

Float switch

Type ABZMS-41



The data specified above only serve to describe the product. As our products are constantly being further developed, no statements concerning a certain condition or suitability for a certain application can be derived from our information. The information given does not release the user from the obligation of own judgment and verification. It must be remembered that our products are subject to a natural process of wear and aging.

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The cover shows an example configuration. The product supplied may therefore differ from the figure shown.

The original operating instructions were prepared in German.

Contents

1	About this documentation	7
1.1	Validity of the documentation	7
1.2	Required and amending documentation	7
1.3	Representation of information	7
1.3.1	Safety instructions	8
1.3.2	Symbols	8
1.3.3	Designations	9
1.3.4	Abbreviations	9
2	Safety instructions	10
2.1	About this chapter	10
2.2	Intended use	10
2.3	Improper use	10
2.4	Qualification of personnel	11
2.5	General safety instructions	11
2.6	Product- and technology-dependent safety instructions	12
2.7	Personal protective equipment	13
2.8	Obligations of the machine end-user	13
3	General information on damage to property and damage to product	14
4	Scope of delivery	15
5	Product information	16
5.1	Performance description	16
5.1.1	Filling level monitoring	16
5.1.2	Temperature monitoring	16
5.2	Product description	17
5.2.1	Overview of the series and models	17
5.2.2	Display and control unit for the D1, D2 and D3 models	18
5.2.3	Switching points for the Mx and RTA models	18
5.2.4	Switching function of the switching points for the Mx models	19
5.2.5	Notes on the life cycle extension of reed contacts	20
5.2.6	Display ranges	21
5.3	Product identification	21
6	Transport and storage	22
6.1	Transporting the ABZMS-41 float switch	22
6.2	Storing the ABZMS-41 float switch	22
7	Assembly	23
7.1	Installation conditions	23
7.2	Assembling the ABZMS-41 float switch	23
7.3	Connecting the voltage supply	24
7.3.1	Connection versions and pin assignment	24
7.3.2	Voltage supply variants	26
7.4	Adjustment of the switching point positioning for the Mx models	27
7.5	Adjustment of the switching function of the switching points for the Mx models	27

8	Commissioning and operation	28
8.1	Switch-on procedure	28
8.1.1	Models without display and control unit	28
8.1.2	Models with display and control unit	28
8.2	LED status displays	29
8.3	General key functions	29
8.4	Active key lock	30
8.5	Menu overview	31
8.6	Changing the basic settings	32
8.6.1	Disabling normal error handling	32
8.6.2	Setting the unit for the filling level	33
8.6.3	Setting the unit for the temperature	33
8.6.4	Defining switching outputs	34
8.6.5	Reassignment of the switching outputs	34
8.6.6	Setting the display's update rate	35
8.6.7	Activating/deactivating the key lock	35
8.6.8	Scaling the display range for the filling level	36
8.6.9	Filling level: maximum display value	37
8.6.10	Filling level: minimum display value	37
8.6.11	Restoring factory settings (reset)	37
8.7	Switching outputs	39
8.7.1	Switching output X: definition of the switching characteristic	39
8.7.2	Switching output X: upper switching limit (switching point)	41
8.7.3	Switching output X: lower switching limit (switch-back point)	41
8.7.4	Switching output X: switch-on delay	42
8.7.5	Switching output X: switch-back delay	42
8.7.6	Switching output X: testing of the switching output	43
8.7.7	Changing the display function of the status LEDs	43
8.8	Analog outputs	45
8.8.1	Analog output X: assignment of the upper limit	45
8.8.2	Analog output X: assignment of the lower limit	46
8.8.3	Analog output X: setting the signal type	47
8.8.4	Analog output X: testing the analog output	47
8.9	IO-Link (version LTD and D3)	47
8.10	Diagnosis options	48
8.10.1	Calling the log book	48
8.10.2	Maximum and minimum filling level	49
8.10.3	Maximum and minimum temperature	49
8.10.4	Determining the switching output to be logged	50
8.10.5	Delay until storage of the min/max filling level	50
8.10.6	Delay until storage of the min/max temperature	50
9	Maintenance and repair	51
9.1	Inspection and maintenance	51
9.2	Cleaning and care	51
9.3	Repair	51
9.4	Troubleshooting	51

10	Disassembly and replacement	52
10.1	Preparing for disassembly	52
10.2	Disassembly process	52
10.3	Preparing the components for storage/further use	52
11	Disposal	53
11.1	Environmental protection	53
11.2	Return to Bosch Rexroth	53
11.3	Packaging	53
11.4	Materials used	53
11.5	Recycling	54
12	Extension and modification	54
13	Troubleshooting	55
13.1	How to proceed for troubleshooting	55
13.2	Troubleshooting	56
14	Technical data	57
15	Appendix	58
15.1	List of addresses	58
15.2	Overview of the menu sequence	59
15.3	Prohibited substances – REACH, RoHS, WEEE	61
16	Alphabetical index	62

1 About this documentation

1.1 Validity of the documentation

This documentation applies to type ABZMS-41 float switches.



Further information on the available series and models can be found in chapter 5.2 "Product description".

This documentation is intended for assemblers, operators, service engineers, system end-users and machine manufacturers.

This documentation contains important information on the safe and proper assembly, transport, commissioning, operation, use, maintenance, disassembly and simple troubleshooting of the product.

- Read this documentation thoroughly, and in particular chapter 2 "Safety instructions" and chapter 3 "General information on damage to property and damage to product", before handling the product.

1.2 Required and amending documentation

- The product must not be commissioned until you have been provided with the documentation marked with the book symbol  and you have understood and observed it. You can find the documentation in the online product catalog at www.boschrexroth.com or in the media directory at www.boschrexroth.com/mediadirectory.

Table 1: Required and amending documentation

	Title	Document number	Document type
	Float switch, type ABZMS-41	50223	Data sheet
	Float switch, type ABZMS-41	50223-PA	Parameter description

1.3 Representation of information

Uniform safety instructions, symbols, terms and abbreviations are used so that you can quickly and safely work with your product using this documentation. For a better understanding, they are explained in the following sections.

1.3.1
Safety instructions

In this documentation, safety instructions are indicated whenever sequences of actions are explained which bear the risk of personal injury or damage to property. The measures described for hazard avoidance must be observed.

Safety instructions are set out as follows:

 SIGNAL WORD
Type and source of danger Consequences in case of non-compliance ▶ Hazard avoidance measures ▶ <Enumeration>

- **Warning sign:** Draws attention to the danger
- **Signal word:** Identifies the degree of danger
- **Type and source of danger:** Specifies the type and source of danger
- **Consequences:** Describes the consequences of non-compliance
- **Precaution:** Specifies how the danger can be prevented

Table 2: Risk classes according to ANSI Z535.6-2006

Warning sign, signal word	Meaning
 DANGER	Indicates a dangerous situation which will cause death or severe injury if not avoided.
 WARNING	Indicates a dangerous situation which may cause death or severe personal injuries if not avoided.
 CAUTION	Indicates a dangerous situation which may cause minor or medium personal injuries if not avoided.
NOTICE	Damage to property: The product or the environment could be damaged.

1.3.2
Symbols

The following symbols indicate notes which are not safety-relevant but increase the comprehensibility of the documentation.

Table 3: Meaning of the symbols

Symbol	Meaning
	If this information is not observed, the product cannot be optimally used and/or operated.
▶	Individual, independent action
1.	Numbered instruction:
2.	The numbers indicate that the actions must be carried out one after the other.
3.	

1.3.3 Designations

The following designations are used in this documentation:

Table 4: Designations

Designation	Meaning
ABZMS-41	Float switch
RE xxxxx	Rexroth data sheet in English
RE xxxxx-B	Rexroth operating instructions in English
RE xxxxx-PA	Rexroth parameter description in English

1.3.4 Abbreviations

The following abbreviations are used in this documentation:

Table 5: Abbreviations

Abbreviation	Meaning
AB	A ggregate- B au (power unit construction)
AC	A lternating C urrent
DC	D irect C urrent
EMC	E lectromagnetic C ompatibility
GND	G rou ND
NC	N ormally C losed
NO	N ormally O pen
PE	P rotective E arth
PELV	P rotective E xtra L ow V oltage

2 Safety instructions

2.1 About this chapter

The product has been manufactured according to the generally accepted codes of practice. However, there is still the danger of personal injury and damage to property if you do not observe this chapter and the safety instructions in this documentation.

- ▶ Read this documentation completely and thoroughly before working with the product.
- ▶ Keep this documentation in a location where it is accessible to all users at all times.
- ▶ Always include the required documentation when passing the product on to third parties.

2.2 Intended use

The product is an electric component.

Depending on the configuration, you may use the product as follows:

- For monitoring the filling level and, if necessary, the temperature in fluid systems
- As a pure switch
- For continuous measurement and display of filling level and temperature

The product is intended only for professional use and not for private use.

Intended use includes having read and understood this documentation, especially chapters 2 "Safety instructions" and 3 "General information on damage to property and damage to product".

2.3 Improper use

Any use deviating from the intended use is improper and thus not admissible.

Improper use of the product includes:

- operation of the float switch outside the specified performance limits and operating conditions, in particular the specified environmental conditions.
- use as a safety-relevant part of controls as defined in DIN EN ISO 13849. Functional safety must be realized by appropriate additional components.
- use of a float switch in potentially explosive atmospheres.

Bosch Rexroth AG does not assume any liability for damage caused by improper use. The user assumes responsibility for all risks surrounding improper use.

2.4 Qualification of personnel

The activities described in this documentation require basic knowledge of electrics and hydraulics as well as knowledge of the appropriate technical terms. In order to ensure safe use, these activities may only be carried out by an expert in the respective field or an instructed person under the direction and supervision of an expert.

Experts are those who can recognize potential dangers and apply the appropriate safety measures due to their professional training, knowledge and experience, as well as their understanding of the relevant conditions pertaining to the work to be undertaken. An expert must observe the relevant specific professional rules.

Hydraulic expert knowledge means, among other things:

- reading and completely understanding hydraulic circuit drawings,
- in particular, completely understanding the relationships regarding the safety equipment, and
- having knowledge of the function and set-up of hydraulic components.



Bosch Rexroth offers training measures in specific fields. An overview of the training contents can be found online at:

www.boschrexroth.com/de/de/academy/

2.5 General safety instructions

- Observe the valid regulations on accident prevention and environmental protection.
- Observe the safety regulations and provisions of the country in which the product is used/applied.
- Only use Rexroth products in technically perfect condition.
- Observe all notes on the product.
- Persons who assemble, operate, disassemble or maintain Rexroth products must not consume any alcohol, drugs or pharmaceuticals that may affect their ability to react.
- Only use accessories and spare parts approved by the manufacturer in order to exclude hazards to persons due to unsuitable spare parts.
- Comply with the technical data and environmental conditions specified in the product documentation.
- The installation or use of inappropriate products in safety-relevant applications could result in unintended operating conditions when being used which in turn could cause personal injuries and/or damage to property. Therefore, only use a product for safety-relevant applications if this use is expressly specified and permitted in the documentation of the product, or if the safe suitability of the product in the application is confirmed by a separate conformity assessment procedure for the end product, e.g. in explosion-protected areas or in safety-related parts of control systems (functional safety).
- Do not commission the product until you can be sure that the end product (for example a machine or system) where the Rexroth product is installed complies with the country-specific provisions, safety regulations and standards of the application.

2.6 Product- and technology-dependent safety instructions

WARNING

Restriction of the function of other electronics due to interference/electromagnetic radiation!

Danger to life, risk of injury due to malfunction, incorrect signal or uncontrolled motions on the machine!

- ▶ Observe the EMC limit values.
- ▶ Only use recommended electrical connection lines.
- ▶ Ensure that the cabling is EMC-compliant and only use shielded cables for analog signals.
- ▶ Provide for correct grounding and provide for proper equipotential bonding.
- ▶ If necessary, shield other electronics from the source of interference.
- ▶ Ensure sufficient distance to other electronics.

Direct contact with energized parts or live components (230 VAC) in case of fault, e.g. loose terminals, insulation defects, missing grounding, malfunction of fuses or damaged lines, components or terminals!

Danger to life! Risk of injury! Danger caused by electric shock or severe injury!

- ▶ Before carrying out any maintenance, repair or installation work, always de-energize the relevant system part and secure it against restarting.
- ▶ Ensure continuous connection of the protective grounding conductor.
- ▶ Observe the operating conditions and performance limits specified in the technical data.
- ▶ Work at electric equipment may only be performed by specialized electricians.

Overload due to operation outside the admissible voltage and current range!

Danger to life! Risk of injury! Danger caused by electric shock or severe injury!

Damage to property!

- ▶ Only use admissible device connectors and mating connectors such as those specified in data sheet 50223, see chapter 1.2 "Required and amending documentation".
- ▶ Specify the maximum possible load of the switching contacts and ensure that it is not exceeded.

**Valid for the models:
M1 (VAC), M2 (VAC),
M1-T70F (VAC) and
M2-T70F (VAC)**

**Valid for the models:
M1 (VAC), M2 (VAC),
M1-T70F (VAC) and
M2-T70F (VAC)**



WARNING

Short-circuit due to missing grounding and/or missing PE connection!

Danger to life! Risk of injury! Danger caused by electric shock or severe injury!
Risk of fire!

- ▶ Ensure a proper, secure PE connection, especially for models M1 (VAC), M2 (VAC), M1-T70F (VAC) and M2-T70F (VAC).
- ▶ Ensure that the container and the metallic connection from the sensor to the container are grounded.

High electrical voltage due to incorrect connection!

Danger to life! Risk of injury caused by electric shock!

- ▶ De-energize the relevant system part for all works and secure it against restarting.
- ▶ Work at electric equipment may only be performed by specialized electricians.
- ▶ All connections with voltages between 0 and 50 V may only be connected with devices, electric components and lines with a protective extra-low voltage (PELV).
- ▶ Only connect voltages and electric circuits provided with a safe isolation from dangerous voltages. Safe isolation can be achieved with isolation transformers, safe optocouplers or mains-free battery operation.

2.7 Personal protective equipment

The personal protective equipment must be specified by the end-user of the machine/system.

2.8 Obligations of the machine end-user

The operation of installations, systems and machines basically requires the implementation of a holistic IT security concept which is state-of-the-art in terms of technology. Accordingly, Rexroth products and their properties have to be considered as components of installations, systems and machines for their holistic IT security concept.

Unless otherwise documented, Rexroth products are designed for operation in local, physically and logically secured networks with access restrictions for authorized persons, and they are not classified according to IEC 62443-4-2.

3 General information on damage to property and damage to product



The warranty only applies to the delivered configuration. The claim to warranty expires if the product is assembled, commissioned and operated incorrectly, not used as intended and/or handled improperly.

NOTICE

Ingress of dust, water or humidity!

Malfunction! Short-circuit! Damage to property!

- Only use the float switch within the IP protection class specified in data sheet 50223, see chapter 1.2 "Required and amending documentation".

Inadmissible temperature range!

Danger due to overheating! Damage to property!

- Observe the temperature range specified in data sheet 50223, see chapter 1.2 "Required and amending documentation".

4 Scope of delivery

The scope of delivery includes:

- Float switch (without mating connector)
- Screws and seals
- Operating instructions



Further information on the mating connectors and how to order them can be found in data sheet 50223, see chapter 1.2 "Required and amending documentation".

5 Product information

5.1 Performance description

ABZMS-41 float switches are used for filling level and temperature monitoring.

5.1.1 Filling level monitoring

The measuring tube is located in the tank. The reed chain (resistance measuring chain) is arranged inside the measuring tube. The reed chain functions like a normal resistance potentiometer and consists of a number of reed switches with resistors connected in series in parallel. The total length of the chain depends on the distance to be monitored.

If a reed switch is activated by a solenoid housed in a float, a resistance signal proportional to the position of the float is present at the output. If the float changes its position, more or fewer resistors are activated and the resistance signal changes according to the position of the float. The resistance signal passes through another converter and is evaluated by the display unit.

5.1.2 Temperature monitoring

The temperature is monitored via a temperature sensor (Pt100), which is mounted in the sensor tube.

The temperature switching outputs are designed as PNP transistors (see figure below).

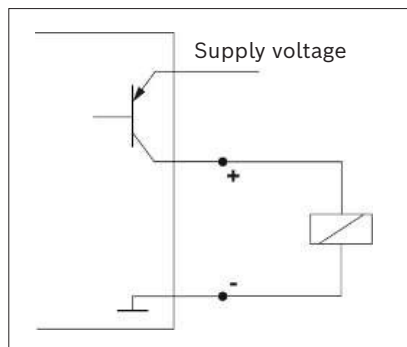


Fig. 1: PNP switching outputs

Depending on the design, several PNP switching outputs combined with an analog output (4-20 mA) are available. The temperature is shown on the display.



When measuring the PNP switching output with high-impedance measuring device inputs or when using it as a frequency output, a 10 k Ω resistor must be connected between the output and ground (GND) to prevent incorrect measurements.

5.2 Product description

Float switches are switching devices operated by a float moved by fluid. These are used to control fluid levels in power unit tanks.

5.2.1 Overview of the series and models

The following series are available:

- Float switch, type ABZMS...M
- Float switch, type ABZMS...RTA
- Float switch, type ABZMS...LTD
- Float switch, type ABZMS...D

The following models are available:

Table 6: Available models

ABZMS... float switch	
M1 to M4	1 to 4 switching contacts (level), normally closed contact or normally open contact
M1-T70F to M3-T70F	1 to 3 switching contacts (level), normally closed contact or normally open contact and temperature contact 70 °C, normally closed contact (option 60/80 °C)
M1-TS to M3-TS	1 to 3 switching contacts (level), normally closed contact or normally open contact and temperature sensor Pt100
M1-TA to M3-TA	1 to 3 switching contacts (level), normally closed contact or normally open contact and resistance thermometer (temperature); analog output 4 to 20 mA
RTA	Resistance measuring chain (level) and resistance thermometer (temperature); analog output 4 to 20 mA
LTD	Resistance measuring chain (level) and resistance thermometer (temperature); IO-Link output and a programmable PNP switching output
D1	Display and control unit with resistance measuring chain (level), resistance thermometer (temperature) and four programmable PNP switching outputs
D2	Display and control unit with resistance measuring chain (level), resistance thermometer (temperature) and two programmable PNP switching outputs and two programmable analog outputs 4 to 20 mA (analog output programmable in 0-10 V, 2-10 V, 0-5 V). Two PNP switching outputs can be assigned as frequency output.
D3	Display and control unit with resistance measuring chain (level), resistance thermometer (temperature), IO-Link output and programmable PNP switching output

5.2.2 Display and control unit for the D1, D2 and D3 models

The ABZMS-41 D1, D2 and D3 float switches have an additional display and control unit for level and temperature setting. The display unit, which is mounted on a flange, can be rotated by approx. 270° around the vertical axis to make the display easier to read.

5.2.3 Switching points for the Mx and RTA models

Models Mx

The contacts operated by the float are fastened to a galvanically gold-plated contact strip (with cm scale) by means of plastic screws. The contact housings are color-coded and may only be mounted on the contact strip in the given order. They are positioned according to the order data ex works and can be adjusted upwards or downwards retroactively.



Observe the minimum distances (40 mm) when positioning the contact housings!

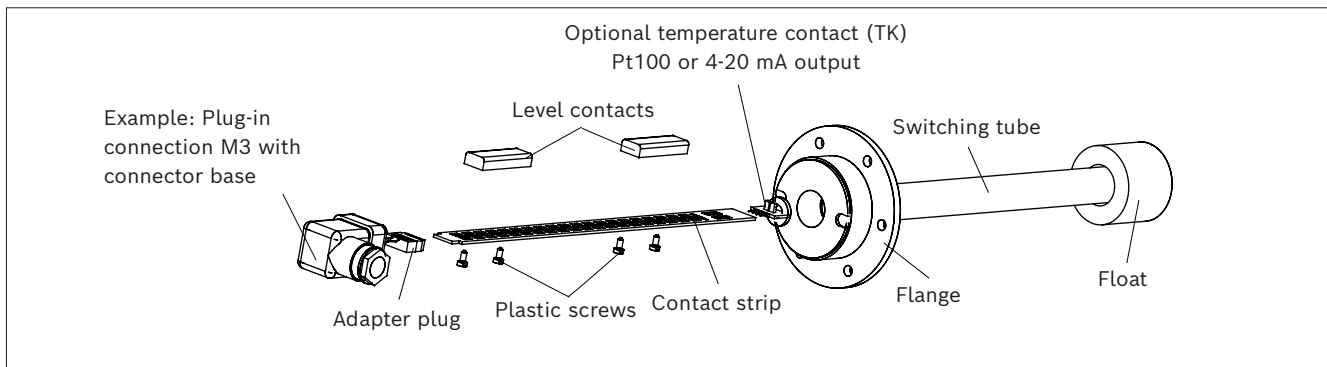


Fig. 2: Set-up of Mx models for positioning the switching points

Model RTA

In models with permanent level output (RTA), no changes can be made. They are fixedly set ex works (analog output: 4 mA = tank empty; 20 mA = tank full).

5.2.4 Switching function of the switching points for the Mx models

The contacts are designed as normally open (NO) or normally closed (NC) contact, depending on the order. As the contacts are bistable, any subsequent change in the contact function is possible by rotating the contacts by 180°. On the contact housing, there are two arrows. The arrow pointing upwards in the installed condition indicates the valid contact function.

Example:

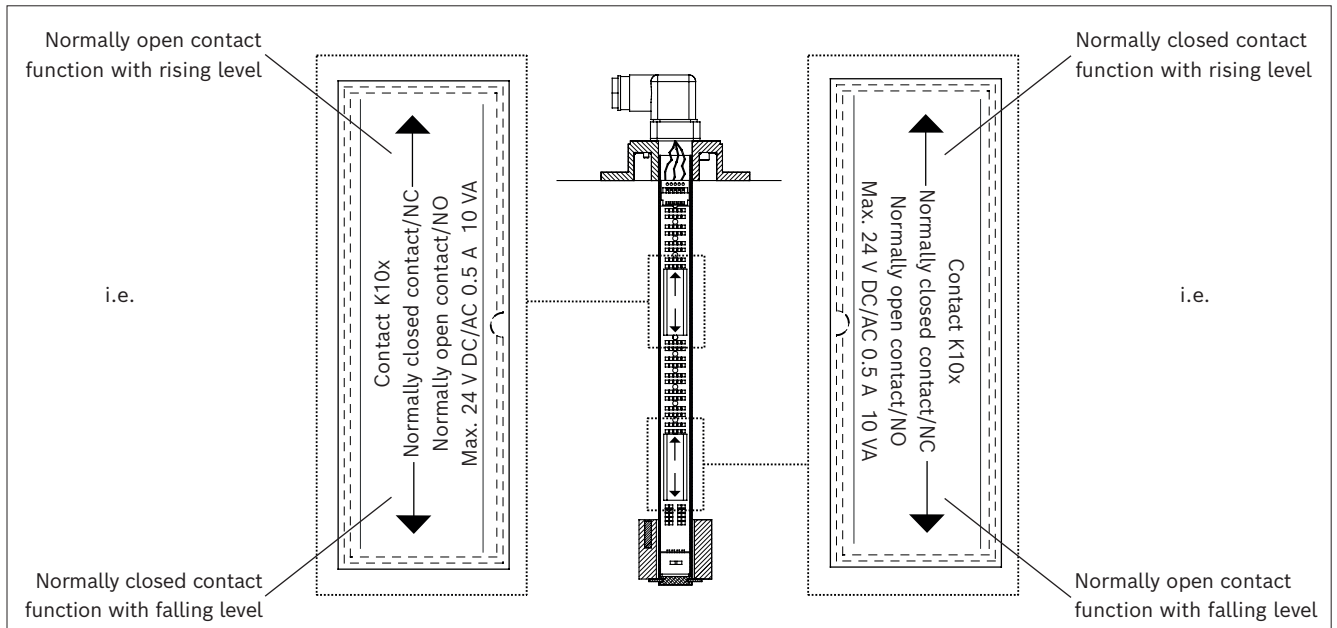


Fig. 3: Information with sinking oil level

5.2.5
Notes on the life cycle extension of reed contacts

Due to their construction, reed contacts are very durable and reliable components. Nevertheless, the following should be observed:

Contact protection
Excessive inductive loads creating high reverse voltages when a reed switch is opened can be reduced by means of the following circuit:

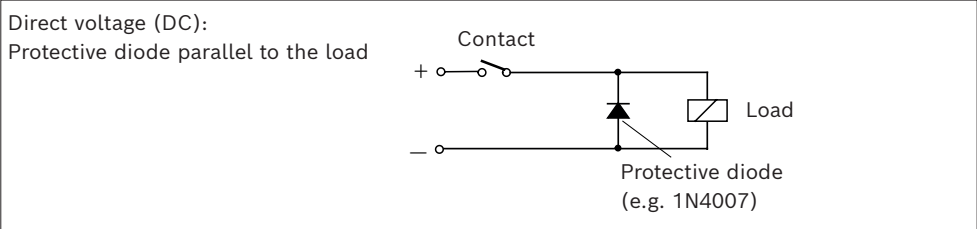


Fig. 4: Contact protection, direct voltage

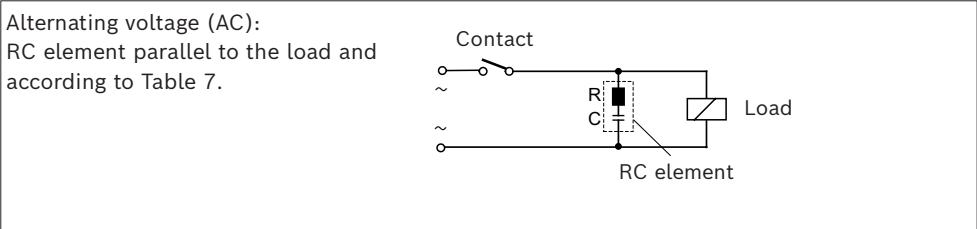


Fig. 5: Contact protection, alternating voltage

Table 7: Contact protection, alternating voltage

VA Voltage at the open contact	10		25		50		75		100	
	R/Ohm	C/μF	R/Ohm	C/μF	R/Ohm	C/μF	R/Ohm	C/μF	R/Ohm	C/μF
24 AC	22	0.022	1	0.1	1	0.47	1	1.0	1	1.0
48 AC	120	0.0047	22	0.022	1	0.1	1	0.47	1	0.47
115 AC	470	0.001	120	0.0047	22	0.022	22	0.047	22	0.1
230 AC	470	0.001	470	0.001	120	0.0047	120	0.022	120	0.022

5.2.6 Display ranges

Table 8: Display ranges of the units

Name	Menu/unit	Display	Range from/ with unit	Range to/ with unit
Temperature				
°C	<i>C</i>	<i>C</i>	-100 °C	999 °C
°F	<i>F</i>	<i>F</i>	-100 °F	999 °F
Filling level				
Percentage	<i>- l -</i>	<i>-</i>	-100%	999%
cm	<i>cm</i>	<i>c</i>	-100 cm	999 cm
inch	<i>in</i>	<i>i</i>	-100 inch	999 inch
Liter	<i>L, l</i>	<i>L</i>	-100 liters	999 liters
Gallon	<i>Gal</i>	<i>G</i>	-100 gallons	999 gallons
Without				
None	<i>nan</i>	None	-1000	9999
None	<i>nan 1</i>	None	-100.0	999.9
None	<i>nan 2</i>	None	-10.00	99.99

5.3 Product identification

There is a sticker on the side of the ABZMS-41 float switch with the most important information.

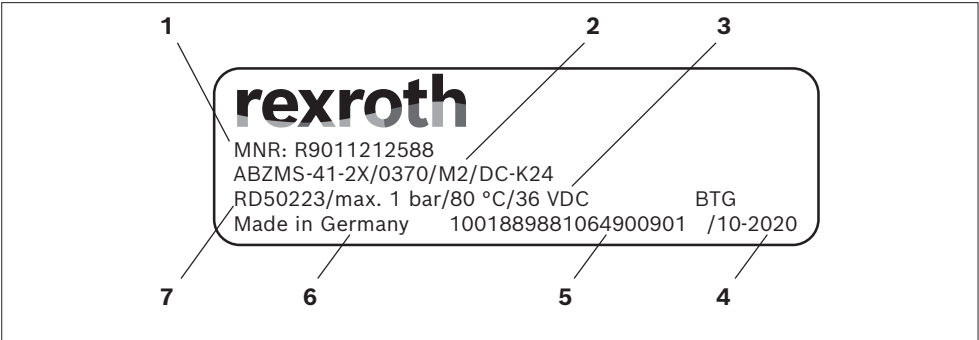


Fig. 6: Name plate

- 1

Material number
- 2

Type code
- 3

Technical data
- 4

Date of manufacture
- 5

Rexroth internal number
- 6

Country of origin
- 7

Data sheet number

6 Transport and storage

- For storing and transporting the product always observe the environmental conditions specified in the technical data of data sheet 50223.

6.1 Transporting the ABZMS-41 float switch

- Transport the ABZMS-41 float switch in its original packaging or a suitable replacement.

6.2 Storing the ABZMS-41 float switch

To store the ABZMS-41 float switch, proceed as follows:

- Use the original packaging for storage.
- Store the float switches at room temperature.
- Protect the float switches from dust, humidity and UV radiation.

7 Assembly



WARNING

Electrical voltage!

Risk of injury caused by electric shock!

- ▶ Only wire the float switch when it is de-energized.
- ▶ When connecting, observe the maximum admissible voltages and currents and design the required line cross-sections and circuit breakers accordingly.
- ▶ When selecting the connection lines, observe the maximum admissible operating temperatures.
- ▶ Ensure that the operating voltage does not exceed 16 V AC effective or 35 V DC when installing the float switch in wet or outdoor areas.

NOTICE

High potential differences when connecting or disconnecting connectors under voltage (only 230 V)!

Destruction of the float switch! Damage to property!

- ▶ De-energize the relevant system part before assembling the float switch or when connecting and disconnecting connectors.

**Valid for the models:
M1 (VAC), M2 (VAC),
M1-T70F (VAC) and
M2-T70F (VAC)**

7.1 Installation conditions

- ▶ Install the ABZMS-41 float switch vertically ($\pm 10\%$).

7.2 Assembling the ABZMS-41 float switch

- ▶ Screw the switching tube for direct tank attachment into the intended bore (according to DIN 24557, part 2) with the cork seal at the tank.
- ▶ Attach the switching tube to the DIN flange using the enclosed screws and seals.
 - Tighten the screws to a suitable torque.
 - In this connection, ensure that the float is freely movable and that the distance to the tank wall and installations is sufficient.
- ▶ After a possible disassembly of the float, ensure that the solenoid in the float is above the fluid level. The easiest way to check this is by means of an iron part by means of which you determine the position of the solenoid in the float.

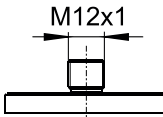
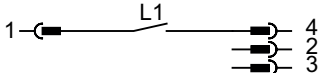
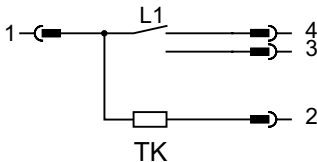
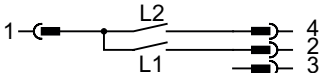
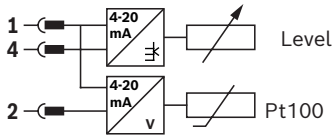
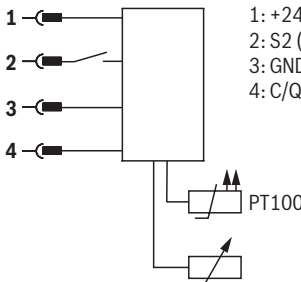


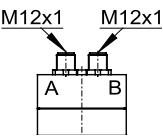
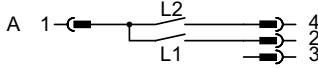
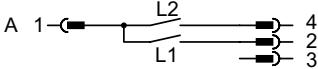
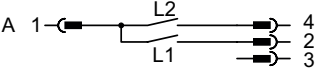
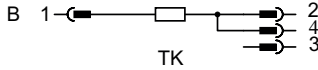
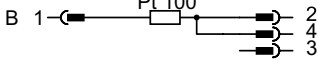
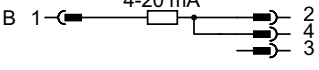
The display unit of the display and control unit can be rotated by approx. 270° around the vertical axis and has an integrated rotation stop. When the stop is reached, you will feel increased resistance. A rotation beyond this stop can damage the display unit.

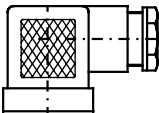
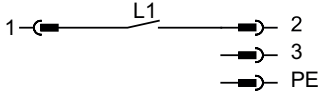
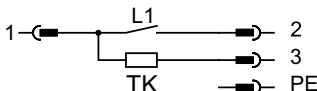
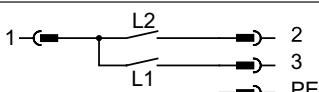
7.3
Connecting the voltage supply

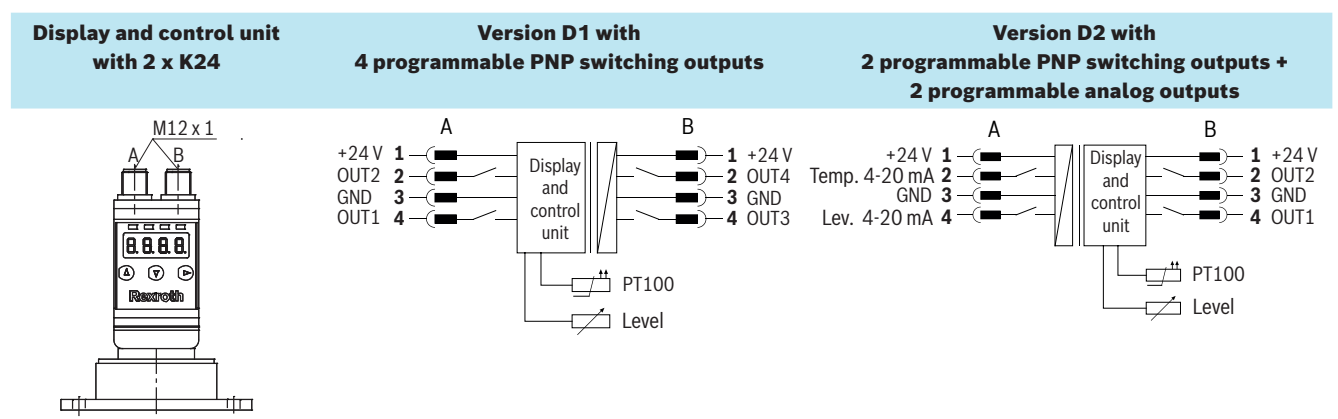
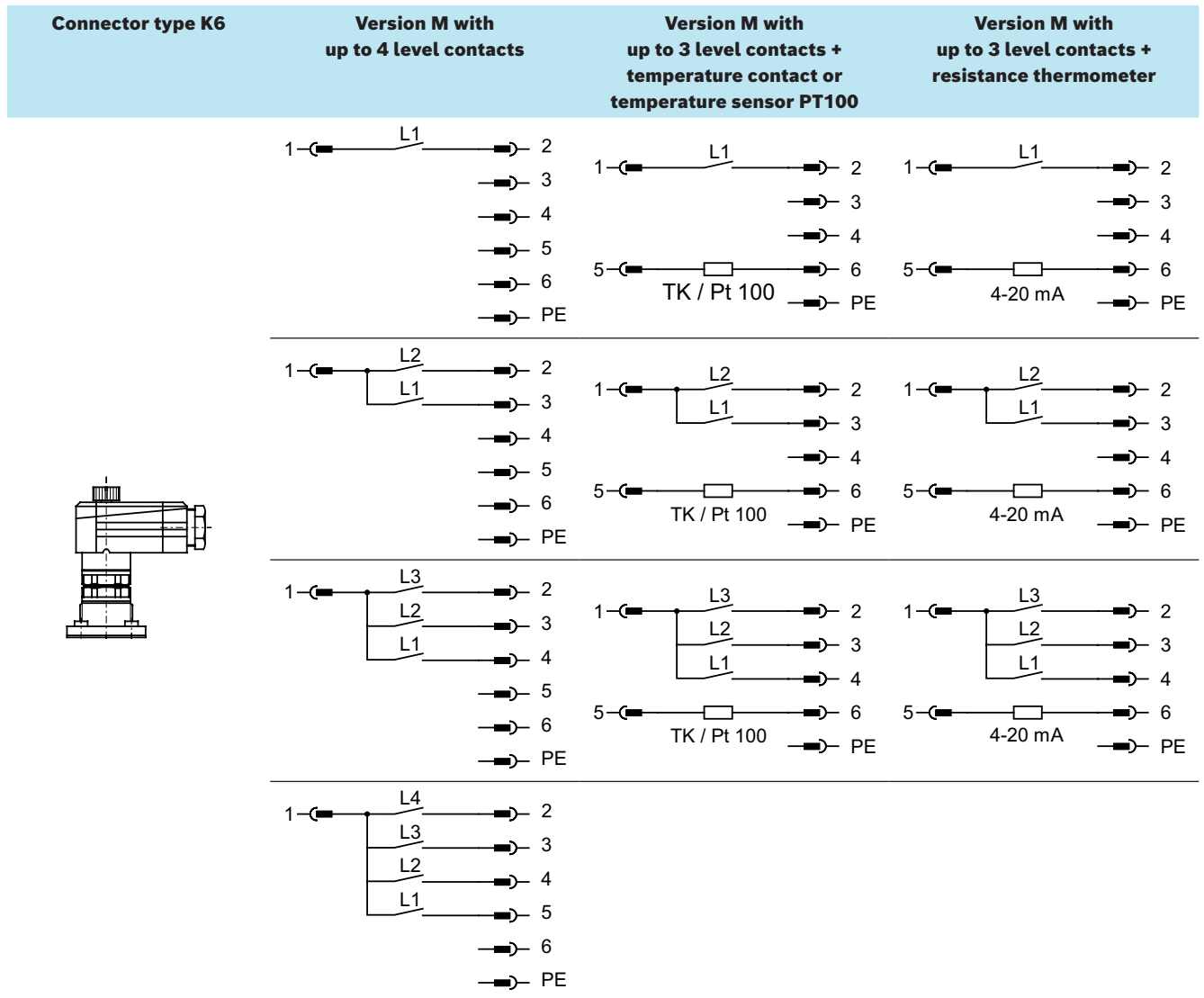
The voltage is supplied via the device connectors.

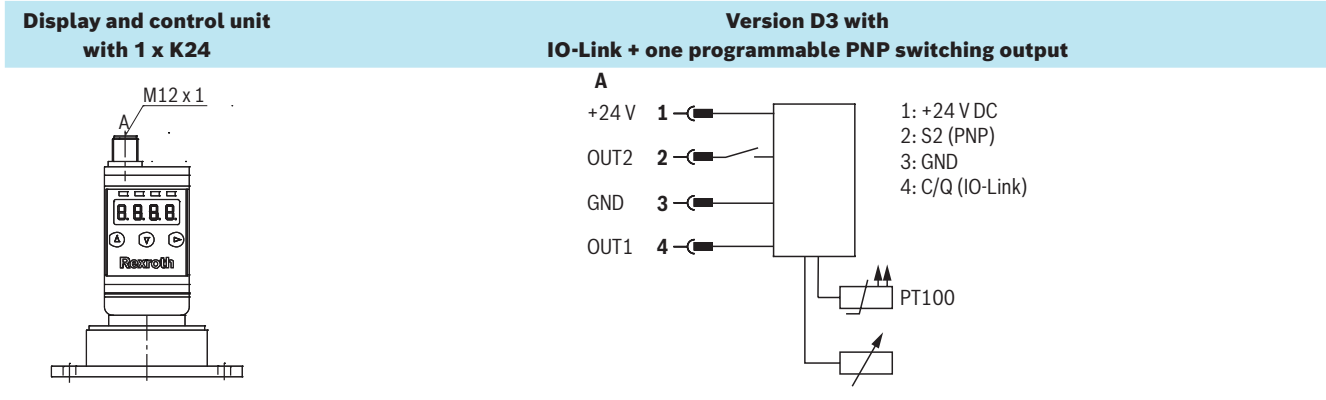
7.3.1
Connection versions and pin assignment

Connector type K24		Version M with 1 or 2 level contacts	Version M with 1 level contact + 1 temperature contact
			
			
	Version RTA with level output 4-20 mA + temperature output 4-20 mA +24 V DC 4-20 mA Level 4-20 mA Temperature 	Version LTD with IO-Link + one programmable PNP switching output +24 V OUT2 GND OUT1  1: +24 VDC 2: S2 (PNP) 3: GND 4: C/Q (IO-Link)	

Connector type 2K24		Version M with 2 level contacts + 1 temperature contact	Version M with 2 level contacts + temperature sensor PT100	Version M with 2 level contacts + resistance thermometer
	A			
	B			

Connector type K14		Version M with 1 or 2 level contacts	Version M with 1 level contact + 1 temperature contact
			
			





7.3.2 Voltage supply variants

Table 9: Voltage supply plug-in connector variants

Function	Voltage				VAC 10-230	
	K24	VDC 10-36 2K24	K14	K6	K14	K6
M1	X	-	X	X	X	X
M2	X	-	X	X	X	X
M3	-	-	-	X	-	-
M4	-	-	-	X	-	-
M1-T70F	X	-	X	X	X	X
M2-T70F	-	X	-	X	-	X
M3-T70F	-	-	-	X	-	-
M1-TS	-	X	-	X	-	-
M2-TS	-	X	-	X	-	-
M3-TS	-	-	-	X	-	-
M1-TA	-	X	-	X	-	-
M2-TA	-	X	-	X	-	-
M3-TA	-	-	-	X	-	-
RTA	X	-	-	-	-	-
LTD	X	-	-	-	-	-
D1	-	X	-	-	-	-
D2	-	X	-	-	-	-
D3	X	-	-	-	-	-

7.4 Adjustment of the switching point positioning for the Mx models



In this connection, also refer to chapter 5.2.3 "Switching points for the Mx and RTA models".

For positioning the switching points, proceed as follows:

- 1.** Disconnect the voltage supply.
- 2.** Disconnect the plug-in connections.
- 3.** Unscrew the connector base and carefully pull it out upwards together with the adapter plug and the contact strip.
- 4.** Loosen the plastic screws on the contacts and reposition the contacts using the cm scale on the back of the contact strip (adjustment in increments of 1 cm).
- 5.** Tighten the plastic screws for contact fastening hand-tight.
- 6.** Ensure during the assembly that the adapter plug is re-applied to the contact strip in the correct way. This can be seen from the red mark at the adapter plug and the contact strip.

7.5 Adjustment of the switching function of the switching points for the Mx models



In this connection, also refer to chapter 5.2.4 "Switching function of the switching points for the Mx models".

To adjust the switching function of the switching points, proceed as follows:

- Rotate the contacts 180°.

The arrow pointing upwards on the contact housing in the installed condition indicates the valid contact function.

8 Commissioning and operation

8.1 Switch-on procedure

The respective device switches on immediately when it is connected to the supply voltage.

8.1.1 Models without display and control unit

The models without display and control unit are immediately ready for operation after connection of the supply voltage.

8.1.2 Models with display and control unit

On models with display and control unit, the software version appears briefly at the beginning. At the same time, the device checks the installed components. Afterwards, the display changes to the measured value display.

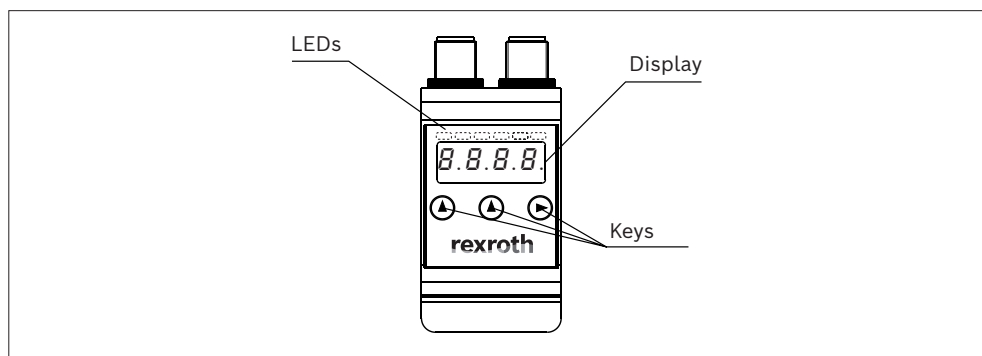


Fig. 7: Display and control unit



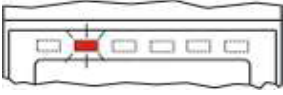
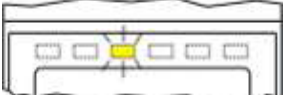
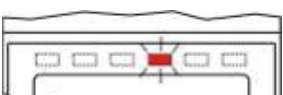
If an error message appears on the display during operation, you will find a list of problems or errors at Table 18 "Error messages".

8.2 LED status displays

The six LEDs above the display, see Fig. 7, indicate the status of the switching outputs. They are fixedly assigned to the switching outputs.

The following table shows the factory settings for the assignment of the switching outputs to filling level and temperature:

Table 10: LED status displays

LED ¹⁾	Associated switching output	2 switching outputs	4 switching outputs
	LED 1 – yellow Status of switching output 1	Filling level	Filling level
	LED 2 – red Status of switching output 2	Temperature	Filling level
	LED 3 – yellow Status of switching output 3	-	Temperature
	LED 4 – red Status of switching output 4	-	Temperature

1) The two LEDs on the right have no function.



The LEDs' switching behavior (illuminated in case of closed or open switching contact) can be changed.

8.3 General key functions

Operation is effected using the keys below the display. A detailed explanation of the menu control is contained in the following chapters.

Table 11: Key functions

Key	Mode	Function
▶	Measured value display:	Change of the displayed measurement; example:  (▶) 
	In the menu:	Change to a subordinate menu Change to the superior menu
	At the end of the menu:	(Exit) signals the end of the menu 
	After input/selection:	Confirming and saving an entered numerical value or a function selection. The display flashes when the parameter is changed.
▲	Measured value display:	Display of the configuration, see chapter 8.5
	In the menu:	Going to the next menu item, numerical value or function selection. If the key is kept pressed, this is done continuously.

Key	Mode	Function
▼	Measured value display:	Change to the main menu
	In the menu:	Going to the previous menu item, numerical value or function selection. If the key is kept pressed, this is done continuously.
▼+► ¹⁾	In the menu:	Exiting the main / sub- / optional menu and going back to the measured value display
▲+► ¹⁾	In the menu:	Changing to the next higher menu level
No action for 60 s ¹⁾	In the menu:	Exiting the main / sub- / optional menu

¹⁾ If the optional or setup menu is exited, the changed values will not be stored.

For selecting a menu item and setting the values, proceed as follows:

- ▶ Open the main menu with the ▼ key.
- ▶ Select the submenu with the ▼ and ▲ keys and open the submenu with the ► key.
- ▶ If necessary, select the next submenu with the ▼ and ▲ keys and open it with the ► key.
- ▶ Select the desired menu item with the ▼ and ▲ keys and open the value list with the ► key.
- ▶ Set the value with the ▼ and ▲ keys and confirm with the ► key.

The changed settings are stored and the device returns to the submenu.

- ▶ Exit the submenu by selecting the EXIT menu item and confirm it with the ► key.

The device returns to the superior menu or the measured value display.

8.4 Active key lock

When the key lock is activated, the following display  will appear instead of the main menu when calling the menu using the ▼ key. The active number is marked by a point.

- ▶ Enter the code using the ▼ and ▲ keys and confirm with the ► key.

The active number is moved one digit to the right.

After entering the 3rd digit, the main menu opens.

If a wrong numerical code is entered, the device jumps back to the measured value display. If you have forgotten the password, you can access the menu at any time by means of the master code 287.

You can cancel the key lock by resetting the code with the entry 000 in the (Loc) menu item in the **Basic Adv. Functions** (bEF) submenu.

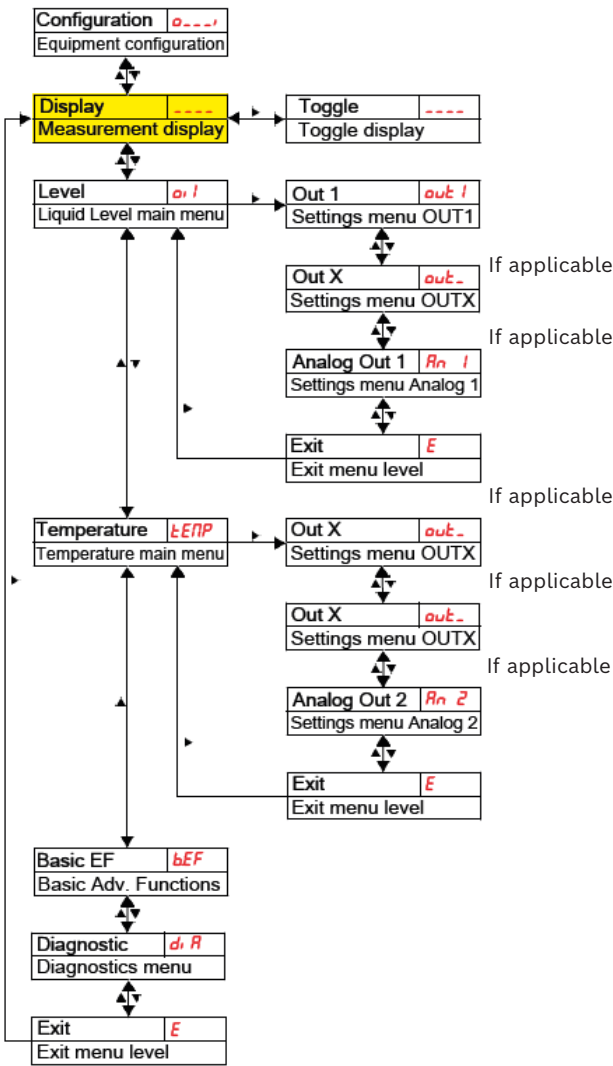
8.5 Menu overview

The menu structure is based on the VDMA standard sheet 24574 et sq. The menu has a hierarchic structure. The topmost menu level contains the main menu entries, e.g. *o*1**, *t*ENP**, *b*EF**, *d*i* R*, *E*. Each main menu contains more submenu items. The menu items may vary depending on the device configuration. Not all menu items described in the following may be available in your device.

- You can call the configuration by pressing the ▲ key in the display mode.

A 4-digit code will be displayed, e.g.

		Whereas the 4 digits tsav have the following meaning:	
t: Type		t = Temperature measurement	
s: Number of switching outputs		o = Level and temperature measurement	
a: Number of analog outputs		2 or 4	
v: Assembly type of the devices		0 or 2	
		i = Standard assembly (tank installation)	



The individual menu items will not appear if the option is not available. Example: With a = 0, the menu items for setting the analog output are not available. You can then skip the description of these points.

The structure of the main menu **Level** (*o*1**) and **Temperature** (*t*ENP**) is identical. Here, the settings for the switching outputs and/or the analog outputs (if available) are made.

The basic settings of the device can be changed. Generally valid settings are made in the **Basic Adv. Functions** (*b*EF**) menu. These settings should be made first as they influence the displays and setting options in the individual menus. Such settings include e.g. the units used and the assignment of the switching outputs to filling level and temperature measurement. The assignment of the analog outputs cannot be changed.

In addition, diagnosis possibilities are available in the **Diagnostic** (*d*i* R*) menu.

A detailed representation of the entire menu structure can be found in the appendix, see chapter 15 in these instructions.

8.6 Changing the basic settings

In the **Basic Adv. Functions** (*bEF*) menu, the generally valid basic settings are made. These settings influence the representation in the measured value display as well as the setting options in the various main menus. The assignment of the switching outputs can also be changed here.

- ▶ In order to access the main menu, press the ▼ key.
- ▶ Select the (*bEF*) menu item using the ▼ and ▲ keys and open the menu using the ► key.

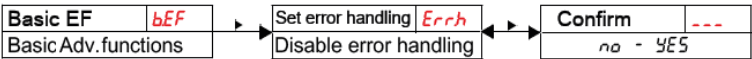
8.6.1 Disabling normal error handling

Here you can activate/deactivate the normal error handling and evaluation.



Disabling normal error handling and evaluation may lead to hazardous operating conditions and consequently to hazards for operators or machines. Before using this option, check the hazard potential within your process. Bosch Rexroth AG accepts no responsibility for any damage to health or material damage that may occur as a result of this setting.

The **Disable error handling** (*Errh*) function deactivates normal error handling and evaluation.



 Optional settings: [no, YES]	The following options are available:	
	 Deactivates normal error handling.	 Activates normal error handling (standard setting).



If the measuring range is exceeded or sensor errors occur, the measured value is frozen and all six LEDs in the status bar flash. When the measured value is back within the valid range, the LEDs stop flashing and the display is updated normally again.

8.6.2 Setting the unit for the filling level

Here, the displayed unit symbol for the filling level is determined.

Basic EF	bEF
Basic Adv. Functions	

Set Unit Level	awni
Liquid Level unit	

Selection menu	---
	- / - - non

Optional settings:
[- / -, cn, in, Lit, GAL, non]

The following options are available:

Percentage

Centimeter

Inch

If "non (without unit)" is selected, the display will scale the measured values to a four-digit output.

The measured values are not converted automatically. After changing the unit (if necessary), the measurement range should be scaled (see menu **Level** (aHi) and (aLo)).

8.6.3 Setting the unit for the temperature

Here, the displayed unit symbol for the temperature is determined.

Basic EF	bEF
Basic Adv. Functions	

Set Unit Temp	twni
Temperature unit	

Selection menu	-
	C - F

Optional settings:
[°C, °F]

The following options are available:

Degree Celsius

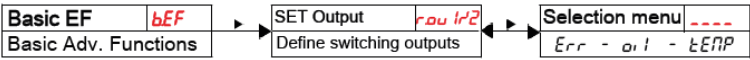
Degree Fahrenheit



The measured value conversion and the adjustment of the measurement range are carried out automatically. Nevertheless, the corresponding switching and switch-back points must be checked.

8.6.4 Defining switching outputs

Here you can define the switching outputs.
By means of the **Define switching outputs** function, you can define the switching outputs (*rou1* and *rou2*). It is possible to define the switching outputs as *Err*, *oil* and *TEMP*.



Optional settings:
[Err, oil, TEMP]

The following options are available:

Err

oil

TEMP

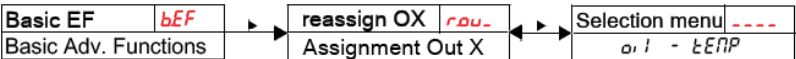


Alternatively, switching outputs 1 and 2 can be wired as error indicators. In this case, the output is wired as a normally closed contact that opens when the range is exceeded or another error state occurs. However, the LED assigned to the output is not always activated, as all 6 LEDs in the status bar flash when an error occurs.

If a switching output is defined as an error indicator, it is no longer offered in the normal switching output settings.

8.6.5 Reassignment of the switching outputs

Change of the switching output assignment is here described for switching output 1. The procedure can be transferred to all other switching outputs.



The switching outputs 1 to n can be freely assigned to the filling level or temperature measurement. The assignment will influence the appearance of the **Level** (*oil*) and **Temperature** (*TEMP*) menu. In the factory setting, the OUT 1 switching output is assigned to the filling level.

Example: OUT 1 is to be assigned to the temperature. For this purpose, *rou1* must be set to *TEMP*. This results in the shifting of the *oil* setup menu from the **Level** menu into the **Temperature** menu. The procedure for changing the settings does not change.



In the reassignment of the switching outputs, all related settings have to be checked. The values set in advance are not adjusted automatically. The assignment of the LEDs to the status display does not change.

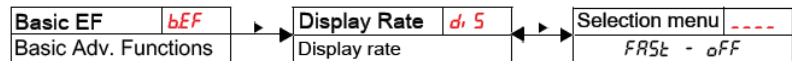
 Optional settings: [0.1, 1ENP]	The following options are available:  Filling level measurement  Temperature measurement
---	--

Assignment of the other switching outputs to the filling level or temperature measurement is realized in the same way as for switching output 1.

- Perform the same steps as described for the OUT 1 switching output.

8.6.6 Setting the display's update rate

Depending on the application, the display's update rate can be set. The display can also be switched off completely. The function of the LED remains unchanged.



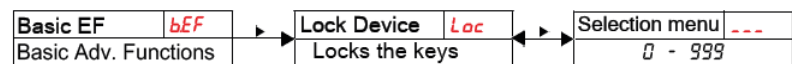
 Optional settings: [FRSt, nEdt, SI o, oFF]	The following options are available:  fast  medium  slow  Display off (off)
---	--



Error messages will be displayed despite switched-off display.

8.6.7 Activating/deactivating the key lock

In order to prevent unauthorized changes in the device settings, a key lock can be set up.



The key lock is activated if at least one number > 0 is entered. During the entry, the active number is marked with a point.

 Setting range: 000 to 999	► Open the value list by means of the ► key:  ► Set the digit using the ▼ and ▲ keys (0 to 9) and confirm with the ► key. The active number is moved one digit to the right. ► Finally confirm the code by means of the ► key. The device returns to the submenu.
--	--



Canceling the key lock with the entry: 000.

8.6.8 Scaling the display range for the filling level

The display range is scaled between the highest and the lowest point of the float. The display accuracy and the resolution for the determination of the switching outputs for the filling level are also influenced by this scaling.

The factory setting of the switching points and the display is shown in the following figure:

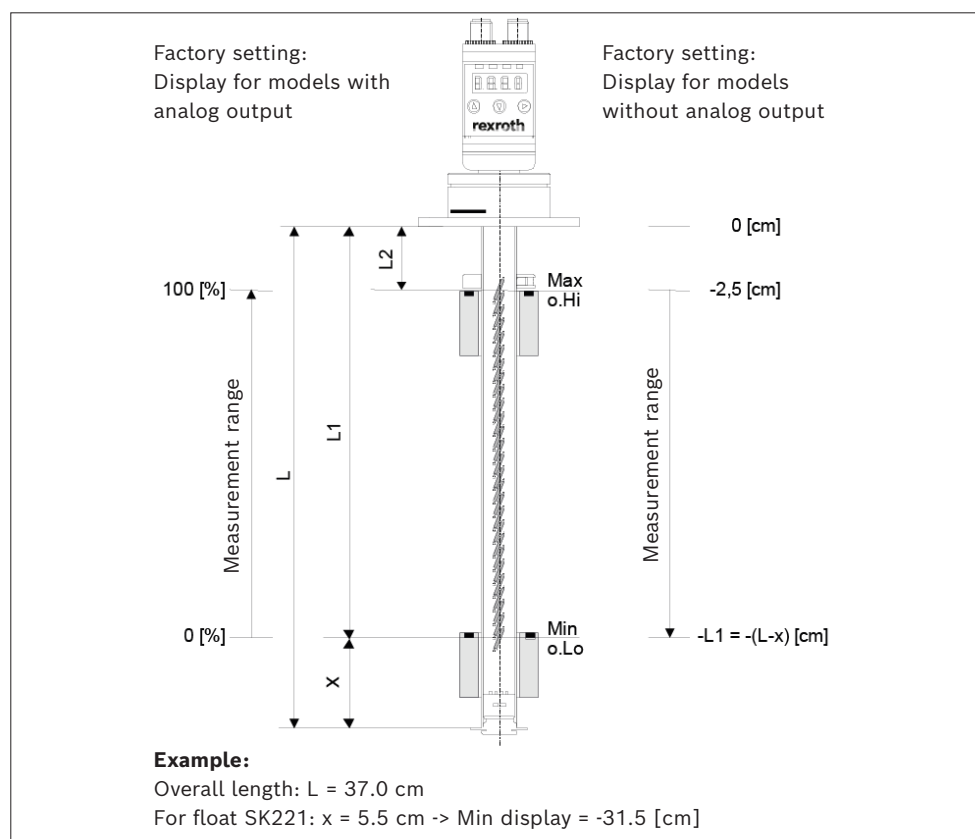


Fig. 8: Filling level display range

Models with analog output:

In the factory setting, the display increases as the filling level increases so that 0% is displayed at the lowest possible point and 100% at the highest possible point. These values can be changed as described below.

Models without analog output:

As the installation situation is not known in the factory, the distance of the float to the flange level in cm is shown as default setting. As with a falling filling level, this results in a greater value, this is relativized by putting a minus sign in front of the display value.

In a level switch with a length of 37.0 cm, the value rises e.g. from -31.5 (cm) to -2.5 (cm) when the level rises. These values can be changed as described below.

8.6.9 Filling level: maximum display value

Here, the largest display value (upper limit of the measurement range) for the maximum filling level is determined.

Basic EF

bEF

Basic Adv. Functions

→

Set Upper

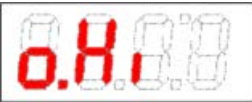
aHi

Assign 100 %

↔

Selection menu

-999 - 9999



Setting range:
-999 to 9999

Assignment of the largest display value (upper limit of the measurement range) to the maximum filling level.



With the attached sensor, the display range is already pre-set to 0-100%.

8.6.10 Filling level: minimum display value

Here, the smallest display value (lower limit of the measurement range) for the minimum filling level is determined.

Basic EF

bEF

Basic Adv. Functions

→

Set Lower

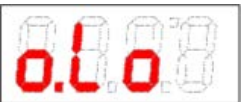
aLo

Assign 0 %

↔

Selection menu

-999 - 9999



Setting range:
-999 to 9999

Assignment of the smallest display value (lower limit of the measurement range) to the minimum filling level.



With the attached sensor, the display range is already pre-set to 0-100%.

8.6.11 Restoring factory settings (reset)

By means of the **Reset** (*rE5*) function, the factory settings can be restored. When doing so, all changes will be lost. As the limit values are also reset, the settings for the filling level and the temperature must mandatorily be checked.

Basic EF

bEF

Basic Adv. Functions

→

Reset

rE5

Factory setting

↔

Confirm

no - YES



Optional settings:
[no, YES]

The following options are available:



Condition as supplied:
No, the current settings are maintained.



Condition as supplied:
Yes, the settings are reset to the standard factory settings.

Below you will find a list of the factory settings.

Table 12: Factory settings

Definitions of the factory settings:	
<i>SPx / rPx</i>	Switching point / switch-back point x
<i>dSx / drx</i>	Switch-on delay / switch-back delay for switching output x
<i>RxHi / RxLo</i>	Maximum and minimum measured value for the output
<i>RouX</i>	Signal form of the analog output
<i>ouX</i>	Switching characteristic of switching output x
<i>ouni / tuni</i>	Unit for filling level / temperature
<i>aHi / aLo</i>	Maximum / minimum filling level
<i>rouX</i>	Assignment of the switching output x to the filling level or temperature monitoring
<i>di S</i>	Display update rate
<i>Loc</i>	Key lock
<i>Sdau</i>	Logged switching output
<i>dafln</i>	Delay for recording the minimum / maximum filling level
<i>dtfln</i>	Delay for recording the minimum / maximum temperature

Table 13: Version with 4 switching outputs

Switching outputs		Basic settings		Diagnosis	
<i>SP1 / rP1 *</i>	-(L-7.0 cm) / -(L-6.0 cm) *	<i>ouni</i>	<i>cn</i>	<i>Sdau</i>	<i>out1</i>
<i>dS1 / dr1 / ou1</i>	0 / 0 / Hno	<i>tuni</i>	<i>l</i>	<i>dafln</i>	00
<i>SP2 / rP2 *</i>	-(L-9.0 cm) / -(L-8.0 cm) *	<i>aHi</i>	-2.5 cm**	<i>dtfln</i>	00
<i>dS2 / dr2 / ou2</i>	0 / 0 / Hno	<i>aLo</i>	-(L-x)cm*		
<i>SP3 / rP3 *</i>	70 / 65 l	<i>rou1</i>	<i>oi L</i>		
<i>dS3 / dr3 / ou3</i>	0 / 0 / Hno	<i>rou2</i>	<i>oi L</i>		
<i>SP4 / rP4 *</i>	80 / 75 l	<i>rou3</i>	<i>tENP</i>		
<i>dS4 / dr4 / ou4</i>	0 / 0 / Hno	<i>rou4</i>	<i>tENP</i>		
		<i>di S</i>	<i>FRSt</i>		
		<i>Loc</i>	000		

* Relating to the total length L of the level switch
x = 5.5 cm for stainless steel float SK 221
x = 3.5 cm for PU float SK 604

** Minimum distance to the flange

Table 14: Version with 2 switching outputs and 2 analog outputs

Switching outputs		Basic settings		Diagnosis	
<i>SP1 / rP1 *</i>	5% / 2% *	<i>ouni</i>	-1 - (%)	<i>Sdau</i>	<i>out1</i>
<i>dS1 / dr1 / ou1</i>	0 / 0 / Hno	<i>tuni</i>	<i>l</i>	<i>dafln</i>	00
<i>SP2 / rP2</i>	60 / 55 l	<i>aHi</i>	100% **	<i>dtfln</i>	00
<i>dS2 / dr2 / ou2</i>	0 / 0 / Hno	<i>aLo</i>	0%		
		<i>rou1</i>	<i>oi L</i>		
Analog outputs		<i>rou2</i>	<i>tENP</i>		
<i>R1Hi / R1Lo / Rou1</i>	0 / 100 / 1 l	<i>di S</i>	<i>FRSt</i>		
<i>R2Hi / R2Lo / Rou2</i>	0 / 100 / 1 l	<i>Loc</i>	000		

* Relating to the total length L of the level switch -x
x = 5.5 cm for stainless steel float SK 221
x = 3.5 cm for PU float SK 604

** Minimum distance to the flange = 2.5 cm

8.7 Switching outputs

All switching outputs are set in the same way. The number of the switching output is therefore shown with x. Call up the switching output to be set via the menu of the corresponding measurement (**OUT 1** or **TEMP**).

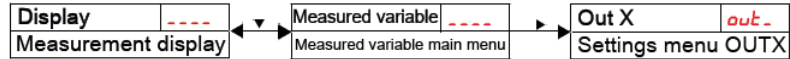


Table 15: Factory assignment of the switching outputs

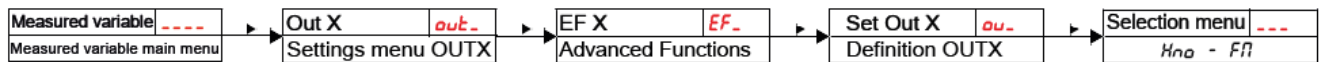
Switching output x	Assignment with 2 switching outputs	Assignment with 4 switching outputs
1	Filling level	Filling level
2	Temperature	Filling level
3	-	Temperature
4	-	Temperature

The assignment of the switching outputs as well as more basic settings referring to all switching outputs can be changed in the **Basic Adv. Functions** menu, see chapter 8.6.5 "Reassignment of the switching outputs".

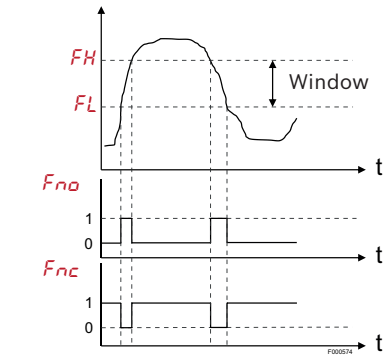
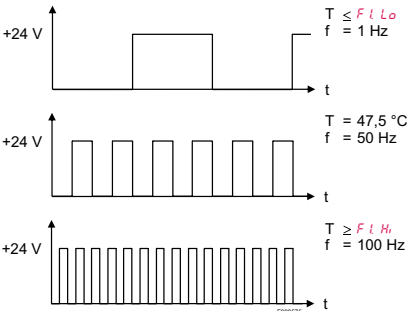
In the **Advanced Functions** submenu, more settings for each individual switching output can be made, which influence e.g. the switching behavior of the output. Here, the output can also be tested.

8.7.1 Switching output X: definition of the switching characteristic

The switching characteristic for the output is determined in the following menu:

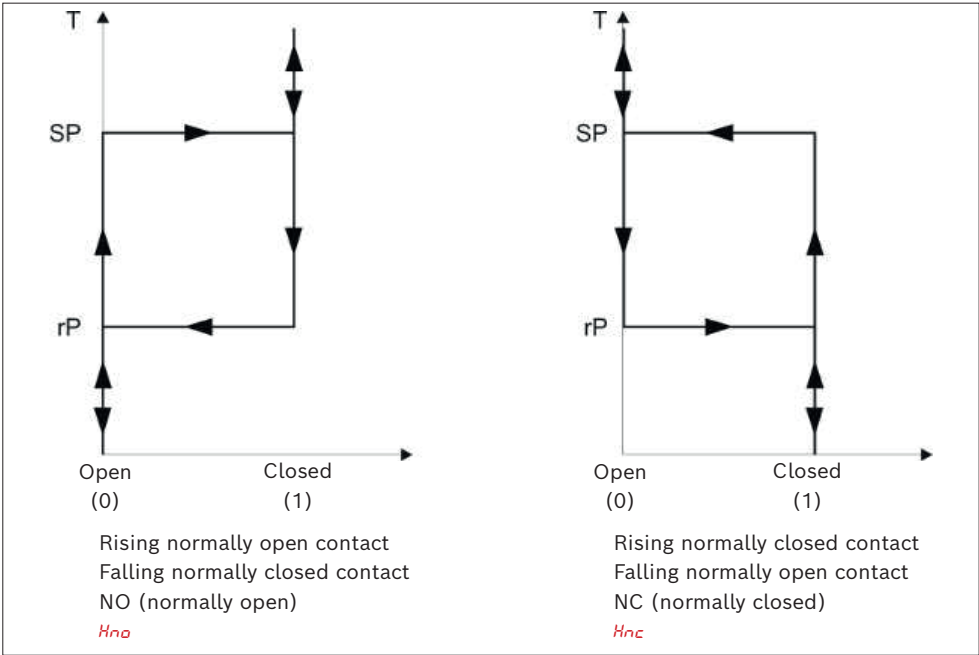


	The following options are available:	
Hysteresis function Hysteresis function as normally open contact Hysteresis function as normally closed contact	Normally open or closed contact function in which the output signal will be set if the set switching points are exceeded. The output signal is deleted if the value falls below the set switch-back point. Here, normally open contact (Hno) means that the PNP switching output is closed above the switching point SPx and opens again when the value falls below the switch-back point rPx. Here, normally closed contact (Hnc) means that the PNP switching output is open above the switching point SPx and closes again when the value falls below the switch-back point rPx. See also explanations to the diagram below.	Hno (Normally open contact) Hnc (Normally closed contact) SP-rP (Hysteresis) t (Time)

Window function  Window function as normally open contact  Window function as normally closed contact	Normally open or closed contact function by means of which a signal window is determined. If the measuring window is reached, the output signal is set; if the window is left, it will be deleted again. Here, normally open contact (F_{no}) means that the PNP switching output is closed if the value is within the window. Otherwise, the switching output is open. Here, normally closed contact (F_{nc}) means that the PNP switching output is open if the value is within the window. Otherwise, the switching output is closed.	 F_{no} (Normally open contact) F_{nc} (Normally closed contact) t (Time)
Frequency output  Frequency output	If the output is defined as frequency output, a rectangular signal with a frequency between 1 Hz and 100 Hz proportional to the set temperature value is output. Notice: In order to increase the edge steepness of the rectangular signal, we recommend loading the switching output with a 10 kΩ resistor.	Example: $F_{Lo} = 15\text{ °C}$, $F_{Hi} = 80\text{ °C}$ with temperature T and frequency f:  t (Time)

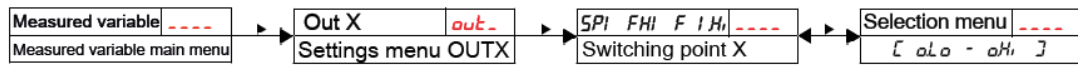


The switching function may have different designations:



8.7.2 Switching output X: upper switching limit (switching point)

The upper switching limit for the OUT X switching output is set in the following submenu:



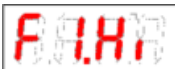
 Setting range: [aLo]...[aHi]	Switching point for OUT X
---	---------------------------



The switching point must be selected within the range limits (see **Basic Adv. Functions** menu).

If the OUT 1 switching output has been assigned the **Window** function,  will be displayed.

The set value corresponds to the upper window limit.

If the OUT 1 switching output has been assigned the **Frequency output** function,  will be displayed.

The set value corresponds to the frequency 100 Hz.

8.7.3 Switching output X: lower switching limit (switch-back point)

The lower switching limit for the OUT X switching output is set in the following submenu:



 Setting range: [aLo]...[aHi]	Switch-back point for OUT X
---	-----------------------------



The switch-back point must be selected within the range limits.

If the OUT 1 switching output has been assigned the **Window** function,  will be displayed.

The set value corresponds to the upper window limit.

If the OUT 1 switching output has been assigned the **Frequency output** function,  will be displayed.

The set value corresponds to the frequency 1 Hz.

8.7.4 Switching output X: switch-on delay

In the **Advanced Functions** *EF_* menu, further settings can be made for the OUT X switching output. The submenu is located on the second submenu level. The switching and switch-back delay time prevent the alarm from responding too frequently in case of unstable conditions. The switching delay is set in the following menu:

Measured variable *----*
Measured variable main menu

→

Out X *out_*
Settings menu OUTX

→

EF X *EF_*
Advanced Functions

→

Delay SP X *dS_*
Delay OUTX On

↔

Selection menu *---*
0 - 100



Setting range:
0...100 seconds

Time period in seconds during which the signal must be continuously available for the switching output to respond.



If the OUT X switching output has been assigned the **Window** function, the set value corresponds to the switch-on delay detecting the valid achievement of the measuring window.
If the OUT X switching output has been assigned the **Frequency output** function, this value will have no effect.

8.7.5 Switching output X: switch-back delay

The switch-back delay is set in the following menu:

Measured variable *----*
Measured variable main menu

→

Out X *out_*
Settings menu OUTX

→

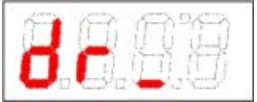
EF X *EF_*
Advanced Functions

→

Delay RP X *dr_*
Delay OUTX Off

↔

Selection menu *---*
0 - 100



Setting range:
0...100 seconds

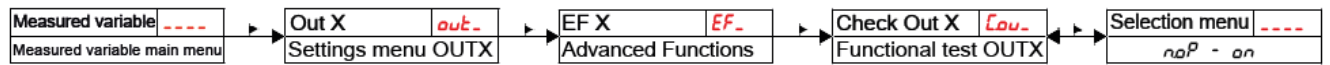
Delay of the switch-back signal for OUT X
Time period in seconds during which the signal must be continuously available for the switching output to respond.

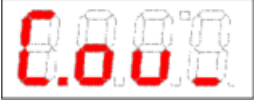


If the OUT X switching output has been assigned the **Window** function, the set value corresponds to the switch-back delay detecting the valid achievement of the measuring window.
If the OUT X switching output has been assigned the **Frequency output** function, this value will have no effect.

8.7.6 Switching output X: testing of the switching output

A test of the switching output can be started in the following menu:





Optional settings:
[noP, off, on]

Optional settings:
[noP, F 1, F 100]

Test possibility for the OUT X switching output
Options when setting *out* to *Hno* / *Hnc* / *Fno* / *Fnc*:

		
Normal operation of the switching output	Permanently deactivating the switching output	Permanently activating the switching output

Options when setting *out* to *Fn*:

		
Normal operation of the frequency output	Output Frequency 1 Hz	Output Frequency 100 Hz



After termination of the test, you should imperatively set the function to normal operation *noP*.

8.7.7 Changing the display function of the status LEDs

The switching status of the output is signaled by the LEDs in the display.

The assignment of the LED to the switching output can be seen from the following table:

Table 16: Assignment of the LEDs to the switching outputs

LED numbering	Switching output X	Assignment with 2 switching outputs	Assignment with 4 switching outputs
LED	1	LED 1: yellow	LED 1: yellow
1 2 3 4 5 6	2	LED 2: red	LED 2: red
	3	-	LED 3: yellow
	4	-	LED 4: red

In the factory setting, the LED indicates the physical condition of the PNP switching output (switching output closed – LED illuminated).

You might want the logical function of the display to work in a different way than the physical signal on the switching output. You can therefore also reverse this display in this menu item (switching output open – LED illuminated).

Example using the temperature

You have 2 switching outputs for the temperature, which are set as follows:

- **Switching output 1:** Max. contact, rising normally open contact.
The LED is illuminated if the maximum temperature value is exceeded and the temperature is outside the desired range. So the indicated status is "error" if the LED is illuminated.
- **Switching output 2:** Min. contact, rising normally open contact.
So with the factory setting, the LED is illuminated if the minimum temperature value is exceeded. So in this case, the LED would be illuminated if the status is ok.

The table shows an example with the factory setting and with inverted status function for LED3. The switching points are defined as follows:

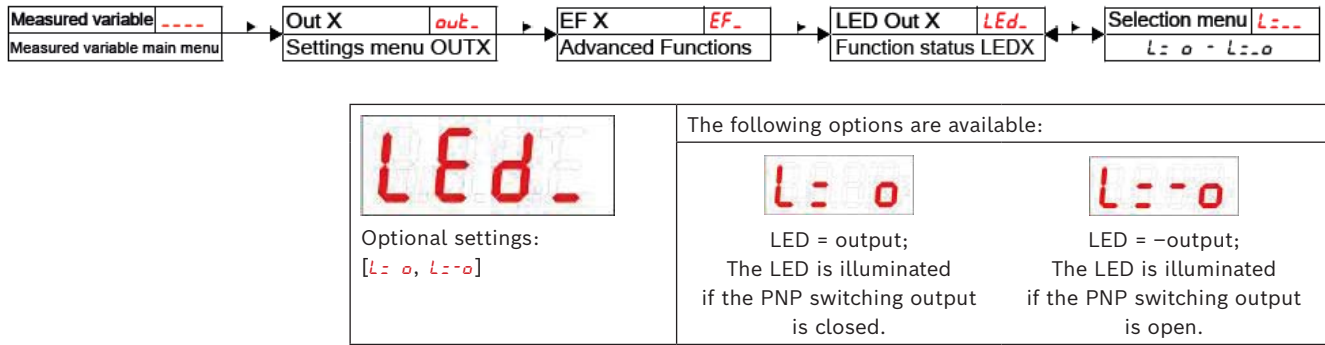
SP3 = 70 °C, rP3 = 65 °C

SP4 = 80 °C, rP4 = 75 °C

Table 17: Example

	Factory setting	Status function LED3 inverted	Condition	Status
A	  LED3 ON	  LED3 OFF	Temperature increases to > 70 °C PNP switching output 3 closed	OK
B	  LED4 and LED3 ON	  Only LED4 ON	Temperature increases to > 80 °C PNP switching output 4 closed	Error
C	  LED3 ON	  LED3 OFF	Temperature decreases to < 75 °C PNP switching output 4 open	OK
D	  LED3 OFF	  LED3 ON	Temperature decreases to < 65 °C PNP switching output 3 open	Error

Here, you can reverse the LED status function for a contact: The LED is illuminated if the contact is open, i.e. below the minimum temperature, and the "Error" status is indicated again if the LED is illuminated.

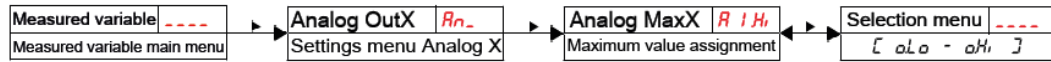


The display function of the status LED influences the recording of events, see chapter 8.10, Diagnosis options.

8.8 Analog outputs

8.8.1 Analog output X: assignment of the upper limit

Filling level Here, it is assigned at which filling level the maximum analog signal is to be output. The setting is made in the following menu:



Setting range:
[oLo , oHi]

- ▶ Open the value list by means of the ► key.
 - ▶ Set the value with the ▼ and ▲ keys and confirm with the ► key (e.g. -2.5 cm).
- The device returns to the submenu.

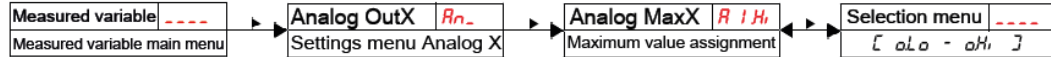


The set output range must not be selected to be less than 10% of the measurement range:

$$RiHi - RiLo \geq 10\% * (oHi - oLo)$$

If the selected range is too small, the analog value output may show steps.

Temperature Here, it is assigned at which temperature the maximum analog signal is to be output. The setting is made in the following menu:



Setting range:
0 °C to 100 °C
(32 °F to 212 °F)

- ▶ Open the value list by means of the ► key.
 - ▶ Set the value with the ▼ and ▲ keys and confirm with the ► key (e.g. 10 °C).
- The device returns to the submenu.



The set output range must not be selected to be less than 10% of the measurement range:

$$RiHi - RiLo \geq 10\%$$

If the selected range is too small, the analog value output may show steps.

8.8.2 Analog output X: assignment of the lower limit

Filling level Here, it is assigned at which filling level the minimum analog signal is to be output. The setting is made in the following menu:

Measured variable

Measured variable main menu

▶

Analog OutX

RL_

Settings menu Analog X

▶

Analog MinX

RL_

Minimum value assignment

◀ ▶

Selection menu

[oLo - oHi]

RL_

Setting range:

[oLo , oHi]

▶ Open the value list by means of the ▶ key.

▶ Set the value with the ▼ and ▲ keys and confirm with the ▶ key (e.g. -31.5 cm).

The device returns to the submenu.

i The set output range must not be selected to be less than 10% of the measurement range:

$$RL_{Hi} - RL_{Lo} \geq 10\% * (oHi - oLo)$$
If the selected range is too small, the analog value output may show steps.

Temperature Here, it is assigned at which temperature the minimum analog signal is to be output. The setting is made in the following menu:

Measured variable

Measured variable main menu

▶

Analog OutX

RL_

Settings menu Analog X

▶

Analog MinX

RL_

Minimum value assignment

◀ ▶

Selection menu

[oLo - oHi]

RL_

Setting range:

[oLo , oHi]

▶ Open the value list by means of the ▶ key.

▶ Set the value with the ▼ and ▲ keys and confirm with the ▶ key (e.g. 80 °C).

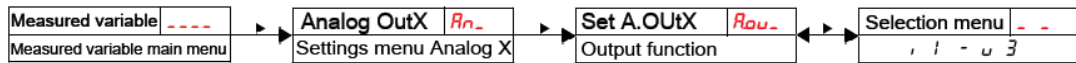
The device returns to the submenu.

i The set output range must not be selected to be less than 10% of the measurement range:

$$RL_{Hi} - RL_{Lo} \geq 10\%$$
If the selected range is too small, the analog value output may show steps.

8.8.3 Analog output X: setting the signal type

The analog output can be defined as voltage or current output with different value ranges. The setting is made in the following menu:





Optional settings:
[1, u 1, u 2, u 3]

- ▶ Open the value list by means of the ► key.
- ▶ Set the value with the ▼ and ▲ keys and confirm with the ► key (e.g. 10 mA or 10 V).

The device returns to the submenu.

The following options are available:



4 mA to 20 mA



2 V to 10 V



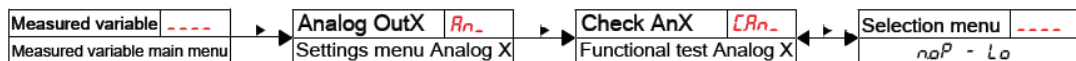
0 V to 10 V



0 V to 5 V

8.8.4 Analog output X: testing the analog output

The analog output can be tested, as well. The largest, the medium and the smallest analog value can be output one after the other. The setting is made in the following menu:





Optional settings:
[noP, Hi, HALF, Lo]

- ▶ Open the value list by means of the ► key.
- ▶ Set the value with the ▼ and ▲ keys and confirm with the ► key.

The device returns to the submenu.

The following options are available:



Normal operation



Output highest analog value



Output medium analog value



Output lowest analog value



After termination of the test, you should imperatively set the function to normal operation *noP*.

8.9 IO-Link (version LTD and D3)

The IO-Link interface can be used to query all the information of the float switch, e.g. via a master. The current level and temperature values can be output, switching points and hysteresis can be set and min/max values can be read out. Furthermore, general information such as type codes, material numbers and pin assignments can also be read out.

The IODD of the float switches can be found at:

www.boschrexroth.com/de/de/produkte

8.10 Diagnosis options

The device is able to log events for a switching output. An event is defined as the lighting up of the LED. I.e. the recording of the switching processes depends on the setting of the LED switching function, see 8.7.7 "Changing the display function of the status LEDs".

The settings and evaluation can be made in the following menu:



Only one switching output can be logged. The switching output to be logged is set in the menu item Switching output **Set Journal Out** (*Set Jout*).

- ▶ In order to access the main menu, press the ▼ key.
- ▶ Select the *d, R* menu item with the ▼ and ▲ keys.

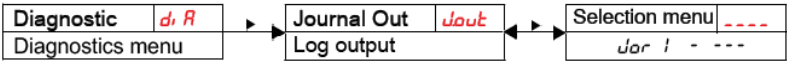
From here, you can access different diagnosis values and logs regarding the measured value monitoring.

- ▶ Open the menu with the ▶ key.

Now, you can change and/or call the diagnosis settings.

8.10.1 Calling the log book

The last 6 events of the logged switching output can be called up in the following menu and all entries can be deleted.



The log entries are displayed as follows:	Example:
• Latest event <i>Jout 1</i> occurred x hours (h) / days (d) ago • Events 2 to 5 occurred x hours / days ago	<i>Jout 1</i> ⇔ 13h, key ▼ <i>Jout 2</i> ⇔ 24h, key ▼, ▲ <i>Jout 3</i> ⇔ 6.1h, key ▼, ▲ <i>Jout 4</i> ⇔ 82h, key ▼, ▲ <i>Jout 5</i> ⇔ non *, key ▼, ▲ <i>Jout 6</i> ⇔ non *, key ▼, ▲ - - -, key ▲; ▶ = delete

* Not yet assigned, only 4 events have occurred

The index of entry x and the time are indicated alternately, e.g. *Jout 1* ⇔ 14h for the latest event 1.4 hours ago.

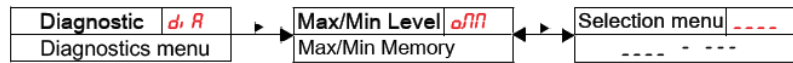
- ▶ Press the ▶ key to return to the submenu or use the ▼ and ▲ keys to select the next log entry.
- ▶ Confirm the display with the ▶ key to delete the event list and return to the submenu.



If no events have been recorded, the display changes between *Jout* and *non*.
The stored data will be overwritten after 6 months.

8.10.2 Maximum and minimum filling level

In the following menu, the stored maximum and minimum filling level are displayed or deleted.

**The log entries are displayed as follows:**

- Maximum filling level value
- Reached x hours / days ago
- Minimum filling level value
- Reached x hours / days ago
- Delete function

Example:

150, key ▼
 84h, key ▼, ▲
 60, key ▼, ▲
 2.1h, key ▼, ▲
 - - -, key ▲; ► = delete



Menu order:

- Max. value
- Time
- Min. value
- Time
- Delete

- Press the ► key to return to the submenu or use the ▼ and ▲ keys to select the next log entry.

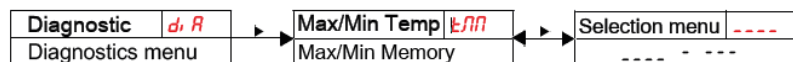
- Confirm the display  with the ► key to delete the event list and return to the submenu.



The stored data will be overwritten after 6 months.

8.10.3 Maximum and minimum temperature

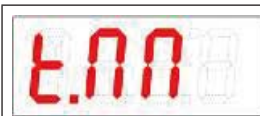
In the following menu, the stored maximum and minimum temperature are displayed or deleted.

**The log entries are displayed as follows:**

- Maximum temperature value
- Reached x hours / days ago
- Minimum temperature value
- Reached x hours / days ago
- Delete function

Example:

72 °C, key ▼
 84h, key ▼, ▲
 22 °C, key ▼, ▲
 2.1h, key ▼, ▲
 - - -, key ▲; ► = delete



Menu order:

- Max. value
- Time
- Min. value
- Time
- Delete (reset)

- Press the ► key to return to the submenu or use the ▼ and ▲ keys to select the next log entry.

- Confirm the display  with the ► key to delete the event list and return to the submenu.



The stored data will be overwritten after 6 months.

8.10.4 **Determining the switching output to be logged**

In the following menu, the switching output to be logged is selected. Only one switching output can be logged.

Diagnostic	d, R
Diagnostics menu	

Set Journal Out	S, d, o, u
Output monitoring	

Selection menu	o, u, t, _
O, u, t, 1 - O, u, t, _	



Selection:
[out 1 to out X]

- ▶ Open the value list by means of the ► key.
- ▶ Set the value with the ▼ and ▲ keys and confirm with the ► key.

The device returns to the submenu.



The values are stored from the volatile memory into the non-volatile one approx. every three hours.

8.10.5 **Delay until storage of the min/max filling level**

In order to record reliable values in case of an unstable fluid level, a delay time until storage of the minimum and maximum filling level can be set. Here, the time period in seconds is indicated during which the signal must be continuously available before the filling level will be logged.

Diagnostic	d, R
Diagnostics menu	

Delay MM	d, o, n, n
Min/Max Delay	

Selection menu	---
0 - 100	



Setting range:
0...100 seconds

- ▶ Open the value list by means of the ► key.
- ▶ Set the value with the ▼ and ▲ keys and confirm with the ► key (e.g. 5 (seconds)).

The device returns to the submenu.

8.10.6 **Delay until storage of the min/max temperature**

In order to record reliable values in case of temperature variations, a delay time until storage of the minimum and maximum temperature can be set. Here, the time period in seconds is indicated during which the signal must be continuously available before the temperature will be logged.

Diagnostic	d, R
Diagnostics menu	

Delay MM	d, t, n, n
Min/Max Delay	

Selection menu	---
0 - 100	



Setting range:
0...100 seconds

- ▶ Open the value list by means of the ► key.
- ▶ Set the value with the ▼ and ▲ keys and confirm with the ► key (e.g. 5 (seconds)).

The device returns to the submenu.

9 Maintenance and repair

9.1 Inspection and maintenance

The device is working in a maintenance-free way.

9.2 Cleaning and care

- ▶ Match the type of cleaning to the IP protection class of the float switches.
- ▶ Do not use any cleaning agents which could be aggressive against the installed materials.

9.3 Repair



If an error occurs during operation, Table 18 "Error messages" provides troubleshooting information.

If after removal of possible failures and switch-on of the mains voltage, the device does not function correctly, it must be checked by the manufacturer. For this purpose, please put the device in suitable packaging and return it to one of the Bosch Rexroth service representations.

You can find the addresses of our service representations at www.boschrexroth.com.

9.4 Troubleshooting

In case of an error, all outputs are de-energized. The four LEDs flash. Errors remain stored in the device until switch-off.



You can find troubleshooting information at Table 18 "Error messages".

10 Disassembly and replacement



A screwdriver is required for replacement.

10.1 Preparing for disassembly

- ▶ Decommission the overall system as described in the overall system instructions.
- ▶ In any case, bring the system to a safe state, shut it down, depressurize and de-energize it and secure it against restarting.

10.2 Disassembly process

- ▶ For disassembly, proceed in reverse order to assembly.
- ▶ After a possible disassembly of the float, ensure that the solenoid in the float is above the fluid level.
 - The easiest way to check this is by means of an iron part by means of which you determine the position of the solenoid in the float.

10.3 Preparing the components for storage/further use

Proceed as follows in order to prepare the float switch for storage and further use:

- ▶ Use the original packaging for storage.
- ▶ Protect the float switch from dust and humidity.

11 Disposal

11.1 Environmental protection

Careless disposal of the float switch may result in environmental pollution.

- ▶ Dispose of the product therefore in accordance with the currently applicable national provisions in your country.
- ▶ Please observe the following notes for environmentally-friendly disposal of the float switch.

11.2 Return to Bosch Rexroth

The products manufactured by us can be returned to us for disposal purposes at no costs. There must be no inappropriate foreign substances or third-party components when products are returned. The components have to be sent free to the door to the following address:

Bosch Rexroth AG
Industrial Hydraulics Service
Bürgermeister-Dr.-Nebel-Straße 8
97816 Lohr am Main
Germany

11.3 Packaging

Upon request, reusable systems can be used for regular deliveries.

The materials for disposable packaging are mostly cardboard, wood, and expanded polystyrene. They can be recycled without any problems. For ecological reasons, disposable packaging should not be used for returning products to Bosch Rexroth.

11.4 Materials used

Hydraulic components from Bosch Rexroth do not contain any hazardous materials that could be released during intended use. Normally, no negative effects on human beings and on the environment are to be expected.

The float switch mainly consists of:

- Steel
- Aluminum
- Copper
- Plastics
- Electronics components and assemblies
- Elastomers

11.5 Recycling

Due to the high share of metal, the products can mostly be recycled. In order to achieve an ideal metal recovery, disassembly into individual assemblies is required. The metals contained in electric and electronic assemblies can be recovered by means of special separation procedures as well. If the products contain batteries or accumulators, they have to be removed before recycling and furnished to the battery recycling, if possible.

12 Extension and modification

You will be considered responsible for any extensions to or modifications of the ABZMS-41 float switch.

Any declarations shall become invalid

If you undertake any extensions to or modifications of the product marketed by Bosch Rexroth, this means you are changing the condition as supplied. Any statements made by Bosch Rexroth regarding this product will then become invalid.



The Bosch Rexroth warranty applies only to the configuration supplied. Following an extension or a modification, the claim to warranty expires.

13 Troubleshooting

13.1 How to proceed for troubleshooting

- ▶ Always work systematically and purposefully, even when under time pressure. Random, thoughtless disassembly and changing of settings might in the worst case result in the inability to restore the original cause of error.
- ▶ First get a general idea of how your product works in conjunction with the overall system.
- ▶ Try to find out whether the product has functioned properly in conjunction with the overall system before the error occurred first.
- ▶ Try to determine any changes of the overall system in which the product is integrated:
 - Were there any changes to the product's application conditions or area of application?
 - Have modifications (e.g. refittings) or repair works been carried out on the overall system (machine/system, electrical system, control) or on the product? If yes: What were they?
 - Was the product or machine used as intended?
 - How did the fault become apparent?
- ▶ Try to get a clear idea of the cause of error. If necessary, ask the actual (machine) operator.
- ▶ Document all work done.
- ▶ In case you are not able to remedy an error that has occurred, please contact one of the addresses that you can find at www.boschrexroth.com or in the list of addresses in chapter 15.1.

13.2 Troubleshooting

Table 18: Error messages

Problem/error	Possible cause	Remedy
No display	No supply voltage	► Check the cable and replace it if necessary.
Error messages in the display: Change between <i>Err</i> and <i>Exxx</i> : e.g. 		
 Error 01	Ambient temperature too low	► Observe the limit values.
 Error 02	Ambient temperature too high	► Observe the limit values.
 Error 04	Pt 100 defective (short-circuit)	► Return the device for repair.
 Error 08	Pt 100 defective (cable break)	► Return the device for repair.
 Error 16	Reed chain defective (short-circuit)	► Return the device for repair.
 Error 32	Reed chain defective (supply line open)	► Return the device for repair.
 Error 1024	No supply voltage at the second connector	► Check the supply voltage at the second connector. ► Ensure that the supply voltage is connected to the second connector before or shortly after the first.
	Internal error	► Contact the customer service.

14 Technical data



You can find the technical data on the ABZMS-41 float switch in the data sheet 50223, see chapter 1.2 "Required and amending documentation".

15 Appendix

15.1 List of addresses

**Contacts for service
and spare parts:** Bosch Rexroth AG
Industrial Hydraulics Service
Bürgermeister-Dr.-Nebel-Straße 8
97816 Lohr am Main
Germany

Phone: +49 (0) 9352/40 50 60
Email: service@boschrexroth.de

For service representatives in your area outside of Germany, please refer to
www.boschrexroth.com.

Headquarters: Bosch Rexroth AG
Zum Eisengießer 1
97816 Lohr am Main
Germany

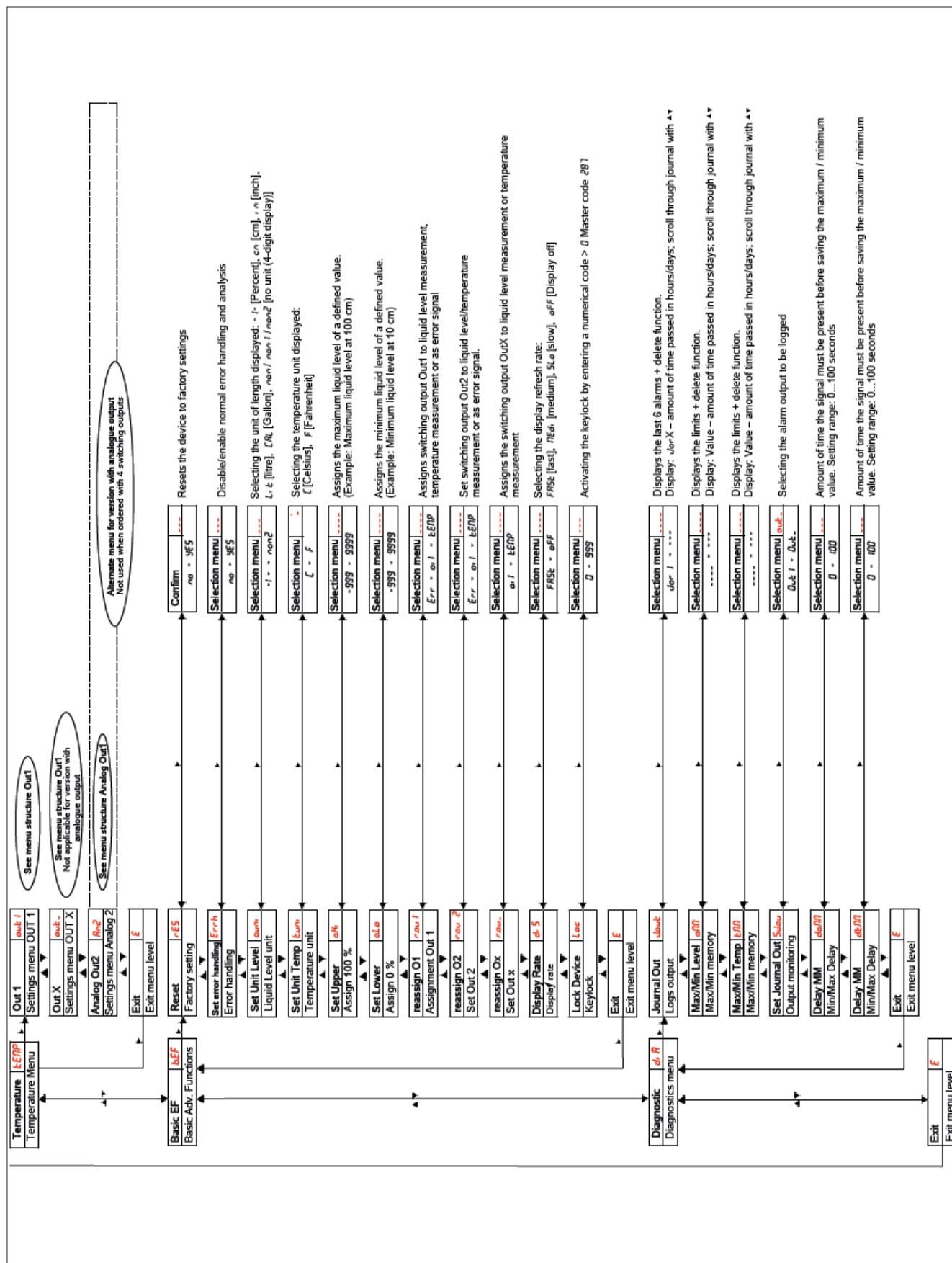
Phone: +49 (0) 9352/18 0

**For questions about the
product:** Bosch Rexroth AG
Online Customer Support

Phone: +49 (0) 9352/40 30 20
Email: my.support@boschrexroth.com

The addresses of our sales and service network and sales organizations can be
found at www.boschrexroth.com.

[illegible]



15.3 Prohibited substances – REACH, RoHS, WEEE

Our AB products such as power units, manifolds, AB assemblies and AB accessories are free of prohibited substances according to the current status and thus meet all EU requirements with regard to the above-mentioned directives. If, in exceptional cases, prohibited substances are used above the admissible concentration, we will endeavor to replace these substances or notify our customers of their use (REACH information on the use of lead alloys >0.1% on our website). Our products do not formally fall under the relevant substance prohibition directives (REACH, RoHS, WEEE), as they are intended as partly completed machinery, assemblies or components to be installed in machines by specialists. Our AB products do not provide a stand-alone function for end users. Therefore, they do not receive a CE mark due to the mentioned directives. As far as necessary in individual cases, we issue the required declarations of conformity, supplier's declarations for our products/product families for each order or make the LINK available for download. We regularly check our products for the use of hazardous substances (SVHC), buy our components exclusively from qualified suppliers and ensure with the compliance of the Bosch standard N2580 that our AB products do not pose any danger to people and the environment.

16 Alphabetical index

A

Abbreviations	9
Activating/deactivating	
the key lock	35
Analog outputs	45
Analog output X	
- Assignment of the lower limit ...	46
- Assignment of the upper limit ...	45
- Setting the signal type	47
- Testing	47
Assembly	23

C

Change basic settings	32
Changing the display	
function of the status LEDs	43
Cleaning and care	51
Connecting the voltage supply ...	24
Connector type	
- 2K24	24
- K6	25
- K14	24
- K24	24
Contact protection	20

D

Damage to property	14
Designations	9
Diagnosis	
- Calling the log book	48
- Delay time until storage	
of the filling level	50
- Delay time until storage	
of the temperature	50
- Determining the switching	
output to be logged	50
- Max. and min. filling level	49
- Max. and min. temperature	49
Disabling normal error handling ...	32
Disassembly process	52
Display and control unit	18
- with 2 x K24	25
- with K24	26
Display ranges	21
Disposal	53

E

Environmental protection	53
Error messages in the display	56
Extension and modification	54

F

Filling level monitoring	16
--------------------------------	----

I

Inspection and maintenance	51
Installation conditions	23
Intended use	10
IO-Link (version LTD and D3)	47

K

Key functions	29
Key lock	30

L

LED status displays	29
Life cycle extension of	
reed contacts	20
List of addresses	58

M

Materials used	53
Menu overview	31
Menu sequence	59
Models	17

O

Obligations of the machine	
end-user	13

P

Packaging	53
Performance description	16
Preparing for disassembly	52
Preparing the components for	
storage/further use	52
Product description	17
Product identification	21
Prohibited substances – REACH,	
RoHS, WEEE	61

Q

Qualification	11
---------------------	----

R

Recycling	54
Repair	51
Required documentation	7
Required tools	52
Reset	37
Restoring factory settings	37
Return to Bosch Rexroth	53
Risk classes according to ANSI Z535.6-2006	8

S

Safety instructions	10
- General	11
- Product-dependent	12
- Signal word	8
Scaling the display range for the filling level	36
- Maximum display value	37
- Minimum display value	37
Scope of delivery	15
Service and spare parts	58
Setting the display's update rate ...	35
Setting the unit for the filling level	33
Setting the unit for the temperature	33
Storage	22
Structure of safety instructions	8
Switching function of the switching points for Mx models ...	27
Switching outputs - Define	34

- Factory assignment	39
- Reassignment	34
Switching output X - Lower switching limit (switch-back point)	41
- Switch-back delay	42
- Switching characteristic	39
- Switch-on delay	42
- Testing of the switching output ...	43
- Upper switching limit (switching point)	41
Switching point positioning for Mx models	27
Switch-on procedure	28
- Models with display and control unit	28
- Models without display and control unit	28
Symbols	8

T

Technical data	57
Temperature monitoring	16
Transport	22
Troubleshooting	51, 56

V

Validity of the documentation	7
Voltage supply - VAC 10-230	26
- VDC 10-36	26

W

Warranty	54
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