OPERATING MANUAL

PIPE PULLER SZ10-M

terra infrastructure

safety: efficient and sustainable

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CONTENTS

Information about the operating manual

This manual enables safe and efficient use of the SZ10-M pipe puller. The manual forms an integral part of the machine and must be kept in the immediate vicinity of the machine and be accessible to personnel at all times.

Personnel must have carefully read and understood this manual before commencing any work. Compliance with all the safety notes and instructions for use provided in this manual is a basic prerequisite for safe working.

The local occupational health and safety regulations and general safety regulations for the machine's area of use apply too.

The manufacturer's Customer Service department

Please contact the manufacturer's Customer Service department for technical information:

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1. INFORMATION ABOUT THIS MANUAL

The SZ10-M pipe puller is referred to as the ‘machine’ for short in this manual.

1.1. Design features of this operating manual

The text elements in this operating manual are structured as follows:

Mark	Explanation
	Normal text
•	Lists, first level
-	Lists, second level
1., 2., 3. ...	Captions
▶	Instructions for use
➢	Results of action steps
	Special hints, tips and recommendations

1.2. Keeping the manual available

This operating manual forms an integral part of the machine.

- ▶ Read this operating manual before operating the machine.
- ▶ Always keep the operating manual with the machine.
- ▶ Ensure that this manual is permanently available to the user at the machine and in a legible condition.
- ▶ Request a new copy from the manufacturer if this manual is lost or becomes unusable.
- ▶ Pass on the operating manual if you sell or otherwise pass on the machine.

1.3. Scope of delivery

The scope of delivery includes the following components:

- Transport box
- Pipe puller with assembled sleeve tensioner, built-in 12 V battery and integrated hydraulic unit with Remote control
- Battery charger, Remote control with operating manual
- Two-leg sling chain
- Tie beam
- Optional: One or more adapter pipes

After receiving the machine

▶ Check all parts after receiving the machine.

▶ If parts are missing or you notice damage, inform the transport company and terra infrastructure immediately.

1.4. Other applicable documents

The following documents form part of this manual:

- Declaration of conformity
- Supplier documentation

1.5. Target groups

This manual is intended for the following target groups:

Target group	The target group's task
Instructed personnel	• Operates the machine according to sections 1 – 6 of this manual.
Specialist	• Instructs the operating personnel. • May carry out maintenance and repair work in accordance with sections 7 – 8 of this manual in addition to operating the machine.

The qualifications that the target groups need to have are described in section 2.2 of this manual.

2. SAFETY

The ‘Safety’ section contains safety notes that apply to all phases of the machine’s life. They do not replace the warnings in the sections that follow.

- ▶ Also observe the warnings in the sections that follow.
- ▶ Also observe the safety and accident prevention regulations applicable at the place of use.

2.1. Intended use

The machine is designed for civil engineering. It is used to pull a pipe segment that has not been laid yet onto a pipe segment that has already been laid and to thereby connect the two pipe segments. It can be used in pipes with diameters ranging from 800 to 2400 mm (also with deviating pipe diameters under certain circumstances).

Intended use also includes observing and following all the information in this operating manual, particularly the safety notes. Any other use is expressly deemed to be unintended and will cause the warranty and liability claims to lapse.

2.2. Personnel qualifications

Instructed personnel’s qualifications

The instructed machine operators must meet the following requirements at least:

- They have received instruction in how to operate the machine, so that they can set up and use the machine as intended.
- They are capable of assessing the hazards that the machine and its components pose(s).
- They are familiar with the hazard-preventing measures.
- They understand how the machine works and how the individual components interact.
- They understand the measured values shown.
- They know that improper operation, maintenance and repair can cause accidents.
- They can assess the hazards that electrical voltage and current pose.
- They can assess the hazards that pressurised components pose.
- They can assess hazards and environmental damage that the media and operating supplies used pose.

- They can identify damage to the machine and its components by performing a visual inspection:
  - Missing or defective safety equipment,
  - Leaks,
  - Kinks and damaged insulation on electrical wires,
  - Kinks and external damage to hydraulic hose lines,
  - Incorrect oil level,
  - Missing covers,
  - Deformations or damage to the steel pulling rope.

Specialists 'and banksmen's qualifications

The specialists and banksmen must meet the following requirements at least:

- They are trained technicians (e.g. industrial mechanics or mechatronics engineers) who have professional experience.
- They are familiar with the relevant provisions set out by the Civil Engineering Trade Association (BG BAU) and in DIN 4124.
- They can explain to the operators how to use the machine safely.
- They have special knowledge and experience with the machine.
- They can recognise errors and determine what has caused them and recognise error interactions.
- They can identify wear on components at an early stage.
- They are technically qualified to carry out the maintenance and repair work described in this manual.

2.3. Ban on unauthorised conversions

Unauthorised conversions or modifications to the machine can lead to severe or even fatal injuries. This particularly applies to bridging, modifying and adjusting safety equipment.

▶ Never bridge or bypass existing safety equipment.

▶ Do not make any modifications or conversions to the machine that are not described in this manual.

Unauthorised conversions or modifications to the machine will invalidate the warranty.

2.4. Safety equipment

The machine is equipped with the following safety equipment:

- Emergency stop button on the remote control

The machine is immediately de-energised and de-pressurised when the emergency stop button is pressed. The cylinders remain in their current position.

2.5. Warning and information signs on the machine

The following warning and information signs are attached to the front of the electrical control box:

Sign	Explanation
	Follow the manual
	Warning – possibility of hand injuries
	Wear safety goggles
	Wear hearing protection
	Wear safety gloves

2.6. Structure of the warnings

Layout of the warnings

The warnings are laid out as follows:

SIGNALWORD

Nature and source of the hazard
Potential consequences if the warning is not observed
▶ Action necessary to prevent the hazard

Types of warnings

The warnings are laid out as follows:

DANGER

Notes with the word DANGER warn of a dangerous situation that will result in death or severe injuries.

WARNING

Notes with the word WARNING warn of a dangerous situation that may potentially result in death or severe injuries.

CAUTION

Notes with the word CAUTION warn of a situation that may result in minor or moderate injuries.

ATTENTION

Notes with the word ATTENTION warn of a situation that results in material damage and restricted functionality.

2.7. Basic safety notes

Avoiding severe and fatal injuries

DANGER

Danger of death and risk of injury due to suspended loads!

Loads can swing out and fall down during lifting operations. There is a danger of death and risk of injury!

- Cranes or hydraulic excavators in hoist mode preferably are to be used for transport; when transporting with forklift trucks, be sure to bear in mind that the ground in the construction site area is often uneven. This can cause the load to slip or fall – additional securing measures may be necessary when transporting with forklift trucks.
- Hydraulic excavators in hoist mode must be equipped with overload warning equipment and line break protection; the overload warning equipment must be switched on in hoist mode.
- Lifting gear, load handling attachments and slings must be selected according to the load; the dynamic loads must also be taken into account in addition to the static loads.
- All the lifting gear, load stops and load handling attachments must be approved and tested.
- The slings may only be attached to the intended slinging points.
- Transport should be carried out as close to the ground as possible.
- Never carry the load over people.
- Slung loads must be guided with guide ropes / guide rods; always walk behind the load and do not walk backwards.
- People accompanying the load and slingers must always be within the machine operator's field of vision outside the travel path or danger zone.
- People accompanying the load and slingers must take up a safe standing position; never stand between a suspended load and a fixed abutment.
- When lifting, guiding and setting down the load, always ensure that fingers are free; never guide loads by the sling.
- Observe and comply with the applicable national regulations and codes.

WARNING

The following hazards may cause death or severe injuries:

- Improper handling of the machine.
- Fire due to overload or damage to electrical equipment.
- Electric shock caused by contact with live parts.
- Injury in the event of a malfunction caused by electromagnetic radiation.
- Hearing damage caused by high levels of noise pollution.
- Danger of falling due to a steep, unsecured descent.
- Risk of crushing and impact due to suspended loads.
- Injury caused by the steel pulling rope being torn off and flapping.
- Damage to the skin or eyes due to hydraulic oil spraying out of leaking connections, hoses or cylinders.
- Delayed shutdown in an emergency situation, if the operator of the control bulb does not recognise the dangerous situation in the pit bed.

Avoiding moderate and minor injuries

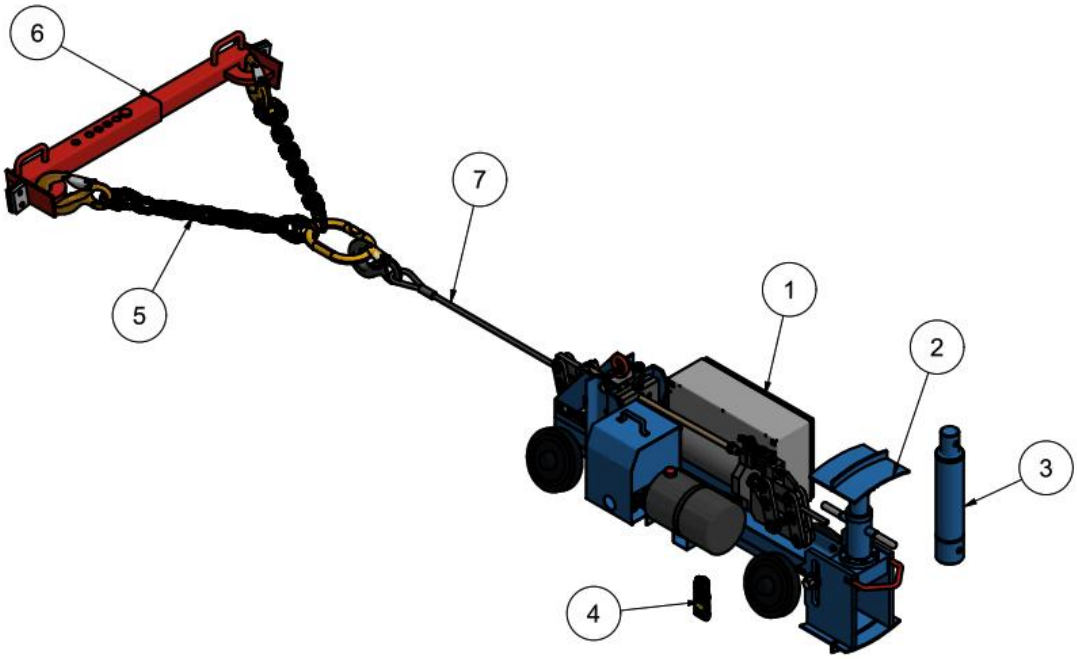
CAUTION

The following hazards may cause moderate or minor injuries:

- Crushing when engaging the clamping tongs during actuation.
- Crushing of fingers or hands during the clamping process.
- Injury due to handling the tie beam, steel pulling rope and load hook.
- Back problems caused by lifting adapter pipes weighing up to 25 kg.
- Skin irritation due to leaking hydraulic oil.
- Slipping on rough or wet ground.
- Hunched posture when working in a confined environment.
- Bumping during activities in a confined environment.
- Cuts on sharp wire ends.

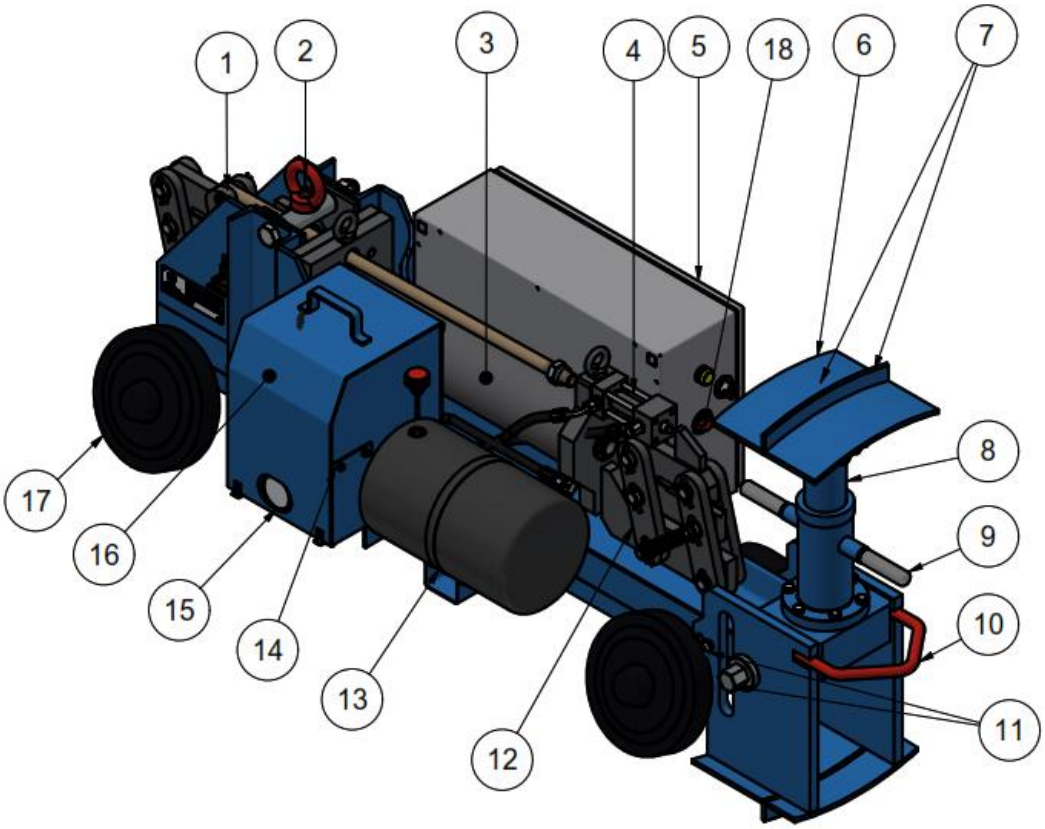
3. DESCRIPTION

3.1. Overview of the machine components



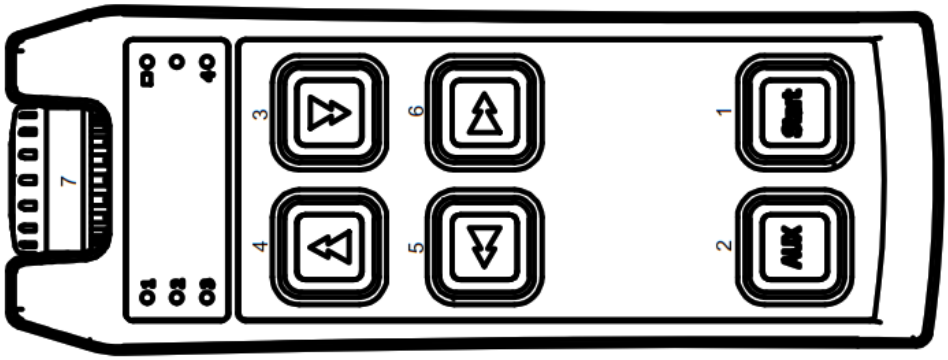
1. Pipe trolley (see the section that follows)
2. Sleeve tensioner (part of the pipe trolley)
3. Adapter pipe for sleeve tensioner
4. Remote control
5. Two-leg sling chain
6. Tie beam
7. Steel pulling rope

3.2. Layout of the pipe trolley



1. Front clamping tongs
2. Transport lug for carrying pipe trolley
3. Hydraulic pulling cylinder
4. Hydraulic opening cylinder
5. Electrical control box with battery
6. Sleeve tensioner
7. Sleeve tensioner´s support and stop
8. Sleeve tensioner´s lathe spindle
9. Lathe spindle´s hand toggle
10. Transport bracket for carrying the pipe trolley
11. Sleeve tensioner´s tilting equipment (bolt and fixing screw)
12. Rear clamping tongs
13. Oil reservoir
14. Hydraulic unit with pump
15. Pressure gauge for pressure
16. housing hydraulic unit
17. Pipe trolley with inclined hard rubber wheels
18. On/Off switch battery

3.3. Overview remote control/battery switch



1.	„Start“ Switching on the control unit and the motor	The lamp next to the battery symbol lights up yellow. After connecting to the control unit, press Start again. Lamp flashes green (automatic switch-off after 5 minutes)
2.	„AUX“ connection with control unit	Lamp next to battery symbol flashes yellow (has connection).
3.	Rope clamping „Arrow down“	Close the rear clamping tongs.
4.	Rope clamping „Arrow up“	Move the opening cylinder apart to open the rear clamping tongs.
5.	Pulling cylinder „Arrow left“	Bring the pulling cylinder together to the end position, thereby closing the front clamping tongs and pulling the pipe segment.
6.	Pulling cylinder „Arrow right“	Move the pull cylinder apart to the end position to open the front clamping tongs.
7.	Emergency stop button, switching off the control unit and the motor	The machine stops when pressed. (it is de-energized and depressurized) After unlocking, a normal start is possible.
8.	Horn signals approx. 4 seconds (inside the switch cabinet)	If approx. 120 mm stroke is still available during the pulling process.
9.	Yellow indicator light „Pressure“	Lights up when the working pressure of 160 bar is reached.
10.	Rotary switch “On/Off” battery	Opens and closes the power supply to the machine.

3.4. Functional description

The SZ10-M pipe puller is used to pull together pipe segments in civil engineering. The pipe trolley is inserted into an already laid pipe segment and clamped there for this purpose. A steel pulling rope with tie beam is laid through the pipe segment to be pulled. The tie beam is attached to the end of the pipe segment to be pulled.

An operator gives the tightening command by pressing a button on the remote control. The pulling force is provided by an electro-hydraulic pump with a hydraulic pulling cylinder.

3.5. Technical data

Category	Value					
Width	1900 mm					
Depth	670 mm					
Height	800 mm					
Weight	380 kg					
Model	Splashproof					
Suitable for pipe diameter	800–2400 mm					
Max. pipe diameter without adapter pipe	800 mm					
Pulling force (max.)	100 kN (107 kN max.)					
Pulling lenght	Not restricted					
Working path (stroke)	500 mm					
Lenght of pulling rope	35 m					
Pulling rope extension	20 m					
Pullingrope diameter	18 mm					
Tie beam lenghts [mm]	800	1000	1300	1800		
Tie beam weights [kg]	20	32	40	42		
Adapter pipe lenghts [mm]	100	200	300	500	1000	1500
Adapter pipe weights [kg]	5,5	10,0	13,8	17,7	28,0	37,5
Electric motor	1,6 kW, 12 V					
Hydraulic gear pump	5,8 l/min, 160 bar					
Working pressure	160 bar					
Hydraulic oil	SHELL Tellus S2 MX 46					
Oil quantity	15 l					
Battery	LiFePO4 12 V /105 Ah with bluetooth					

4. TRANSPORT AND INSTALLATION

4.1. Safety notes

DANGER

Danger of death due to suspended loads

- ▶ Only allow people with the necessary qualifications to transport suspended loads.
- ▶ Cordon off the transport route and swivel area for the duration of transport.
- ▶ Only use load suspension equipment and slings that is/are suitable for the load and undamaged.
- ▶ Take the position of the load's centre of gravity into account.
- ▶ When lifting and transporting loads, ensure that nobody is under the suspended load and in the transport vehicle's swivel range.

DANGER

Danger to death due to the use of incorrect transport lugs!

The machine may crash!

- ▶ Only use the red lug and the red bracket to transport the machine.

WARNING

Risk of crushing and impact due to suspended loads.

The suspended machine moves freely during loading.

- ▶ Always keep an eye on the machine during loading.

CAUTION

Danger due to the load slipping.

The machine must be transported to the place of use in a vehicle.

Risk of injury and machine damage.

- ▶ Secure the machine for transport in the vehicle so that it cannot slip.

ATTENTION

Damage caused by bumping the machine.

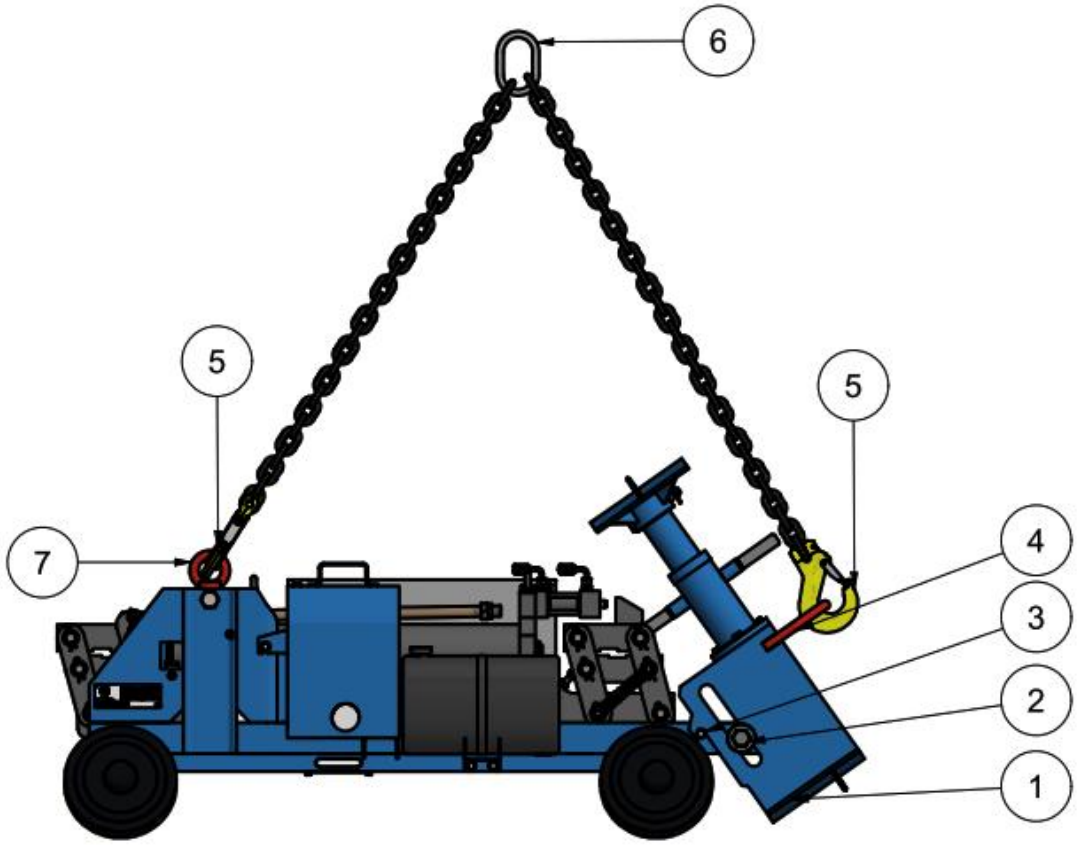
- ▶ When transporting, ensure that the machine does not hit other objects.
- ▶ If the machine hits another object:
  - ➢ Inform your supervisor,
  - ➢ Do not put the machine into operation.

4.2. Transporting the machine

The machine may only be transported with the sleeve tensioner tilted down.

For the machine to be set down in the pit bed, a first pipe segment must have already been laid.

The machine's transport position



1. Sleeve tensioner, tilted
2. Fixing screw in slotted hole (on both sides)
3. Bolts (on both sides)
4. Red transport bracket
5. Load hook
6. Top lug
7. Red transport lug

Proceed as follows to transport the machine:

1. Tilting the sleeve tensioner

▶ Grasp the sleeve tensioner with both hands from behind at the transport bracket (4) and carefully tilt it forwards onto the pipe trolley.

➢ The nose engages behind the two bolts (3).

2. Slinging a two-leg sling chain

- ▶ Hook one hook (5) of the two-leg sling chain into the red transport lug (ring nut) (7) on the carriage.
- ▶ Hook the other hook (5) of the two-leg sling chain into the transport bracket (4) of the socket tensioner.

3. Transporting and setting down the machine

- ▶ Attach the transport vehicle's carrying hook to the upper lug (6) of the two-leg sling chain.
- ▶ Slowly lift the machine, bring it to the place of use and set it down.

4. Setting the machine down in the pit bed

- ▶ Lift the machine and turn it in the working direction.
- ▶ Set the machine down directly in front of or behind the laid pipe segment.

5. Removing the two-leg sling chain

- ▶ Remove the two-leg sling chain.
- ▶ Do not set the sleeve tensioner back to vertical yet.

5. COMMISSIONING

This section describes the daily or repeated commissioning operations.

The daily commissioning operations include the following activities:

- Installing the machine in the pipe
- Inserting an adapter pipe (if necessary)
- Fixing the sleeve tensioner in the pipe
- Checks before operation

The checks can be omitted when commissioning for the first time, since the machine is brought to the place of use in a ready-to-operate condition for first operation.

The remote control is needed to check the machine functions.

5.1. Safety notes

DANGER

Danger of death if the machine is operated with damaged components.

Safe operation is no longer guaranteed if components are damaged.

▶ Only operate the machine when it is in a perfect condition.

DANGER

Risk of fatal injuries if work is carried out improperly.

▶ Only allow people with the necessary qualifications to carry out work.

▶ Observe all the operational safety and accident prevention regulations and rules applicable at the workplace.

WARNING

Risk of injury if safety equipment is missing or defective.

▶ Never override safety equipment.

▶ Before each commissioning process, ensure that all the existing safety equipment is installed and in working order.

WARNING

High physical strain when inserting an adapter pipe.

The adapter pipes weigh between 5.5 and 37.5 kg.

Lifting and handling can cause back problems, among other things.

- ▶ Components that weigh more than 25 kg may only be lifted and used with lifting gear or with two people.
- ▶ Always maintain good posture and keep your back as straight as possible when lifting heavy components.

CAUTION

Risk of crushing when clamping the sleeve tensioner.

Fingers can be crushed when the sleeve tensioner is clamped.

- ▶ Always grip both hand toggles when clamping the sleeve tensioner.

CAUTION

Risk of injury due to potentially leaking hydraulic oil.

Contact with hydraulic oil may cause skin irritation.

- ▶ If oil is leaking, do not operate the machine.

5.2. Switching on power supply

Rotary switch on Switch box

The machine has a red rotary switch (10).

Turn the switch to “ON” to close the circuit.

5.3. Installing the machine in the pipe

▶ Have two people push the machine to the start of the first laid pipe segment.

- ➢ The machine is exactly horizontal.
- ➢ The sleeve tensioner is at the level of the pipe sleeve.

Setting the sleeve tensioner upright

Set the sleeve tensioner in a vertical position as follows:

▶ Grasp the tilted sleeve tensioner from behind with both hands at the transport bracket.

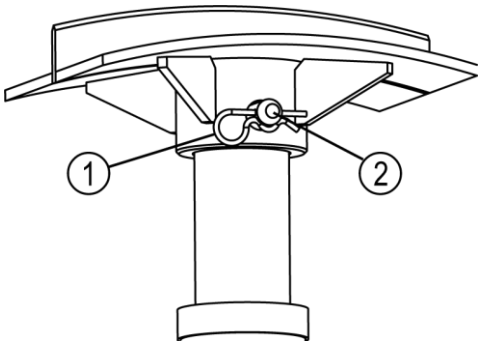
▶ Carefully pull it up and towards you a little.

- ➢ The sleeve tensioner is released from the engagement on the bolts.
- ➢ The sleeve tensioner lowers to the basic position in the vertical position.

5.4. Inserting an adapter pipe

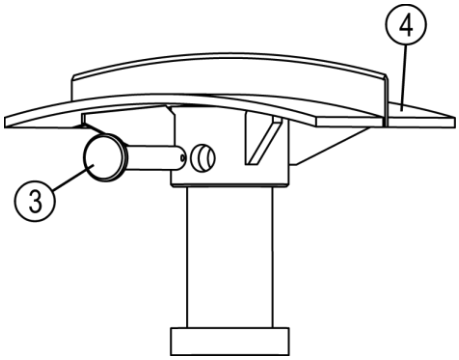
The height of the sleeve tensioner is sufficient for a pipe diameter of up to 800 mm. One or more of the supplied adapter pipes must be used for larger pipe diameters. The number of adapter pipes should be selected depending on the pipe diameter to be pulled.

Proceed as follows to insert an adapter pipe:

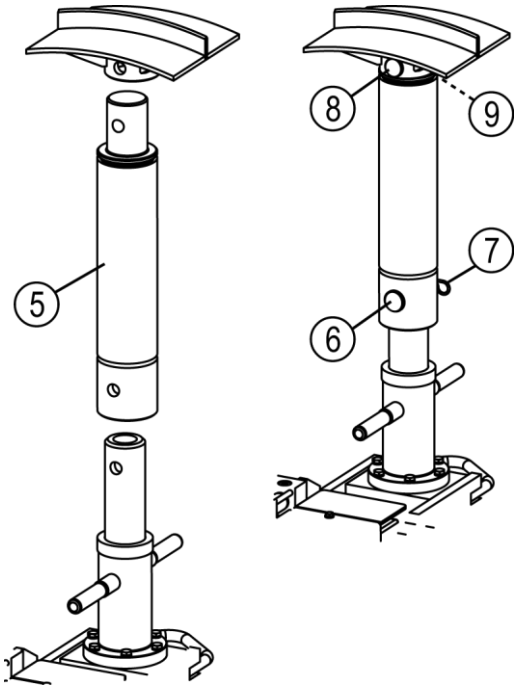


The sleeve tensioner's support is secured with pins and spring cotters.

- Pull the spring cotter (1) out of the end of the pin (2).



- Pull out the pin (3).
- Pull the support (4) upwards.

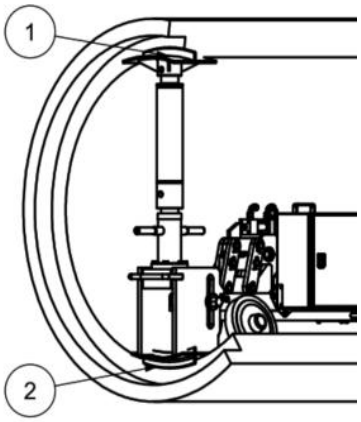


- Put on the adapter pipe (5).
- Insert the existing pin (6) into the bottom opening.
- Secure at the end of the pin with the existing spring cotter (7).
- Insert the pin supplied with the adapter pipe (8) into the top opening.
- Secure at the end of the pin with the supplied spring cotter (9, not shown).

5.5. Fixing the sleeve tensioner in the pipe

The machine is fixed in the laid pipe by two factors:

- by the stops of the supports in the pipe sleeve,
- by the pressure of the sleeve tensioner in the pipe.

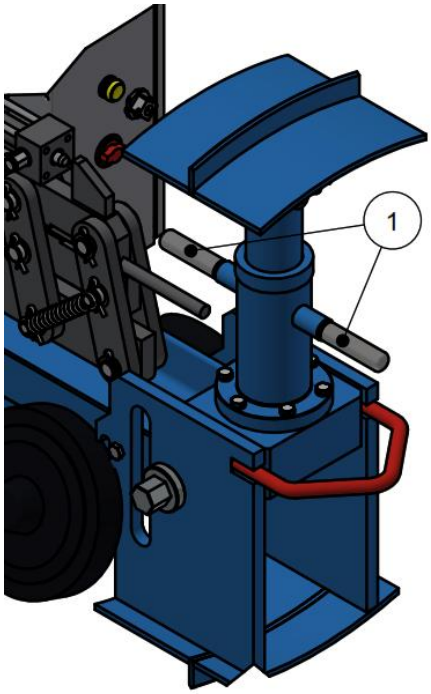


The machine must be fixed in the pipe so that the supports' top (1) and bottom (2) stops are exactly at the pipe sleeve.

Proceed as follows to fix the machine:

▶ Remove coarse dirt from the inside of the pipe.

▶ Set the machine so that the bottom stop engages behind the collar of the pipe sleeve.



▶ Grasp both hand toggles (1) at the sleeve tensioner and turn clockwise.

➢ The top support moves upwards.

▶ Continue turning until the top stop engages behind the collar of the pipe sleeve and the support is firmly against the pipe.

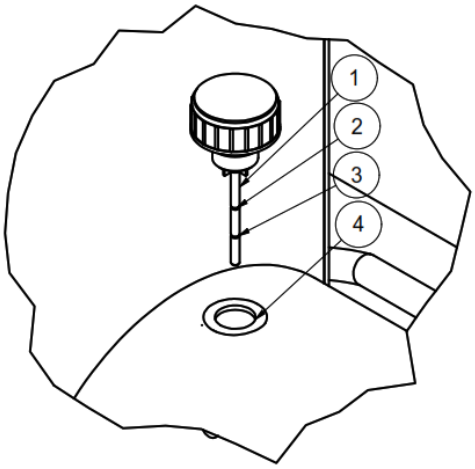
▶ Correct the machine's position if the stop comes out too far outside the pipe or inside the pipe.

▶ Tighten the sleeve tensioner firmly with the hand toggles when the stop position is correct.

5.6. Check before operating

Prerequisite: The steel pulling rope is not clamped yet.

Checking the oil level



- ▶ Pull out the dipstick (1).
- ▶ Read the oil level: It must be between the two marks – MIN (3) and MAX (2).
- ▶ Check the oil quality (see the section that follows).
- ▶ Clean the dipstick with a soft cloth.
- ▶ If the oil level is too low, top the oil up by pouring the following type through the opening (4):

  SHELL Tellus S2 MX 46.

Checking the oil quality

How the hydraulic oil ages depends on the operating conditions. The degree of ageing and usability are assessed by a simple visual inspection.

Appearance of the oil	Cause
Dark colouring	Overheating, missed oil change, potentially ingress of third-party oil.
Milky turbidity	Ingress of water or air.
Air bubbles	Ingress o fair, e.g. due to a lack of oil or a leaking suction line
Suspended or deposited impurities	Wear, dirt, ageing products
Smell of burnt oil	Overheating

- ▶ Discontinue use of the machine if the oil has any of these appearances.
- ▶ Have the oil changed (see section 7.6).

Checking the lubrication

The following bearing positions must be checked to ensure they are sufficiently lubricated:

- Spindle of the sleeve tensioner

If grease is missing, the component in question must be lubricated (see section 7.5).

Checking the battery charge

The battery charge status is displayed in the app. (see supplier documentation)

- Check the battery charge.
- If the battery is not charged to 30%, connect the charger to the battery.
- Wait for the battery to charge.

A full battery charge takes approx. 8 hours.
Further information can be found in the operating instructions supplied with the charger.

Checking hydraulic functions with the remote control

The operator stands next to the machine with the control bulb so that they can see the pressure gauge, but does not stand within the movement radius of the clamping tongs.

Perform the following functions and check the effect:

Function	Effect
Press the „Arrow up“ button	Rear clamping tongs open.
Press the „Arrow down“ button	Rear clamping tongs closes.
Press the „Arrow right“ button	Pull cylinder extends. When the end position is reached, the front clamping tongs open.
Press the „Arrow left“ button	The pull cylinder closes, the pressure on the pressure gauge rises. When the end position is reached or when the working pressure of 160 bar is reached, the indicator light on the control box lights up yellow. Shortly before the end of the pulling process, when approx. 120 mm stroke is still available, a horn sounds. This signal is triggered by a sensor that monitors the travel of the cylinder.

- Do not operate the machine if one of the functions does not have the described effect, or if an indicator light does not light up as described.
- Arrange for repair.

6. OPERATION

Operation includes the following activities:

- Placing the tie beam with the steel pulling rope on the pipe to be pulled
- Securing the steel pulling rope in the machine
- Pulling the pipe segment.

The remote control is needed to fix the steel pulling rope in the machine.

6.1. Safety notes

DANGER

Danger of death if the machine is operated with damaged components.

Safe operation is no longer guaranteed if components are damaged.

▶ Only operate the machine when it is in a perfect condition.

DANGER

Risk of fatal injuries if work is carried out improperly.

▶ Only allow people with the necessary qualifications to carry out work.

▶ Observe all the operational safety and accident prevention regulations and rules applicable at the workplace.

WARNING

Risk of severe injuries when operating the machine at close range.

A moving pipe segment, the tensioned pulling rope and the machine with the open clamping tongs can cause severe injuries. It is therefore prohibited to operate the machine at close range and inside the pipe.

▶ Operate the machine with the remote control outside the range of movement of the pulling rope and pipe.

WARNING

High physical strain and risk of crushing when inserting the tie beam.

The tie beam weighs between 20 and 42 kg.

Lifting and handling can cause back problems, among other things. Hands and fingers can be crushed.

- ▶ Components that weigh more than 25 kg may only be lifted and used with lifting gear or with two people.
- ▶ Always maintain good posture and keep your back as straight as possible when lifting heavy components.

WARNING

Electric shock caused by contact with live parts.

Live parts are located in the electrical switch box and in the hydraulic housing.

- ▶ Before switching on, ensure that the covers of the control box and battery box are firmly installed.

WARNING

Risk of hearing loss.

The noise of the hydraulic unit may cause a strong resonance depending on the ambient conditions.

- ▶ Wear hearing protection.
- ▶ Stay as far away from the source of the noise as possible for work.

WARNING

Risk of crushing when intervening in the clamping tongs.

The clamping tongs are open. Hands and fingers can be crushed when inserting the steel pulling rope and during the pulling process.

- ▶ Ensure that nobody can trigger the pulling process by monitoring the remote control when inserting the steel pulling rope.
- ▶ Always perform the pulling process from a distance with the remote control.

WARNING

Danger due to a torn and flapping steel pulling rope.

The steel pulling rope can break if it is damaged or if the pulled pipe is jammed. A flapping steel pulling rope can cause severe injuries.

- ▶ Do not use a damaged steel pulling rope.
- ▶ Do not continue pulling if the pulling process blocked; loosen the tension instead. Do not approach the machine until the steel pulling rope has been loosened.

WARNING

Danger due to hydraulic oil spraying out of leaking components.

Hydraulic oil can spray out and cause skin and eye damage if connections, hoses, or cylinders are damaged.

- ▶ Put on safety goggles and safety gloves and immediately shut down or do not operate the machine if oil is leaking from any part of the machine.
- ▶ Arrange for repair.

CAUTION

Risk of slipping due to rough or wet ground.

The ground in the pit bed may cause a tripping or falling hazard.

- ▶ Ensure that the steel pulling rope and tie beam are positioned securely when inserting them.

CAUTION

Risk of physical strain and impact due to the confined environment.

Working in a pipe segment may necessitate a hunched posture and cause musculoskeletal discomfort. There is also a risk of impact.

- ▶ Do not work in the pipe segment that you cannot adopt an upright position in for longer than absolutely necessary.
- ▶ Take regular breaks and balance your posture.
- ▶ Always move slowly and carefully in the pipe.

CAUTION

Risk of cuts due to loosened strands on the steel pulling rope.

Strands on the steel pulling rope may come loose after pro-longed use.

- ▶ Always wear safety gloves when handling the steel pulling rope.
- ▶ Cut off visible strands.

⚠ CAUTION

Risk of injury when inserting the load hook.

For the pulling arrangement, the steel pulling rope's load hook must be inserted into the lug of the two-leg sling chain. There is a risk of crushing.

▶ Wear safety gloves when inserting the load hook.

⚠ CAUTION

Risk of injury due to potentially leaking hydraulic oil.

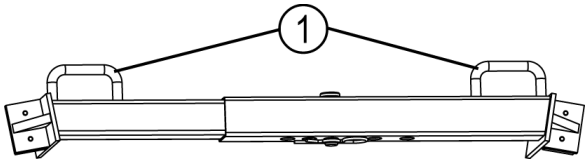
Contact with hydraulic oil may cause skin irritation.

▶ If oil is leaking, do not operate the machine.

6.2. Preparing the tie beams

The tie beams weigh between 20 and 42 kg.

▶ Always move and carry tie beams weighing more than 25 kg with at least two people or suitable lifting gear.



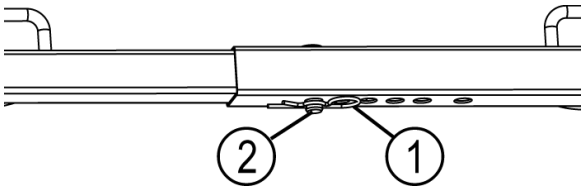
▶ Always grasp the tie beam by the handles (1) when carrying by hand.

Setting the width

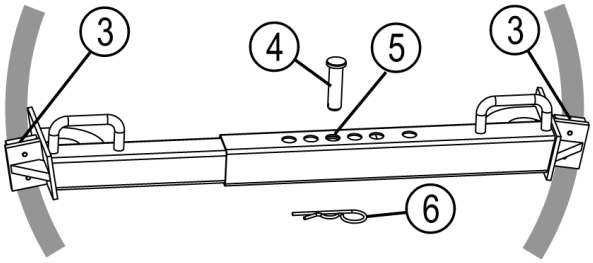
The tie beams are telescopic, i.e. their width can be adjusted. There is a scale with millimetre indications at the pin opening.

▶ Place the tie beam behind the pipe segment to be pulled.

▶ Lift the tie beam in pairs or with lifting gear to the height that the tie beam is to pull the pipe segment at. The tie beam should rest in the bottom half of the pipe.



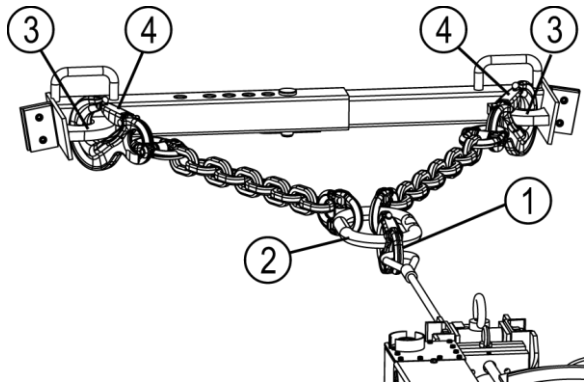
▶ Pull the spring cotter (1) out of the end of the pin (2) and pull out the pin.



▶ Pull the tie beams apart or push them together so that the aluminium jaws (3) are exactly in contact with the pipe sleeve.

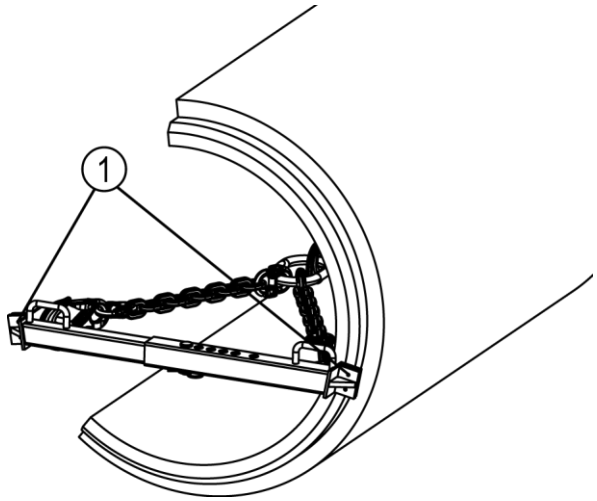
▶ Push the pin (4) into the suitable opening (5) and fix it with the spring cotter (6).

Connecting tie beams with the two-leg sling chain



- Connect the load hook (1) of the steel pulling rope to the lug (2) of the two-leg sling chain.
- Connect the two hooks (4) of the two-leg sling chain to the lugs (3) on the tie beam.

Overview of the correctly positioned tie beam



The tie beam is correctly inserted as follows:

- It is horizontal.
- It is at most up to the central height of the pipe segment or below.
- The aluminium jaws (1) are in contact with the pipe sleeve.
- The chain is equally long on both sides (thus forming an isosceles triangle with the tie beam).

6.3. Installing the steel pulling rope and pulling a pipe segment

Opening the clamping tongs

- Move away from the machine with the remote control so that you are not within the machine's range of movement.
- To open the rear clamping tongs, press the “Arrow up” pushbutton.
  - ➢ The opening cylinder extends and opens the rear clamping edge.
- To open the front clamping tongs, press the “Arrow right” pushbutton.
  - ➢ The pull cylinder extends and opens the front clamping tongs.
- Put down the remote control and ensure that no one is operating the buttons on the remote control. (or press the emergency stop).

WARNING

Risk of crushing when intervening in the clamping tongs.

The clamping tongs are open. Hands and fingers can be crushed when inserting the steel pulling rope.

- ▶ Ensure that nobody presses the control bulb buttons and thus moves the clamping tongs or triggers a pulling process when inserting the steel pulling rope.

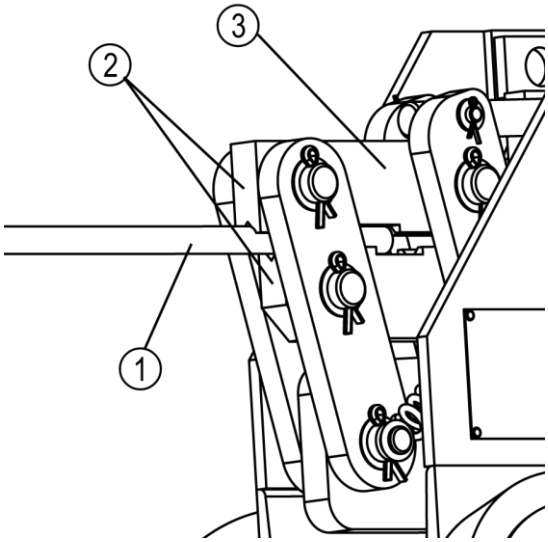
CAUTION

Risk of overheating.

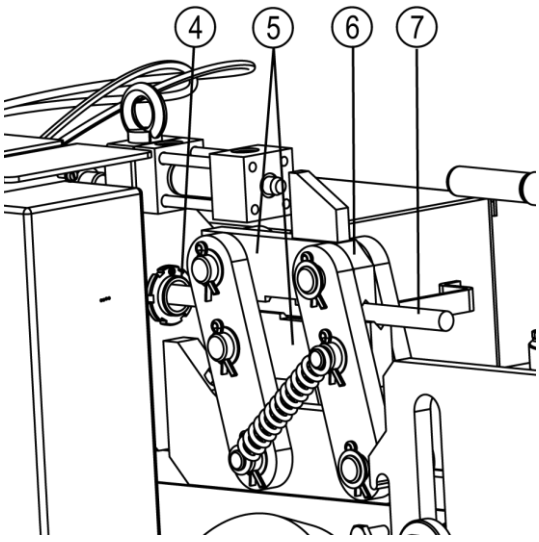
The hydraulic oil heats up too much if the machine pulls against too strong a resistance. There is a distinct odour.

- ▶ Press the remote control emergency stop button.

Guiding the steel pulling rope through the machine



- ▶ Push the tapered end (1) of the steel pulling rope through the opened clamping jaws (2) of the front clamping tongs (3).



- ▶ Continue pushing through the cylinder until the end of the steel pulling rope (7) comes out of the cylinder (4).
- ▶ Push the steel pulling rope further through the open clamping jaws (5) of the rear clamping tongs (6).

Fixing the steel pulling rope and pulling the pipe segment

WARNING

Risk of crushing when pulling the pipe segment.

The „Arrow down“ command closes the clamping tongs. Then the pipe is pulled. There is a risk of injury.

- ▶ Always give the „Arrow left“ command outside the danger zone with the remote control.

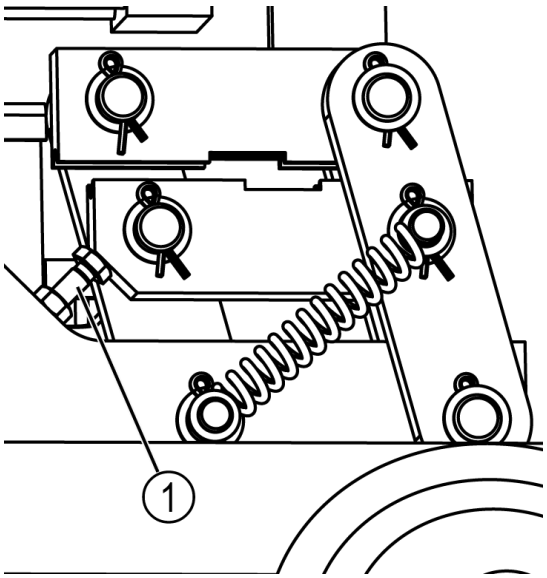
Proceed as follows to secure the steel pulling rope in the machine:

- ▶ Move far enough away from the machine with the remote control so that you are not in the machine's range of movement.
- ▶ Press the „Arrow down“ button to close the rear clamping tongs.
  - ➢ The opening cylinder retracts and closes the rear clamping tongs. The rope is now clamped in the machine.
- ▶ Press the „Arrow left“ button to tighten the steel pulling rope and thereby pull the pipe segment.
  - ➢ The pulling cylinder retracts, closes the front clamping tongs and pulls the pipe segment by 500 mm.
  - ➢ Interrupt the pulling process after approx. 50 mm. The pulling rope is now slightly compressed between the front and rear clamping tongs and is no longer under tension. This relieves the pressure on the rear clamping tongs.
- ▶ Press the „Arrow up“ button.
  - ➢ The rear clamping tongs open. The pulling rope can now be freely guided out of the machine to the rear. The rope is not compressed.
- ▶ After opening the rear clamping tongs, continue the pulling process by pressing the „Arrow left“ button.

After the first pull

- ▶ Retighten the sleeve tensioner after the first pull (see section 5.5).
- ▶ Regrip the steel pulling rope if the stroke distance of 500 mm is insufficient (see page 32).

Retightening the setscrew



- ▶ After the first pull, check the setscrew (1) on the rear clamp and retighten if necessary.

Regripping the steel pulling rope

Perform the following steps to retighten the steel pulling rope:

- ▶ Press the „Arrow down“ button.
  - ➢ The rear clamping tongs close.
- ▶ Press the „Arrow right“ button.
  - ➢ The pulling cylinder extends and the front clamping tongs open.
- ▶ Press the „Arrow left“ button.
  - ➢ Pull for approx. 50 mm. Then interrupt the process. The pressure on the rear clamping tongs is relieved.
- ▶ Press the „Arrow up“ button.
  - ➢ The rear clamping tongs open.
- ▶ After opening the rear clamping tongs, continue the pulling process by pressing the „Arrow left“ button.

Repeat these steps if necessary.

Using the battery economically

The battery charge lasts for about 1 hour at full load from the pulling processes.

- ▶ To save battery charge, switch off the machine after each pulling operation by pressing the emergency stop switch.

6.4. Decommissioning

Decommissioning at the end of the shift includes the following activities:

- Pressing the ‘Arrow right’ and ‘Arrow up’ buttons to open the front and rear clamping jaws
- Pulling the steel pulling rope out of the machine
- Switch on emergency stop on remote control
- Turn battery switch to Off
- Removing the tie beam
- Removing the two-leg sling chain
- Lowering the sleeve tensioner.

Protecting the machine from water ingress

The machine must not get wet

▶ Protect the machine in the pit bed against water ingress and flooding.

⚠ CAUTION

Water ingress will render the machine inoperable.

The machine is protected against splash water, so it is not waterproof.

▶ Protect against water ingress and flooding.

▶ Do not operate a machine that has become wet!

▶ Do not attempt to dry a machine that has become wet!

▶ Contact the manufacturer if a machine has become wet.

Charging the battery

▶ Connect the battery to the charger for the next use.

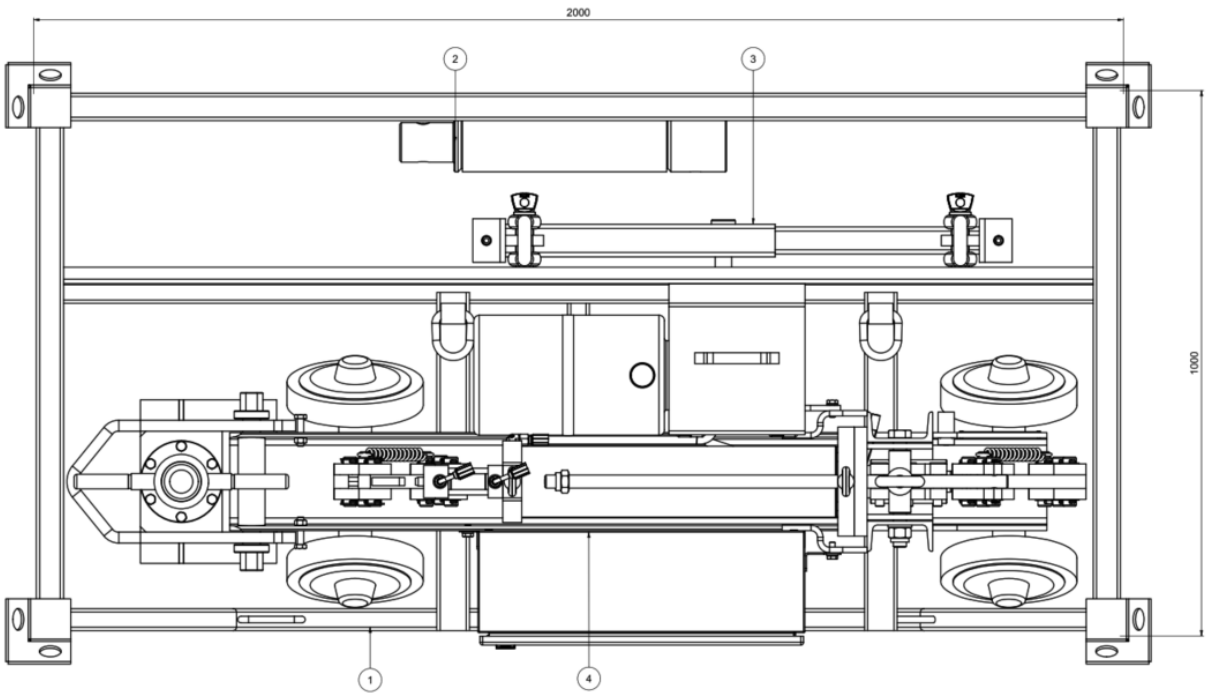
It takes approximately 8 hours to fully charge. The battery is protected against overcharging.

6.5. Storage and transport

Store the machine in the supplied transport box if decommissioning for an extended period of time.

Storage in the supplied transport box

The following figure illustrates how to correctly store the machine and accessories in the transport box:



1. Transport box
2. Adapter pipe SB 108x...
3. Tie beam size. X
4. Pipe puller SZ10-M

▶ Place the chain and accessories loosely next to the machine in the transport compartment of the transport box.

7. MAINTENANCE AND REPAIR

7.1. Safety notes

WARNING

Risk of severe injury if maintenance work is carried out improperly.

- ▶ Perform only the maintenance work described in this manual.
- ▶ Contact the manufacturer or its authorised specialist for all other maintenance.
- ▶ Never work on the electrical, hydraulic and mechanical systems.

WARNING

Electric shock caused by contact with live parts.

There are live parts in the electrical control box and hydraulic housing.

- ▶ During maintenance, ensure that the covers of the control box and battery box are firmly installed.

WARNING

Danger due to hydraulic oil spraying out of leaking components.

Hydraulic oil can spray out and cause skin and eye damage if con-nections, hoses, or cylinders are damaged.

- ▶ If oil leaks from any part of the machine, inspect only when wearing safety goggles and safety gloves.
- ▶ Arrange for repair.

CAUTION

Risk of injury due to potentially leaking hydraulic oil.

Contact with hydraulic oil may cause skin irritation.

- ▶ Wear safety gloves during maintenance.

CAUTION

Risk of cuts due to loosened strands on the steel pulling rope.

Strands on the steel pulling rope may come loose after prolonged use.

- ▶ Always wear safety gloves when handling the steel pulling rope.
- ▶ Cut off visible strands.
- ▶ Replace the steel pulling rope if damage is too severe.

7.2. Maintenance overview

Maintenance work	Interval			
	If required	Daily Every 8h	Monthly Every 160 h	Annual Every 2000 h
Charging the battery	x			
Charging the battery	x			
Checking the electrical contacts and cables	x			x
Checking the hydraulic hoses	x			x
Checking the pulling cylinder	x			x
Checking the hydraulic unit	x			x
Checking the clamping tongs along with the clamping jaws and springs	x			x
Checking the steel pulling rope	x			x
Checking the impellers	x			
Greasing the impeller's axles	x			
Replacing the handles	x			
Cleaning the machine		x		
Checking that the control bulb is working		x		
Checking the remote control is working				
Checking the machine functions (retraction and extension of cylinders, opening and closing of clamps).		x		
Lubricating the spindle of the sleeve tensioner			x	
Lubricating the axles of the clamping tongs			x	
Changing the hydraulic oil and suction filter				x

7.3. Repair work

Maintenance and repair work that may be carried out by the facility operator's qualified personnel is listed below.

WARNING

Risk of severe injury if repair work is carried out improperly.

- Only professionally qualified, trained technicians with knowledge of the relevant provisions set out by the Civil Engineering Trade Association and in DIN 4124 may carry out repair work on the machine.
- Contact the manufacturer or its authorised specialists for all other repair work.
- Never work on the electrical, hydraulic and mechanical systems.

Corrosion protection

If the machine's corrosion protection wears off, renew it with paints or thinners.

CAUTION

Risk of damage to seals and bearings.

- Do not allow seals and bearings to come into contact with paints and thinners.

Electrical contacts

- Check electrical supply cables for damage to insulation, kinking and crushing.
- Replace defective and damaged plugs, sockets and electrical supply cables.

Checking the machine for leaks and checking the hydraulic hoses

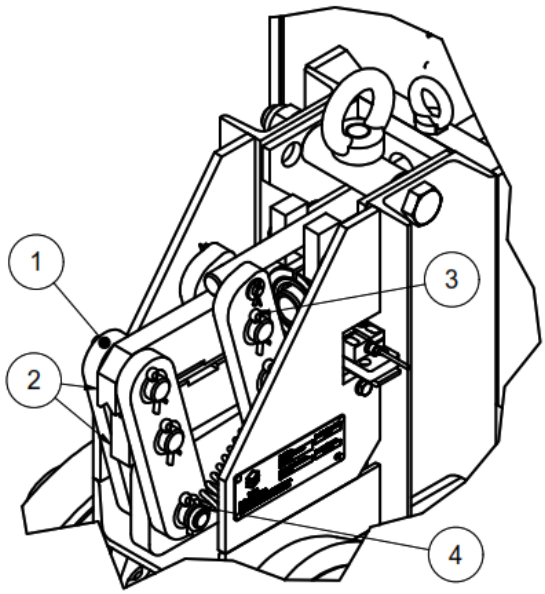
- Inspect all the machine parts where oil could leak (cylinders, valves, hoses) for leaks and spilled oil.

If too much oil leaks out, the pressure build-up is no longer adequate for a pulling process.

- In this case, shut down the machine and contact the manufacturer.
- Also check the hydraulic hoses for damage to the outer sheath, kinking and crushing.
- Replace damaged hoses.

Clamping jaws and clamping tongs

The steel pulling rope may slip if the clamping jaws are heavily worn. The clamping jaws must be replaced.



- ▶ Check the clamping jaws (2) of the clamping tongs (1) for wear.
- ▶ Check that the springs (4) of the clamping tongs (1) are tight.

To replace the clamping jaws:

- ▶ Set the rotary switch on the switch box to “Off”.
- ▶ Remove all retaining pins (3) from the pins.
- ▶ Remove the spring (4).
- ▶ Use a mandrel to drive the axles of the clamping tongs out of the holes.
- ▶ Lubricate the axles with rolling bearing grease.
- ▶ Replace worn clamping jaws with genuine spare parts.
- ▶ If the springs have too much play, replace them with genuine spare parts too.
- ▶ Reassemble in reverse order to dismantling.

The hydraulic unit’s housing

- ▶ Check the hydraulic unit’s housing for mechanical damage.

Seals

- ▶ Check the seals on the pulling cylinder and the opening cylinder.
- ▶ Replace damaged seal sets.

Steel pulling rope

A damaged steel pulling rope can break.

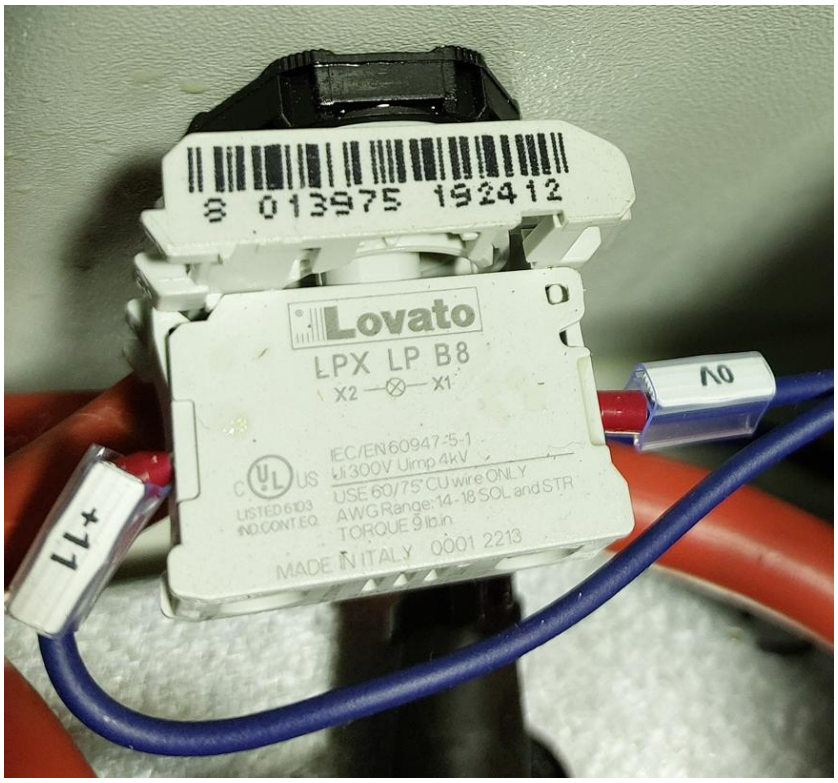
- ▶ Check the steel pulling rope for wear.
- ▶ Cut off protruding, torn strands.
- ▶ Completely replace the steel pulling rope if it is heavily worn.

The impeller’s axles

- ▶ Check the impeller’s axles for mechanical damage.
- ▶ Shut down the machine and contact the manufacturer if they are damaged.

Replacing a bulb

To replace the light source (LPX LP B8), open the switch cabinet, loosen the clamp and pull it out. Disconnect the wiring, replace the bulb, wire and reinsert.



Check sensor

Check whether the sensor has come loose and the switching distance is <8 mm.

To check the sensor, the pull cylinder must be moved past the sensor and back again to trigger it.

7.4. Daily maintenance

Cleaning the machine

- ▶ Press the emergency stop button.
- ▶ Set the battery switch to Off.
- ▶ Remove coarse dirt from the entire machine.
- ▶ Pay particular attention to the gaps and openings on the clamping tongs and cylinders.

⚠ CAUTION

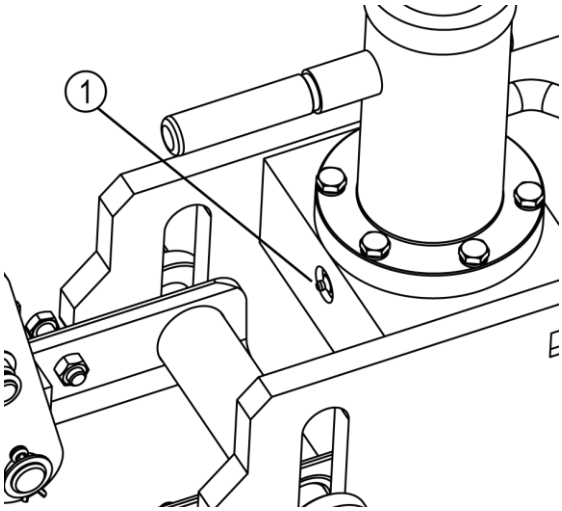
Risk of malfunction due to dirt.

The machine may malfunction if dirt enters the moving parts.

- ▶ Inspect machine carefully for dirt, and remove any dirt.

7.5. Monthly maintenance

Lubricating the spindle of the sleeve tensioner



- ▶ Lubricate the spindle of the sleeve tensioner with graphite grease via the lubricating nipple (1) using a grease gun.
- ▶ Remove excess grease.

Lubricating the clamping tongs

- ▶ Loosen the clamping tongs' axles.
- ▶ Lubricate the axles with rolling bearing grease.
- ▶ Reinstall the axles.

7.6. Annual maintenance

Electrical contacts

- ▶ Check electrical supply cables for damage to insulation, kinking and crushing.
- ▶ Replace defective and damaged plugs, sockets and electrical supply cables.

Checking the machine for leaks and checking the hydraulic hoses

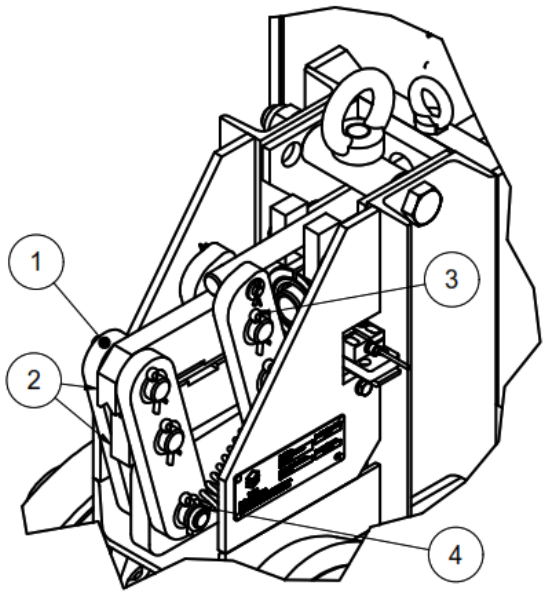
- ▶ Inspect all the machine parts where oil could leak (cylinders, valves, hoses) for leaks and spilled oil.

If too much oil leaks out, the pressure build-up is no longer adequate for a pulling process.

- ▶ In this case, shut down the machine and contact the manufacturer.
- ▶ Also check the hydraulic hoses for damage to the outer sheath, kinking and crushing.
- ▶ Replace damaged hoses.

Clamping jaws and clamping tongs

The steel pulling rope may slip if the clamping jaws are heavily worn. The clamping jaws must be replaced.



- Check the clamping jaws (2) of the clamping tongs (1) for wear.
- Check that the springs (4) of the clamping tongs (1) are tight.

To replace the clamping jaws:

- Set the rotary switch on the switch box to “Off”.
- Remove all retaining pins (3) from the pins.
- Remove the spring (4).
- Use a mandrel to drive the axles of the clamping tongs out of the holes.
- Lubricate the axles with rolling bearing grease.
- Replace worn clamping jaws with genuine spare parts.
- If the springs have too much play, replace them with genuine spare parts too.
- Reassemble in reverse order to dismantling.

Seals

- Check the seals on the pulling cylinder and the opening cylinder.
- Replace damaged seal sets.

Steel pulling rope

A damaged steel pulling rope can break.

- Check the steel pulling rope for wear.
- Cut off protruding, torn strands.
- Completely replace the steel pulling rope if it is heavily worn.

Changing the oil and replacing the suction filter

- Place the collection container under the oil drain screw.
- Remove the magnetic oil drain screw.
- Drain and collect used hydraulic oil.
- Open the hydraulic unit housing and remove the fastening screws underneath the housing
- The unit can now be easily moved to access the tank fastening screws and remove the tank.
  - ➢ The suction filter at the beginning of the suction pipe is accessible.
- Replace the suction filter.
- Fit the tank and mount with screws.
- Reposition the unit so that the fastening screws can be refitted and then close the housing.
- Check the magnetic oil drain screw for metallic wear.
- Shut down the machine and contact the manufacturer if there is visible wear.
- Screw the oil drain screw back in if there is no visible wear.

▶ Fill with fresh SHELL Tellus S2 MX 46 hydraulic oil until the fluid level on the dipstick is between the two marks.

Disposing of used oil

WARNING

Environmental hazards due to improper disposal:

▶ Dispose of hydraulic oil in accordance with regulations and in an environmentally friendly manner.

▶ Observe and comply with the regional regulations and legal requirements applicable at the place of operation.

8. TROUBLESHOOTING

This section describes potential faults during operation, their potential causes and how to remedy them.

Fault	Potential cause	Remedy
Yellow indicator lamp does not light up when 160 bar is reached.	Bulb in the indicator light defective.	Replace the blub (see page 40).
Yellow indicator lamp lights up.	Obstacle in the pipe puller's path.	Remove the obstacle.
Horn not sounds 120 mm before the end of the pulling process.	Horn in switch box defective.	Check sensor (see page 40).
The hydraulic oil smells and is getting too hot during the pulling process. The machine is getting hot.	The machine is pulling against a resistance.	Remove the resistance. Wait until the machine has cooled down.
The hydraulic pulling cylinder retracts without pulling the steel pulling rope.	The clamping jaws are not gripping.	Check the springs. Retighten the setscrew on the rear clamping tongs (see page Fixing the sleeve tensioner in the pipe 33). Have the clamping jaws replaced by the manufacturer if this measure is unsuccessful.
Steel pulling rope sags during the pulling process.	Steel pulling rope snapped.	Replace the steel pulling rope.
The pipe puller is not pulling. The indicator light on the switch box does not light up. The battery is charged; the electrical connections are OK.	The hydraulic unit's motor isn't working.	Contact the manufacturer.
The pipe puller moves out of the pipe during the pulling process.	The sleeve tensioner isn't fixed in the pipe.	Secure the pipe puller in the pipe again with the sleeve tensioner (see section 5.5). Check the adapter pipe and adjust if necessary. Retighten the sleeve tensioner after the first pull.

9. ACCESSORIES/SPARE PARTS

Item no.	Brief description	Weight [kg]
GV000520	SZ10-M pipe puller inc. remote control	380,0
GV000521	SZ10-M pipe puller with accessories	782,0
284 970	Tie beam size 1 – 800 to 1000 mm	20,0
284 940	Tie beam size 2 – 1000 to 1300 mm	32,0
284 950	Tie beam size 3 – 1300 to 1800 mm	40,0
284 960	Tie beam size 4 – 1800 to 2400 mm	42,0
284 980	Tie beam extension up to 2800 mm	7,4
AC4113E	Clamping jaws for tie beam size 1	0,2
AC4111E	Clamping jaws for tie beam size 2	0,4
AC4109E	Clamping jaws for tie beam size 3/4	0,6
IB0141F	M10 x 25 cylinder head screw	0,02
139 380	SB adapter pipe, 108 x 100 mm	5,5
139 415	SB adapter pipe, 108 x 200 mm	10,0
139 430	SB adapter pipe, 108 x 300 mm	13,8
139 445	SB adapter pipe, 108 x 500 mm	17,7
139 385	SB adapter pipe, 108 x 1000 mm	28,0
139 400	SB adapter pipe, 108 x 1500 mm	37,5
138 030	Pin, 125 x 20 mm	0,35
138 200	Spring cotter, 92 x 5 mm	0,05
284 905	Steel pulling rope, L = 20 m / D = 18 mm (extension)	55,0
284 830	Steel pulling rope, L = 35 m / D = 18 mm	67,0
284 850	Steel pulling rope, L = 50 m / D = 18 mm	89,0
853 090	Kette -2-strängig 16/1500 mm	35,0
GV000559	Charger 15A 12 Volt IP65	1,9
284 025	Transport frame	180,0
281 475	SZ10 sleeve tensioner, standard	84,00
281 477	SZ10 sleeve tensioner, egg-shaped section 150	61,0
281 480	SZ10 sleeve tensioner, straight	75,0
GV000518	SZ10-M seal set for opening cylinder	0,1
GV000519	SZ10-M seal set for pulling cylinder	0,1
GV000231	SZ10-M battery	10,5
GV000156	Remote control T6B	0,25
GV000157	Charger for Akku Autec	0,15
GV000158	Akku Autec 3,7V 660mAH LPM00	0,03

10. EC DECLARATION OF CONFORMITY

terra infrastructure

terra infrastructure GmbH

EG-Konformitätserklärung

nach EG-Richtlinie 2006/42/EG über Maschinen, Anhang II 1.A (Amtsblatt der EU L157/24 vom 9.6.2006)

Hersteller:	**terra infrastructure GmbH** Ottostr. 30, 41836 Hückelhoven
Produkt:	**Seilzugmaschine**
Typ:	**SZ10-M**

Der Hersteller erklärt hiermit in alleiniger Verantwortung, dass das Produkt allen einschlägigen Bestimmungen sowie allen relevanten grundlegenden Sicherheits- und Gesundheitsschutzanforderungen der EG-Richtlinie 2006/42/EG über Maschinen (Amtsblatt der Europäischen Union L157/24 vom 9.6.2006) entspricht.

Darüber hinaus entspricht das Produkt der Richtlinie 2014/30/EU über Elektromagnetische Verträglichkeit (Amtsblatt der Europäischen Union L96/97 vom 29.3.2014).

Folgende harmonisierte Normen wurden angewandt:

EN ISO 12100:2010-11	Sicherheit von Maschinen – Allgemeine Gestaltungsleitsätze – Risikobewertung und Risikominderung
EN ISO 4413:2010	Fluidtechnik – Allgemeine Regeln und sicherheitstechnische Anforderungen an Hydraulikanlagen und deren Bauteile
EN ISO 13849-1:2015	Sicherheit von Maschinen – Sicherheitsbezogene Teile von Steuerungen – Teil 1: Allgemeine Gestaltungsleitsätze
EN ISO 13850:2015	Sicherheit von Maschinen – Not-Halt – Gestaltungsleitsätze
EN 60204-1:2018	Sicherheit von Maschinen – Elektrische Ausrüstung von Maschinen – Teil 1: Allgemeine Anforderungen

Dokumentationsbevollmächtigter:

Herr Roland Moll, Leiter technisches Büro, Sparte Grabenverbau

Terra infrastructure GmbH

Ottostr. 30, 41836 Hückelhoven, Tel.: +49 2433-453-0

Hückelhoven, 08.12.2023 — i. V.

Ort, Datum — Herr Roland Moll, Leiter technisches Büro

Seilzugmaschine SZ10-M 1 / 1

11. SUPPLIER DOKUMENTATION

Baltic States
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