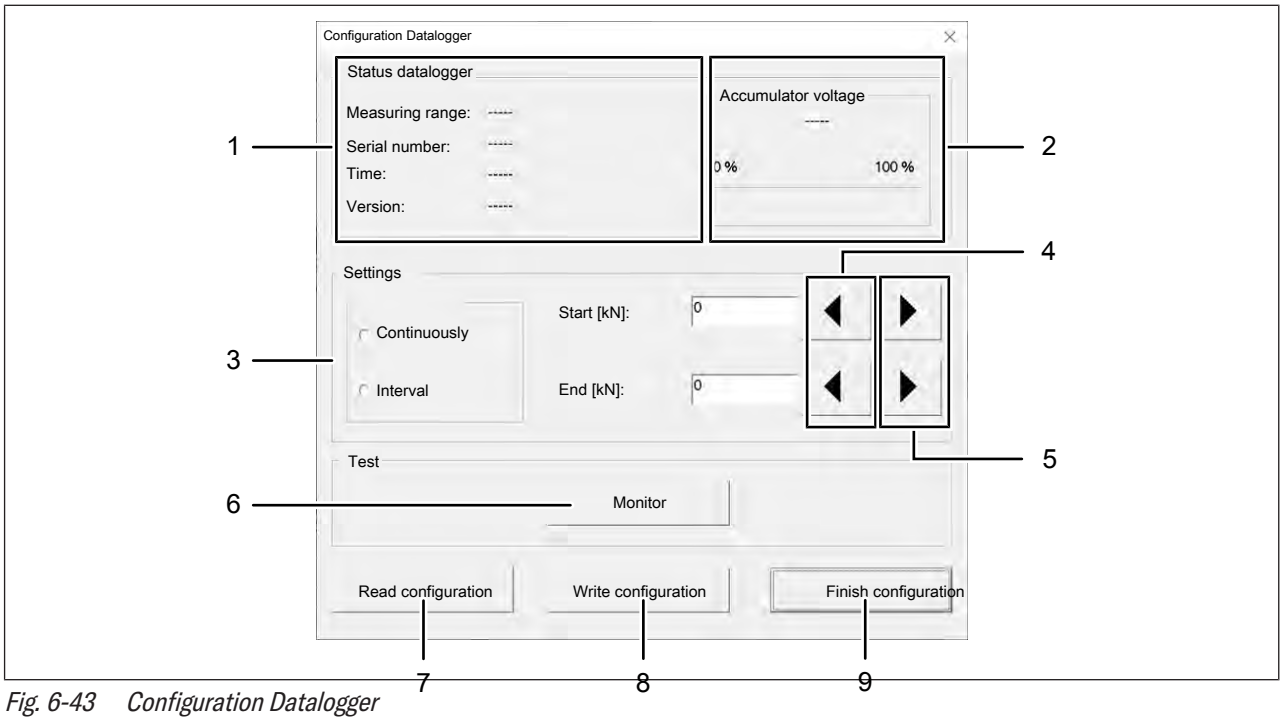



*Fig. 6-43 Configuration Datalogger*

*Tab. 6-29 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.<br>Choose "Interval" if tensile force measuring is to be carried out only in the range between "Start" and "End".<br>"Start" indicates the start value for tensile force measurement.<br>"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:

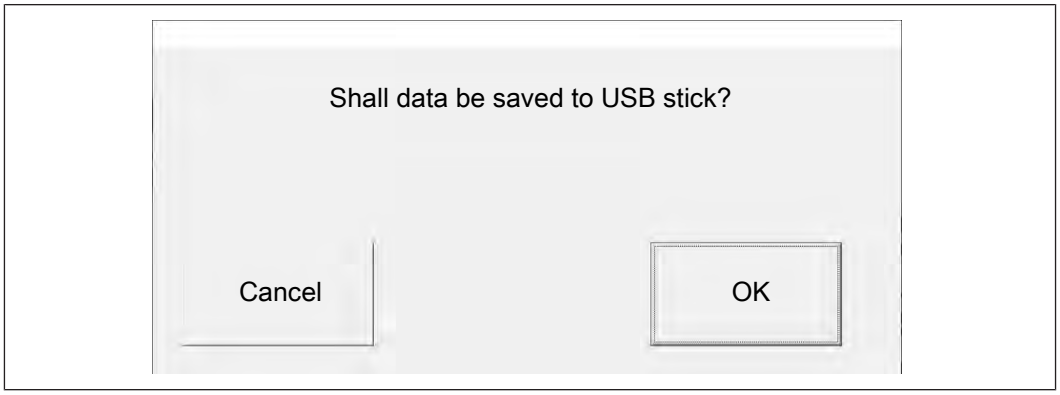



*Fig. 6-44 Saving the tensile force data*

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:

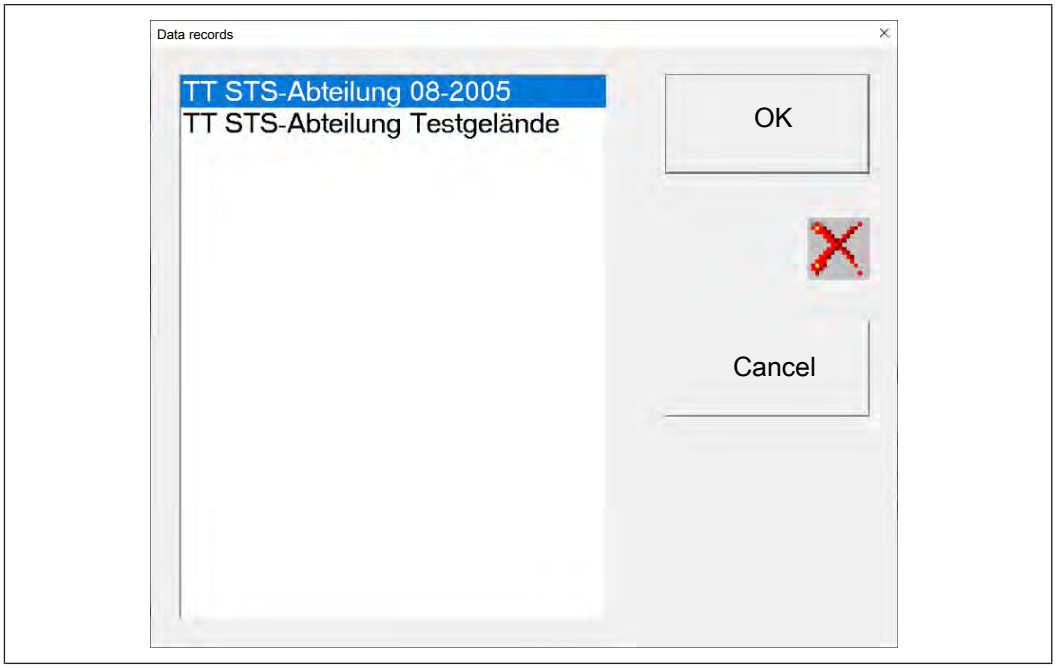



*Fig. 6-45 Selecting tensile force data to be deleted*

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:

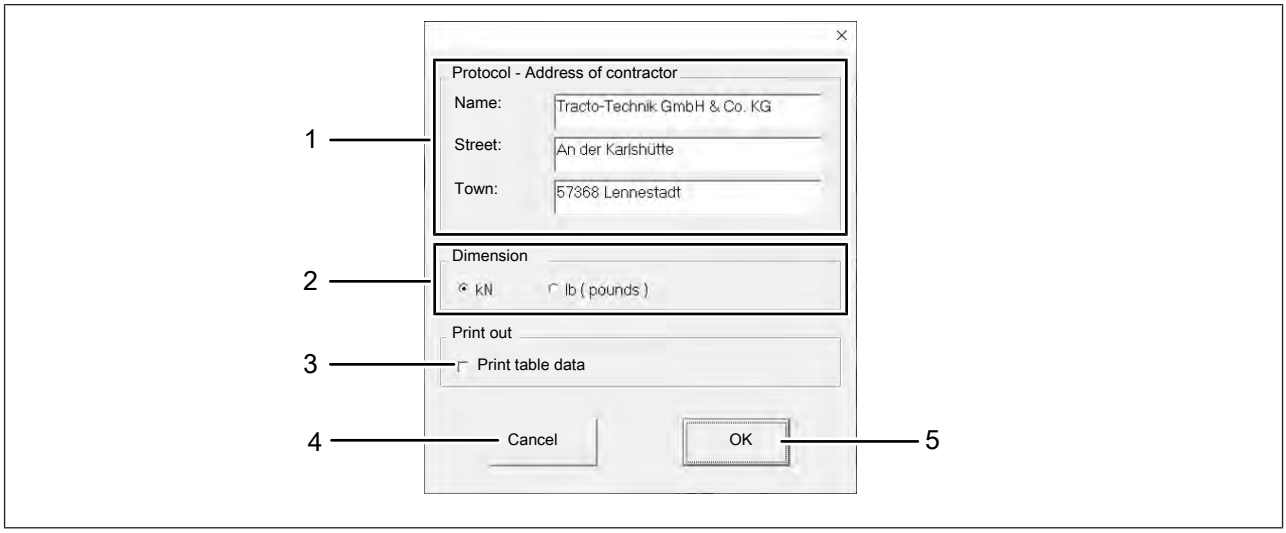



*Fig. 6-46 Grundolog – Options*

*Tab. 6-30 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. 6-47 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 6.2.8.4, page 158).

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

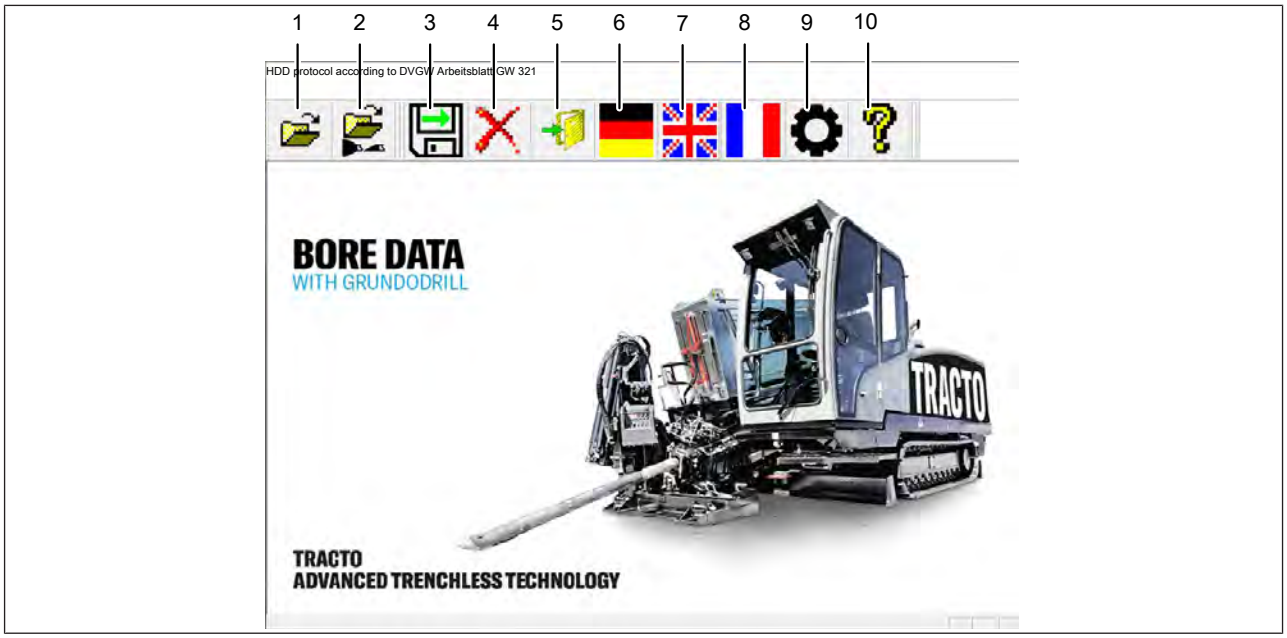



*Fig. 6-48 "Bore data" screen*

*Tab. 6-31 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 196).<br>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 198).<br>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 201). |
| 4 | >>Delete<< button | Opens a window for selecting stored DAT files (chapter 6.2.10.5, page 201).<br>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 200). |
| 10 | >>Information<< button | Opens a window displaying programme information (chapter 6.2.10.6, page 202). |

### *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:

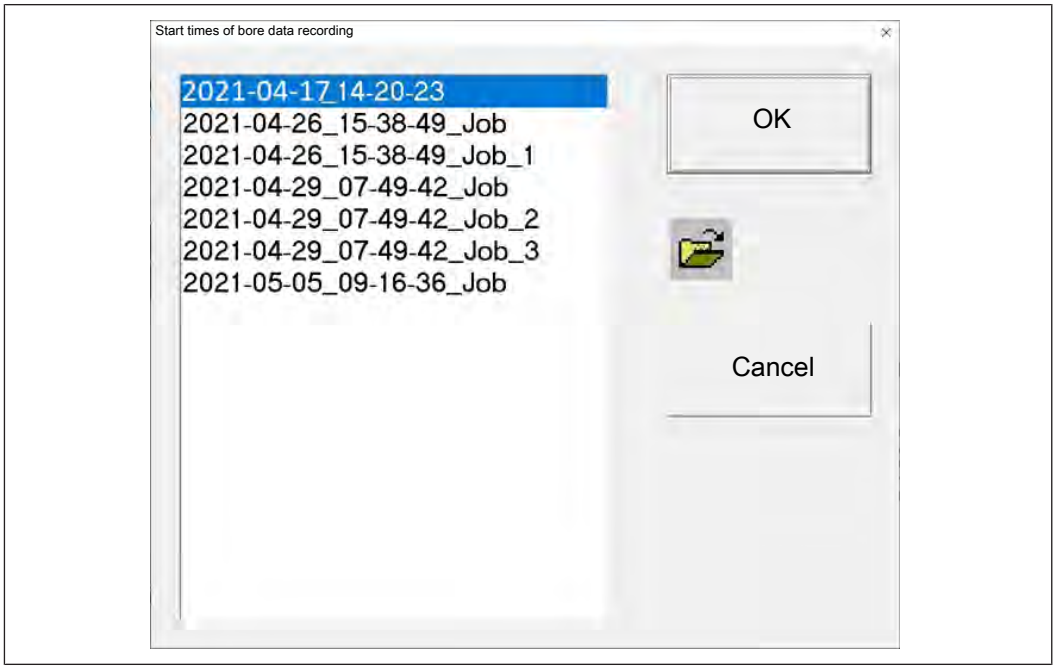



*Fig. 6-49 Selecting bore data file*

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.

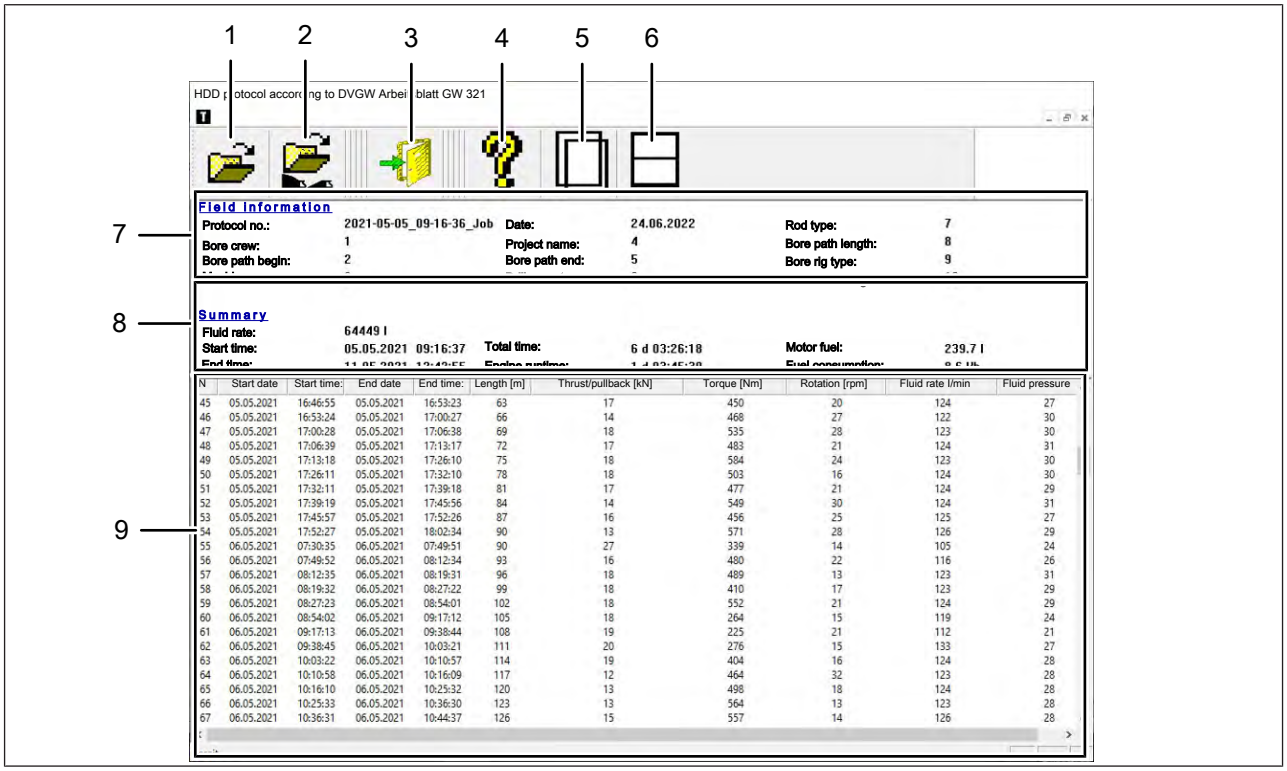



*Fig. 6-50 Bore data protocol*

*Tab. 6-32 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 196).<br>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 198).<br>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 202). |
| 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:

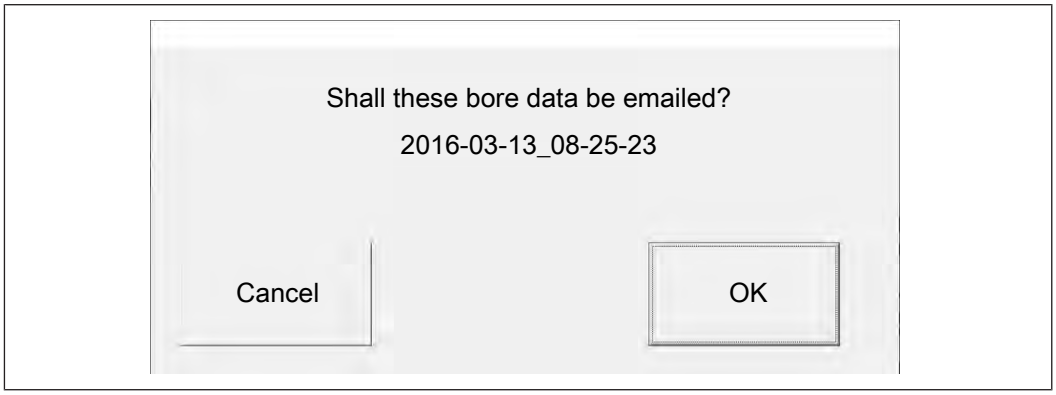



*Fig. 6-51 Sending bore data*

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:

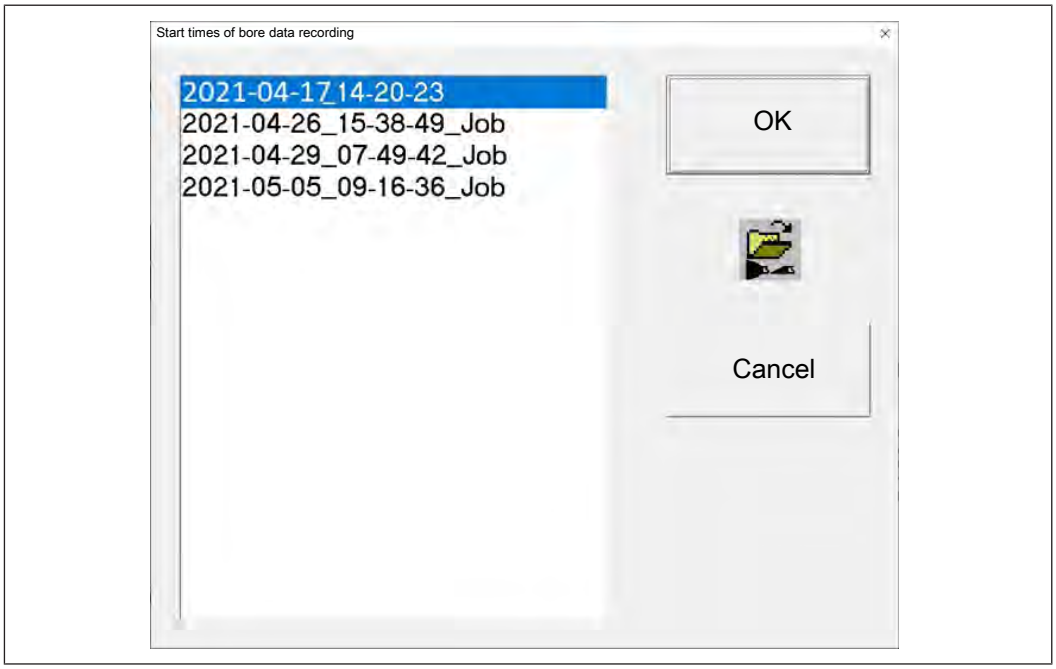



*Fig. 6-52 Selecting bore data to be opened*

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.

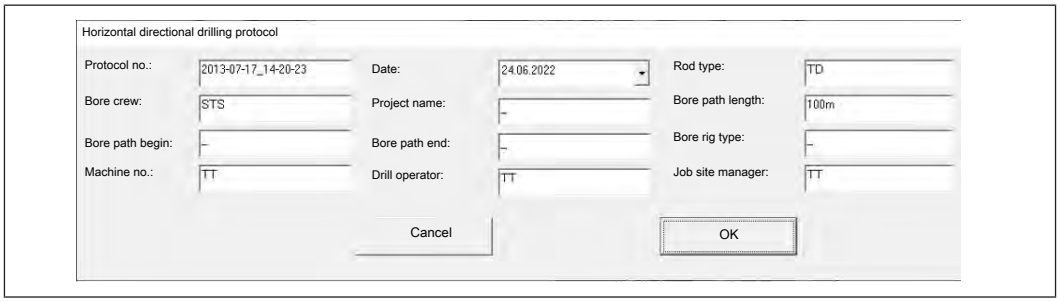



*Fig. 6-53 Field description for bore data*

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. 6-54 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:

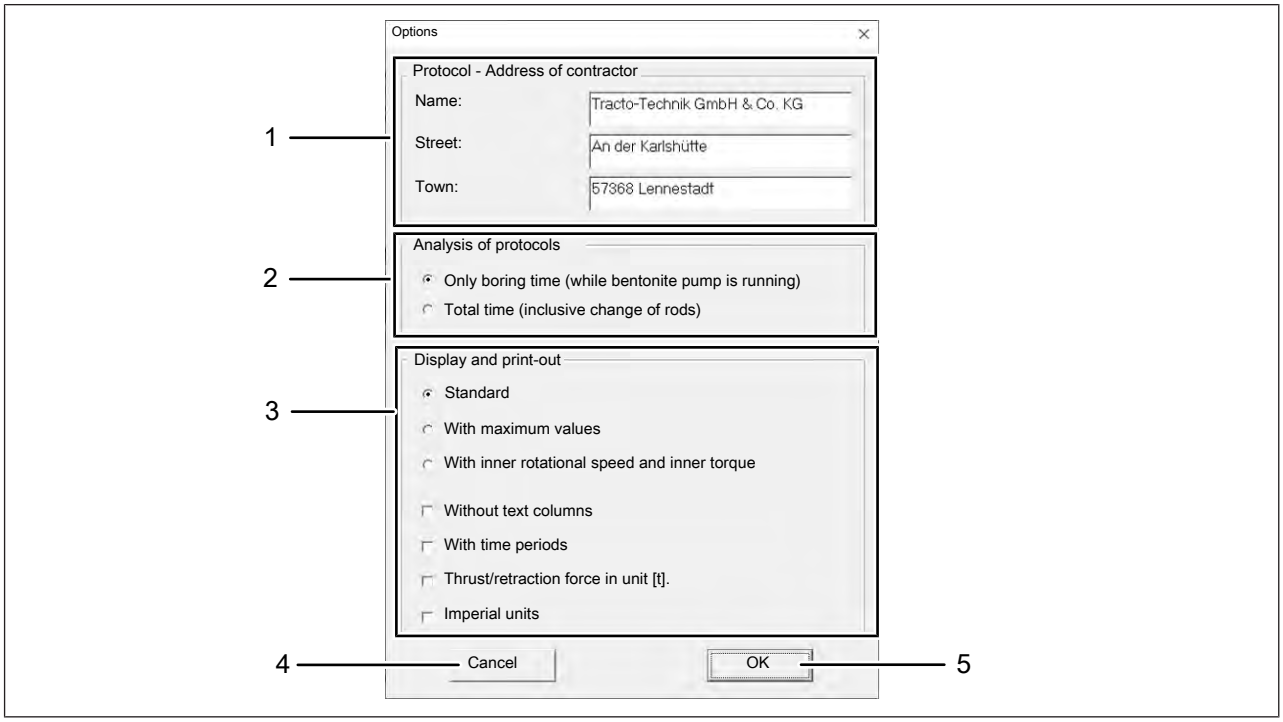



*Fig. 6-55 Bore data - Options*

*Tab. 6-33 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.<br>**Info!**<br>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:

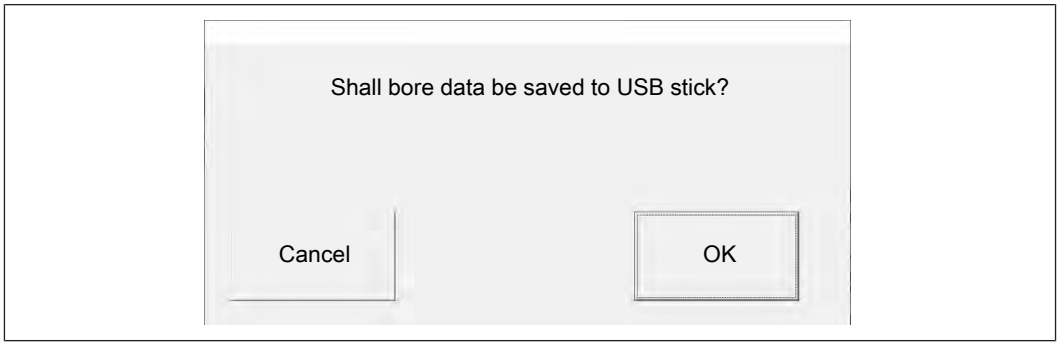



*Fig. 6-56 Saving bore data*

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:

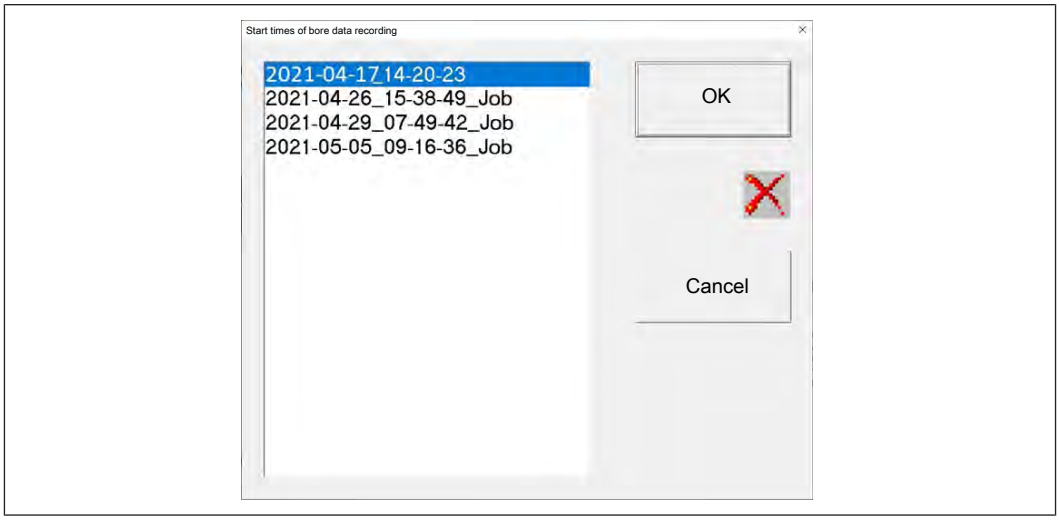



*Fig. 6-57 Deleting bore data*

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. 6-58 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 the panel in front of the right joystick.

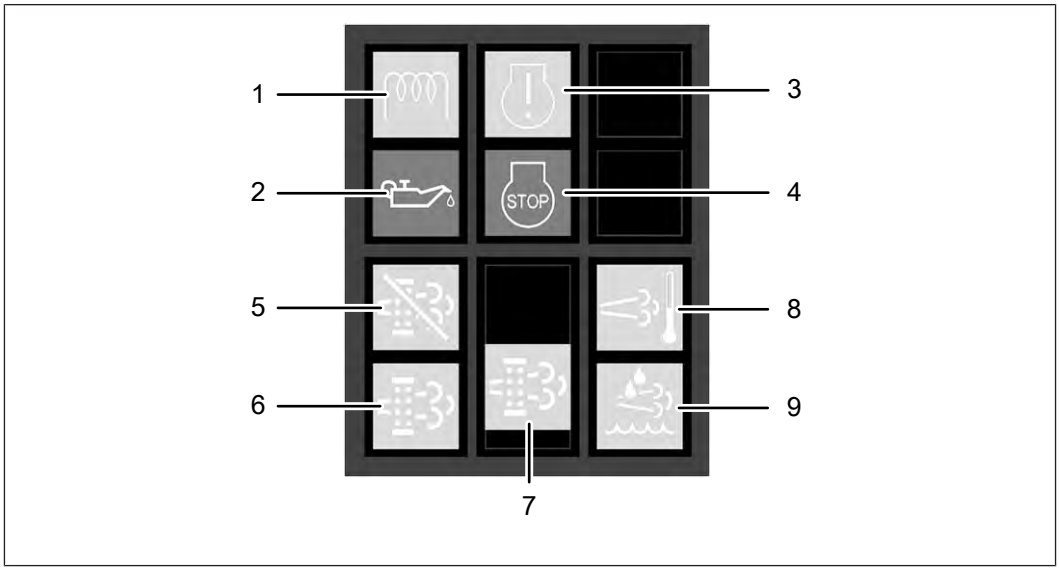



*Fig. 6-59 Indicators diesel engine*

*Tab. 6-34 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.<br>– 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

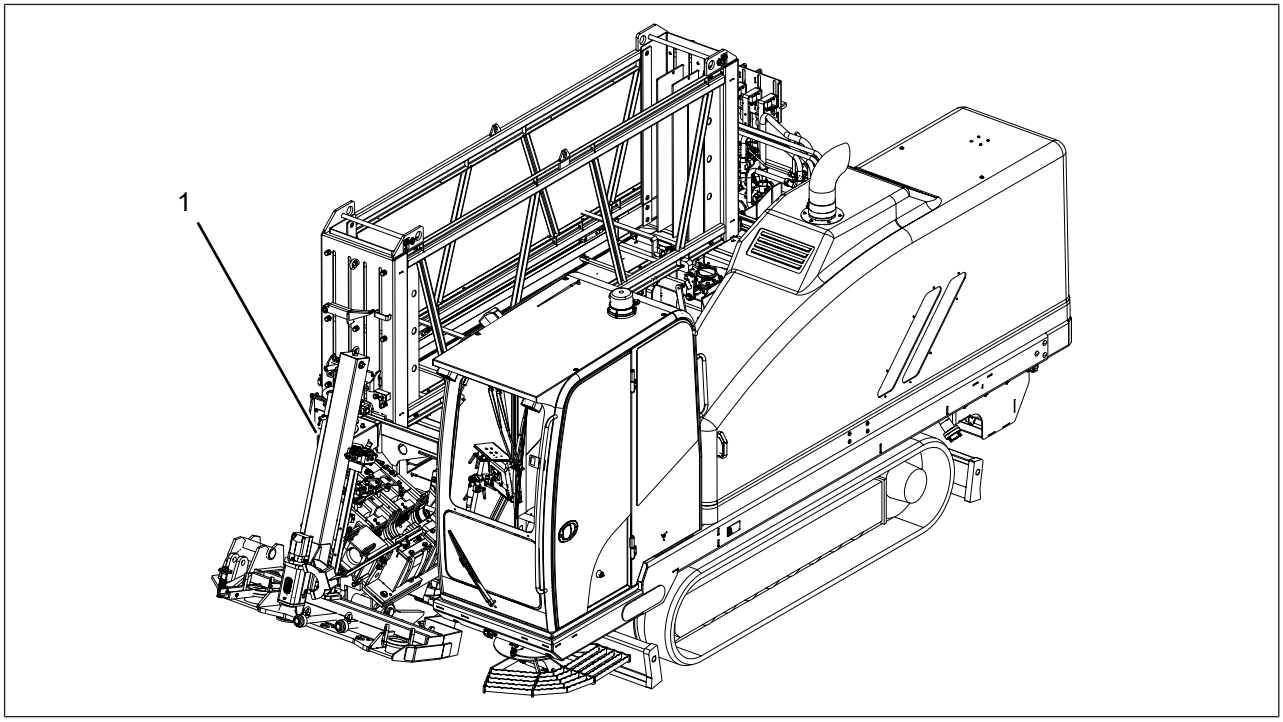



*Fig. 6-60 Pressure relief high-pressure cleaning pump*

*Tab. 6-35 Operating elements high-pressure cleaning pump*

| Item | Operating element | Meaning/function |
|---|---|---|
| 1 | Ball valve pressure relief high-pressure cleaning pump | For pressure relief of the fresh water connection in case the high-pressure cleaning pump has been switched on without connecting the high-pressure cleaning gun or the rod cleaning nozzle first |

## 6.2.13 Operator seat

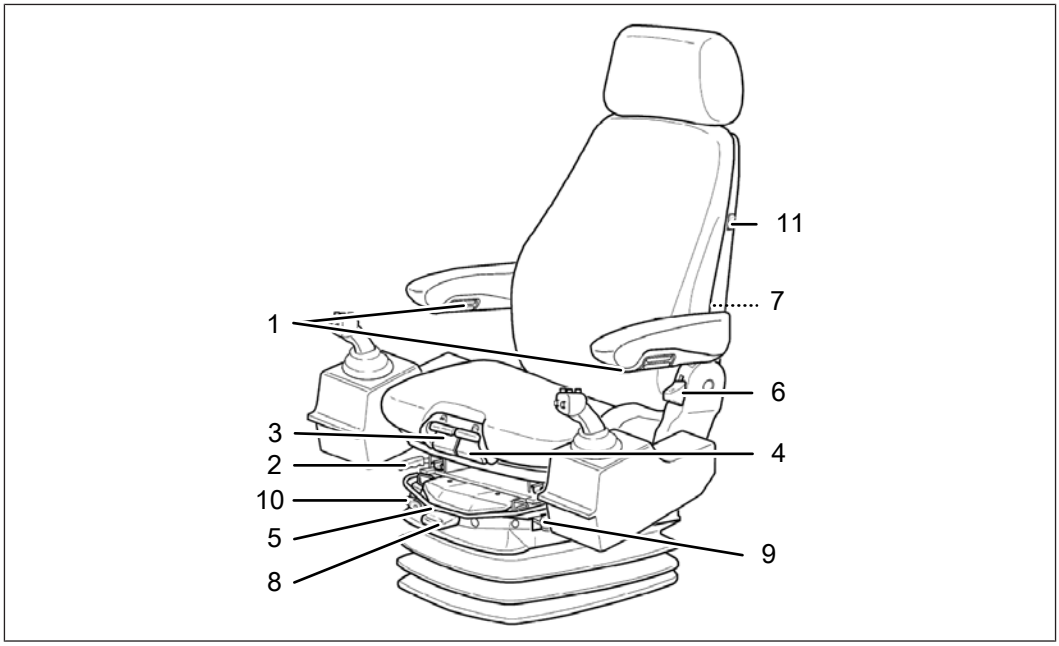



*Fig. 6-61 Operator seat*

*Tab. 6-36 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 (pneumatically). |
| 9 | Horizontal suspension | switches the horizontal suspension on or off. |
| 10 | Shock absorption adjustment | adjusts the shock absorption in 3 levels. |
| 11 | Seat heating | switches the seat heating on or off. |

### 6.2.14 Further elements in the cab

The following operating elements are installed in the cab:

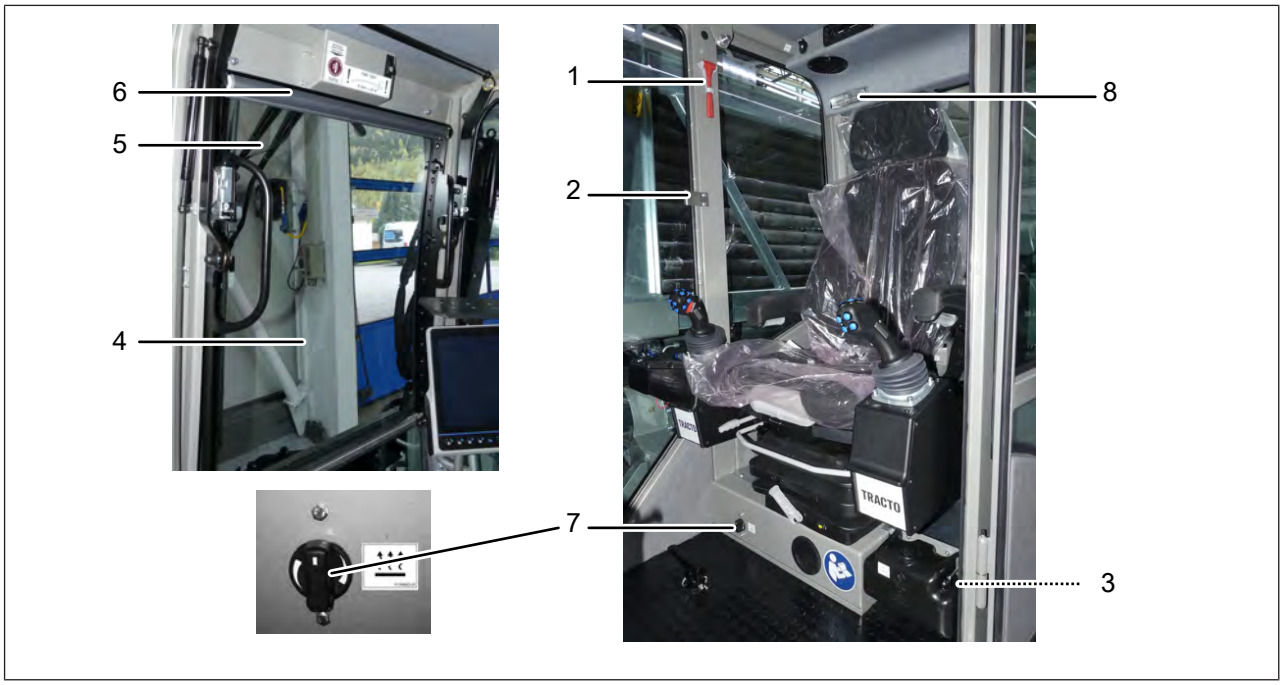



*Fig. 6-62 Elements in the cab*

*Tab. 6-37 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<br>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.<br>You can switch the lamp on and off by shifting it sideways. |

## 6.2.15 Operating elements behind the operator seat

Behind the operator seat you can find the following operating elements:

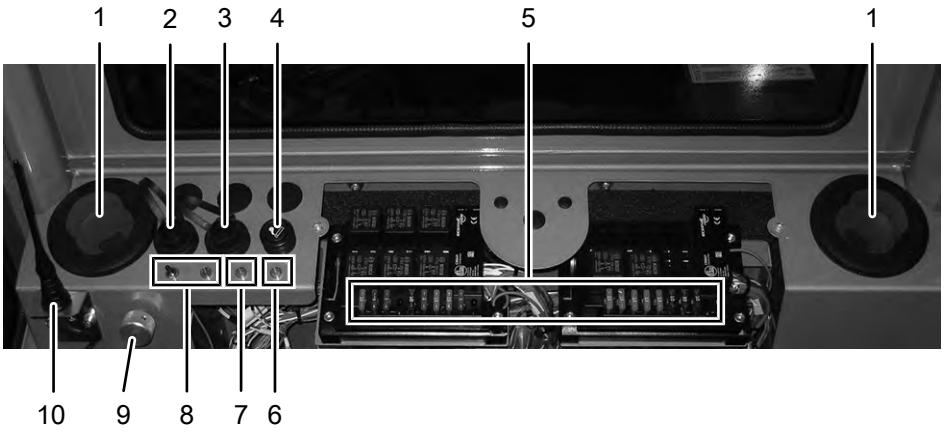



*Fig. 6-63 Operating elements behind the operator seat*

*Tab. 6-38 Operating elements behind the operator seat*

| No. | Operating element | Meaning/function |
|---|---|---|
| 1 | Ventilation elements | To open or close the cab ventilation |
| 2 | Connection tensile force measuring system | To connect the tensile force measuring system |
| 3 | Connection wire-controlled measuring system | To connect the wire-controlled measuring system |
| 4 | 24 V connection | For a 24 V power supply |
| 5 | Electrical vehicle fuses | Protect the electrical components |
| 6 | LED indicator | Green = indicator light for fuse testing |
| 7 | LED indicator for the control unit | The green LED (right) flashes cyclically and indicates the operating status of the control unit. |
| 8 | Flip switch and LED indicator for emergency mode | Flip switch up: emergency mode activated<br>Flip switch down: emergency mode deactivated<br>When emergency mode is switched on, the LED is illuminated in red. |
| 9 | Diesel speed potentiometer | Only active when the control unit failed:<br>For manual adjustment of the rotational speed of the diesel engine |
| 10 | Radio antenna | For the wireless remote control |

## 6.2.16 Operating panels for wire-controlled drilling

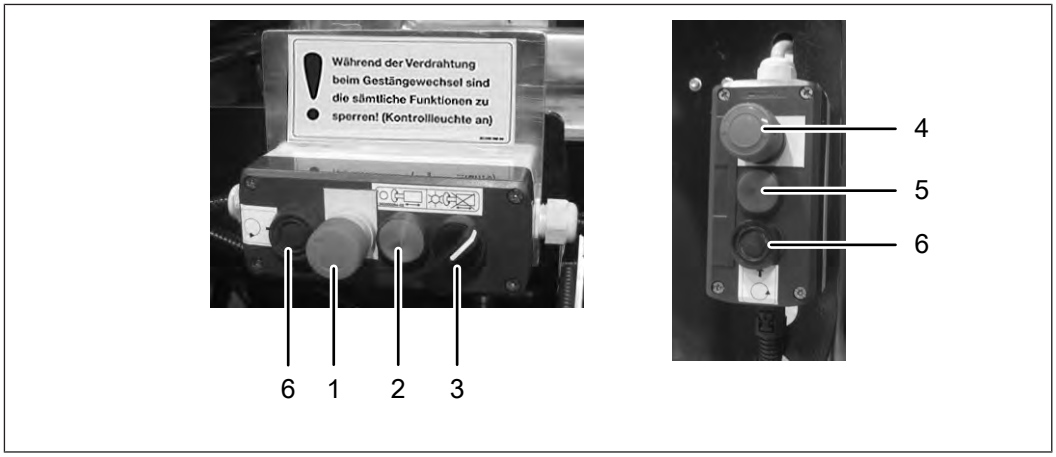



*Fig. 6-64 Operating panels for wire-controlled drilling*

*Tab. 6-39 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.<br>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 | Push button | Rotates the inner rod/hollow shaft. |

### 6.2.17 Step grid

To swivel out the step grid, pull the index bolt (1) upwards. Swivel out the step grid until the index bolt engages.

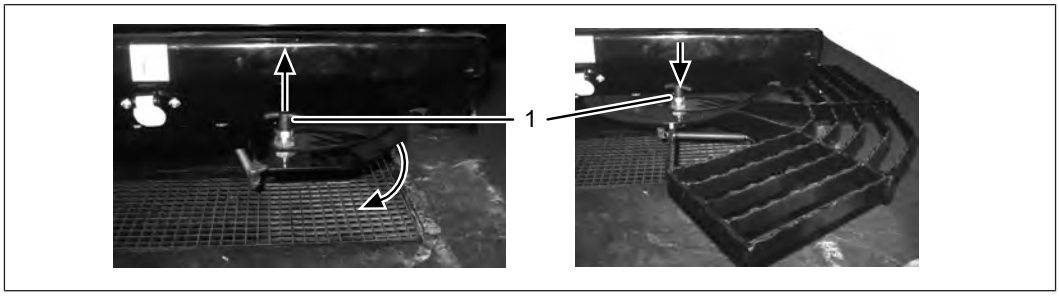



*Fig. 6-65 Swivelling out the step grid*

To swivel in the step grid, pull the index bolt (1) upwards and swivel in the step grid until the index bolt engages again.

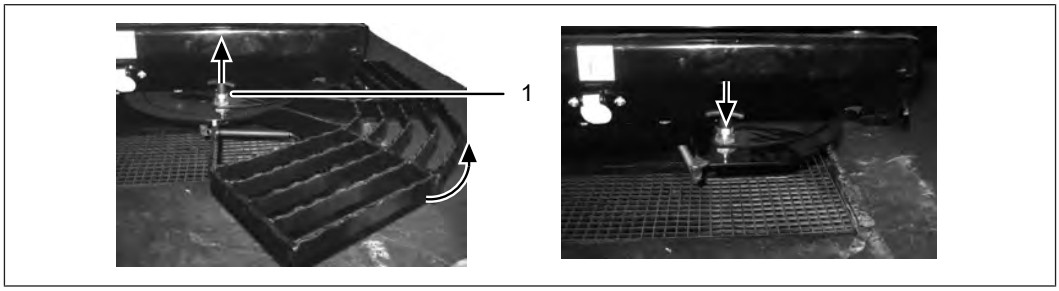



*Fig. 6-66 Swivelling in the step grid*

### 6.2.18 Rod lubrication

The rod lubrication nozzle must be positioned exactly above the connection point for the drill rods to be screwed on.

Use the hand lever (1) of the rod lubrication to align the nozzle precisely. By using the hand lever (1) you can adjust the rod lubrication in the direction of the arrow.

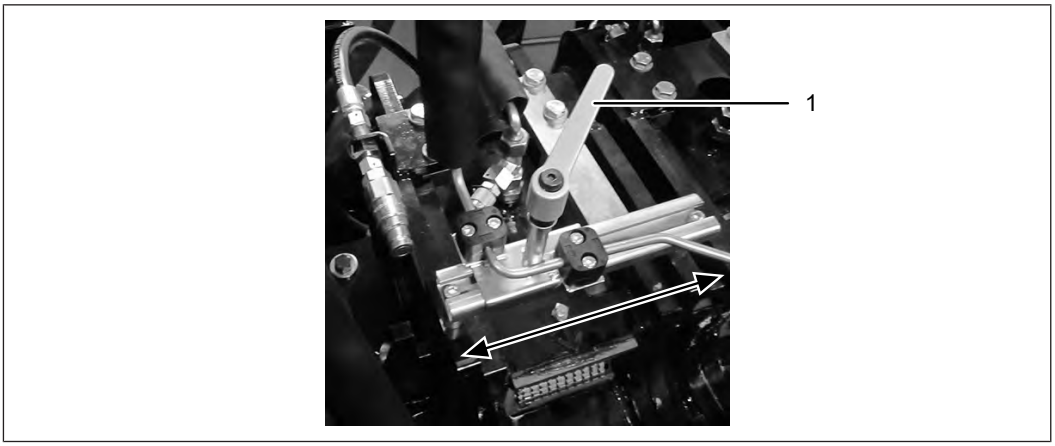



*Fig. 6-67 Hand lever for adjustment of the rod lubrication*

### 6.2.19 Anti-jamming function

The anti-jamming function serves to reduce the thrust pressure if the rotation pressure exceeds 80 % 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). The anti-jamming function is switched off when the lever is positioned vertically to the line.

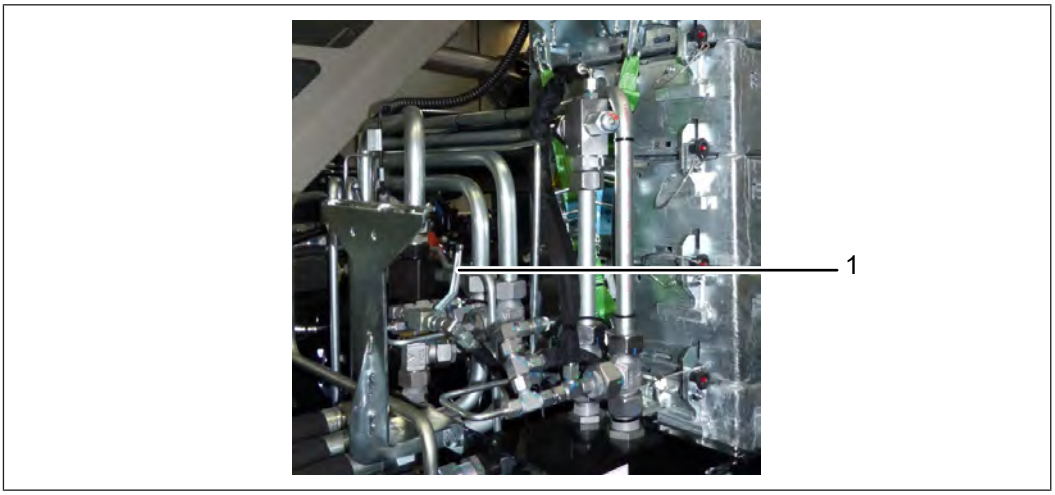



*Fig. 6-68 Ball valve for setting the anti-jamming function*

## 6.2.20 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/stacking boxes 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.

### *6.2.20.1 Emergency hydraulic system*

The operating elements behind the protection cover underneath the rod box/stacking boxes 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:

**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.

1. Set the desired rotational speed of the diesel engine at the potentiometer behind the tailgate.
   The potentiometer is only functional when the engine control is disturbed.

2. Open the protective flap.



*Fig. 6-69 Opened protective flap (example illustration)*

3. Loosen the nut (2) of the release valve.
4. Screw the inner screw (1) completely into the block.
5. Carefully re-tighten the nut.

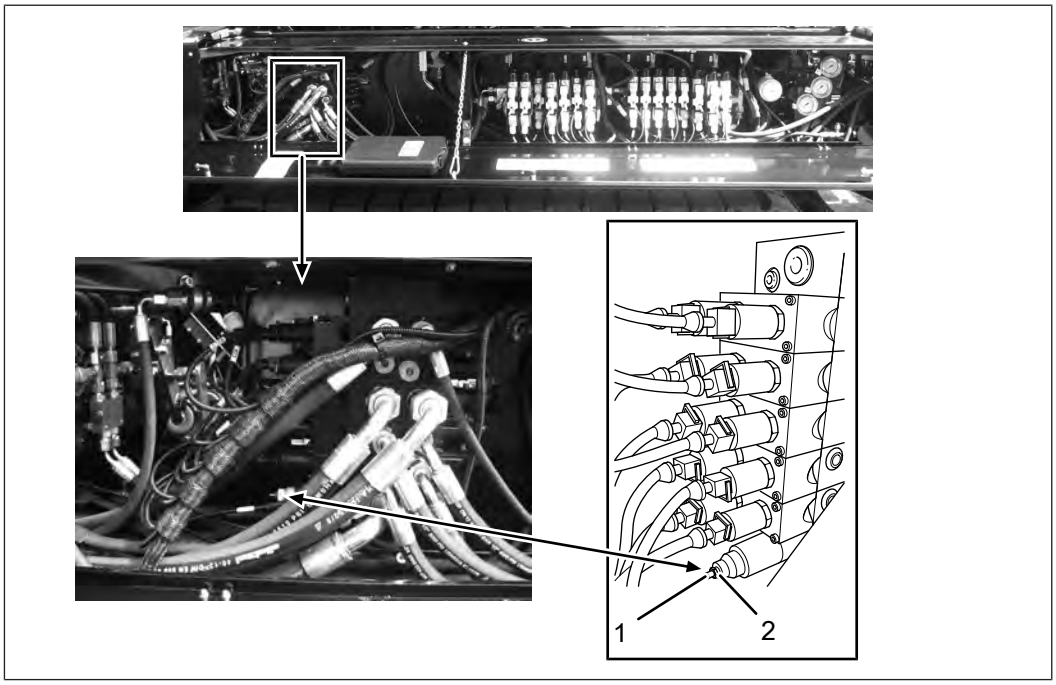



*Fig. 6-70 Preparing the emergency hydraulic system*

6. For operation, position an operating lever (1) on the desired valve and move it towards the corresponding function.

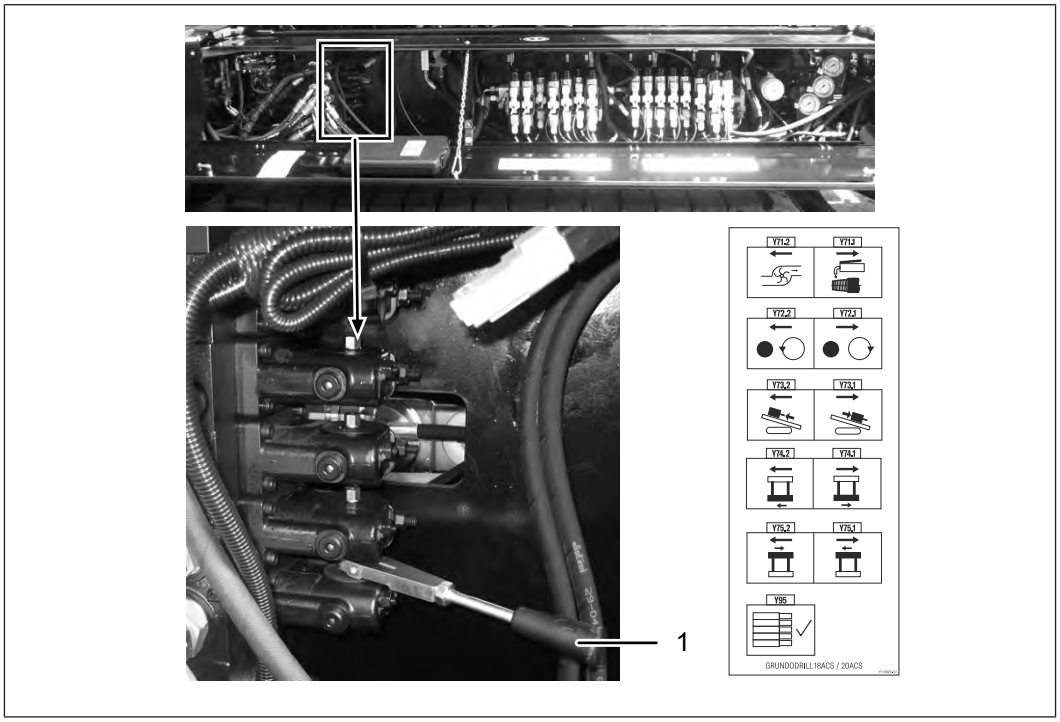



*Fig. 6-71 Manual actuation of the emergency hydraulic system*

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.

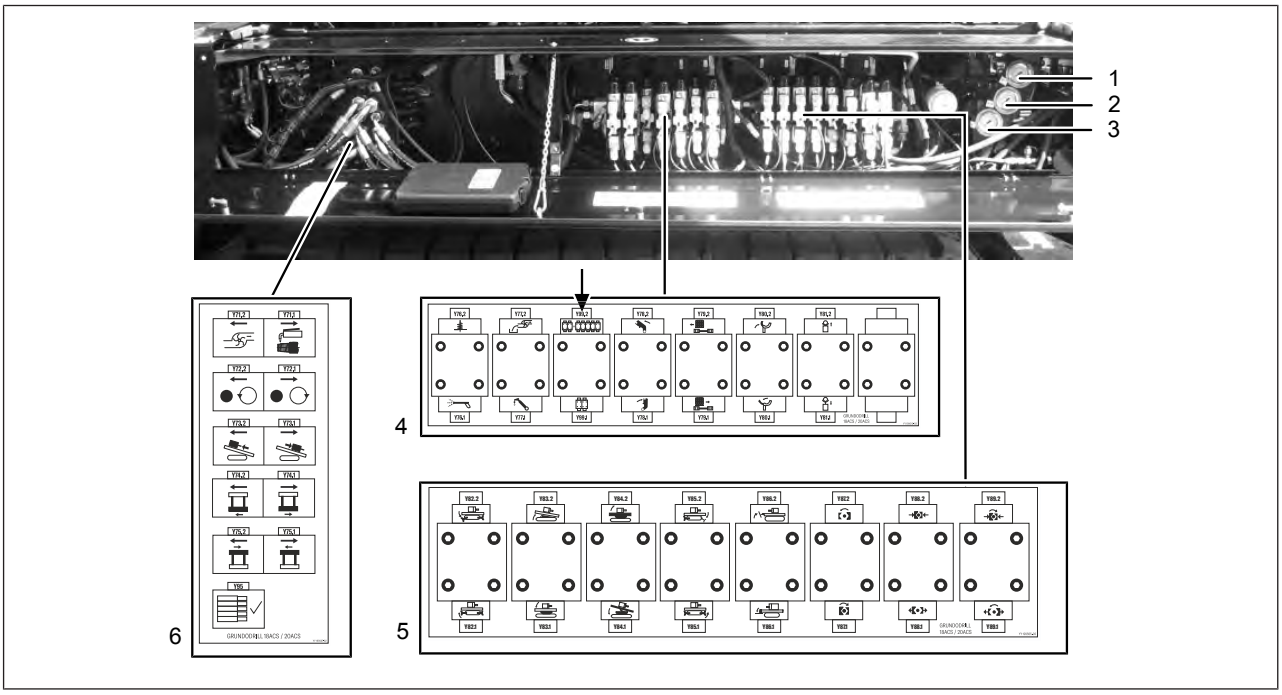



*Fig. 6-72 Valves for the emergency hydraulic system*

*Tab. 6-40 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 |
| 4, 5 | Valves with manual controls top and bottom | Auxiliary functions:<br>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:<br>drilling fluid / rod lubrication<br>rotation<br>thrust<br>right crawler track<br>left crawler track<br>release valve |

***Operating the emergency hydraulic system***

Work with another person.

***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.

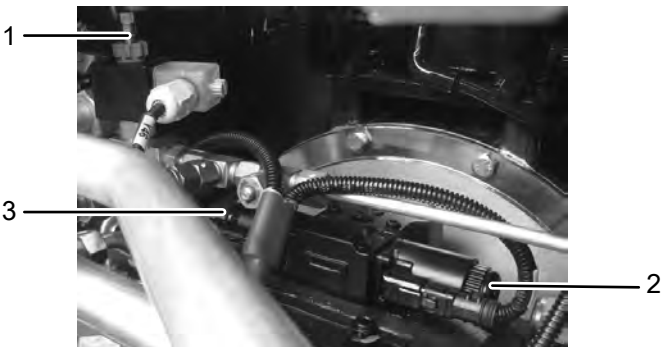



*Fig. 6-73 Release valve rotation and selection of rotational direction*

2. Manually start the rotation at the rotation pump.
   Press the button (2) to make the sub-saver rotate counter-clockwise.
   Press the button (3) to make the sub-saver rotate clockwise.
3. Terminate the emergency mode of the rotation by turning the manual control of the release valve to the left.

***Terminating the emergency hydraulic system***

1. Loosen the nut (2) of the release valve.
2. Unscrew the inner screw (1) back to its original position.
3. Carefully re-tighten the nut.

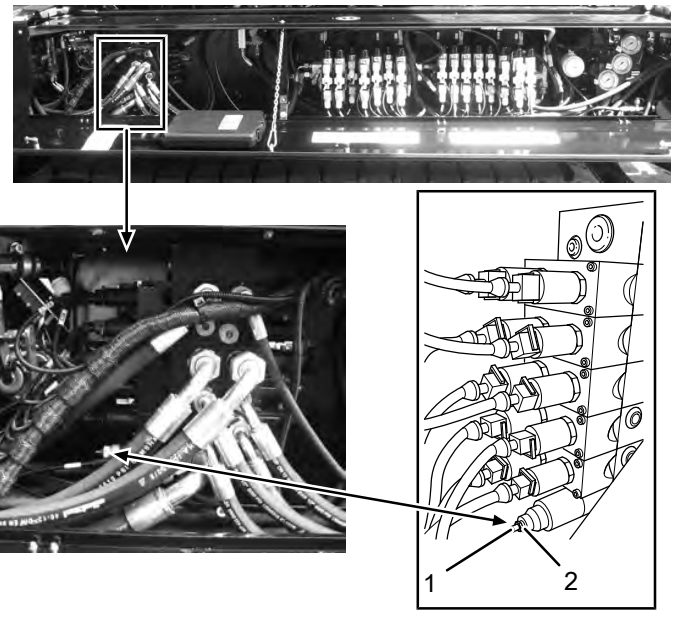



*Fig. 6-74 Terminating emergency hydraulics mode*

### *6.2.20.2 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 6.2.8.4, page 158).
2. Tap the input field (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.

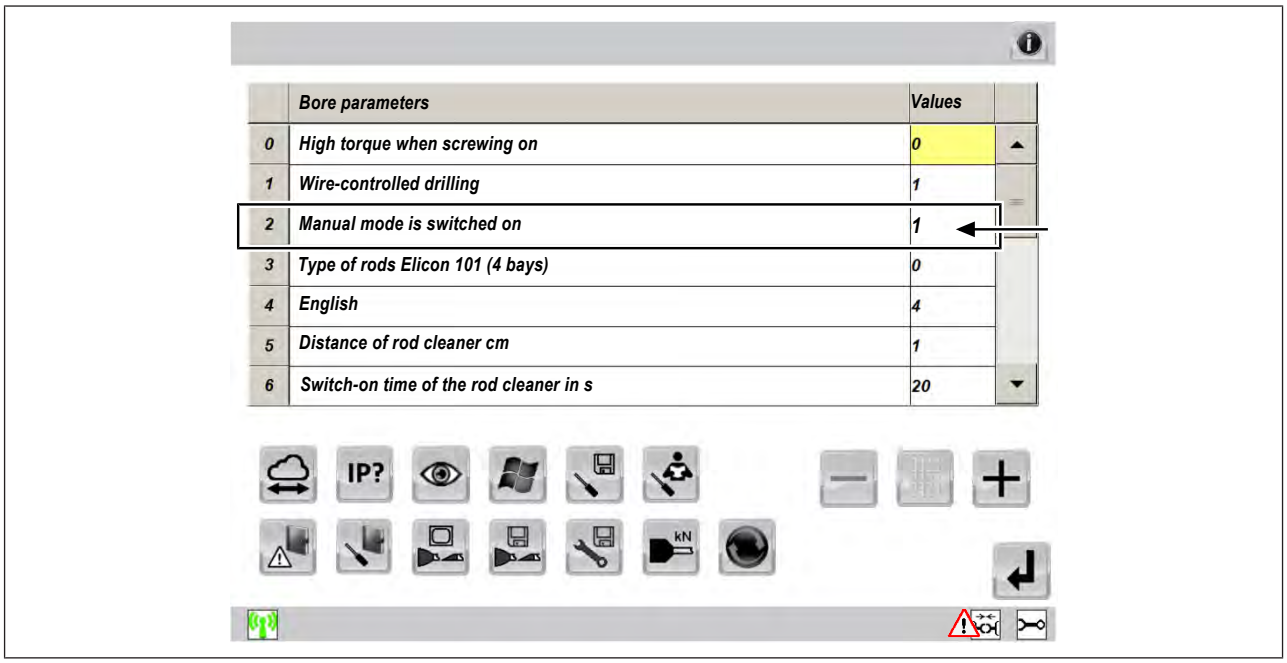



*Fig. 6-75 "Bore parameter settings" screen – emergency mode*

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

Push up the flip switch (1) for emergency mode. The flip switch and LEDs for emergency mode are located behind the operator seat.

– The red LED (2) is illuminated.

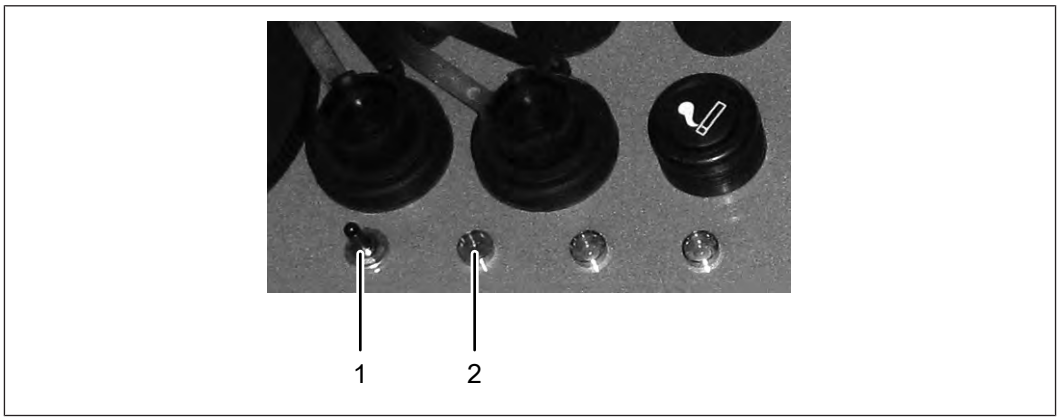



*Fig. 6-76 Flip switch and LED for emergency mode*

***Terminating emergency mode***

To end the emergency mode

- re-set the value (see arrow in the illustration) of the "Bore parameter settings" screen to "0" or
- switch the flip switch off again.

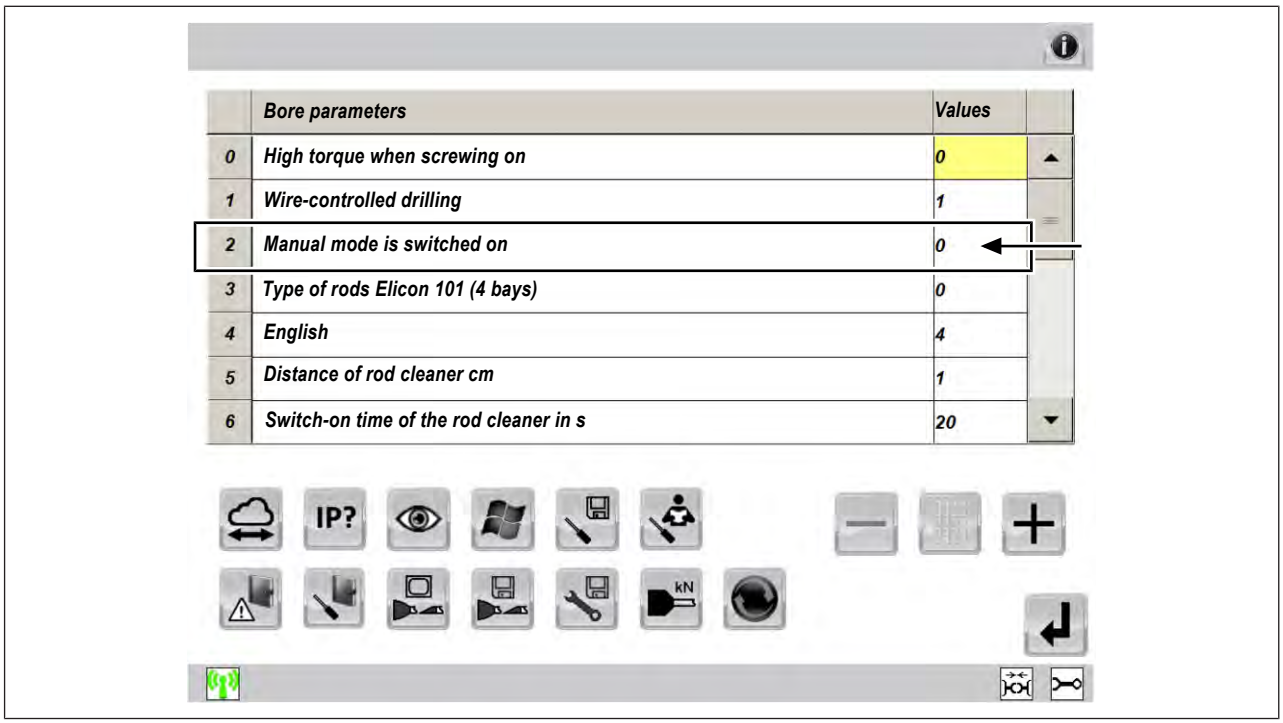



*Fig. 6-77 "Bore parameter settings" screen*

## 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
– The rod holding bar has been removed.
– Emergency mode is deactivated (chapter 6.2.20, page 211)
– 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

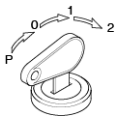
***Conditions***

- 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 86).

**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

**Info!**
This chapter applies to bores with rock drilling unit.

If you are using a flex rod, screw it on directly behind the rock drilling unit.

**NOTICE**

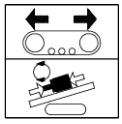
**Oils and greases hazardous to the environment!**



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.

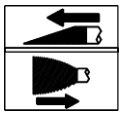
1. Always grease the drill rod threads!
   Avoid excessive grease on the drill rods. Prevent oils and greases from penetrating into the soil, water or sewage system.



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.



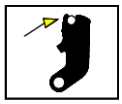
4. Switch over from pull-in to pilot bore on the right joystick panel.

**⚠ WARNING**

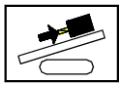
**Danger of crushing between toothed rack and pinion!**



- Keep out of the danger area!
- Wear hand protection.

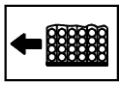


5. If necessary, swing the gripper arms into the rod retaining position by moving the right joystick to the right.





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. Use the push button (press once) on the left joystick to move the rod box/ stacking boxes outwards in a way that bay 1 is positioned over the bore axis.

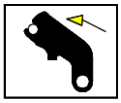
**Info!**
To ensure an even wear of the drill rods, please start in turn with the outer and the inner bay.



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.



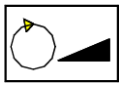
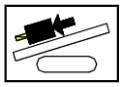
10. Then swing the gripper arms with the drill rod into the bore axis by pushing the right joystick to the left. The hydraulic jacks move upwards.

**Info!**
You can only swing the gripper arms into the bore axis when the thrust rig is completely reversed.

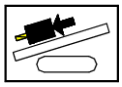
**NOTICE**

**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 (outer rod / drill rod) by pushing the left joystick forward and holding it. The inner rod automatically rotates along with the outer rod (if the front clamp is closed).
Simultaneously push the right joystick forward to advance the thrust rig until the sub-saver and the drill rod are 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.
Simultaneously swing the gripper arms underneath the rod box/stacking boxes 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

**Info!**
This chapter applies to bores with twin tube rods and rock drilling unit.

**⚠ DANGER**

**Rotating drill rod!**

Contact with the rotating drill rod can lead to injuries or death!

- Only screw the rock drilling unit to the drill rod by hand (or with a suitable tool) using a suitable lifting device.
- 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.

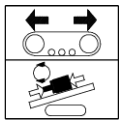
**⚠ WARNING**

**Risk of injury due to unintentional joystick actuation!**

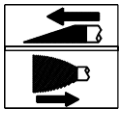
When exiting the cab while the engine is running, there is a risk of actuating the left joystick unintentionally and thus initiating a machine movement. The machine movement could injure yourself or others.

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

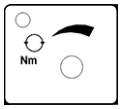
1. Attach a suitable drilling tool to the bore head assembly.



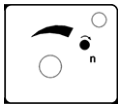
2. If necessary, switch over from drive mode to bore mode on the right joystick panel.



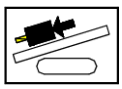
3. Switch over from pull-in to pilot bore on the right joystick panel.




4. Set the potentiometer for the rotation of the inner rod on the left joystick panel to 100 % to achieve the maximal rotation speed.




5. Set the potentiometer for the rotation of the outer rod on the left joystick panel to 100 % to achieve the maximal rotation speed.



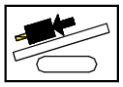
6. Push the right joystick forward to advance the thrust rig until the drill rod protrudes from the front of the clamp.

7. Manually screw the rock drilling unit onto the first drill rod using a suitable lifting device.

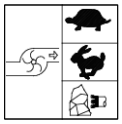
**NOTICE**

**Potential damage to the drill rod if the rock drilling unit is insufficiently secured!**

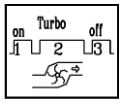
- Make sure that the threaded shoulders of the drill rod and the rock drilling unit are adjacent to each other.



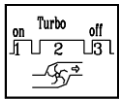
8. Push the right joystick forward to advance the thrust rig until the drill head reaches the ground.



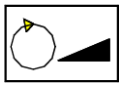
9. Switch the drilling fluid to tortoise (low flow rate) on the left joystick panel.



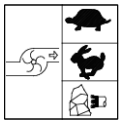

10. Switch on the drilling fluid pump on the left joystick by briefly pressing the push button.
11. Check whether drilling fluid exits from all nozzles of the drill head.



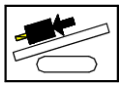

12. Switch the drilling fluid off again by briefly pressing the push button on the left joystick.



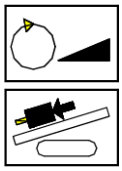
13. Push the left joystick forward to turn the drill rod exactly into "6 o'clock position".




14. Set the drilling fluid to tortoise (low flow rate) at the left joystick panel and switch on the drilling fluid pump.

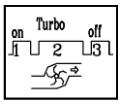


15. Push the right joystick forward to advance the thrust rig until the bore tip has entered the ground by approx. 30–40 cm.
16. Leave the drilling fluid switched on.

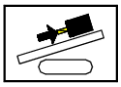


17. Switch on clockwise rotation by pushing the left joystick forward and holding it in this position.
    At the same time, push the right joystick forward to drive the thrust rig forward until the drill rod has completely entered the ground, or until the thrust rig has driven to the front stopper.

**Info!**
This way the rod connection lies exactly between both clamps.

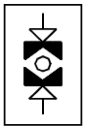



18. Switch the drilling fluid off again by briefly pressing the push button on the left joystick.



19. 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).



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.

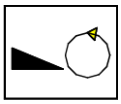
**Info!**
As soon as the clamp is closed, the valve for drilling fluid pressure relief will open automatically.

**⚠ WARNING**

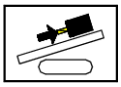


**Danger of crushing between toothed rack and pinion!**

- Keep out of the danger area!
- Wear hand protection.



21. Fully unscrew the drill rod from the sub-saver counter-clockwise by pulling the left joystick back.





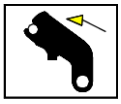
22. Completely reverse the thrust rig to the stop position by pulling the right joystick backwards.
By pressing the >>Rapid motion on<< push button on the right joystick, you can quickly reverse the thrust rig.

### 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.

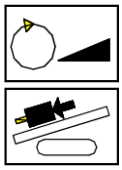


2. Then swing the gripper arms with the drill rod into the bore axis by pushing the right joystick to the left. The hydraulic jacks move upwards.

**NOTICE**

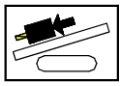
**Possible damage to the threads due to too fast rotation or too high thrust speed!**

- 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.

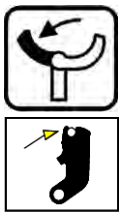


3. Switch on clockwise rotation (outer rod / drill rod) by pushing the left joystick forward and holding it. The inner rod automatically rotates along with the outer rod (if the front clamp is closed).
Simultaneously push the right joystick forward to advance the thrust rig until the sub-saver and the drill rod are screwed together.

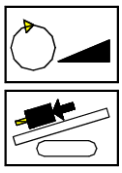
4. Switch off the rotation by letting go of the left joystick.



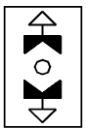
5. Push the right joystick forward to slowly advance the thrust rig until the front end of the drill rod rests inside the clamp.



6. Open the rod grippers by pushing the left joystick to the left and holding it in this position.
Simultaneously swing the gripper arms underneath the rod box/stacking boxes 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!**



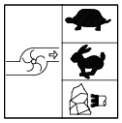
7. Switch on clockwise rotation (outer rod / drill rod) by pushing the left joystick forward and holding it. The inner rod automatically rotates along with the outer rod (if the front clamping is closed).
Simultaneously push the right joystick forward to advance the thrust rig until the two drill rods are screwed together. Always screw on the rods with maximum torque.



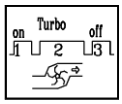
8. Close the clamp via the push button on the right joystick.

***Straight bores***

**Info!**
Only carry out the following working steps in case of straight bores!

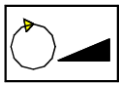


9. Switch the drilling fluid to tortoise (low flow rate) on the left joystick panel.

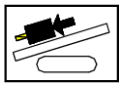



10. Switch on the drilling fluid pump on the left joystick by briefly pressing the push button.
11. Wait until the pressure has built up on the gauge in the "Bore mode" screen (chapter 6.2.8.3, page 155).

**Info!**
For quicker rod filling you can press the push button again and hold onto it.



12. Switch on clockwise rotation by pushing the left joystick forward and holding it in this position.



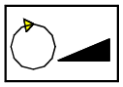
13. Push the right joystick forward to advance the thrust rig.

***Correcting the drilling direction***

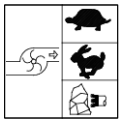
**NOTICE**

**Potential rod damage when falling below the minimum bending radius!**

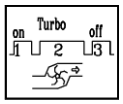
- Observe the minimum bending radius of the drill rods used. The relevant information can be found in the technical data (chapter 3.3, page 59).



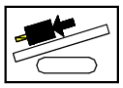
14. Push the left joystick gently forward to switch on clockwise rotation until the desired position is reached.
    Check the position using the detection system.
15. Afterwards, switch off the rotation by bringing the left joystick into centre position.



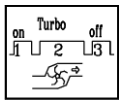
16. Switch the drilling fluid to tortoise (low flow rate) on the left joystick panel.




17. Switch on the drilling fluid pump on the left joystick by briefly pressing the push button.

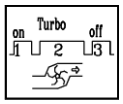


18. Push the right joystick forward to advance the thrust rig.

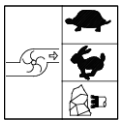



19. Switch the drilling fluid off again by briefly pressing the push button on the left joystick.
20. Stop the thrust of the thrust rig by letting go of the right joystick.
21. Locate the drill head (see instructions provided by the manufacturer of the detection system) and compare its position with the destined bore path (height and side position).
    In case of any deviations, carry out the required corrections again!

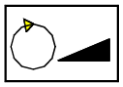
***Continuing drilling operation***



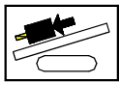

22. Switch on the drilling fluid pump on the left joystick by briefly pressing the push button.



23. Switch the drilling fluid to tortoise (low flow rate) on the left joystick panel.
24. Wait until the pressure has built up on the gauge in the "Bore mode" screen (chapter 6.2.8.3, page 155).



25. Switch on clockwise rotation by pushing the left joystick forward and holding it in this position.



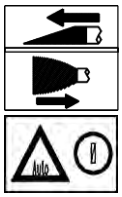
26. Push the right joystick forward to advance the thrust rig and to drive the drill rod further into the ground.



27. If necessary, switch on the mud pump to pump out the bore mud. To do so, keep the push button on the right joystick pressed.

Repeat this process until the pilot bore is completed.

### 6.6.2 Auto-bore during pilot bore



If the machine is in "Pilot bore" mode (see rocker switch on the right joystick panel), the drill rods will be added and screwed automatically (depending on the type of rod) if you briefly press the push button for automatic drilling on the left joystick once.
If auto-bore is switched on, the sub-saver will be detached from the rod string automatically and another drill rod will be added and screwed with the rod string.

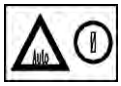
**Info!**
If you press the push button for automatic drilling on the left joystick panel twice in quick succession, a new drill rod will be taken out, the bore will be carried out automatically and another drill rod will be taken out subsequently. This process is repeated automatically (depending on the type of rod).
**Only activate this function when using a push drill head (pilot bore)!**

**⚠ DANGER** **Risk of injury due to machine movements during auto-bore!**

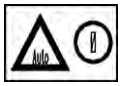
- Sit down on the operator seat to keep out of the machine's movement range.
- Remain seated until all working steps of the auto-bore have been completed.
- Make sure that nobody is standing in the machine's movement range.

***Requirements***

– The drilling fluid pump is switched on.
– The drilling fluid quantity is set.



1. Switch on auto-bore mode using the push button for automatic drilling on the left joystick.
   ⇨ A new drill rod will be fed.
   ⇨ The rod connection is now situated exactly between the two clamp jaws.
2. From this point onwards, assume control until the screw connection between drill rod and sub-saver is situated between the two clamp jaws again.



3. Automatic drilling can be interrupted by pressing the push button for automatic drilling on the left joystick again or by leaving the operator seat.

## 6.7 Drilling with standard rods

***Changing the rod box/stacking boxes***

For drilling with standard rods (TD73 or TD82) replace the rod box/stacking boxes containing twin tube rods with a rod box/stacking boxes containing standard rods (chapter 6.11, page 273 and chapter 6.9, page 250).

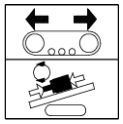
In order to drill with other rods (TD73 or TD82), the

- Clamping mechanism
- Magazine
- Rotational drive

must be converted and the machine's operating parameters must be modified.
For further information please contact the TRACTO-TECHNIK customer service (chapter 8, page 313).

Please proceed as follows:

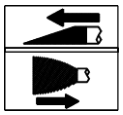
1. Make sure that a rod box/stacking boxes with standard rods (TD73 or TD82) are mounted.



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.



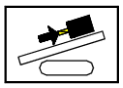
4. Switch over from pull-in to pilot bore on the right joystick panel.

**⚠ WARNING**



**Danger of crushing between toothed rack and pinion!**

- Keep out of the danger area!
- Wear hand protection.

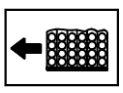




5. Completely reverse the thrust rig to the stop position by pulling the right joystick backwards.
   By pressing the >>Rapid motion on<< push button on the right joystick, you can quickly reverse the thrust rig.



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



7. Use the push button (press once) on the left joystick to move the rod box/stacking boxes outwards in a way that bay 1 is positioned over the bore axis.

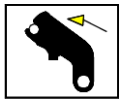
**Info!**
To ensure an even wear of the drill rods, please start in turn with the outer and the inner bay.



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!**

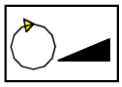


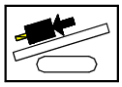
9. Close the rod grippers by pressing the left joystick to the right.



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.

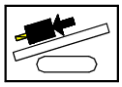
**Info!**
You can only swing the gripper arms into the bore axis when the thrust rig is completely reversed.





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 with rod adapter and the drill rod are screwed together.

**Info!**
The sub-saver and the drill rod will be screwed together automatically with the predefined torque.



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.
Simultaneously swing the gripper arms underneath the rod box/stacking boxes 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!**

14. Add further single outer rods according to chapter 6.12, page 285.

## 6.8 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 119 and chapter 5.10, page 122).
The TRACTO-TECHNIK customer service (chapter 8, page 313) 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 $mm^2$.

### 6.8.1 Pilot bore with wire-controlled drilling

***Requirements***

- The bore head assembly is equipped with a transmitter with cable (chapter 5.9, page 119).
- The bore rig is converted for wire-controlled drilling (chapter 5.10, page 122).
- 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. Open the "Bore parameter settings" screen.
2. Enable wire-controlled drilling in line 1 by setting the value in the input field to "1" with the >>+<< button.

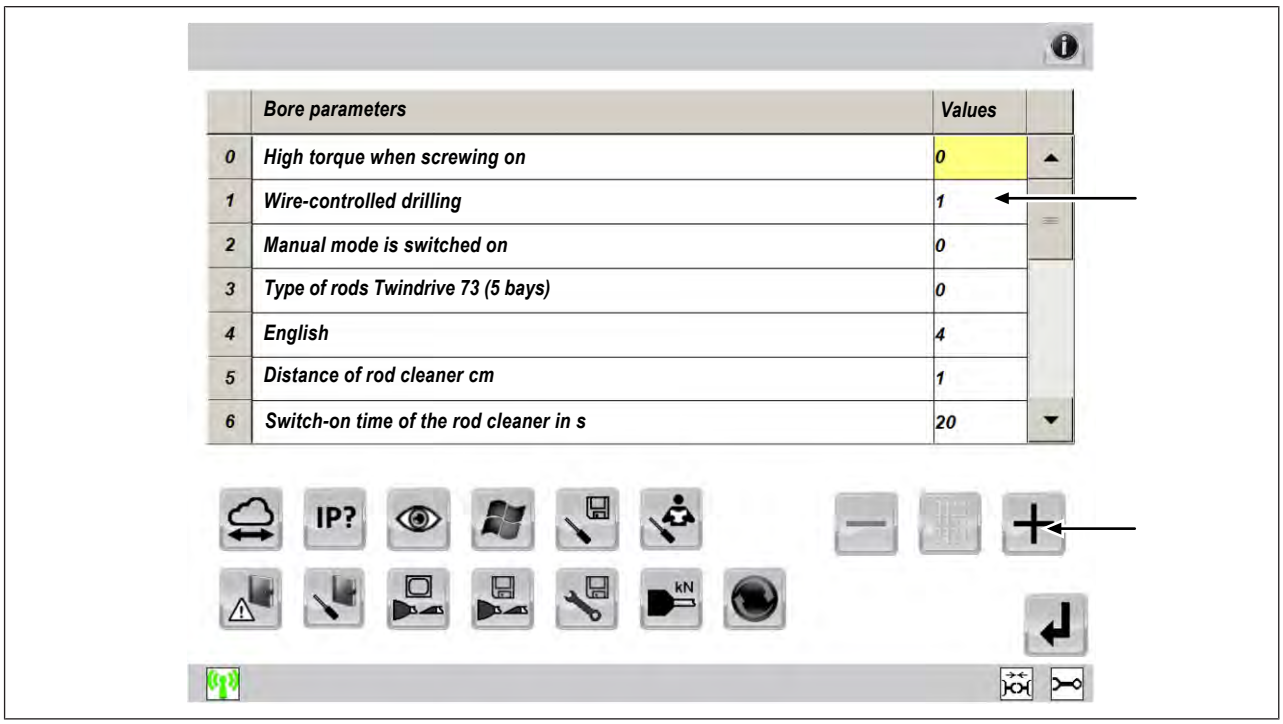
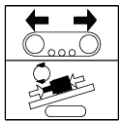



*Fig. 6-78 Enabling wire-controlled drilling*

3. 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.

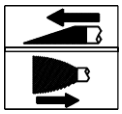
*Operator on operator seat – inserting a rod*



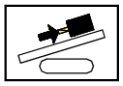
4. If necessary, switch over from drive mode to bore mode on the right joystick panel.



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

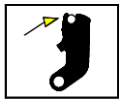


6. Switch over from pull-in to pilot bore on the right joystick panel.

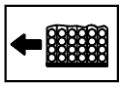




7. Completely reverse the thrust rig to the stop position by pulling the right joystick backwards.
   By pressing the >>Rapid motion on<< push button on the right joystick, you can quickly reverse the thrust rig.



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



9. Use the push button (press once) on the left joystick to move the rod box/ stacking boxes outwards in a way that bay 1 is positioned over the bore axis.



**Info!**
To ensure an even wear of the drill rods, please start in turn with the outer and the inner bay.



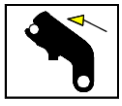
10. Open the rod grippers for the drill rod so that the hydraulic jack can move down. To do so, push the left joystick to the left.
    **Only let go of the joystick once the drill rod has been placed inside the rod grippers!**



11. 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.



12. 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**

**Rotating drill rod!**

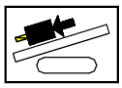
Contact with the rotating drill rod can lead to injuries or death!

- Only screw the rock drilling unit to the drill rod by hand (or with a suitable tool) using a suitable lifting device.
- 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 – screwing a rod to the sub-saver*

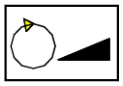


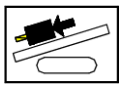
13. Push the right joystick forwards to advance the thrust rig until the threading of the sub-saver is positioned inside the rod.

**NOTICE**

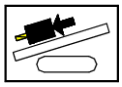
**Possible damage to the threads due to too fast rotation or too high thrust speed!**

- 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.

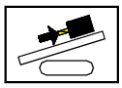




14. Switch on clockwise rotation (outer rod / drill rod) by pushing the left joystick forward and holding it. The inner rod automatically rotates along with the outer rod (if the front clamp is closed).
Simultaneously push the right joystick forward to advance the thrust rig until the sub-saver and the drill rod are screwed together.

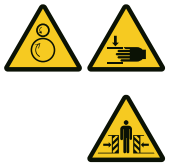


15. Push the right joystick forward to slowly advance the thrust rig until the front end of the drill rod rests inside the clamp.



16. Completely reverse the thrust rig to the stop position by pulling the right joystick backwards.

**⚠ 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.

***Rear operator***

17. Access the working platform.
18. Check whether the hollow shaft (1) is positioned correctly.
19. If necessary, correct the position of the hollow shaft using the button (2) of the rear operating panel for wire-controlled drilling.

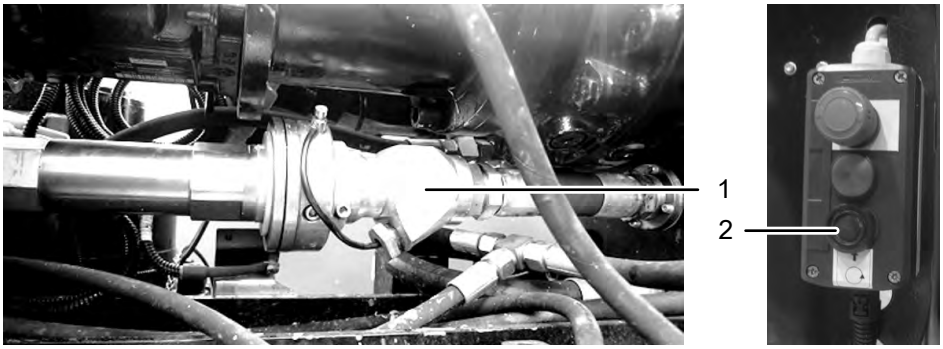



*Fig. 6-79 Hollow shaft and rear operating panel for wire-controlled drilling*

20. Open the slide door.

***Rear operator – installing the cable***

21. Remove the screw-down nut (2) from the cable feed-through of the conversion set and slide the screw-down nut and the seal ring (1) onto the loose end of the cable at the cable drum.

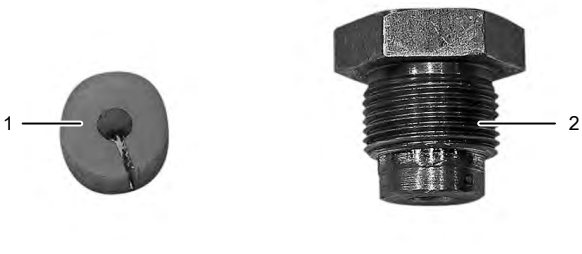



*Fig. 6-80 Seal and screw-down nut*

22. Connect the cable to the cable pulling aid.

***For machines with double rotation motor (18ACS):***

23. Unlock the cable drum by turning the spring lever (1) and thus releasing the drum.

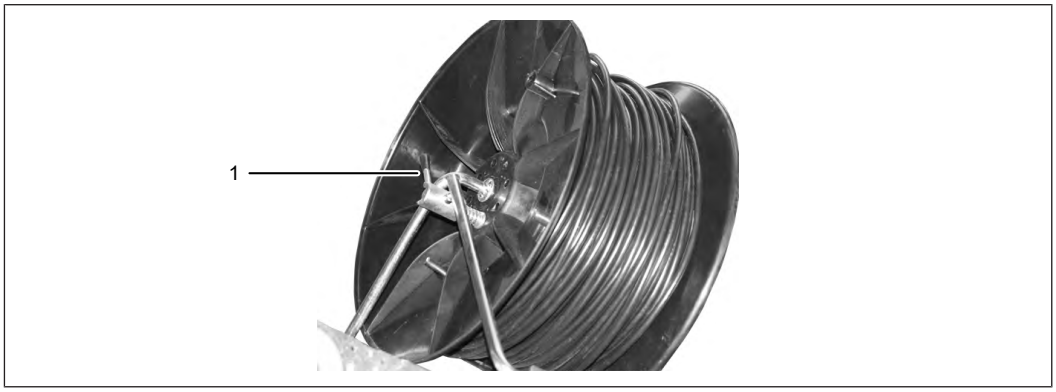



*Fig. 6-81 Unlocking the cable drum (double rotation motor)*

24. Insert the cable pulling aid into the cable feed-through and push it towards the front through the drill rod.

***Front operator – connecting the cable***

25. 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.
26. Disconnect the cable pulling aid from the cable.
27. 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.

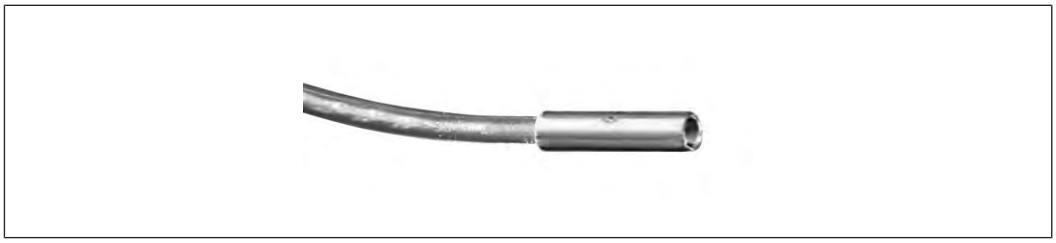


*Fig. 6-82 Crimp connector on cable*

⇨ Crimp the crimp connector onto the cable twice using the pliers. The second time, turn the pliers by 180°.



*Fig. 6-83 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. 6-84 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. 6-85 Crimping the second cable*

⇨ Slide the shrinking hose centrally onto the crimp connector.



*Fig. 6-86 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.

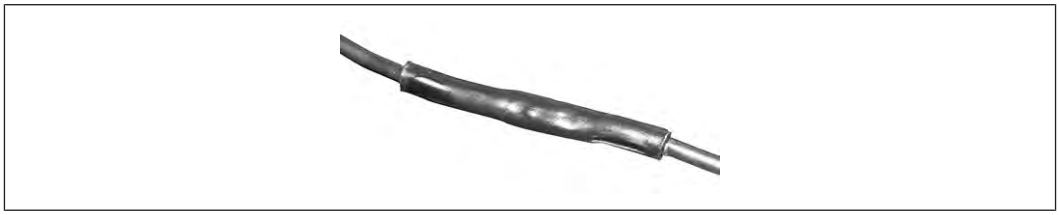


*Fig. 6-87 Shrinking the shrinking hose*

⇨ Let the shrinking hose cool down before proceeding.

28. 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 (double rotation motor, 18ACS)***

29. Pull the cable out of the hollow shaft and straighten it.
30. Cut off the cable at suitable length.
31. Re-insert the seal ring and the screw-down nut back into the cable bearing and screw the screw-down nut tight.
32. Strip the end of the cable and insert it into the cable connection (1) of the friction ring.
33. Manually tighten the screw (2) of the cable connection.

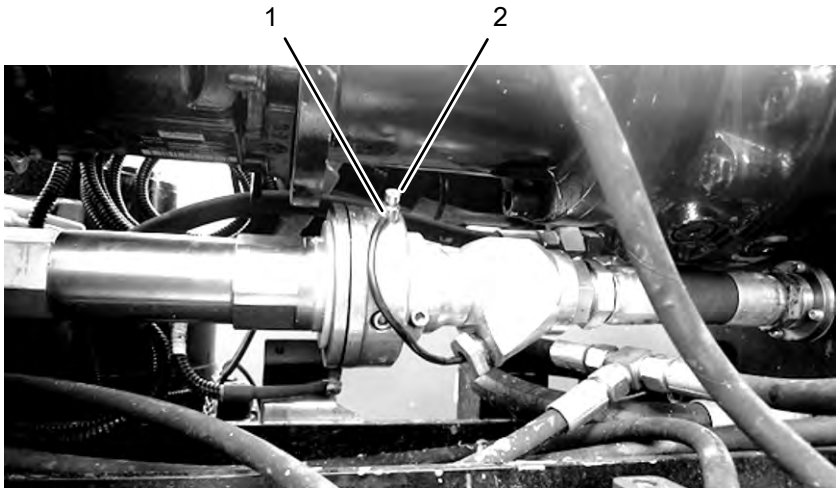



*Fig. 6-88 Connecting the cable to the friction ring (double rotation motor, 18ACS)*

34. Close the slide door.

***Front operator***

35. Release the bore rig functions by turning the rotary switch on the front operating panel to the left.

**⚠ DANGER**

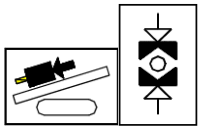
**Rotating drill rod!**

Contact with the rotating drill rod can lead to injuries or death!

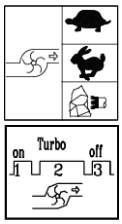
- Only screw the rock drilling unit to the drill rod by hand (or with a suitable tool) using a suitable lifting device.
- Only start drilling operation if there is nobody in the range of rotating parts.
- Only personnel required to operate the machine are allowed near the machine.
- Keep out of the danger 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.

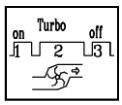
***Operator on operator seat – pilot bore***



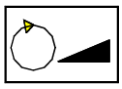
36. Push the right joystick forward to advance the thrust rig until the drill head reaches the ground.
37. You can additionally clamp the drilling lance to hold it in place.



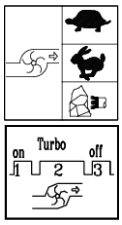

38. Set the drilling fluid to tortoise (low flow rate) at the left joystick panel and switch on the drilling fluid pump.
39. Check whether drilling fluid exits from all nozzles of the drill head.



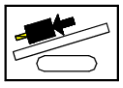

40. Switch the drilling fluid off again by briefly pressing the push button on the left joystick.



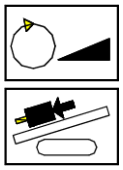
41. Push the left joystick forward to turn the drill rod exactly into "6 o'clock position".




42. Set the drilling fluid to tortoise (low flow rate) at the left joystick panel and switch on the drilling fluid pump.

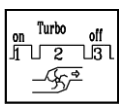


43. Push the right joystick forward to advance the thrust rig until the bore tip has entered the ground by approx. 30–40 cm.
44. Leave the drilling fluid switched on.

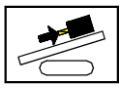


45. Switch on clockwise rotation by pushing the left joystick forward and holding it in this position.
    At the same time, push the right joystick forward to drive the thrust rig forward until the drill rod has completely entered the ground, or until the thrust rig has driven to the front stopper.

**Info!**
This way the rod connection lies exactly between both clamps.

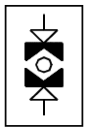



46. Switch the drilling fluid off again by briefly pressing the push button on the left joystick.



47. 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).



48. 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 – disconnecting the cable***

49. Check whether the hollow shaft (1) is positioned correctly.
    ⇨ If necessary, correct the position of the hollow shaft using the button (2) of the front operating panel for wire-controlled drilling.

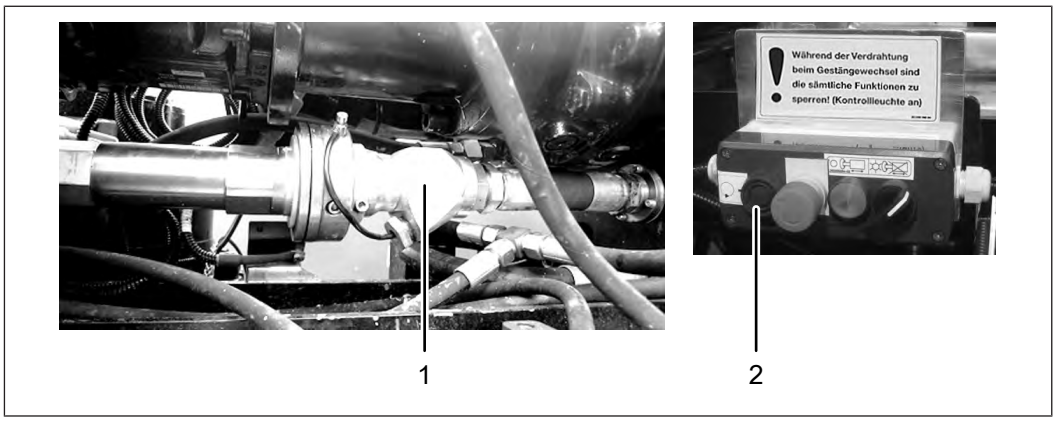



*Fig. 6-89 Hollow shaft and front operating panel for wire-controlled drilling*

50. Block the bore rig functions by turning the rotary switch on the front operating panel to the right.
51. Disconnect the cable between cable feed-through and cable drum.
52. Loosen the screw-down nut and remove the screw-down nut and the seal ring from the cable feed-through and the cable so that the cable does not tear off when unscrewing the sub-saver.
53. Release the bore rig functions by turning the rotary switch on the front operating panel to the left.

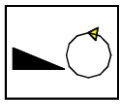
**⚠ DANGER**

**Rotating drill rod!**

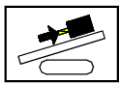
Contact with the rotating drill rod can lead to injuries or death!

- Only screw the rock drilling unit to the drill rod by hand (or with a suitable tool) using a suitable lifting device.
- 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***



54. 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.

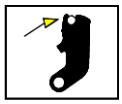




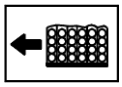
55. Completely reverse the thrust rig to the stop position by pulling the right joystick backwards.
    By pressing the >>Rapid motion on<< push button on the right joystick, you can quickly reverse the thrust rig.

### 6.8.2 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. Use the push button (press once) on the left joystick to move the rod box/ stacking boxes outwards in a way that bay 1 is positioned over the bore axis.

**Info!**
To ensure an even wear of the drill rods, please start in turn with the outer and the inner bay.

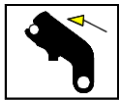


3. Open the rod grippers for the drill rod so that the hydraulic jack can move down. To do so, push the left joystick to the left.
**Only let go of the joystick once the drill rod has been placed inside the rod grippers!**



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**

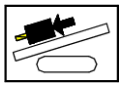
**Rotating drill rod!**

Contact with the rotating drill rod can lead to injuries or death!

- Only screw the rock drilling unit to the drill rod by hand (or with a suitable tool) using a suitable lifting device.
- 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 – screwing a rod to the sub-saver*

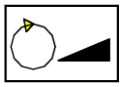


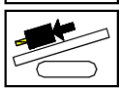
6. Push the right joystick forwards to advance the thrust rig until the threading of the sub-saver is positioned inside the rod.

**NOTICE**

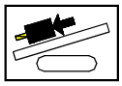
**Possible damage to the threads due to too fast rotation or too high thrust speed!**

- 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.

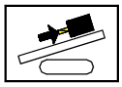




7. Switch on clockwise rotation (outer rod / drill rod) by pushing the left joystick forward and holding it. The inner rod automatically rotates along with the outer rod (if the front clamp is closed).
   Simultaneously push the right joystick forward to advance the thrust rig until the sub-saver and the drill rod are screwed together.



8. Push the right joystick forward to slowly advance the thrust rig until the front end of the drill rod rests inside the clamp.



9. Completely reverse the thrust rig to the stop position by pulling the right joystick backwards.

**⚠ 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.

***Rear operator***

10. Access the working platform.
11. Check whether the hollow shaft (1) is positioned correctly.
12. If necessary, correct the position of the hollow shaft using the button (2) of the rear operating panel for wire-controlled drilling.

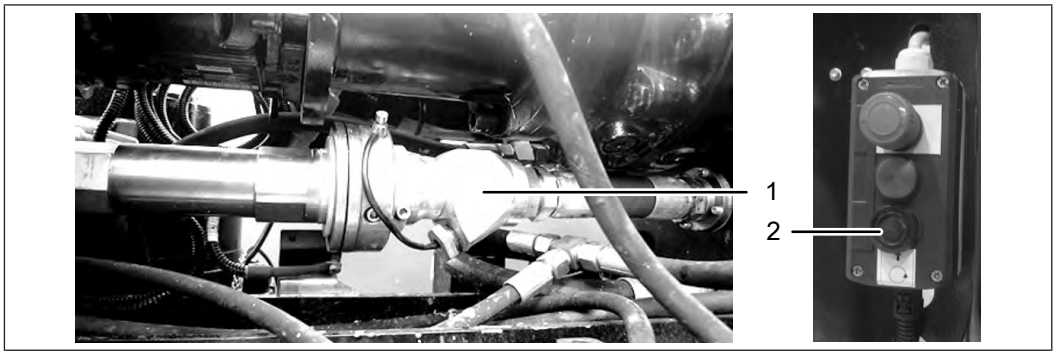



*Fig. 6-90 Hollow shaft and rear operating panel for wire-controlled drilling*

13. Open the slide door.

***Rear operator – installing the cable***

14. Remove the screw-down nut (2) from the cable feed-through of the conversion set and slide the screw-down nut and the seal ring (1) onto the loose end of the cable at the cable drum.

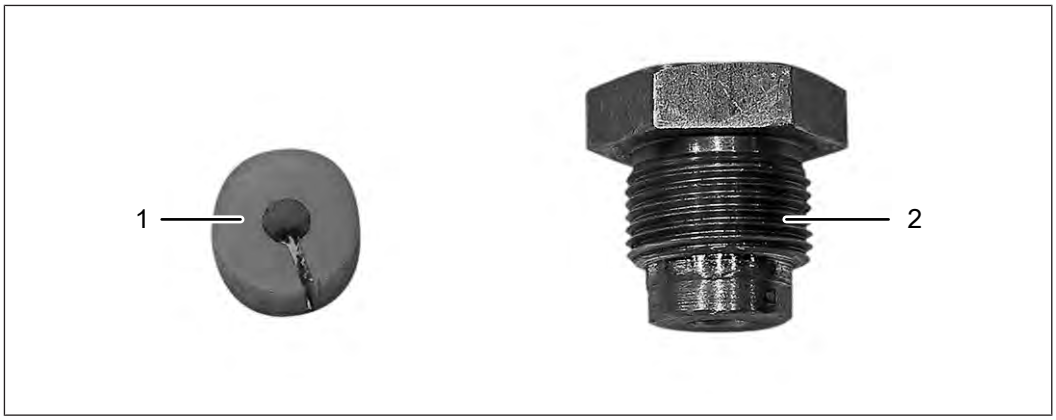



*Fig. 6-91 Seal and screw-down nut*

15. Connect the cable to the cable pulling aid.

***For machines with double rotation motor (18ACS):***

16. Unlock the cable drum by turning the spring lever (1) and thus releasing the drum.

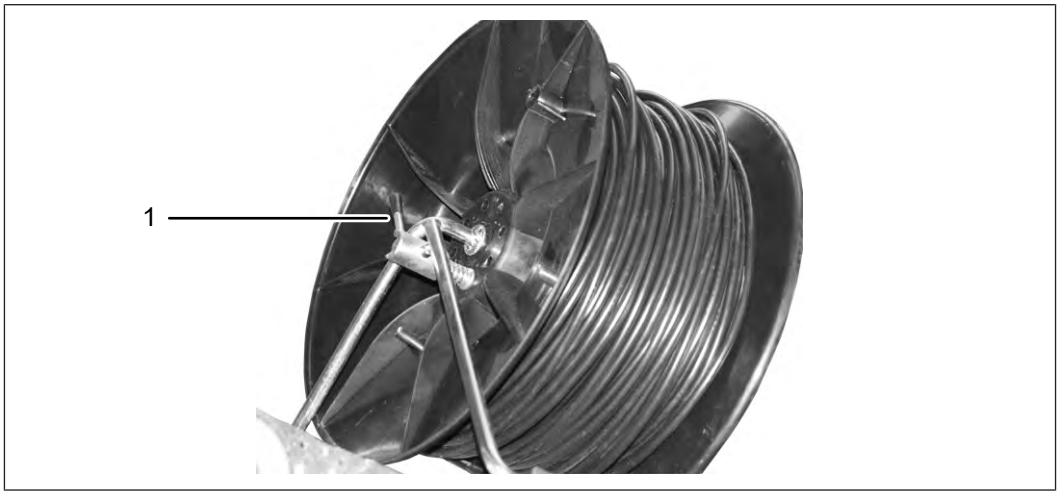



*Fig. 6-92 Unlocking the cable drum (double rotation motor)*

17. Insert the cable pulling aid into the cable feed-through and push it towards the front through the drill rod.

***Front operator – connecting the cable***

18. 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.
19. Disconnect the cable pulling aid from the cable.
20. Connect the new and old cable by use of a crimp connector (chapter 6.8.1, page 234).
21. Wait until the shrinking hose has cooled down.

***Front operator***

22. Release the bore rig functions by turning the rotary switch on the front operating panel to the left.

**⚠ DANGER**

**Rotating drill rod!**

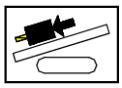
Contact with the rotating drill rod can lead to injuries or death!

- Only screw the rock drilling unit to the drill rod by hand (or with a suitable tool) using a suitable lifting device.
- 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 – screwing rods together*

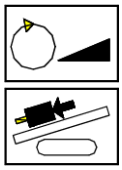


23. Push the right joystick forwards to advance the thrust rig until the threading of the sub-saver is positioned inside the rod.

**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.



24. Switch on clockwise rotation (outer rod / drill rod) by pushing the left joystick forward and holding it. The inner rod automatically rotates along with the outer rod (if the front clamping is closed).
Simultaneously push the right joystick forward to advance the thrust rig until the two drill rods 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 – tightening the cable (double rotation motor, 18ACS)*

26. Pull the cable out of the hollow shaft and straighten it.
27. Cut off the cable at suitable length.
28. Re-insert the seal ring and the screw-down nut back into the cable bearing and screw the screw-down nut tight.

29. Strip the end of the cable and insert it into the cable connection (1) of the friction ring.
30. Manually tighten the screw (2) of the cable connection.

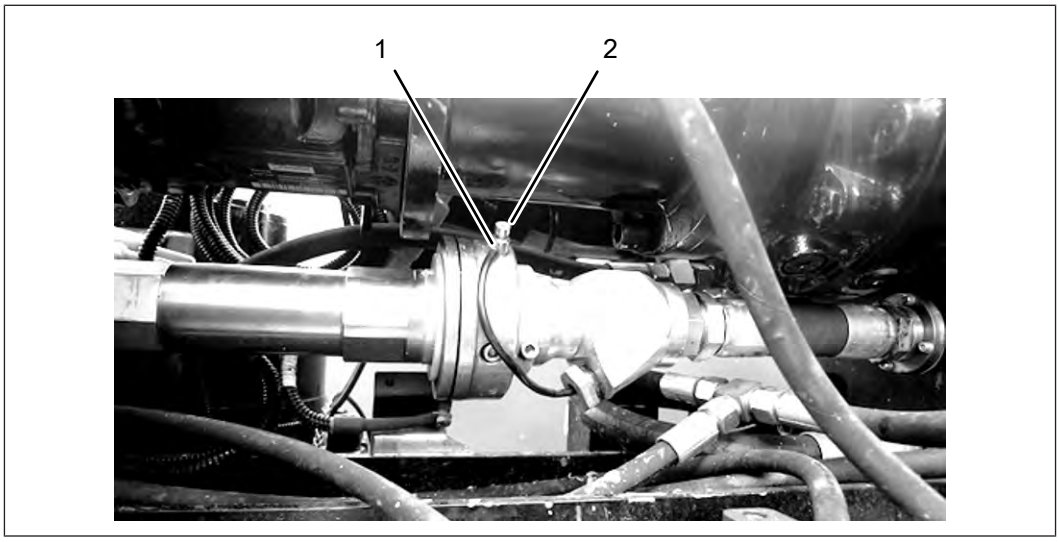



*Fig. 6-93 Connecting the cable to the friction ring (double rotation motor, 18ACS)*

31. Close the slide door.

***Front operator***

32. Release the bore rig functions by turning the rotary switch on the front operating panel to the left.

**⚠ DANGER**

**Rotating drill rod!**

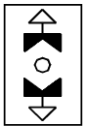
Contact with the rotating drill rod can lead to injuries or death!

- Only screw the rock drilling unit to the drill rod by hand (or with a suitable tool) using a suitable lifting device.
- 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***



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.

## 6.9 Changing the stacking box

**Info!**
This chapter contains information on how to change the stacking boxes. For information on the number of drill rods per stacking box, please refer to the technical data (chapter 3.3, page 59).

It is necessary to change the stacking boxes, for example, if you want to continue drilling with a rod box and then refit the stacking boxes after drilling.

Before exchanging the stacking boxes you must have completely read and understood the instructions for the loading crane!
Always work with at least two persons when changing the stacking boxes. One person operates the loading crane, the other person stands on the secured ladder of the machine in order to connect the stacking boxes with a chain strand or to detach the chain strand from the stacking boxes as well as to help to guide the stacking boxes hanging from the loading crane.

Secure the ladder on the machine by means of the ladder guide:

1. Insert the bolt (2) of the ladder guide (1) through the hole (3) in the magazine.
2. Secure the ladder guide with the linchpin (4).
3. Fit the ladder (5) into the ladder guide.
4. Secure the ladder with the star handle screws (6).

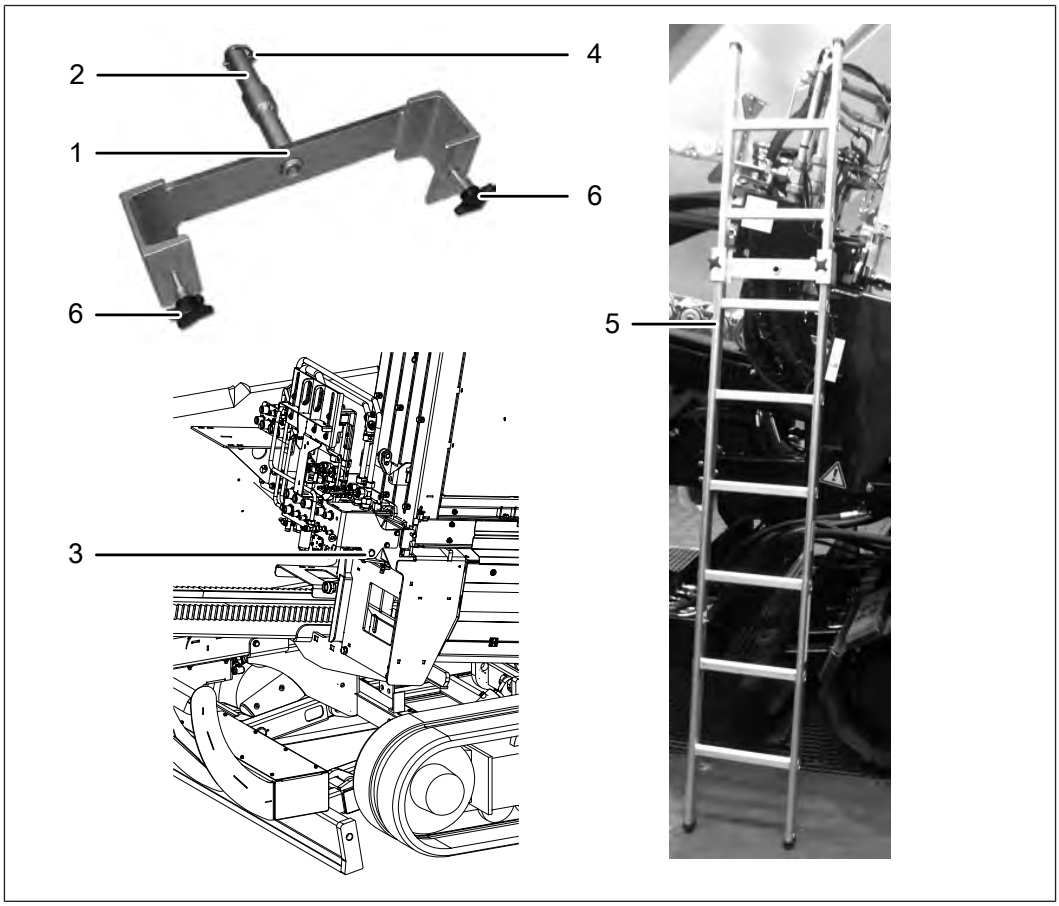



*Fig. 6-94 Mounting the ladder*

**⚠ WARNING**

**Crush hazard!**



When attaching or detaching the chain strand and when guiding the stacking boxes there is a hand crush hazard.

- Wear hand protection.

**⚠ WARNING**

**Impact hazard due to the stacking box hanging from the crane!**



When guiding the stacking box there is a risk of head impact due to the loading crane and the stacking box hanging from the loading crane.

- Wear head protection.

The loading crane must be operated by trained personnel only. The relevant national qualification requirements must be complied with (Personnel qualification).

The loading crane is exclusively designed to lift stacking boxes in accordance with the technical data (chapter 3.3, page 59).
The weights of a full stacking box and the single rods can be found in chapter 3.3, page 59.

***Requirements***

- The stacking box is either empty or completely full.
- The last used drill rod is located in the ground.
- The thrust rig is reversed.
- The anchor plate has been lowered to the ground.

**⚠ WARNING**

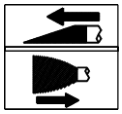


**Crush and impact hazard!**

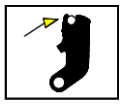
When exchanging the bay fill level detection, there is a risk of head and hand injury.

- Wear head and hand protection when exchanging the stacking box!

If you are carrying out the pilot bore, raise the hydraulic jacks as follows:



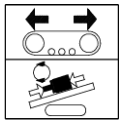
5. Switch over from pilot bore to pull-in mode on the right joystick panel.



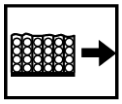
6. Swing the gripper arms underneath the stack of boxes by moving the right joystick to the right.



7. Open the rod grippers so that the hydraulic jacks can move upwards. To do so, push the left joystick to the left.



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



9. Press the push button on the left joystick to drive the stack of boxes into the outermost inside position.

***Removing the stacking box***

10. Remove the tension straps (1) on both sides of the stacking boxes.

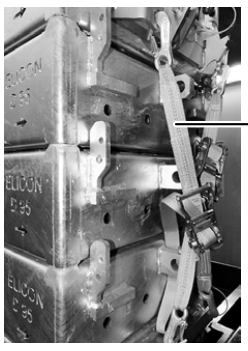



*Fig. 6-95 Removing the tension straps*

11. Insert the two rod holding bars (1) into the lower connectors of the lower stacking box.
12. Fasten the two rod holding bars (1) with one M12 x 35 DIN 933 screw (3) and one M12 Nord-Lock washer each to the hole (2) on the opposite side of the machine.

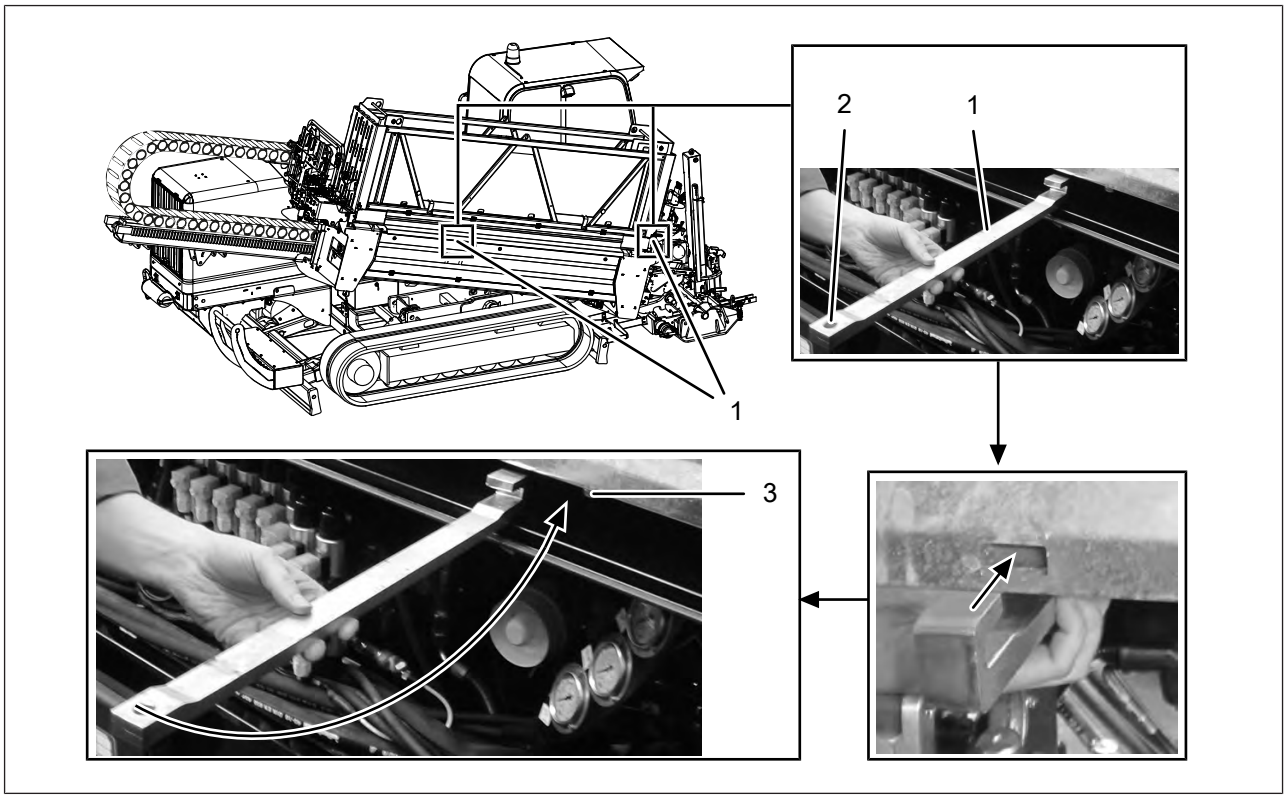



*Fig. 6-96 Inserting the rod holding bars into the connectors of the lower stacking box and fastening them with screws*

13. Remove the locking bolt (1) of the upper stacking box.
14. Dismantle the bay fill level detection (2).
    ⇨ Press the lever (3) on the bay fill level detection upwards and pull out the bay fill level detection to the top.
15. During the change procedure, store the bay fill level detection in the holder at the rear panel.

**Info!**
The connection of the electric cable does not have to be dismantled.




*Fig. 6-97 Dismantling the bay fill level detection*

**⚠ WARNING**

**When using defective rod holders or defective locking bolts, the rod can fall out when the stacking box is lifted!**

- Make sure that the rod holders are intact and not deformed.
- Insert the rod holders completely and flush into the stacking box.
- Check the locking bolts for intactness.
- Make sure that the locking bolts engage again after insertion. If the locking bolts do not engage, clean or replace the locking bolts.

16. Remove the locking bolts (1) at the front and rear of the second stacking box from the connecting hook (2).
    ⇨ Press the push button of the locking bolt and pull out the locking bolt.
    ⇨ Flip the connecting hook down by 180°. The connecting hook must no longer engage with the retainer of the upper stacking box.

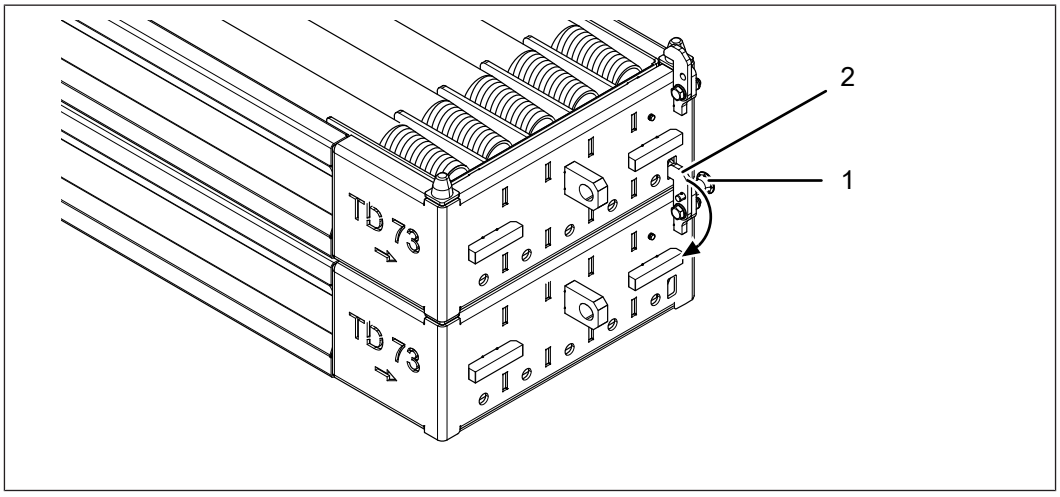



*Fig. 6-98 Disconnecting the stacking boxes*

**Info!**
Before inserting the rod holders make sure that the hydraulic jacks are still in top position.

17. Insert the rod holder (1) into the stacking box. Insert another rod holder on the opposite side of the stacking box.
    ⇨ Insert the rod holders completely and flush into the stacking box.

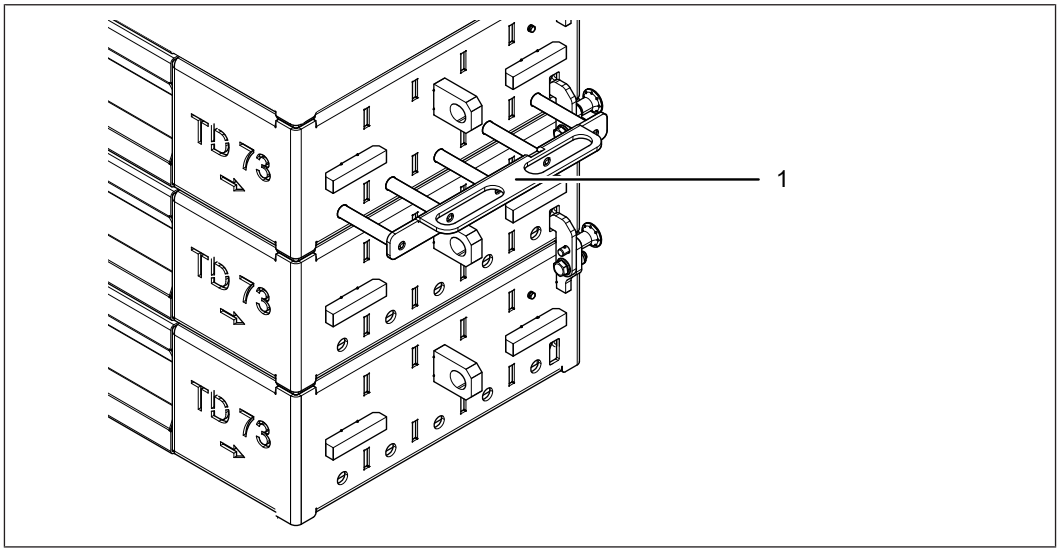



*Fig. 6-99 Inserting a rod holder*

18. Secure the rod holders (1) with the locking bolts (2).
    ⇨ Press the push button of the locking bolt and insert the locking bolt into the bore hole.
    ⇨ Make sure that the locking bolts engage again after insertion. If the locking bolts do not engage, clean or replace the locking bolts.

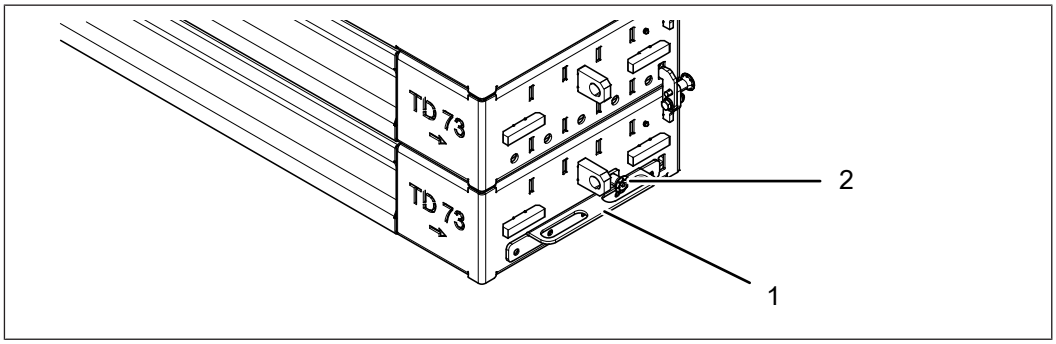



*Fig. 6-100 Securing the rod holder with a locking bolt*

19. Attach a chain strand (1) to the loading crane. For this purpose also observe the technical data (chapter 3.3, page 59).
20. Connect the chain strand with the external retainer of the stacking box (see arrow in the figure).

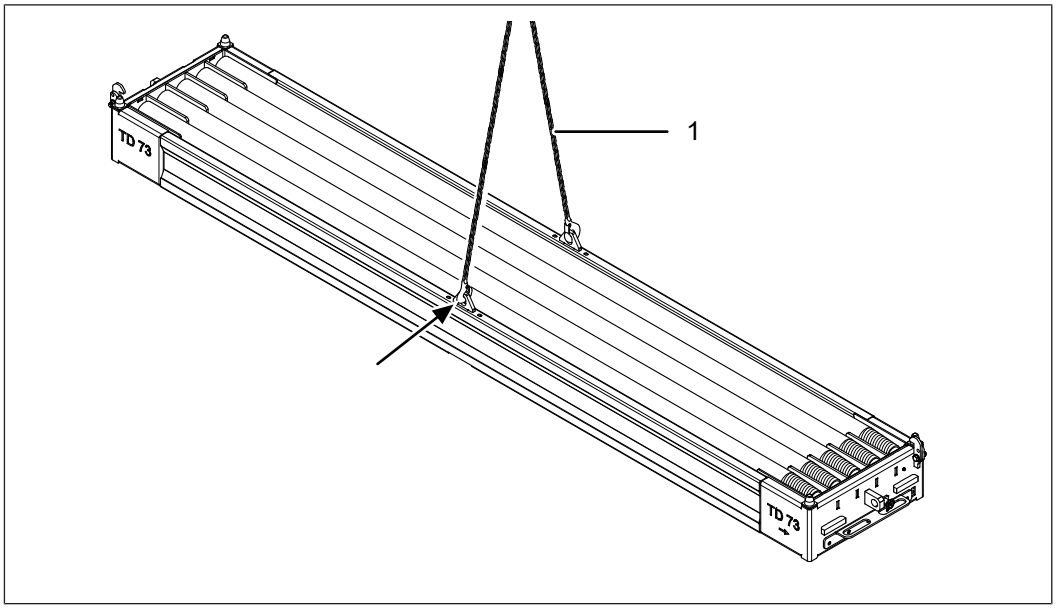



*Fig. 6-101 Attaching a chain strand to the stacking box (schematic diagram)*

21. To connect the chain strand with the internal retainer of the stacking box, proceed as follows:

    ⇨ Hook the auxiliary footstep (1) into the machine frame between bonnet and cab.

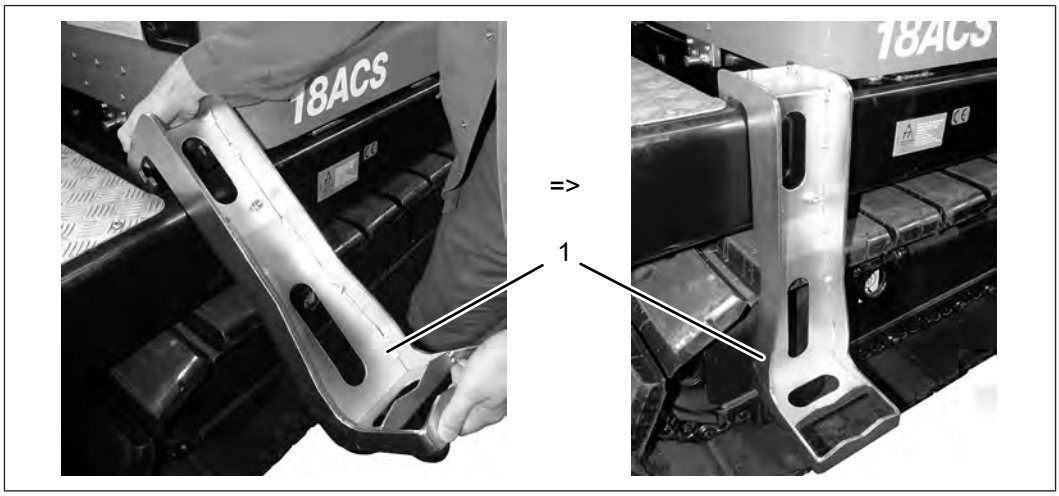



*Fig. 6-102 Hooking up the auxiliary footstep between bonnet and cab*

⇨ Use the auxiliary footstep (1) to reach the machine's platform.

⇨ Connect the chain strand with the internal retainer of the stacking box.



*Fig. 6-103 Hooking up the chain strand*

⇨ Leave the machine.

**Info!**
Only use the auxiliary footstep to connect the chain strand with the internal retainer of the stacking box. Do not climb onto other machine parts.

**⚠ DANGER**

**Suspended loads!**

Risk of injury due to falling loads.

- Keep out of any suspended components.
- Keep third persons away from the danger area.

22. Make sure that the hydraulic system of the loading crane is switched on and that there are no leakages.
23. Make sure that the loading crane does not collide with other objects during operation.
24. Switch on the loading crane using the ignition key on the crane operating panel (position "ON").



25. In drive mode you can activate the loading crane by pressing the "Hydraulic crane operation" push button on the left joystick.
26. In bore mode you can activate the loading crane using the >>Loading crane switched on/off<< button in the "Bore mode" screen.

The loading crane is operated using the operating levers at the crane.

27. Lift the upper stacking box (2) with the loading crane (1) and remove the stacking box (see also the original instructions provided by the crane manufacturer).
28. Put the stacking box safely aside.

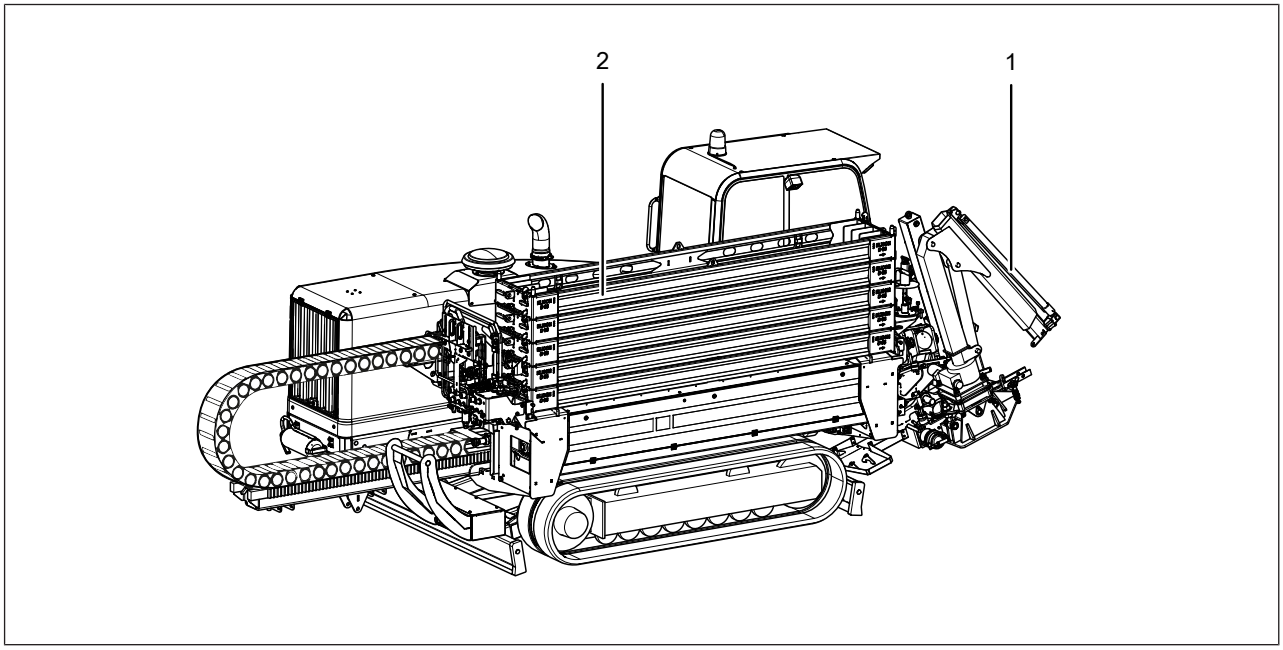



*Fig. 6-104 Stacking box and loading crane*

29. Remove the chain strand from the dismantled stacking box.
30. Repeat point 12 to point 23 for the subsequent stacking boxes until only the last stacking box is left on the machine.

31. Remove the linchpin (1) from the stacking box lock.
32. Turn the stacking box lock (2) upwards.
33. Pull the stacking box lock (2) out of the bore holes by means of the lashing eye (3).
34. Repeat point 26 and point 27 on the opposite side of the stacking box to detach it completely from the machine frame.

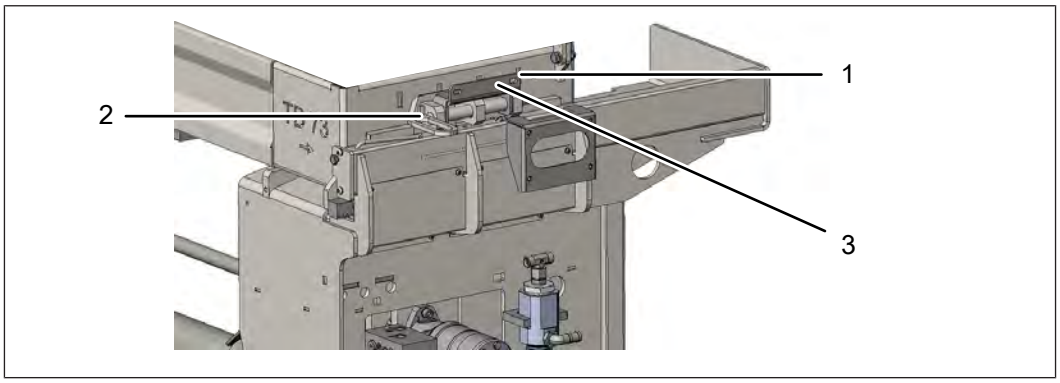



*Fig. 6-105 Disconnecting the lower stacking box*

35. Secure the shifting plates with the hooks by inserting the short side of each hook into the centre hole (1) of the shifting plate.

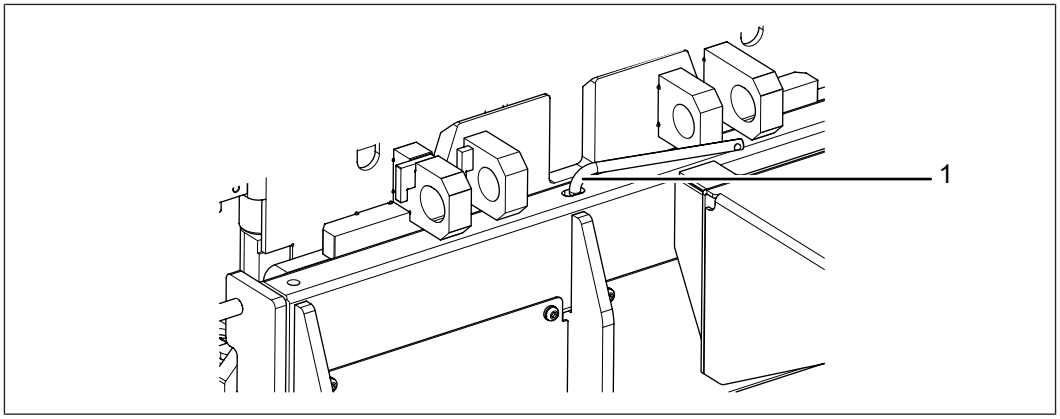



*Fig. 6-106 Securing the shifting plate with hooks (here: front)*

36. Connect the chain strand (1) already connected with the loading crane with the external retainer of the stacking box (see arrow in the figure).

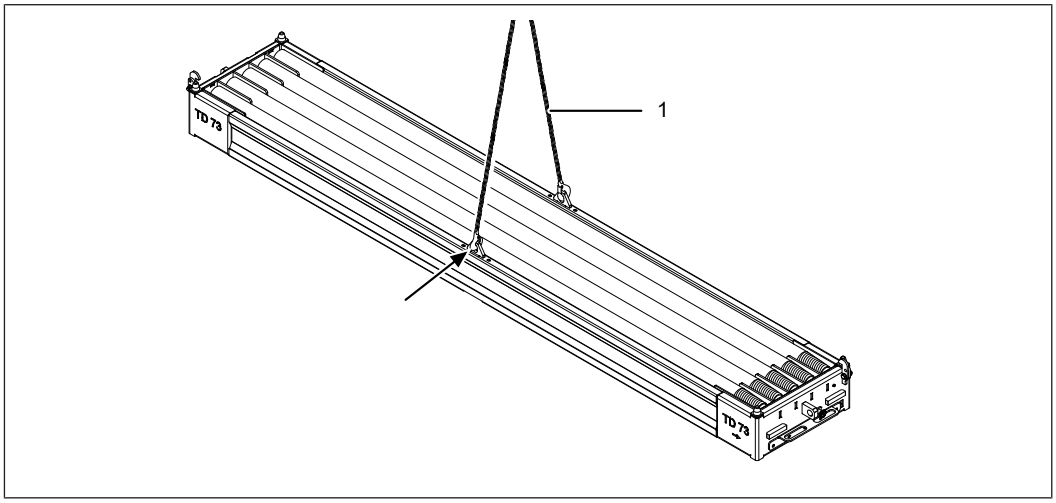



*Fig. 6-107 Attaching a chain strand to the stacking box (schematic diagram)*

37. To connect the chain strand with the internal retainer of the stacking box, proceed as follows:

    ⇨ Connect the chain strand with the internal retainer of the stacking box.



*Fig. 6-108 Hooking up the chain strand*

    ⇨ Leave the machine and remove the auxiliary footstep (1).

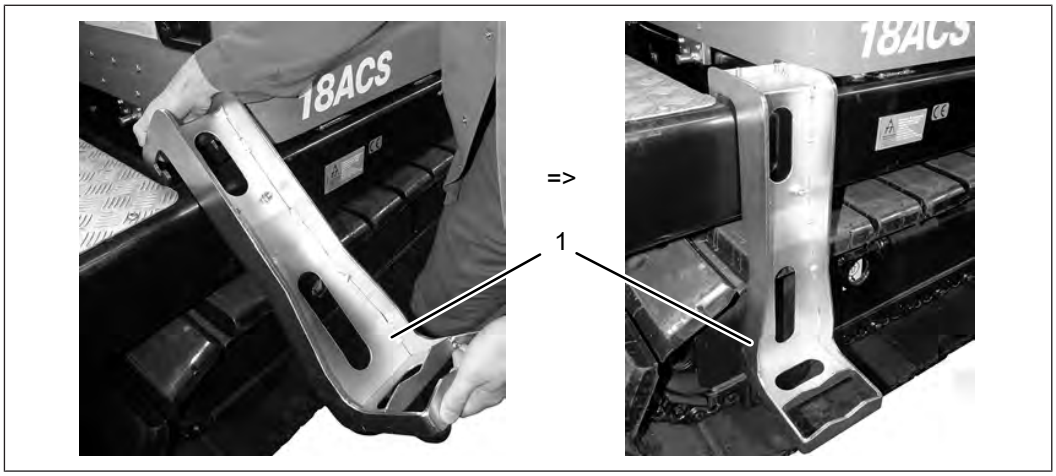



*Fig. 6-109 Removing the auxiliary footstep between bonnet and cab*

**Info!**
Only use the auxiliary footstep to connect the chain strand with the internal retainer of the stacking box. Do not climb onto other machine parts.

**⚠ DANGER**

**Suspended loads!**



Risk of injury due to falling loads.

- Keep out of any suspended components.
- Keep third persons away from the danger area.

***Mounting a stacking box***

**Info!**

Mount the lower stacking box first. Attach the rod holding bars to the stacking box.

1. Make sure that the chain strand (1) is properly connected with the loading crane. For this purpose also observe the technical data (chapter 3.3, page 59).
2. Connect the chain strand (1) connected with the loading crane with the two retainers of the stacking box (see arrows in the figure).

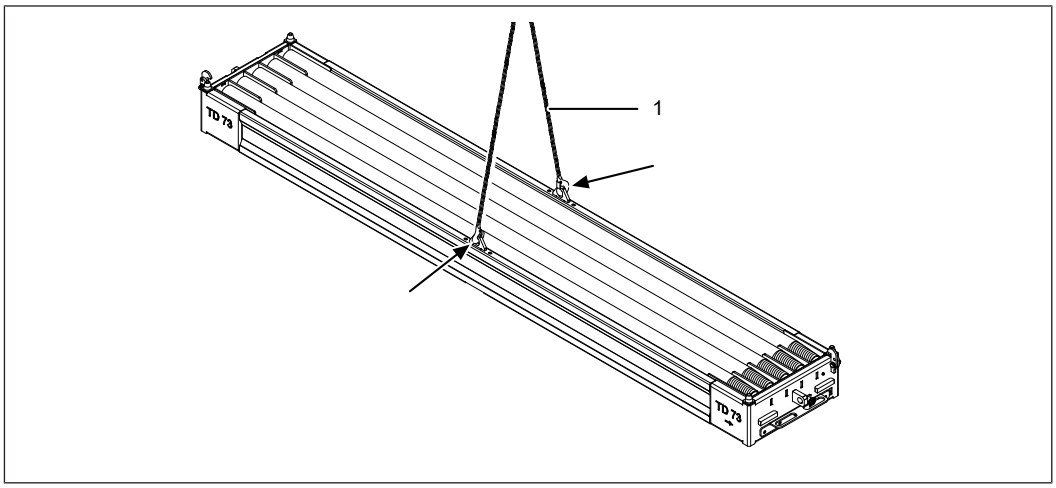



*Fig. 6-110 Attaching a chain strand to the stacking box (schematic diagram)*

**Info!**

Only use the auxiliary footstep to connect the chain strand with the internal retainer of the stacking box or to guide the stacking box hanging from the loading crane. Do not climb onto other machine parts.

3. Mount the auxiliary footstep (1) to the machine by hooking it into the machine frame between bonnet and cab.

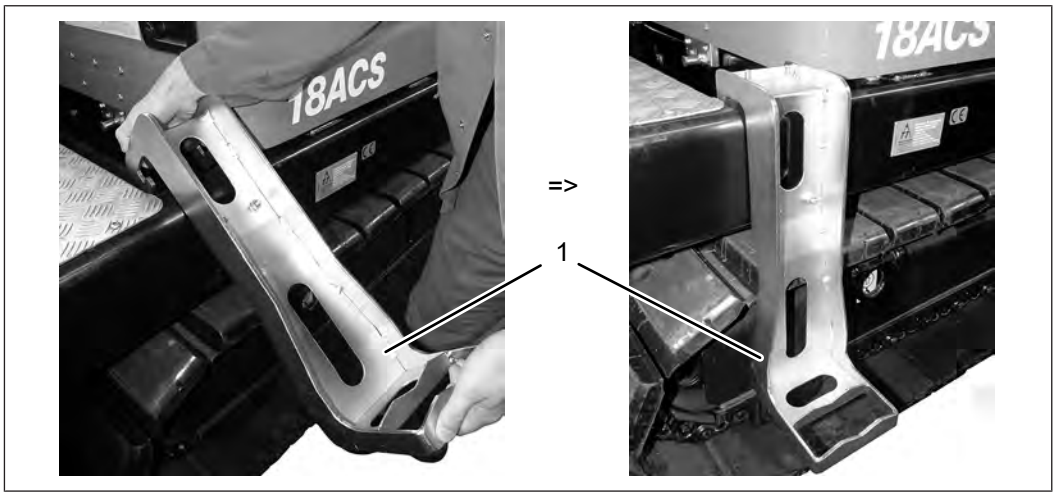



*Fig. 6-111 Hooking up the auxiliary footstep between bonnet and cab*

4. Use the auxiliary footstep (1) to reach the machine's platform. Guide the stacking box hanging from the loading crane with your hand.



*Fig. 6-112 Hooking in the chain strand and guiding the stacking 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.

5. Make sure that the hydraulic system of the loading crane is switched on and that there are no leakages.
6. Make sure that the loading crane does not collide with other objects during operation.
7. Switch on the loading crane using the ignition key on the crane operating panel (position "ON").
8. Make sure that the two rod holding bars are mounted below the stacking box.
9. Lift the stacking box with the loading crane. Only use stacking boxes authorized by TRACTO-TECHNIK (chapter 3.3, page 59).
10. Push the stacking box slightly down at the front so that the drill rods slide forward.

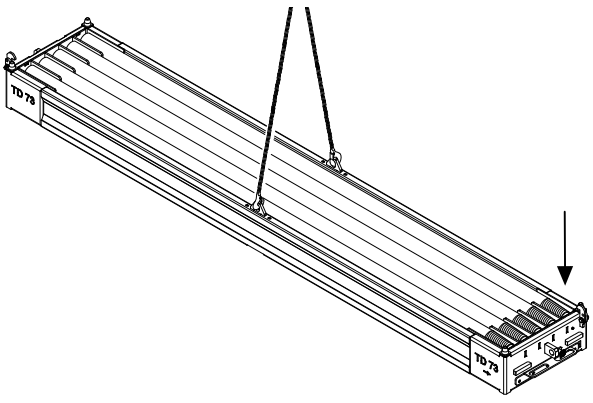


*Fig. 6-113 Slightly pushing down the stacking box at the front*

11. With the help of another person standing on the machine platform, position the stacking box from above (see also the instructions provided by the crane manufacturer).
12. Remove the chain strand from the stacking box.



*Fig. 6-114 Removing the chain strand*

13. Place the hook (1) back into the parking position to secure the shifting plate.
14. Insert the lashing eye YY 232300 (2) and secure it by re-inserting the lock for the rod box (3).
15. Turn the stacking box lock downwards to connect the lower stacking box with the machine frame.
16. Secure the stacking box lock with the linchpin (4).
17. Repeat point 13–16 on the opposite side of the lower stacking box.

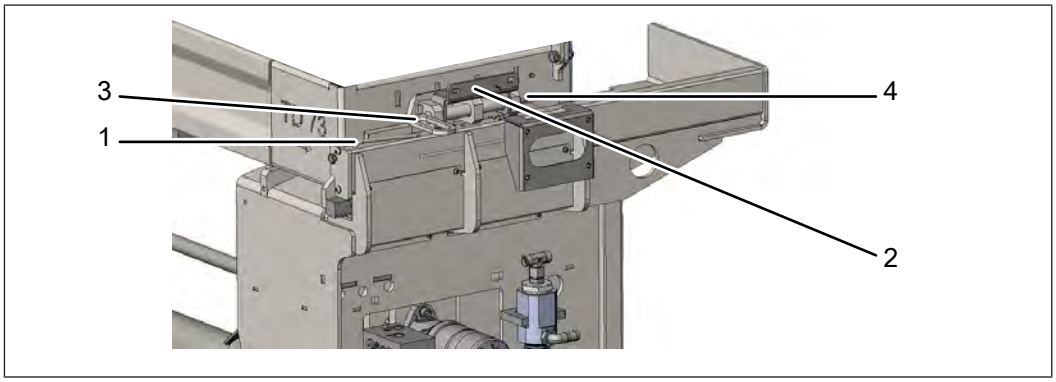



*Fig. 6-115 Connecting the lower stacking box*

18. Connect the chain strand with the new stacking box. For this purpose also observe the technical data (chapter 3.3, page 59).

**Info!**
Before using the loading crane, observe the instructions provided by the crane manufacturer.

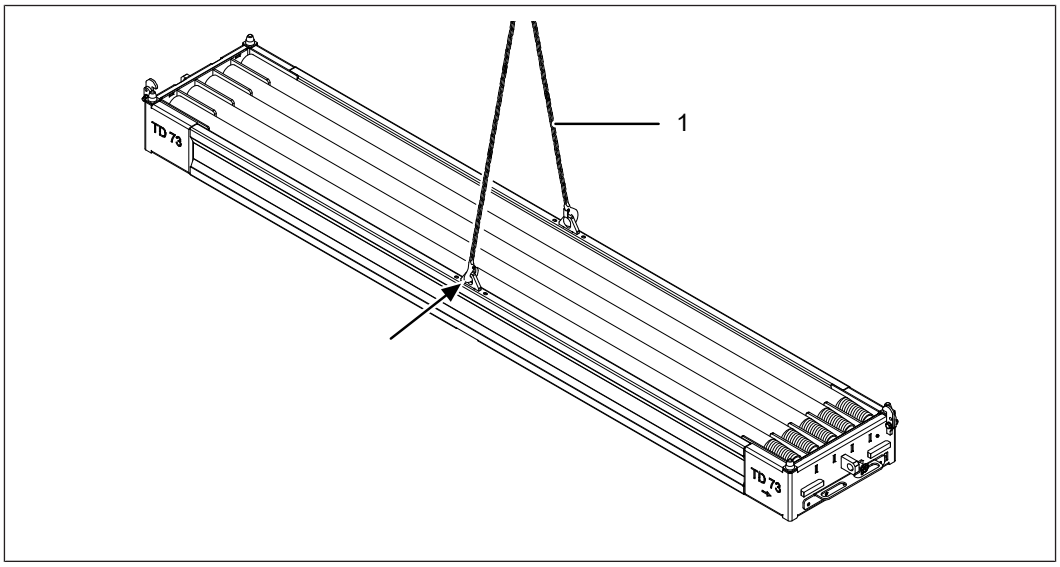



*Fig. 6-116 Attaching a chain strand to the stacking box*

**⚠ DANGER**

**Suspended loads!**



Risk of injury due to falling loads.

- Keep out of any suspended components.
- Keep third persons away from the danger area.

19. Make sure that the hydraulic system of the loading crane is switched on and that there are no leakages.
20. Make sure that the loading crane does not collide with other objects during operation.
21. Switch on the loading crane using the ignition key on the crane operating panel (position "ON").

**⚠ DANGER**

**Crush hazard!**



Below the stacking box there is a risk of hand injury.

- Keep your hands out of the danger area.

22. Lift the stacking box with the loading crane (1).

23. Push the stacking box slightly down at the front so that the drill rods slide forward.

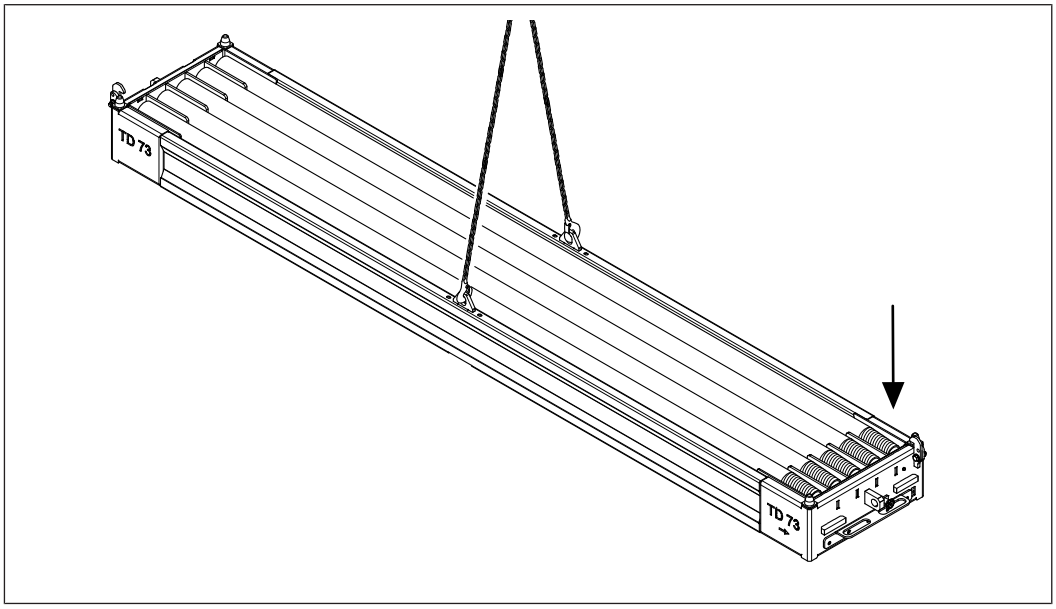



*Fig. 6-117 Slightly pushing down the stacking box at the front*

24. With the help of another person standing on the machine platform, position the stacking box from above (see also the original instructions provided by the crane manufacturer).

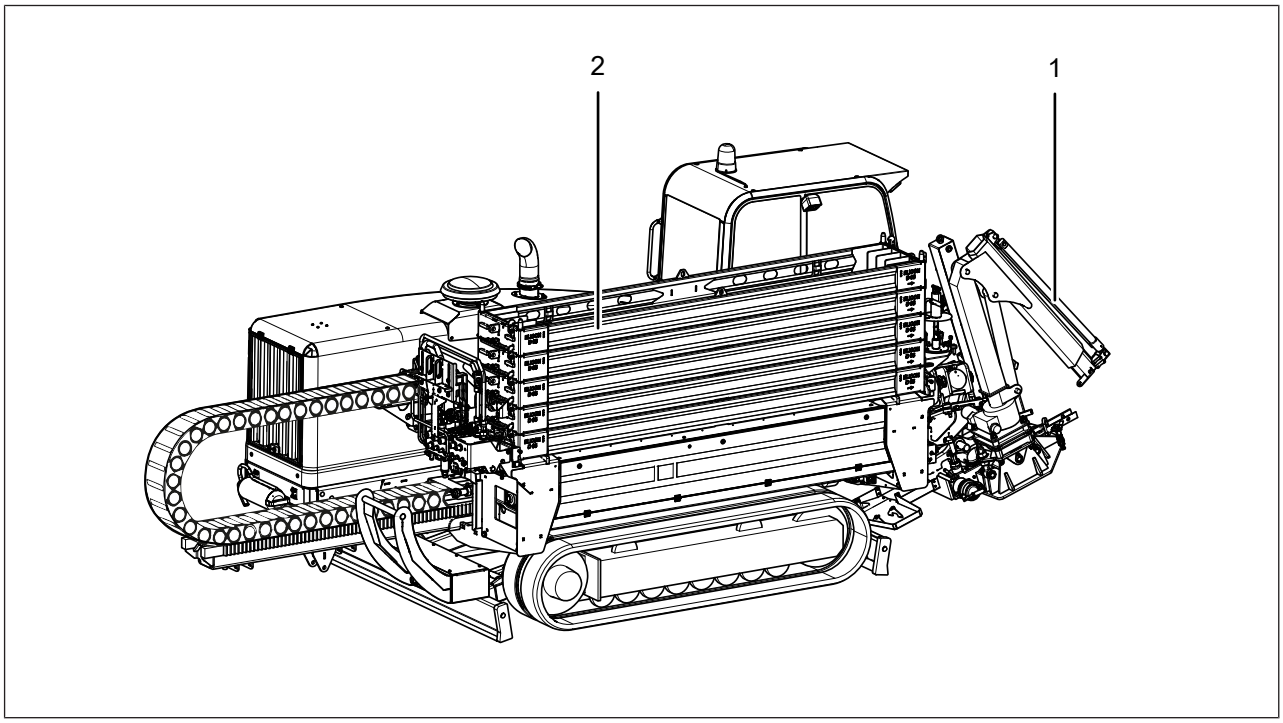



*Fig. 6-118 Mounting a stacking box with the help of another person*

25. Remove the chain strand from the stacking box.

26. Remove the locking bolt (1) from the rod holder (2) on both sides of the stacking box.
    ⇨ Press the push button of the locking bolt (1) and pull the locking bolt out of the rod holder.
27. Flip the connecting hook (2) up by 180° on both sides of the stacking box. Make sure that the connecting hook engages with the retainer of the upper stacking box.

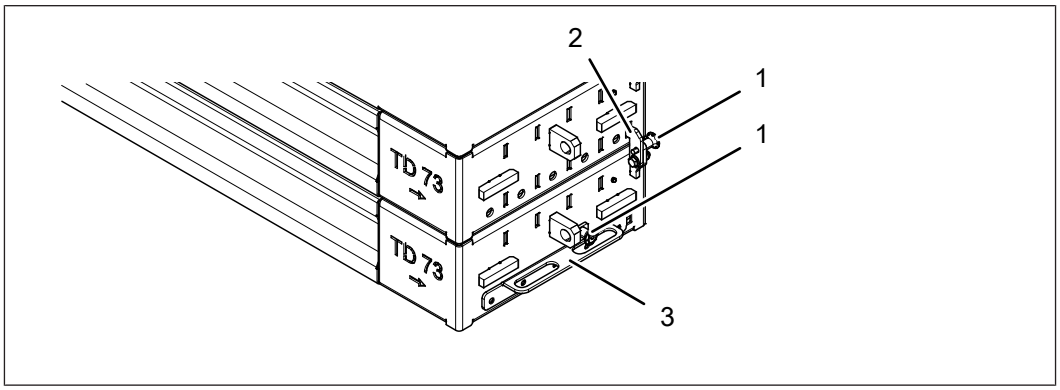



*Fig. 6-119 Removing the locking bolt from the rod holder and securing the connecting hook*

28. Secure the connecting hooks (2) with the locking bolts (1).
    ⇨ Make sure that the locking bolts engage again after insertion. If the locking bolts do not engage, clean or replace the locking bolts.
29. Pull out the rod holder (1) on both sides of the stacking box.

**Info!**
Before removing the rod holders make sure that the hydraulic jacks are still in top position.

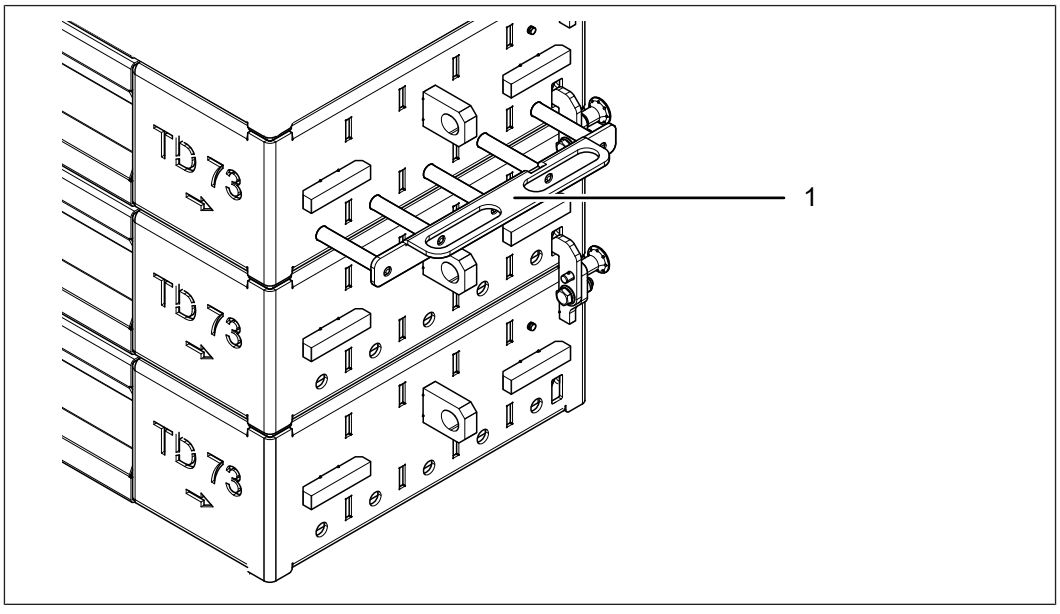



*Fig. 6-120 Removing the rod holders*

30. Repeat point 17 to point 28 to mount further stacking boxes without exceeding the maximum permitted number (chapter 3.3, page 59).
31. Leave the machine and remove the auxiliary footstep (1).

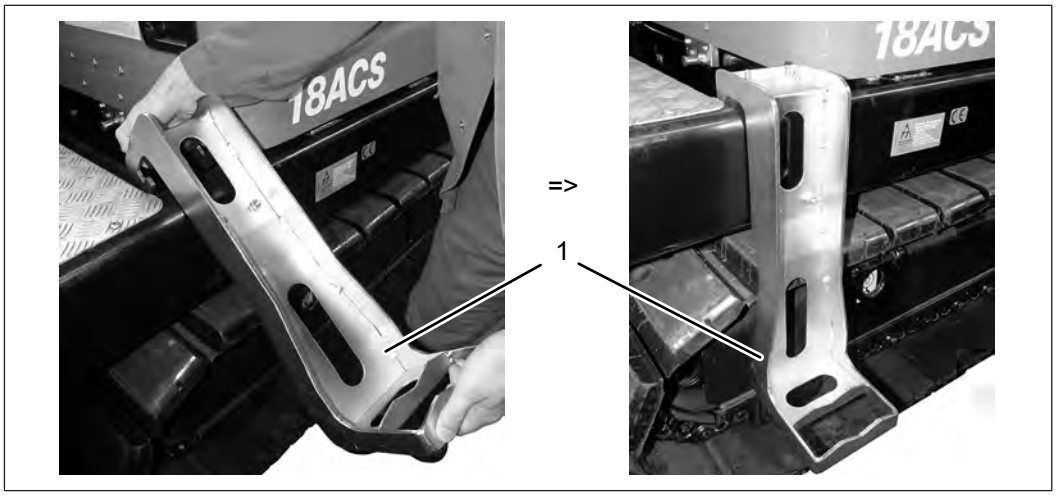
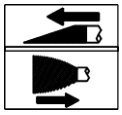
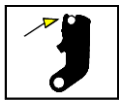



*Fig. 6-121 Removing the auxiliary footstep between bonnet and cab*

If you are carrying out the pilot bore, raise the hydraulic jacks as follows:



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



33. Swing the gripper arms underneath the stack of boxes by moving the right joystick to the right.



34. Open the rod grippers so that the hydraulic jacks can move upwards. To do so, push the left joystick to the left.
35. Loosen the screw (2) of each of the two rod holding bars (1) at the lower stacking box.

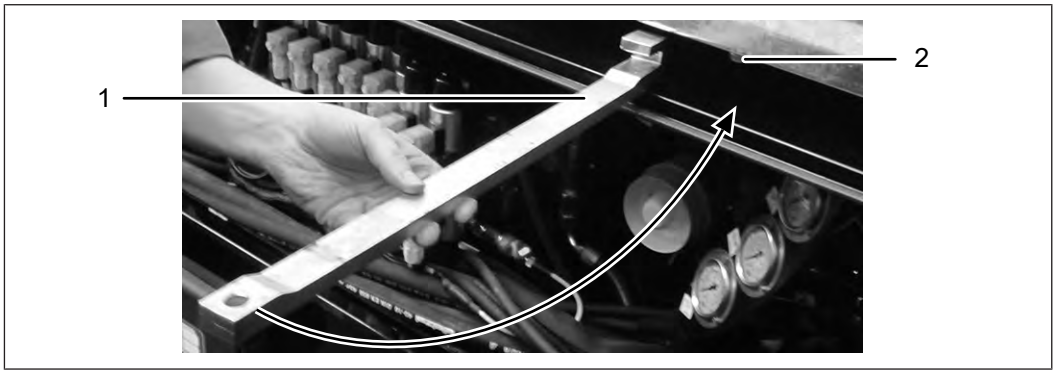



*Fig. 6-122 Loosening the screws of the rod holding bar*

36. Remove the two rod holding bars (1) from the lower connectors of the stacking box.
37. Put the two rod holding bars safely aside.

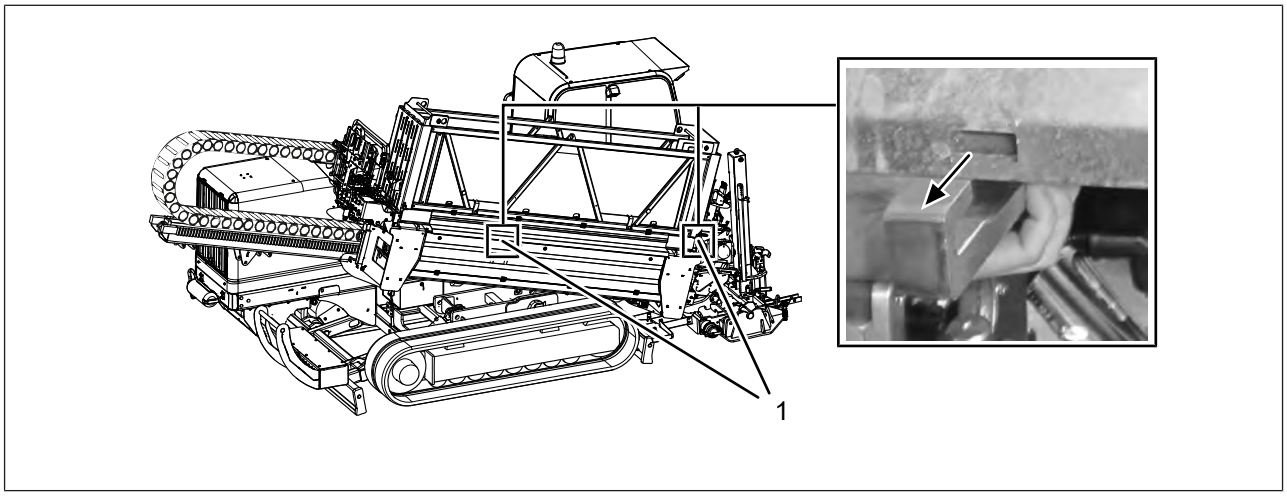



*Fig. 6-123 Removing the rod holding bars from the connectors of the lower stacking box*

38. Mount the bay fill level detection (2) onto the upper stacking box.
    - ⇨ Place the bay fill level detection (2) from the top onto the stacking box so that the connecting pins of the bay fill level detection fit into the slit-shaped openings of the stacking box.
    - ⇨ Lift the lever (3) on the bay fill level detection to allow for the fastening bolt of the bay fill level detection to engage in the bore hole of the stacking box.
    - ⇨ Insert the locking bolt (1) of the upper stacking box.

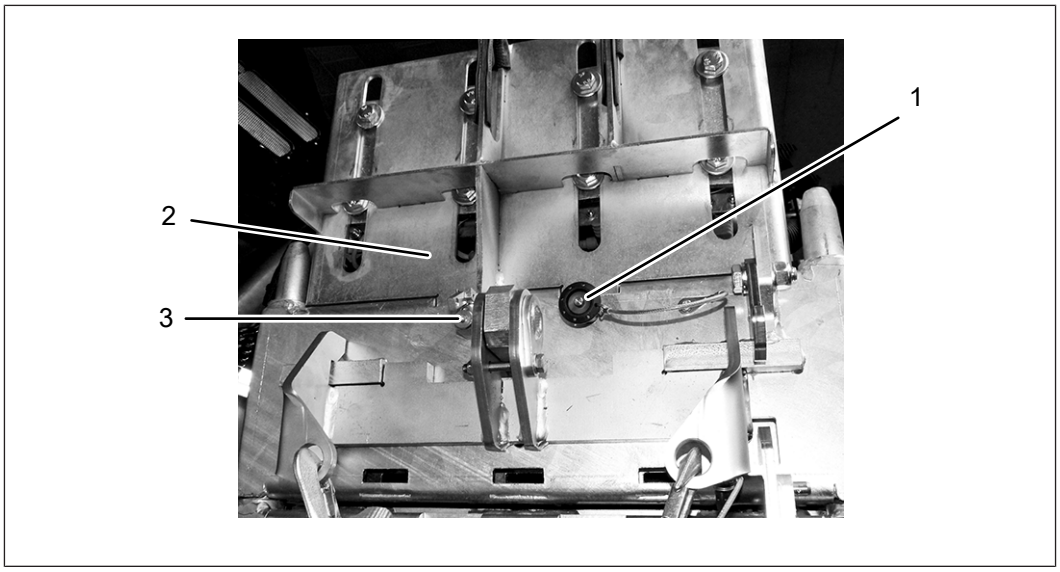



*Fig. 6-124 Mounting the bay fill level detection*

39. Mount the transport lock (2) onto the upper stacking box.
    ⇨ Position the transport lock (2) on the upper stacking box. Make sure that the locking bolt (1) of the transport lock is aligned with the bore hole of the stacking box.
    ⇨ Swing the locking bolt (1) of the transport lock upwards (also on the opposite side of the transport lock).
40. Mount another transport lock (2) on the opposite side of the upper stacking box.




*Fig. 6-125 Mounting the transport lock*

***Bracing the stacking boxes with tension straps***

After assembly of the stacking boxes lash them as follows:

1. Attach the lashing plates (1) at the front and rear of the upper stacking box.
2. Secure the lashing plates using the attached bolt (2) with hexagonal screw and nut (3).

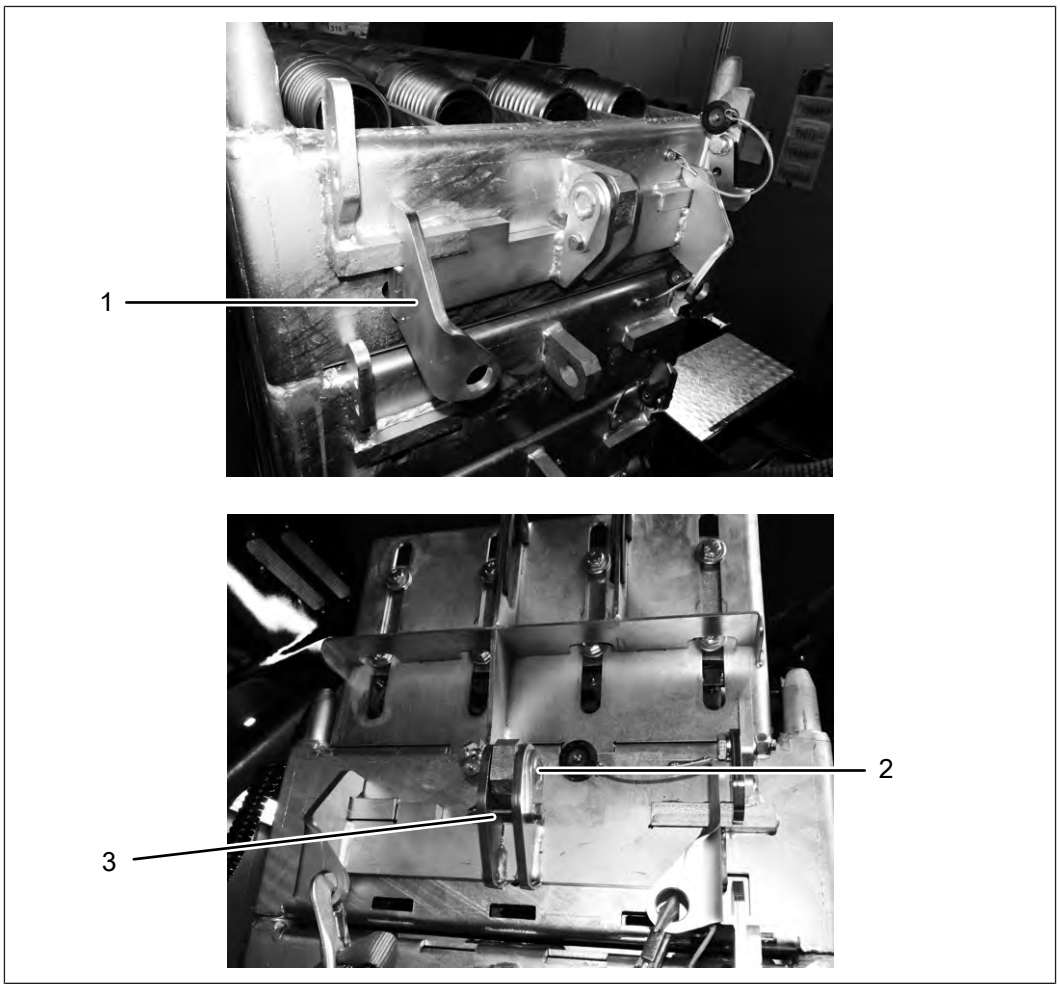



*Fig. 6-126 Mounting the lashing plates*

3. Lash down the front and rear stacking box diagonally with 2 tension straps each (as per EN 12195-2 using snap hooks, LC = 1000 daN, length: 1.15 m, width: 35 mm).

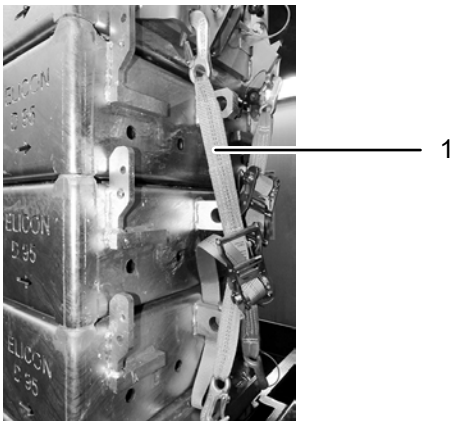



*Fig. 6-127 Bracing the stacking boxes with tension straps*

## 6.10 Inserting and removing an additional rod into/from the stacking box

If a larger rod quantity is required, single drill rods may be added. The weights of a full stacking box and the single rods can be found in chapter 3.3, page 59.

**⚠ 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.

1. Use the loading crane with a special rod gripper to insert single drill rods into the stacking box.
2. Grip a single drill rod outside its centre so that it is slightly tilted with an inclination matching the boom inclination.
3. Only load the two middle rows of the stacking box with single drill rods.
4. Carefully insert the drill rod into the stacking box.
5. Use the special cable winch to unlock the rod gripper.

## 6.11 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 59).

It is necessary to change the rod box, for example, if you want to continue drilling with the stacking boxes and refit the rod box after drilling.

Always work with at least two persons when changing the rod box. One person operates the external lifting device, the other person stands on the secured ladder of the machine in order to connect the rod box with a chain strand or to detach the chain strand from the rod box as well as to help to guide the rod box hanging from the lifting device.

**⚠ 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.

**⚠ WARNING**



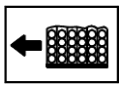
**Crush and impact hazard!**

When exchanging the bay fill level detection, there is a risk of head and hand injury.

- Wear head and hand protection when exchanging the rod box!

***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 stabilisers are 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.



1. Before dismantling, move the rod box outwards all the way using the push button on the left joystick.
2. Switch off the motor (chapter 6.15, page 306).

### 6.11.1 Disassembling the rod box

1. Fold up the cover sheet under the rod box.
2. Release the two rod holding bars (1) from the parking position at the front of the rod box.

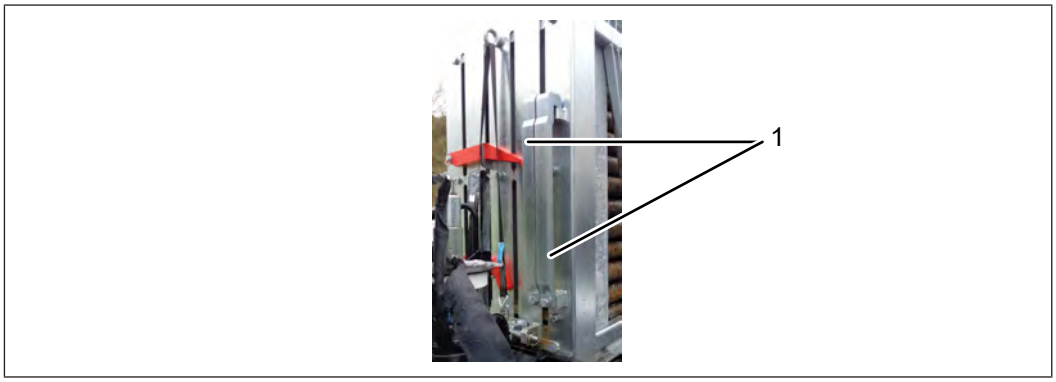



*Fig. 6-129 Rod holding bars on the rod box*

3. Insert the two rod holding bars (1) into the lower connectors on the left side of the rod box in the direction of travel.
4. Screw the two rod holding bars on the outside into the hole using an M12 x 35 DIN 933 screw (2) and an M12 Nord-Lock washer (3).

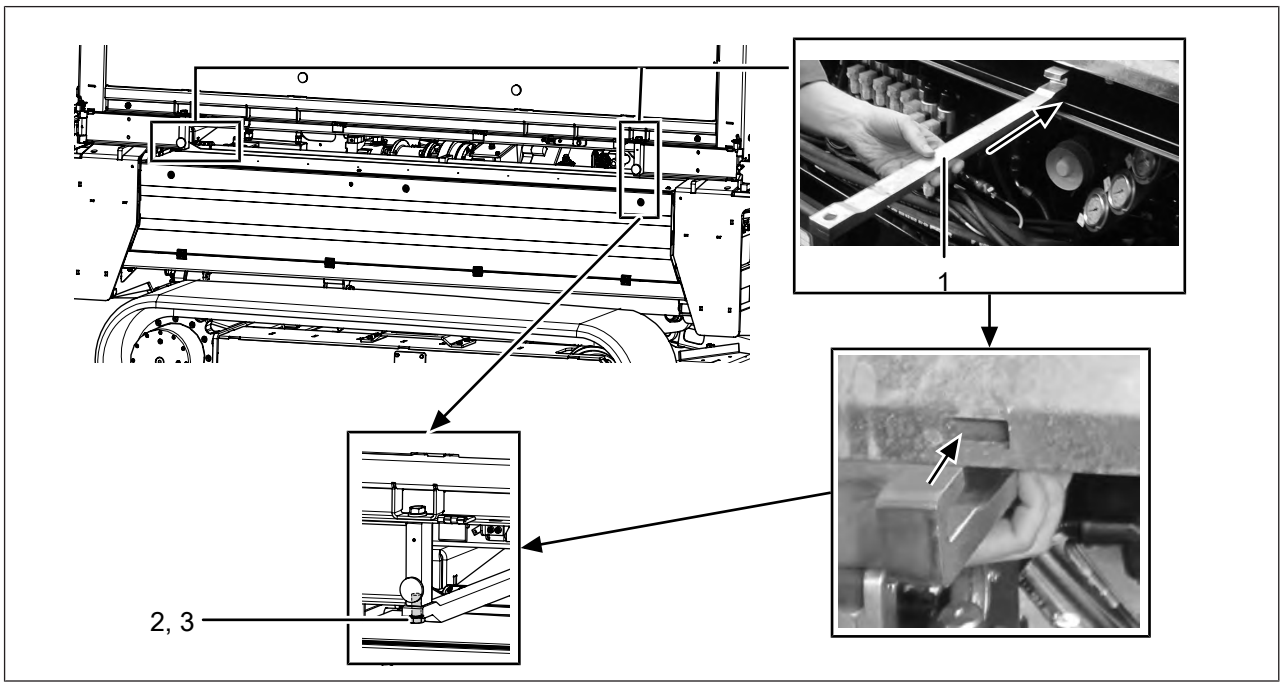



*Fig. 6-130 Inserting the rod holding bars into the lower connectors of the rod box and fastening them with screws*

Secure the ladder on the machine by means of the ladder guide:

5. Insert the bolt (2) of the ladder guide (1) through the hole (3) in the magazine.
6. Secure the ladder guide with the linchpin (4).
7. Fit the ladder (5) into the ladder guide.
8. Secure the ladder with the star handle screws (6).

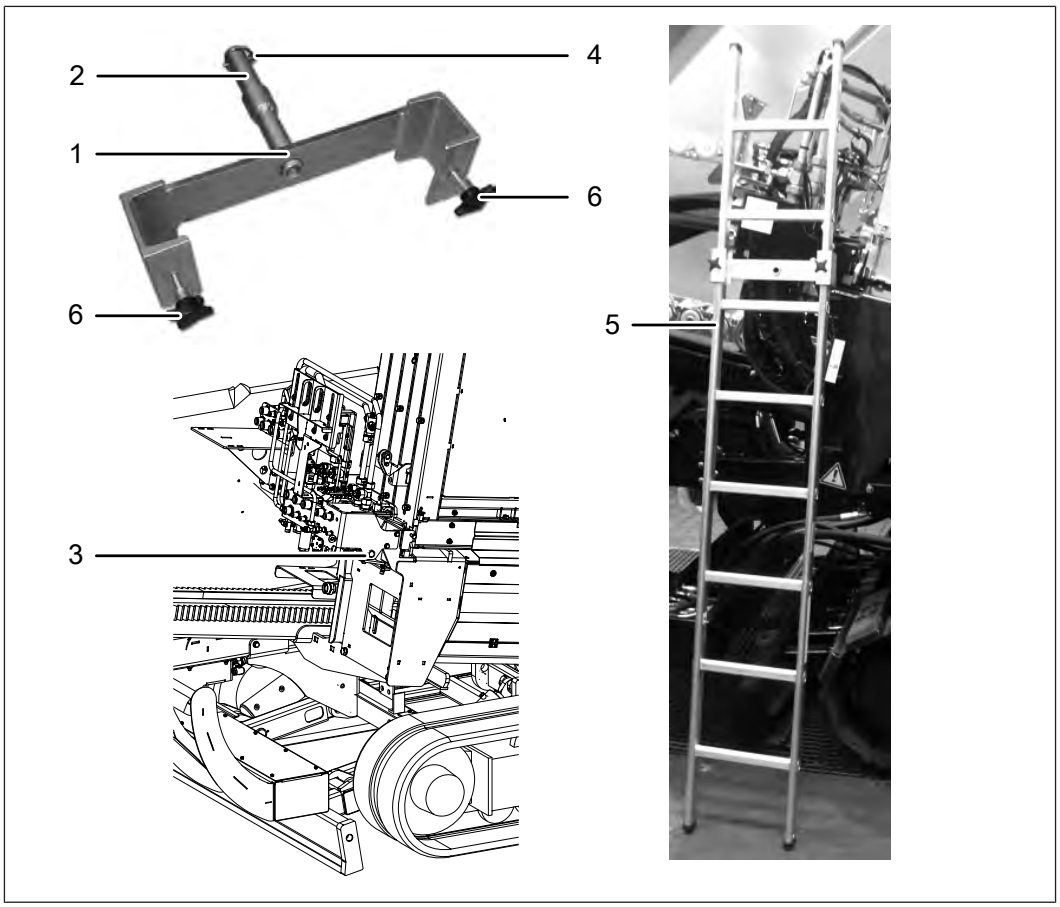



*Fig. 6-131 Mounting the ladder*

9. Remove the locking bolt (1) at the top of the rod box.
10. Dismantle the bay fill level detection (2).
    ⇨ To do so, press the lever (2) on the bay fill level detection (3) upwards and pull out the bay fill level detection to the top.
11. When changing the rod box, store the bay fill level detection in the holder at the rear panel (4).

**Info!**
The connection of the electric cable remains mounted.

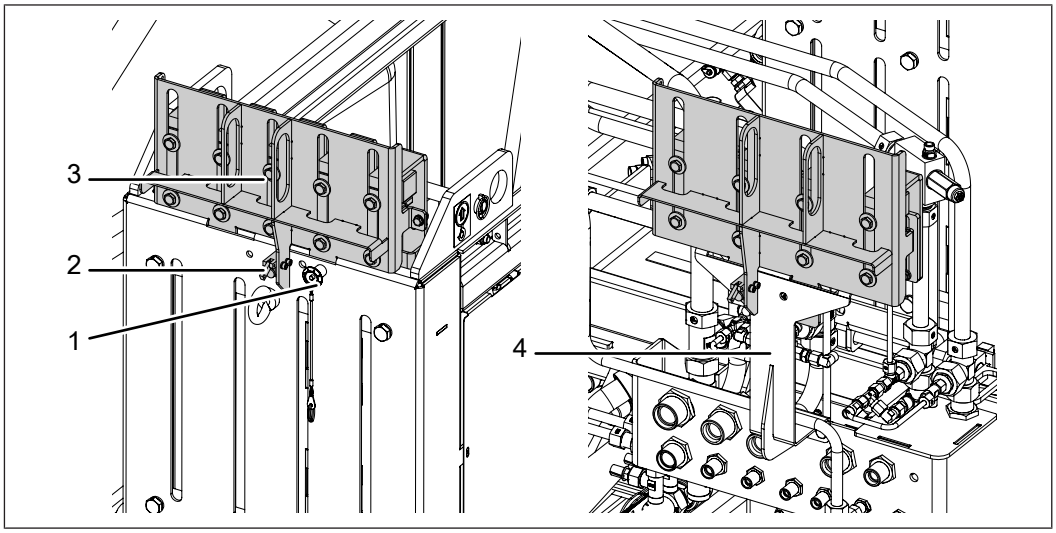



*Fig. 6-132 Dismantling and parking the bay fill level detection*

**Info!**
Only use the auxiliary footstep to connect the chain strand with the retainers of the rod box. Do not climb onto other machine parts.

12. Secure the rod box with the external lifting device from above using the outer attachment points.
    Use the auxiliary footstep to attach the chain strand to the internal attachment points of the rod box:

13. Hook the auxiliary footstep (1) into the machine frame between bonnet and cab.

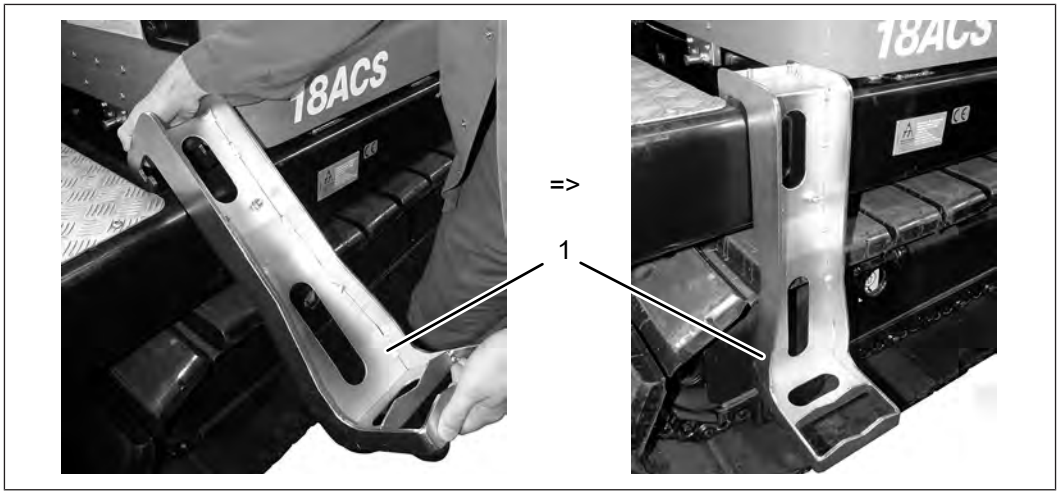



*Fig. 6-133 Hooking up the auxiliary footstep between bonnet and cab*

⇨ Use the auxiliary footstep to reach the machine's platform.

14. Connect the chain strand to all four retainers (see arrows in the illustration) of the rod box.

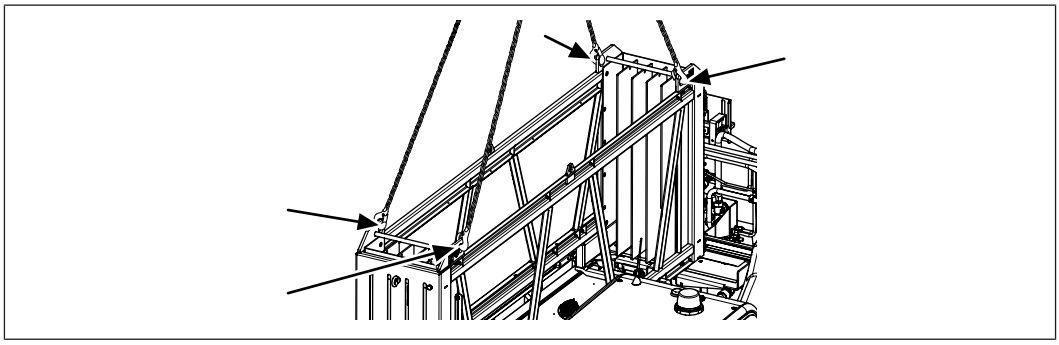


*Fig. 6-134 Hooking up the chain strand*

15. Leave the machine.
16. Lift the external lifting device slightly so that the chain strand is under tension.

17. Detach the tension straps (1) from the front and rear of the rod box.

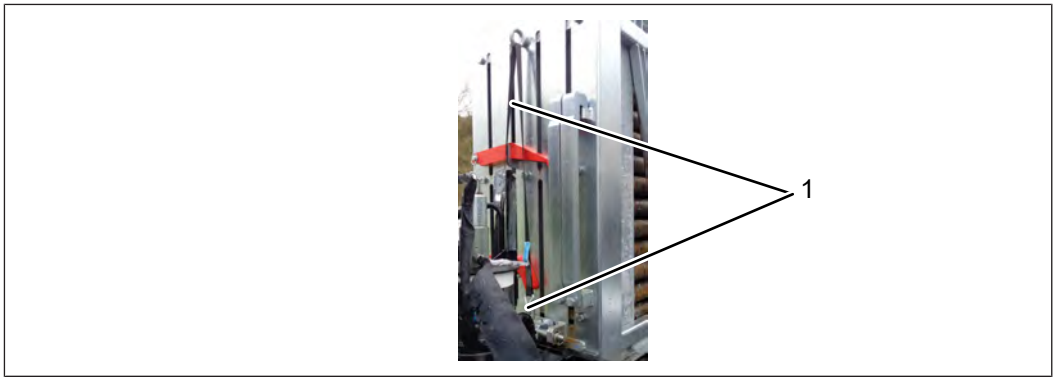



*Fig. 6-135 Tension strap for rod box (here: front)*

18. 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.
    - ⇨ Remove the lashing eye (3).

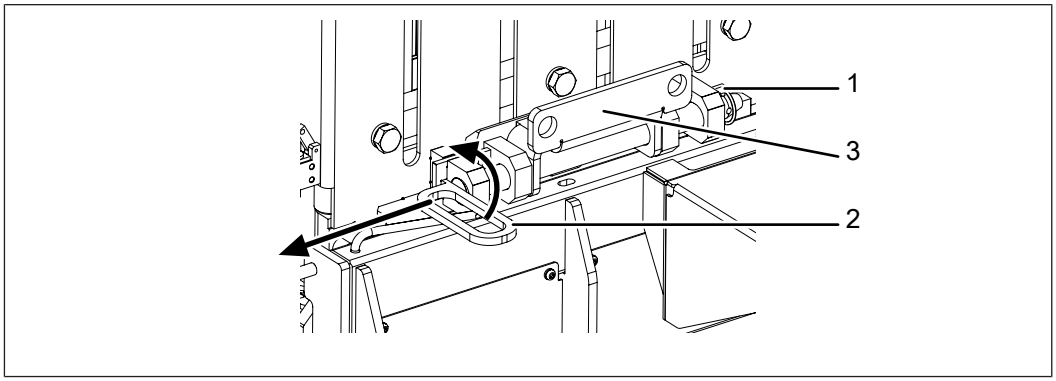



*Fig. 6-136 Releasing the lock for the rod box (here: front)*

19. Secure the shifting plates with the hooks by inserting the short side of each hook into the centre hole (1) of the shifting plate.

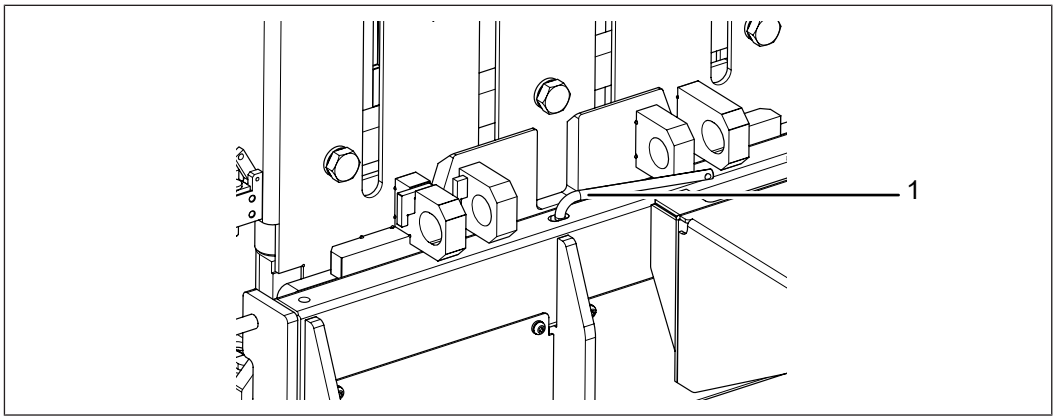



*Fig. 6-137 Securing the shifting plate with hooks (here: front)*

**⚠ DANGER**

**Suspended loads!**



Risk of injury due to falling loads.

- Keep out of any suspended components.
- Keep third persons away from the danger area.

20. Lift the rod box with the external lifting device and place it on suitable square timbers on level, sufficiently firm ground.

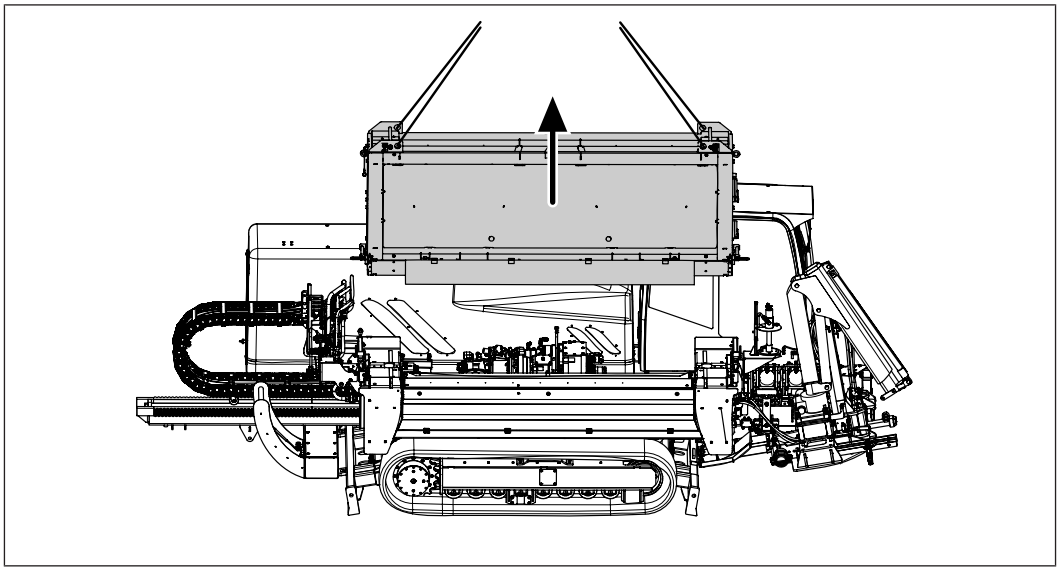


*Fig. 6-138 Rod box lifted*

### 6.11.2 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. 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.

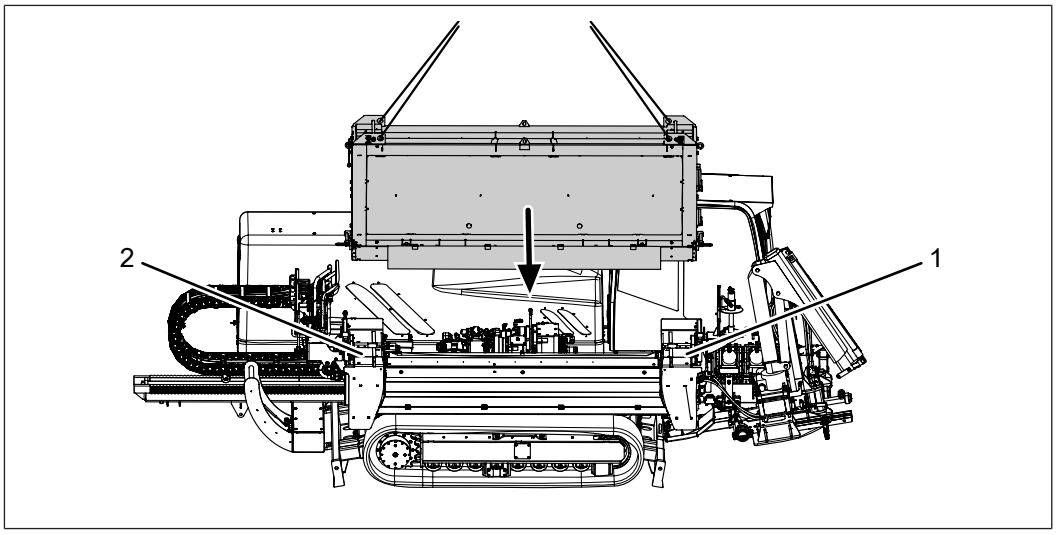



*Fig. 6-139 Rod box lifted*

2. 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).

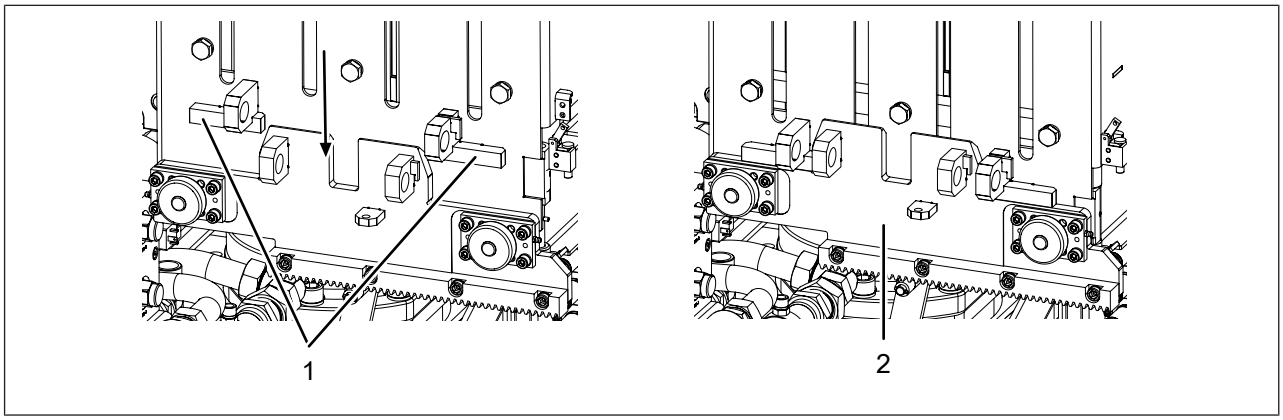



*Fig. 6-140 Placing the rod box on the shifting plates*

3. After positioning, ensure that the chain hoist is still tensioned so that the rod box does not fall off the machine.

4. At the front and rear, pull the hooks out of the shifting plate and insert them back into the parking position (1).

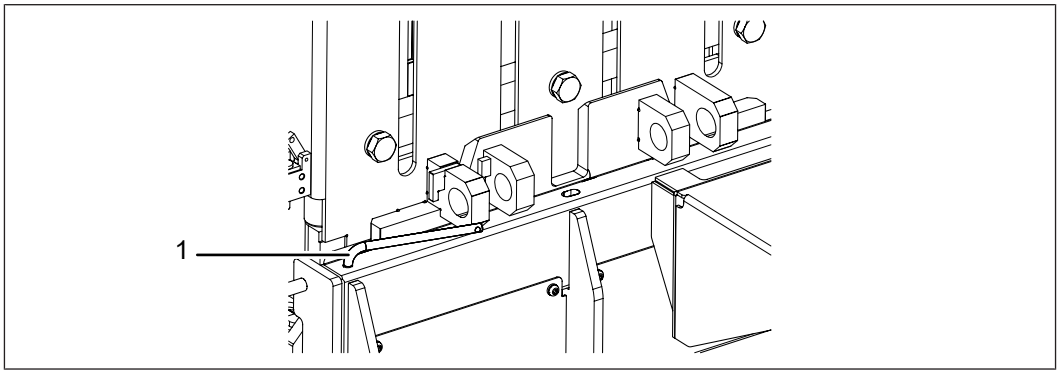



*Fig. 6-141 Hook in parking position (here: front)*

5. Attach the locks of the rod box at the front and rear:
   - ⇨ Insert the lashing eye (1) and secure it by re-inserting the lock for the rod box (2).
   - ⇨ Turn the lock for the rod box downwards to connect the rod box to the machine frame.
   - ⇨ Secure the bolt with the linchpin (3).

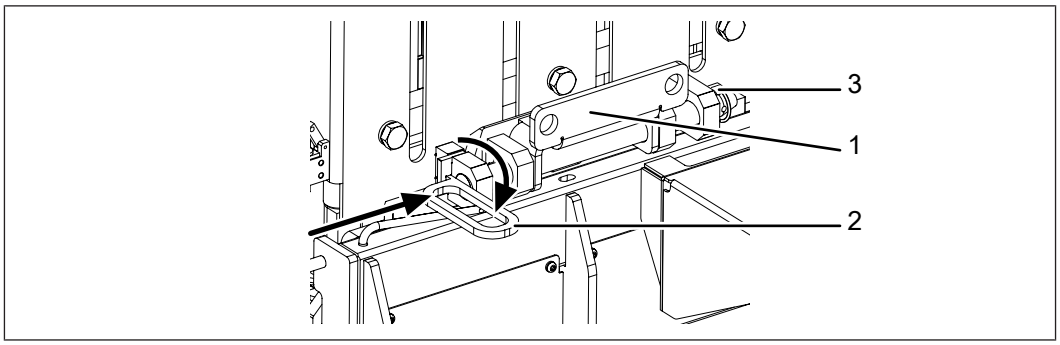



*Fig. 6-142 Attaching the lock for the rod box*

6. Lash the rod box at the front and rear with tension straps.

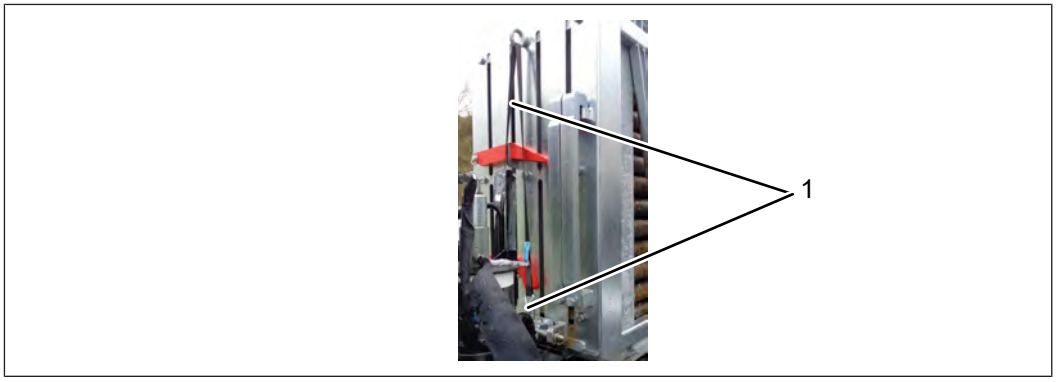



*Fig. 6-143 Tension straps*

**Info!**
Only use the auxiliary footstep step to remove the chain strand from the retainers of the rod box. Do not climb onto other machine parts.

7. Climb onto the auxiliary footstep and remove the chain strand from all four retainers (see arrows in the illustration) of the rod box.

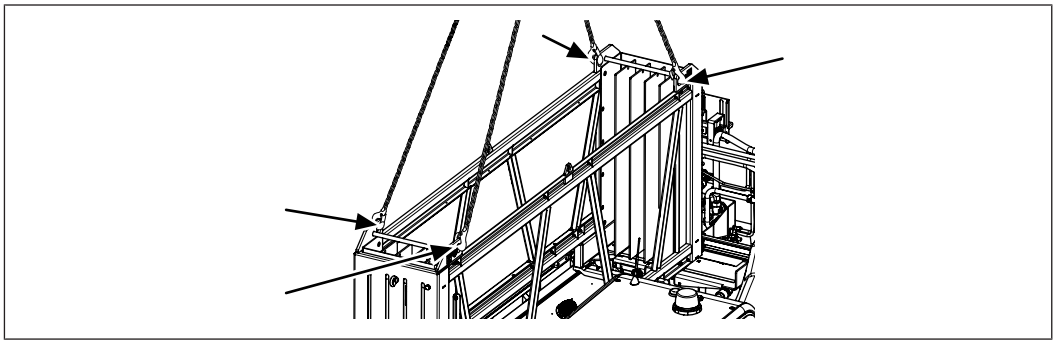


*Fig. 6-144 Removing the chain strand*

8. Leave the machine and remove the auxiliary footstep.

**Info!**
Use the ladder attached when dismantling the rod box (see Fig. 6-131) to fit the bay fill level detection.

9. Remove the bay fill level detection from the holder at the rear panel (1).
10. Mount the bay fill level detection (2).
    ⇨ Place the bay fill level detection from the top onto the rod box so that the connecting pins of the bay fill level detection fit into the slit-shaped openings of the rod box.
11. Lift the lever (3) on the bay fill level detection to allow for the fastening bolt of the bay fill level detection to engage in the bore hole of the rod box.

12. Insert the locking bolt (4) into the top of the rod box.

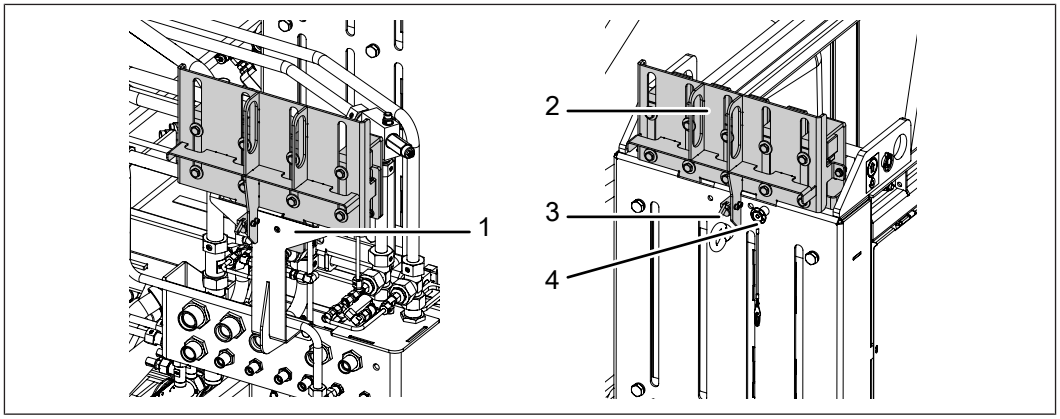



*Fig. 6-145 Mounting the bay fill level detection*

13. Loosen the screws and Nord-Lock washers (1) on both rod holding bars on the outside.
14. Release the two rod holding bars (2) from the connectors on the left side of the rod box in the direction of travel and pull out the rod holding bars.

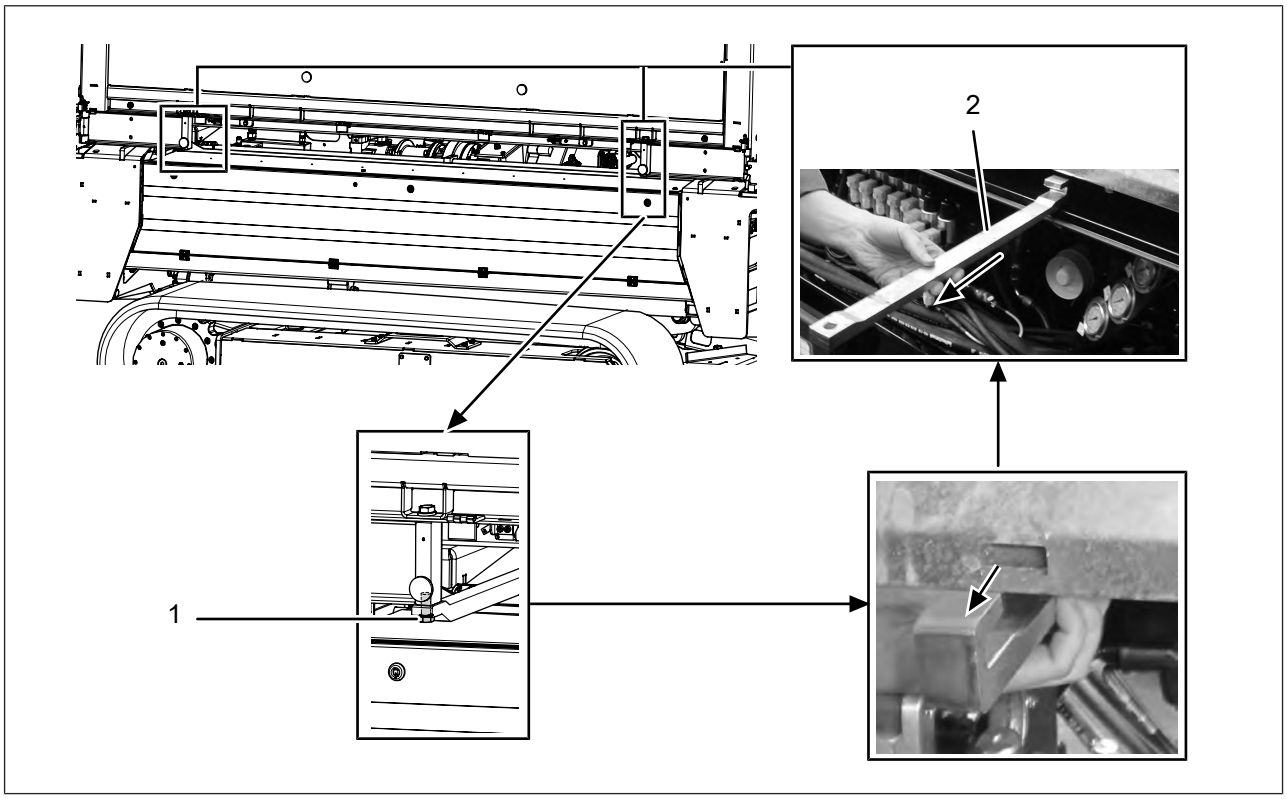



*Fig. 6-146 Loosening the rod holding bars and pulling them out of the connectors*

15. Reattach the two rod holding bars to the parking position (1).

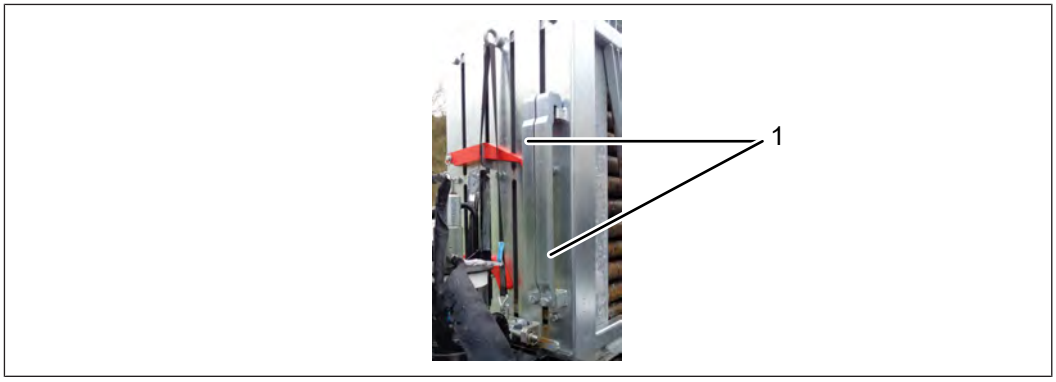


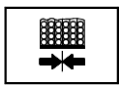

*Fig. 6-147 Rod holding bars on the rod box*

16. Fold the cover plate of the rod box back down.



*Fig. 6-148 Folding down the cover plate of the rod box*

17. Start the engine (chapter 5.3.2, page 86).



18. Press the push button on the left joystick to move the rod box in transport position again.

## 6.12 Inserting and removing an additional rod into/from the rod box

A full rod box (not a stacking box) contains 40 Elicon 101 twin tube rods for a bore length of 120 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.

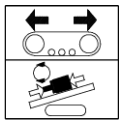
### 6.12.1 Inserting individual rods into the rod box

***Requirements***

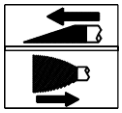
- The outer bay of the rod box is empty.
- At least one of the other bays of the rod box is not filled completely.
- The thrust rig is reversed.
- The grippers of the gripper arm are empty.
- The operating mode "pilot bore" has been selected (chapter 6.6, page 223).

**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.

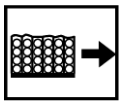
***Preparation***



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).

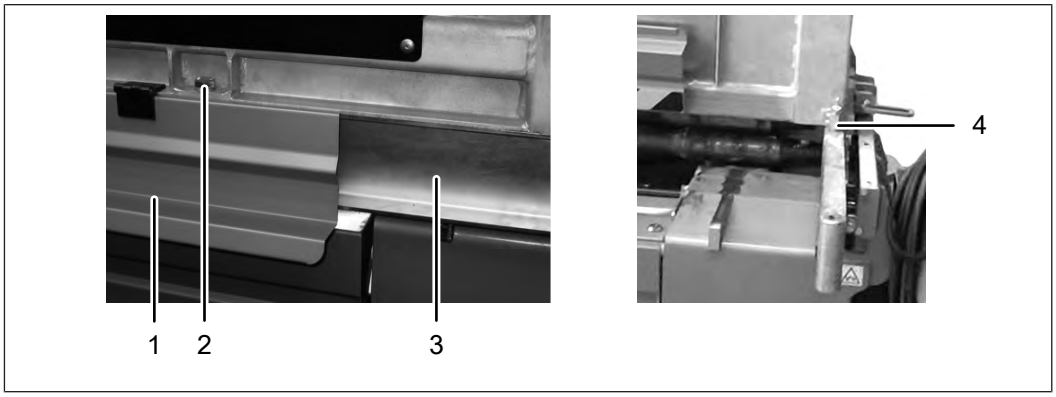



*Fig. 6-149 Folding out the lateral legs of the rod box*

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.

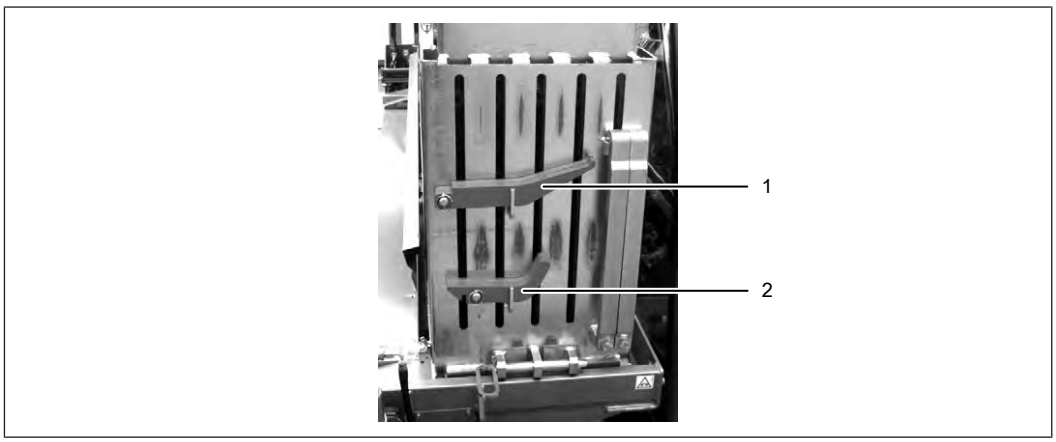



*Fig. 6-150 Loading and unloading aids*

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.

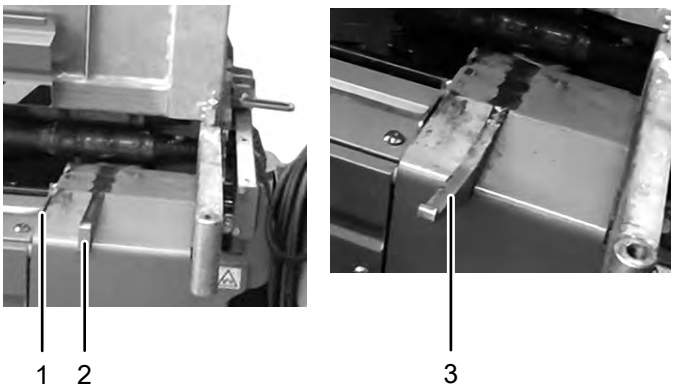



*Fig. 6-151 Mounting the loading aids*

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.

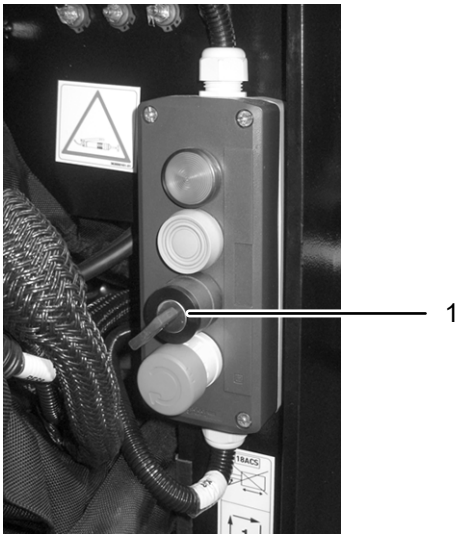



*Fig. 6-152 Key switch for automatic rod feed and removal*

**⚠ 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.

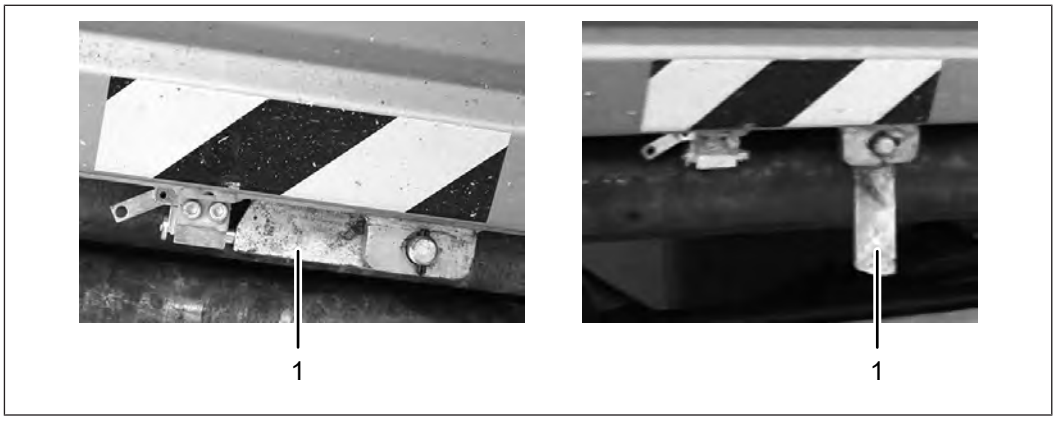



*Fig. 6-153 Folding down the safeguards*

15. Press the >>start automatic<< button (1) on the automatic rod feed and removal operating panel:

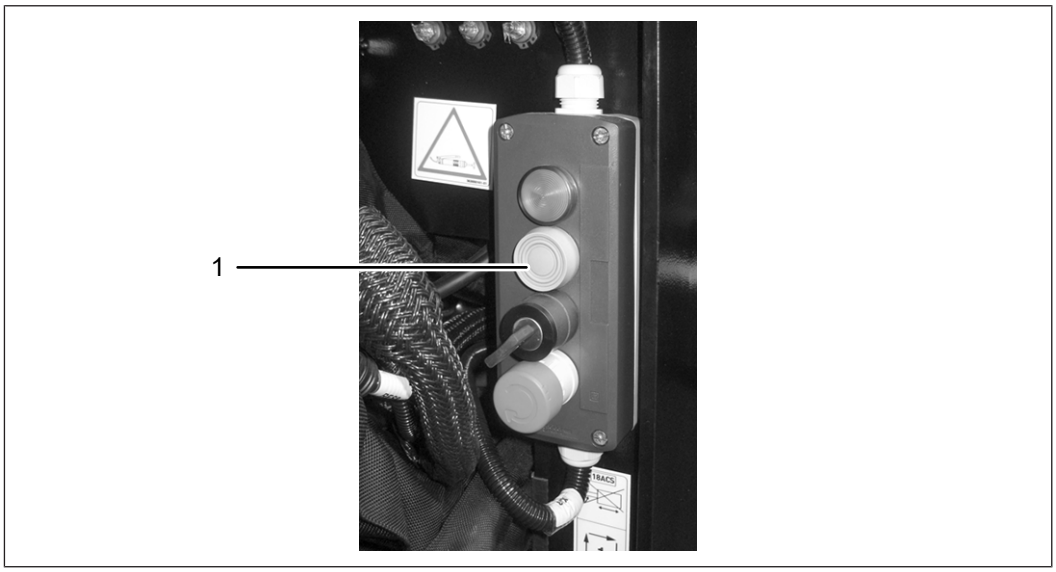



*Fig. 6-154 Button for automatic rod feed and removal*

⇨ 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.

Continue with the pilot bore.

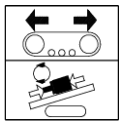
### 6.12.2 Removing single rods from the rod box

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.

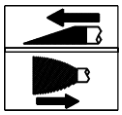
***Requirements***

- The outer bay of the rod box is empty.
- The thrust rig is reversed.
- The operating mode "expansion/pull-in mode" has been selected.

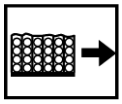
***Preparation***



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).

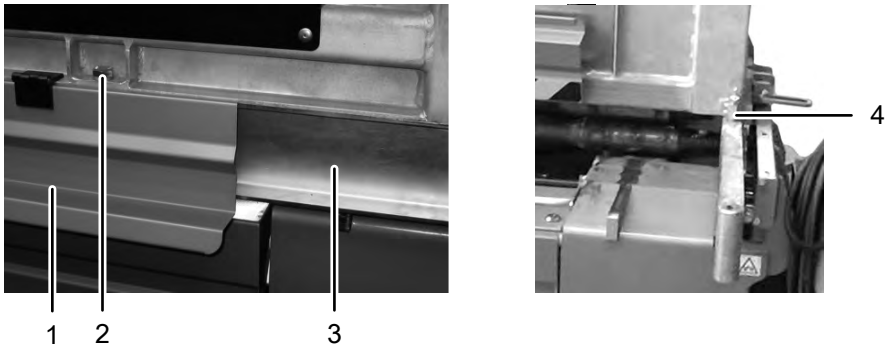



*Fig. 6-155 Folding out the lateral legs of the rod box*

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.

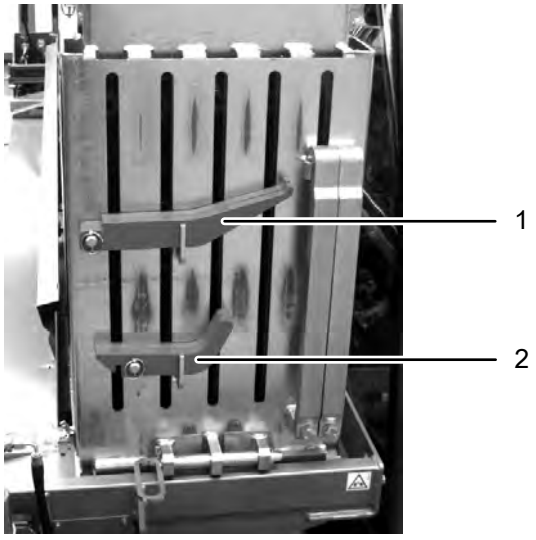



*Fig. 6-156 Loading and unloading aids*

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.

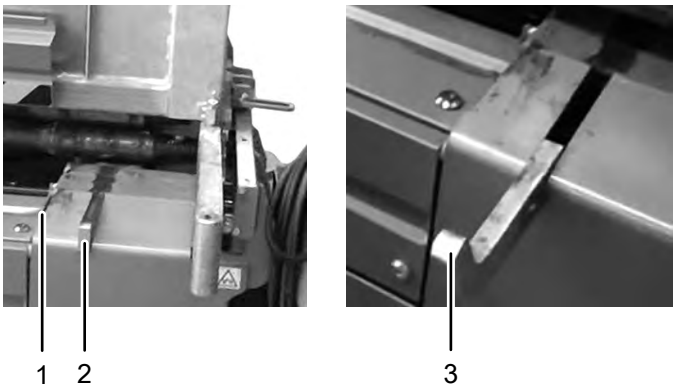



*Fig. 6-157 Mounting the unloading aids*

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.

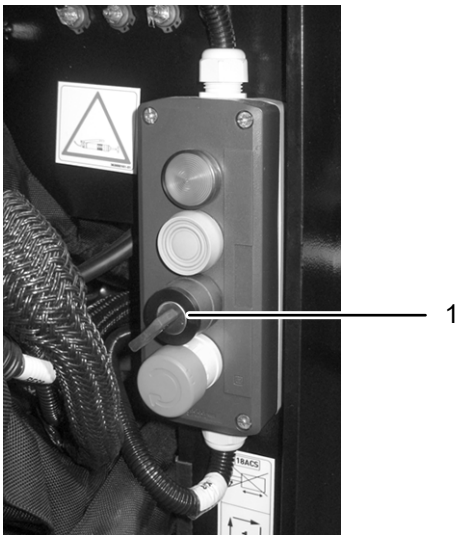



*Fig. 6-158 Key switch for automatic rod feed and removal*

**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):

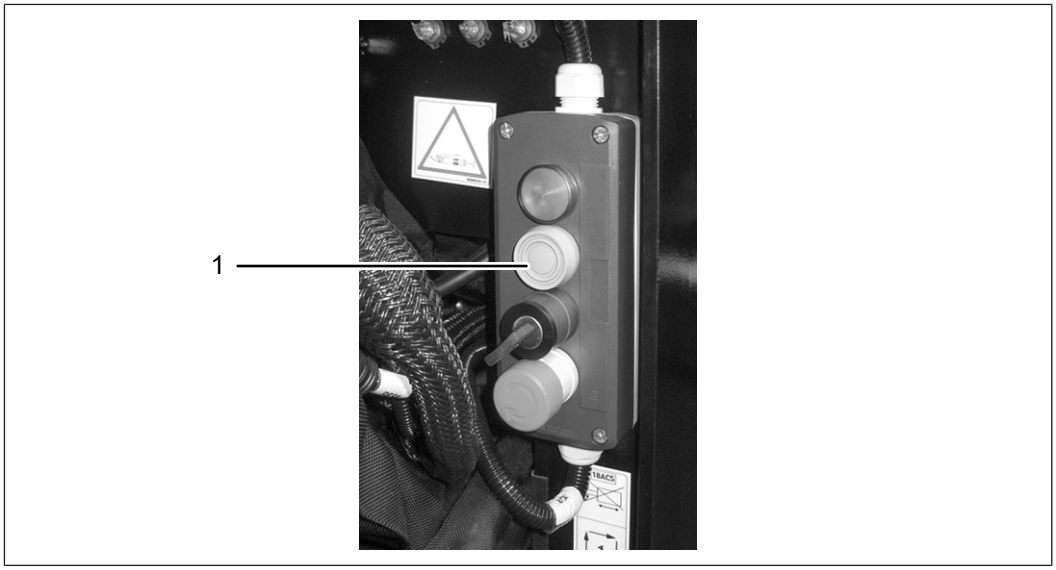



*Fig. 6-159 Button for automatic rod feed and removal*

⇨ 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.

Continue with the pilot bore.

## 6.13 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).

**NOTICE**

**Flex rod damage during pull-in operation!**

- After the pilot bore, disconnect the flex rod from the drill rod string.

**⚠ 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.

### 6.13.1 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**

**Suspended loads!**



Danger due to falling loads!

- Keep out of any suspended components.
- Keep third persons away from the danger area.
- Always adhere to the maximum permissible bearing load of the lifting gear used.

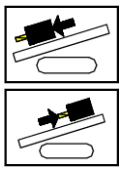
**Info!**
When disassembling the expander head, use the loading crane to lift the expander head.
Observe the specifications regarding the max. permissible weight and operating distance of the loading crane provided in the technical data (chapter 3.3, page 59).

**⚠ DANGER**

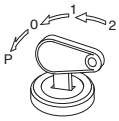
**Pre-tensioned drill rod!**

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 or drilling unit 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 90 and chapter 6.2.3, page 142).

***Operator in the target pit***

4. Detach the bore head assembly or the rock drilling unit and, if necessary, the flex rod from the rod string.

**Info!**
When expanding with twin tube rods, you have to use an adapter in between the expander head and the rod.
This adapter fits on the nipple of the outer rod but not on the nipple of the flex rod.

5. Screw the prepared expander head onto the drill rod. Prevent dirt from reaching the screwed connections or drill rods.

### 6.13.2 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.

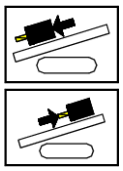
**⚠ DANGER**

**Pre-tensioned drill rod!**

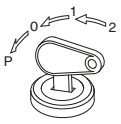
The drill rod can be pre-tensioned, twist all of a sudden and cause injuries!

- Before loosening the bore head assembly, relieve the pretension of the drill rod or drilling unit 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. Unlock the cable drum and relieve the cable by slightly turning the drum.
5. Disconnect the cable between cable drum and cable feed-through.
6. Unscrew the screw-down nut at the cable feed-through of the conversion set and pull off the screw-down nut and the seal ring from the cable so that it does not get stuck when pulling it out of 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 90 and chapter 6.2.3, page 142).

***Operator in the target pit***

7. Detach the bore head assembly or the rock drilling unit and, if necessary, the flex rod from the rod string.
8. Sever the cable at the bore head assembly and pull the cable out of the drill rod towards the front.
9. Screw the prepared expander head onto the drill rod. Prevent dirt from reaching the screwed connections or drill rods.

### 6.13.3 Connecting the product pipe to the expander head

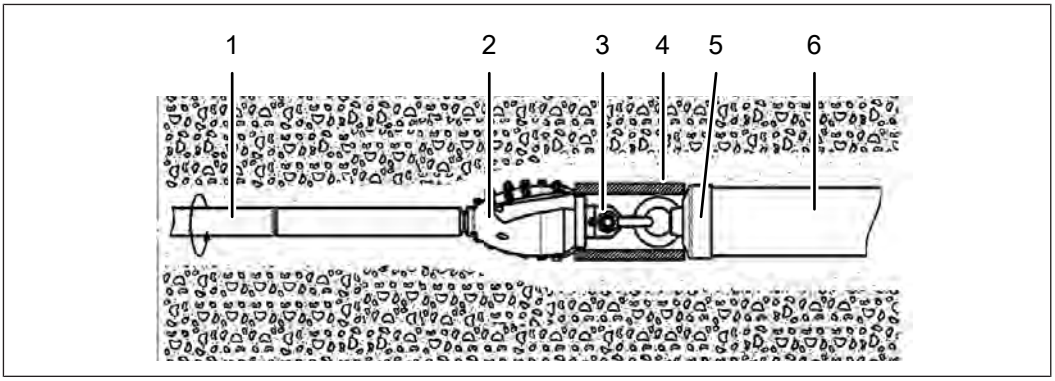



*Fig. 6-160 Example set-up of drill rod with expander head and product pipe*

| | | | |
|---|---|---|---|
| 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.

6.13.4 Expanding and installing the product pipe

1. Hook in the rod wiper (not depicted) ahead of the rod guidance.

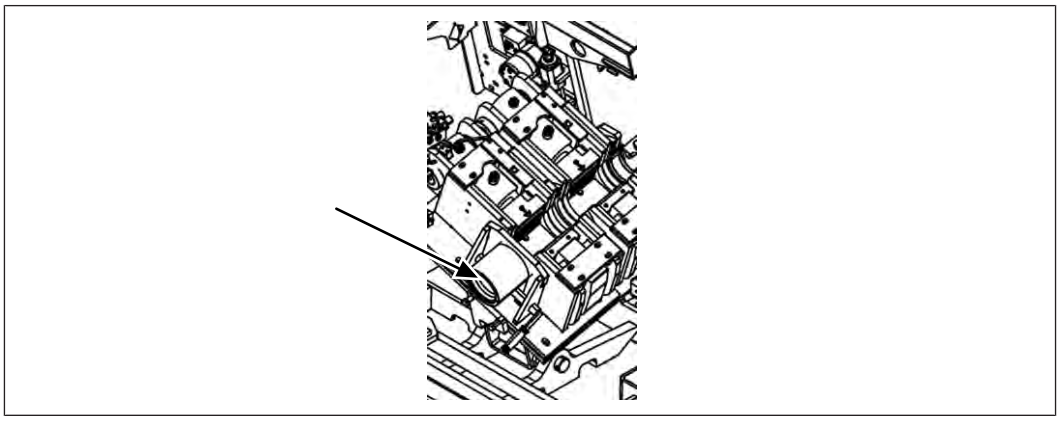
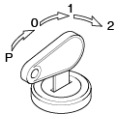
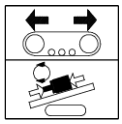


*Fig. 6-161 Rod wiper*



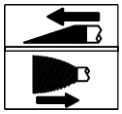

2. Start the machine's drive engine by turning the ignition key (chapter 5.3.2, page 86).



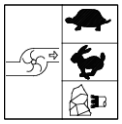
3. If necessary, switch over from drive mode to bore mode on the right joystick panel.



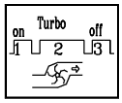
4. Set the engine speed to approx. 1,400 rpm via the potentiometer on the right joystick.



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

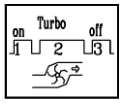


6. Switch the drilling fluid to tortoise (low flow rate) on the left joystick panel.

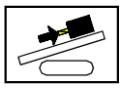



7. Switch on the drilling fluid pump on the left joystick by briefly pressing the push button.

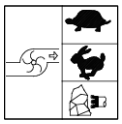
8. Check whether drilling fluid exits from all nozzles of the backreamer.



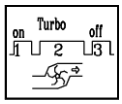

9. Switch the drilling fluid off again by briefly pressing the push button on the left joystick.



10. Reverse the thrust rig until the expander head abuts on the ground.
To do so, pull the right joystick backward.



11. Switch the drilling fluid to rabbit (high flow rate) on the left joystick panel.



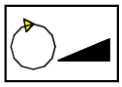

12. Switch on the drilling fluid pump on the left joystick by pressing and holding the push button.

    ⇨ This way the rod string is filled quickly.

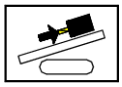
13. Check the pressure on the gauge in the "Bore mode" screen (chapter 6.2.8.3, page 155).
    The pressure should be between 20 bar and 40 bar.



14. 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. 2,200 rpm) is reached.



15. Switch on clockwise rotation by pushing the left joystick forward and holding it in this position.

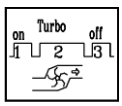


16. Reverse the thrust rig until the first screw connection point of the drill rods is positioned precisely between the two clamp jaws.
    To do so, pull the right joystick backward.
    At the same time make sure that the rotation does not get caught and that the cuttings or rather drilling debris 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.

17. Switch off the rotation by letting go of the left joystick.




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

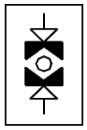
**⚠ DANGER**

**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.



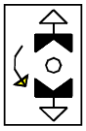
19. Close the clamp via the push button on the right joystick.

**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.

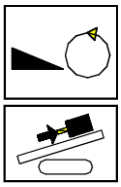
**Info!**
As soon as the clamp is closed, the valve for drilling fluid pressure relief will open automatically.



20. 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.



21. 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.



22. 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!**

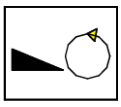


Your hands may be crushed when the break-away clamp closes.

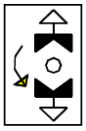
- Keep away from the clamp and break-away device and keep other persons away.



23. Close the break-away clamp by pressing the push button on the right joystick.



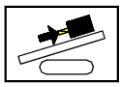
24. Pull the left joystick back to detach the sub-saver from the drill rod in a counter-clockwise rotation. Turn the sub-saver 1.5 rotations.
    Then let go of the left joystick to stop counter-clockwise rotation.



25. Open the break-away clamp by pressing the push button on the right joystick.



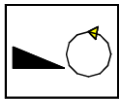
26. Then swing the gripper arms without the drill rod into the bore axis by pushing the right joystick to the left and holding it in this position.
At the same time, push the left joystick to the left to open the rod grippers.
Let go of the joysticks as soon as the gripper arms have reached their end position.



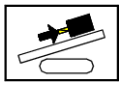
27. Reverse the thrust rig to the rod retainer mark by pulling the right joystick back.



28. Close the rod grippers by pressing the left joystick to the right.



29. In order to completely loosen the screwing between drill rod and sub-saver, switch on counter-clockwise rotation by pulling the left joystick back.



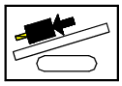
30. Completely reverse the thrust rig to the stop position by pulling the right joystick backwards.



**Info!**
The gripper arms can only be swivelled when the rod grippers are closed and the thrust rig is completely reversed.



31. Swing the gripper arms with the drill rod underneath the rod box/stacking boxes 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/ stacking boxes by the hydraulic jacks.

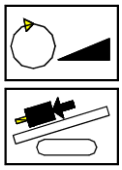


32. Advance the thrust rig to the next drill rod by pushing the right joystick forward.

**NOTICE**

**Possible damage to the threads due to too fast rotation or too high thrust speed!**

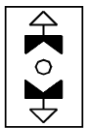
- When screwing the sub-saver to the rods and the rods to each other, proceed slowly and with low thrust to avoid damaging the threads.



33. 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 with rod adapter and the drill rod are screwed together.

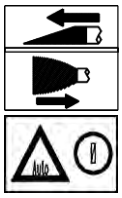


**Info!**
The sub-saver and the drill rod will be screwed together automatically with the predefined torque.



34. Close the clamp via the push button on the right joystick.
35. Proceed with the installation of the drill rods as described starting at point 11 until the rod box has been filled or until the stacking boxes are filled or the expansion is completed.

### 6.13.5 Auto-bore during expanding / pipe installation



If the machine is in "pull-in" mode (rocker switch on the right joystick panel), expanding and rod exchange will take place automatically if you press the push button for automatic drilling on the left joystick panel once.



**Info!**
If you press the push button for automatic drilling on the left joystick panel twice in quick succession, a new drill rod will be taken out, the expansion will be carried out automatically and another drill rod will be taken out subsequently. This process is repeated automatically.

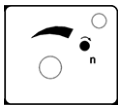
**⚠ DANGER** **Risk of injury due to machine movements during auto-bore!**

- 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.

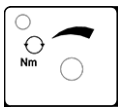
***Starting position***

– The rod grippers are below the rod box/stacking boxes.
– 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:



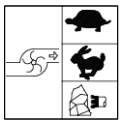

1. Set the potentiometer for the rotation of the inner rod on the left joystick panel.




2. Set the potentiometer for the rotation of the outer rod on the left joystick panel.



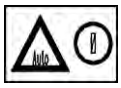
3. Set the traction speed at the potentiometer on the right joystick panel.



4. Switch the drilling fluid to tortoise (low flow rate) or rabbit (high flow rate) on the left joystick panel.



5. If required, readjust the engine speed via the potentiometer on the right joystick.



6. Automatic drilling 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.

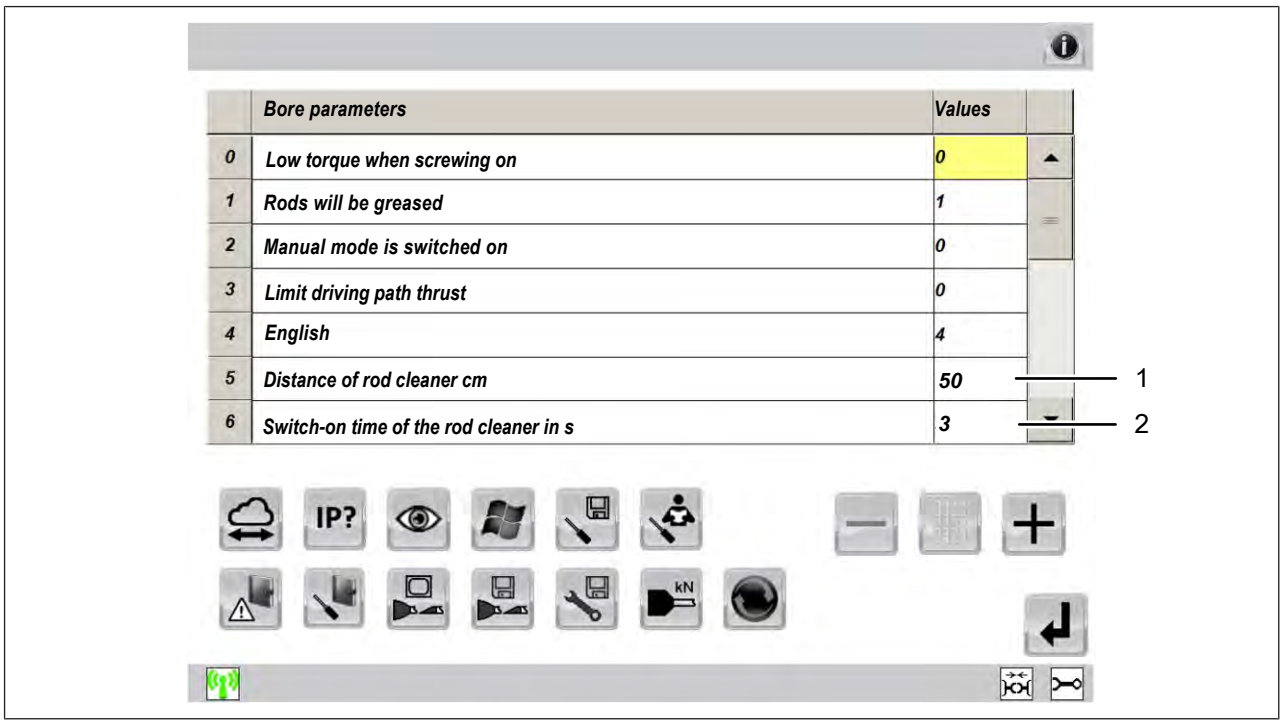



*Fig. 6-162 "Bore parameters" screen (exemplary illustration)*

## 6.14 Cleaning of the exhaust gas system

### 6.14.1 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.

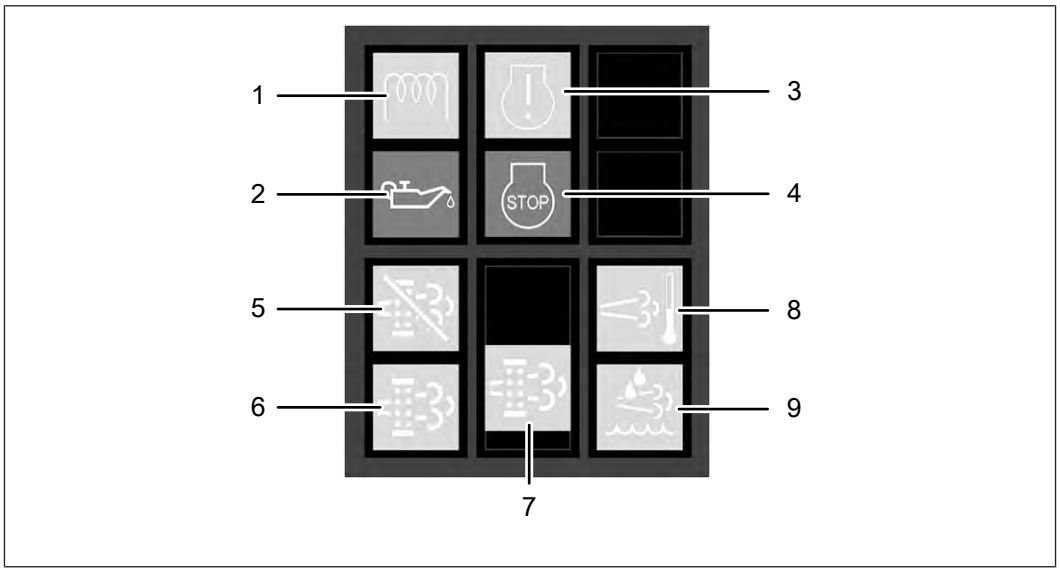



*Fig. 6-163 Indicators diesel engine*

*Tab. 6-41 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.<br>– 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. 6-42 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.

These diesel engines also need diesel exhaust fluid (DEF), e.g. AdBlue®. The DEF lamps indicate when the DEF tank needs to be re-filled, as does the DEF filling level indication. They alert the operator when he needs to take action.

*Tab. 6-43 DEF lamps*

| Lamps | Meaning | Remedial action |
|---|---|---|
| 9<br><br>illuminated | **DEF** lamp – Lights up in case of a low DEF filling level. | If necessary, refill the DEF tank. |
| 3 + 9<br><br>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<br><br>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<br><br><br>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. |

If re-filling the DEF tank does not cause the lamps to go out and the normal engine power to be restored, please contact the TRACTO-TECHNIK customer service.

6.14.2 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.

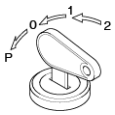


2. Set the engine speed to idling via the potentiometer on the right joystick.



3. 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.
4. 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.

## 6.15 Switching off the machine




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

***Requirements***

- The accessories have been disconnected from the machine.
- The step grid at the cab is swung in.
- All drill rods are inside the rod box/stacking boxes.
- The thrust rig has been brought into the front end position.
- The boom and the stabilisers are raised.
- The loading crane is folded in.

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).

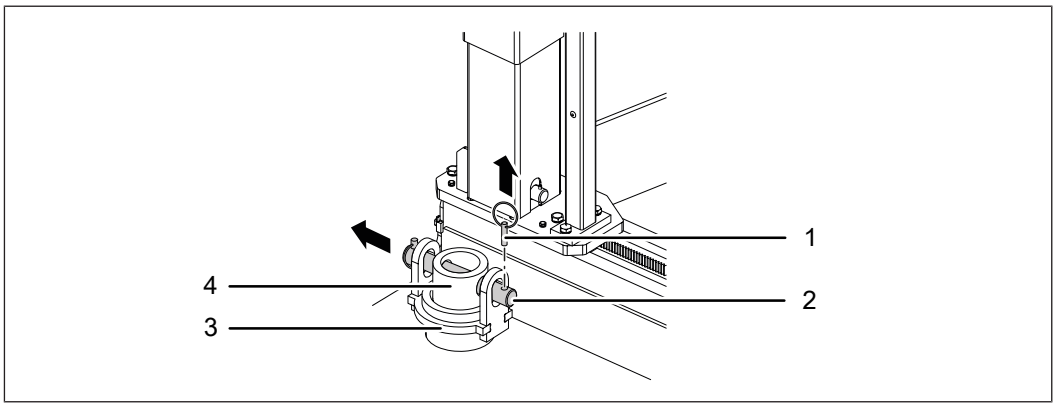



*Fig. 7-1 Pulling out the bolt*

3. Turn the ring (1) by approx. 90° (from the alignment direction) and attach the impact head (2).

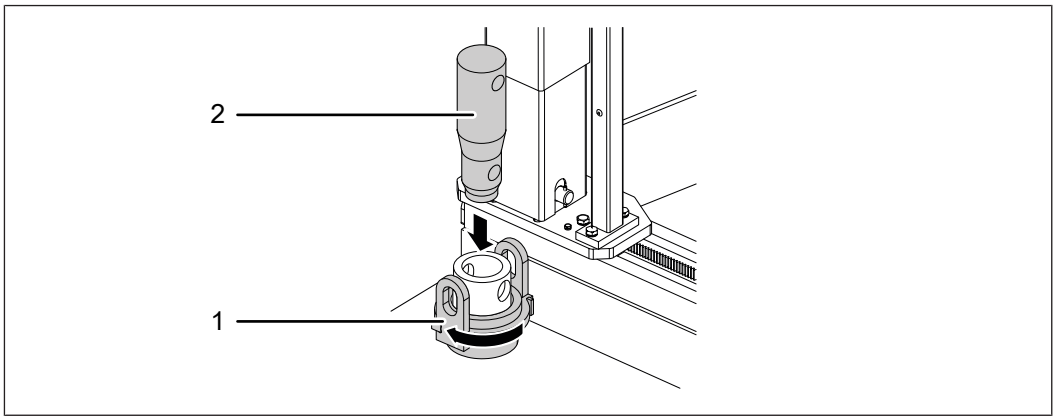



*Fig. 7-2 Removing the bolt, attaching the impact head*

4. Push the bolt (1) through the thrust anchor (2) and the impact head (3).
5. Fix the bolt with the safety pin (4).

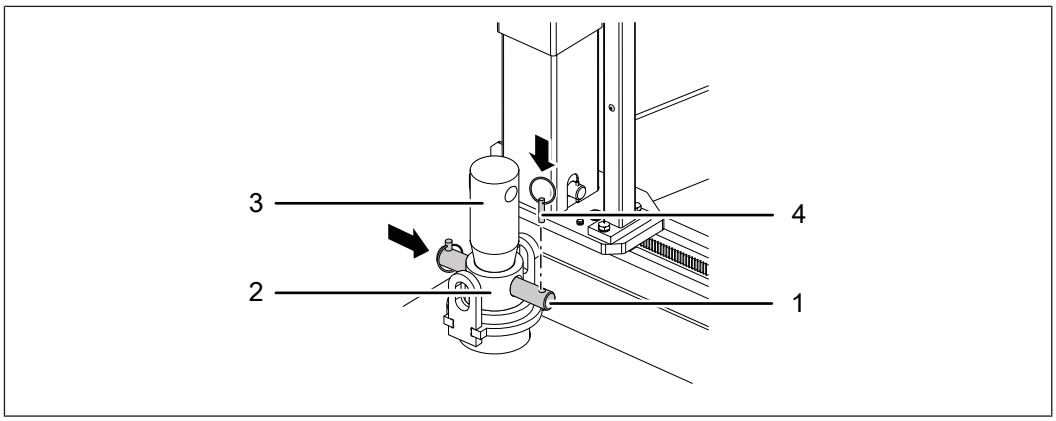



*Fig. 7-3 Fixing the bolt in place*

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).

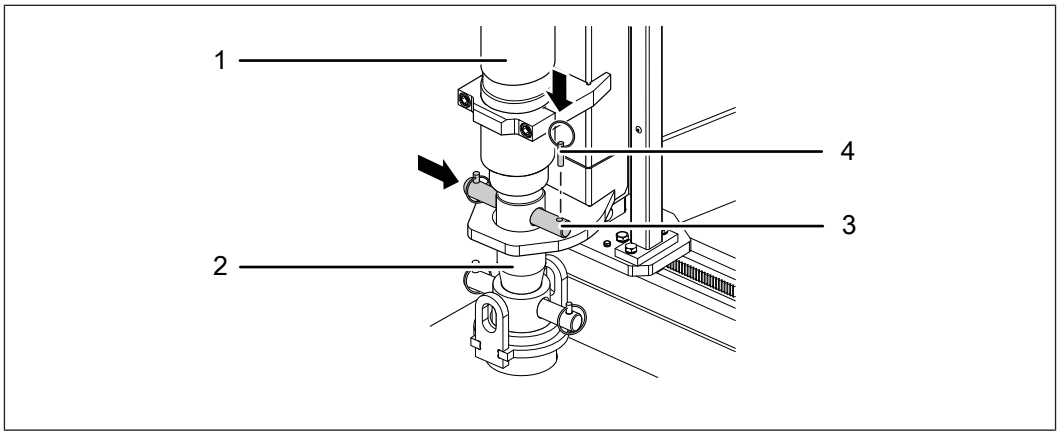



*Fig. 7-4 Bringing the anchor thrust unit in position and lowering it, inserting second bolt*

**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.

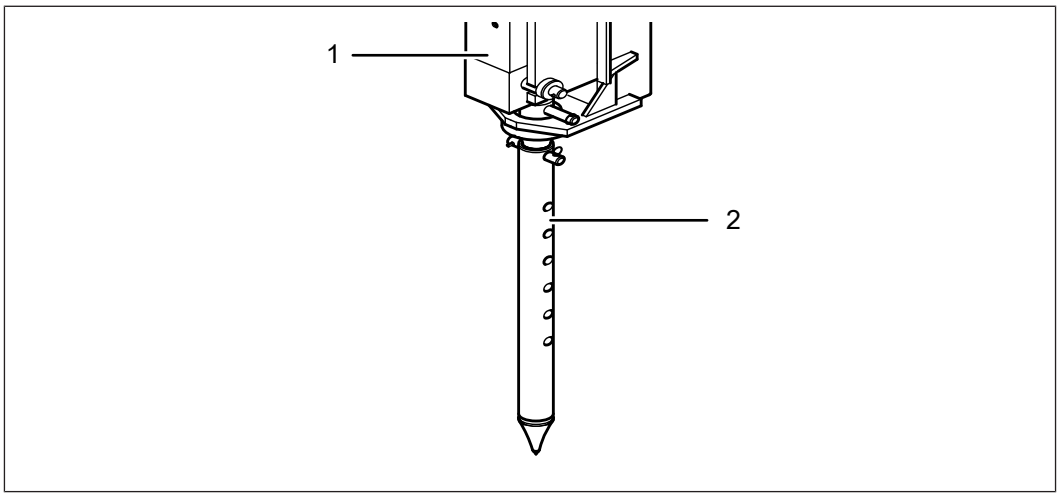



*Fig. 7-5 Raising the anchor thrust unit*

## 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.

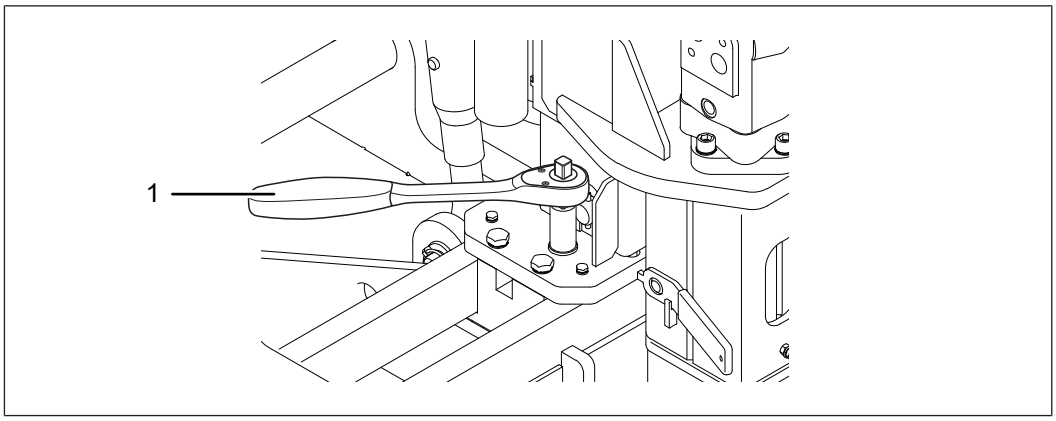



*Fig. 7-6 Hand ratchet anchor boring rig*

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.

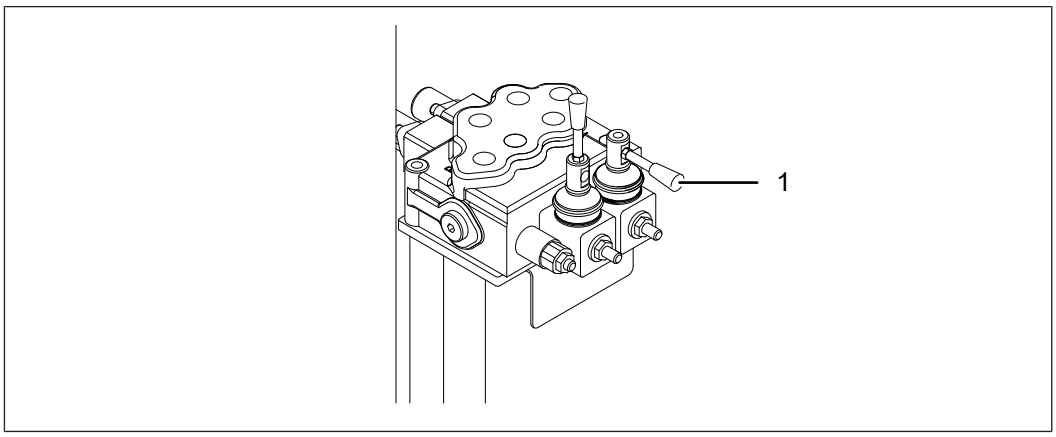



*Fig. 7-7 Hand lever >>Lift/lower anchor boring rig<<*

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.

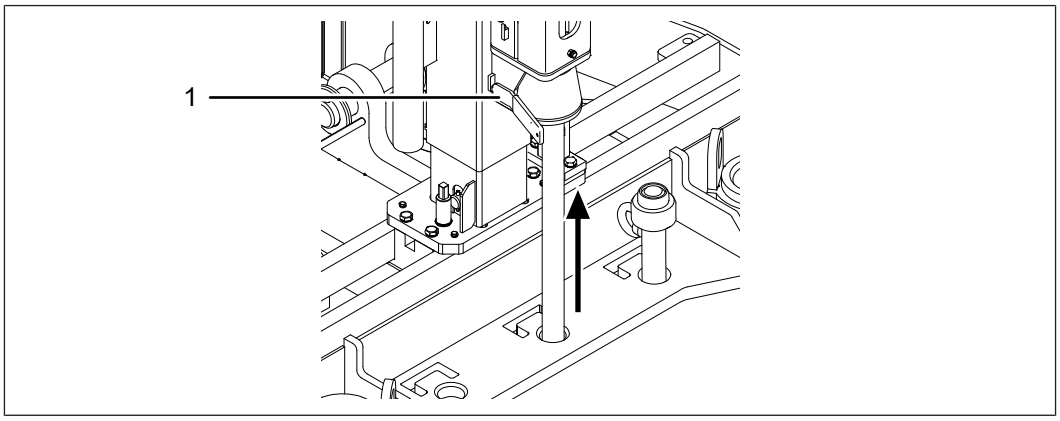



*Fig. 7-8 Pulling out the earth stake*

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.

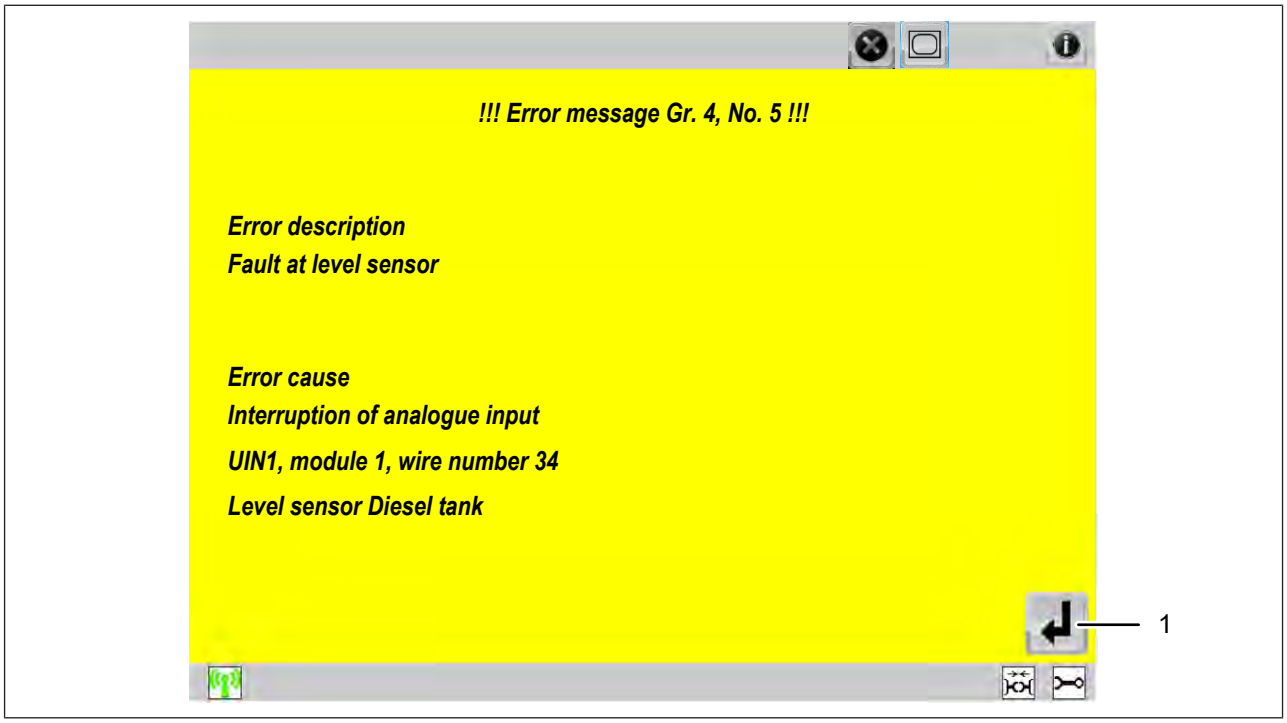



*Fig. 8-1 "Error messages" screen*

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:<br>**TRACTO-TECHNIK GmbH & Co. KG**<br>Tel.: +49 2723 808-0<br>www.tracto.com<br>E-mail: info@tracto.com | | |
| USA / Canada:<br>**TT Technologies Inc.**<br>Tel.: +1 630-851-8200<br>www.tttechnologies.com<br>E-mail: info@tttechnologies.com | Switzerland:<br>**TRACTO-TECHNIK Schweiz AG**<br>Tel.: +41 79 820 3897<br>www.tracto-technik.ch<br>E-mail: info@tracto-technik.ch | UK:<br>**T.T. UK LTD**<br>Tel.: +44 1234 342 566<br>www.tracto-technik.com.uk<br>E-mail: info@tracto-technik.com.uk |
| France:<br>**Tracto-Techniques S.a.r.l.**<br>Tel.: +33 160 42 49 40<br>www.tracto-technik.fr<br>E-Mail: info@tracto-technik.fr | Africa:<br>**TRACTO-TECHNIK Afrique S.a.r.l.**<br>Tel.: +212 5 37 40 13 63 / 64<br>www.tracto-technik.ma<br>E-mail: info@tracto-technik.ma | Pacific Rim:<br>**TRACTO-TECHNIK Australia Pty Ltd.**<br>Tel: +61 7 3420 5455<br>www.tracto-technik.com.au<br>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.<br>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 350). |
| 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.<br>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 330 |
| Safety devices | Functional check of the electric shock protection device | | X | X | X | prior to start-up, chapter 9.8.2, page 330 |
| Safety devices | Visual inspection of the electric shock protection device | | X | X | X | chapter 9.8.1, page 330 |

| Assembly group | Maintenance activity | Maintenance intervals | | | | Further information |
|---|---|---|---|---|---|---|
| | | d | w | 6 m | a | |
| 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 330 |
| 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<br>chapter 9.9, page 331 |
| Entire machine | Visual inspection of the base frame | | | | X | chapter 9.9, page 331 |
| Entire machine | Checking the screw connections for tight fit*) | once after 20 operating hours, then according to manufacturer's specifications | | | | chapter 9.9, page 331 |
| Entire machine | Visual inspection of the welded connections for intactness | | | X | | initially after 50 operating hours,<br>chapter 9.9, page 331 |
| Entire machine | Check of hydraulic and electric lines for leak tightness and tight fit | X | | | | |
| Entire machine | Cleaning | X | | | | after every operation,<br>chapter 10, page 353 |
| Entire machine | Checking the rotational drive for functioning and leakages | X | | | X | |
| Entire machine | Gear oil pump rotational drive<br>Cleaning the magnet in the suction line | | X | X | X | initially after 50 operating hours, then every 500 operating hours |
| Entire machine | Checking the screw connections on the thrust motors for tight fit | | | x | | initially after 50 operating hours |
| Entire machine | Checking the screw connections on the cab swing bearing for tight fit**) | | | X | X | every 500 operating hours,<br>chapter 9.9, page 331 |
| 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/ stacking boxes | | | X | | initially after 50 operating hours |

| Assembly group | Maintenance activity | Maintenance intervals | | | | Further information |
|---|---|---|---|---|---|---|
| | | d | w | 6 m | a | |
| 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 342 |
| Entire machine | Crawler tracks Checking the oil level | | | X | | |
| Entire machine | Applying a sticker for the next maintenance | | | X | X | |
| Entire machine | Checking the screw connections of the safety cylinder at the magazine for tight fit | | | x | | initially after 50 operating hours |
| Entire machine | Visual inspection of toothed racks and pinions of the thrust rig for intactness*) | | x | x | x | initially after 50 operating hours, then every 500 operating hours |
| Entire machine | Cleaning the magnetic screws of the planetary gears | | | x | x | |
| 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 83 |
| 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 | |

| Assembly group | Maintenance activity | Maintenance intervals | | | | Further information |
|---|---|---|---|---|---|---|
| | | d | w | 6 m | a | |
| Diesel engine | Checking the V-belt of the diesel engine for tension and cracks | | x | x | x | initially after 25 operating hours<br>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 |
| 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 | Checking the V-belt tensioning roller | | | | x | |
| 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 |

| Assembly group | Maintenance activity | Maintenance intervals | | | | Further information |
|---|---|---|---|---|---|---|
| | | d | w | 6 m | a | |
| Drill rods | Checking the O-ring for intactness | X | | | X | chapter 9.11, page 336 |
| | 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<br>chapter 9.11, page 336 |
| Drill head | Visual inspection for wear | x | | | x | chapter 9.16, page 339 |
| | Visual inspection of carbide inserts | x | | | | All carbide inserts must be soldered. |
| | Checking the permeability of the drilling fluid nozzle | x | | | x | chapter 9.16, page 339 |
| | 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<br>chapter 9.17, page 340 |
| Detection system | Functional check*) | | x | x | x | initially after 50 operating hours, then every 500 operating hours<br>see instructions for the detection system |

| Assembly group | Maintenance activity | Maintenance intervals | | | | Further information |
|---|---|---|---|---|---|---|
| | | d | w | 6 m | a | |
| Expander head | Checking the permeability of the drilling fluid nozzles | x | | | | chapter 9.14, page 338 |
| | 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 | | | | |
| Mud pump | Checking the connections for tight fit*) | | | | x | |
| | Functional check of the pump | | x | x | | initially after 50 operating hours, then every 500 operating hours |
| | Visual inspection of the pump for leakages | x | | | x | |
| Pipe puller | Functional check | x | | | | chapter 9.12, page 336 |
| | Visual inspection for intactness and, if necessary, replacement of the O-ring | x | | | | |
| | Visual inspection of the yoke for intactness | x | | | | |
| Swivel | Visual inspection of the O-ring | x | | | | chapter 9.13, page 337 |
| | 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

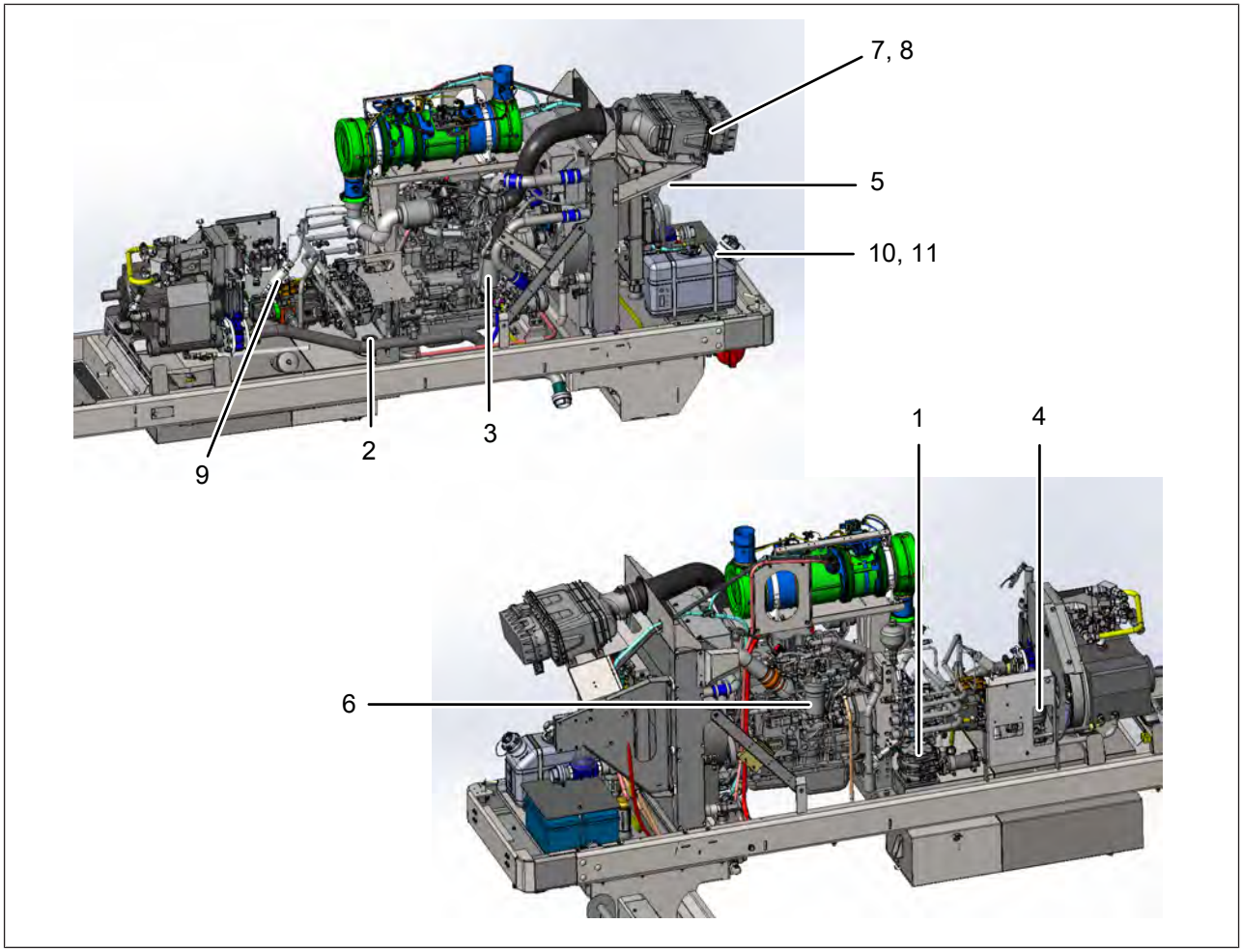



*Fig. 9-1 Filters on the machine*

*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 336 |
| Swivel | Lubricating the swivel | x | | | | chapter 9.19, page 343 |
| Pipe puller | Lubricating the threading | x | | | | chapter 9.19, page 343 |
| Entire machine | Lubricating the crawler tracks' stabiliser cylinders | | x | | | chapter 9.19.1, page 344 |
| 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 344 |
| 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<br>Changing gear oil | | | X | | |
| Entire machine | Changing the gear oil of the track-mounted undercarriage*) | | | | X | see manufacturer's instructions |
| Entire machine | Multi-disc brake rotation, oil change | | | X | | if not integrated in the gear oil circuit |
| Entire machine | Free wheel internal rotation, oil change | | | | X | |

| Assembly group | Activity | Interval | | | | Further information |
|---|---|---|---|---|---|---|
| | | d | w | 6m | a | |
| Entire machine | Greasing the toothed racks of the rod box/stacking boes*) | | X | X | | initially after 50 operating hours, then every 500 operating hours, Tab. 9-6 |
| Entire machine | Greasing the rotary joint | | X | | | |
| Entire machine | Lubricating the magazine locking flaps at the rod box/stacking boxes | | X | | | Tab. 9-6 |
| Entire machine | Multi-disc brake rotation, oil change | | | x | | |
| Entire machine | Free wheel internal rotation, oil change | | | | x | |
| Entire machine | Greasing the rotary joint | | x | | | Tab. 9-6 |
| Entire machine | Changing the gear oil of rotational drive*) | | x | x | | initially after 50 operating hours, then every 500 operating hours |
| Entire machine | Changing the filter of the rotation gear oil | | x | x | | |
| Entire machine | Check hydraulic oil level | x | | | x | chapter 5.3.1, page 83 |
| Entire machine | Changing the hydraulic oil | | | | x | every 1000 operating hours see oil manufacturer's instructions |
| Cab | Lubricating the swing bearing of the cab | | x | | | chapter 9.19.1, page 344 |
| Cab | Lubricating the guide rollers | | | x | | initially after 50 operating hours |
| Drill head | Lubricating the drill head | | | | x | chapter 9.19, page 343 |
| 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 102.

### 9.8.3 Functional check of the emergency stop buttons

1. Start the engine (chapter 5.3.2, page 86).
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.

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 and the inner connectors 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 343).
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.

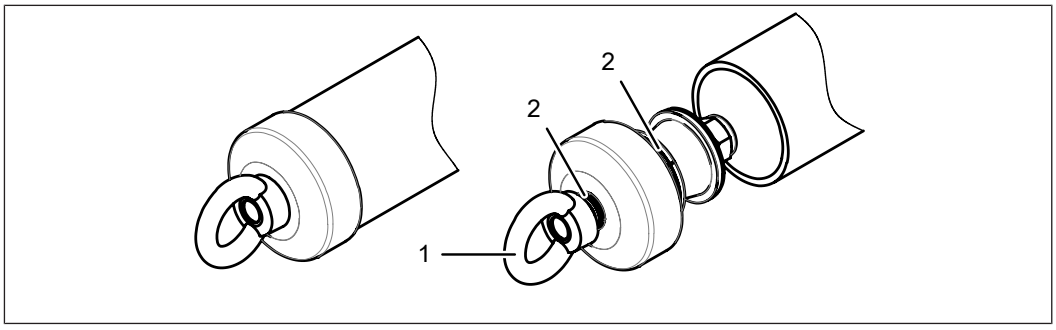



*Fig. 9-2 Pipe puller*

## 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.

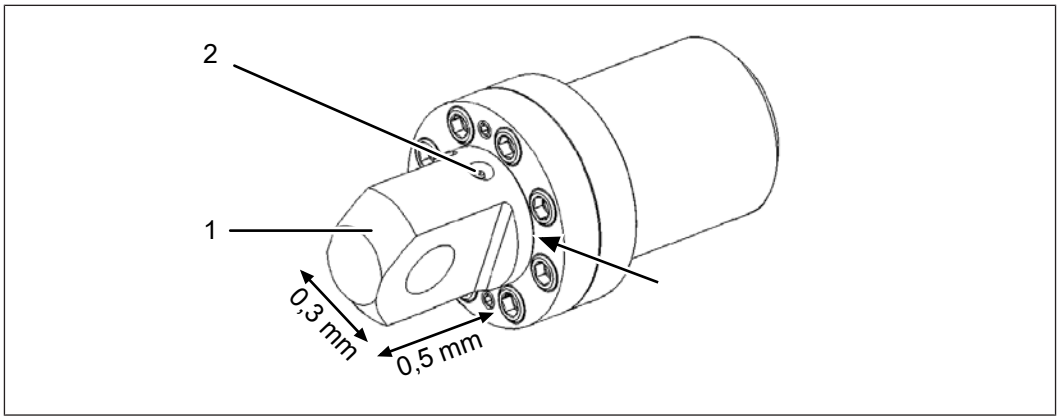



*Fig. 9-3 Swivel*

## 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.

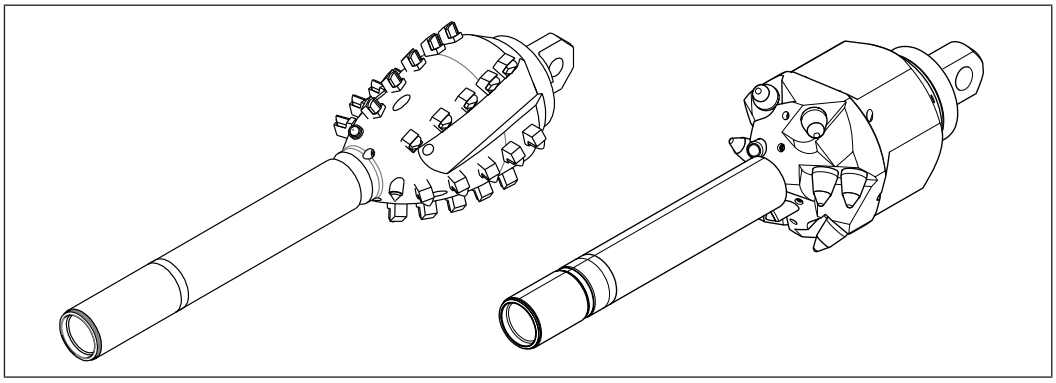


*Fig. 9-4 Expander head (example illustration, left: for rinsing drilling, right: for rock drilling)*

## 9.15 Maintaining the roller chisel

Check the following at the roller chisel:
- the thread for intactness
- the permeability of the nozzles
- the bits for intactness
- the clearance of the roller chisel

Remove any burrs, thrown-up material and chippings. Check that all bits are soldered.

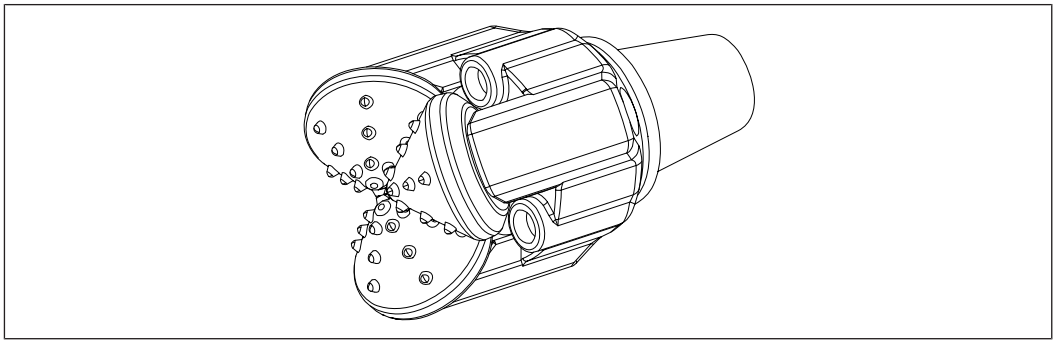


*Fig. 9-5 Roller chisel for rock drilling*

## 9.16 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.

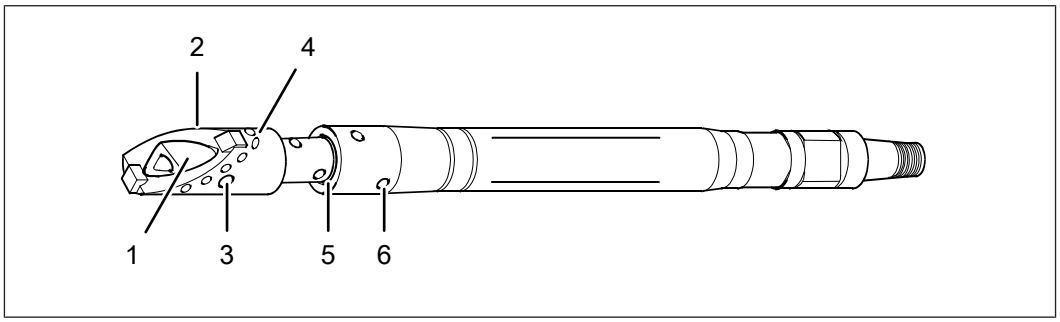



*Fig. 9-6 Drill head*

## 9.17 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.

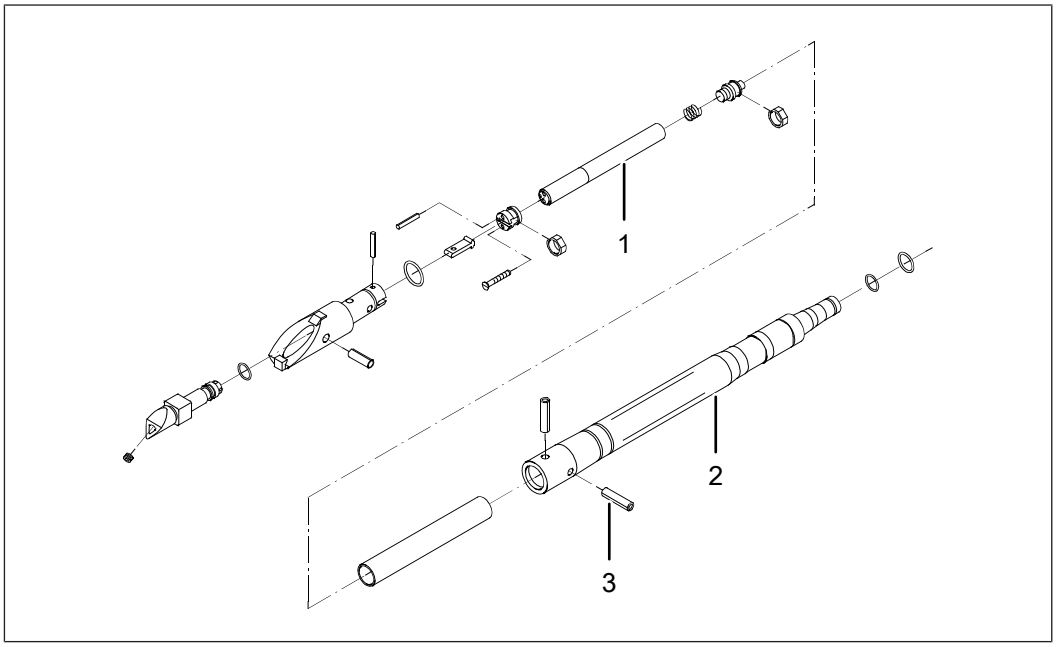



*Fig. 9-7 Bore head assembly with transmitter housing and transmitter*

Information regarding the structure of the bore head assembly, wherein the transmitter housing is integrated, can be found starting from chapter 5.8, page 115.

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.

## 9.18 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, press the push buttons on the right joystick or push the flip levers on the wireless drive remote control down.
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 between 30 mm and 60 mm.

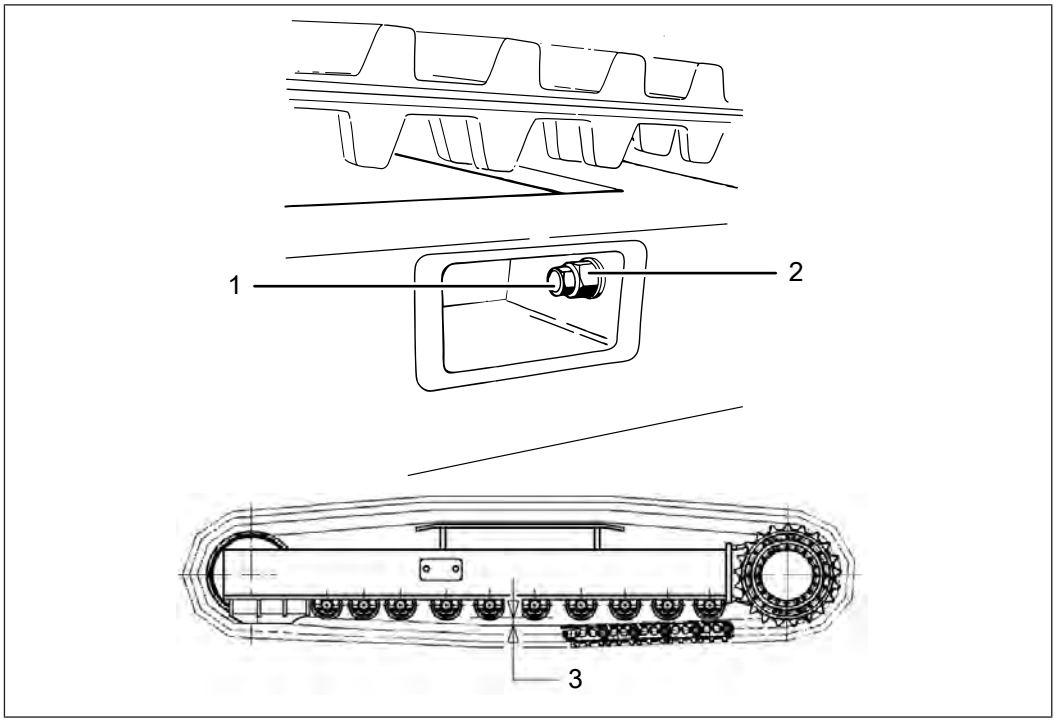



*Fig. 9-8 Retensioning the track chain*

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:

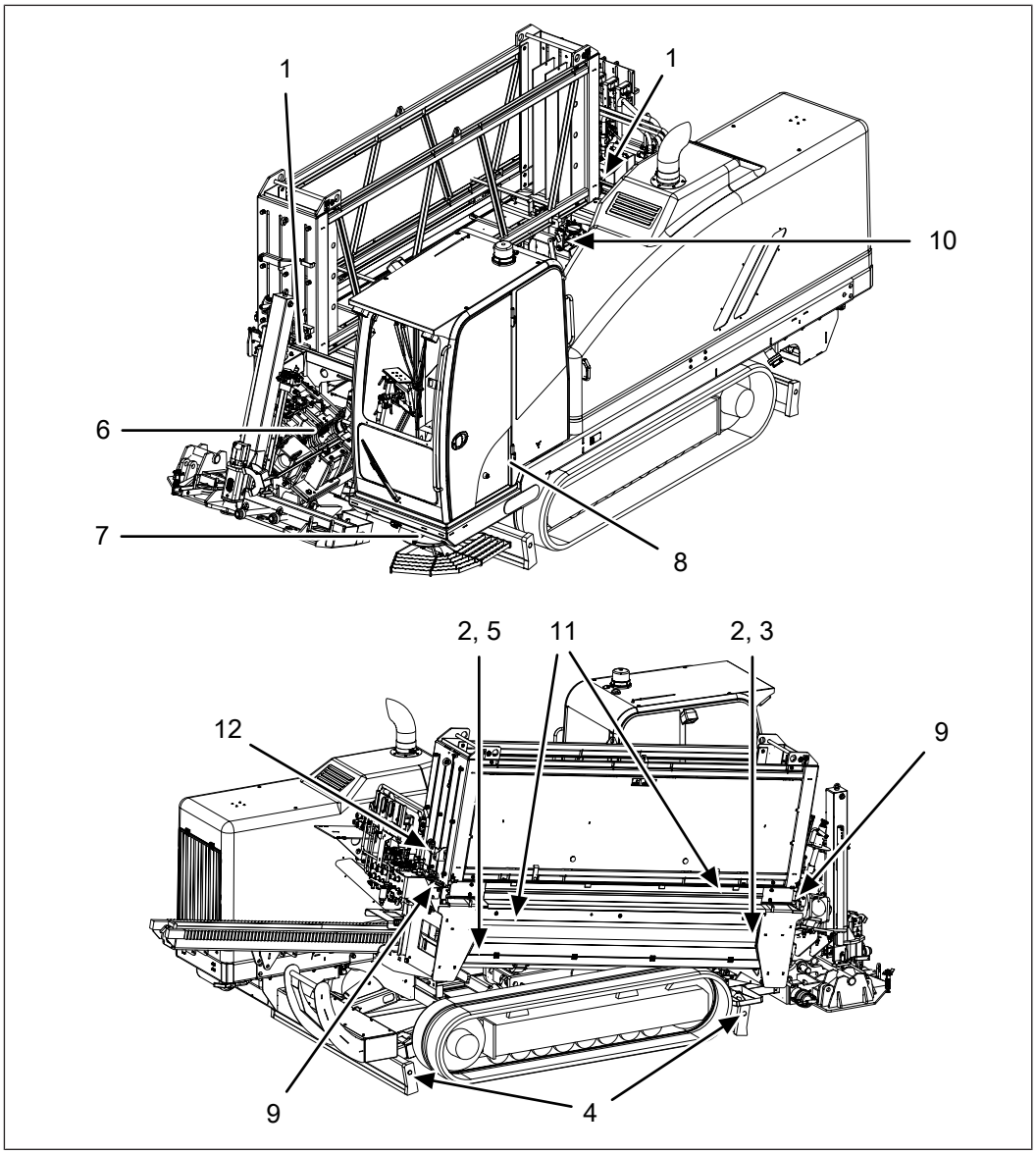



*Fig. 9-9 Lubrication points on the machine*

*Tab. 9-6 Lubrication points on the machine*

| Item | Component | Number of lubrication points | Lubrication interval |
|---|---|---|---|
| 1 | Box adjustment | 1 front, 1 rear | weekly |
| 2 | Rod grippers | 1 front, 1 rear | weekly |
| 3 | Locking flaps magazine | 1 front, 1 rear | weekly |
| 4 | Crawler tracks, stabiliser cylinder | 8 front, 8 rear | weekly |
| 5 | Tilt cylinders | 1 front, 1 rear | monthly |
| 6 | Clamping mechanism | 2 | weekly |

| Item | Component | Number of lubrication points | Lubrication interval |
|---|---|---|---|
| 7 | Swing bearing of the cab | 1 | weekly |
| 8 | Cab door | 2 | weekly |
| 9 | Combined rollers rod box/stacking boxes | 2 front, 2 rear | weekly |
| 10 | Rod retainer, rear | 1 | daily |
| 11 | Gripper cylinders | 1 front, 1 rear | weekly |
| 12 | Rod lock | 1 | weekly |

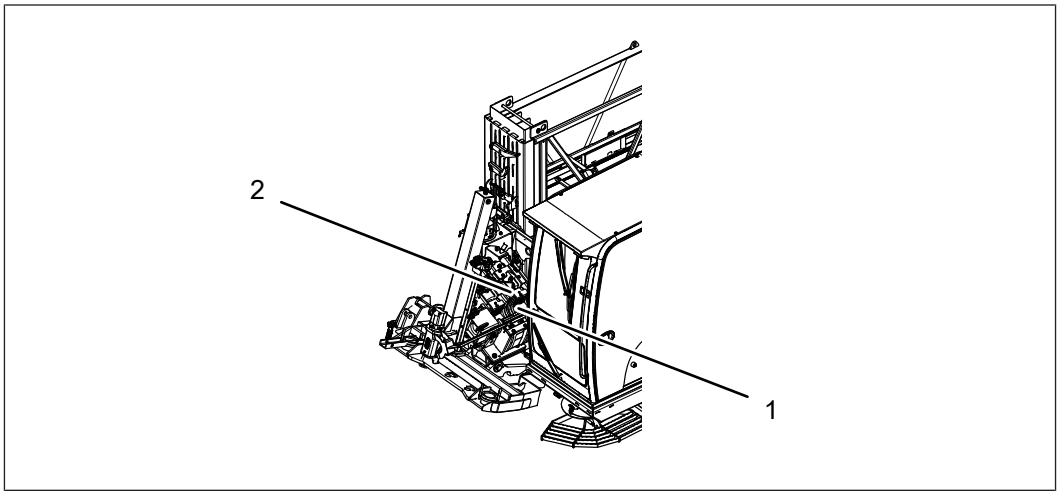



*Fig. 9-10 Lubrication points on the machine*

*Tab. 9-7 Lubrication points on the machine*

| Item | Component | Number of lubrication points | Lubrication interval |
|---|---|---|---|
| 1 | Clamping jaw retainer | 2 (one each) | daily |
| 2 | Rod lubrication | 1 | weekly |

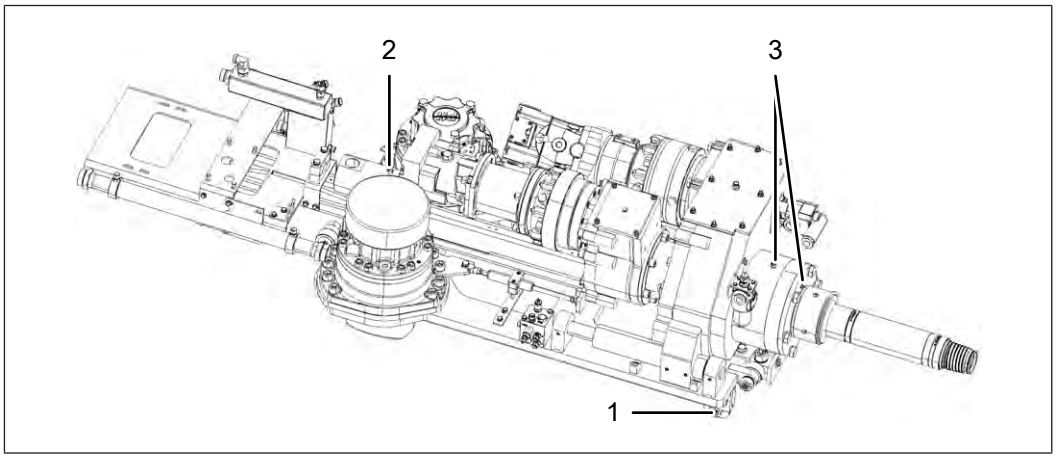



*Fig. 9-11 Lubrication points at the thrust rig*

*Tab. 9-8 Lubrication points at the thrust rig*

| Item | Component | Number of lubrication points | Lubrication interval |
|---|---|---|---|
| 1 | Rollers thrust rig | 10 | daily |
| 2 | Axial rotary joint (not depicted) | 1 | weekly |
| 3 | Rotational bearing | 2 | weekly |

**NOTICE**

**Lubricating the rollers of the thrust rig too quickly may damage the bearing seal and can lead to premature wear of the rollers.**

- Use a manual grease gun.
- Lubricate the rollers of the thrust rig slowly and only with little force.
- Wait at least 5 seconds between two strokes.

## 9.19.2 Lubricant and greasing oil tables

*Tab. 9-9 Lubricant and greasing oil table*

| Component | Filling quantity | Designation |
|---|---|---|
| Crawler tracks per gearbox | 1.8 l | EP 80W-90 |
| Hydraulic tank bore rig | 105 l | Ultramax BIO46[1] |
| Hydraulic tank bore rig | 105 l | Ultramax HVLP 68 [1] |
| Hydraulic tank bore rig | 105 l | Ultramax HVLP 46 [1] |
| Engine oil for diesel engine | 11–13 l | SAE 10W/40[2] |
| Drilling fluid pump P72 | 9 l | EP 80W-90 |
| Speck pump high-pressure cleaner | 0.28 l | EP 80W-90 |
| Rotational gear | 11 l | E.P.G 220 |
| Gear "Lift rod" | 1.7 l | EP 80W-90 |
| Multi-disc brake rotation | 0.1 l | ATF55 |
| Free wheel internal rotation | 0.1 l | 10W40 |

[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 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.

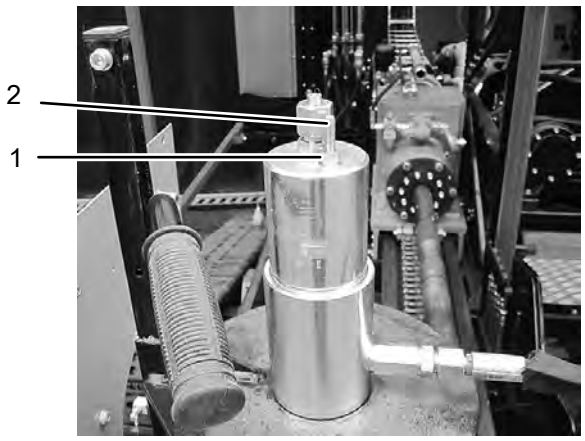



*Fig. 9-12 Setting the drill rod greasing quantity*

9.19.4 Exchanging the lubricant container for rod lubrication

1. Pull out the index bolt (1).
2. Lift out the inner cylinder (2) with inner cover (3).
3. Put the components safely aside.

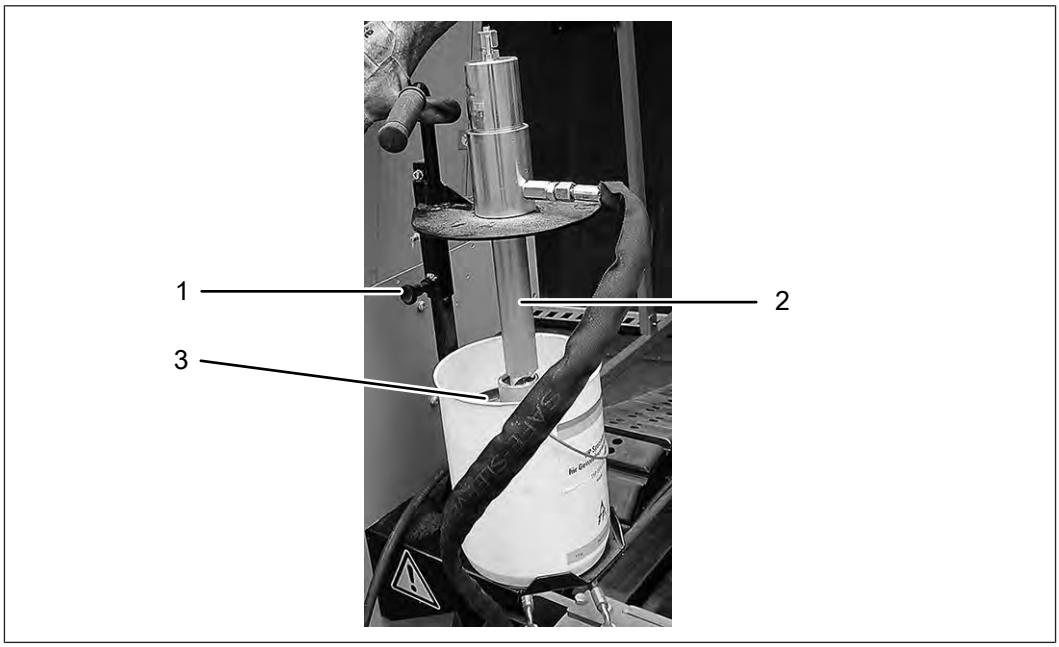



*Fig. 9-13 Lifting out the inner cylinder with inner cover*

4. Remove the lubricant container and insert a new container.
5. Re-insert the inner cylinder (2) with inner cover (3) into the lubricant container.
6. Secure the inner cylinder and inner cover with the index bolt (1) again.

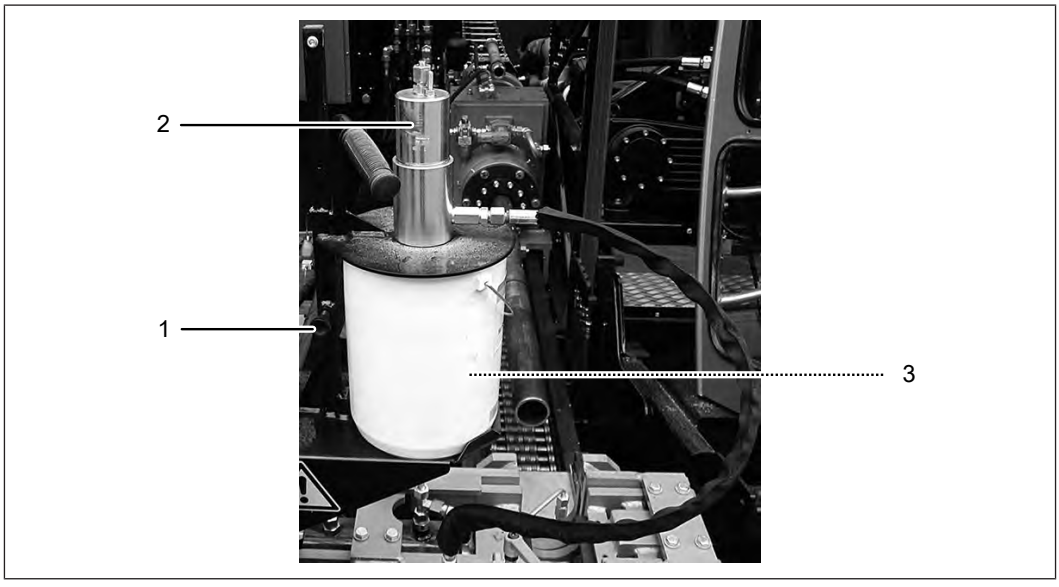



*Fig. 9-14 Assembling the lubricant container*

## 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.

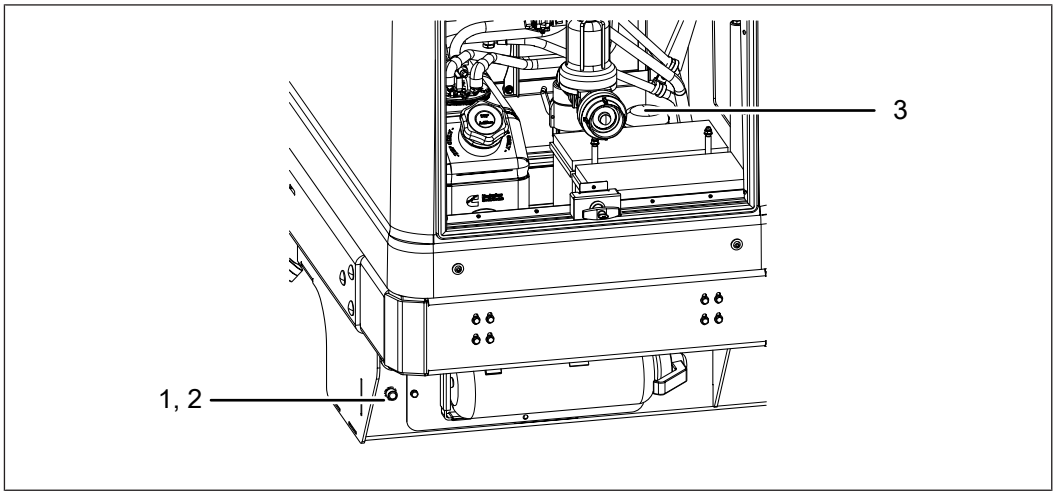



*Fig. 9-15 Emptying the water tank*

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 a can.

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.

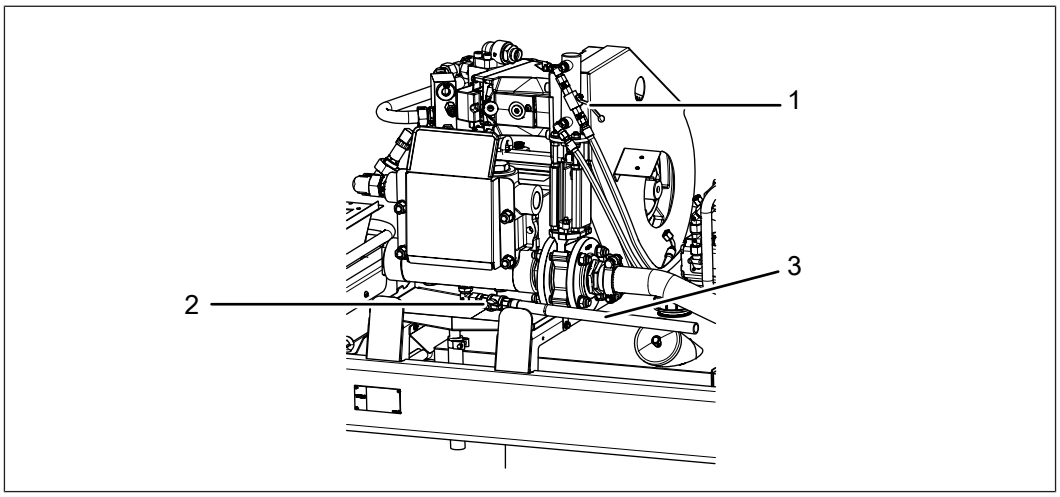



*Fig. 9-16 Stop cocks of the drilling fluid pump*

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.

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 132.
- 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<br>minimum<br>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 321.
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** |
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## 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 18ACS |
| Serial number: | from DRI21.... |
| Year of manufacture: | |
| complies with the following relevant provisions: | |
| Directive 2006/42/EC | as of 17 May 2006 |
| Directive 2000/14/EC | as of 08 May 2000 |
| Directive 2014/30/EU | as of 26 February 2014 |
| | Guaranteed sound power level $L_{WA}$: 104 dB |

**APPLIED HARMONISED STANDARDS:**

| | | |
|---|---|---|
| EN ISO 12100:2011-03 | EN ISO 13854:2020-01 | EN ISO 14120:2016-05 |
| EN ISO 13857:2020-04 | EN 16228-1:2022-07 | EN 16228-3:2020-07 |
| EN ISO 4413:2011-04 | EN 60204-1:2019-06 | EN 13766-1:2019-04 |
| EN ISO 13849-1:2016-06 | EN ISO 13849-2:2013-02 | |

**MANUFACTURER:**

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Authorised representative for the compilation of the technical documents: Dipl.-Ing. Rouwen Homringhaus

Lennestadt, ....

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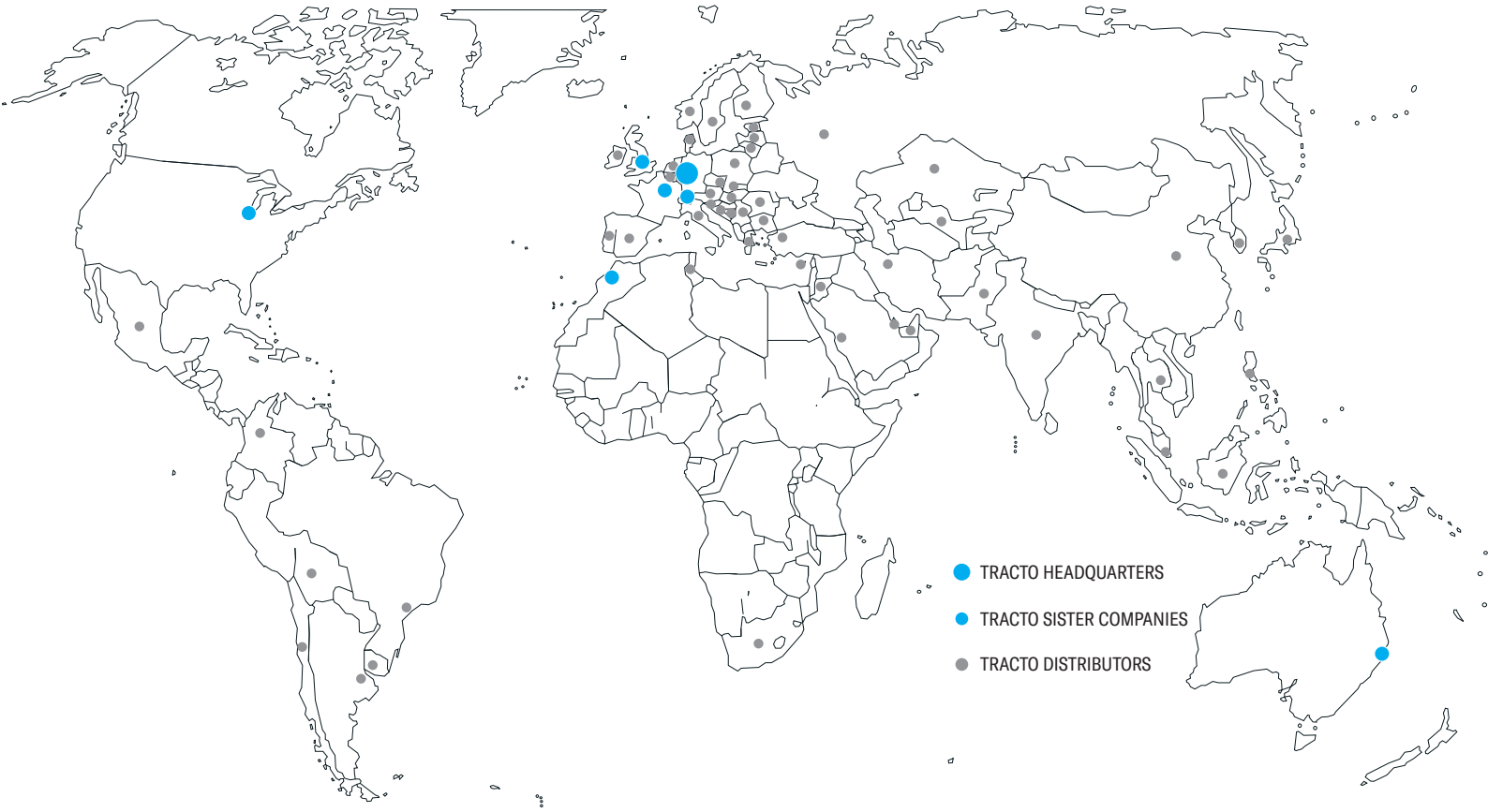
Dipl.-Ing. Meinolf Rameil, CTO

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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