

Conductivity-Converter UNICON®-LFI

Inductive conductivity measurement of liquids

Features

- Measurement range programmable
from 0 ... 100.0 $\mu\text{S}/\text{cm}$ up to 0 ... 2000 mS/cm
- Output 4 ... 20 mA for conductivity, loop powered
- 2nd measuring range for conductivity,
reversible by external signal
- Non contact measuring principle
- Temperature compensation with
RTD (Pt1000) sensor
- Output 4 ... 20 mA for temperature,
loop powered, free programmable
- 2 alarm outputs, transistor potential free
- Outputs electrical isolated
- Simulation mode (manual operation)
for conductivity and temperature
- Protection IP65



General information

The Conductivity-Converter UNICON-LFI operates on the inductive method. It is used for higher conductivities (from about 0 ... 100 $\mu\text{S}/\text{cm}$ up to 0 ... 2000 mS/cm). Especially when the measured medium is highly contaminated or tends to form deposits on the surface of the inductive probes this method demonstrates their advantage. Typically it is used in the field of beverage industry, filling and CIP-installations, waste water, washing liquids, concentrated acids and lyes. Suitable inductive probes with different process connections are available.

Short information

Programming	Parameters are programmed via front side membrane keypad.
Alarm outputs	Switching performance for the alarm outputs is programmable as minimum or maximum function. States are displayed in the LCD Display.
Measuring range switching	It is possible to activate a 2 nd measuring range for conductivity with an external signal. The resolution of the analog signal can be used optimal at varying medium.

Technical data

Supply voltage

Loop voltage	: 14 ... 30 V DC, 2-wire
Operating temperature	: -10 ... 60 °C (14 ... 140 °F)
Isolation	: conductivity output/temperature output/alarm output 1/ alarm output 2/measurement range switching
Test voltage	: 500V DC
CE - conformity	: EN61326-1

Conductivity measurement

Unit	: µS/cm; mS/cm; kΩ/cm; MΩ/cm programmable
Decimals	: 0 ... 3 decimals (depending on unit)
Display range	: 4 digit
min./max. range	: 0 ... 100 µS/cm up to 0 ... 2000 mS/cm;
Temperature compensation	: non linear for natural water or linear programmable from 0.000 ... 8.000 %/°C
Cell constant	: programmable from 0.100 ... 8.000
Standard error	: ± 0.5 % from measured value ± 2Digit
Temperature coefficient	: <100 ppm/°C
Measuring rate	: appr. 3/sec
Measuring frequency	: 1 kHz

Temperature measurement

Temperature sensor	: Pt1000 acc. to DIN IEC 751 class A; 3-wire
Unit	: °C; °F programmable
Messbereich	: programmable from -40.0 ... +250.0 °C (-40.0 ... +482.0 °F)
min. / max. span	: 25.0 °C (45.0 °F)/290 °C (522.0 °F)
Standard error	: ± 0.1 % ± 1 Digit of the measuring value
Temperature coefficient	: <50 ppm/°C
Linearisation error	: ± 0.1 %

Analog outputs

	: 4 ... 20mA
Burden	: $RA [\Omega] \leq \frac{\text{Supply voltage} - 14 \text{ V}}{0.02\text{A}}$

Alarm outputs

Transistor	: 14 ... 30 V DC, max. 60 mA, short circuit protection
Voltage drop	: < 2V

Measuring range change-over

Input resistance	: >10 KΩ
Range 1 active	: U = 0 ... 3 V DC
Range 2 active	: U = 12 ... 30 V DC

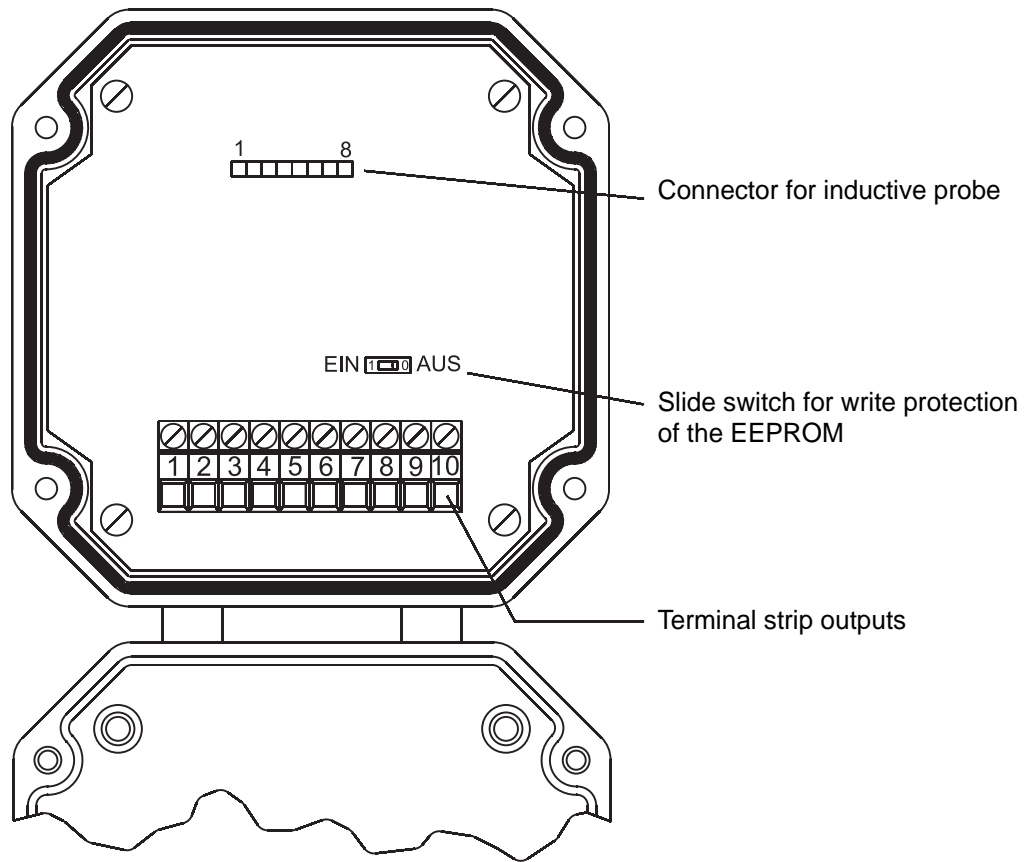
Display

	: LCD-dot matrix, 3.8 mm character height 2 lines 16 characters each
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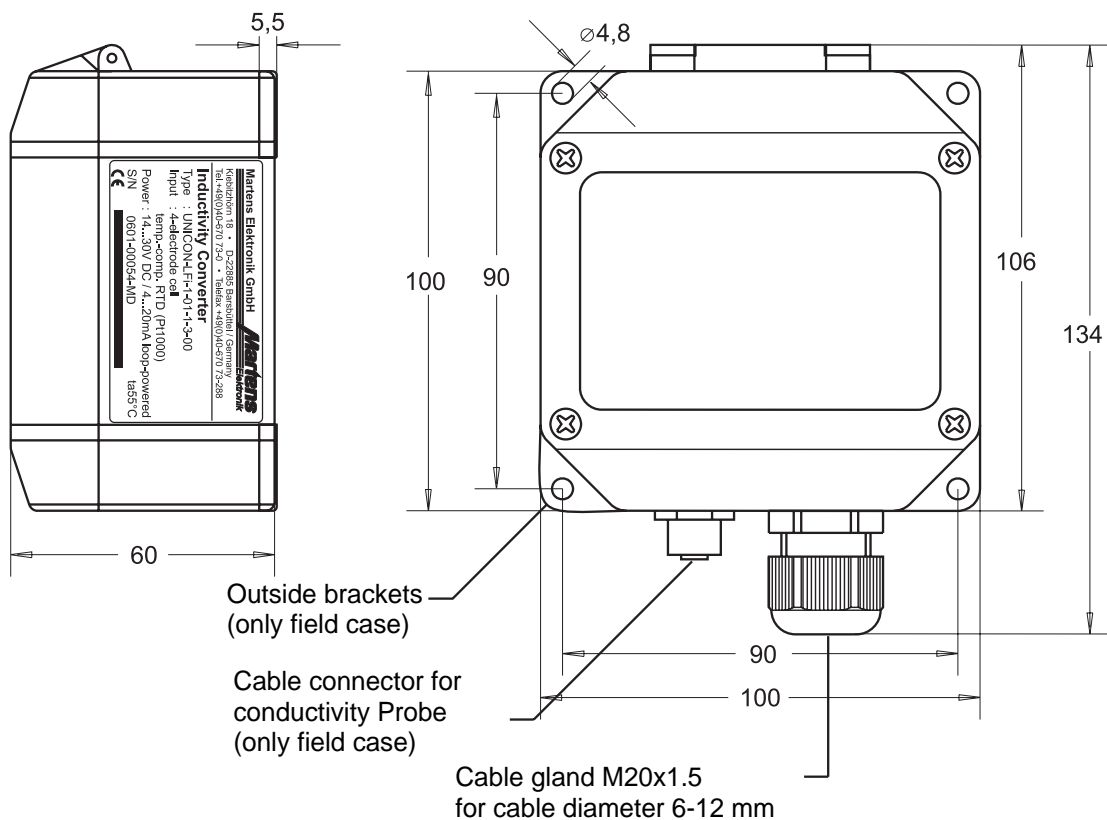
Case

Design	: Head mounting/field mounting
Protection	: IP65
Material	: Polyamide with fibre glass PA6-GF 15/15
Weight	: 0.36 kg
Electrical connection	: screw terminal with pressure plate, 2.5mm ² fine wire, 4mm ² single wire
Front keyboard	: polyester

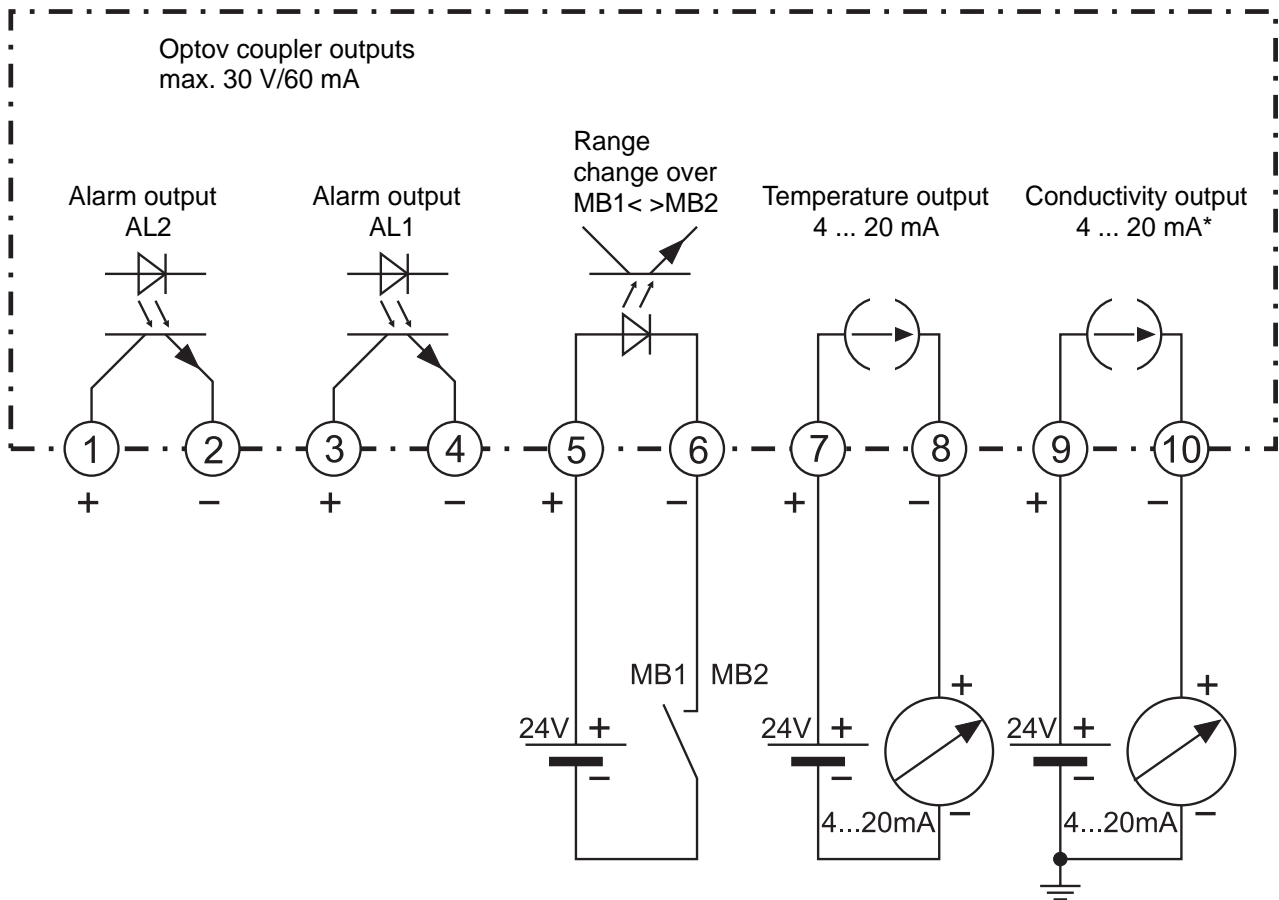
Legend (open lid)



Dimensions



Connection diagram



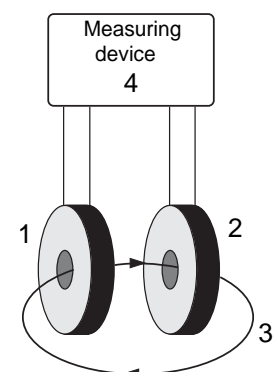
*For supplying the converter use terminals (9) and (10) as shown. If the converter is used for monitoring only, terminals (9) and (10) must be connected direct to supply voltage.

Functional principle of the inductive conductivity measurement

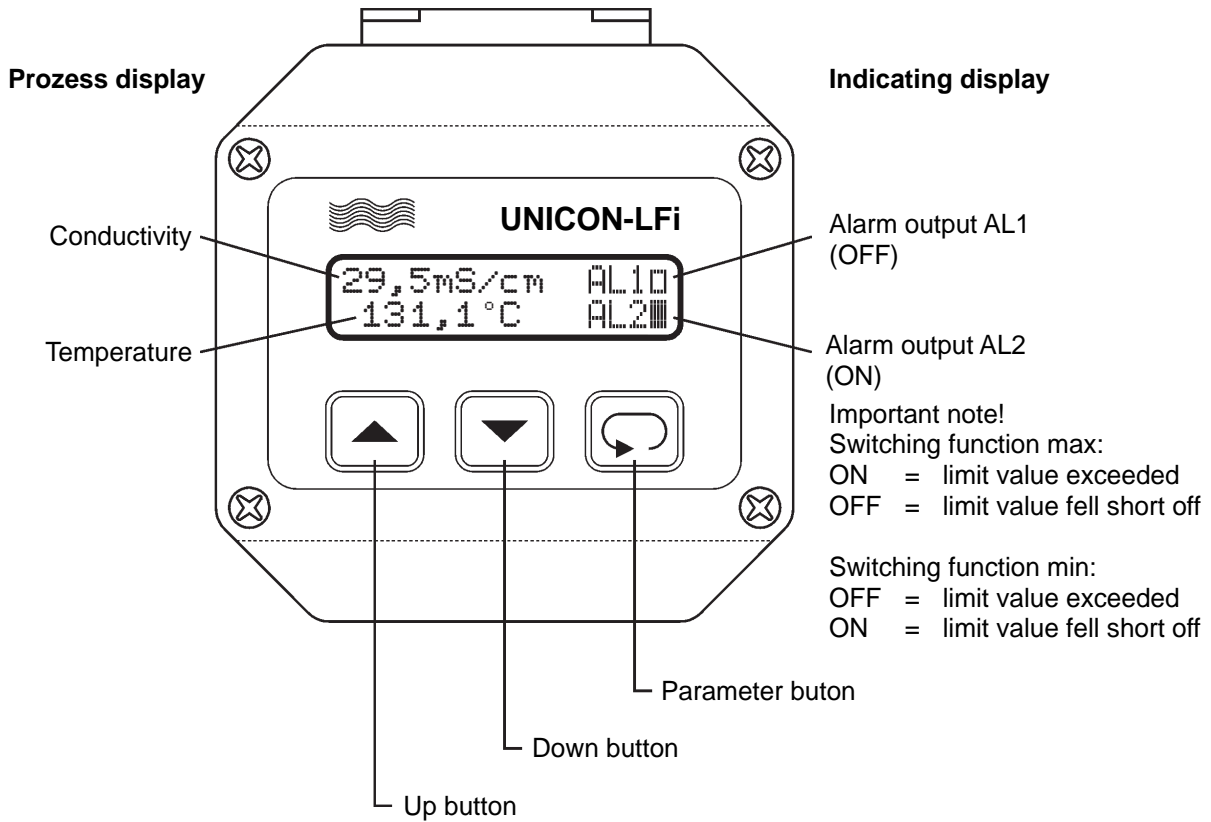
Functional principle of inductive conductivity measurement

A gauging head of an inductive probe exists of 2 ring core coils, arranged side by side. Transmitter-coil (1) and receiver-coil (2) are magnetically isolated against each other.

The measuring device (4) feeds the transmitter-coil (1) with an AC-voltage. Because of the transformer-principle this will induce a voltage in the liquid-ring (3). It comes to a transport of free charge carriers (ions) and with it to an electrical current flow in the liquid. The current is directly proportional to the conductivity. It even flows through coil (2) and induce a voltage in it. In the measuring device (4) this voltage is evaluated and transduced into a standardised signal 4...20 mA based on the programmed measuring range.







Controls and indicators



Description

After switching on the supply voltage, the converter initializes itself. The display shows device type and software version. After initialisation, current measured values and the status of alarm outputs are displayed.

The device must be configured for the intended use. The configuration level is called up by pressing the button . For selection within the parameters or for entering data, use buttons  and . Now all the parameters which defines the function of the converter can be programmed. With the last parameter, the configuration is done and the display shows the process values.

After finishing the configuration or when no button was pushed for more than 2 minutes, the program returns to the working level. Leaving the configuration level is possible at any time by pressing the button  for 2 seconds.

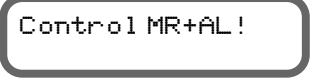
Programming

Notes to representation

Note to display message



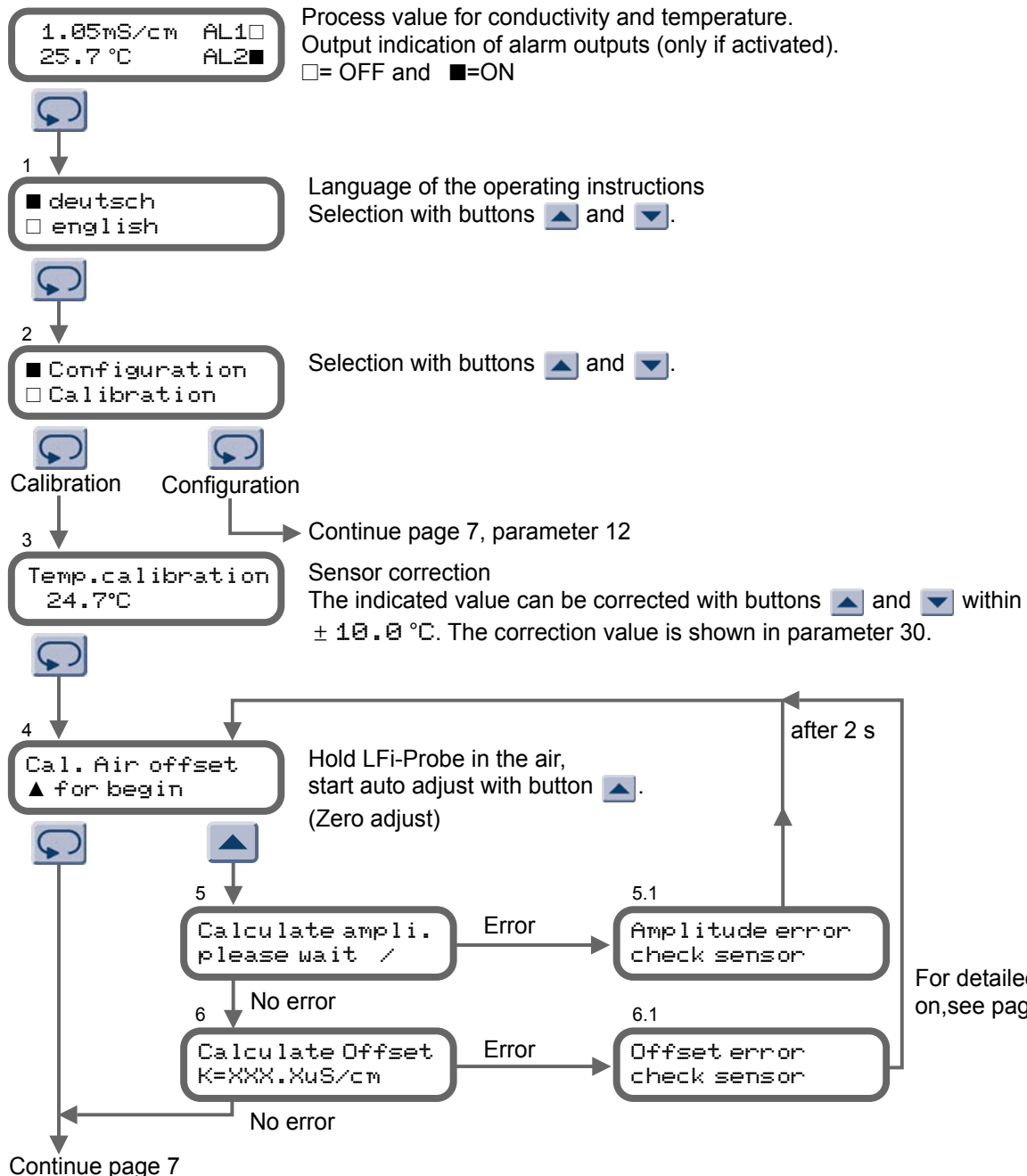
Parameter is only displayed if included (see order code)

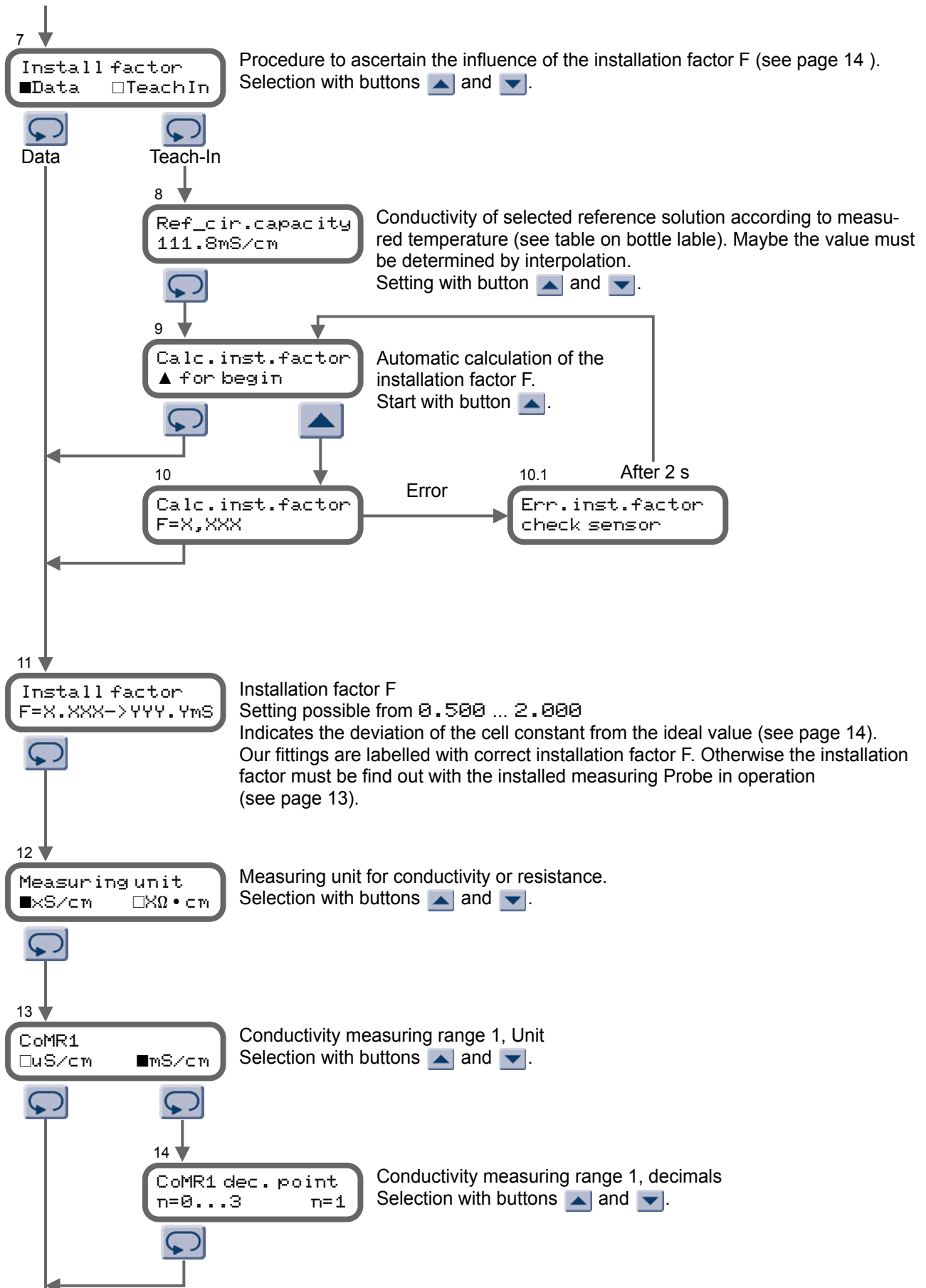


Control MR+AL!
Measuring range (MR) and alarm outputs (AL) must be tested

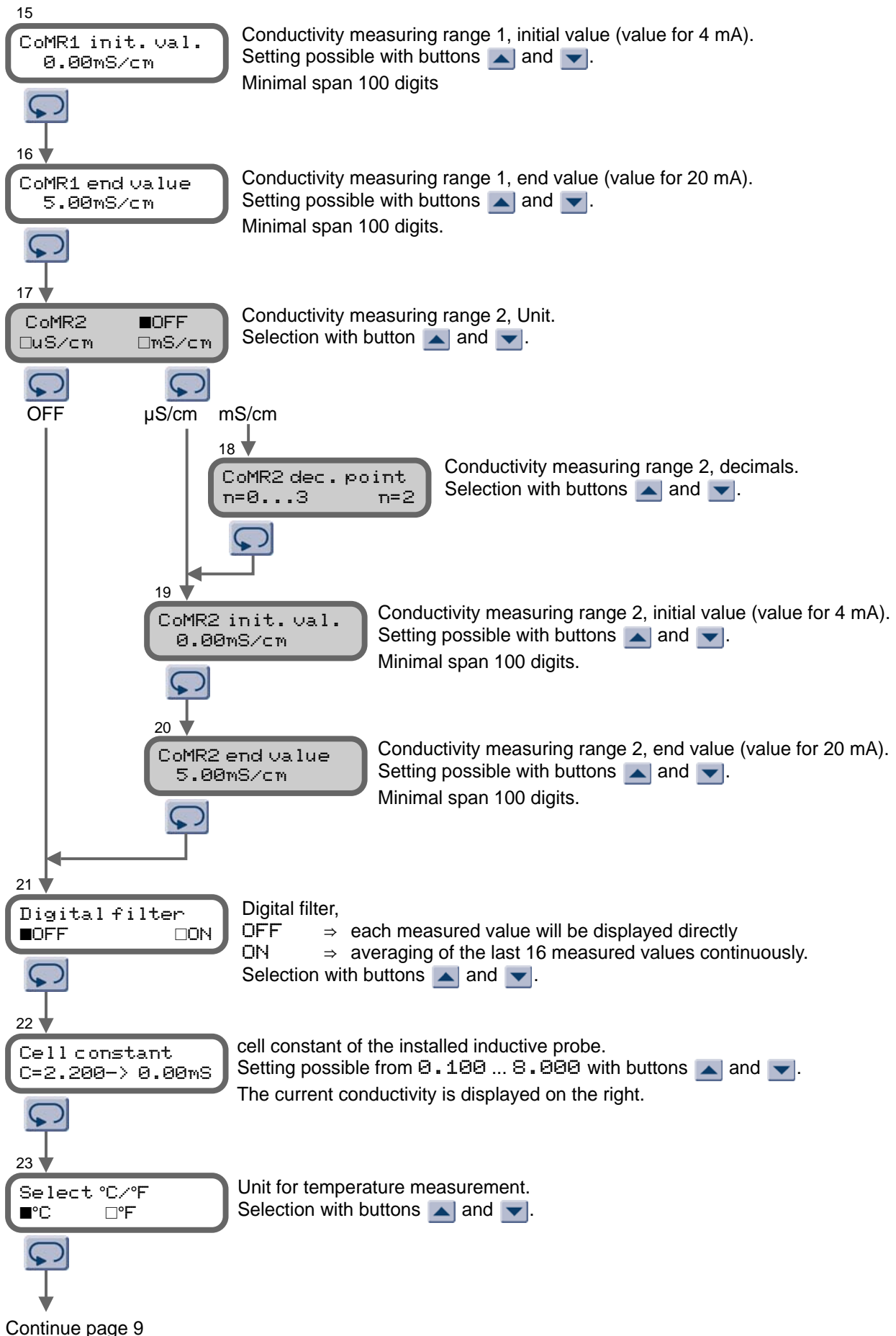
Note: All parameters can be called if they are not blocked by other programmed parameters and if they are available. Factory settings are shown in the **display graphic**.

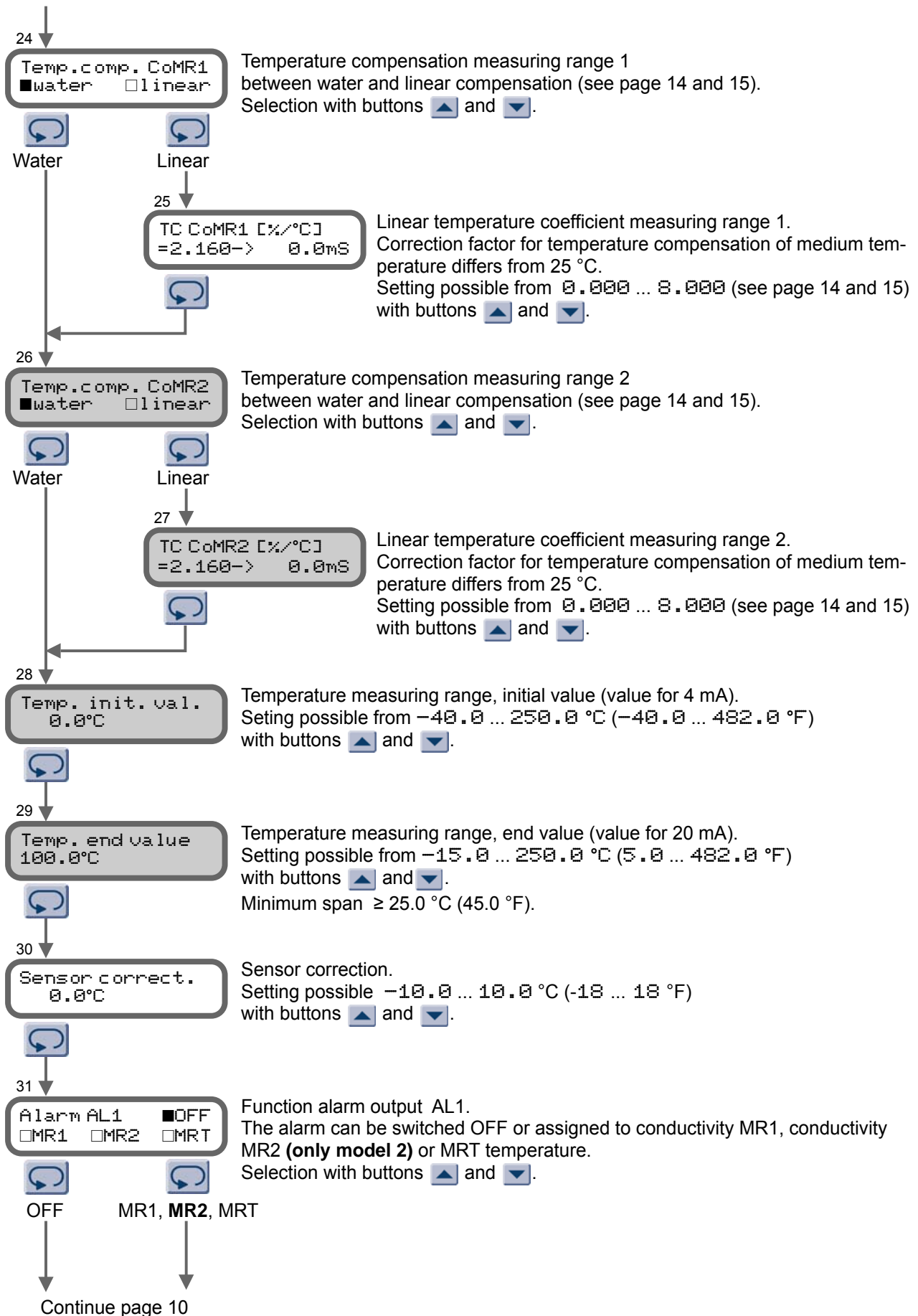
- Programming button for parameter selection or entering data
- Up- and down-button for selection or setting parameter values

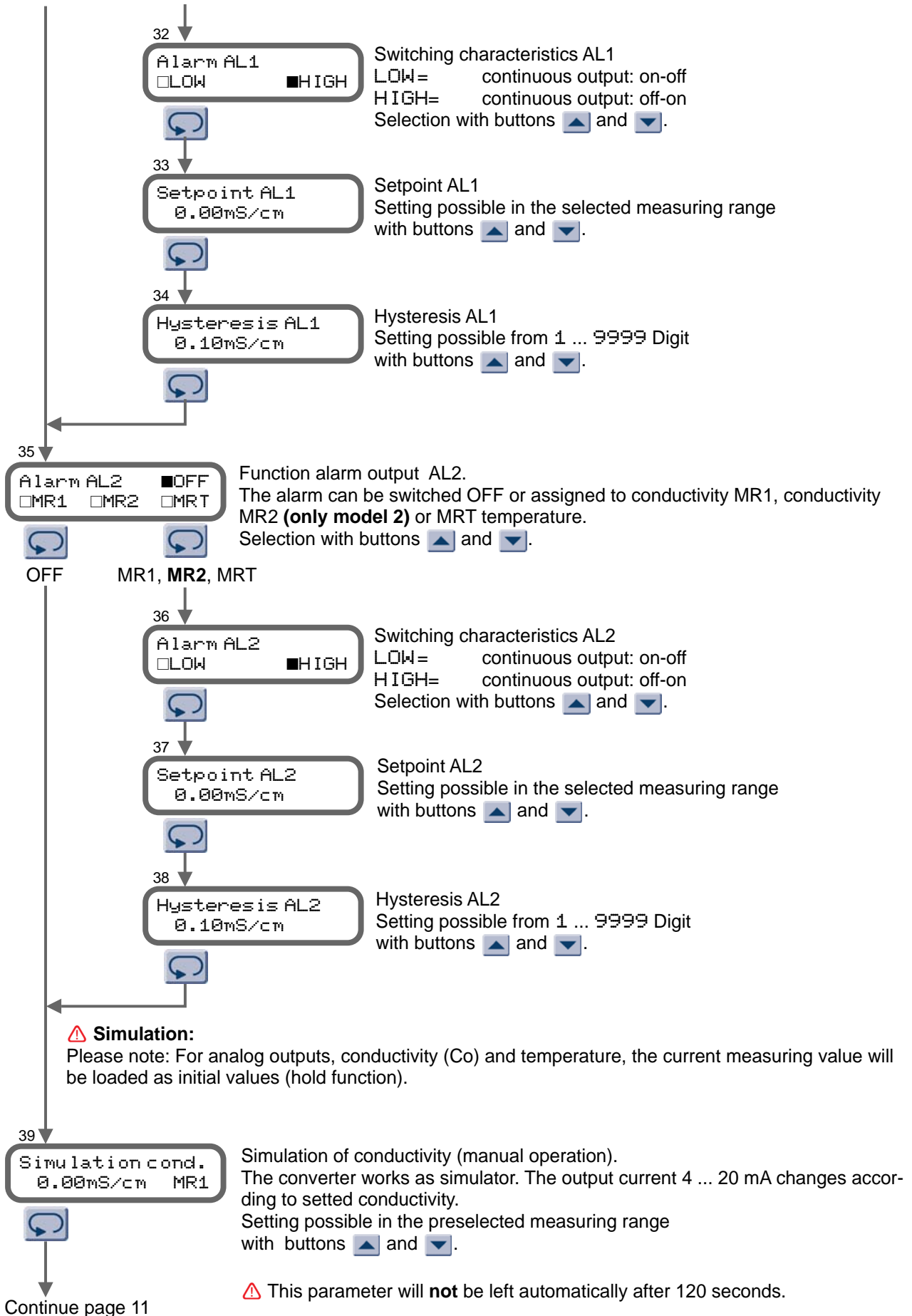


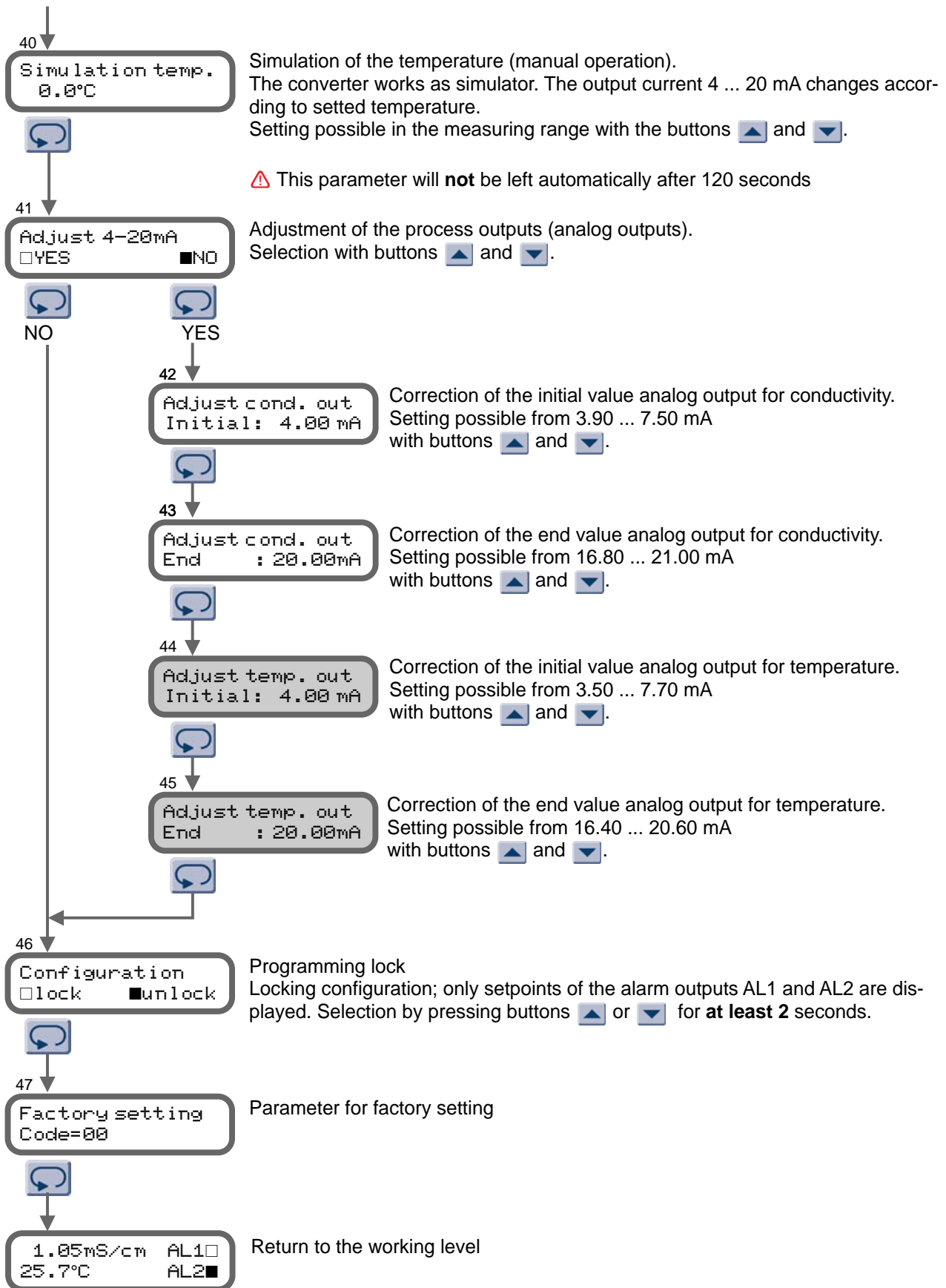


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Error codes

Display	Description and remedy
Display flashes	Measuring range over flow.
Write protect!!	A changed parameter setting cannot be stored, because write protection is activated by intern slide switch in position ON. Set switch to position OFF and modify settings again.
Transmiss. error RAM<->EEPROM	An error occurred during data transfer between controller and EEPROM.
↓ Automatic changing after 2s	
Transmiss. error ▲ for Init RAM	Using the button  a re-initialisation of the EEPROM can be stated. The programmed parameters are lost. The converter works with a reduced accuracy. Please ship the converter to factory for repair service.
↓ Automatic changing after 2s	
Reset	
UNICON-LFi Version 2.0	The converter triggers an internal reset. An attempt is made to read data from the EEPROM.
Amplitude error check sensor	The data of the connected conductivity probe are out of the tolerance.
Offset error check sensor	The electromagnetic coupling between transmitter-coil and receiver in the probe is to high or negative (wrong polarity of the coil).
Error in. factor check sensor	The calculated installation factor is off range. The sensor installation must be tested.










Adjusting the cell constant

The exact cell constant C is labelled on all conductivity probes manufactured by us. This cell constant must be taken into account when setting (see parameter 22).

Due to aging processes the cell constant may be changed. In order to determine the correct cell constant the probe has to be dipped into a reference solution while carefully stirring. Free space of 30 mm must be all around between probe and tumbler.

Various reference solutions are available. The chosen reference solution should be correspond to the conductivity of the measured liquid.

To determine the cell constant use the following procedure:




- ① Use the button  to select the parameter 24 "Temp.comp. CoMR1".
- ② Use the buttons  or  to select "■ Linear" stellen.
- ③ Use the button  to select parameter 25 "TC".
- ④ Use button  to change the value to "0.000".
Press the button  for 2s to leave the configuration level.
- ⑤ Dip the probe into the reference solution. Free space of min. 30 mm must be all around between probe and tumbler.
- ⑥ Determine the temperature of the solution by stirring it constantly (notice the temperature is shown in the display of the converter).
- ⑥ Watch the temperature/conductivity table (as indicated on the bottle of the reference solution) to determine the correct conductivity.
- ⑧ Use the button  to select parameter 22 "Cell constant".
- ⑨ Use the buttons  or  to change the parameter until the same conductivity as the reference solution will be displayed.
- ⑩ Finish adjustment and configure the parameters from item ① to ④ with the settings for the intended use.

Installation factor F

If it is not possible to keep a free space of 30 mm in the fitting, the measured value will not be accurate. This error will be specified with the installation factor F (see table page 14). To determine the installation factor the system has to be filled with the same reference solution which is used for the probe calibration. If the Conductivity-Converter UNICON-LFi display another value, the installation factor differs from the value of 1.000. For the exact measurement the factor F must be determined.

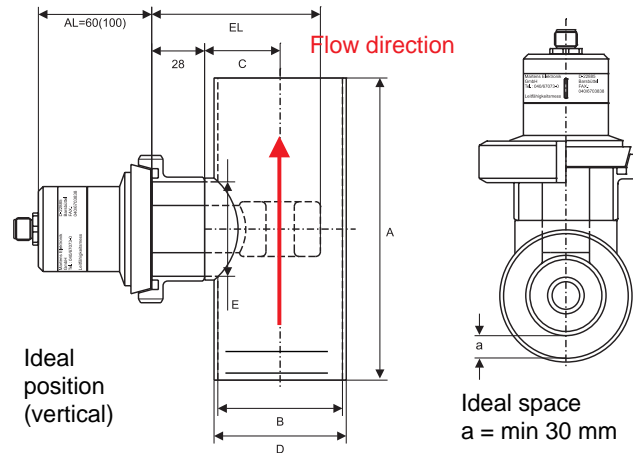
To determine the installation factor use the following procedure:

Point ① up to ④ as shown before.

- ⑤ Use button  to select the parameter 11 "Install factor".
- ⑥ Change the value with buttons  and  until the conductivity of the reference solution is displayed. Select the referred conductivity in the temperature/conductivity table (see reference solution).
- ⑥ The calculated installation factor F will be displayed and stored.

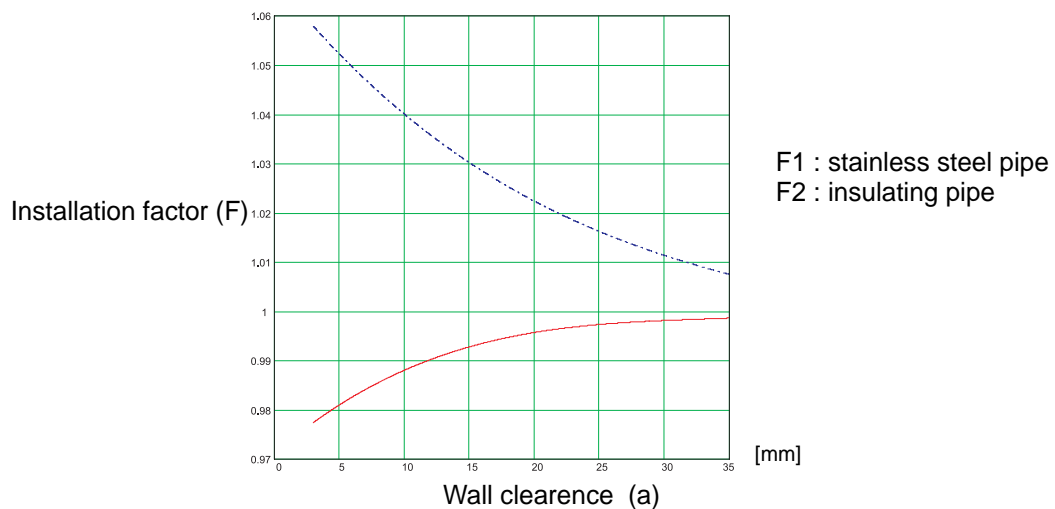
Mounting position and installation factor

Mounting position of the probe and distance to fitting



The installation factor can be disregarded if free space allover more than 30 mm.

The factor could be larger or lesser at a smaller wall clearance (a, see diagram). The exact installation factor is labelled on all inductive conductivity probes, delivered by us.






Temperature compensation

For accurate conductivity measurement a well matched temperature compensation is needed. The converter UNICON-LFi offers two modes of temperature compensation:

- Water Use this setting for "natural water" like ground water, spring water and above ground water. The temperature compensation will be calculated by considering the measured temperature and conductivity. The method of calculation is based on the "non-linear characteristic of natural water" according EN27888. In the temperature range from 0 °C to 100 °C good results are effected.
- Linear Use this setting for saline solution, dilute acid, caustic solution and cleansing solution. This solution will be compensated by using a "linear characteristic". By factory setting the temperature coefficient is set to compensate a NaCl solution. Other solutions needs a special TC. Use the data sheet of the suppliers to define the TC.

If there is no information about the TC available, use following procedure:

- ① Dip the conductivity probe into the solution
- ② Stir the solution constantly and bring it to a temperature of 25 °C (watch temperature on the display)
- ③ Notice the measured conductivity at 25 °C
- ④ Heat the solution to the working temperature (minimum difference 10 °C)
- ⑤ Select parameter 25/27 "TC:" with button .
- ⑥ Use the buttons  or  to change the parameter until the displayed conductivity is the same as shown at 25 °C

If there is no way to use this procedure, following values can be used approximately:

NaCl-solution	(20 % weight of electrolyte)	2.160 %/°C (factory setting)
NaOH-solution	(20 % weight of electrolyte)	2.990 %/°C
KOH-solution	(20 % weight of electrolyte)	1.980 %/°C
H ₃ PO ₄ -solution	(20 % weight of electrolyte)	1.140 %/°C
H ₂ SO ₄ -solution	(20 % weight of electrolyte)	1.450 %/°C
NH ₄ NO ₃ -solution	(20 % weight of electrolyte)	1.790 %/°C

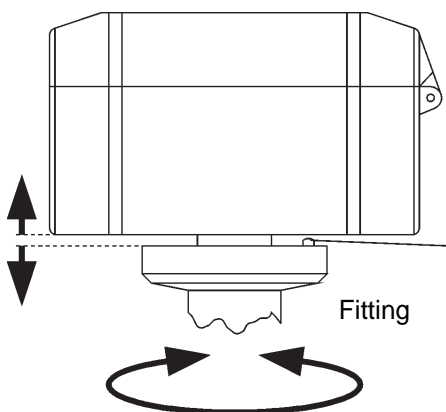
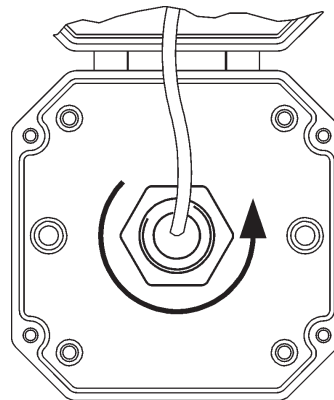
Installation notes

When installing conductivity probes, please make sure, that there is no air around the gauge-head of the probe.

When installing a system with UNICON-LFi head mounting, it may be necessary to turn converter and conductivity Probe against each other for easy operation and better reading of the display. These assembly variations are possible in steps of 30°.

In order to turn the case against the probe, please proceed as follows:

- ① Open the UNICON-LFi by releasing the 4 cover screws
- ② Release the nut of the connected UNICON-LFi and conductivity probe appr. 2 revolutions.



- ③ Separate UNICON-LFi and conductivity probe and place in the desired angle with the turning lock into the case.

- ④ Tighten the nut of the connected UNICON-LFi and conductivity probe.

Ordering code:

UNICON-LFi - 1. - 2. - 3. - 4. - 5.

1. Model

- 1 Output 4 ... 20 mA for conductivity, loop powered,
2 potential-free transistor alarm outputs,
supply voltage 14 ... 30 V DC
- 2 as 1, but additional
2. measuring range for conductivity and
output 4 ... 20 mA for temperature, loop powered

2. Mounting

- 01 Head mounting, connection with flat cable connector of the probe
- 03 Field mounting,
connection with separate connection cable,
plugs stainless steel 1.4571
Note: Conductivity probe and connection cable
must be ordered separately
(see data sheet about accessories and illustrated pricelist)

3. Measuring principle

- 1 inductive

4. Temperature measurement (RTD)

- 3 Pt1000 Sensor

5. Options

- 00 without option