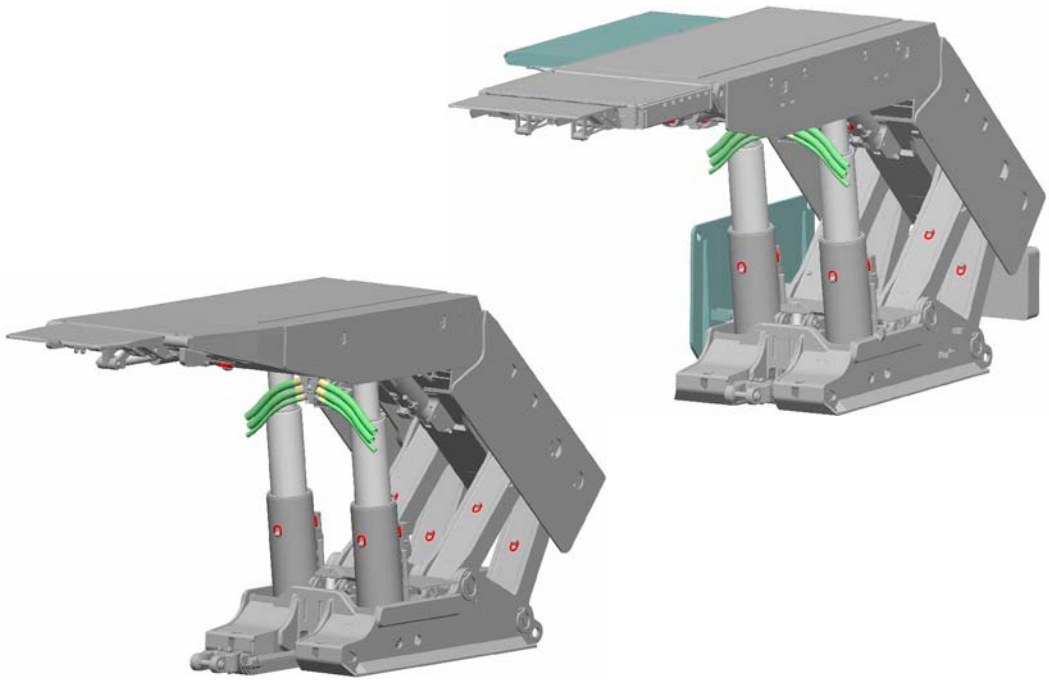
Operating Manual

DBT-Shield
1700/3500-2X4412-1750

Doc. No.: 7420 163 000 BA 00



DBT GmbH
Industriestraße 1
D-44534 Lünen
Telefon: +49 (0) 23 06 / 709 - 0
Telefax: +49 (0) 23 06 / 709 - 1421
e-mail: infodbt@dbt.de
Internet: www.dbt.de

- ■ Items in lists are marked with black squares.
- – Points in sub-lists are marked with a long dash at the start of the line.
- ☞ The symbol of the hand asks you to do something. Several successive paragraphs marked with the symbol of the hand represent a string of actions which must be executed in the order specified. Follow the respective instructions step-by-step to perform the work safely and efficiently.

Operation

shield control

In automatic mode, the support units of a longwall face are controlled by an automatic programme without any human interference. When travelling the face you should therefore always keep in mind that the support units may move automatically. Therefore it is vital that you observe the warnings at the face entries as well as the visual and acoustic warning signals sent by the control unit in the support currently operated.

Check to determine whether all protective devices on the shield are present and functional. See also chapter 6.

Operate the shield control system only if you have a profound knowledge of the control elements and their functions. It is necessary that you have been task trained on the respective control system and know the contents of the respective operating manual.

Do not stay in the shield whose functions you are to operate. Always operate the shield only from the adjacent shield.

Make sure that no persons are present in the area of the shield being actuated.

When operating the shield manually the operator has to watch the shield movement area constantly before and while operating the shield in order to avoid potential hazards by cautious behavior.

Always set the shield until full setting pressure has been reached since a good support of the roof can only be ensured in this manner.

Extend the flipper towards the coal face as far as possible to prevent coal or surrounding rock from falling into the travelway.

Clean the control elements of the control units regularly. Ensure that the operating symbols are clearly recognizable. This measure avoids faulty operation and resulting accidents.

Keep the floor as clean as possible. Keep the floor free from debris. This way you will be able to extend the shifting unit without hindrance and to advance the conveyor without problems.

Ensure that the water spray system responds during advancement.

inclined faces

On inclined faces it may be necessary to anchor the conveyor with respect to the support. This measure helps to prevent lateral displacement between the conveyor and the shield. And it reduces the risk of the shifting unit jamming between the skids.

Hydraulic anchorages must always be supplied with the specified working pressure since only thus a sufficient anchorage between shield and conveyor is ensured.

When pulling up the shields, always observe the specified sequence of steps to prevent the shields from colliding with the anchorage cylinders.

Always stay clear of a shield which is being moved. Circumstances which are not always obvious may lead to unexpected movements of the shield unit which could result in severe injuries or even death.
For example, the shield canopy may jerk free during lowering if it was stuck between the canopies of the adjacent shields.

During normal operation, the shield-type support is operated only by means of the control unit of the electrohydraulic adjacent control system. Observe the separate manual for the control unit.

Do not put the filter into operation, before making sure that all connections have been made properly.

Never put both levers into backflush position simultaneously, because the emulsion flow will be completely shut off and backflushing will be impossible.

The control elements on the control valve block may only be used in an emergency and during repairs and only in compliance with the special operating instructions of the mine for that purpose. They are not allowed to be used for normal operation as otherwise hazardous situations may arise which might result in very serious injuries. During normal operating mode, the shield is operated exclusively by means of the electronic control. In this respect it is imperative that you observe the separate operating manual of the control unit. If the electronic control is part of the scope of supply of DBT the respective operating manual will be included in the DBT documentation provided for the installation.

You are only allowed to operate the controls of the control valve block when you know exactly which effects the functions have with respect to the shield. Therefore you should have received adequate training. If not, there is a risk of operating errors involved which might cause severe injuries to persons, possibly resulting in death.

The manual operation of a push button on one of the pilot valves causes the direct execution of the respective function. In this case, dependencies between the individual functions will not be considered. This could lead to dangerous situations if, for example, functional sequences are initiated in the wrong order. For example, the function ”advance shield” can be activated without the functions ”retract side seal” and ”actively lower shield” having been actuated before. This could cause hazardous situations resulting in very severe injuries.

When the operating safety is at risk any damaged components must be replaced without delay. If this is not possible, stop the shield operation at once and secure the shield. Immediately inform the complete face crew and your superior.

Trouble shooting on hydraulic systems entails an increased accident hazard. Particularly by malfunctions of the hydraulic system and hydraulic medium escaping at high pressure severe injuries could be caused.
Therefore you are required to be very cautious and wear the specified protective equipment. Failure to comply with these instructions could cause severe injuries.

CAUTION!
Never exceed the max. permissible angles of inclination of the canopy. Exceeding the permissible angles of inclination of the canopy stated in chapter 6, section ”Technical data” can result in damage to the shield. This does particularly apply to the stabilizing cylinders, their fastening elements and points of attachment to shield canopy and caving shield.

HFA fluids

With respect to the storage of HFA fluids or concentrates for the production of HFA fluids in any case the regulations of the manufacturer or supplier of those media have to be observed first. Supplementary information is given in the section ”Permissible media” in this manual.

Take care to ensure that new supplies are stored separately from existing stock and that removal takes place on the ”first in, first out” principle. Mark the containers accordingly.

Used equipment

If there is any need to store hydraulic equipment that has been in use before the items specified above apply analogously, with the exception of the item corrosion protection.

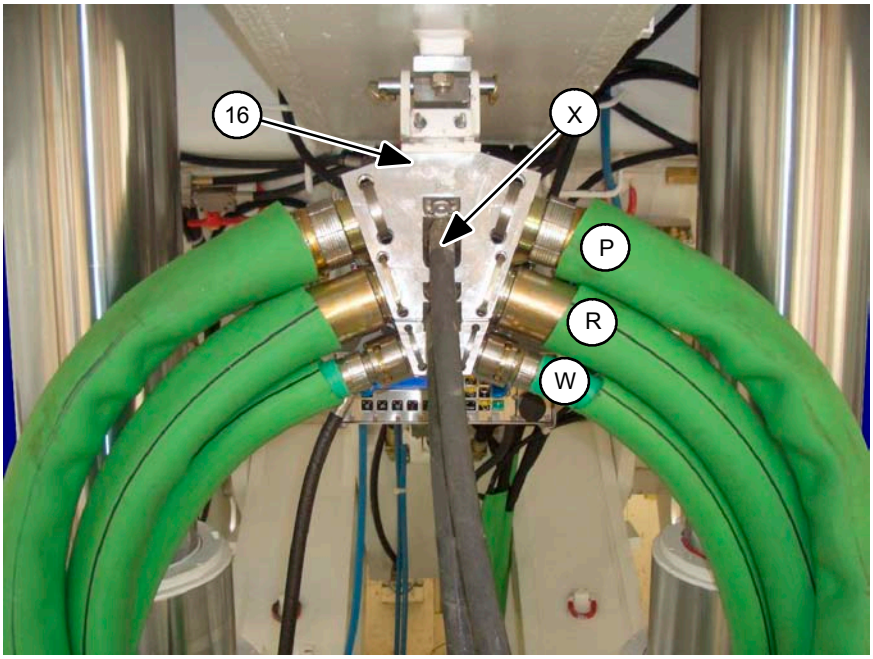
corrosion protection

In case the hydraulic system is to be put out of operation temporarily the complete system has to be flushed thoroughly and filled with a suitable preserving fluid (e.g. HYDROCOR® CV 50). If this is not done, considerable damage to the hydraulic components may be caused within a short time since the properties of the medium used may change very fast and negatively, e.g. due to microbial attack.

Supply connections

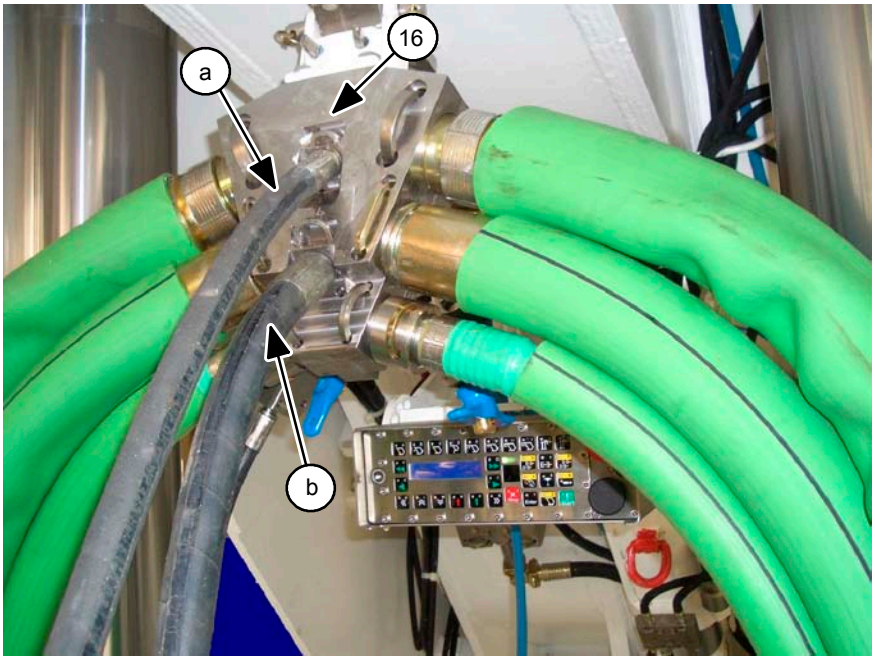
During installation, the individual shields can be supplied with pressure and operated using the socalled auxiliary supply line. The auxiliary supply line must be connected to ports a and b (fig. 15).

Fig. 14: View on the auxiliary supply line



16 manifold pipe
X auxiliary supply line
P pressure line, DN 50SS
R return line, DN 50
W water line, DN 25

Fig. 15: View of the auxiliary connections on the supply block Drawing No.:



16 manifold pipe
a Pressure line
b Return line

5 Operation

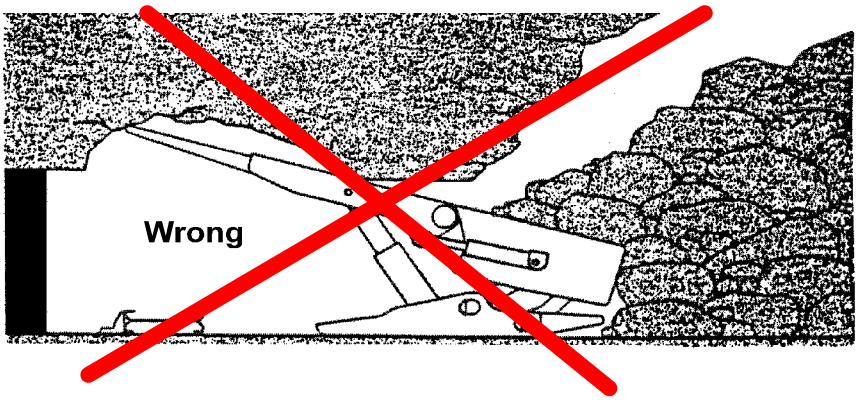
CAUTION!
Avoid an excessive inclination of the canopy by filling roof fall-outs or by supporting minor fall-outs with the shield in horizontal position.
At this point, we explicitly emphasize again that any damage caused by the non-compliance with these instructions is possibly not covered by the guarantee.

CAUTION!
Do not exceed the angles of inclination of the canopy (angle between shield canopy and caving shield) specified in chapter 6 ”Technical data”. If the angles are exceeded, this will cause damage to props and hydraulic cylinders, their arresting elements as well as the articulations of the components.

Since changes in the angles result in considerable changes in height at the ends of the canopy or skids, the necessity of taking appropriate countermeasures can be recognized at an early stage, even without a measuring instrument. For instance, it may be necessary to rip and level off steps in the floor and roof, or fill cavities in the roof.

Never set the tip of the canopy of two-leg shields with stabilizing cylinder in a cavity (figure 26) if the stabilizing cylinder is fully extended. There must always be sufficient stroke available for decreasing dynamic loads from the roof by the hydraulically protected stabilizing cylinder.

Fig. 26: W r o n g, by no means must the tip of the canopy be set in a cavity, if the stabilizing cylinder is fully extended.



Cavities in the roof can be overcome by placing crib blocks onto the tip of the canopy (see Fig. 27) or by leveling off the canopy.
By these measures the roof will be supported during the next step.

Fig. 32: Shield hydraulics, arrangement (1), shield variants 03 and 05
key, see table 6

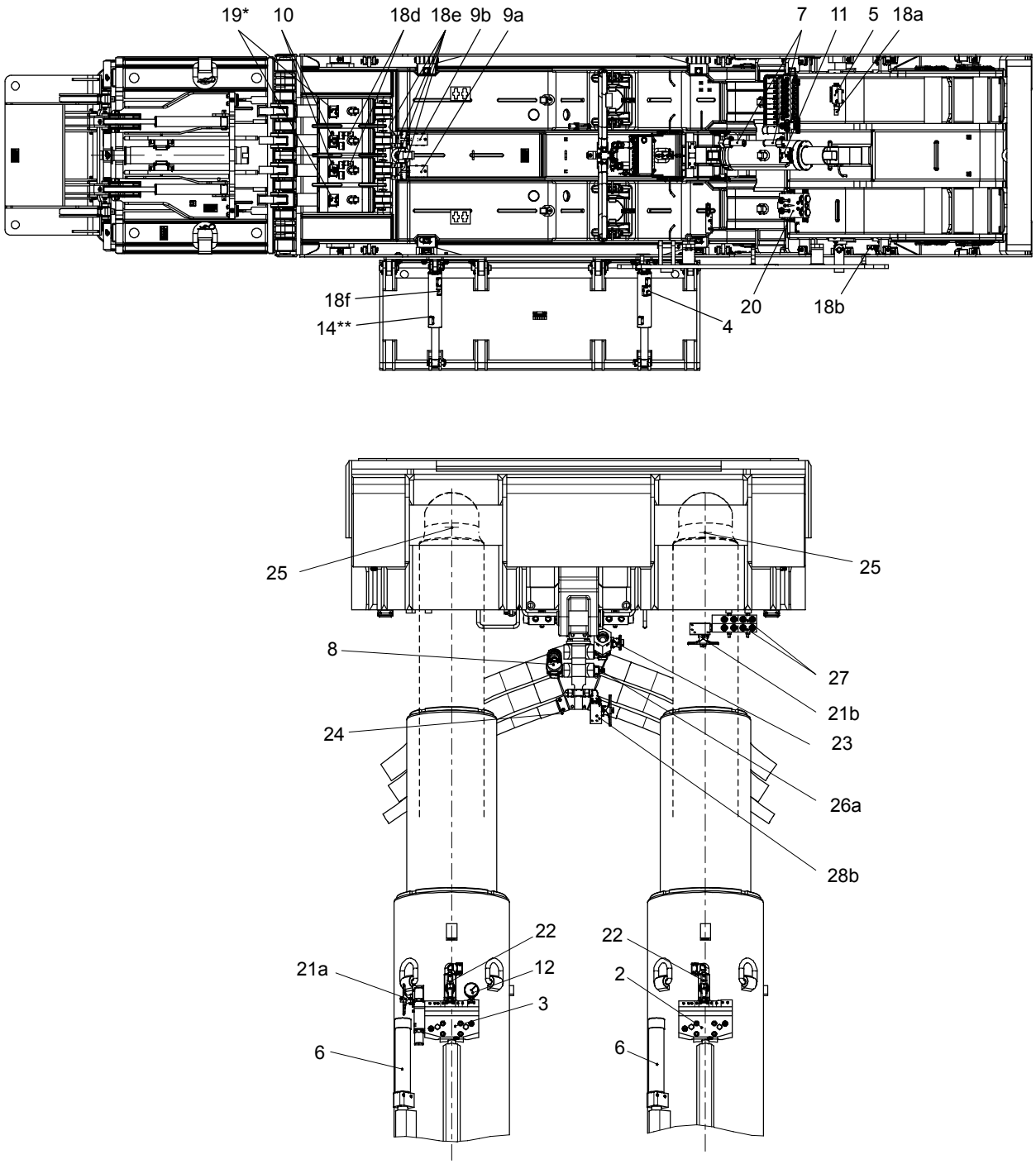
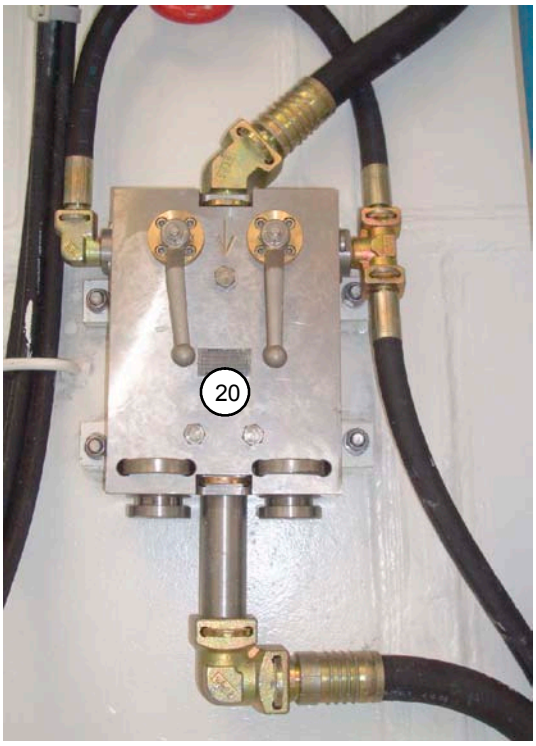
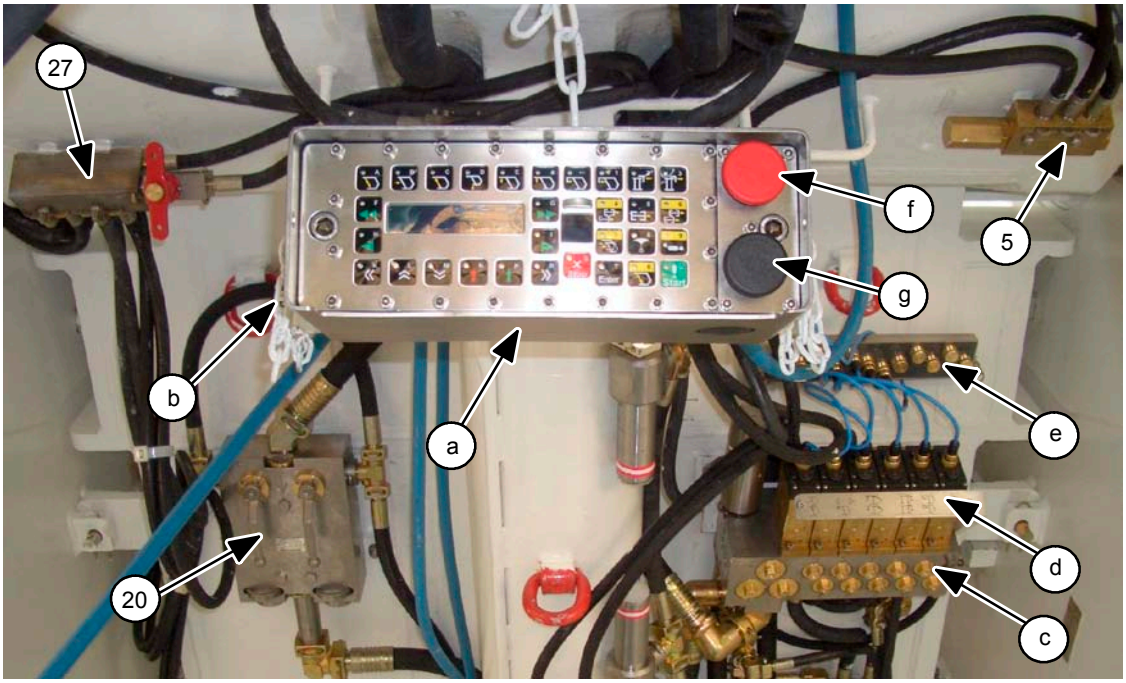


Fig. 42: View of the dual filter Drawing No.:



20 Dual filter, can be backflushed

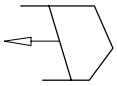
Fig. 43: PMC®-R control device on adjustable holder, Drawing No.:



5 RV, for shifting cylinder
20 Dual filter
27 Distribution
a PMC®-R control device
b Support for PMC®-R control device
c Electro-hydro control
d Symbol plate
e Valve control strip
f E-Stop
g Shield support blocked button

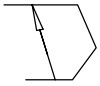
Shield functions for the shield variants 03 to 05

(18 functions)

1 

Advance shield

Before this function is initiated, the side seal of the shield must be released and the function ”lower prop” must have been executed for both props.
The function is performed as long as the button is held depressed, until equilibrium of forces has been obtained or until the end position has been reached.
As long as the function is activated, the pilot-operated check valve sealing off the annulus of the shifting ram is automatically held open.

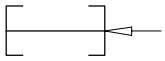
2 

Set both props

Before this function is initiated the canopy should be aligned properly. This function is performed as long as the button is held depressed, until equilibrium of forces has been obtained or until the end position has been reached.
The baselift cylinder retracts automatically.
During setting of the props, a canopy bar of the shield which is set at too steep an angle will adjust itself automatically to the roof as long as the function of the compensating valve for the stabilizing cylinder is not barred.

Compensating valve

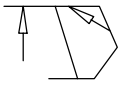
The compensating valve (see figure 45, item 21b) and the related shut-off valve (see figure 45, item 21e) are located at the R.H. prop as seen looking towards the coal face. When the shut-off valve is open (lever aligned to the direction of flow), the compensating valve is active. If the isolating valve valve is closed (lever across the direction of flow), the compensating valve has no function.

3 

Advance conveyor

Before initiating this function, ensure that the shield has been completely set to the roof.
The function is performed as long as the button is held depressed, until equilibrium of forces has been obtained or until the end position has been reached.

4 **not used**

5 

Extend stabilizing cylinder

CAUTION!
Do not exceed permissible canopy angle!
Observe value for minimum residual stroke.

This function causes the canopy tip to raise and serves to correct the attitude of the canopy. It is performed as long as the button is held depressed, until equilibrium of forces has been obtained or until the end position has been reached.
After the attitude of the canopy has been corrected the props will have to be set again.

6 Technical data

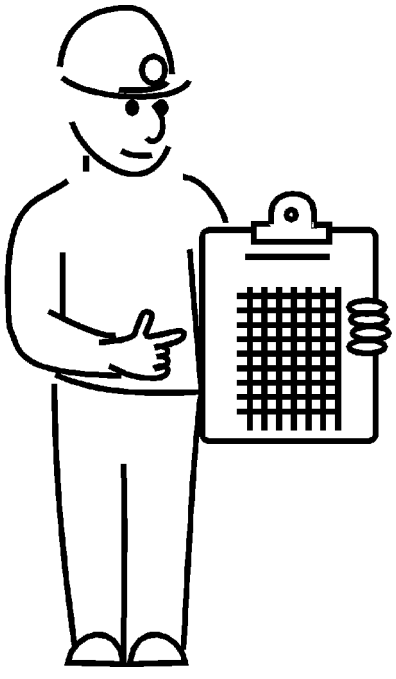
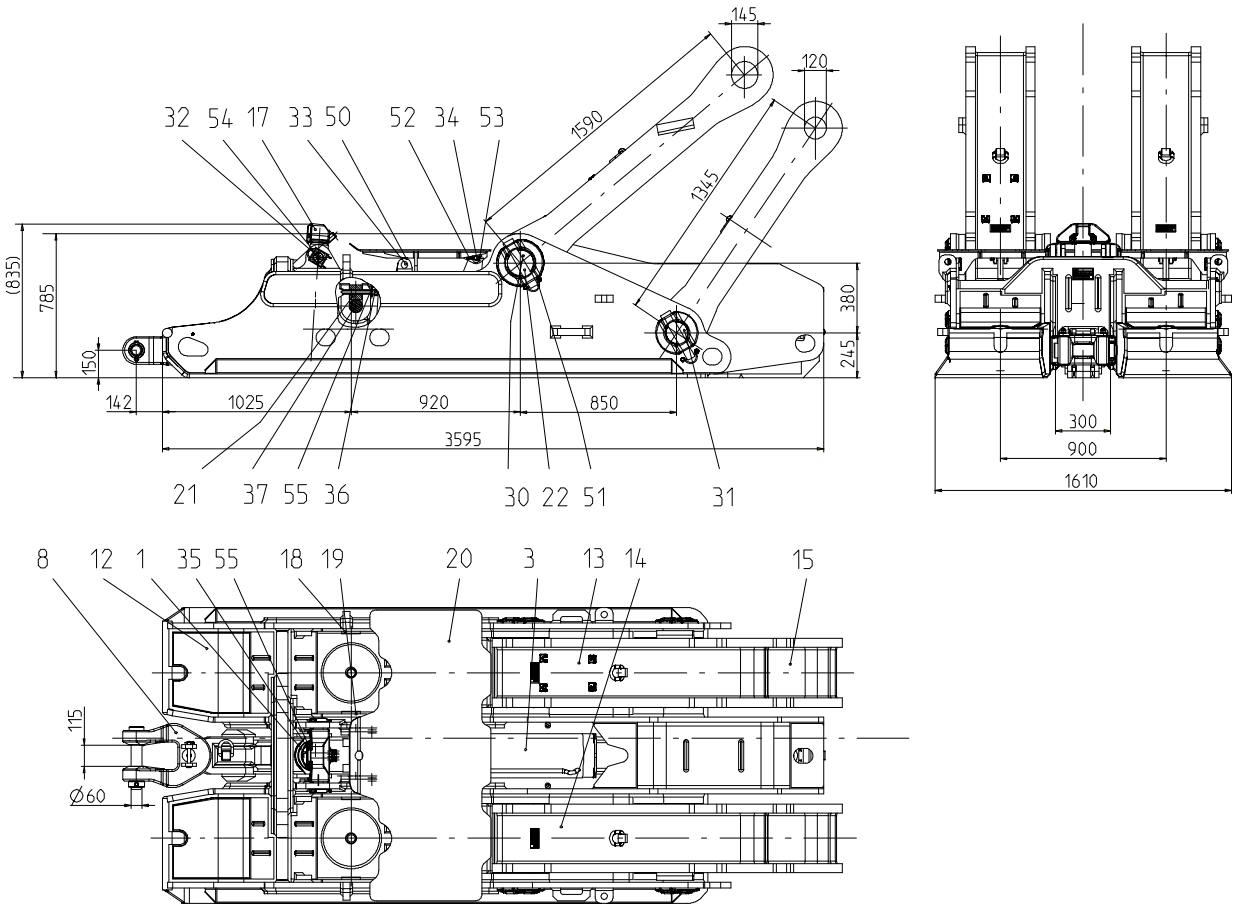
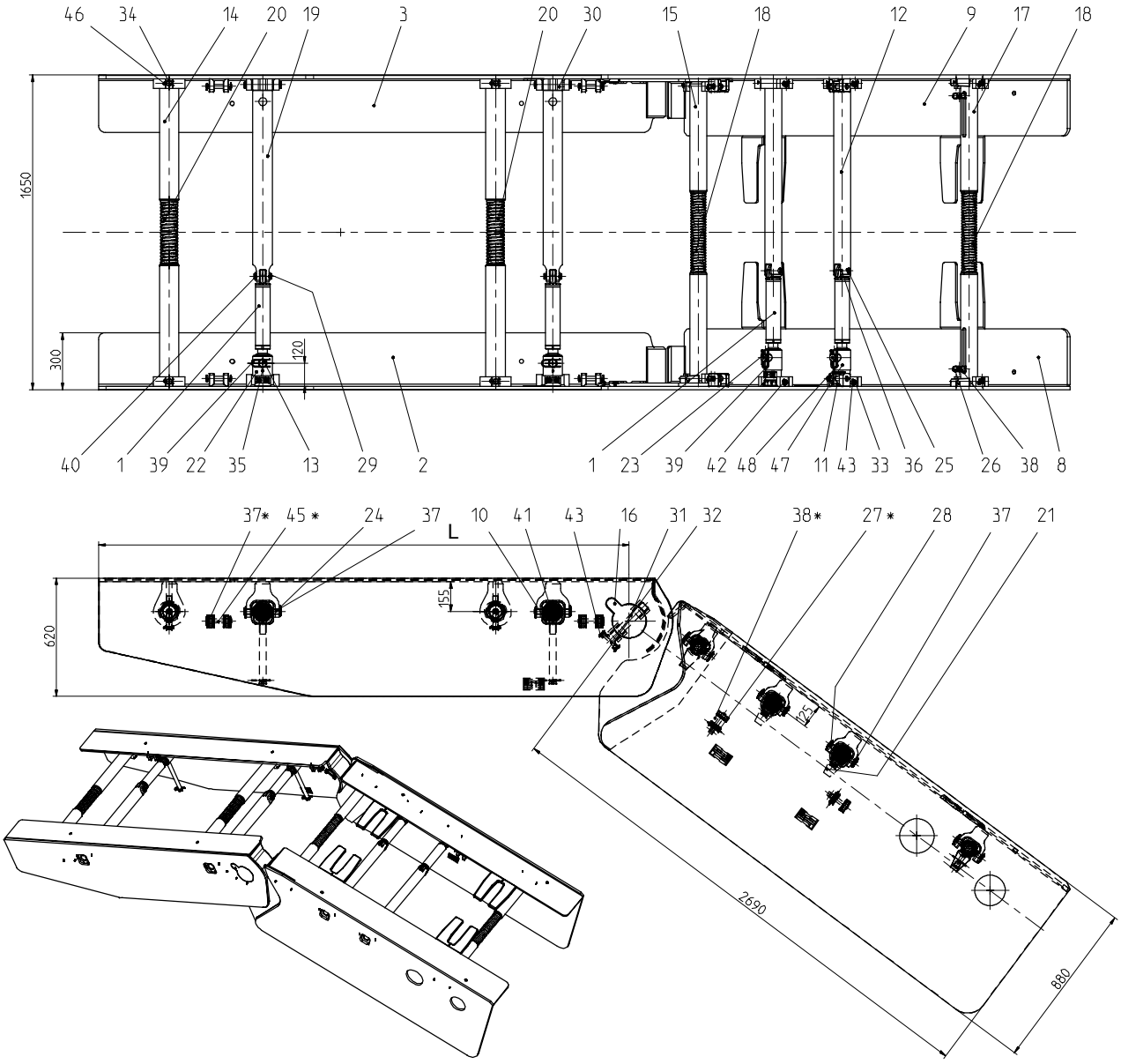


Fig. 57: Base, shield variants 03 to 05



1 base lift cylinder ZE-135/90-240
3 shifting ram ZE-200/140-960
8 shifting unit
12 base
13 front lemniscatic link, R.H.
14 front lemniscatic link, L.H.
15 rear lemniscatic link, RH
16 rear lemniscatic link, LH
17 base lift cylinder bearing
18 prop retainer, R.H.
19 prop retainer, L.H.
20 travel path
21 bracket
22 locking plate
30 lemniscatic pin Ø144,3x525
31 lemniscatic pin Ø119,3x525
32 pin Ø50x105
33 pin Ø29x57
34 pin 35/25x90
35 pin Ø16x117
36 pin
37 pin Ø70x292
50 locking clip 4
51 locking clip 5,6
52 spring cotter 5
53 washer
54 circlip
55 staple DN 10
refer to the spare parts catalog too

Fig. 67: Side seal for face shields, variants 01 and 02



1 hydraulic cylinder ZE-119-63/50-215
2 side seal, canopy, R.H.
3 side seal, canopy, L.H.
8 side seal, caving shield, R.H.
9 side seal, caving shield, L.H.
10 cover
11 cover
12 guide pin Ø90x1035
13 pin Ø34x359
14 guide pin Ø103x690
15 guide pin
16 cap
17 guide pin
18 compression spring 12x64x621
19 guide pin
20 compression spring 12x64x621
21 torque support
22 cylinder liner 103x105
23 pin 40/34x64
24 pin Ø22x196
25 pin Ø28x74
26 pin 30/24x59
27 transport retainer 22x128
28 pin Ø22x177
29 pin Ø28x93
30 torque support
31 locking device
32 pin Ø12x120
33 pin Ø12x165
34 pin 30/25x175
35 screw pin M10x12-45 H
36 roll pin Ø50x50
37 spring clip
38 staple DN 12
39 staple DN 25
40 split pin Ø6,3x40
41 hex. head bolt M 12x20-A 4-80
42 washer
43 locking clip
44 pin Ø22x135
46 staple DN 12
47 cylinder liner 92x105
48 screw pin M 6x8-14 H

For parts not listed here, please refer to the spare parts list supplied.

Pos.	Pcs.	Designation	Arrangement	Title
21	2	HP ball valve	a) at the compensating valve for corner cylinders on the left-hand prop b) on the distributor (Pos. 27)	a) for corner cylinder b) for seal cylinders
22	2	HP ball valve	in each case on the prop,	in the pressure supplyline
23	1	HP ball valve	on the supply block (Pos. 16)	in the pressure supplyline
24	1[1)]	Pipeline filter	on the supply block (Pos. 16)	in the water feed line
25	2	Screw-in socket	on the prop head	
26	3 [1)] 1[2)3)]	Plug cap with pressure release	a) 1x on the supply block (Pos. 16) b) 2x on the RV (Pos. 9a), only with shield variants 01 and 02	
27	2	Distributor	to the right at the rear beneath the caving shield	in the seal cylinder circuit
28	2[1)] 1[2)3)]	HP ball valve	a) on the supply block, only with shield variants 01 and 02 b) on the supply block,	a) in the water feed line for spraying b) in the spray pipe
S1	1	Pressure sensor	on the prop RV, only right-hand side	
Z1	2	Props		
Z2	1	Shifting cylinder		
Z3	1	Corner cylinder		
Z4	4	Seal cylinder		
Z5	1	Lift-out cylinder		
Z6	1[1] 2[2)3)]	Flipper cylinder		
Z7[*)]	4	Adjusting cylinder	on the front cantilever	only with variants 03 to 05
Z8	2	Lateral flap cylinder	on the side flap	only with variants 03 and 05
Z9	1[2)3)]	Sliding cylinder	on the front cantilever	only with variants 03 to 05

1) Quantity for shield variants 01 and 02
2) Quantity for shield variant 04
3) Quantity for end shield variants 03 and 05
*) only for end shield variants 03 to 05
**) only for end shield variants 03 and 05

WARNING!
Risk of serious bodily injuries due to pressure fluid suddenly escaping at high pressure and bursting hydraulic hose lines caused by dangerous overpressure.
Never close the lowering ports of double-acting props pressure-tight! If you do, a pressure might build up in the annulus when extending the prop which is a multiple of the setting pressure.

Function

prop setting

Pressure fluid is admitted under the piston of the center prop through the piston chamber connection. The center prop will extend first and the pressure fluid displaced from the annulus is passed into the return line. If the piston of the center prop contacts the threaded bush before the canopy comes to rest against the roof, the inner prop will extend. Pressure fluid is admitted through the check valve.

prop loading

a) Center prop extended only

Load is transmitted mechanically from the canopy to the inner prop via the prop head and, then, to the valve housing installed in the inner prop. The further transmission of load is hydraulically via the pressure fluid under the center prop into the foot of the prop and from there mechanically into the base.

The hydraulic pressure under the center prop cannot exceed the pre-determined value as a pressure relief valve is installed in the respective control valve. When the preset pressure is exceeded, the pressure relief valve will open and permit fluid to escape and the prop yields with the rated prop resistance.

b) Center prop and inner prop extended

Load is transmitted mechanically from the canopy to the inner prop via the prop head. The inner prop bears on the pressure fluid under its piston. This fluid is trapped by the check valve. The further course of load transmission is as described under a).

prop lowering

The pressure fluid under the center prop is connected to the return by means of the prop control valve.

Both stages of the prop can be power lowered. The inner prop will start to close when the center prop is closed completely and the check valve is opened by the tappet.

Just a few millimeters before the piston pipe ”touches down” the check valve is opened by the tappet with the pressure fluid under the piston pipe acting as a spring lifting the piston pipe to close the valve again. When the prop is lowered over the complete stroke this procedure is repeated several times.

Pressure relief valves

Pressure relief valves protect the hydraulic equipment, such as props and cylinders, connected with them from overload. When the set pressure is reached, the valve opens and the pressure fluid is discharged to atmosphere.

For the type of valve used please see the following table, the hydraulic flow plan or the spare parts catalog.

Tab. 22: Pressure relief valves, use of different types

application	type	set pressure in bar	order no.
general application, not for props and stabilizing cylinders	spring-loaded	380	7337 486 380 00 00
only at stabilizing cylinder	spring-loaded	470	8220 028 470 00 00
only at props	spring-loaded	462	0000 000 417 01 46

CAUTION!
Do not change the pressure setting of pressure relief valves! Only use pressure relief valves which have been factory-set to the required value and are provided with the relevant color code.
Failure to comply with this impairs the operational safety of the hydraulic system and may lead to severe damage to and the destruction of components.

CAUTION!
Always replace pressure relief valves with valves which are as new and have the same properties. Refer to the hydraulic flow plan in this respect. Failure to comply with this impairs the operational safety of the hydraulic system and may lead to severe damage to and the destruction of components.

NOTICE!
Always fit new seals when replacing a pressure relief valve. Failure to comply may result in leakages at the plug-type connection and impair the operational safety of the hydraulic system.

code system

Pressure relief valves are color and letter coded according to DIN 21557.

The letter code includes the following details:

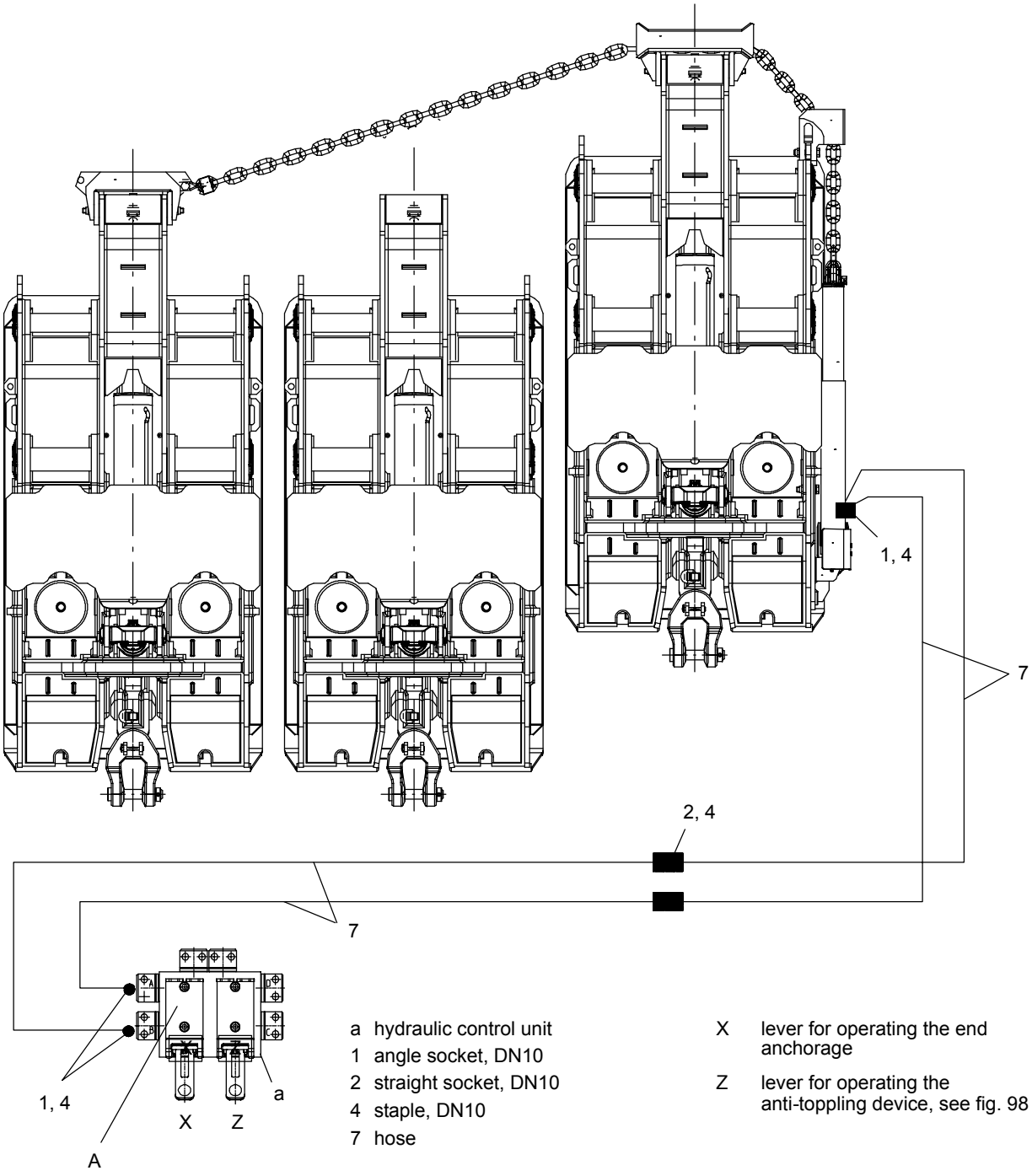
- Set pressure, target value
- Week setting was made
- Year setting was made
- Last setting made by

Tab. 23: Typical letter code

420 or 42 [1)]	09	03	xy
set pressure	week	year	made by last

The color code may consist of one or two colors. It characterizes the setting pressure range. The following figure 90 shows a pressure relief valve provided with a blue-white color code. This color code corresponds to the pressure range of 350 to 399 bar.

Fig. 100: Control unit for end anchorage



a hydraulic control unit
1 angle socket, DN10
2 straight socket, DN10
4 staple, DN10
7 hose

X lever for operating the end anchorage
Z lever for operating the anti-toppling device, see fig. 98

For your information

If you need to order spare parts or if technical problems occur, please contact our after-sales service personnel or contact us direct (Homepage: **www.dbt.de**).

Service addresses

Europe

Germany

DBT GmbH (Headquarters)

Industriestraße 1
D-44534 Lünen

Tel: +49 / 23 06 70 9 - 0
Fax: +49 / 23 06 70 9 - 1421
E-mail: infodbt@dbt.de

Great Britain

DBT GB Limited

Hallam Fields Road
Ilkeston, Derbyshire DE7 4BS
England

Tel: +44 / 11 59 51 - 2500
Fax: +44 / 11 59 32 - 9683
E-mail: martin.daldrup@dbtgb.com

DBT GB Limited Engineering

Pioneer House
2 Renshaw Place
Europoint Office Park
Eurocentral
Lanarkshire, ML1 4UF
Scotland

Tel: +44 / 16 98 83 5 - 000
Fax: +44 / 16 98 83 5 - 038

Poland

DBT POLSKA Sp. z. o.o.

ul. Fabryczna 6,
41-404 Myslowice

Tel: +48 / 32 31 70 - 500
Fax: +48 / 32 31 70 - 509
E-mail: dbtpolska@dbtpolska.com

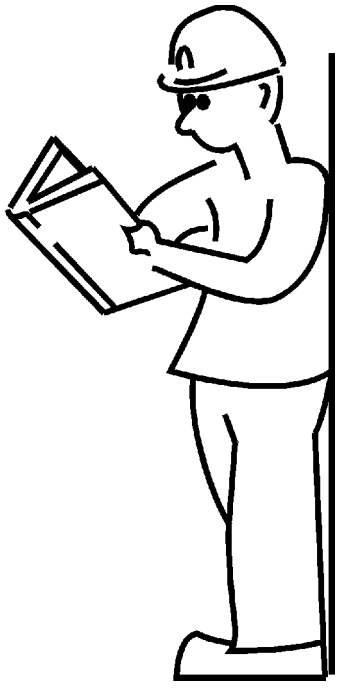
Russia

DBT Office Moskau

Bolschoi Tscherkassi Per. No. 15, Office 310
103626 Moskau

Tel: +7 / 49 56 23 - 5396
Fax: +7 / 49 59 24 - 8363
E-mail: dbt@co.ru

1 About this manual



Hydraulics

handling of hydraulic fluids

Avoid direct contact between the skin and hydraulic fluids. Hydraulic fluid can penetrate the skin and cause serious infections.

protective equipment -hydraulic

When removing protective equipment which includes hydraulic components keep in mind that these components may be pressurized. You could be severely injured by hydraulic fluid jetting out in an uncontrolled manner. Therefore it is imperative that you depressurize the hydraulic components before removing the protective equipment.

Never use hydraulic fluids for rinsing or cleaning. Hydraulic fluids represent a very serious danger to health.

maintenance, repair

Only persons who have and can demonstrate a special knowledge of hydraulics are allowed to work on the hydraulic system.

pressure relief valves

Make sure that pressure relief valves are always provided with protection caps. Replace defective caps without delay.

Carry out a visual inspection of all the hydraulic components at regular intervals. In particular check that:

- The hoses are not pinched or trapped.
- The hoses have no bubbles or blisters.
- The hoses or the outer sheathes of the hoses are not abnormally rigid or hard.
- The outer sheath of the hose is not damaged.
- The connectors are securely inserted into the sockets.
- The connections are leak-tight.

Ensure that no dirt enters the hydraulic system during repair work. Dirt in the hydraulic system can cause serious damage in the whole system! Flush out the hydraulic lines thoroughly before connecting.

Before removing staple locks to disconnect hydraulic hoses turn the hose at the coupling to check whether the line is still pressurised. If the hose is difficult to turn or does not turn at all the line is still pressurised. Be sure to depressurise the line.

If hydraulic hose couplers are difficult to disconnect or cannot be disconnected, the hydraulic line may still be pressurised. Be sure to depressurise the line before disconnecting couplers.

Secure the connectors of the hydraulic elements only with the proper coupling clamps. Always fasten the clamps completely. Never use nails, wire or similar materials for securing.

After finishing repair work, check all connectors and connections for leaks before pressuring the system again.

permissable hoses

Use only hydraulic hoses approved for the prevailing pressures.

Do not use any hydraulic hoses with damaged connectors or worn O-rings.

Replace hydraulic hoses only with hoses of the same or a higher quality.

Observe the date of manufacture stamped on the hydraulic hoses. Never use hydraulic hoses which are more than 2 years old, even if they have no visible signs of damage.

Transport

Transport crates

Several elektrohydraulic controls are packed together in transport crates. They should remain in these crates until they reach their final place of installation in order to protect them from damage.

Ensure that the crates are not damaged during transport. Pay attention in particular that they do not:

- fall or
- burst open

during transport.

Protect the transport crates from moisture.

temperatures below freezing

Before transporting the elektrohydraulic control at temperatures below freezing, the block must be completely emptied and then filled with a suitable preserving fluid (e.g. HYDROCOR® CV 50).

If the electrohydraulic control unit is subjected to temperatures below -20 ºC during transport special measures are required. In this case, please contact the DBT service department prior to the commencement of transport to clarify the requirements.

Dimensions and weight

depth:	271,5 mm
width:	340 mm
height:	140 mm
weight:	53,50 kg

Plugs

The connections of the individual electrohydraulic control units are sealed with plastic plugs to protect these from damp, dirt and damage.

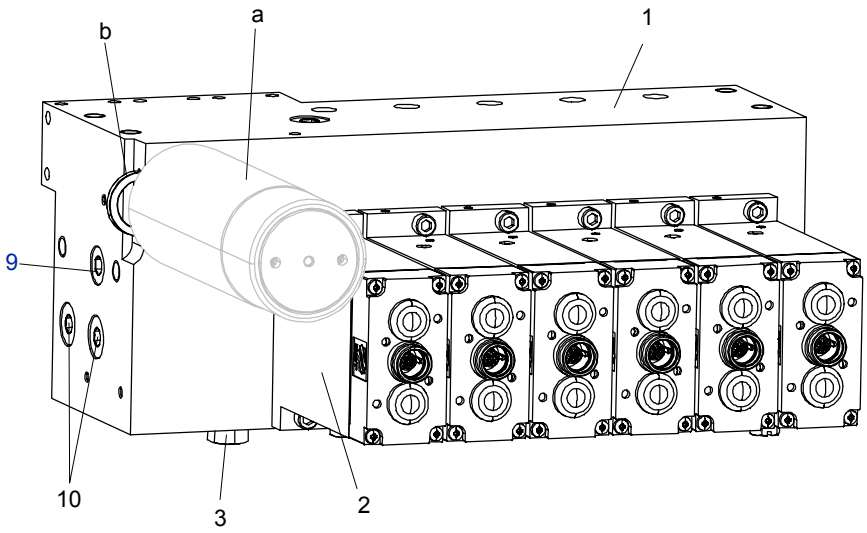
NOTICE!
Dirt in the hydraulic system can result in failure of the whole system and necessitate costly repairs.
Remove the plugs just immediately before connection of the electrohydraulic control unit.

Operation

This chapter contains information on the operation of the electrohydraulic control unit and on its functions. Be sure to also observe the operating manuals for the support and the control unit.

DANGER!
Safety hazard due to shield movements.
Persons may be severely injured or even killed, for example by unexpected movements of the shield, if the control unit is operated by somebody who does not have sufficient knowledge of how to perform this work.
Only operate the controls of the electrohydraulic control unit if you have the required knowledge.

Fig. 8: electrohydraulic control unit, 12-functions



1 manifold block
2 double 3/2 way-solenoid-valve
3 screw-in socket DN20
9 plug M 16x1
10 plug M 18x1
a accumulator cartridge
b staple

Operation and function of the pilot valves

Control of the shields is particularly dangerous in repair mode, as you then directly control the shield under which you are working. It is therefore extremely important that you know and understand the different functions and sequences of movement of the shield control.

If you are operating the shield in repair control mode, no one else is allowed to remain in the movement area of the shield.

Technical data

This chapter contains important and useful information on the design and materials used. Information on permissible hydraulic fluids and recommendations on lubricants can be found at the end of the chapter.

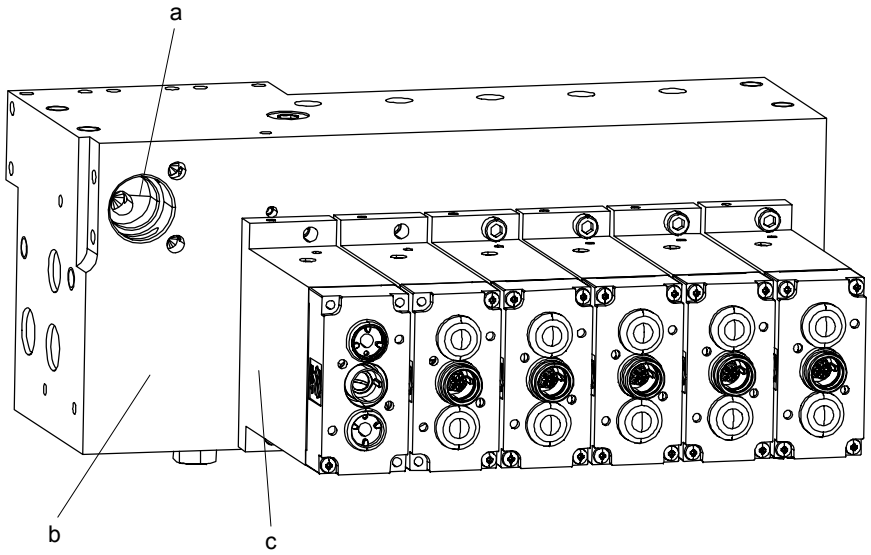
IMPORTANT!
Please use the spare parts catalog supplied when ordering spare parts.

Description

Functions

The electrohydraulic control unit permits to control 12 independent functions. The directional valves of the control block are actuated via solenoid-operated pilot valves. Operation of the pilot valves requires an electronic control unit such as for example a shield control unit of type PMC®-R.

Fig. 12: Electrohydraulic control unit, front view



a accumulator cartridge port, DN20
b manifold block
c pilot control valves

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 having the same saponification base but different origins.
In case of doubt, the manufacturer of the lubricating grease to be used should be contacted as to the compatibility of the grease in question.

Lubricating pastes

lubricating pastes B3

Lubricating pastes free from molybdenum disulfide, containing solid lubricants for lubricating centerings and connections of splined shafts of sprocket drums and chain sprockets during assembly.

Tab. 5: Lubricating pastes free from molybdenum disulfide

Supplier	Type	Base	NLGI class	flash point °C
gleitmolybdän	gleitmo 805 *)	Li	2	220

When the equipment is lubricated in our works for the first time, the lubricant type used as lubricating paste B 3 according to the DBT works standard EWN 7068 is:

gleitmolybdän "gleitmo 805"

lubricating pastes B6

Separating agents and lubricants with organic lubricating media on a synthetic base for lubricating thread areas and fits of props and hydraulic cylinders, of bolted connections and similar connecting elements of roof supports.

Behavior in the presence of water: . . . . non-soluble in water

Temperature of application: . . . . . -34 to +120 ºC

When the equipment is lubricated in our works for the first time, the lubricant type used as lubricant B 6 according to the DBT works standard EWN 7068 is :

Chesterton separating agent and lubricant 785 (flash point 132 ºC)

IMPORTANT!
The instructions for the use of the lubricating greases given under "important" also apply to the lubricating pastes.

*) The products listed in table 3 are suitable lubricating greases for filling of adjacent cavities.

Contents

1. About this manual

2. Your safety

3. Storage and transport

4. Installation

5. Operation

Safety instructions

Basic principles

general

Always concentrate on your work.

Please also observe the operating manuals for the shield support and the control unit.

Always familiarize yourself with your working environment first before taking up work.

Never stay under a shield that is not secured.

Always wear your personal protective clothing and equipment.

Please observe the visual and audible pre-start warnings. Particularly observe the pre-start warning signals of the conveyor and the mining machine.

prerequisite

Employ only electrohydraulic control units which are in a technically flawless condition.

EMERGENCY STOP

Press the emergency stop switch immediately in the event of malfunctions or irregularities in operation. Notify your foreman of any peculiarity, in order that necessary action be taken immediately.

support lock-out switch

If the shield is equipped with an electrohydraulic control unit you have to operate the support lock-out switch (repair switch) in order to lock out the shield. After this has been done, the shield cannot be operated from the control unit.

Actuate the support lock-out switch before performing.

- maintenance work,
- inspection work,
- repair work, and before
- prolonged presence in the shield.

moving parts

Never reach into or enter areas between machine components which can move. This applies especially to the:

- side seals,
- base skids,
- shifting units,
- lemniscatic links,
- hydraulic props and cylinders,
- canopies and
- flippers.

Storage and Transport

Never store materials of any kind in the travelway or in your working area.

Immediately remove defective components from the face in order not to hinder the face crew and to prevent these parts being reinstalled elsewhere.
Pass them on for servicing without delay.

Observe the specified storage time limits and the storage instructions.

Storage and transport

This chapter contains important information on the correct storage and transport of the elektrohydraulic control.
Observance of the instructions and tips will increase the service life of the elektrohydraulic control. You will also be able to carry out the transport work quicker and more safely.
Careful attention to the points in this chapter will help you to simplify your day-to-day work.

Storage

Storage of new equipment

corrosion protection

The surfaces of the equipment are provided with a temporary corrosion protection. If stored properly, the equipment parts will be protected for six months referred to the date of delivery.

Prior to delivery the hydraulically operated equipment will be tested and operated at the DBT site using the anti corrosive and anti freezing fluid HYDROCOR® CV50*). This fluid remains in the hydraulic system for transport and a following short-time storage period. HYDROCOR® CV50 is freeze-proof down to - 40 degrees Celsius and protects the metallic materials against corrosion.
HYDROCOR® CV50 is equipped with a color indicator, which is responsive on the pH-value of the fluid. The color of the fluid will change from ”red” to ”yellow” in case the pH-value drops. A yellow colored fluid indicates insufficient corrosion protection.

For further particulars on the properties of HYDROCOR® CV50 please refer to the respective data sheet of the manufacturer.

exposure to sunlight

Protect the equipment against direct exposure to sunlight.
Store the electrical equipment, electronic components, spare parts of rubber or plastic - such as seals and hoses - and hydraulic fluids only in closed rooms at temperatures of 15 ºC to 25 ºC.

natural ageing

Even with proper storage, seals and hoses are subject to natural ageing. A storage period of approx. two years is therefore recommended for these parts.

moisture and dirt

Protect all hydraulic elements during storage in a suitable manner against the ingress of dirt and moisture. The connecting surfaces of the hydraulic components must be protected against corrosion and closed with blind plates. Hydraulic plug-type connections and the connectors of the electric cables must be closed with suitable caps or plugs.

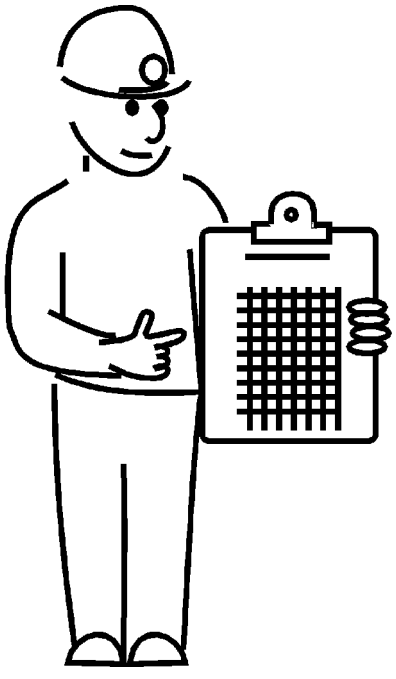
short-term storage

During short-term storage (approx. 4 weeks) of equipment outdoors, but at temperatures **above** freezing, electrical components need not be removed. Such components must, however, be particularly protected against environmental influences, including high temperatures, for example by suitable covers or sheathings for the controls and by additionally covering the equipment.

*) HYDROCOR® CV50 is a trade name of Theunissen, Chemische Fabriken GmbH, Wuppertal / Germany

5 Operation

6 Technical data



Hydraulic fluid maintenance

A consistent good quality of the hydraulic fluid is essential for the operational reliability of hydraulic systems. Therefore, maintenance of the hydraulic fluid must not be neglected but should be performed with special care. The most important properties of the hydraulic fluid should ideally be monitored automatically and recorded in order to be able to directly counter any harmful effects. These properties include: temperature, foaming, pH-value, concentrate ratio, and microbial load.

The operator of the equipment has to prepare a hydraulic fluid maintenance concept for any individual application. The maintenance concept should be prepared in close cooperation with the manufacturer of the concentrate and has to be applied consistently.

If it is not possible to monitor the hydraulic fluid continuously the properties listed in the following should be checked at least once every week:

- pH-value
  - Target value: 7.5 to 9.5
- Concentrate ratio
  - Target value: see certificate
- Microbial load
  - Target value: < 10^5 Kol/m

In addition, the electrical conductivity, foaming and the operating temperature of the hydraulic fluid should be monitored regularly.

The permissible max. temperature of the hydraulic fluid is 55 °C. During normal operation, however, an operating temperature of 45 °C should not be exceeded. A higher operating temperature will reduce the stability of the emulsion and shorten the life of the sealing material.

Quality of the process water

The quality of the water used for the preparation of the hydraulic fluid has an enormous influence on the properties of the hydraulic fluid. Accordingly, the requirements for monitoring the water quality are very high.

The following table 2 lists limit values for the essential properties and components of the water.

If the limit values shown are maintained it can be assumed that the water is basically suitable.

If one or several of the limit values mentioned are not met this should be taken into consideration when selecting a concentrate. Additional water treatment may also be required.

The customer shall in any case, however, provide a sample of the original water to permit performing the tests required for the issue of the certificate.

Changes in the composition of the water will also lead to the loss of the certificate even if they are within the limit values mentioned.