USER MANUAL

Conductivity and resistivity monitors	RES
BAMOPHAR 323	
24-12-2018 M-323.01-EN-AD	**323-01** /1

SUMMARY

1. DESCRIPTION

The BAMOPHAR 323 is designed for in-line measurement of liquid conductivity or resistivity. The instrument is equipped with a colour touch-screen which displays a multilingual, user-friendly and intuitive menu. It allows easy reading of the measurement, temperature and status of the relays. In order to facilitate commissioning, a test menu is used to simulate the measurement, acting on the analog outputs and on the thresholds.

2. TECHNICAL FEATURES

User interface	Colour touch-screen, format: 4.3", resolution: 480 x 272 pixels
	Display of measurements, menus, temperature, status of relays
	Parameter settings are protected by means of an access code
Measuring ranges	Conductivity: 0 ... 2 µS/cm to 0 ... 20 mS/cm (see tables on following pages)
	Resistivity measurement: 200 Ω.cm to 200 MΩ.cm
Accuracy	± 0.3 % ; ± 0.3 °C
Cell signal input	BNC connector
Temperature compensation	Automatic: With a Pt 100 Ω, 3-wire sensor, within 0 ... 100 °C
	Working temperature manually adjustable within 0 ... 100° C
Relay outputs	4 contacts N.O., voltage free
Adjustable thresholds	2 independent thresholds assigned to the measurement or the temperature
	1 independent threshold assigned to an external contact, to measurement or temperature
	1 threshold used as a system alarm or Pt 100 sensor damaged
Input resistance of the contact	Approx. 100 mΩ (voltage drop: 6 V DC, 1 A)
Switching capacity	831 VA AC / 3 A / 277 V AC
	90 W / 3 A / 30 V DC
Min. switching capacity	100 mA, 5 V DC (variable according to switching frequency, environmental conditions, accuracy)
Mechanical lifetime (min.)	5×10^6 operations (180 op./min)
Electrical lifetime (min.)	2×10^5 (at 20 op./min) for 3 A 125 V AC, 3 A 30 V DC - 10^5 (estimated load) for 3 A 125 V AC
Output: Copy of conductivity measurement	0/4 ... 20 mA, maximum load: 600 Ω
Output: Copy of temperature measurement	0/4 ... 20 mA, max. load 600 Ω within any range from 0 to 100° C
Measurement simulation	The measured value can be simulated manually in the Measurement Simulation menu for test purposes
Power supply	230 V - 50/60 Hz, approx. 10 VA; Other powers on request
Mounting versions	Panel mount; Front: IP 65, 96 x 144 mm; Connector terminals: IP 40
	Wall mount, IP 65. Internal connector terminals, cable glands
OPTION (RS 422 + Logger)	
Communication	Output: RS-422 J-BUS interface - binary slave mode - 2400 to 9600 baud
Memory (data logger)	Automatic recording of average measurement within the set interval; Records: 150,000 max. on memory card (external card reader required)

3. DIMENSIONS
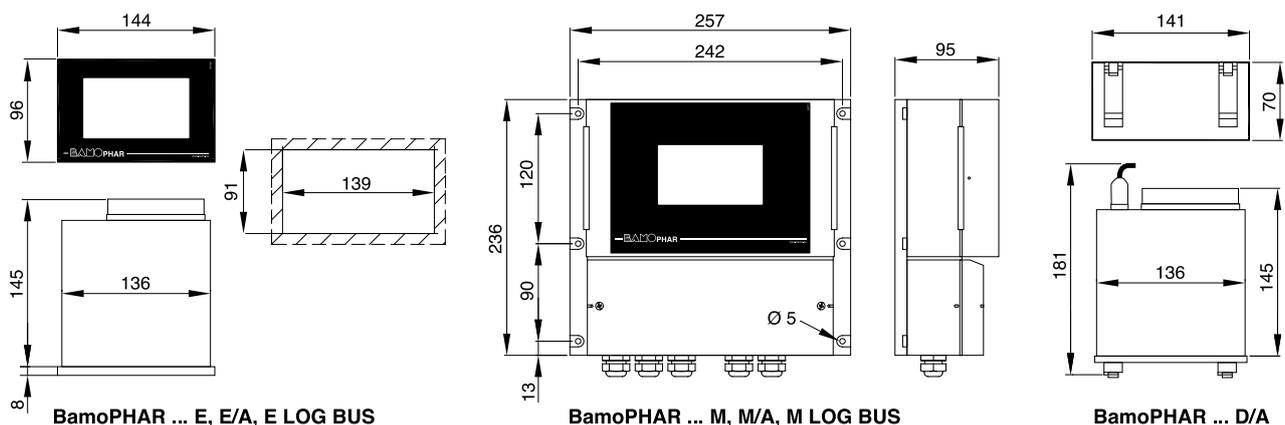
BamoPHAR ... E, E/A, E LOG BUS

BamoPHAR ... M, M/A, M LOG BUS

BamoPHAR ... D/A

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4.1 VIEW OF TERMINALS

PANEL MOUNT VERSION

Measurement signal input
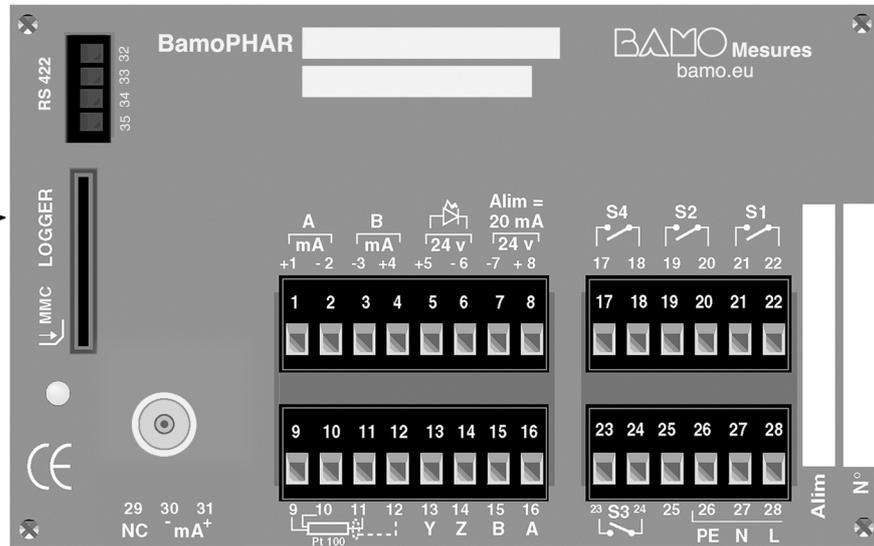
Option: Data Logger and RS-422

*(Wall mount version:
Access after removing the
top cover)*

WALL MOUNT VERSION
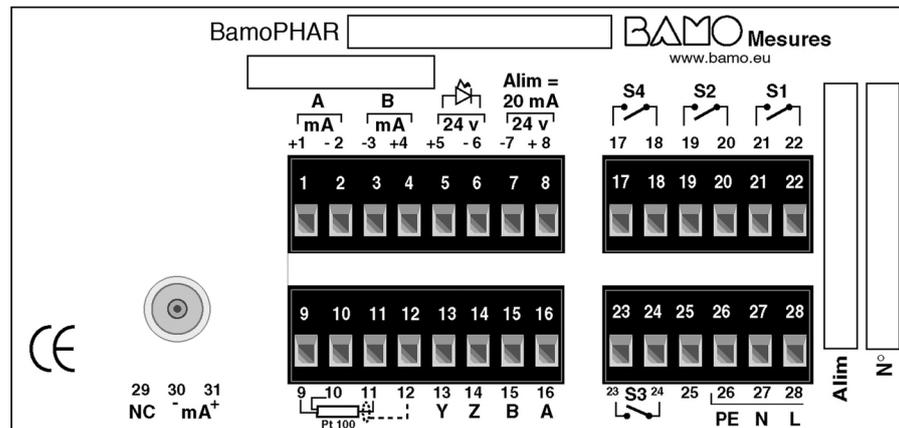
Measurement signal input

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5. CONNECTION TERMINALS

Description		Terminal Number	Connection
Analogue output (conductivity or resistivity)		1	+ mA
		2	- mA
Output in mA (temperature)		3	- mA
		4	+ mA
External controller - Inductive detector (194831) - Voltage free contact		5	+ 24V
		6	0
	Power supply to sensor 20 mA, 2-wire	7	0
		8	+ 24V
Temperature probe: Pt 100 Ohm, 3-wire		9	+
		10	+
		11	-
		12	Shielding
Connection with Extension unit (Blind version)		13	Y
		14	Z
		15	B
		16	A
Relay S4 (N.O. contact), Fault alarm		17	S4
		18	
Relay S1 (N.O. contact); Measurement or temperature		19	S1
		20	
Relay S2 (N.O. contact); Measurement or temperature		21	S2
		22	
Relay S3 (N.O. contact) for measurement or temperature If assigned to an external sensor, it becomes a N.C. contact (see § 10.3)		23	S3
		24	
		25	
Supply power		26	PE = ground
		27	N = Neutral
		28	L = Live
		29	
BNC for 2-wire probe		30	
		31	

Connecting an Extension Unit
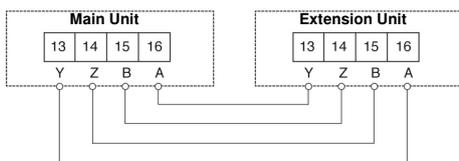
Max. length: 500 m (network cable or shielded cable 4-wire, each ≥ 0.25 mm²)

To connect a flow detector type NPN (code 194831)
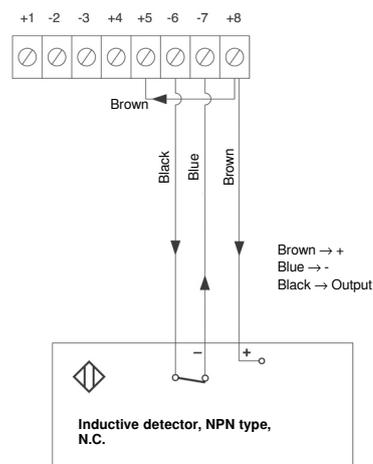
Brown → +
Blue → -
Black → Output

Inductive detector, NPN type, N.C.

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6.1 WITHOUT EXTENSION UNIT

Switching Status of Relays S1, S2, S3, S4
(contact symbol appears when relay is set up)

Designation

Measured Value Display
Measured Value and Temperature Value

E1 Status
Closed = actuated; Open: not active

A
S1
S2
S3
S4
E1

Voie A

1,526 mS

+22,0°C

Menu

21/12/2016 14:24:50

Parameter Settings

Display settings

Date and Time
(only for the version with data logger)

Measurement Details
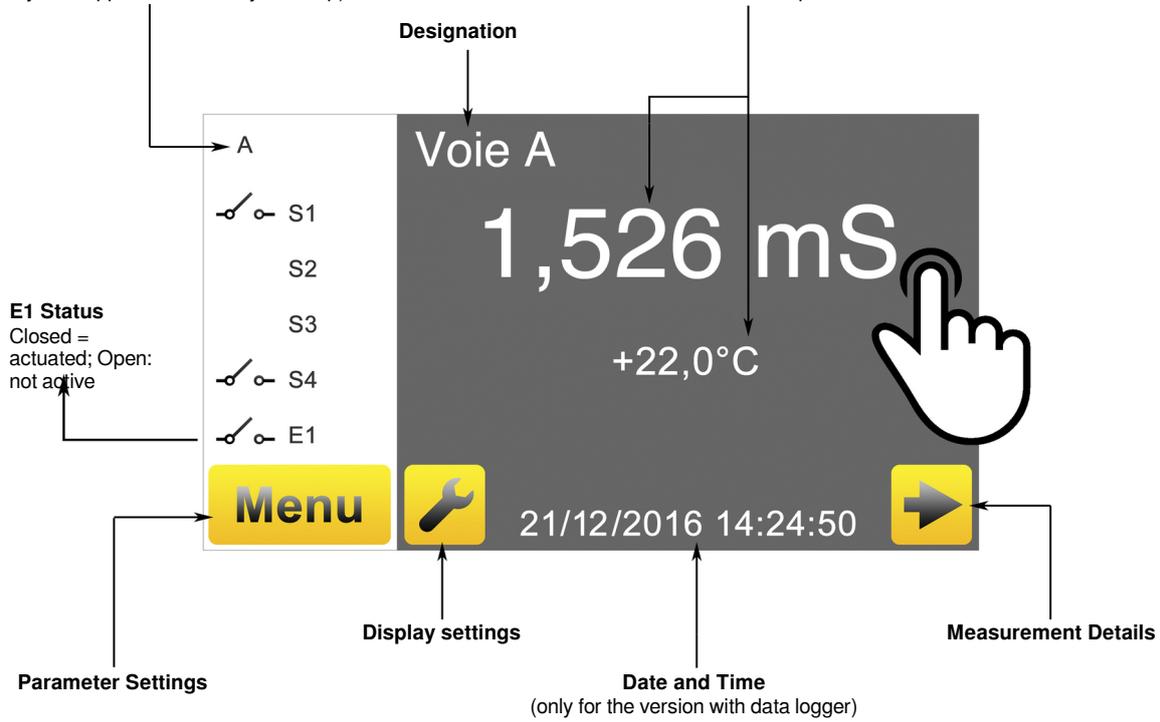
6.2 WITH EXTENSION UNIT

Switching Status of Relays S1, S2, S3, S4
(contact symbol appears when relay is set up)

Designation

Measured Value Display
Display of Basic and Extended Measured Values

The main unit is shown in yellow
The extension unit is shown in green
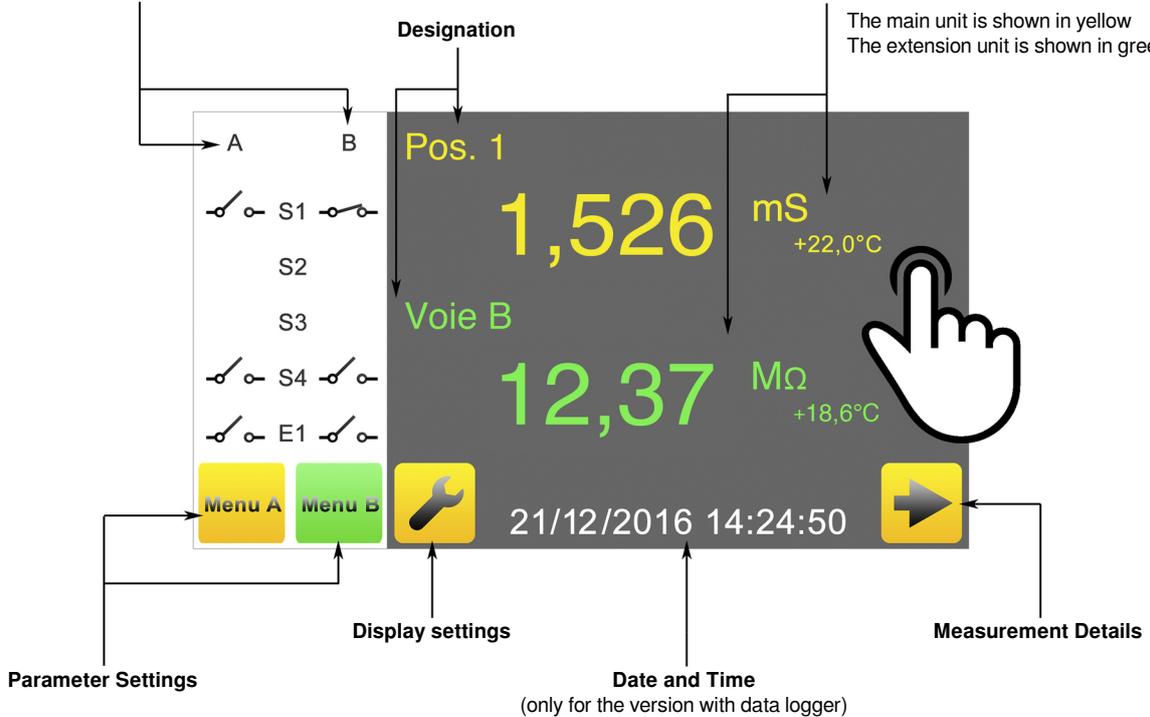
A   B
S1
S2
S3
S4
E1

Pos. 1

1,526 mS
+22,0°C

Voie B

12,37 MΩ
+18,6°C

Menu A   Menu B

21/12/2016 14:24:50

Parameter Settings

Display settings

Date and Time
(only for the version with data logger)

Measurement Details

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Use the touch screen to navigate through the menus and set the display according to your use.
For each yellow button dedicated to the main unit, there is a green variant dedicated to the extension unit.

MAIN MENU
Return to main menu
Example with green icon for the extension unit

SETTINGS
Access to the settings menu (language and device designation)

LANGUAGE
Language selection

MENU
Access to device parameters

INFO
Access to the instrument's serial number and version

PADLOCK
Open = MODIFICATION MODE
Closed = QUERY MODE

RETURN KEY
Return to previous screen

ARROWS
Display cursor for navigating within the menus

SELECTION
Scroll through the selection list

ACKNOWLEDGE
Access to the next parameter

SAVE
Save parameters

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Please note that access to the menus is enabled in the MODIFICATION MODE (see CONSULTATION/MODIFICATION section).

8.1 SCREEN INFORMATION

ID number and version of display screen can be find out in this menu.

8.2 SCREEN SAVER

Screen saver brightness can be increased or reduced by moving the cursor (from left to right and reverse).

8.3 LANGUAGE SELECTION

Select the flag which represents the desired language.
The display is then returned to the previous view.
Press the home key in order to return to the main menu.

8.4 DESIGNATION

The designation/name of the measuring point can be entered for channels A and B:

1) Press on the channel you like to modify.
2) Use the keyboard to enter the device's name.
3) Save your changes.

9. CONSULTATION / MODIFICATION

All parameters can be displayed in the query mode "CONSULTATION".
This mode is indicated by means of the closed padlock.

In order to change device parameters, you have to switch to the mode "MODIFICATION".
This mode is protected with a password which consists of the last four digits of the serial number.

From the main view, go to "Menu".
Press on the padlock icon and enter the last four digits of the serial number.
After acknowledgement, the instrument is switched into the mode MODIFICATION (open padlock).
If case of an incorrect password, the message "Error" is displayed for 3 seconds.

The query mode "CONSULTATION" is reactivated automatically after 30 minutes.

Where to find the serial number?
The serial number is located on the BAMOPHAR's identification sticker.
Also, it is displayed in the menu INFO.

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10.1   MEASUREMENT PARAMETERS

10.1.1 MEASUREMENT SETTINGS OF BAMOPHAR 323 CONDUCTIVITY-METER
Go to the menu "MEASURE DATA"

CONDUCTIVITY	Confirm in order to proceed to the next parameter.
CELL K : _ _ _ _ _	Enter the cell's constant and confirm your entry.
KR : _ _ _ _ _	Enter the cell's factor and confirm your entry.
SCALE: µS / mS	Select the scale unit and confirm your selection.

Measuring ranges:

Cell's Constant	**0,01**	**0,1**	**1**	**10**
With Automatic Temperature Compensation				
Measuring range 1	2,000 µS	20,00 µS	200,0 µS	2,000 mS
Measuring range 2	20,00 µS	200,0 µS	2,000 mS	20,00 mS
Without Automatic Temperature Compensation				
Measuring range 1	2,000 µS	2,000 µS	20,00 µS	200,0 µS
Measuring range 2	20,00 µS	20,00 µS	200,0 µS	2,000 mS
Measuring range 3		200,0 µS	2,000 mS	20 mS

Max. cable length according the measuring range:
In all measuring ranges, max. cable length is 100 m regardless of the cell's constant.

10.1.2 RESISTIVITY MONITORING PARAMETERS
Go to the menu "MEASURE DATA"

RESISTIVITY	Confirm in order to proceed to the next parameter.
CELL K: _ _ _ _ _	Enter the cell's constant and confirm your entry.
KR: _ _ _ _ _	Enter the cell's factor and confirm your entry.
RANGE: kΩ / MΩ	Select the scale unit and confirm your selection.

Measuring ranges:

Cell's constant	**0,01**	**0,1**	**1**	**10**
With Automatic Temperature Correction				
Range 1	20,00 MΩ	2,000 MΩ	200,0 KΩ	20,00 KΩ
Range 2	2,000 MΩ	200,0 KΩ	20,00 KΩ	2,000 KΩ
Without Automatic Temperature Correction				
Range 1	200,0 MΩ	20,00 MΩ	2,000 MΩ	200,0 KΩ
Range 2	20,00 MΩ	2,000 MΩ	200,0 KΩ	20,00 KΩ
Range 3	2,00 MΩ	200,0 KΩ	20,00 KΩ	2,000 KΩ
Range 4	200,0 KΩ	20,00 KΩ	2,000 KΩ	200,0 Ω

The cable Length depends of the measuring range.

Cell's constant	**0,01**	**0,1**	**1**	**10**
Measuring Range				
200 MΩ	10 m			
20 MΩ	50 m	10 m		
2 MΩ	100 m	50 m	10 m	
200 KΩ		100 m	50 m	10 m
20 KΩ		100 m	100 m	50 m
2 KΩ			100 m	100 m
200 Ω				100 m

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10.2 SETTING THRESHOLDS FOR RELAYS S1, S2 AND S3

Below is a detailed description of how to set up the threshold S1:
Go to the menu "ADJUST ALARM 1".

ALARM 1 ON / OFF	Select "ON" to enable the relay and confirm your selection.
	Select "OFF" to disable the relay, then confirm and SAVE.
ALARM 1 MEASURE / TEMP	Threshold S1 may be assigned or to the measured value, or to the temperature:
	MEASURE = Threshold S1 is assigned to the conductivity
	TEMP = Threshold S1 is assigned to the temperature
ALARM 1 LOW / HIGH	"HIGH": Triggering when measurement is going above the threshold
	"LOW": Triggering when measurement is going below the threshold
	Select the mode and confirm your selection.
ON 0000 µS / °C	Enter the value for which the relay S1 is activated and confirm your entry.
OFF 0000 µS / °C	Enter the value for which the relay S1 is deactivated and confirm your entry.
DELAY UP ON / OFF	With or without pick-up delay for relay S1.
TIME 0000 SEC	Enter the duration of delay on activation of S1 and confirm your entry.
DELAY DOWN ON / OFF	With or without dropout delay for relay S1.
TIME 0000 SEC	Enter the duration of delay on deactivation of S1 and confirm your entry.
SAVE?	Press the SAVE icon in order to save the parameters.

Settings for thresholds S2 and S3 are available in the respective "ALARM 2" and "ALARM 3" menus.

10.3 ASSIGNING THRESHOLD S3 TO AN EXTERNAL SIGNAL

Go to menu "ALARM 3".

ALARM 3 ON / OFF	Select "ON" to enable the relay S3 and confirm your selection.
EXTERN NO / YES	NO = Settings are identical to settings of relays S1 and S2.
	YES = External detector signal assigns to S3
	Relay S3 becomes a NC contact (normally closed); It will open when external detector (terminals 5 & 6) is activated (see wiring diagram).
	Confirm your selection.
SAVE?	Press on the SAVE icon in order to save the parameters.
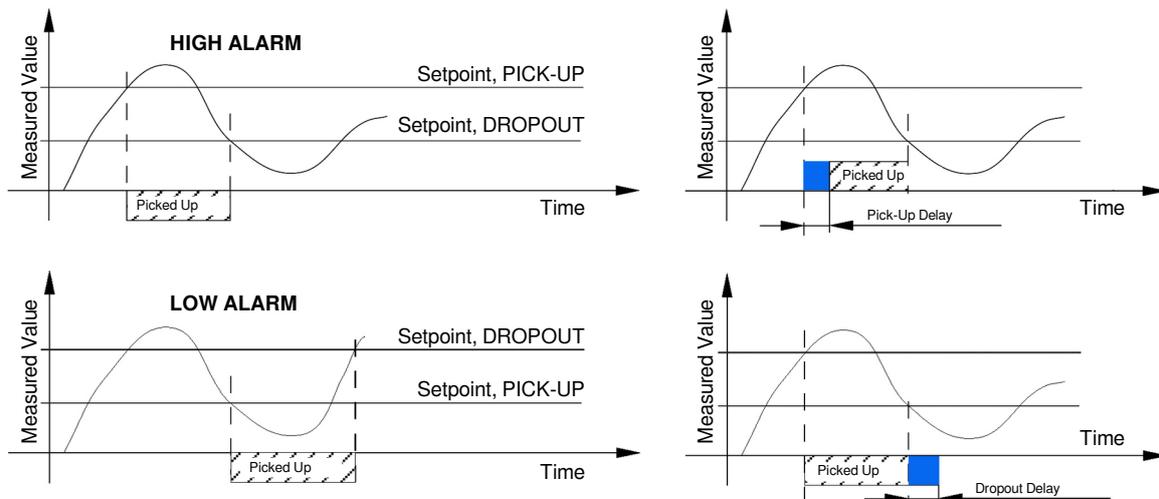
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10.4 SETTING THE TEMPERATURE PARAMETERS

Go to "TEMPERATURE" menu.

MEASURE AUTO / MANUAL	AUTO: Measurement is done with a Pt100 Ogm sensor. MANU: Without sensor, operating temperature is manually entered. Confirm your selection.
FLUID T. + 00.00 °C	In mode "MANU", enter the liquid temperature and confirm your entry.
AUTO T.C. YES / NO	"AUTO" temperature compensation: If YES is selected, choose a reference value of 20° C or 25° C and confirm your choice. If NO is selected, confirm.
SAVE?	Press on the SAVE icon in order to save the parameters.

10.5 SETTING OF mA OUTPUT FOR THE MEASUREMENT

Go to "OUTPUT mA" menu

HIGHER 000.0 xx	Enter the value at which the output will be 20 mA and confirm your entry.
LOWER 000.0 xx	Enter the value at which the output will be or 0 mA or 4 mA and confirm your entry.
OUTPUT 4-20 mA / 0-20 mA	Select the desired range and confirm your selection.
SAVE?	Press on the SAVE icon in order to save the parameters.

10.6 SETTING OF mA OUTPUT FOR THE TEMPERATURE

Go to "OUTPUT mA TEMP." menu

HIGHER 000.0 °C	Enter the value at which the output will be 20 mA and confirm your entry.
LOWER 000.0 °C	Enter the the value at which the output will be or 0 or 4 mA and confirm your entry.
OUTPUT 4-20 mA / 0-20 mA	Select the desired range and confirm your selection.
SAVE?	Press on the SAVE icon in order to save the parameters.

10.7 SIMULATION OF THE RELAY OUTPUTS

This menu "FORCED RELAY" test manually relays S1, S2, S3 and S4.
Default setting of S4 is not actuated. The test will begin with relay S1
To test the realy, switch it from OFF (not actuated) to ON (actuated).
Confirm each step in order to access the next relay.

10.8 SIMULATION OF MEASUREMENT

Go to "FORCED MEASURE" menu.

000.0 µS	Simulation of the measured value is available for test purposes The fist line shows the current measurement. Confirm, then enter the value to be simulated.

Note: Simulated value is immediately processed by the instrument (Thresholds, mA outputs, are acting...)

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11. CONSEQUENCES OF BAMOPHAR 323 SETTINGS ON DISPLAYED MEASUREMENT

11.1 WITHOUT TEMPERATURE PROBE

When a conductivity or resistivity cell does not integrate a Pt 100 Ohm sensor:

Measured Value T °C AUTO / MANU	Liquid Temp T° + 00,00 °C	T° Comp. AUTO YES / NO	Reference Temp. 20/25 °C	Display and Meaning	Example
AUTO	AUTO	YES	20 °C	No conductivity: ERROR without PT100 No temperature displayed	0,0 µS ----
AUTO	AUTO	YES	25 °C	No conductivity: ERROR without PT100 No temperature displayed	0,0 µS ----
AUTO	AUTO	NO	None	Absolute conductivity of the solution No temperature displayed	10,0 µS ----
MANU	+ xx °C	YES	20 °C	Conductivity compensated for entered T° Displayed conductivity restored at 20 °C Displayed temperature entered manually	6,7 µS 40 °C
MANU	+ xx °C	YES	25 °C	Conductivity compensated for entered T° Conductivity restored at 20° C Manually displayed input temperature	7,5 µS 40 °C
MANU	+ xx °C	NO	NONE	Absolute conductivity of the solution Manually displayed input temperature	10,0 µS 40 °C

11.2 WITH A TEMPERATURE PROBE FOR COMPENSATION

When a PT100 Ohm sensor is connected or integrated into the measuring cell:

Measured T °C AUTO / MANU	Liquid Temp T° + 00,00 °C	T° Comp. AUTO YES / NO	Ref. Temp. 20/25 °C	Display and Meaning	Example
AUTO	AUTO	YES	20 °C	Conductivity compensated for T° Conductivity compensated for 20° C Automatically displayed T° (Pt100)	6,7 µS 38,3 °C
AUTO	AUTO	YES	25 °C	Conductivity compensated for measured T° Displayed conductivity compensated for 25° C Automatically displayed T° (Pt100)	7,5 µS 38,3 °C
AUTO	AUTO	NO	NONE	Absolute conductivity of the solution Automatically displayed temperature (Pt100)	10,0 µS 38,3 °C
MANU	+ xx °C	YES	20 °C	Compensated conductivity with manually entered T° Displayed conductivity compensated for 20° C Manually entered T°	6,5 µS 40 °C
MANU	+ xx °C	YES	25 °C	Compensated conductivity with manually entered T° Displayed conductivity restored at 25° C Manually displayed input temperature	7,5 µS 40 °C
MANU	+ xx °C	NO	NONE	Absolute conductivity of the solution Manually displayed input temperature	10,0 µS 40 °C