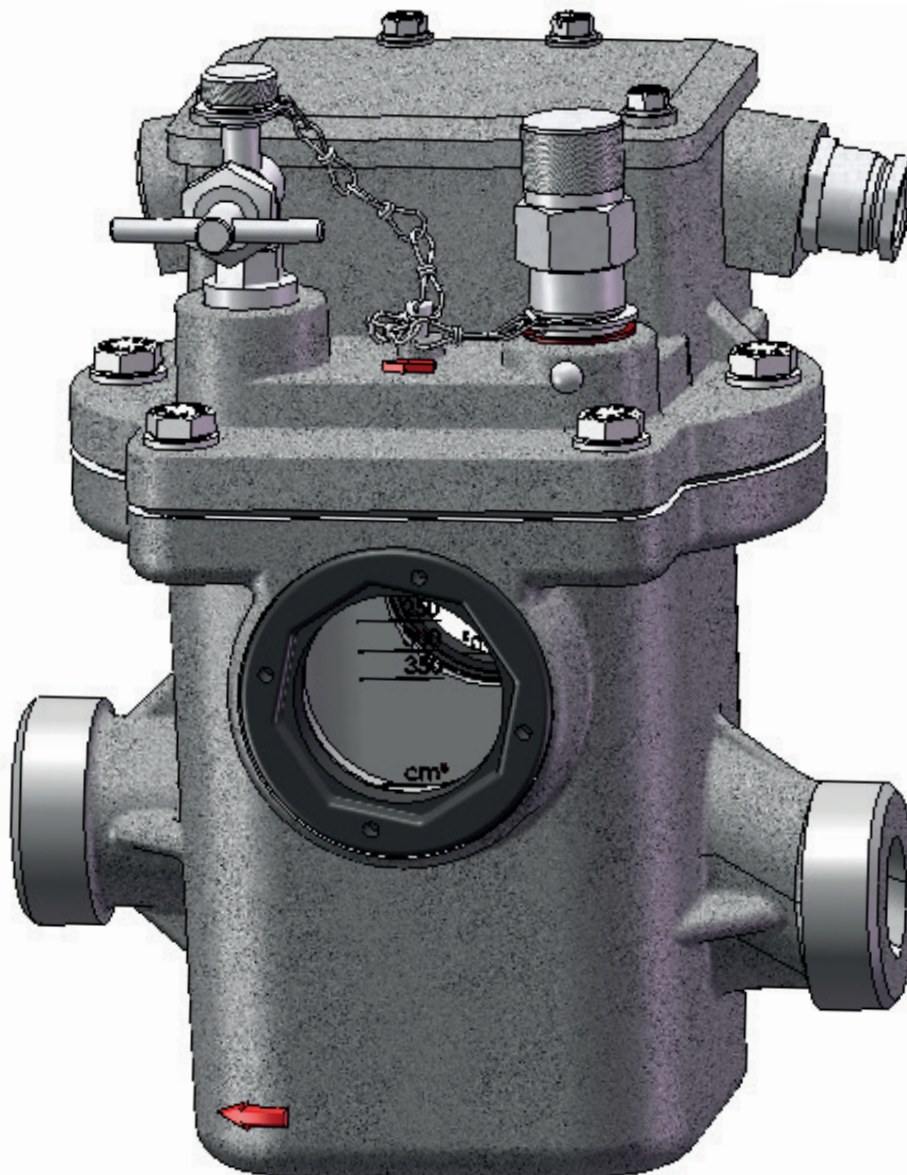




*Elektromotoren und
Gerätebau Barleben GmbH*



TECHNICAL DOCUMENTATION
Buchholz Relay Type 22 (BB 25)
(for use in rail vehicles)

Table of contents

	Page	
1	Safety instructions	3
2	Function	4
2.1	Gas accumulation	4
2.2	Insulating liquid loss	5
2.3	Insulating liquid flow	5
3	Tests	6
4	Technical data	7
5	Options/ Special designs	8
6	Ordering data/Type code	9
7	Survey, Harting connector	10
8	Installation	16
8.1	Installation in piping	16
8.2	Filling and bleeding of the Buchholz relay	18
8.3	Removal of transport lock	18
8.4.	Connection of signal lead	19
8.4.1.	Electrical connection	19
8.4.2	Electrical connection with premounted Harting connector	21
9	Functional test	22
9.1	Testing by means of test key	22
9.2	Testing by means of test pump	23
10	Transport/ despatch/ storage	23
11	What to do in the event of gas accumulation	24
12	What to do when the permissible insulating liquid flow rate is exceeded	24
13	Maintenance	24
14	Additional devices for Buchholz relays	25
15	Other Buchholz relay types for use in rail vehicles	27

1 Safety instructions

Make sure that any persons installing, taking into operation and operating the Buchholz relay:

- are qualified and competent and
- fully comply with these operating instructions.

Improper operation or misuse might cause danger to

- life and limb,
- the relay and other property of the operator and
- the relay's proper function.

Opening of the device will void your warranty.

Safety instructions in this technical documentation are presented in three different forms to emphasize important information:



NOTE

This symbol refers to important information on a specific subject.



CAUTION

This symbol indicates particular risks for the device or any other property of the operator. Danger to life and limb cannot be excluded.



WARNING

This symbol indicates serious danger to life and limb. Disregarding the warning can lead to serious or even fatal injury.

2 Function

The Buchholz relay BB 25 is installed in the pipe between the transformer tank and the conservator. During normal operation it is filled completely with insulating liquid.

Due to buoyancy both floats of the Buchholz relay are at their top position.

If a fault occurs inside the transformer, the Buchholz relay responds as follows:

2.1 Gas accumulation

Fault: Free gas is available in the insulating liquid.

Response: The gas in the liquid moves upwards, accumulates in the Buchholz relay and displaces the insulating liquid level. As the liquid level falls, the upper float moves downwards.

Movement of the upper float actuates a switch contact of the upper switching system so that an alarm signal is tripped.

The lower float is not affected as from a certain gas volume the gas flows through a piping to the conservator.

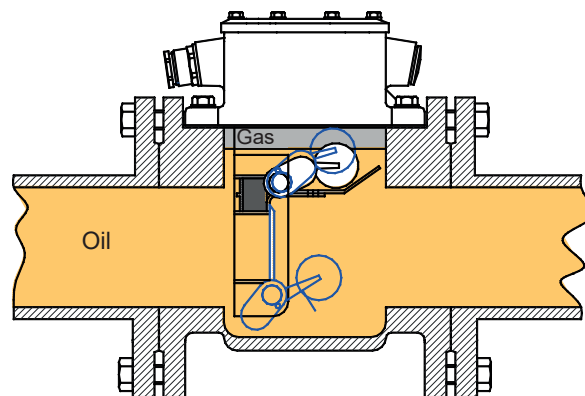


Figure 1 - Gas accumulation

2.2 Insulating liquid loss

Fault: Insulating liquid loss due to leakage.

Response: As the liquid level falls the top float moves downwards. An alarm is tripped. If the liquid loss continues, conservator and piping as well as the Buchholz relay will be emptied. As the liquid level falls, the lower float moves downwards.

The moving lower float of the lower switching system actuates a switch contact so that the transformer is disconnected.

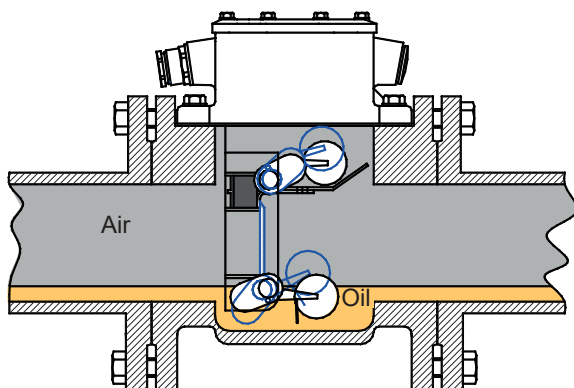


Figure 2 - Insulating liquid loss

2.3 Insulating liquid flow

Fault: A spontaneous incident generates a pressure wave moving in the direction of the conservator.

Response: The liquid flow reaches the damper arranged in the liquid flow and held by a permanent magnet. If the flow rate exceeds the operating value of the damper, the latter moves in flow direction.

Due to this movement a switch contact of the lower switching system is actuated so that the transformer is disconnected.

After response the damper is locked and retained in this position even after reduction of the flow rate. Now the damper and, hence the lower switching system have to be unlocked by turning the test key anticlockwise (see Section 9.1).

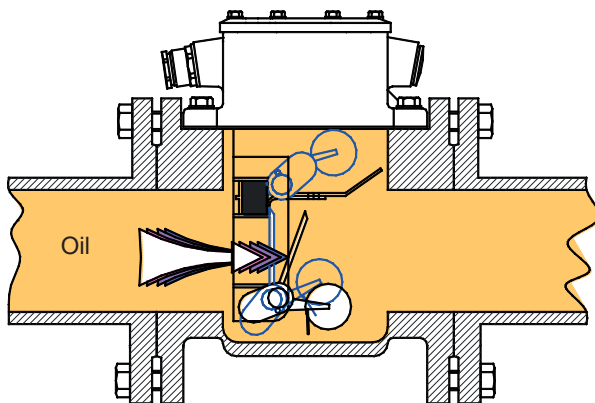


Figure 3 - Insulating liquid flow

3 Tests

Each Buchholz relay is provided with a works-number that is specified on the test certificate and the name plate. The tests carried out on the Buchholz relay are recorded in the test certificate.

- Dielectric strength test
- Leakage test
- Functional test
- Flow test.

Buchholz relays are delivered in transport cardboards.

For each relay delivered the following documents in the language agreed are provided:

- Operating instructions
- Test certificate.



NOTE

Flange gaskets are not included in the scope of delivery!

The name plate covers the following information:

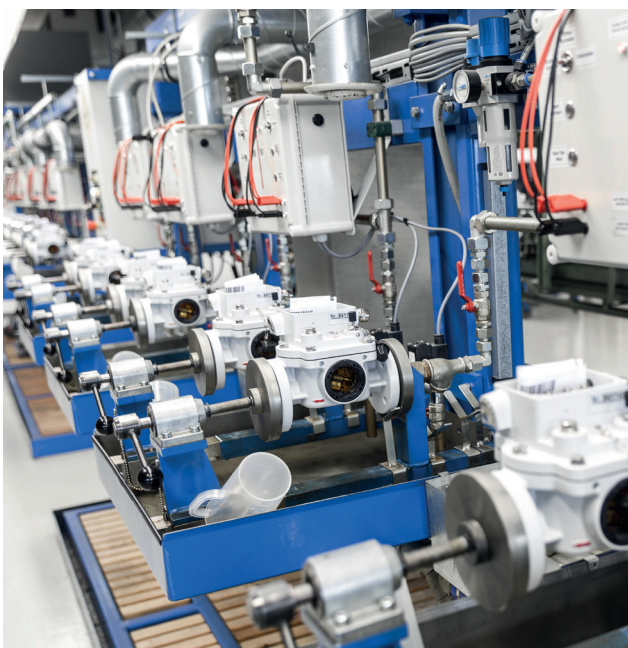
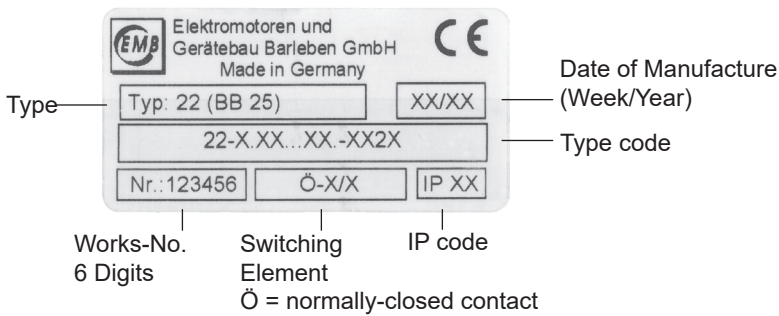


Figure 4 - Functional and leakage test



Figure 5 - Flow test

4 Technical data

Parameter	Data	Notes
Voltage	AC 5 V - max. 250 V DC 5 V - max. 250 V	
Current	AC 0.01 A - max. 6 A DC 0.01 A - max. 6 A	Cos $\varphi > 0.5$ L/R < 40 ms
Switching capacity	AC max. 1500 VA DC max. 1250 W	
Dielectric strength	AC 2500 V AC 2000 V (normally-open contact, normally-closed contact) AC 1000 V (change-over contact)	Between electric circuit and earth Between open contacts
Temperature range: - Ambient temperature - Operating range * Temperature of the insulating liquid * Viscosity of the insulating liquid	- 40 °C to + 55 °C - 40 °F to + 131 °F - 40 °C to + 115 °C - 40 °F to + 239 °F Till + 135 °C requires type code 21 1 mm ² /s to 1100 mm ² /s	Climatic testing acc. to DIN EN 60068-2-78 Others on request
Insulating liquid	Mineral oil	Others on request
Resistance against vibration	Vibration: 2-200 Hz, 2 g Shock: 25 g, 6 ms	Acc. to class 4M6 following DIN EN 60721-3-4
Resistance to pressure	0.25 MPa	
Resistance to vacuum	< 2.5 kPa	
Insensitivity to magnetic fields	25 mT	Static magnetic field of any direction and polarity
Switching system: - Number of switching contacts per switching system - Switching element - Damper Response time of damper	1 Magnet contact tube Held by magnets < 0.1 s	More on request
Response of switching system in case of: - Gas accumulation - Insulating liquid flow Pipe diameter DN: 25 mm	200 cm ³ to 300 cm ³ 01 = 0.65 +/- 15% 02 = 1.00 +/- 15% 03 = 1.50 +/- 15%	Others on request
Cable gland	M20x1.5; M25x1.5	Others on request
IP code	IP 56	Others on request
Casing colour	Two-component texture paint	On polyurethane basis

Options available are specified in tables of Section 5. These special designs are coded using the respective code when ordering Buchholz relays.

[More options on request available.](#)

5 Options/ Special designs

Cable gland *

Explanation	Code
M20x1,5: 1 cable gland and 1 dummy plug	1
M25x1,5: 1 cable gland and 1 dummy plug	2
M20x1,5: 2 cable glands	3
M20x1,5: 2 cable glands plus 1 additional dummy plug	3B
M25x1,5: 2 cable glands	4
M25x1,5: 2 cable glands plus 1 additional dummy plug	4B
M20x1,5: 1 Harting connector and 1 dummy plug	5
1/2" NPT: 1 cable gland and 1 dummy plug	6
1/2" NPT: 2 cable glands	7
Cable gland: Special request	9

Casing colour *

Casing colour RAL 9006 (white-aluminium)	40
Casing colour RAL 7001 (silver-grey)	41
Casing colour RAL 7012 (basalt-grey)	42
Casing colour RAL 7022 (umber-grey)	43
Casing colour RAL 7033 (cement-grey)	44
Casing colour RAL 7038 (agate-grey)	45
Casing colour RAL 7035 (light-grey)	46
Casing colour RAL 7016 (anthracite-grey)	47
Casing colour RAL 9002 (grey-white)	48
Casing colour RAL 7032 (siliceous-grey)	49

Climate proof version/ IP code

Climate-proof version for extreme frigid open-air conditions below -40 °C	34
Climate-proof version for Offshore	36
Climate-proof version for aggressive industrial atmosphere	36B
IP code 66	39
IP code 67	39B

Insulating liquid

Insulating liquid silicone oil	20
Insulating liquid based on ester	21

Equipment

Metal plate	15
With oil drain plug (only double-float Buchholz relays)	28
With premounted Harting connector (The option is indicated by a letter after the code. See section 7)	59

Switching system

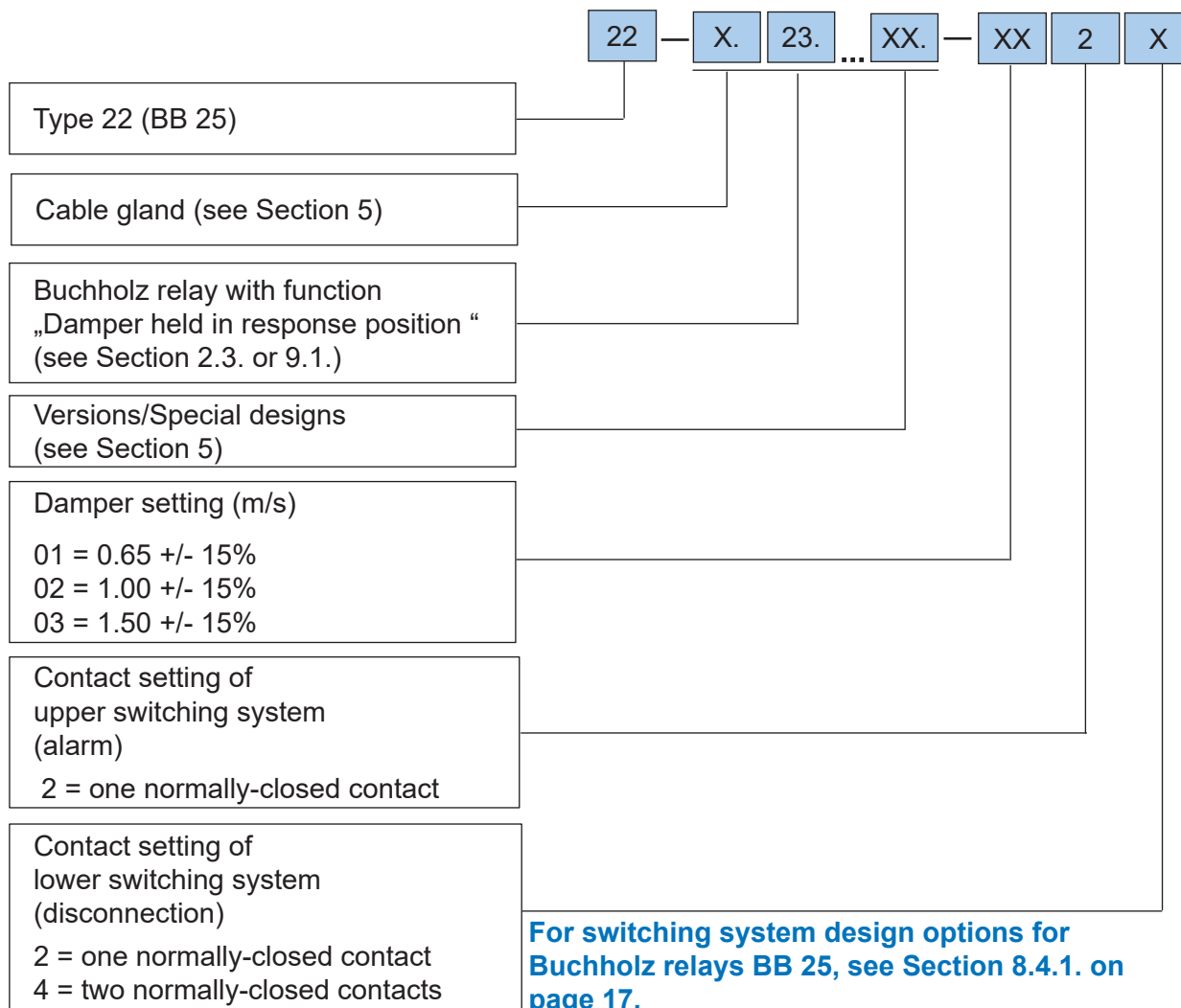
Lower switching system equipped with two magnet contact tubes	25
---	----

Special request

Special request (on special agreement with customer)	29
--	----

6 Ordering data/Type code

For placing orders, please, use the following key:



Ordering example:

You need a Buchholz relay of type 22 (BB 25) with 1 cable gland M20x1,5. The damper should respond at a flow rate of 1.00 m/s. The upper switching system should be equipped with one switching element (magnet contact tube) and the lower with two switching elements (magnet contact tubes). The upper switching element should be designed as one normally closed contact, and the lower as two normally closed contacts. The device should be delivered in colour RAL 7033, IP code 66, damper held in response position and with premounted Harting connector 59 A. Based on the above data the relay ordered has the following

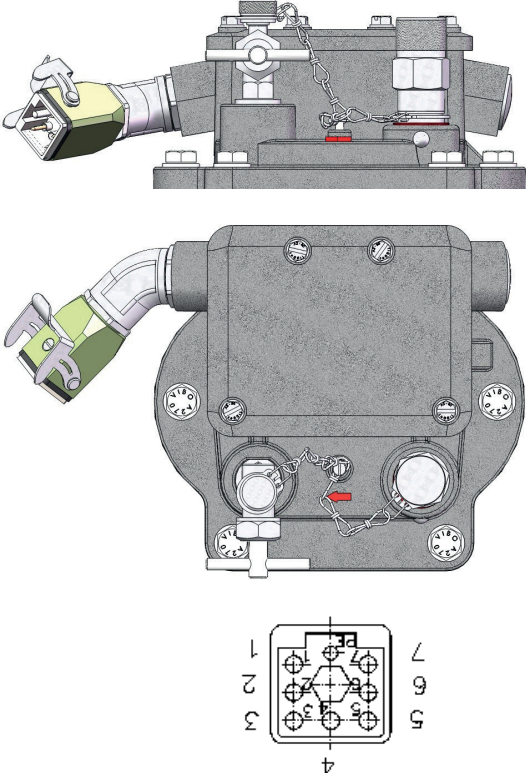
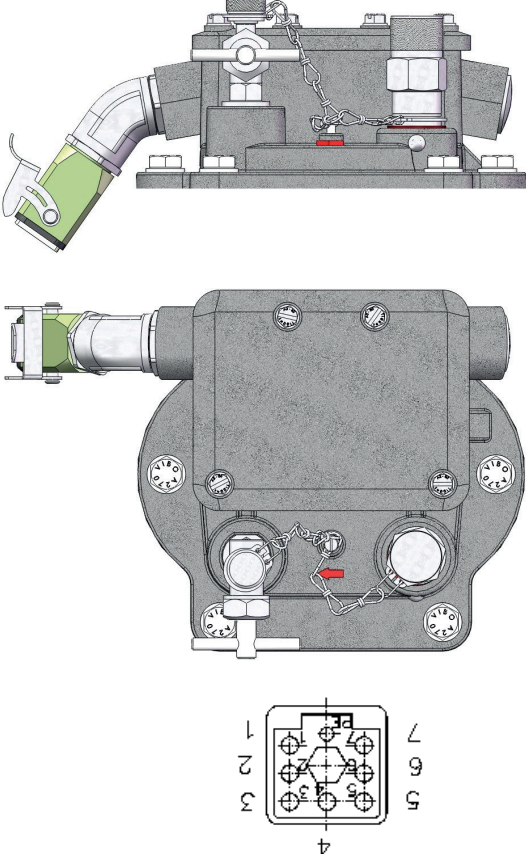
Type code: 22-5.23.25.39.44.59A.-0224

Explanation:

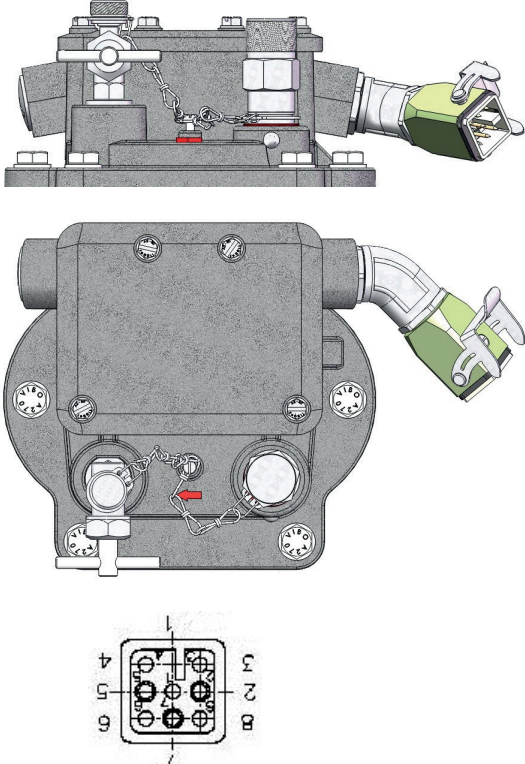
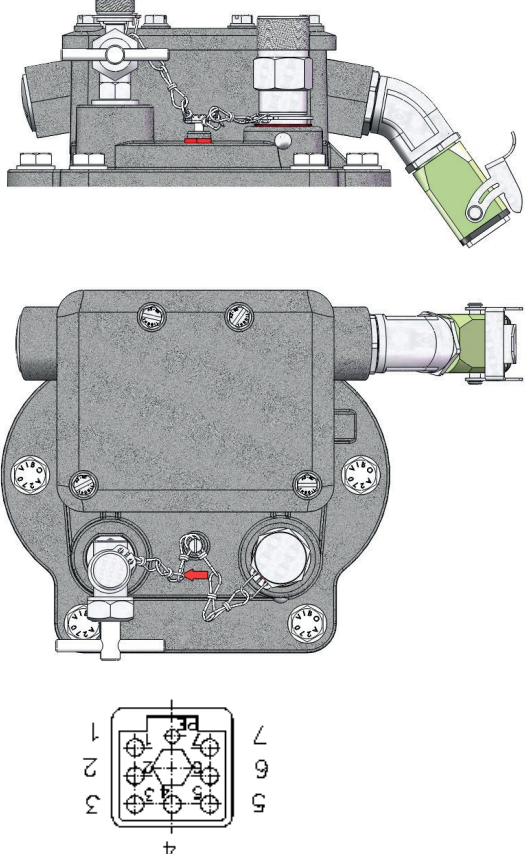
- 22 = Double-float Buchholz relay Type 22 (BB 25)
- 5 = M20x1,5: 1 Harting connector and 1 dummy plug
- 23 = Damper held in response position
- 25 = Lower switching system equipped with two magnet contact tubes
- 39 = IP code 66
- 44 = Casing colour RAL 7033 (cement-grey)
- 59A = With premounted Harting connector 59 A (See Section 7)
- 02 = Damper setting: 1.00 m/s +/- 15 %
- 2 = Contact setting of upper switching system: 1 normally-closed contact
- 4 = Contact setting of lower switching system: 2 normally-closed contacts

7 Survey, Harting connector

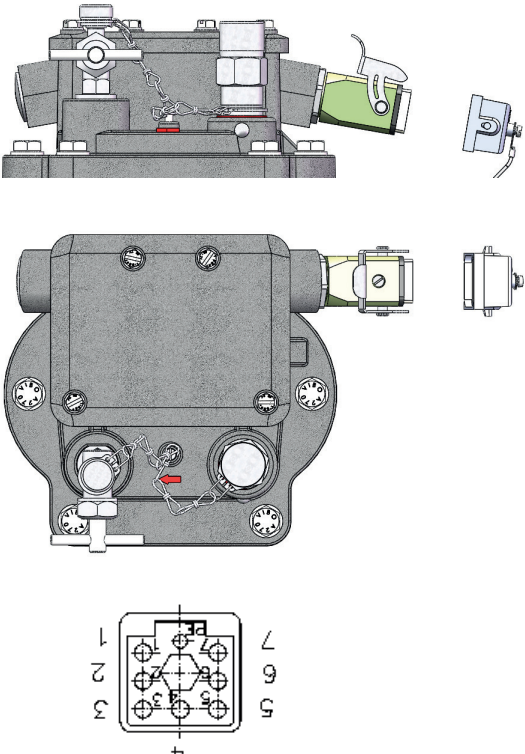
Description of location, direction of view – front of Buchholz relay:

Code	Technical specification	Figure
<p>59A</p>	<p>Screw-in casing:</p> <p><u>1. Standard:</u> Han 3A-eg-QB-M20 Harting Article No.: 19 20 003 1150</p> <p><u>2. Offshore:</u> Han 3M-eg-QB-M20 Harting Article No.: 19 37 003 1150</p> <p><u>3. Low temperature:</u> Han 3M-eg-QB-M20 Harting Article No.: 19 37 003 1150</p> <p>Pin insert: Han Q7/0-M Harting Article No.: 09 12 007 3001</p> <p>Contact pin: R 15-STI-C-1,5 QMM (AU) Harting Article No.: 09 15 000 6121</p>	<p>Figure</p> 
<p>59B</p>	<p>Srew-in casing:</p> <p><u>1. Standard:</u> Han 3A-eg-QB-M20 Harting Article No.: 19 20 003 1150</p> <p><u>2. Offshore:</u> Han 3M-eg-QB-M20 Harting Article No.: 19 37 003 1150</p> <p><u>3. Low temperature:</u> Han 3M-eg-QB-M20 Harting Article No.: 19 37 003 1150</p> <p>Pin insert: Han Q7/0-M Harting Article No.: 09 12 007 3001</p> <p>Contact pin: R 15-STI-C-1,5 QMM (AU) Harting Article No.: 09 15 000 6121</p>	

<p>59C</p>	<p>Srew-in casing:</p> <p>1. <u>Standard:</u> Han 3A-eg-QB-M20 Harting Article No.: 19 20 003 1150</p> <p>2. <u>Offshore:</u> Han 3M-eg-QB-M20 Harting Article No.: 19 37 003 1150</p> <p>3. <u>Low temperature:</u> Han 3M-eg-QB-M20 Harting Article No.: 19 37 003 1150</p> <p>Pin insert: Han 8D-M Harting Article No.: 09 36 008 3001</p> <p>Contact pin: R 15-STI-C-1,5 QMM (AU) Harting Article No.: 09 15 000 6121</p> <p>Contact pin: R 15-STI-C-2,5 QMM (AU) Harting Article No.: 09 15 000 6126</p>	<p>The technical drawings for model 59C include a side view showing a green cable connector on the left, a front view showing two circular contact ports with a red arrow pointing to the right one, and a terminal block diagram with 7 terminals labeled 1 through 7.</p>
<p>59D</p>	<p>Srew-in casing:</p> <p>1. <u>Standard:</u> Han 3A-eg-QB-M20 Harting Article No.: 19 20 003 1150</p> <p>2. <u>Offshore:</u> Han 3M-eg-QB-M20 Harting Article No.: 19 37 003 1150</p> <p>3. <u>Low temperature:</u> Han 3M-eg-QB-M20 Harting Article No.: 19 37 003 1150</p> <p>Pin insert: Han Q7/0-M Harting Article No.: 09 12 007 3001</p> <p>Contact pin: R 15-STI-C-1,5 QMM (AU) Harting Article No.: 09 15 000 6121</p>	<p>The technical drawings for model 59D include a side view showing a green cable connector on the right, a front view showing two circular contact ports with a red arrow pointing to the left one, and a terminal block diagram with 7 terminals labeled 1 through 7.</p>

<p>59E</p>	<p>Srew-in casing: <u>1. Standard:</u> Han 3A-eg-QB-M20 Harting Article No.: 19 20 003 1150 <u>2. Offshore:</u> Han 3M-eg-QB-M20 Harting Article No.: 19 37 003 1150 <u>3. Low temperature:</u> Han 3M-eg-QB-M20 Harting Article No.: 19 37 003 1150</p> <p>Pin insert: Han 8D-M Harting Article No.: 09 36 008 3001</p> <p>Contact pin: R 15-STI-C-1,5 QMM (AU) Harting Article No.: 09 15 000 6121</p> <p>Contact pin: R 15-STI-C-2,5 QMM (AU) Harting Article No.: 09 15 000 6126</p>	
<p>59F</p>	<p>Srew-in casing: <u>1. Standard:</u> Han 3A-eg-QB-M20 Harting Article No.: 19 20 003 1150 <u>2. Offshore:</u> Han 3M-eg-QB-M20 Harting Article No.: 19 37 003 1150 <u>3. Low temperatue:</u> Han 3M-eg-QB-M20 Harting Article No.: 19 37 003 1150</p> <p>Pin insert: Han Q7/0-M Harting Article No.: 09 12 007 3001</p> <p>Contact pin: R 15-STI-C-1,5 QMM (AU) Harting Article No.: 09 15 000 6121</p>	

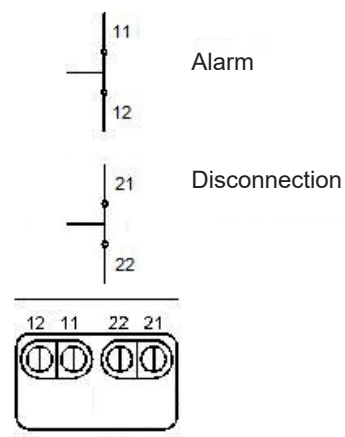
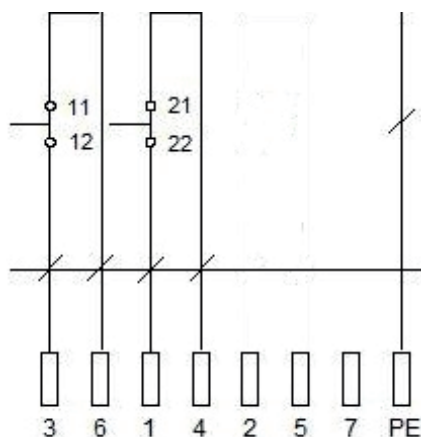
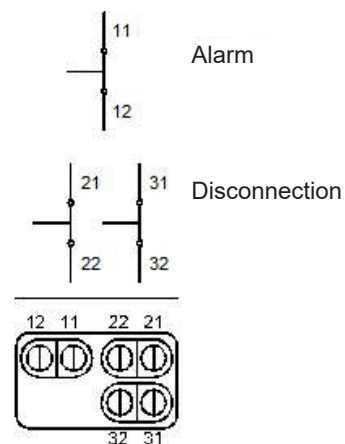
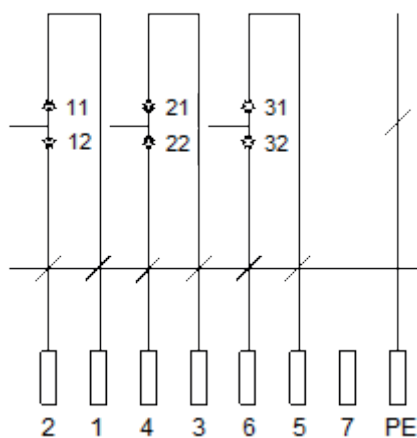
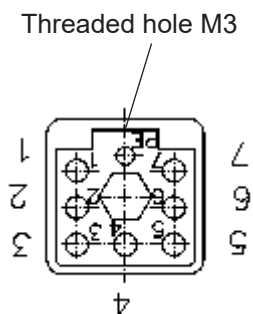
<p>59G</p>	<p>Srew-in casing: <u>1. Standard:</u> Han 3A-eg-QB-M20 Harting Article No.: 19 20 003 1150 <u>2. Offshore:</u> Han 3M-eg-QB-M20 Harting Article No.: 19 37 003 1150 <u>3. Low temperature:</u> Han 3M-eg-QB-M20 Harting Article No.: 19 37 003 1150</p> <p>Pin insert: Han Q7/0-M Harting Article No.: 09 12 007 3001</p> <p>Contact pin: R 15-STI-C-1,5 QMM (AU) Harting Article No.: 09 15 000 6121</p>	
<p>59H</p>	<p>Srew-in casing: <u>1. Standard:</u> Han 3A-eg-QB-M20 Harting Article No.: 19 20 003 1150 <u>2. Offshore:</u> Han 3M-eg-QB-M20 Harting Article No.: 19 37 003 1150 <u>3. Low temperature:</u> Han 3M-eg-QB-M20 Harting Article No.: 19 37 003 1150</p> <p>Pin insert: Han Q7/0-M Harting Article No.: 09 12 007 3001</p> <p>Contact pin: R 15-STI-C-1,5 QMM (AU) Harting Article No.: 09 15 000 6121</p>	

<h1>59J</h1>	<p>Srew-in casing:</p> <p>1. <u>Standard:</u> Han 3A-eg-QB-M20 Harting Article No.: 19 20 003 1150</p> <p>2. <u>Offshore:</u> Han 3M-eg-QB-M20 Harting Article No.: 19 37 003 1150</p> <p>3. <u>Low temperature:</u> Han 3M-eg-QB-M20 Harting Article No.: 19 37 003 1150</p> <p>Pin insert: Han Q7/0-M Harting Article No.: 09 12 007 3001</p> <p>Contact pin: R 15-STI-C-1,5 QMM (AU) Harting Article No.: 09 15 000 6121</p>	 <p>The technical drawings show the motor assembly from three perspectives: a side view at the top, a top view in the middle, and a terminal block diagram at the bottom. The side view shows the motor's profile with a green component on the right. The top view shows the motor's base with mounting holes and a red arrow pointing to a specific feature. The terminal block diagram shows a 7-pin connector with terminals numbered 1 through 7 and a central ground terminal labeled 'PE'.</p>
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Pin insert 09 12 007 3001

Pin assignment

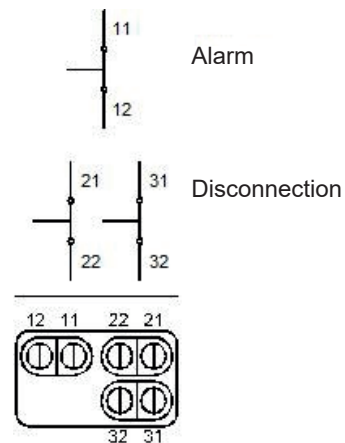
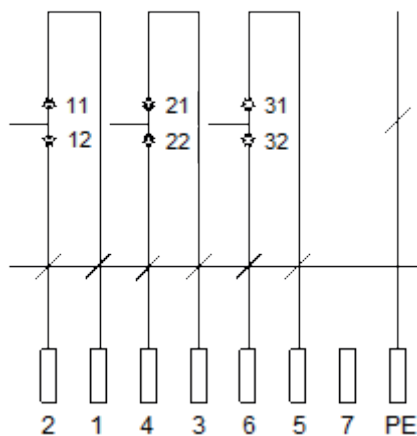
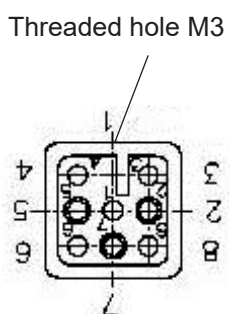
Terminal assignment



Pin insert 09 36 008 3001

Pin assignment

Terminal assignment



8 Installation

8.1 Installation in piping

The Buchholz relay BB 25 (Figure 6/ No. 2) is installed in the pipe (Fig. 6/ No. 3) between the transformer tank (Fig. 6/ No. 1) and the conservator (Fig. 6/ No. 4). During normal operation it is filled completely with insulating liquid.

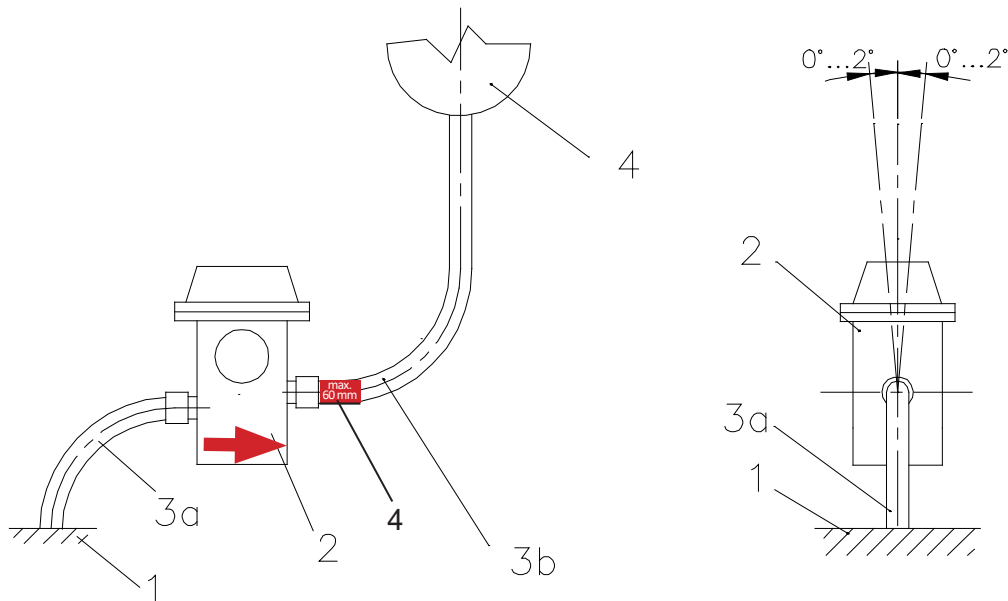


Figure 6 - Installation in piping

Make sure that

- gases produced in the insulating liquid can flow unimpeded to the Buchholz relay.
- the conservator is arranged above the Buchholz relay. It has to be ensured that the minimum insulating liquid level in the conservator is above the insulating liquid level of the Buchholz relay filled completely with insulating liquid.
- the red arrow on the Buchholz relay points to the conservator.
- the piping and, hence the Buchholz relay are arranged horizontally.
- the sealing surfaces of the Buchholz relay are clean and reveal no signs of damage.
- the Buchholz relay is installed stressfree.
- the cap nuts of the piping are tightened at 100-120 Nm.



CAUTION

- **Proper function of the Buchholz relay BB 25 requires a piping offset of 17.5 mm (see Figure 7).**
- **The flange gaskets required for installation in the piping are not included in the scope of delivery of the Buchholz relay!**

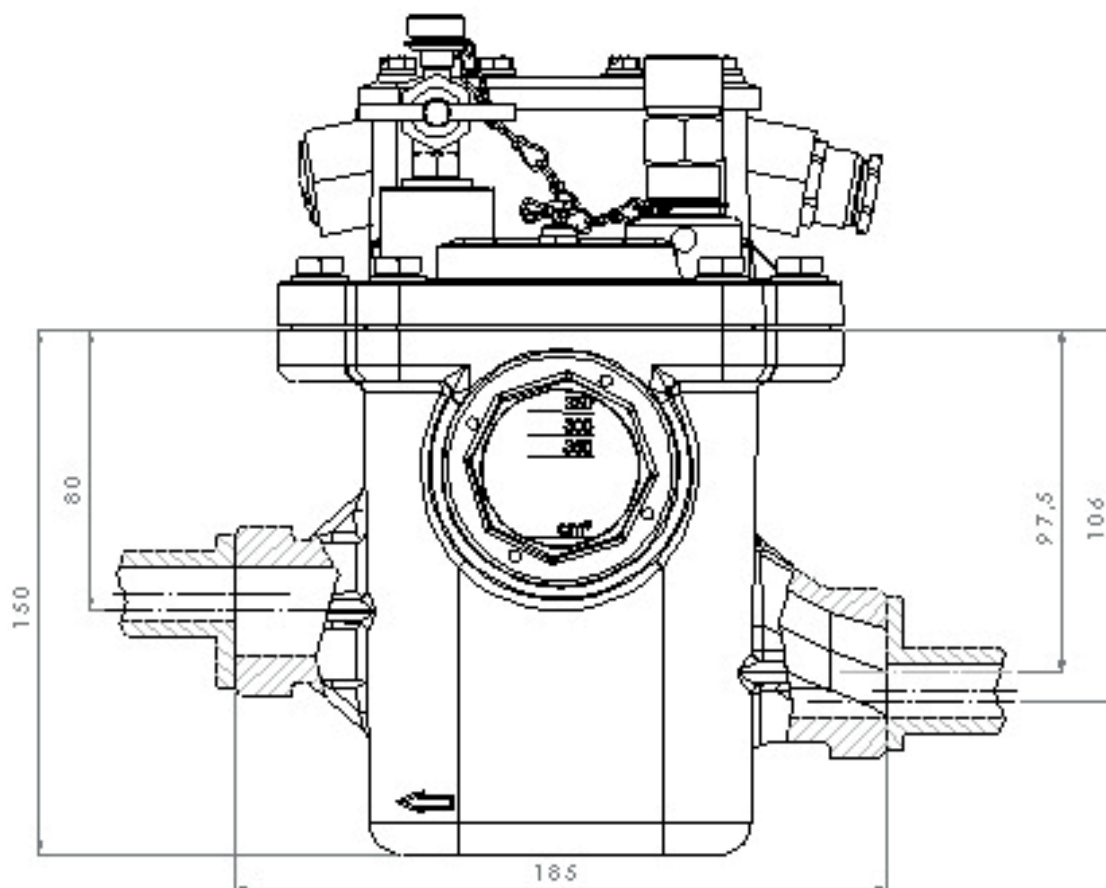


Figure 7 - Buchholz Relay Type 22 (BB25)

- the position of the Buchholz relay in relation to the direction of flow does not deviate from the perpendicular by more than 2° .
- the free length of the piping between the Buchholz relay and the nearest fixed point does not exceed 0.3 m. As for larger distances, provide supports in the direct vicinity of the relay.
- a DN 25 piping is used. If this is not possible for design reasons, the piping or its connection to the relay have to be dimensioned such that drainage of the insulating liquid from the relay to the transformer tank as well as the escape of excessive relay gas to the conservator are ensured in any case (see Figure 7). In this case the quantity (l/min) corresponding to the oil flow (m/s) depends on the actual cross-section of the piping.
- the **horizontal piping section between the relay and the conservator must not be longer than 60 mm** to avoid that excessive gas escapes with each tilting of the locomotive and, hence the relay is disconnected.



CAUTION

- **Make sure during installation that no dirt, moisture or foreign matter get into the relay.**
- **The insulating liquid of the transformer may not contain conductive materials!**

8.2 Filling and bleeding of the Buchholz relay

Once the device to be protected is ready for operation and the conservator has been filled with insulating liquid, bleed the Buchholz relay completely.

Proceed as follows:

- Remove the small cap nut (Fig. 8/ No. 1) from the test valve (Fig. 8/ No. 2)
- Open the test valve (turn anticlockwise) and let the air escape from the Buchholz relay
- Close the test valve as soon as insulating liquid comes out (clockwise rotation), remove any insulating liquid that might have come out and clean the Buchholz relay.
- Fit and tighten the small cap nut on the test valve

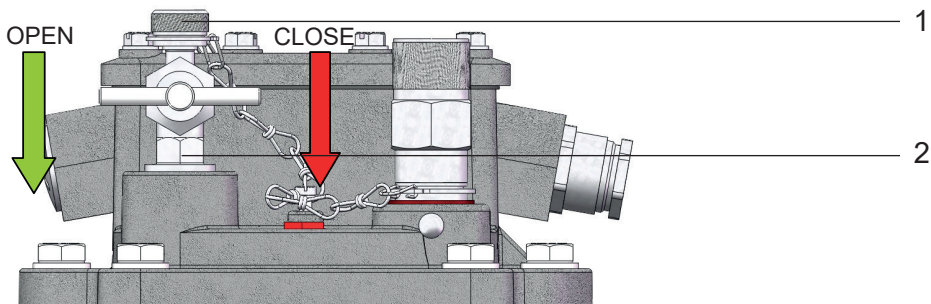


Figure 8 - Test valve

8.3 Removal of transport lock

Proceed as follows:

- Remove the large cap nut (Fig. 9/ No. 1)
- Take the transport lock, consisting of a rubber piece and a washer (Fig. 9/ No. 2), out of the large cap nut
- Fit and tighten the large cap nut **without** the transport lock

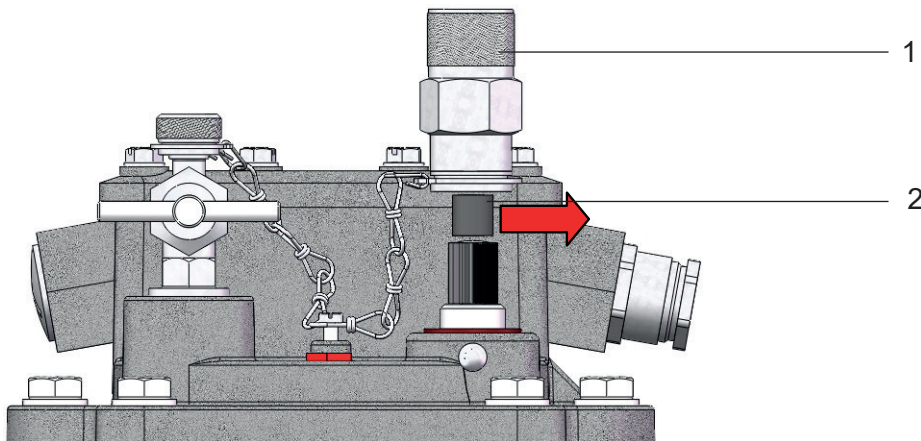


Figure 9 - Removal of transport lock



CAUTION

- Remove the transport lock (rubber piece and washer) before taking the Buchholz relay into operation.
- If the Buchholz relay has to be transported again, reinstall the transport lock (first washer, then rubber piece)!

8.4. Connection of signal lead

8.4.1. Electrical connection

Multicore signal leads can be fitted in the Buchholz relay through cable glands. A conductor cross section of 1.5 mm² (copper) is recommended. The maximum cross section that can be clamped is 4.0 mm².

Proceed as follows:

- Remove 4 screws M5 (Fig. 10/ No. 1)
- Remove the cap (Fig. 10/ No. 2)
- Insert the lead through the cable gland (Fig. 10/ No. 3)
- Connect the lead to the terminal studs (Fig. 10/ No. 4) (maximum torque 3 Nm)
- Tighten the cable gland
- Fit the cap
- Tighten 4 screws M5 (maximum torque 3 Nm)

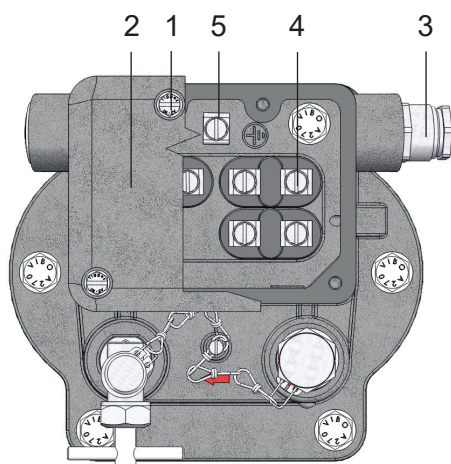


Figure 10 - Electrical connection

Connected load of the switching systems:

Voltage:	AC 12 V - max. 250 V
	DC 12 V - max. 250 V
Current:	AC 0.01 A - max. 2 A $\cos \varphi > 0,5$
	DC 0.01 A - max. 2 A $L/R < 40 \text{ ms}$
Switching capacity:	AC max. 400 VA
	DC max. 250 W



NOTE

The inner side of the cap accommodates a plate with the graphic symbol and the connection diagram. The schemes show the switching systems in their neutral position. The neutral position is the operating condition when the Buchholz relay is filled with insulating liquid up the required level and the device to be protected operates without any fault.



WARNING

Connect the protective conductor (green-yellow insulation) to the earth terminal (Fig. 10/No. 5) (maximum torque 3 Nm)

The connecting cables for the switching systems are connected to the Buchholz relay as shown below. Warning is via the upper switching system (terminals 11-12), and disconnection via the lower switching system (terminals 21-22 and 31-32). Connect the protective conductor (green-yellow insulation) to the earth terminal. After connection of cables close the terminal box carefully and tighten the M5 fastening screws at a max torque of 3 Nm.

Switching system, cause of response and response values (switching points):	Graphic symbol and connection diagramm	Graphic symbol and connection diagramm
	...22	...24
	Alarm	Alarm
	1 normally-closed contact	1 normally-closed contact
Upper switching system (alarm) Gas accumulation: 52 ± 2 mm above mid of piping (relay to conservator) Loss of insulating liquid: 52 ± 2 mm above mid of piping (relay to conservator)		
	Disconnection	Disconnection
	1 normally-closed contact	2 normally-closed contacts
Lower switching system (disconnection) Loss of insulating liquid: 9 ± 2 mm below mid of piping (relay to conservator)		
Insulating liquid flow Pipe diameter DN: 25 mm	01 = 0.65 +/- 15% 02 = 1.00 +/- 15% 03 = 1.50 +/- 15%	

8.4.2 Electrical connection with premounted Harting connector (code 59)

Thanks to the premounted Harting connector no electric installation is required.

Proceed as follows:

- Remove the safety catch (Fig. 11/ No. 1)
- Remove the cap (Fig. 11/ No. 2)
- Connect the plug ensuring proper alignment
- Lock the connector using the safety catch

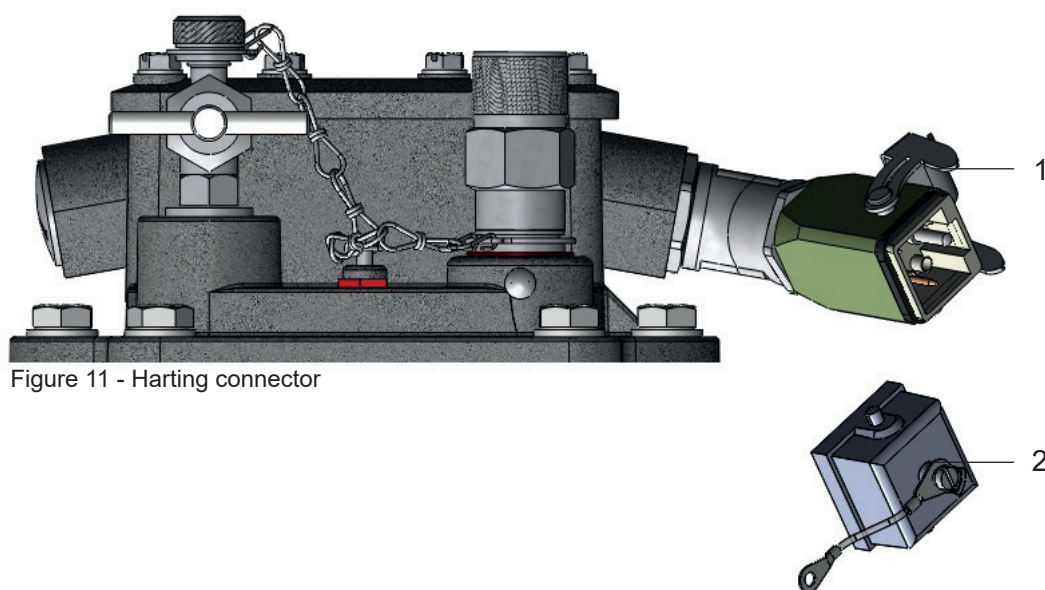


Figure 11 - Harting connector

9 Functional test

The test can be performed with the help of the test key (mechanically) or a special test pump (pneumatically). In both cases the Buchholz relay must be filled completely with insulating liquid and bled.

9.1 Testing by means of test key

Proceed as follows:

- Remove the large cap nut (Fig. 12/ No. 1)
- Press the test key (Fig. 12/ No. 2) half down (Fig. 12/ No. I) and keep depressed (check of upper switching system - alarm)
- Obtain verification of correct function
- Press the test key down to stop position (Fig. 12/ No. II) and keep depressed (check of lower switching system - disconnection)
- Obtain verification of correct function
- Release the test key
- Unlock the test key (turn anticlockwise)
- Fit and tighten the large cap nut

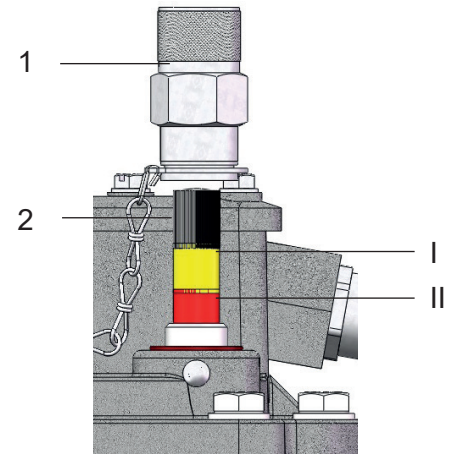


Figure 12 - Test key



CAUTION

For Buchholz relay BB 25, the damper and hence the lower switching system have to be unlocked after the test by turning the test key anticlockwise.

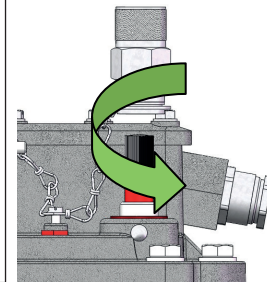


Figure 13 - Test key

9.2 Testing by means of test pump

Proceed as follows:

- Remove the small cap nut (Fig. 14/ No. 1) from the test valve (Fig. 14/ No. 2)
- Fit the adapter with check valve (Fig. 14/ No. 3) of the hose (Fig. 14/ No. 4) providing the connection to the test pump on the valve nozzle (Fig. 14/ No. 5)
- Open the test valve (turn anticlockwise)
- Pump air into the Buchholz relay BB 25 until falling of the **upper** float causes the magnet contact tube to operate (for switching point dimensions, see table in Section 8.4.1)
- Obtain verification of correct function
- Close the test valve (turn clockwise)
- Remove the adapter from the valve nozzle
- Open the test valve and let the air escape (see Section 8.2)
- Close the test valve as soon as insulating liquid comes out
- Fit and tighten the small cap nut on the test valve

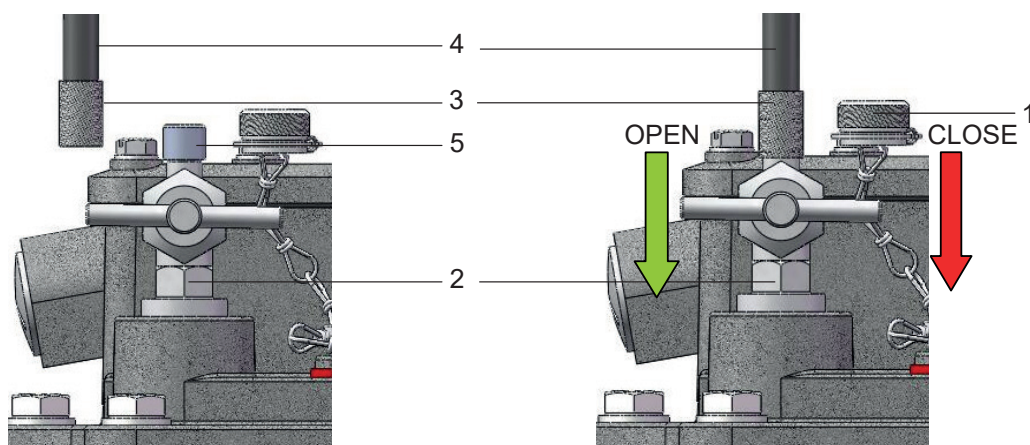


Figure 14 - Testing by means of test pump



NOTE

When the test is performed on the double-float Buchholz relay with the help of a test pump, for design reasons, only the upper switching system (alarm) is tested. Use only test pumps with suitable adapter with check valve supplied by EMB (ZG 5.1 or ZG 5.2).

10 Transport/ despatch/ storage

Buchholz relays are delivered, transported and stored in a transport cardboard. Store the Buchholz relays in a dry place.

If the Buchholz relay has to be transported again, reinstall the transport lock (first washer, then rubber piece) (see Section 8.3).

Buchholz relays have to be transported and stored such that they are protected from impact and cannot fall down.

11 What to do in the event of gas accumulation

When a gas alarm signal is given, the gas should be checked immediately to determine the cause of the fault and avoid potential extension of damage. To this end, withdraw the gas from the Buchholz relay and analyse it.

Bleed the Buchholz relay after removal of gas.



NOTE

The EMB Buchholz gas sampler serves to sample gas and transport the save sample taken from the Buchholz relay or the gas sampler ZG 1.2.

12 What to do when the permissible insulating liquid flow rate is exceeded

After response of the lower switching system the damper does not return automatically from response position to neutral position. This requires that the damper is unlocked manually.

For that purpose remove the large cap nut from the Buchholz relay and return the damper to neutral position by turning the test key anticlockwise.

Then fit the large cap nut on the Buchholz relay again (also see Section 9.1).

When unlocking the damper, the insulating liquid level in the Buchholz relay should be checked. If necessary, the Buchholz relay should be bled.

13 Maintenance

Buchholz relays are insensitive to ambient conditions, provided these conditions were considered when selecting the particular design of the Buchholz relay. Therefore, no special maintenance is required during operation.

Buchholz relays should be inspected and tested at specified intervals as described in the maintenance instructions of the plant operator. Make sure that the functional tests described are performed.

Unless otherwise specified by the operator, EMB recommends operating the test key once a year in the framework of the scheduled maintenance operations.



CAUTION

When removing the relay, make sure that there is no insulating liquid in the device. On customers request EMB GmbH will ensure proper disposal of old relays.

14 Additional devices for Buchholz relays



Buchholz gas sampler BGS

The Buchholz gas sampler provides a safe method of taking and transporting gas samples from the Buchholz relay or the gas sampling device. Its capacity is 100 ml.

Buchholz gas tester BGT 4.1 and BGT 4.2



The Buchholz gas tester is used to measure and analyse the free gases in the oil which have accumulated in the Buchholz relay.

The BGT 4.1 is used to measure the hydrogen concentration in the Buchholz gas.

The BGT 4.2 allows the measurement of hydrogen, carbon dioxide, carbon monoxide, total hydrocarbon and ethyne concentrations in the Buchholz gas.

A BGS is included in the scope of delivery

Gas testing device ZG 3.1.



The gas testing device is used to test the gas accumulated in the Buchholz relay. It can be installed either directly on the bleeding valve of the Buchholz relay or on the gas outlet tap of the gas sampling device. The Buchholz gas flows through two different chemical solutions and its colour reactions indicate the nature of the fault.

Use of the gas testing device is no substitute for a gas chromatographic analysis.



Reflux lock ZG 4.1.

The device prevents insulating liquid from flowing into the gas testing device. The device is installed between the Buchholz relay or gas sampling device and the gas testing device.



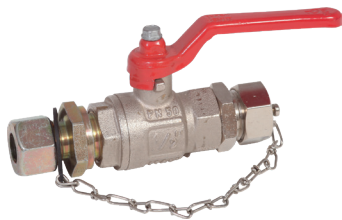
Test pump ZG 5.1., ZG 5.2. and ZG 5.3.

The test pump checks the functioning of the upper switching system (alarm) of the Buchholz relay by pumping in air. The test can be performed directly on the Buchholz relay. For that purpose, the test pump is connected to the bleeding valve of the Buchholz relay. When the test is performed via the gas sampling device, the test pump is connected to the gas outlet tap of the gas sampling device.

- ZG 5.1. manually operated

- ZG 5.2. pedal-operated

- ZG 5.3. manually operated



Oil sampling device ZG 6.1.

The oil sampling device is connected to the Buchholz relay via a pipe and is used to take oil samples from the Buchholz relay (suitable for use with Buchholz relays with an oil drain plug). The pipe is supplied to the customer's specifications.

For further information, please ask for special reference material.

15 Other Buchholz relay types for use in rail vehicles



Type 04 (BG 25)
Type 21 (BG 25S)
Type 06 (BF 25/10)
Type 08 (BF 50/10)
u.a.

Pipe diameter DN: 25 mm (1"), 50 mm (2")
Type of connection: flanged or threaded

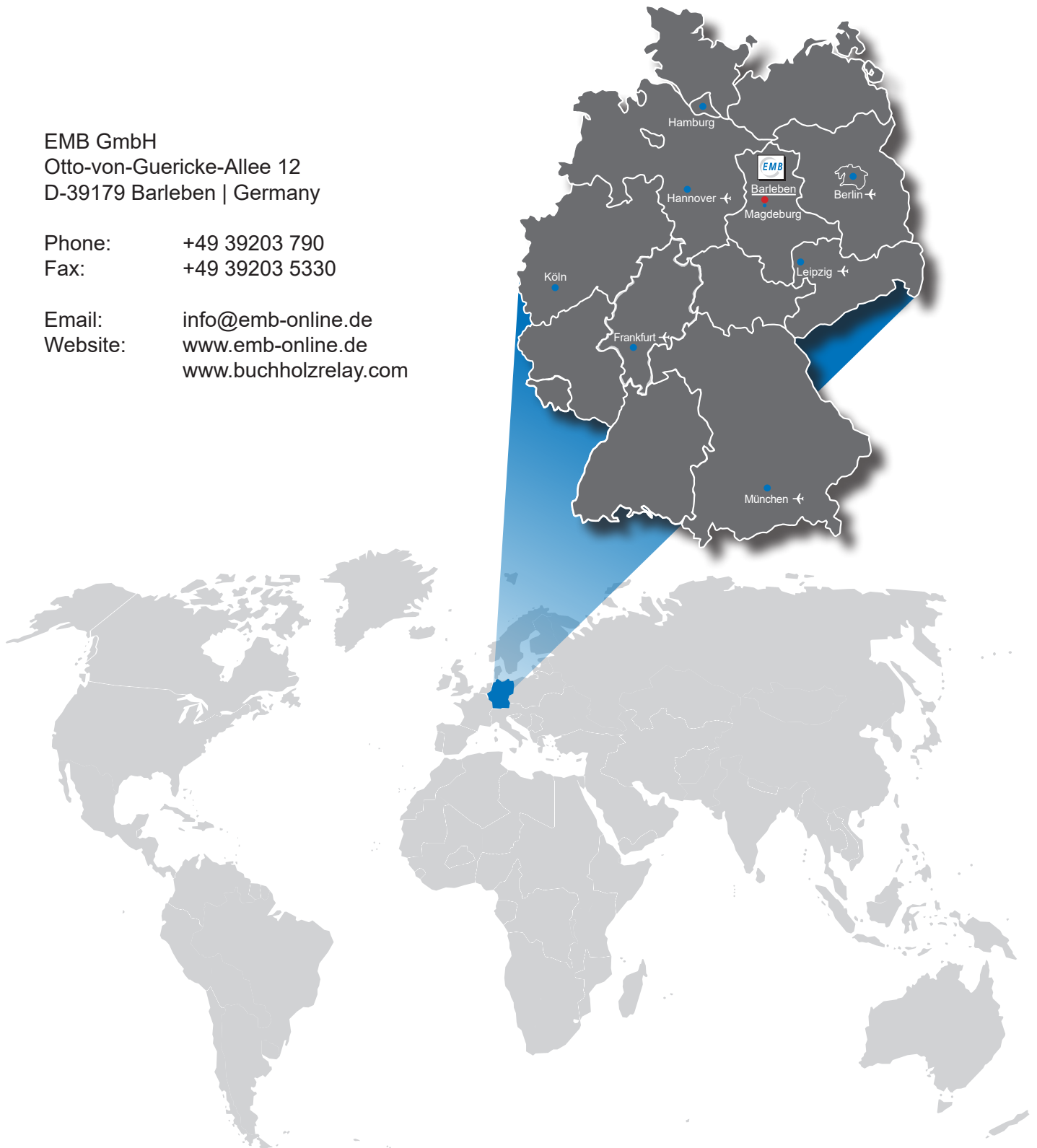


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Due to technical improvement of our products, the information contained in this technical documentation is subject to change without notice. We would like to apologize for any printing errors which have not been found despite of intensive proof-reading.

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