

Reliability at work

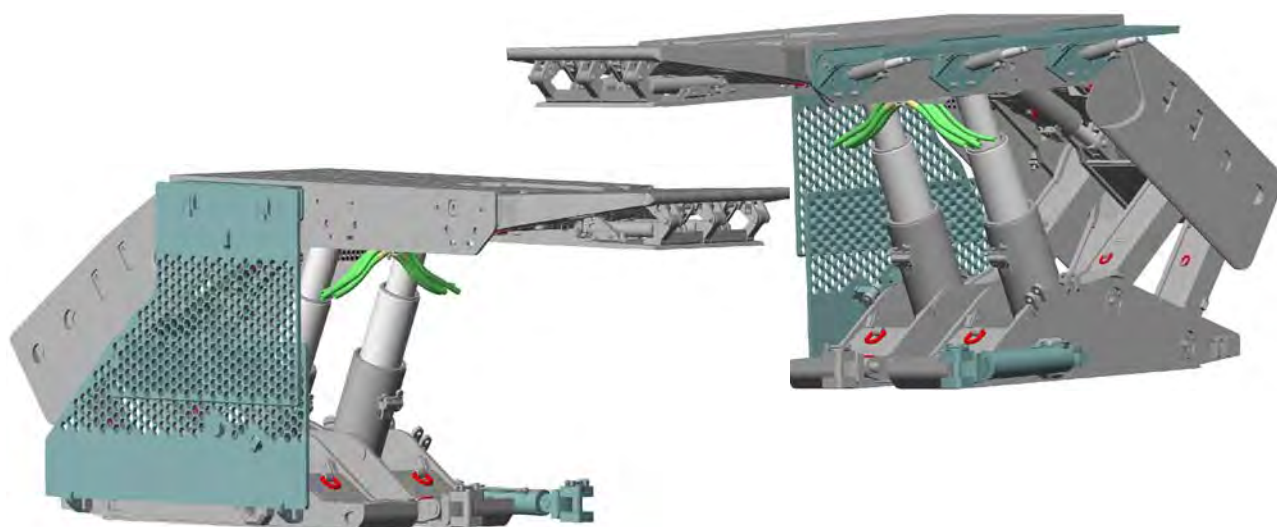


Operating Manual

Shield support

1250/2780-2X3056-1500

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2 Your safety





Safety instructions

If you raise the conveyor in the area of several shields, the shields to which lifting gear is attached must not be located next to one another.

For raising the conveyor, use only:

- high-strength, undamaged chain slings,
- the lifting points provided for the purpose.
Check that the points of attachment are undamaged before attaching a load.
- lifting tackle of adequate load-carrying capacity.

Maintenance

Make sure that all safety and protective equipment of the shield support units are complete and functional. If the safety and protective equipment is included in the Bucyrus scope of delivery, refer to chapter 6, "Technical data", for its location.

Be sure to observe the intervals specified for maintenance and inspection. See chapter 5, section "Maintenance".

Check the shield at least once every shift for externally visible damage.

Inform the supervisory personnel and the face crew about maintenance and repair work. Provide them with information on the intended work and its probable duration.

Secure your working area over a wide range, in order to avoid endangering other persons.

Immediately replace damaged components affecting safety. Stop and lockout the respective shield immediately if component damage creates a hazard and immediate repair is not possible. If there is a safety hazard, secure this area and notify the entire face crew and responsible foreman without delay.

Use only replacement parts which conform to the specified technical requirements. This is best ensured by using original Bucyrus replacement parts.

Please refer to the replacement parts catalog provided for the equipment for the order nos. for the required replacement parts.

Do not make modifications or carry out conversions which might impair the safety of the shield. Bucyrus must be informed of all conversions and modifications to check whether they have any effect on the approval or whether it is necessary to apply for a revised approval.

Any modifications carried out without authorization invalidate the Bucyrus declaration of conformity and a new conformity test will be required.

During work on the relay bar assembly, isolate the working area for the mining equipment.



Transport

Load units; dimensions and weights

It is imperative that you observe the transport sheets. They include information on:

- dimensions,
- weight,
- lifting points and
- centers of gravity.

Where technically possible, the load units have suitable lifting points for transport and installation.



Warning!

Use only load handling devices which comply with the technical and legal regulations for transporting loads. Falling components can cause serious injury and death. Use only suitable load handling devices.

Before transport

freezing temperature

Before transporting the equipment at temperatures below freezing, all hydraulic components operated with by emulsion (HFAE and HFAS) must be completely drained and filled with a corrosion inhibitor (e.g. CV 50).

It is only permitted to transport equipment at temperatures of -21°C to -40°C if certain requirements for these conditions have been taken into account during the design and production of the equipment. Nevertheless, the individual parts and devices of this equipment must not be subjected to sudden impact loads at such low temperatures and may only be loaded statically or quasi-statically.

During transport of this equipment with floor conveying devices at such low temperatures, measures must also be taken to ensure that the parts and devices are not subjected to sudden impact loads.

At very low temperatures and on poor roads, the transport vehicle speed must therefore be limited to maximum 25 km/h for truck transport.

electrical and electronic components

Electrical and electronic components must be removed for overseas transport or prolonged storage outdoors, unless these components or the complete equipment is protected against harmful environmental influences by suitable packaging. The electrical cables remain in the equipment. They must be carefully protected against transport damage and the connections protected against dirt.



Installation

In this chapter, you will be given information about installing the support units. Please pay special attention to the warnings and tips.



Warning!

In addition to the safety instructions given in this manual, also make sure you observe the special safety instructions and operation instructions which apply to the operation of the mine. Failure to do so can lead to extremely serious accidents which may be fatal.



Caution!

Before the hydraulic connections are joined with one another, the coupling sockets and nipples of the plug-O connections must be treated with the molybdenum disulfide-free B3 lubricating paste in accordance with EWN 7068. See Chapter 6, Section "Lubricating greases and pastes".



Caution!

All of the slide surfaces must be treated with the molybdenum disulfide-free B6 lubricating paste in accordance with EWN 7068 before the transport subassemblies of the steel structure are connected with one another. See Chapter 6, Section "Lubricating greases and pastes".

Pre-assembly of the support units

The support units are delivered completely pre-assembled. Accordingly, no further pre-assembly is required on the mechanics and hydraulics of the support units.

The installation parts that are mounted externally such as the side flap, protective wall and relay bar assembly are delivered individually.

Installation of the side flaps

The side flaps are delivered as a complete unit. For installation the brackets (see Fig. 16, item 2) must be removed from the complete unit.

- ☞ Remove the locking clips (7) and the pins (5) which connect the hydraulic cylinders with the brackets.
- ☞ Remove the locking clips (6) and the pins (4).
- ☞ Fasten the three brackets (2) on the side seal using hammer head bolts (9), washers (8) and hex. nuts (10).
- ☞ Install the side flap (1) on the brackets (2) using six pins (4) and secure the pins with locking clips (6).
- ☞ Re-install the hydraulic cylinder using pins (5) securing them with locking clips (7).



Requirements for the face hydraulic system

Requirements for the face hydraulic system

hydraulic medium The hydraulic medium must meet the following conditions for all hydraulics components included in the Bucyrus scope of delivery:

Contamination Class 18/14 pursuant to ISO 4406.

Pressure fluids in accordance with the Section "Permissible media" in Chapter 6 of this operating manual.

pressure, permissible Nominal pressure: 320 bar

Admissible tolerance: $\pm 10\%$ of nominal pressure

If the face hydraulics are designed such that they are unstable or too weak, there could be a temporary pressure drop during operation.

In the event that the pressure falls to 180 bar or less, there is a risk of malfunctions occurring in the electrohydraulic control system. Valve functions might not be executed. It may even result in valves starting to vibrate which could lead to valve damage.



Caution!

If there is a pressure drop, dangerous situations may arise, leading to accidents involving damage to property and/or injuries to personnel.

Make sure that the system pressure can never fall below 180 bar anywhere in the face hydraulic system.



Fig. 24: **Wrong**, support advanced too late

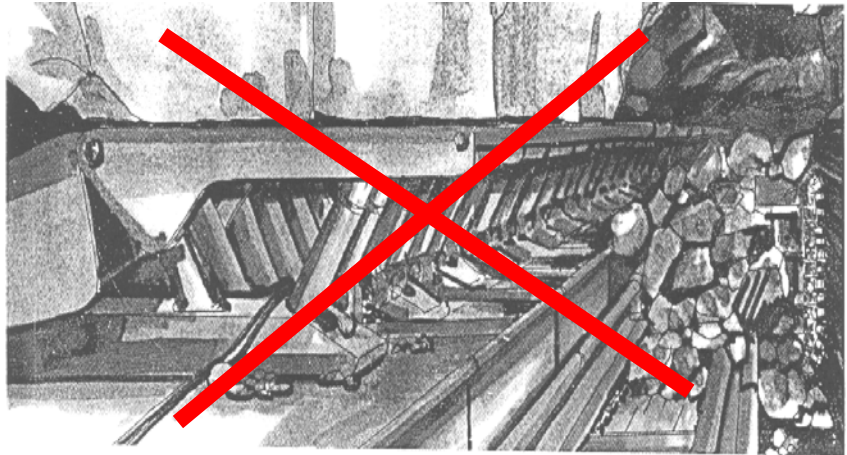
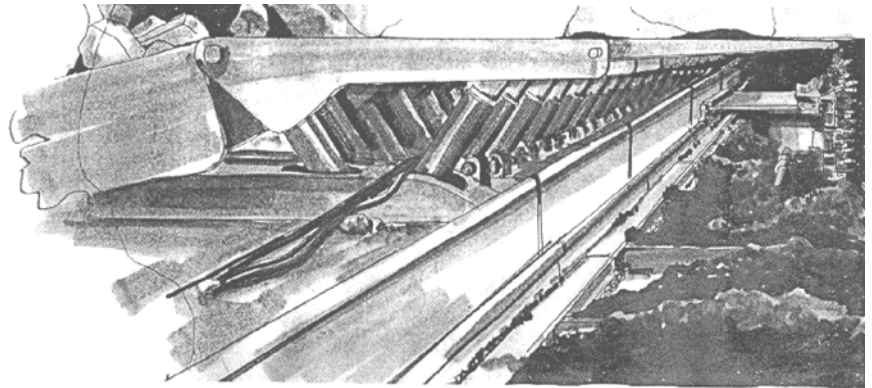


Fig. 25: **Right**, support advanced in time



When taking down a step in the roof, a shield canopy which is angled downwards must not get in the way of mining equipment passing by.

Before a support unit can be pulled up, the flipper must be completely folded in. Under no circumstances may the support be advanced against the coal face with the flipper extended. Failure to observe this can lead to serious damage, especially to the flipper cylinders and the flipper suspension.

When advancing the support, make sure that the shield canopy doesn't get under the side seal of a neighboring shield. The side seal of the neighboring shield can otherwise be seriously damaged.

control system, hydraulics

Do not operate the shield control system incorrectly.

The symbol plates on the control units indicate the functions of the shield control system. They should be legible at all times and may not be removed or damaged.

Hoses must remain free to move. They may not be squeezed or overstretched. Make sure the hose lines are bundled properly.

Damaged hydraulic hoses and hose connections must be replaced immediately. This work may only be carried out by skilled personnel.

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Shield hydraulics

Fig. 31: Shield hydraulics, arrangement (1)
Image caption: see Table 6

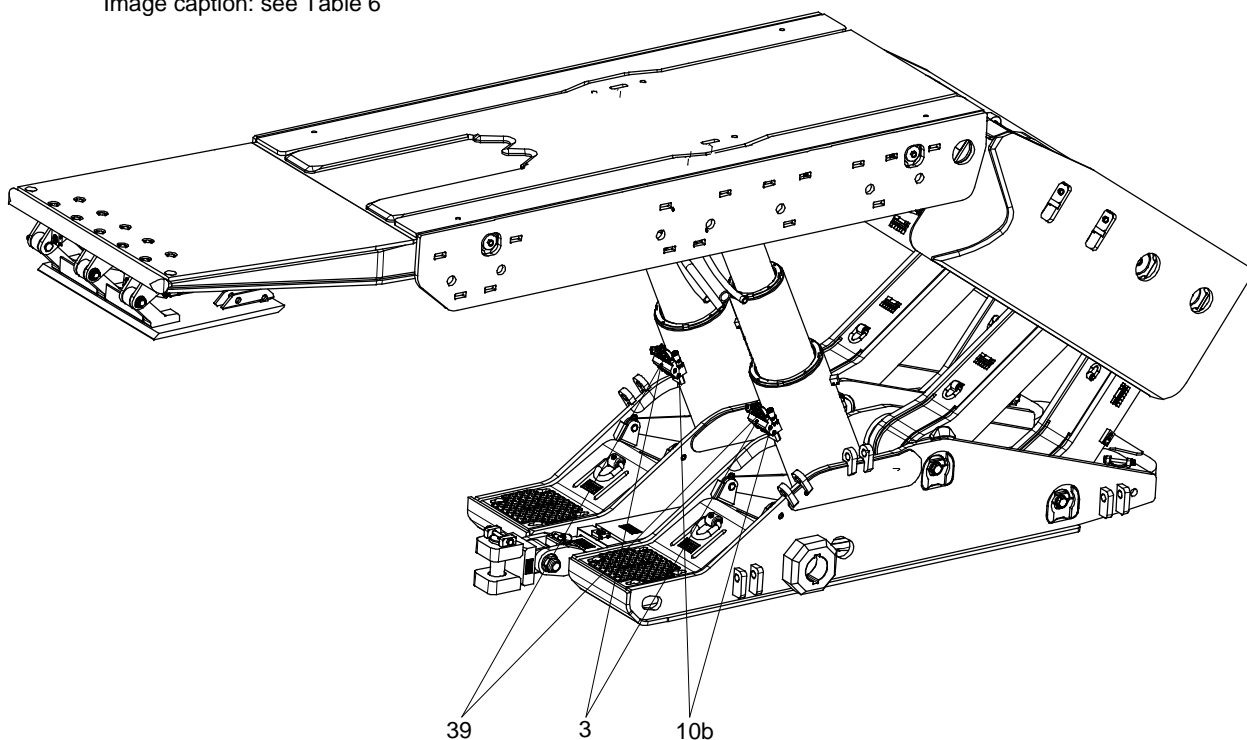
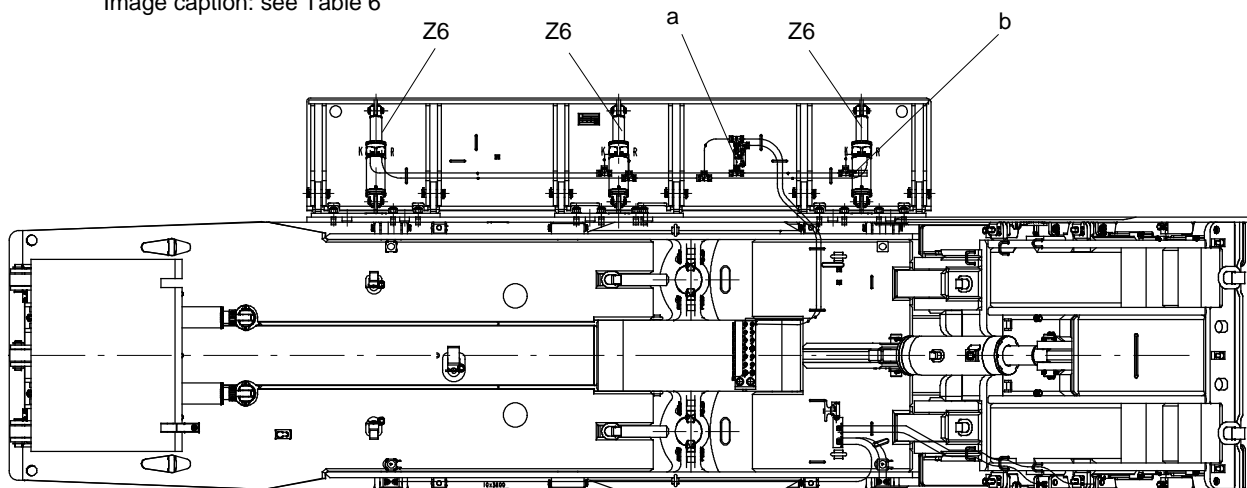


Fig. 32: Shield hydraulics, arrangement (2)
Image caption: see Table 6



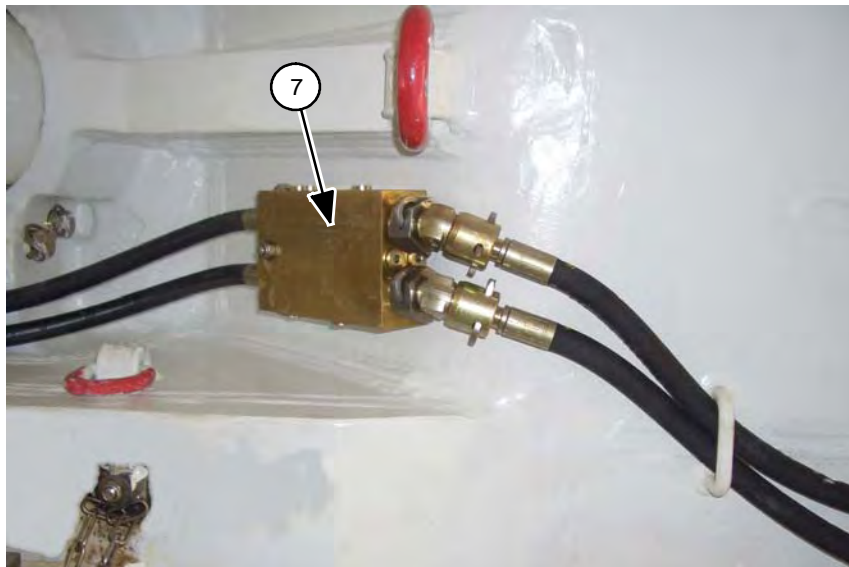
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Twin check valve for flipper cylinder

The check valve for the flipper cylinder is located in front of the right hand prop below the canopy.

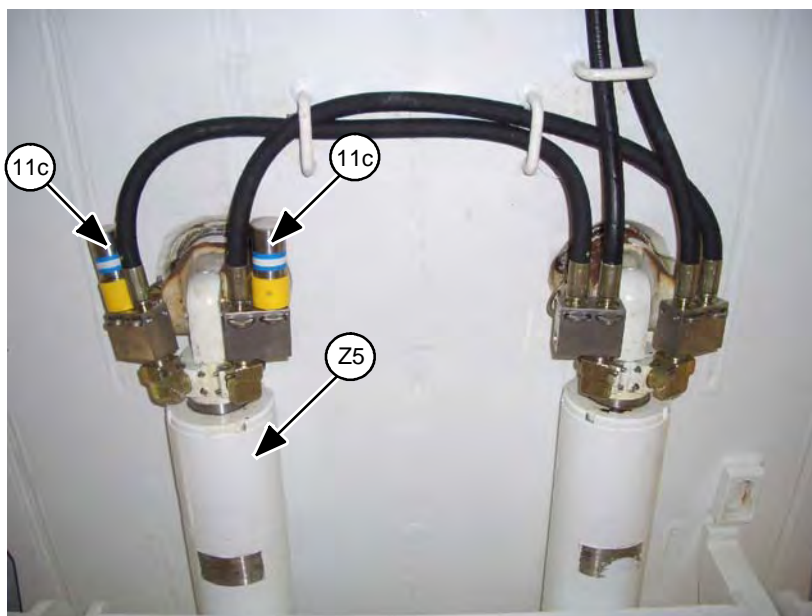
Fig. 44: View of the twin check valve from below the canopy



7 twin check valve for flipper cylinder

Pressure relief valves for flipper cylinder

Fig. 45: View of the flipper cylinder from below the canopy



11c PRV, 380 bar

Z5 flipper cylinder



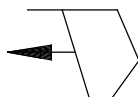
Operation of the shield hydraulics



Warning!

Manual actuation of a button on one of the pilot solenoid valves initiates the direct execution of the corresponding function. Dependencies between the individual functions are not taken into account. Dangerous situations could arise if functional sequences are initiated in an incorrect order. For example, the function “*pull shield*” can be activated without previously activating the functions “*retract side seal*” and “*actively lower support*”. This can cause dangerous situations which can result in very serious injury.

1

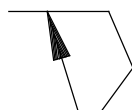


Advance shield

Before this function can be performed, Function 3 “Prop, retract on the right” and Function 4 “Prop, retract on the left” must be carried out.

The function is executed as long as the button is pressed until there is a balance of forces or until the end position is reached. As long as the function is activated, the pilot-operated check valve (14), which hydraulically shuts-off the annular space of the shifting ram, is opened automatically.

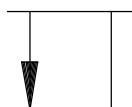
2



Set props

Before this function is actuated, the shield canopy must be correctly aligned. The function is executed as long as the button is pressed until there is a balance of forces or until the end position is reached.

3

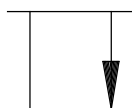


Prop, retract on the right

Before initiating this function, it must be made sure that the neighboring shields are completely set.

The function is executed as long as the button is pressed or until the end position is reached.

4



Prop, retract on the left

Before initiating this function, it must be made sure that the neighboring shields are completely set.

The function is executed as long as the button is pressed or until the end position is reached.

5



Advance conveyor

Before initiating this function, ensure that the support unit is completely set.

The function is executed as long as the button is pressed until there is a balance of forces or until the end position is reached.



Internal by-pass in props

If an internal by-pass in the prop is suspected, this procedure should be followed:

- ☞ Set the prop until the set pressure has been reached.
- ☞ Make sure that the annular space of the prop is depressurized.
- ☞ Release the hose of the prop annular space connection at the prop.
- ☞ Actuate the "Set prop" function from the neighboring support.

If there is an internal by-pass in the prop, for example due to damaged piston packing, fluid will flow out of the prop lower connection. If this happens, the prop must be replaced. If fluid escapes from the detached hose lines, the piloted check valve is defective.

Pressure relief valve defective

Leaking pressure relief valves can normally be detected by the discharge of fluid, or a pressure drop is displayed on the pressure gauge. If fluid is already discharged at working pressure, the pressure relief valve is defective or the discharge pressure setting of the valve used is too low.

In the hydraulic circuit of a support unit, various models of pressure relief valves are used. For example, pressure relief valves are used on the props which have a high flow rate. While the pressure relief valves for securing shifting rams, stabilizing cylinders etc. are designed for a lower flow.

Pressure relief valves for different cylinders or for the piston and ring sides of a cylinder can be set to different maximum pressure values. Please refer to the information in the hydraulic circuit diagrams or the spare parts catalogue.

Defective or blocked filter

Operation of the shield is slow although the system pressure lies in the normal range.

It is also possible that the hydraulic system has been contaminated, for example during repair work on the hydraulic system.

- ☞ Check the filters in the hydraulic system.

Backflush filters can be cleaned by backflushing. The filter elements must be replaced on fine-mesh filters, such as on the electrohydraulic control unit.

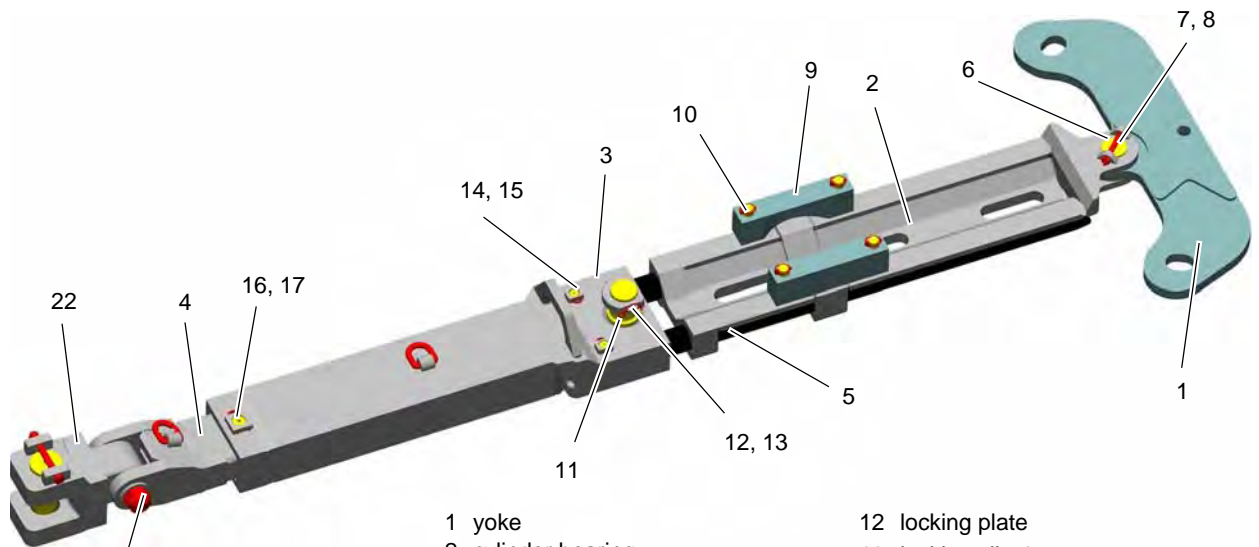
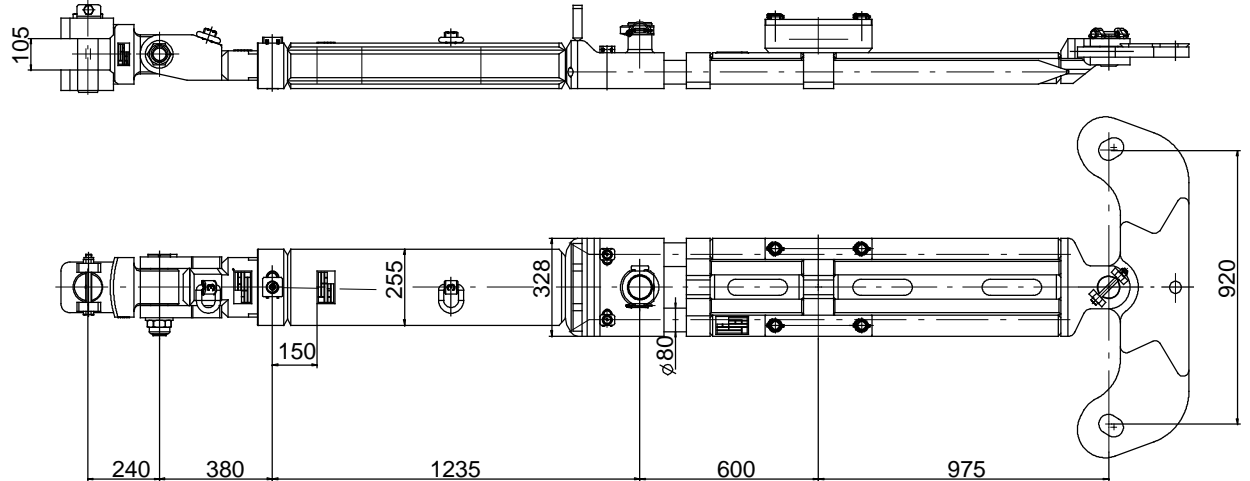


Relay bar assembly



The relay bar assembly unit is used to push the conveyor and advance the shield. To do this, it is telescopically extended or retracted using the shifting ram. The shifting ram functions directly. This means that the greater force that is generated by the piston surface is used to advance the conveyor.

Fig. 63: Relay bar assembly, dimensions and positions



19, 29, 21

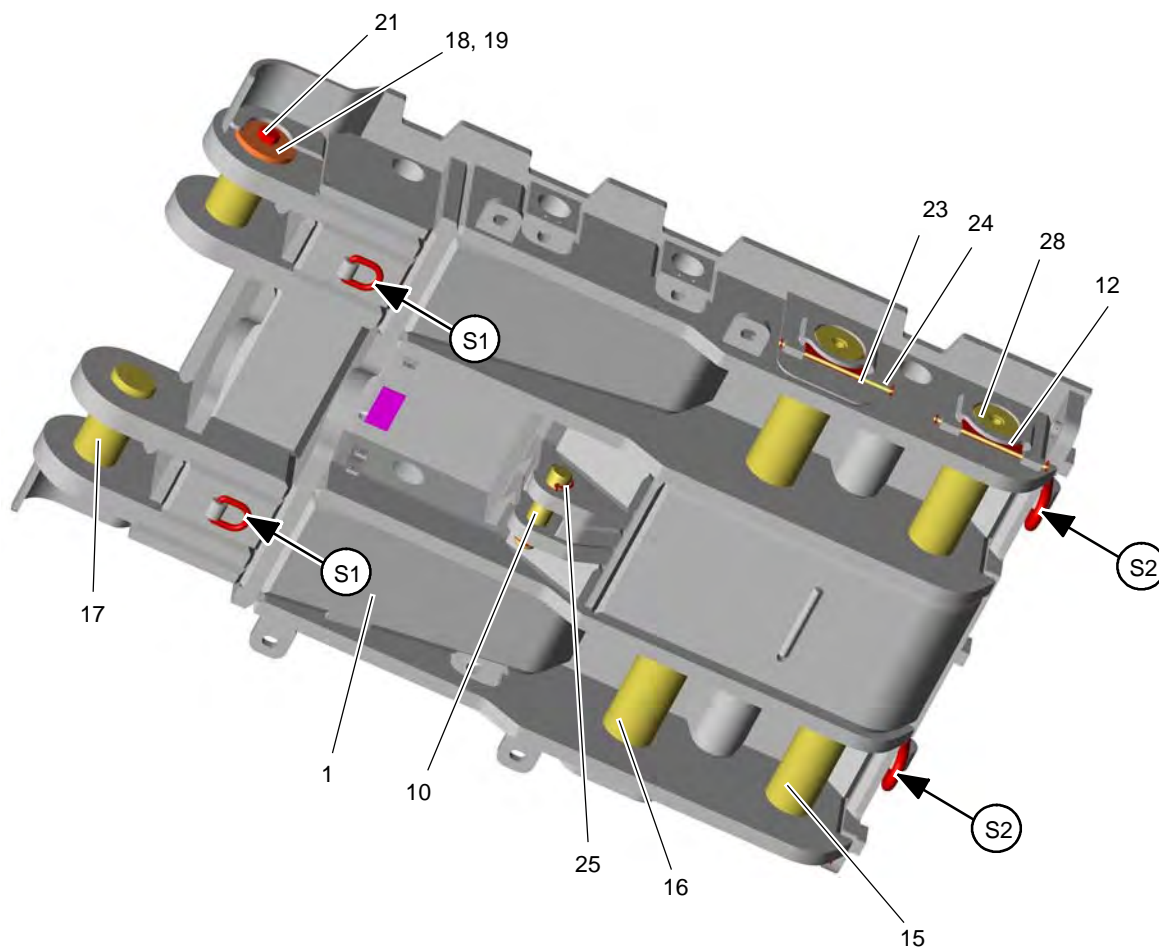
- | | |
|----------------------------------|--|
| 1 yoke | 12 locking plate |
| 2 cylinder bearing | 13 locking clip 4.5 |
| 3 cylinder seat | 14 fastening bolts $\text{Ø}28 \times 138$ |
| 4 beam | 15 coupling clip DN 20 |
| 5 guiding rod | 16 pin $\text{Ø}38.5 \times 171$ |
| 6 pin 75/60x93 | 17 coupling clip DN 25 |
| 7 hex. head screw M16x145-A 4-80 | 19 pin 85/58x265 |
| 8 hex. nut M 16-1.4301 | 20 washer 48 |
| 9 clamp | 21 hex. nut M 48-10 |
| 10 spring clip 8x42 | 22 fastening eye |
| 11 ring | |



Notice!
Apply lubricant B6 EWN7068 to all connecting points and slide surfaces.



Fig. 73: Caving shield for endshield, positions



- | | | | |
|----|---------------------------------|----|--------------------------------------|
| 1 | caving shield | 21 | hex. head screw M 30x50-8.8 |
| 10 | pin Ø54x220 | 23 | pin Ø9x300 |
| 12 | securing device | 24 | locking clip 2.5 |
| 15 | lemniscatic link pin Ø118.5x422 | 25 | locking clip 5.6 |
| 16 | lemniscatic link pin Ø128.5x445 | 28 | protective plug |
| 17 | joint pin Ø113.5x290 | S1 | load ring, load capacity: 3000 kg |
| 18 | retaining washer 155 | S2 | load ring, load capacity: 8000 kg |
| 19 | sleeve | | |

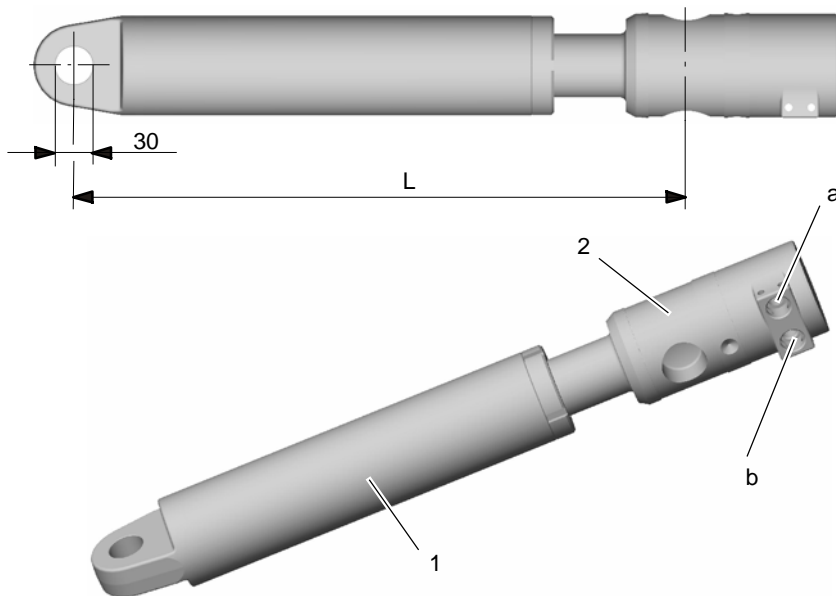


Notice!
Apply lubricant B6 EWN7068 to all connecting points and slide surfaces.



Alignment cylinder (seal cylinder)

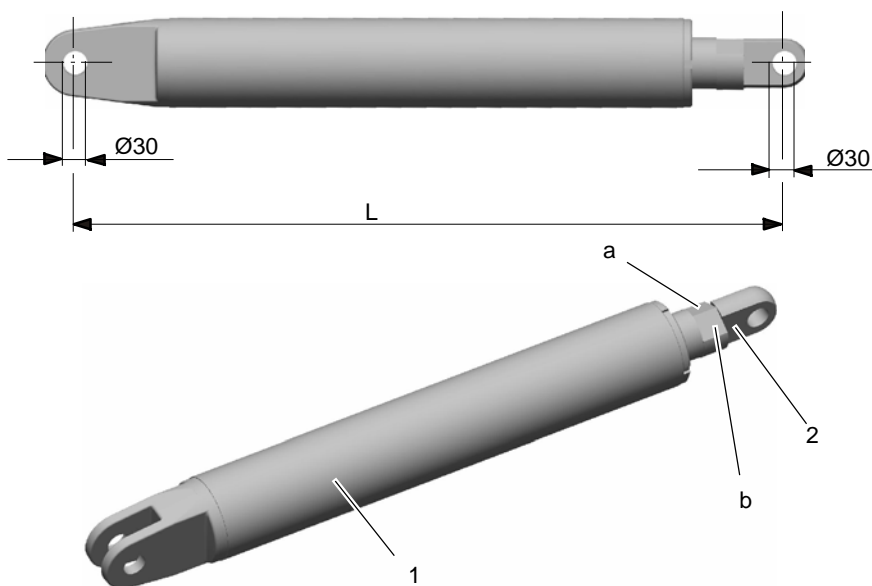
Fig. 84: Hydraulic cylinder ZE-63/50-215



- 1 cylinder tube
- 2 piston rod
- a piston space connection
- b annular space connection
- L retracted 440 - extended 655
stroke: 215

Flipper cylinder

Fig. 85: Hydraulic cylinder ZE-90/63-485 for segment shield



- 1 cylinder tube
- 2 piston rod
- a piston space connection
- b annular space connection
- L retracted 860
extended 1345
stroke: 485



Lubricating greases and pastes



Important!

The lubricants to be used are specified in the respective chapters, e.g. installation, maintenance.

Lubricating greases

properties

Base: Lithium soap
 NLGI class: 2
 Worked penetration: 265 to 295 (0.1 mm)
 Behavior in the presence of water: .. practically insoluble in water
 Temperature of application: -20 to +120 °C
 Flashpoint: ≥ 200 °C

lubricating grease A1

Lubricating greases for general application e.g. for roller bearings subject to normal load, for labyrinths, and for installation (according to EWN *) 7068).

Tab. 19: Lubricating greases for general application

| Supplier | Type | Flashpoint in °C |
|----------|-------------|------------------|
| ARAL | Aralub HL 2 | 300 |
| ESSO | BEACON 2 | 200 |

lubricating grease A2

Lubricating greases containing additives for high pressure applications e.g. for roller bearings and bearing locations subject to extreme load.

Tab. 20: Lubricating greases with additives

| Supplier | Type | Flashpoint in °C |
|----------|--------------|------------------|
| ARAL | Aralub HLP 2 | 300 |
| ESSO | BEACON EP 2 | 200 |



Important!

The greases listed in the same table can be mixed. Other products may only be used if the supplier can guarantee that they are equivalent. Differently composed lubricating greases must not be mixed as this may change the consistency, i.e. the mixture can become thinner so that the lubrication effect is not sufficient.

It may also be dangerous to use lubricating greases that have the same saponification base but different origins. If in doubt, the manufacturer of the lubricating grease to be used should be contacted to confirm the compatibility of the grease in question.

*) EWN = works standard

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