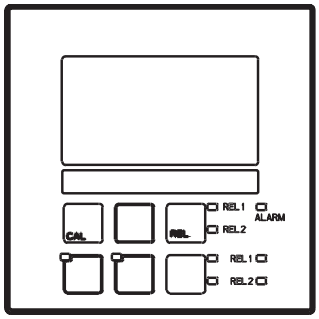
BA 193e00//07.02
51512417

Valid from software version:
2.30

OLM 223 / 253
Transmitter for Conductivity

Operating Instructions



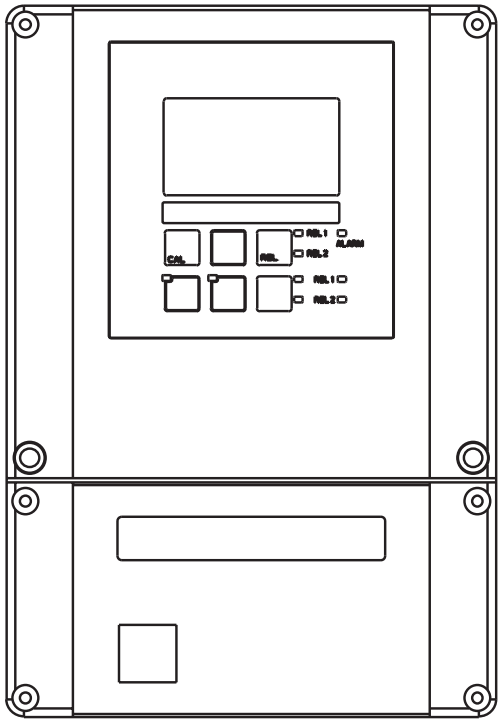


Table of contents

1 General information

1.1 Symbols used

Warning:

This symbol alerts to hazards which could cause serious injuries as well as damage to the equipment if ignored.

Caution:

This symbol alerts to possible faults which could arise from incorrect operation. They could cause damage to the equipment if ignored.

Note:

This symbol indicates important items of information.

Double insulation

Equipment protected by double insulation.

Alarm relay

Input

Output

1.2 Storage and transport

The packaging material used to store or transport the transmitter must provide shock protection. Optimal protection is provided by the original packaging materials.

Conformance with the ambient conditions (see Technical data) must be assured.

1.3 Unpacking

Verify that the packaging and contents are undamaged! Inform the post office or freight carrier of any damage. Damaged merchandise must be retained until the matter has been settled.

Check that the delivery is complete and agrees with the shipping documents and your order (refer to nameplate for type and version).

The delivery includes:

- Transmitter OLM 223 (panel-mounted instrument) or OLM 253 (field instrument)
- Operating instructions BA 193C/07/en
- Panel-mounted instrument:
  – 1 set of plug-in screw terminals
  – 2 clamping screws for panel mounting
- Field instrument:
  – 1 plug-in screw terminal
  – 1 × cable gland Pg 7
  – 1 × cable gland Pg 16, reduced
  – 2 × cable glands Pg 13.5
  – 1 x NPT adapter set
  (optional for CSA versions)

Keep the original packaging materials for future storage or shipping of the instrument.

If you have any questions, consult your supplier or your Sales Agency for your area.

1.4 Dismantling, packaging and disposal

Package the assembly properly for reuse at a later point in time. Optimal protection is provided by the original packaging materials. Oberserve local regulations for disposal.

LM253E01.CHP

1.5 Product structure

You can identify the instrument version by the order code on the nameplate. Sub “codes” are the release codes for Software upgrade shown for ChemoClean (left of diagonal line) or Plus package (right of diagonal line).

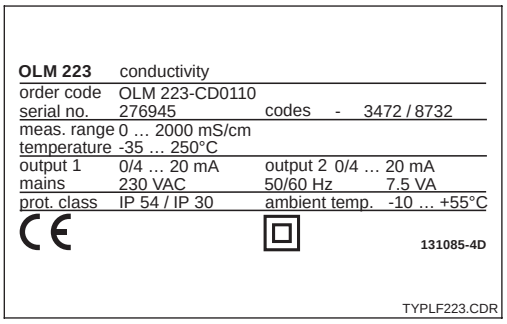


Fig 1.1 Nameplate OLM 223 (left)

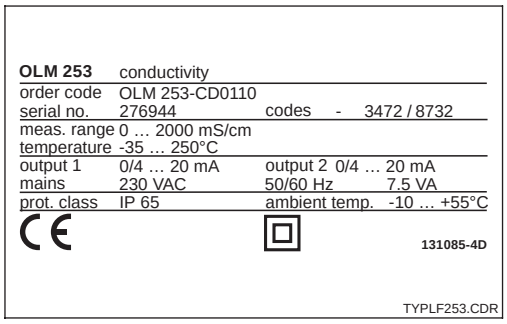


Fig. 1.2 Nameplate OLM 253 (right)

OLM 223 / 253

Version

CD Conductivity/resistance measurement (conductive two-electrode sensor)
CS Conductivity/resistance measurement (conductive two-electrode sensor) with additional functions (Plus package)
ID Conductivity measurement (inductive sensor)
IS Conductivity measurement (ind. sensor) with additional functions (Plus package)

Power supply

0 Power supply 230 V AC
1 Power supply 115 V AC
2 Power supply 230 V AC, CSA Gen. Purp.
3 Power supply 115 V AC, CSA Gen. Purp.
5 Power supply 100 AC
7 Power supply 24 AC, CSA Gen. Purp.
8 Power supply 24 V AC/DC

Measurement output

0 1 output signal conductivity / resistance
1 2 output signals cond. / resistance and temp. / conductivity or resistance / set value

Contacts

05 No additional contacts
10 2 contacts (limit values / PID / timer)
15 4 contacts (limit values / PID / timer / ChemoClean)
16 4 contacts (limit values / PID / timer)
20 2 contacts with current input (limits / PID / timer)
25 4 contacts with cleaning, current input (limit / PID / ChemoClean)
26 4 contacts with timer, current input (limits / PID / timer)

OLM223-					**complete order code**
OLM253-					

Additional functions of the Plus package (CS and IS versions)

- Current output table, fields O23x
- Monitoring for sensor and process, function group P
- Automatic start of cleaning function Field F8
- Measurement according to USP 24 with prealarm, Fields R26x (only conductive with relay card)
- Concentration measurement, function group K
- Adaptive calibration, Fields C13x (only inductive)

2 Safety instructions

2.1 Intended application

OLM 223 / 253 is a field-tested and reliable transmitter to determine the conductivity and resistance of fluid media.

OLM 223 / 253 is particularly suitable for use in the following areas of application:

- Chemicals
- Pharmaceuticals
- Food industry
- Drinking water treatment
- Condensate treatment
- Municipal sewage treatment plants
- Water conditioning

2.2 General safety notes

This device has been manufactured for safe operation according to the state of the art in engineering and conforms to the applicable regulations and European standards (see Technical data). It has been designed according to EN 61010-1 and has left the manufacturer's works in perfect condition with regard to safety aspects.

However, if used imporperly or for purposes other than the intended purpose, it may be dangerous, e.g. due to incorrect connection.

Warning:

- Operating this instrument in any way other than as described in these instructions may compromise the safety and function of the measuring system and is therefore impermissible.
- The notes and warnings in these installation and operating instructions must be strictly adhered to!

2.3 Installation, start-up, operation

Warning:

- This device may only be installed, connected electrically, commissioned, operated and serviced by properly trained personnel authorized by the system operator.
- The personnel must be familiar with these operating instructions and must adhere to the instructions described therein.
- Make sure that the power supply ratings match the data specified on the nameplate before you connect the instrument to a power source.
- A clearly identified mains disconnecting device must be installed close to the instrument.
- Live components can be touched through the vent slots in the housing and the openings on the rear of the housing. Do not insert any tools, wires or similar into these slots (only OLM 223).
- Check that all connections have been properly made before powering up the system!
- Damaged equipment that may be dangerous must not be operated and should be clearly identified as being defective.
- Measuring point faults may only be repaired by authorised and trained personnel.
- If faults cannot be remedied, the instrument must be removed from service and secured to prevent accidental start-up.
- Repairs not described in these operating instructions may only be performed at the manufacturer's works or by your Service Organization.

2.4 Monitoring and safety features

Safety features

The transmitter is protected against external influences and damage by the following design measures:

- Rugged housing
- Degree of protection provided by enclosure: IP 65 (OLM 253)
- UV resistance

Monitoring features

In the event of a system error or power failure, an alarm condition is signalled via a fault-signalling contact.

2.5 Immunity to interference

This instrument has been tested according to the applicable European standards for industrial applications with regard to electromagnetic compatibility. It is protected against electromagnetic interference by the following design measures:

- Cable screen
- Interference suppresser filter
- Interference suppression capacitors

Warning:

The specified immunity to interference only applies for devices connected as outlined in these operating instructions.

2.6 Declaration of conformity

The OLM 223/253 transmitter has been developed and manufactured in accordance with currently valid European standards and directives.
The manufacturer certifies the compliance with the standards by using the CE sign.

3 Installation

The following procedure should be followed for a complete measuring system installation:

- Installation or attachment of transmitter (see chapter 3.3)
- Selection and connection of cables and sensor (see chapter 3.4, 3.5 and 9)
- Installation is followed by start-up (see chapter 5).

3.1 Measuring system

The complete measuring system comprises:

- The OLM 223 or OLM 253 transmitter
- A sensor with or without an integrated temperature sensor
- A measuring cable OYK 71 (conductive measurement) or measuring cable OLK 5 as fixed cable with sensor (inductive measurement).

Optional:

- Extension cable OYK 71 (conductive) or OLK 5 (inductive)
- Junction box VBM.

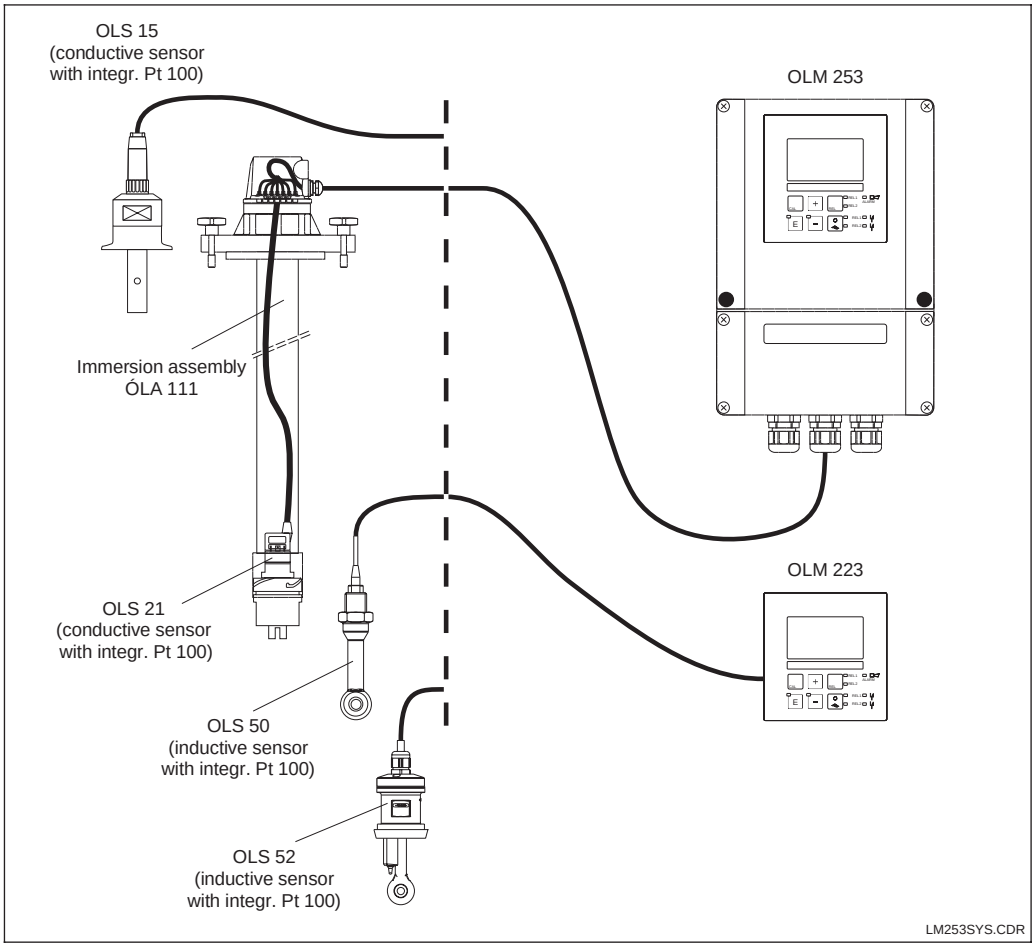
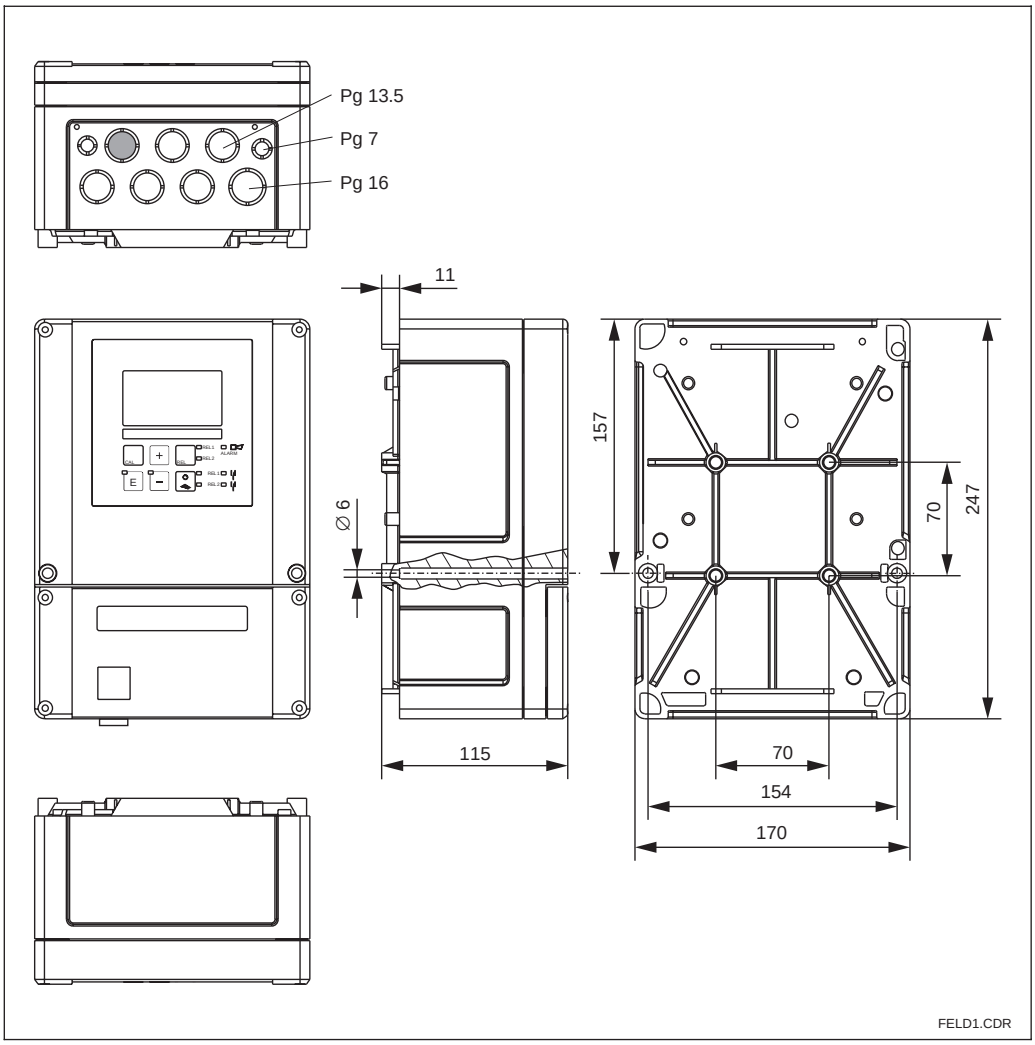


Fig. 3.1 Complete measuring devices OLM 223 / 253 with measuring cable, assembly and conductivity sensor

LM253E03.CHP

3.2 Dimensions



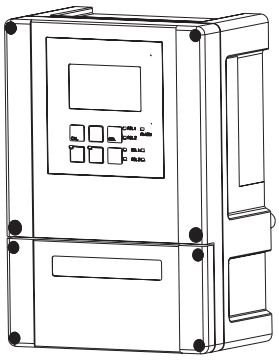
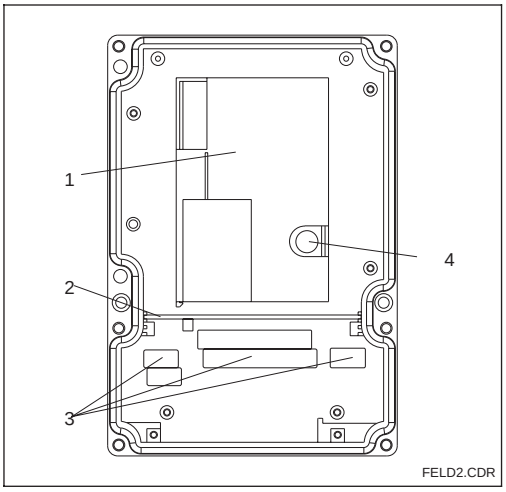


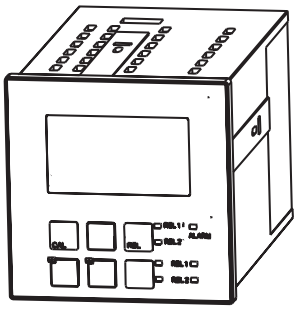
Fig. 3.2 Dimensions of OLM 253

Note:

There is a hole in the punching for Pg 16 cable entry. It serves as a pressure balance during air freight dispatching. Make sure that there is no moisture penetrating into the housing before cable installation. After cable installation, the housing is completely tight.



Inside of housing of OLM 253
1 Removable electronics box
2 Partition plate
3 Terminal blocks
Fig. 3.3 4 Fuse



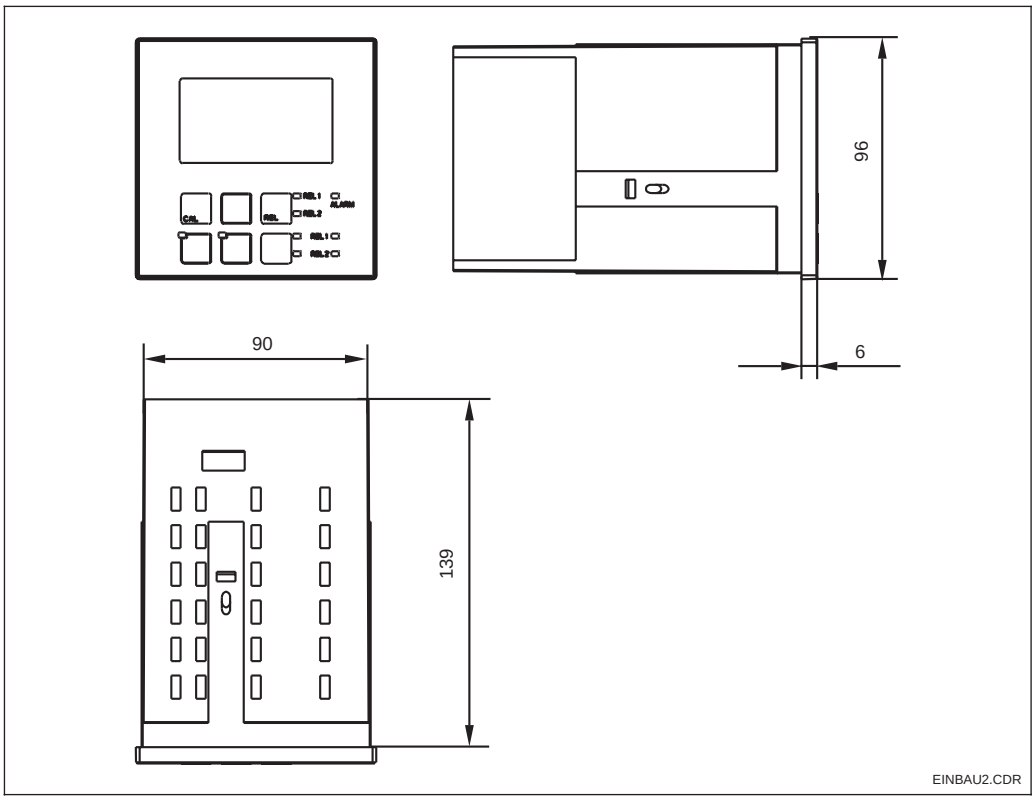


Fig. 3.4 OLM 223, panel-mounted version

3.3 Mounting

3.3.1 Field instrument

Several mounting versions are available for the transmitter in the field instrument version:

- Post mounting on cylindrical pipes
- Post mounting on a square post
- Wall mounting using fastening screws.

Weather protection cover OYY 101 can be used for outdoor installation in conjunction with all mounting versions.

Note:

If installed outdoors, weather protection cover required.

Weather protection cover OYY 101

Weather protection cover for outdoor installation, to be mounted on field instrument; material: stainless steel SS 304

For post or pipe installation, the post mounting kit is additionally required.

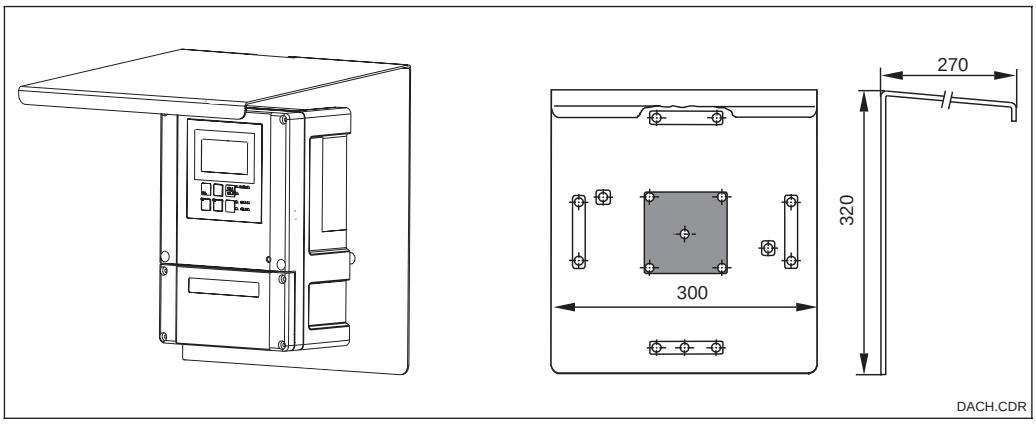


Fig. 3.5 Weather protection cover for field instruments

LM253E03.CHP

Post mounting kit

Mounting kit for installation of field housing on horizontal and vertical pipes (max. ∅ 60 mm); also aids mounting of weather protection cover.
Material: stainless steel SS 304

Universal mounting post OYY 102

Square tube for mounting of measuring transmitters;
Material: stainless steel SS 304

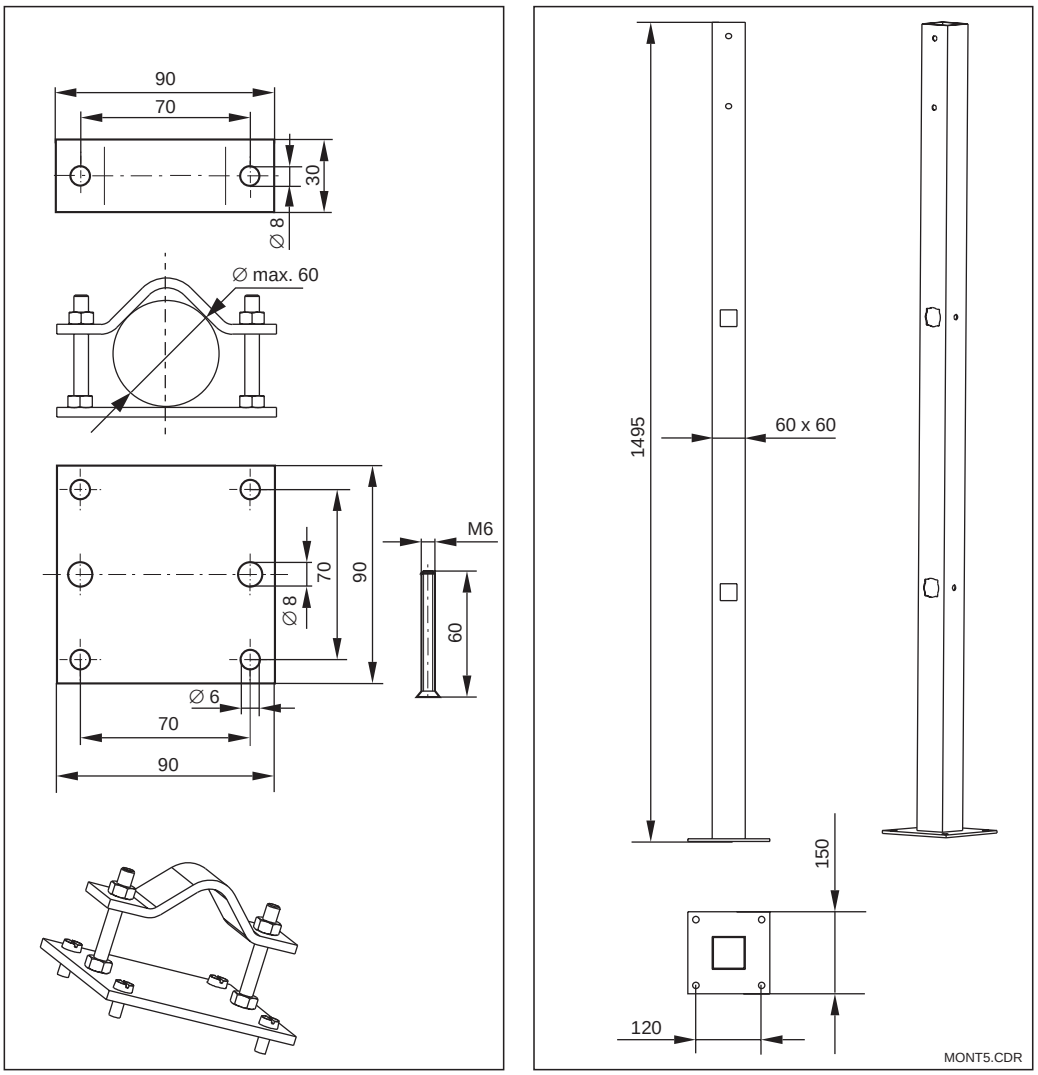
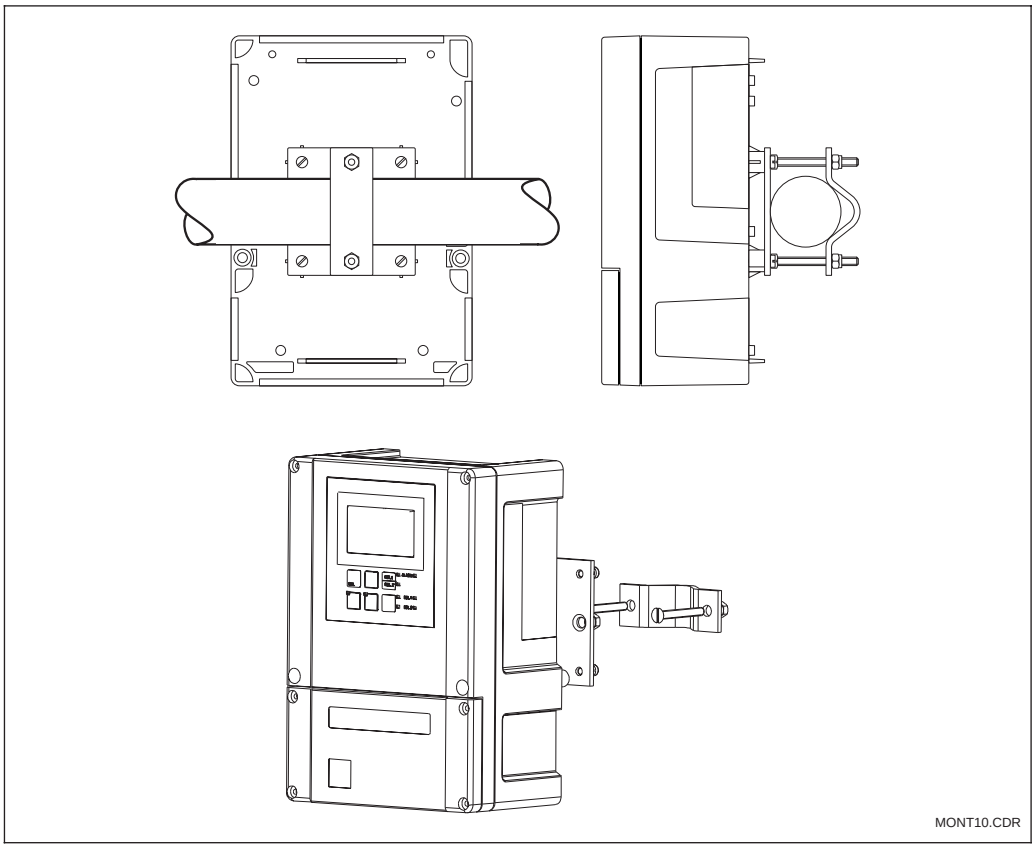
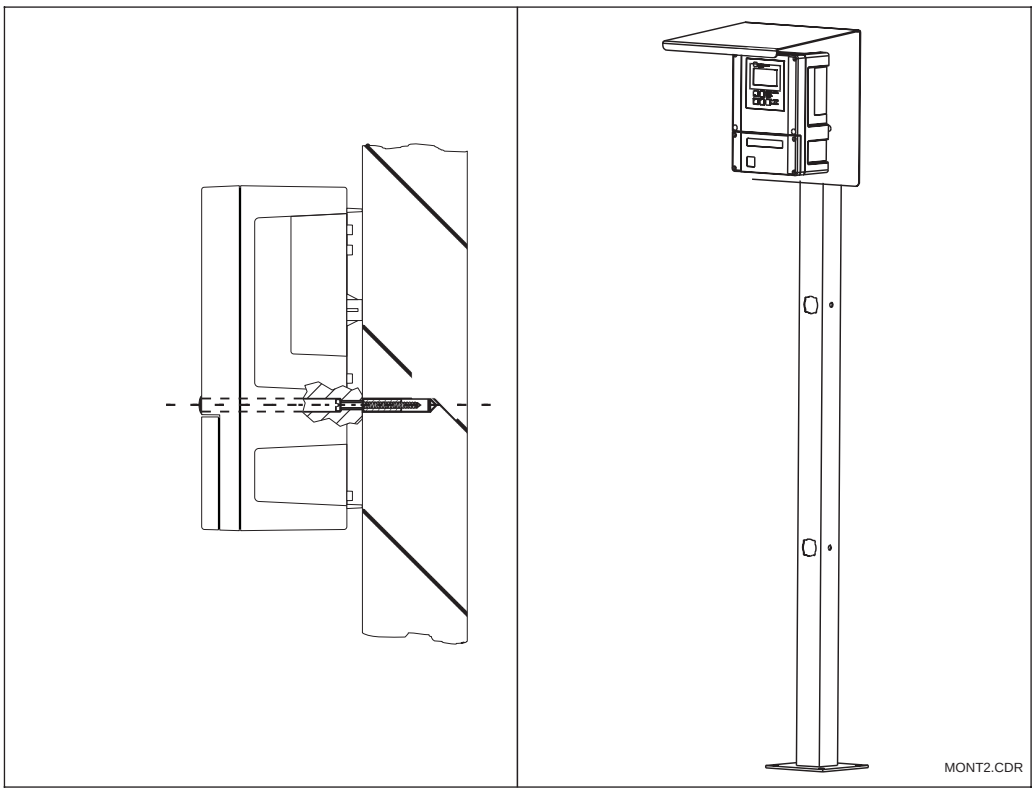


Fig. 3.6 *left:* Mounting kit for post mounting on cylindrical pipes
right: Square mounting post

3.3.2 Mounting examples



Field instrument:
Fig. 3.7 Pipe mounting



Field instrument

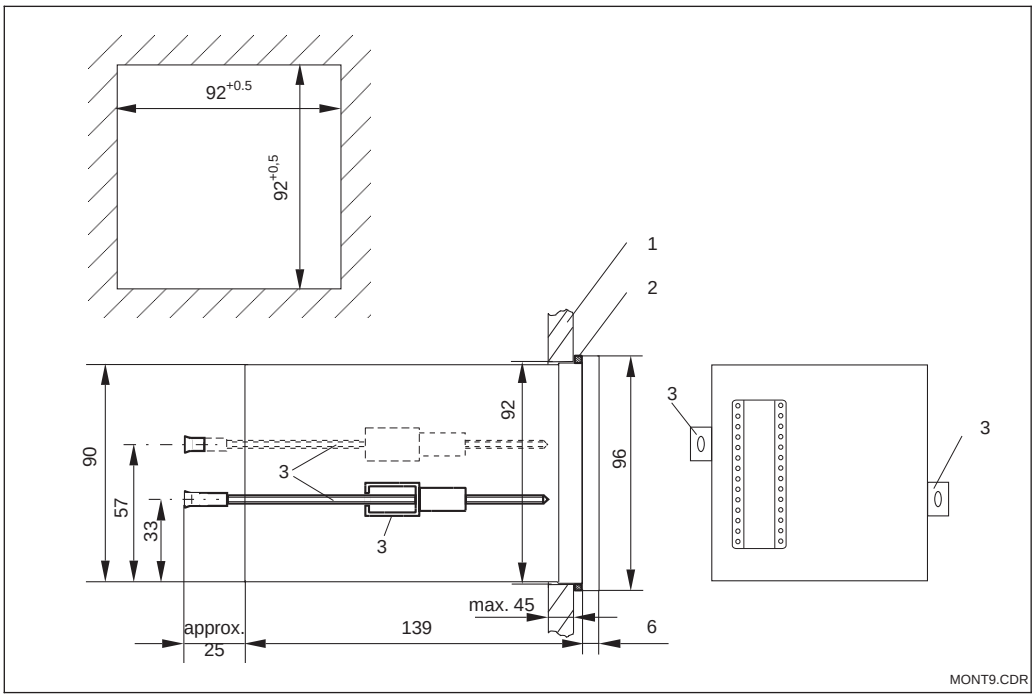
left:
Wall mounting

right:
Mounting with universal post and weather
Fig. 3.8 protection cover

LM253E03.CHP

3.3.3 Panel-mounted instrument

The instrument is attached using the supplied tensioning screws (see Fig. 3.9).
The required overall installation depth is approx. 165 mm.



Attachment of panel-mounted instrument
1 Wall of control cabinet
2 Gasket
Fig. 3.9 3 Tensioning screws

3.4 Electrical connection

Connection diagram

The connection diagram depicted in Fig. 3.10 shows the connections for an inductive or a conductive sensor (dashed lines). The connection for the various sensors is shown in more detail in the figures 3.13 to 3.15

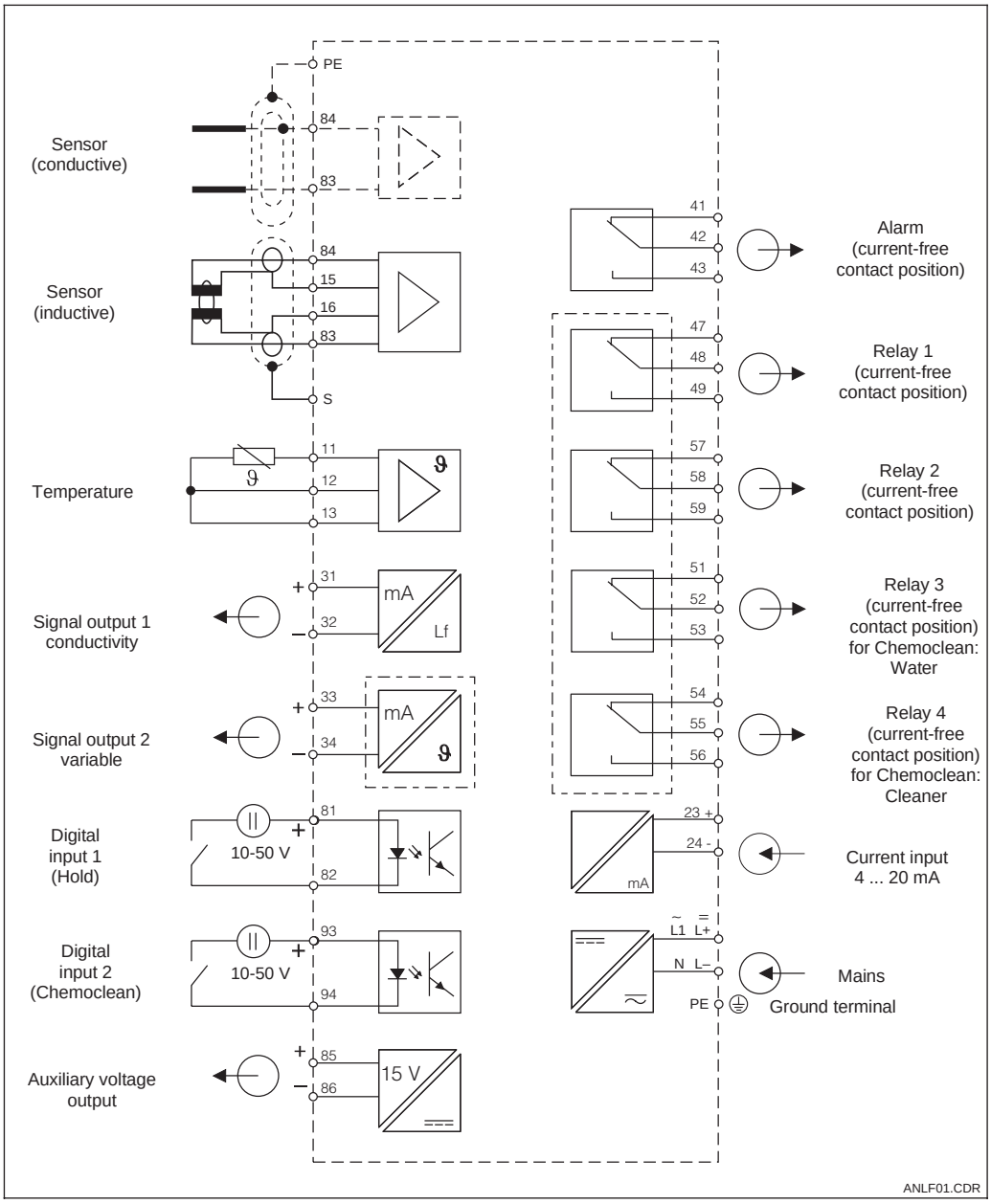


Fig. 3.10 Electrical connection of OLM 223 / 253 with full wiring

Note:

- The instrument has protection class II and is generally operated without protective earth connection.
- However you require a ground connection to ground the measuring cable screening.
- Mains supply voltage fluctuations should not exceed ten percent of the nominal supply voltage.
- 24V AC/DC models must be supplied from an energy limiting SELV source in accordance with dir. IEC 1010.1 Annex H.

LM253E03.CHP

Note:

- Please label the sensor terminal block with the enclosed sticker.
- Connect the ground terminal with PE.

Caution!

- Terminal designated as NC may not be switched.
- Undesignated terminals may not be switched.

Connections of field instrument

For connection, the measuring cables are introduced through the cable glands on the field instrument and connected according to the connection diagram in figures 3.10 and 3.11.

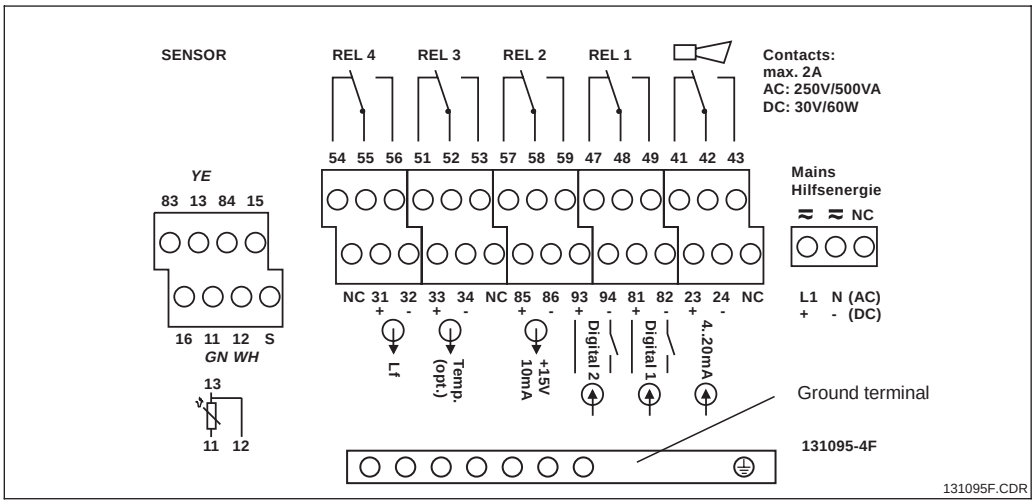


Fig. 3.11 Connection compartment sticker for field instrument OLM 253

Connections of panel-mounted instrument

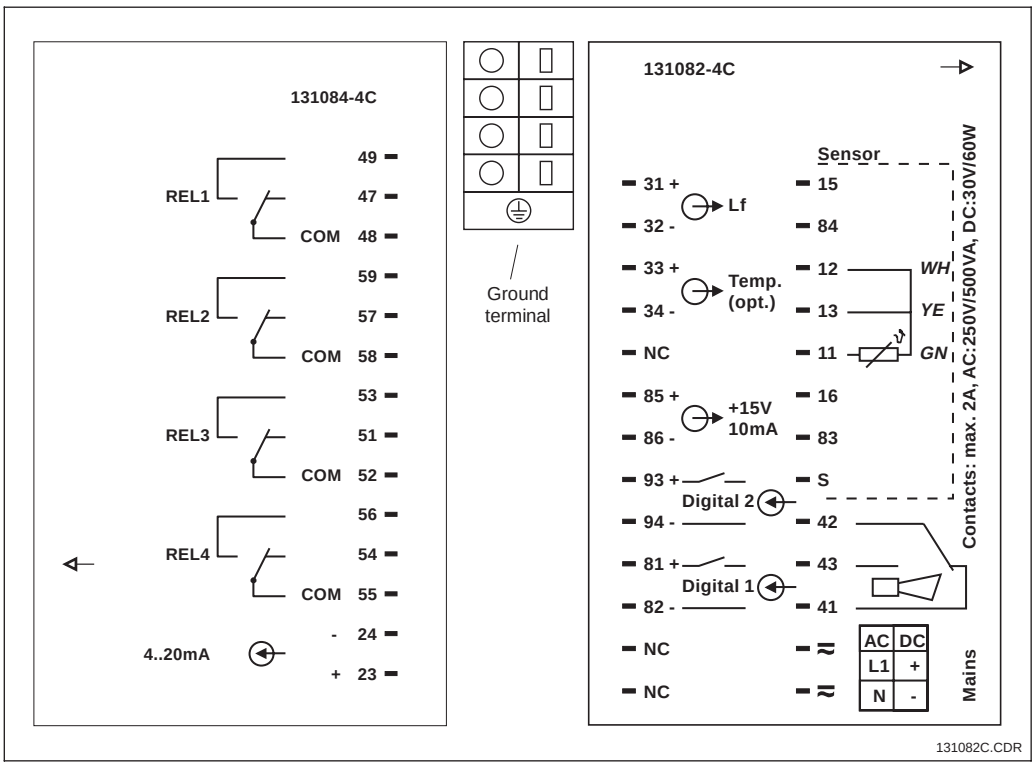


Fig. 3.12 Connection compartment sticker for panel-mounted instrument OLM 223

3.5 Sensor installation and cable connection

Measuring cable connection

The terminal block is located in a separate connection compartment which is accessible by opening the plastic cover. Remove the pre-pressed knock-outs for cable entry.

The conductivity sensors are connected using a special, shielded multi-core cable. Termination instructions are supplied with the measuring cables. Use junction box VBM to extend the measuring cable.

Note:

- Protect connectors, cable ends and terminals against moisture to prevent inaccurate measurement!
- For further information on cables and junction boxes refer to chap. 9 Accessories.

Measuring cable requirements		
Sensor type	**Cable**	**Extension**
2-electrode sensors with or without temperature sensor Pt 100	OYK 71	Junction box VBM + OYK 71
Inductive sensors OLS 50, OLS 52	Cable permanently attached to sensor	Junction box VBM + OLK 5
Maximum cable length		
Conductive conductivity measurement	max. 100 m with OYK 71 (corresponds to 10 nF)	
Resistance measurement	max. 15 m with OYK 71 (corresponds to 2 nF)	
Inductive conductivity measurement	max. 55 m (with OLK 5 and sensor cable)	

Structure and termination of measuring cables

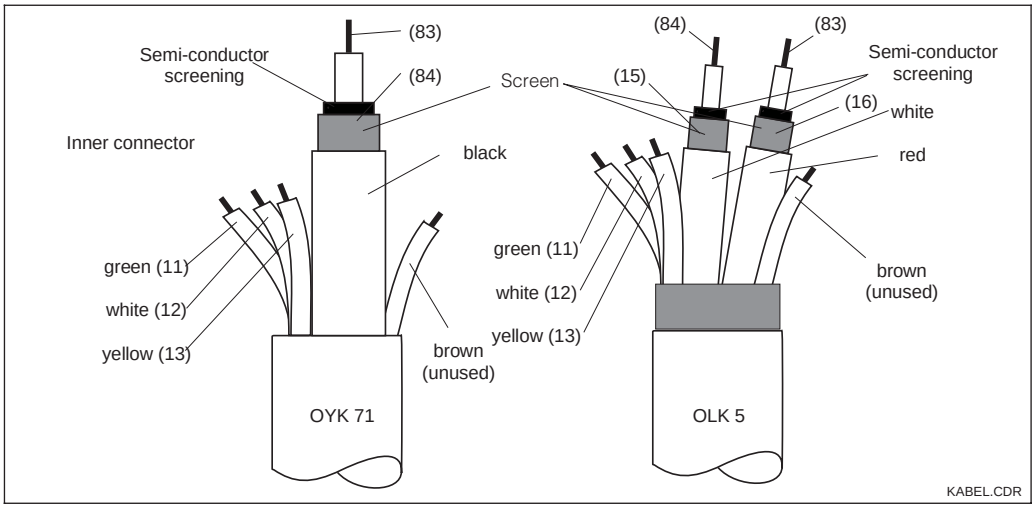


Fig. 3.13 Structure of special measuring cables OYK 71 (left) and OLK 5 (right)

LM253E03.CHP

Examples for connection

Note:

- Ground the sensor screen in order to ensure functional safety and measuring stability of the measuring system. For that purpose, a PE ground terminal is available. This is located on the cover frame of the panel-mounted instrument OLM 223, or in the connection compartment of the field instrument OLM 253.
- Ground the PE ground terminal.

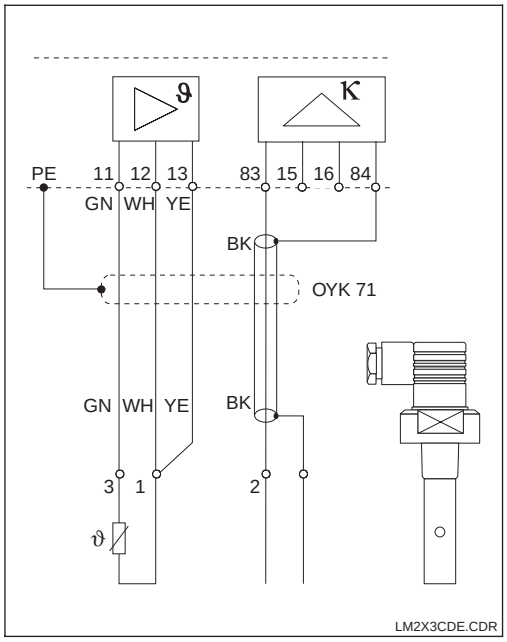


Fig. 3.14 Connection of conductive sensors (OLS 15, OLS 16, OLS 19, OLS 20, OLS 21, OLS 30)

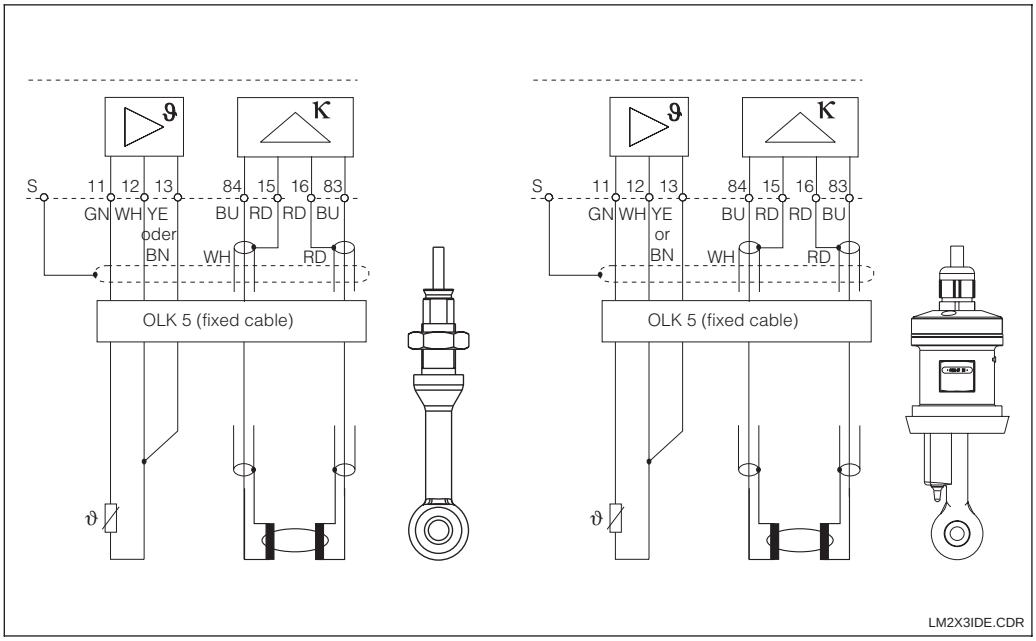


Fig. 3.15 Connection of conductive sensors (left: OLS 50, right: OLS 52)

4 Operation

4.1 Operator interface

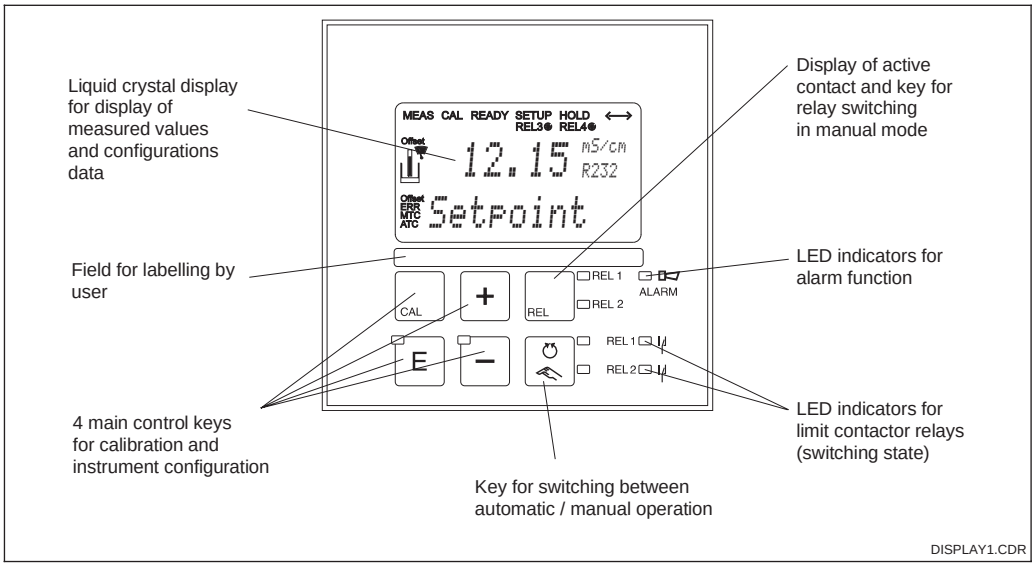


Fig. 4.1 Operating elements

4.2 Display

LED indicators

Indication of current operating mode “Auto” (green LED) or “Manual” (yellow LED)

REL

Indication for relay controlled in “Manual” mode (red LED)

REL 1 / REL 2

Indicates the state of relays 1 and 2
LED green: Measured value within permissible limits, relay inactive
LED red: Measured value outside permissible limits, relay active

ALARM

Alarm indication e.g. for continuous limit violation, temperature sensor failure or system errors (see error list chapter 7)

Liquid crystal display

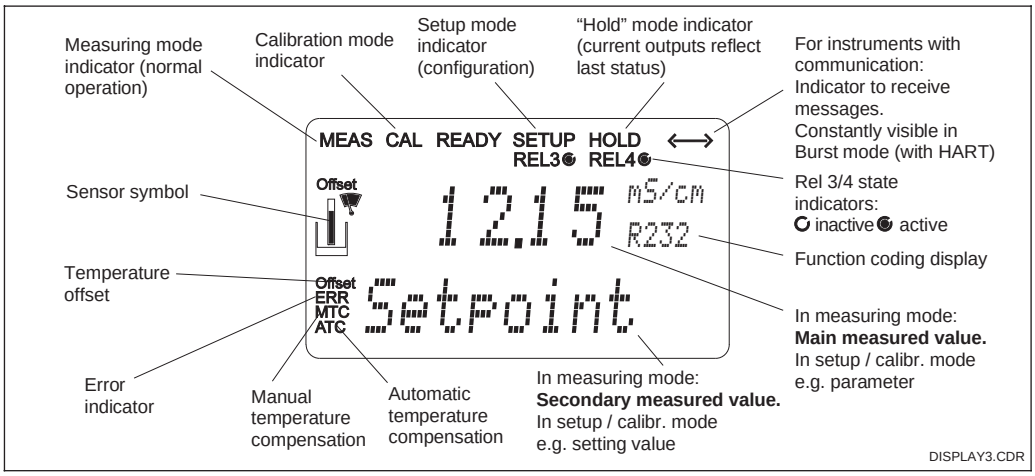
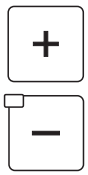
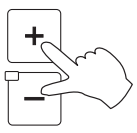
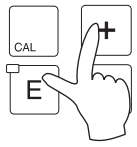
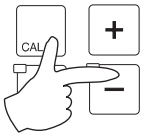
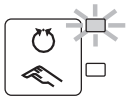
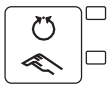


Fig. 4.2 Liquid crystal display

4.3 Key functions

	**CAL key** When the CAL key is pressed, the instrument prompts for the calibration access code: Code 22 for calibration Code 0 or any code for calibration data checking. Press the CAL key to acknowledge the calibration data or to proceed within the calibration menu.
	**ENTER key** The ENTER key has the following functions: Opens the Setup menu in measuring mode Stores (acknowledges) data entered in Setup mode. Moving on within the function groups.
	**PLUS key and MINUS key** The PLUS and MINUS keys have the following functions: Selection of function groups Setting of parameters and numeric values Relay operation in manual mode (see chapter 4.4). Pressing the **PLUS key** allows you to switch between the current input in % and mA. **Repeatedly pressing the PLUS key** displays the following settings in sequence as secondary measured values: 1. Temperature display in °F 2. Hide temperature display 3. Measured value display of uncompensated conductivity 4. Current input signal in % 5. Current input signal in mA 6. Back to basic setting. **Repeatedly pressing the MINUS key** outputs errors: 1. The current errors are displayed one after the other (max. 10) 2. After all the errors are displayed, the standard display is unhidden. In function group F, you can define an alarm for each error code separately.
	**REL key** The REL key toggles between the relay and manual cleaning start in manual mode. In automatic mode you can output the corresponding switch-on points (limit contactor) ot set points (PID controller) when pressing the REL key. Pressing the PLUS key allows you to display the settings of the following relay. Press the REL key to return to measuring mode (automatic return after 30s).
	**AUTO key** The AUTO key is used to toggle between the automatic and manual modes of operation.
	**Escape function** Press the PLUS and MINUS keys simultaneously to return to the main menu. Press the PLUS and MINUS keys again to return to measuring mode.
	**Locking the keypad** Pressing the PLUS and ENTER keys simultaneously for minimum 3s locks the keypad against unintentional entries. However, all settings can still be read. The code prompt displays the code 9999.
	**Unlocking the keypad** Pressing the CAL and MINUS keys simultaneously for minimum 3s unlocks the keypad. The code prompt displays the code 0.

4.4 Auto / manual mode of operation

	**Auto mode** In this mode of operation, the relays are controlled by the transmitter.
	**REL key** In manual mode, the REL key is used to select one of the relays or the cleaning function present in the instrument.
	**Switching to manual mode** The instrument is switched to the manual mode for relay setting by pressing the following keys:
	Press AUTO key.
	Enter code 22. Confirm with ENTER key.
	Select relay or function. Press the REL key to toggle between the relays. The display shows the selected relay and the switching status (ON / OFF) in the second line. In manual mode, the measuring value is continuously displayed (e.g. for monitoring during dosage).
	Set the relays. Switch on with PLUS, switch off with MINUS. The relay remains in effects until it is actively reset.
	Press AUTO key for returning to the measuring mode. All relaus are controlled by the transmitter again.

Note:

- Enable the manual mode by entering access code “22”.
- The operating mode remains in effect even after a power failure.
- The manual mode takes precedence over any other automatic function (hold).
- Hardware locking in the manual mode is not possible.
- The manual settings remain in effect until they are actively reset.
- Error code E102 is signalled in the manual mode.

4.5 Operating concept

4.5.1 Operating modes

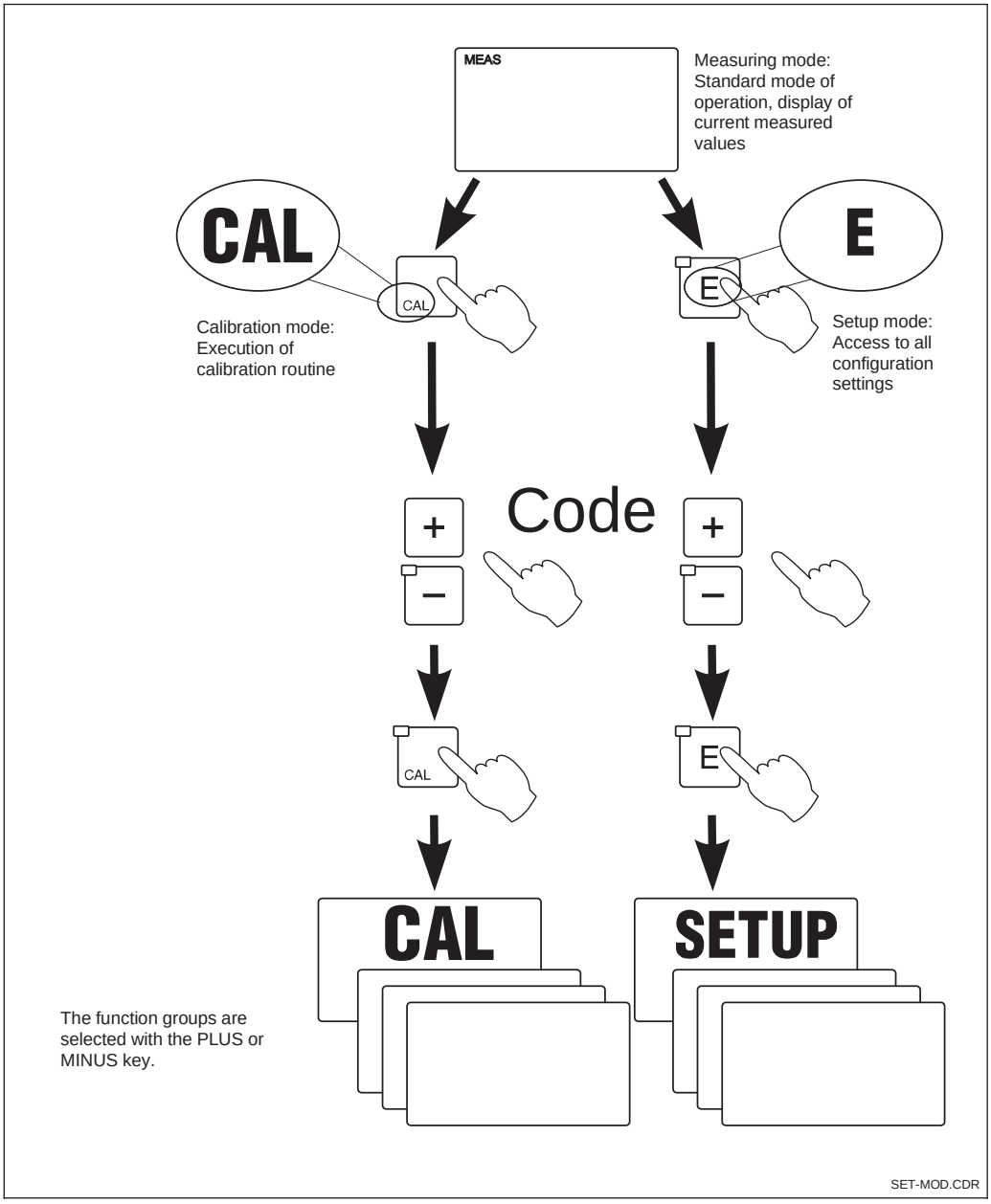


Fig. 4.3 Description of possible operating modes

Note:

- Remains in Setup mode for approx. 15 mins., the system automatically jumps back to Measuring mode. An active Hold function (Hold at Setup) is then reset.

4.5.2 Access codes

All instrument access codes are fixed, i.e. they cannot be modified. When the instrument requests the access codes, it recognises the difference between codes (cf. Fig. 5.3):

- **CAL key + Code 22:** Access to Calibration and Offset menus.
- **ENTER key + Code 22:** Access to the Configuration menus, allowing configuration and user-specific settings.
- **PLUS + ENTER keys + Code 9999:** Locks the keypad.
- **CAL + MINUS keys + Code 0:** Unlocks the keypad.
- **CAL or ENTER key + any Code**: access to Read mode, i.e. all settings can be read but not changed.

4.5.3 Menu structure

The configuration and calibration functions are arranged in a menu structure by function groups.

The function groups are selected in the setup mode with the PLUS and MINUS keys.
The ENTER key is used to move from one function to the next within a function group.
The PLUS and MINUS keys are used for option selection and editing. Selections must be confirmed by pressing the ENTER key. This also moves the cursor to the next function.
Pressing the PLUS and MINUS keys at the same time terminates programming (return to main menu).

Note:

- If a change is made but not confirmed by pressing the ENTER key, the previous setting is retained.
- See the appendix of these operating instructions for an overview of the menu structure.

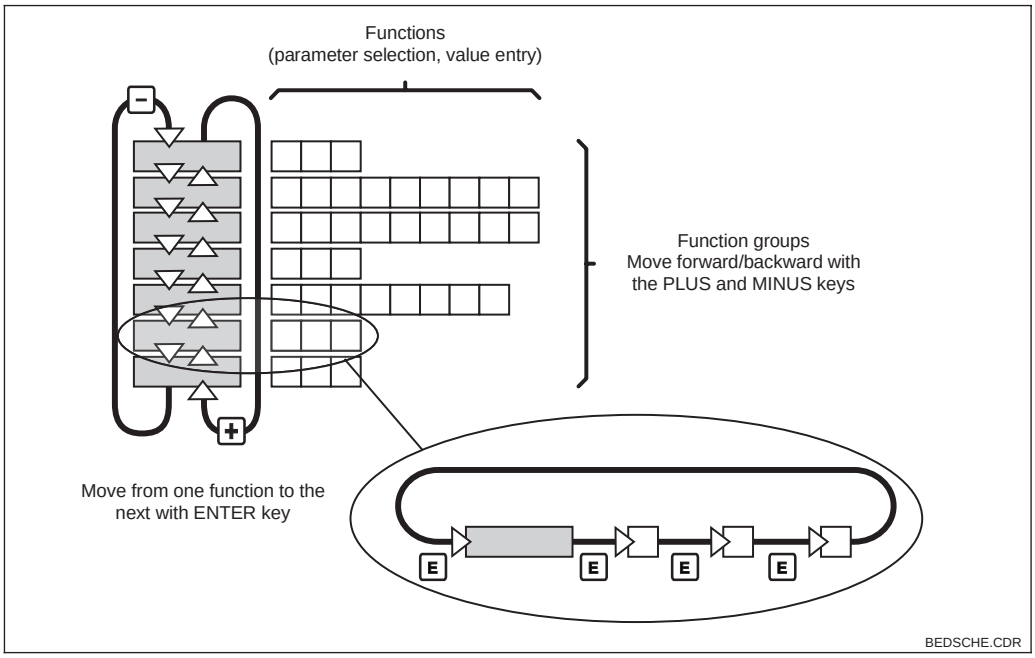


Fig. 4.4 Schematic representation of the menu structure

4.5.4 Hold function: “Freezes” the outputs

The current output is “frozen” in the setup mode and during calibration, i.e. the last current value is constantly output. HOLD appears on the display. In case of steady control (4... 20 mA) on current output 2, it is set to 0/4 mA during Hold.

Note:

- Hold settings can be found in chapter 5.6, function S2.
- During hold, all contacts will go to their normal positions.
- An active hold has priority over all other automatic functions.
- With every hold, the I component of the controller is set to zero.
- A possibly accumulated alarm delay is reset to “0”.
- The hold function can also be activated externally via the hold input (see wiring diagram Fig. 3.10; digital input 1).
- The manual hold (field S3) remains active even after a power failure.

5 Instrument configuration

After power-up the instrument performs a self-test and then enters to measuring mode.

Now it can be configured and calibrated for the first time. The values set by the user are kept even in the event of a power failure.

The following function groups are available on the transmitter (the groups that are only available in the Plus package are marked accordingly in the function descriptions):

Setup mode

➜ SETUP 1 (A)	see chap. 5.2.1
➜ SETUP 2 (B)	see chap. 5.2.2
➜ CURRENT INPUT (Z)	see chap. 5.3
➜ CURRENT OUTPUT (O)	see chap. 5.3
➜ ALARM (F)	see chap. 5.5.1
➜ CHECK (P)	see chap. 5.5.2
➜ RELAY (R)	see chap. 5.5
➜ ALPHA TABLE (T)	see chap. 5.6
➜ CONCENTRATION (K)	see chap. 5.7
➜ SERVICE 1 (S)	see chap. 5.8
➜ SERVICE 2 (E)	see chap. 5.9
➜ INTERFACE (I)	see chap. 5.10

Calibration mode

➜ CALIBRATION (C)	see chap. 5.11

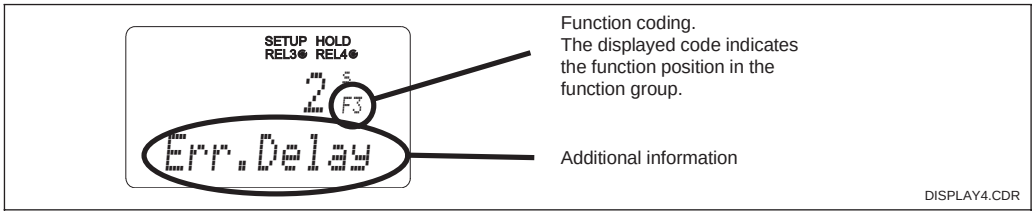


Fig. 5.1 Example of display in setup mode

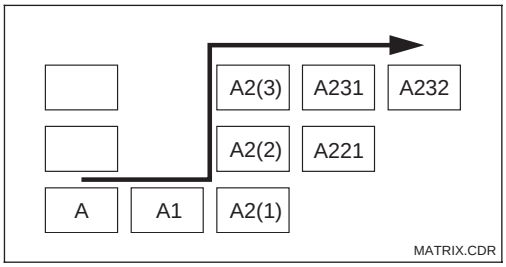


Fig. 5.2 Function coding

Selecting and locating functions is facilitated by a code displayed for each function in a special display field. The structure of this coding is given in Fig. 5.2.
The first column indicates the function group as a letter (see group designations). The functions in the individual groups are counted from the top to the bottom and from the left to the right.

LM253E5A.CHP

Factory settings

When the instrument is switched on for the first time, the factory settings are in effect. The following table provides an overview of all major settings. Please refer to the description of the individual function groups in chapter 5 for all other factory settings (the factory settings are printed in **bold**).

Function	Factory setting
Type of measurement	Conductive conductivity, Temperature in °C
Temperature compensation type	Linear with reference temperature 25 °C
Temperature compensation	Automatic (ATC on)
Limit for controller 1	9999 mS/cm
Limit for controller 2	9999 mS/cm
Hold	Active during configuration and calibration
Measuring range	0 µS/cm ... 2 S/cm (no measuring ranges for setting). The setting is flowing and is guided by the connected sensors (see chapter 9).
Current outputs 1 and 2*	4 ... 20 mA
Current output 1: meas. value for 4 mA signal current	0.00 S/cm
Current output 1: meas. value for 20 mA signal current	2000 mS/cm
Current output 2*: temperature value for 4 mA signal current	35.0 °C
Current output 2*: temperature value at 20 mA signal current	250.0 °C

*on versions equipped accordingly

Alarm contact

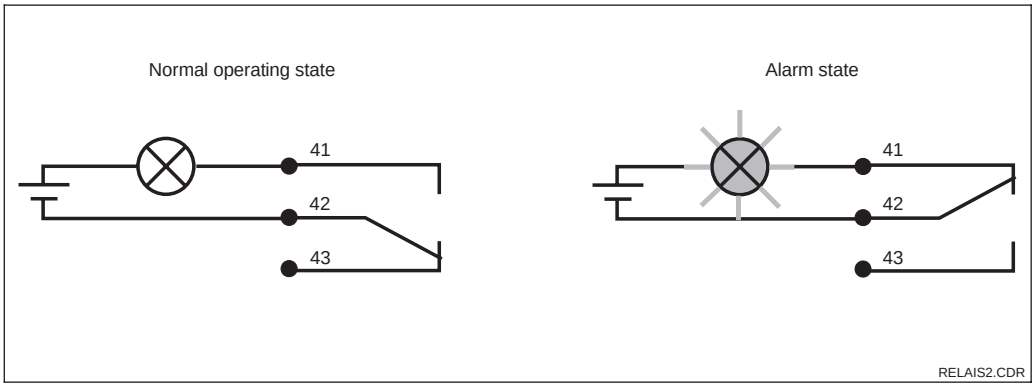


Fig. 5.3 Recommended fail-safe circuit for an alarm contact

Normal operating state:

- Instrument in operation
- No error message available (Alarm LED green)

→ Relay picked up
→ Contact 42/43 closed

Alarm state:

- Error message available (Alarm LED red) or
- Instrument defective or voltage-free (Alarm LED off)

→ Relay dropped out
→ Contact 41/42 closed

5.1 Start-up

After switching the instruement on, make the following settings to the specified function groups:

- **Function group SERVICE (S)**
  S1: Select language and exit function group (not required for English).
- **Function group SETUP 1 (A)**
  Adjust all the parameter in this group, see chapter 5.2.1.
- **Function group SETUP 2 (B)**
  Adjust all the parameters in this group, see chapter 5.2.2.

Other configuration options are explained in the chapters to follow for each menu.

5.2 System configuration

The system is configured using the function groups SETUP 1 and SETUP 2. The measurement type and sensor are selected here, and the settings for temperature measurement are made. All the parameters in these two function groups are to be configured to avoid measuring errors or failure to measure at all.

5.2.1 Setup 1 (Conductivity)

For access to the SETUP menu, please enter Code 22.

Coding	Field	Selection or range Factory setting (bold)	Display	Info
A	**Function group SETUP 1**		SETUP HOLD A SETUP 1	Initial display in function group SETUP 1.
A1	Operation mode selection	**cond** = **conductive** ind = inductive MOhm = resistance *Conc = concentration*	SETUP HOLD cond A1 Oper.Mode	Display varies according to instrument version: – cond/resistance/conc – ind/conc. If the operating mode changes, the user settings are reset to the basic settings.
A2	*Selection of concentration unit to be displayed (only with Plus package)*	***%*** *ppm* *mg/l* *TDS* *without*	SETUP HOLD % A2 Conc.Unit	*A2 only active, if A1 = conc.*
A3	*Selection of display format for concentration unit (only with Plus package)*	***XX.xx*** *X.xxx* *XXX.x* *XXXX*	SETUP HOLD XX.xx A3 Format	*A3 only active, if A1 = conc.*
A4	Selection of unit to be displayed	**auto,** µS/cm, mS/cm, S/cm, µS/m, mS/m, S/m, auto Ω, kΩ·cm, MΩ·cm, kΩ·m	SETUP HOLD auto A4 Unit	When “auto” or “auto Ω” is selected, the maximum resolution possible is automatically selected. A4 not active, if A1 = Conc.

Factory settings are printed in **bold** face;
base version does not include functions in *italic*.

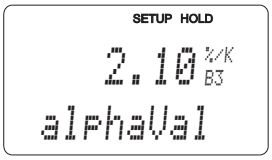
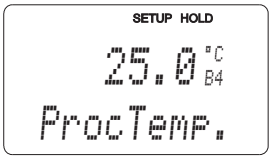
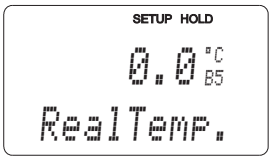
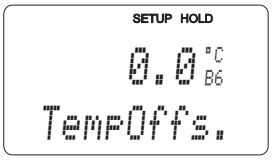
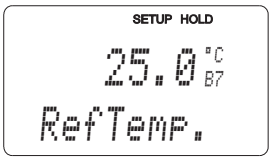
LM253E5A.CHP

Coding		Field	Selection or range Factory setting (bold)	Display	Info
	A5	Enter cell constant for sensors connected	cond: **1,000 cm^{-1}** ind: **1.98 cm^{-1}** MOhm: **0.01 cm^{-1}** 0.0025 ... 99.99 cm^{-1}	SETUP HOLD 1.000 1/cm A5 Cellconst	Refer to the sensor quality certificate for the exact cell constant.
	A6	Enter cable resistance	**0 Ω** 0 ... 99.99 Ω	SETUP HOLD 0 Ω A6 Ohm cable	Only with conductive sensors. Data on CYK 71 in chapter 10. Multiply the standardised line resistance by the actual cable length.
	A7	Enter measured value damping	**1** 1 ... 60	SETUP HOLD 1 A7 Damping	Measured value damping causes averaging over the specified number of individual measured values. It is used, for example, to stabilise the display with applications that fluctuate a great deal. There is no damping if “1” is entered.

5.2.2 Setup 2 (Temperature)

Coding		Field	Selection or range Factory setting (bold)	Display	Info
B		**Function group SETUP 2**		SETUP HOLD B SETUP 2	Initial display in function group SETUP 2.
	B1	Selection of temperature sensor	**Pt100** Pt1k = Pt 1000 NTC30 fixed	SETUP HOLD Pt100 B1 ProcTemp.	“Fixed”: Manual temperature compensation (MTC) , no temperature measurement if fixed temperature value is specified in B4.
	B2	Selection of temperature compensation type	**lin = linear** *Tab = table* NaCl = common salt (IEC 746) Pure = ultrapure water none	SETUP HOLD lin B2 TempComp.	This choice does not appear for concentration measurement. “Pure” is only available for conductive devices (see .)

Factory settings are printed in **bold** face;
base version does not include functions in *italic*.

Coding	Field	Selection or range Factory setting (bold)	Display	Info
B3	Enter temperature coefficient α	**2.10 %/K** 0.00 ... 20.00 %/K		Only if B2 = lin. With other settings in B2, Field B3 has no influence.
B4	Enter correct current process temperature	**25.0 °C** –35.0 ... 250.0 °C		Only if B1 = fixed. You can only edit the correction of the measured temperature value in °C.
B5	Configure temperature sensor	**Actual value display** –35.0 ... 250.0 °C		Making this entry allows the temperature sensor to be configured with an external measurement. Effects B6. Omitted if B1 = fixed.
B6	Enter temperature difference (offset)	**Current offset** –5.0 ... 5.0 °C		The offset is the difference between measured and entered temperature. Omitted if B1 = fixed.
B7	Enter reference temperature	**25.0 °C** –5 ... 100.0 °C		

5.3 Current input

This function group offers two independent application solutions, provided that the current output of an external measured quantity, e.g. flow meter, is connected to the 4 … 20 mA input of OLM 223 / 253. The following assignments then apply:

	Flow in main stream	Current signal in mA	**Current input signal in %**
Lower range limit current input	Lower setting value flow meter	**4**	**0**
Upper range limit current input	Upper setting value flow meter	**20**	**100**

Factory settings are printed in **bold** face;
base version does not include functions in *italic*.

LM253E5A.CHP

5.3.1 Monitoring the flow rate in the main stream

This arrangement is highly practical when the sample stream flowing through the flow assembly is totally independent of the flow rate in the main stream. This permits the signalling of an alarm state in the main stream (flow rate too low or totally stopped) and trigger a dosing switch-off, even if the measuring water stream is retained due to the installation configuration.

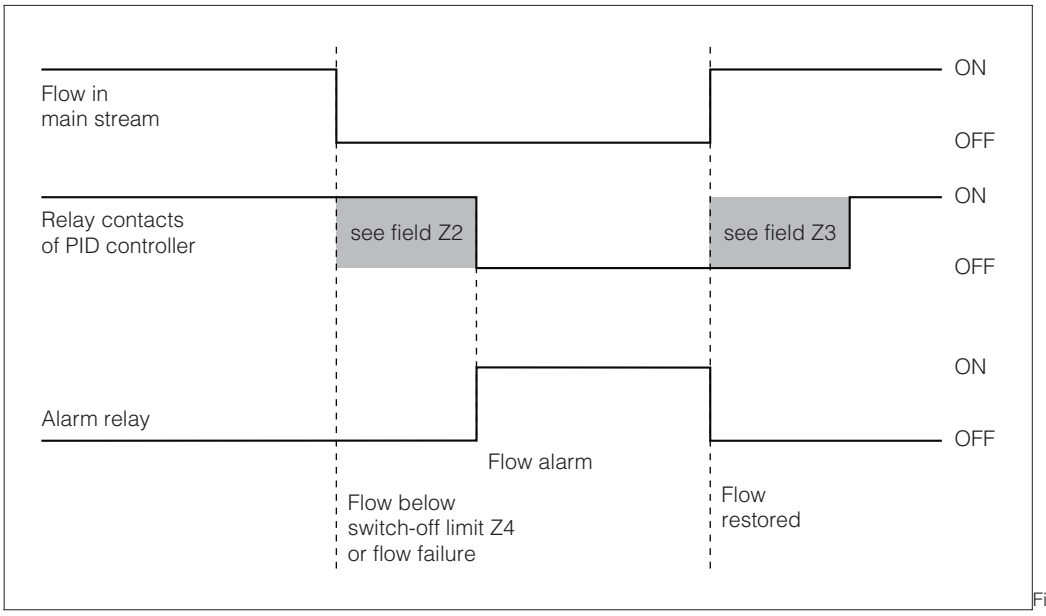


Fig. 5.4 Alarm signalling and dosing switch-off by the main stream

5.3.2 Feedforward control to PID controller

In processes with very short response times it may be practical to apply the flow rate to the controller, if the flow rate fluctuates, in order to optimise the control process.

Feedforward control is a multiplying function as depicted in the below figure (factory setting as example):

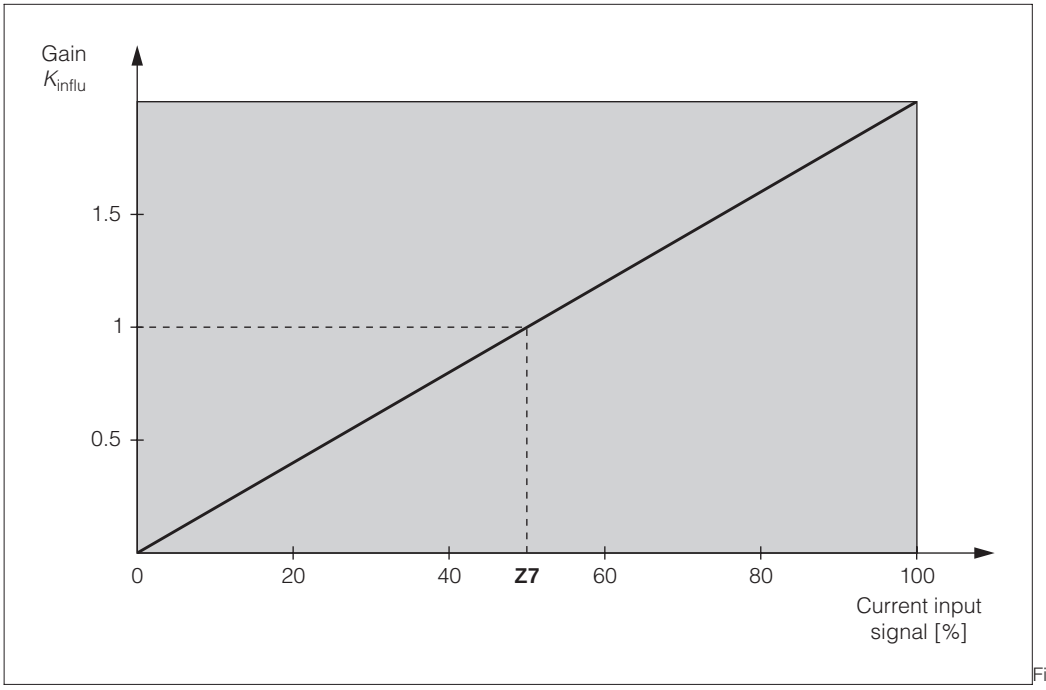


Fig. 5.5 Multiplying feedforward control

Coding	Field	Selection or range Factory setting (bold)	Display	Info
Z	**Function group CURRENT INPUT**		SETUP HOLD Z CUR.INPUT	Initial display in function group CURRENT INPUT.
Z1	Select flow rate monitoring of main stream (with controller switch-off)	**Off** Input	SETUP HOLD Off Z1 Cont.stop	Only switch on when flow meter is connected in main stream. When Z1 = Off, fields Z2 to Z5 do not exist.
Z2	Enter delay for controller switch-off by current input	**0 s** 0 ... 2000 s	SETUP HOLD 0 s Z2 Off Delay	Short-term flow rate undershots can be suppressed by delay and will not cause controller switch-off.
Z3	Enter delay for controller switch-on by current input	**0 s** 0 ... 2000 s	SETUP HOLD 0 s Z3 On Delay	
Z4	Enter switch-off threshold for current input	**50%** 0 ... 100%	SETUP HOLD 50 % Z4 A.Thresh	0 … 100% corresponds to 4 … 20 mA at current input. Note the measured value allocation to the current output of the flow meter.
Z5	Select orientation stop for current input	**Low** High	SETUP HOLD Low Z5 Stop Dir	If the value entered in Z4 is exceeded low or high, the controller switches off.
Z6	Select feedforward control for PID controller	**Off** lin = linear Basic	SETUP HOLD Off Z6 PID influ	When Z6 = Off, Z7 does not exist. Basic = Feedforward control only affects the basic load (alternatively dosage in proportion to quantity, if common PID control is not possible, e.g. due to sensor defect)
Z7	Enter value for feedforward control at which modulation gain = 1	**50%** 0 ... 100%	SETUP HOLD 50 % Z7 Kinflu=1	When the value is set, the controller manipulated value with feedforward control on is identical to feedforward control off.

Factory settings are printed in **bold** face;
base version does not include functions in *italic*.

LM253E5A.CHP

5.4 Current outputs

The function group CURRENT OUTPUT is used to configure the individual outputs. Either a linear (O3 (1)) or, in conjunction with the Plus package, a user-defined current output characteristic (O3 (3)) can be entered. Furthermore, a current output value can be simulated to check the current outputs (O3 (2)).
The controller set value in field R 237 can be output via current output 2, if available.

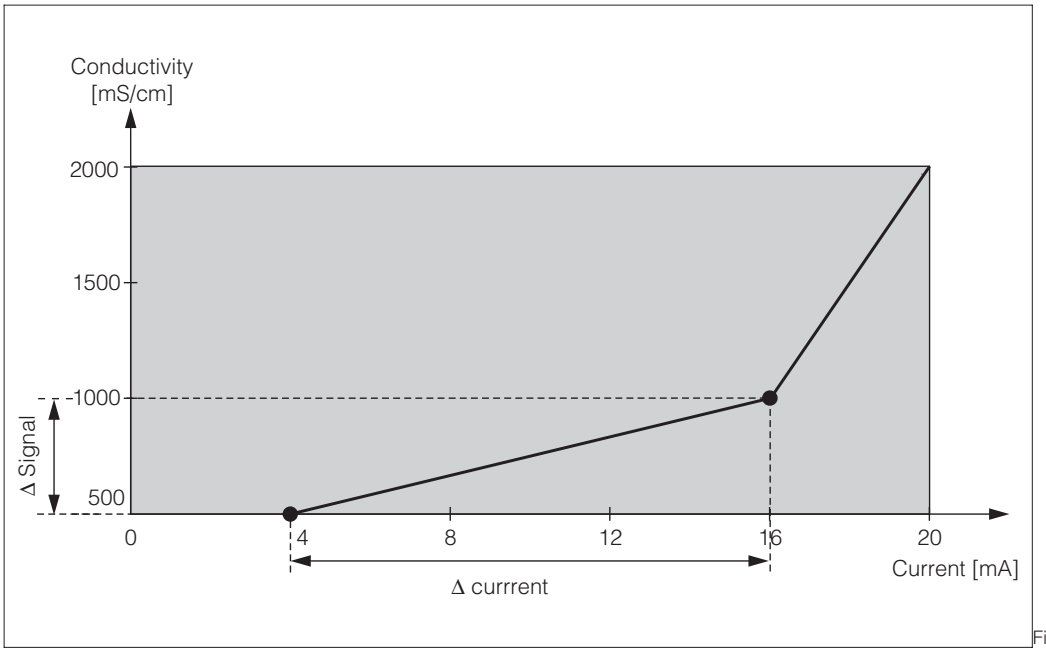


Fig. 5.6 User-defined current output characteristic

The distance Δ signal between two table value pairs must exceed:

- 0.5 % of measuring range per mA

First enter the current output configuration you require in the following blank table. Ensure the required minimum distance by calculating the resulting signal distance **per mA**. Then enter the result in the instrument.

	Current output 1			Current output 2		
Value pair	**pH / mV / % / °C [ ]**	**Current [mA]**	**Distance per mA**	**pH / mV / % / °C [ ]**	**Current [mA]**	**Distance per mA**
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						

Coding	Field	Selection or range Factory setting (bold)	Display	Info
O	**Function group CURRENT OUTPUT**		SETUP HOLD 0 AUSGANG	Initial display in function group CURRENT OUTPUT.
O1	Select current output	**Out1** *Out2*	SETUP HOLD Out1 01 Sel.Out	A different characteristic can be selected for each output.
O2	Select measured quantity for 2nd current output	**°C** mS/cm Contr	SETUP HOLD °C 02 Sel. Out2	Selection of Curr (= current output 2) in field R247 is only possible, if field O2 = Contr is selected.
O3 (1)	Enter or output linear characteristic	**lin** = **linear** (1) sim = simulation (2) *Tab = table (3)*	SETUP HOLD lin 02 Sel.Type	The characteristic can have a positive or negative slope at the measured value output. At set value output (O2 = Contr), the increasing current corresponds to an increasing set value.
O311	Selection of current range	**4–20 mA** 0–20 mA	SETUP HOLD 4-20 0311 Sel.Range	
O312	0/4 mA value; enter corresponding measured value	cond/ind: **0.00 µS/cm** MOhm: **0.00 kΩ·cm** *Conc:* ***0.00 %*** Temp.: **0.0 °C**	SETUP HOLD 0.00 µS/cm 0312 0/4 mA	Enter the measured value corresponding to the minimum current value (0/4 mA) at the transmitter output. Display format from A3. (Spreading see Technical data.)
O313	20 mA value; enter corresponding measured value	cond/ind: **2000 mS/cm** MOhm: **500 kΩ·cm** *Conc:* ***99.99 %*** Temp.: **150.0 °C**	SETUP HOLD 2000 mS/cm 0313 20 mA	Enter the measured value corresponding to the maximum current value (20 mA) at the transmitter output. Display format from A3. (Spreading see Technical data.)
O3 (2)	Current output simulation	lin = linear (1) **sim** = **simulation** (2) *Tab = Table (3)*	SETUP HOLD sim 02 Sel.Type	This simulation is terminated by selecting (1) or (3). See O3 (1), O3 (3) for other characteristics.

LM253E5A.CHP

Coding	Field	Selection or range Factory setting (bold)	Display	Info
O321	Enter simulation value	**current value** 0.00 ... 22.00 mA	SETUP HOLD 4.00 mA 0321 Simulat.	The current value entered here is output through the current output.
O3 (3)	*Enter current output table*	*lin = linear (1)* *sim = simulation (2)* ***Tab** = **Table** (3)*	SETUP HOLD table 02 Sel.Type	*Values may also be added or changed at a later point in time. The values entered are automatically sorted in ascending order by current value. See O3 (1), O3 (2) for other characteristics.*
O331	*Selection of table option*	***read*** *edit*	SETUP HOLD read 0331 Sel.Table	
O332	*Enter number of table value pairs*	***1*** *1 ... 10*	SETUP HOLD 1 0332 No.Elem.	*This is where the number of x and y value pairs (measured value and associated current value) is entered.*
O333	*Selection of table value pair*	**1** *1 ... Number of table value pairs* *Finished*	SETUP HOLD 1 0333 Sel.Elem.	*The function chain O333 ... O335 will run though as many times as correspond to the value in O332. "Finished" appears as the last step. After confirmation the system jumps to O336.*
O334	*Enter x value (measured value)*	*cond/ind:* ***0.00 µS/cm*** *MOhm:* ***0.00 kΩ·cm*** *Conc:* ***0.00 %*** *Temp.:* ***0.0 °C***	SETUP HOLD 0.00 µS/cm 0334 Meas.val.	*x value = User-specified measured value.*
O335	*Enter y value (current value)*	***4.00 mA*** *0.00 ... 20.00 mA*	SETUP HOLD 0.00 mA 0335 mA value	*y value = Current value belonging to O334 which is specified by user.*
O336	*Message whether or not the table status is OK*	***yes*** *no*	SETUP HOLD yes 0336 Status ok	*Return to O3.* *If status = "no", set table correctly (all previous settings are kept) or back to measurement mode (table will be deleted).*

Factory settings are printed in **bold** face;
base version does not include functions in *italic*.

5.5 Monitoring functions

The monitoring functions are used to define various alarms and to set output contacts. Each individual error can be defined to be effective or not (at the contact or as an error current). Moreover, sensor polarisation can be detected (P1). An alarm condition can be defined to activate a cleaning function (F8).

5.5.1 Alarm

Coding	Field	Selection or range Factory setting (bold)	Display	Info
F	**Function group ALARM**		SETUP HOLD F ALARM	Alarm function settings.
F1	Selection of contact type	**Stead** = **steady contact** Fleet = fleeting contact	SETUP HOLD Stead F1 Cont.Type	The contact type selected here only applies to the alarm contact.
F2	Selection of time unit	**s** min	SETUP HOLD s F2 Time Unit	
F3	Enter alarm delay	**0 min (s)** 0 ... 2000 min (s)	SETUP HOLD 0 s F3 Err.Delay	Depending on the unit selected in F2, the alarm delay in entered in s or min.
F4	Selection of error current	**22 mA** 2.4 mA	SETUP HOLD 22mA F4 Err.Curr	This selection must be made even if all errors are suppressed in F5. If you did not select “0–20 mA” in O311, you may not use “2.4 mA”.
F5	Selection of error	**1** 1 ... 255	SETUP HOLD 1 F5 Sel.Error	This is where the errors are selected that are to trigger an alarm signal. The errors are selected via the error number. Please refer to the table in chapter 7 for the error numbers. The factory settings remain in effect for all errors not edited.
F6	Set alarm contact to be effective for selected errors	**yes** no	SETUP HOLD yes F6 Rel.Assg	If set to “no”, all the other alarm settings are also deactivated (e. g. alarm delay). The settings themselves are retained. This setting **only** applies to the error selected in F5.
F7	Set error current to be effective for selected error	**no** yes	SETUP HOLD no F7 Curr.Assg	The error current selected in F4 becomes effective or is suppressed in case of error. This setting **only** applies to the error selected in F5.

LM253E5A.CHP

Coding	Field	Selection or range Factory setting (bold)	Display	Info
F8	Automatic start of cleaning function	**no** yes	SETUP HOLD no F8 CleanTrig	This field only exists for some errors, see chapter 7.
F9	Return to menu or select next error	**next = Next error** <—-R	SETUP HOLD next F9 Select	If next is selected, the display returns to F5. If <—-R is selected, the display returns to F.

5.5.2 Check

The function group RELAYS is only accessible for instruments equipped with the Plus package.

Polarisation detection

Polarisation effects in the interface between electrode and measuring solution limit the measuring range of conductive conductivity sensors. The transmitter has the ability to detect polarisation effects using an intelligent evaluation process.

PCS alarm (Process Check System)

This function us used to examine the measuring signal for deviations. If the measuring signal is constant for a specific period of time (several measured values), an alarm is issued. This type of sensor behaviour may be caused by soiling, etc.

Note:

A current PCS alarm is automatically deleted as soon as the sensor signal changes.

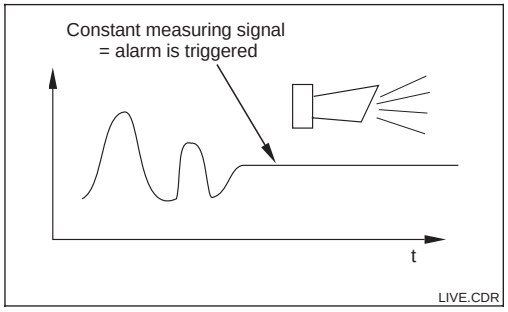
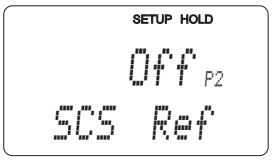
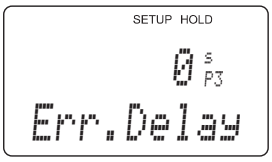
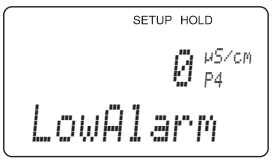
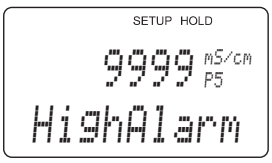
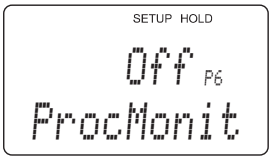
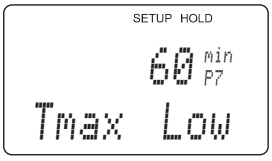
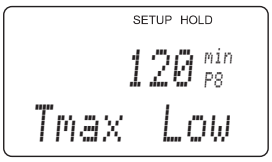
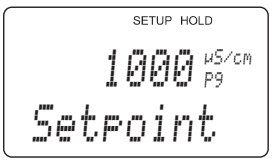


Fig. 5.7 PCS Alarm (live-check)

Coding	Field	Selection or range Factory setting (bold)	Display	Info
P	***Function group CHECK***		SETUP HOLD P CHECK	*Settings for sensor and process monitoring.*
P1	*Switch polarisation detection on or off (conductive only)*	***off*** *on*	SETUP HOLD On P1 SCS Glass	*Polarisation only occurs with conductive sensors.* *Polarisation is detected, but not compensated.* *(Error no.: E071.)*

Factory settings are printed in **bold** face;
base version does not include functions in *italic*.

Coding	Field	Selection or range Factory setting (bold)	Display	Info
P2	*Set PCS Alarm (live-check)*	***Off*** *Low* *High* *Lo+Hi* *Low!* *High!* *LoHi!*		*This function is used to examine the measuring signal. An alarm is signalled if it does not change for the period selected here. Monitoring limit: 0.3 % of mean value over selected period. (Error no.: E152.)*
P3	*Enter error delay*	***0 s (min)*** *0 ... 2000 s (min)*		*Depending on your selection in F2, you can enter the error delay in min or s. Only after this does a high or low limit violation cause an alarm as per field P4 / P5.*
P4	*Enter lower alarm threshold*	***0 µS/cm*** *0 ... 9999 mS/cm*		
P5	*Enter upper alarm threshold*	***9999 µS/cm*** *0 ... 9999 mS/cm*		
P6	*Select process monitoring (PCS alarm)*	***Aus*** *AC* *CC* *AC+CC* *AC!* *CC!* *ACCC!*		*AC = Sensor alternation check* *CC = Controler check* *Alarm signalling optionally with or without simultaneous controller switch-off.* *xxxx = without controller switch-off* *xxxx! = with controller switch-off*
P7	*Enter maximum permissible period for lower monitoring limit violation*	***60 min*** *0 ... 2000 min*		*Only when P6 = CC or AC+CC.*
P8	*Enter maximum permissible period for upper monitoring limit violation*	***120 min*** *0 ... 2000 min*		*Only when P6 = CC or AC+CC.*
P9	*Enter monitoring limit*	***1000 µS/cm*** *0 ... 9999 mS/cm*		*Selected value is an absolute value. This function is mainly used for batch process and single-sided limit switches.*

Factory settings are printed in **bold** face;
base version does not include functions in *italic*.

LM253E5B.CHP

5.5 Relay contact configuration

The function group RELAYS is only accessible for instruments equipped with the Plus package.

The relay contacts described below can be selected and configured as required (max. four contacts depending on options installed):

- Limit contactor for measured conductivity value: R2 (1)
- Limit contactor for temperature: R2 (2):
- P(ID) controller: R2 (3)
- Timer for cleaning function: R2 (4)
- ChemoClean function: R2 (5)
- USP: R2 (6) (for Plus package, conductive only)

5.5.1 Limit contactor for measured conductivity value and temperature

The relay contacts in the transmitter can be assigned different functions.
Switch-on and switch-off points and pickup and dropout delays can be defined for the limit contactor. Moreover, an alarm threshold can be set to issue an error message and to start a cleaning function.
These functions may be used for conductivity as temperature measurement.

Please refer to Fig. 5.5 for a graphic representation of the contact states of any relay or alarm contact.

When the measured value increases (max. function), the relay contact is closed at time t_2 when the switch-on point has been exceeded (t_1) and the pickup delay ($t_2 - t_1$) has expired. When the alarm threshold (t_3) is reached and the alarm delay ($t_4 - t_3$) also has expired, the alarm contact is switched.
When the measured value decreases, the alarm contact is reset when the measured value drops below the alarm threshold (t_5). The relay contact is also reset (t_7, after the dropout delay $t_7 - t_6$).
When the pickup and dropout delays are set to 0 s, the switch-on and switch-off points are identical to the contact switching points.
Settings analogous to the max function can also be made for a min function.

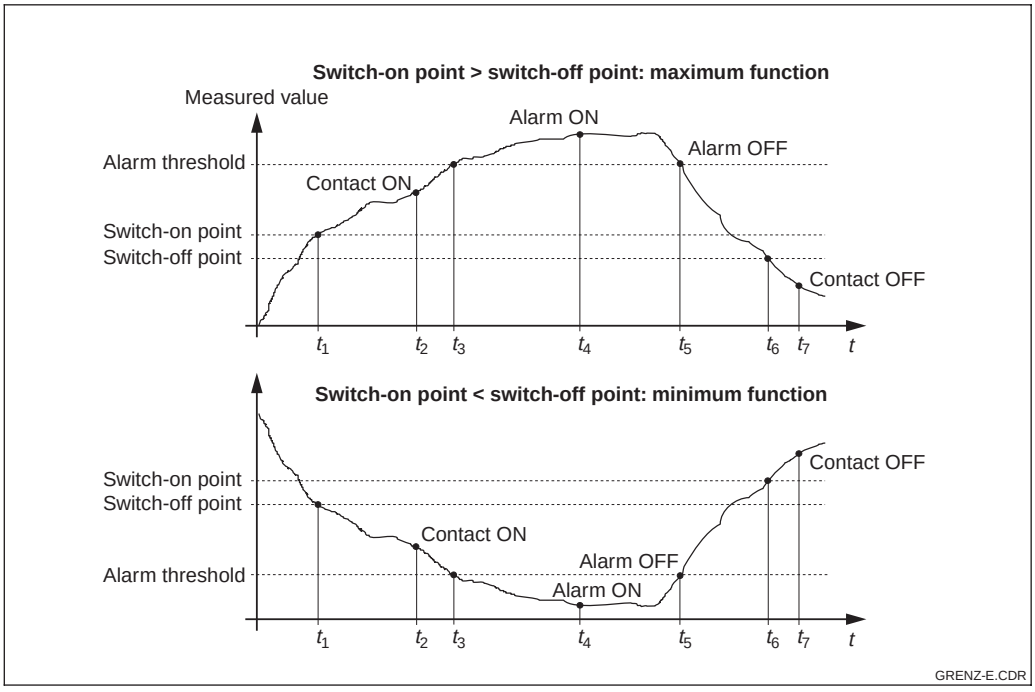


Fig. 5.8 Depiction of alarm functions

5.5.2 P(ID) controller

The transmitter supports the definition of various controller functions. On the basis of the PID controller, P, PI, PD and PID controllers can be implemented. The best control response is obtained, using the controller best suited to the application in question.

- **P controller:** Used for simple linear control purposes with small system deviations. Where major changes are to be controlled, overshooting may occur. A control offset is to be expected.
- **PI controller:** Used for processes where overshooting is to be avoided and permanent offsets are not allowed.
- **PD controller:** Used for processes that require quick response and where peaks are to be corrected.
- **PID controller:** Used for processes for which the type of control provided by a P, PI or PD controller is inadequate.

Setting options of PID controller

There are three setting options for a PID controller:

- Control gain Kp (P impact)
- Integral action time T_n (I impact)
- Derivative action time T_v (D impact)

Start-up

If there are no empirical values available for setting the control parameters, use values that provide the greatest possible stability of the control loop. To optimise the control loop further:

- Increase the control gain K_p until the control variable just starts to overswing.
- Decrease K_p again slightly and shorten the integral action time T_n to achieve the shortest possible correction time without overswing.
- In order to shorten the response time of the controller, you also have to set the derivative action time T_v.

LM253E5B.CHP

Checking and fine tuning of parameter settings using a recorder

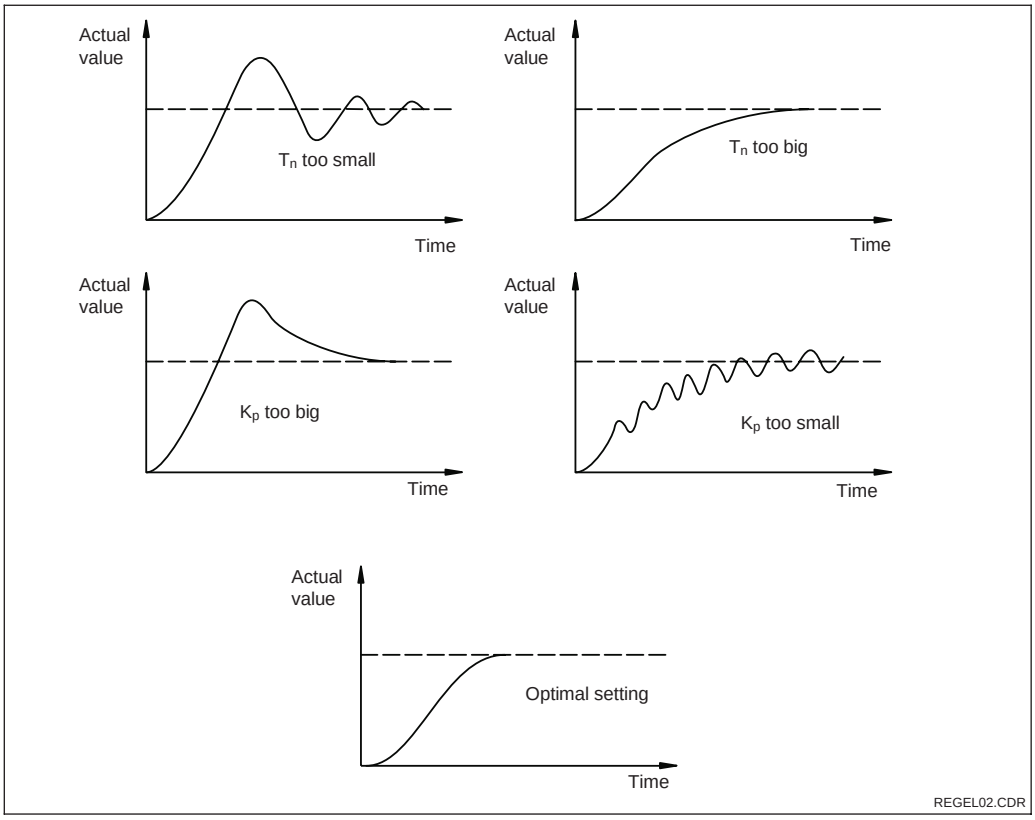


Fig. 5.10 Optimisation of settings for T_n and K_p

Actuating signal outputs (R237 ... R2310)

The control contact in question outputs a switched signal whose intensity corresponds to the controller's output. A distinction is made according to the type of signal output:

- *Pulse length modulation*
  The greater the calculated control output, the longer the contact in question remains picked up. The period can be adjusted between 0.5 and 99 s. Pulse-length modulated outputs are used to control solenoid valves.
- *Pulse frequency modulation*
  The greater the calculated control output, the higher the switching frequency of the contact. The maximum switching frequency 1/T can be adjusted between 60 and 180 min^{-1}. The ON period t_{ON} is constant. Pulse frequency-modulated outputs are used to control solenoid-operated metering pumps.

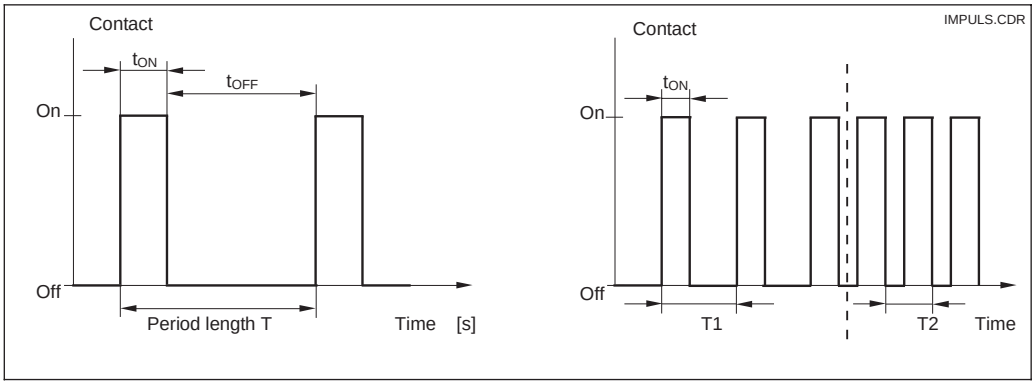


Fig. 5.9 Signal of a pulse length-modulated (left) and a pulse frequency-modulated control contact (right)

Control characteristic for direct and inverted control action

Field R236 offers two control characteristics for selection which have the effects shown in the following diagram.

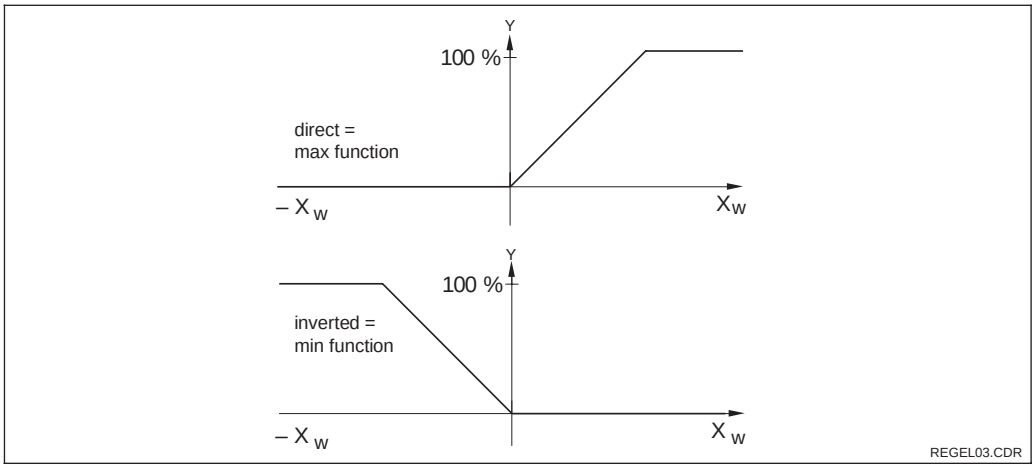


Fig. 5.11 Control characteristic of a proportional controller with direct and inverted control action

5.5.3 Timer for cleaning function

This function can be used to implement a simple cleaning routine. The user can specify a time interval after which cleaning is to start; i.e. only constant intervals can be defined. More extended cleaning functions can be implemented in conjunction with the ChemoClean function (version with four contacts, see chapter 5.5.5 5).

Note:

The timer and ChemoClean do not work independently of each other. Whilst one of the functions is active, the other cannot be started.

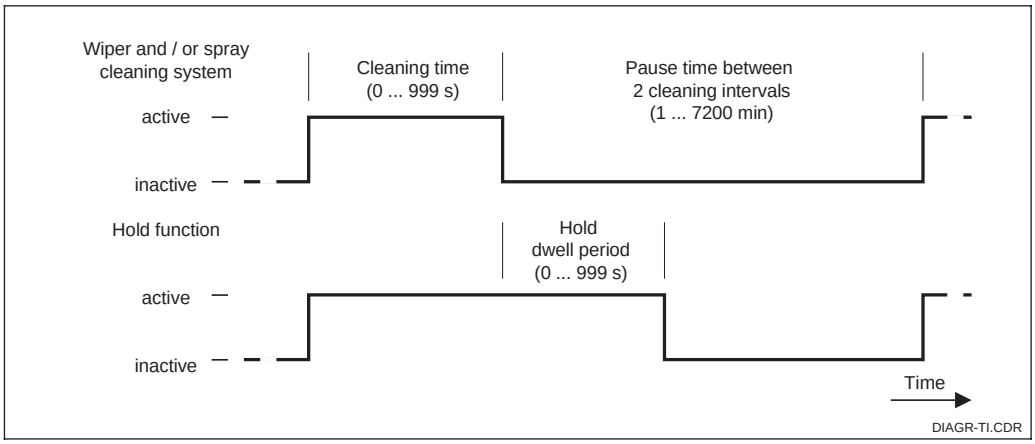


Fig. 5.12 Relationship among cleaning time, pause time and hold dwell period

5.5.4 ChemoClean function

Just like the timer function, ChemoClean can also be used to start a cleaning cycle. By comparison, the function scope is extended by an option for defining cleaning and rinsing intervals. Thus, irregular cleaning with different repeat cycles is possible, and cleaning times with post-rinse times can be individually defined.

Note:

- Use relays 3 (water) and 4 (cleaner) for the ChemoClean function.
- Abortion of the cleaning process is always followed by a post-rinse time.
- When “Economy” is selected, cleaning only takes place with water.

LM253E5B.CHP

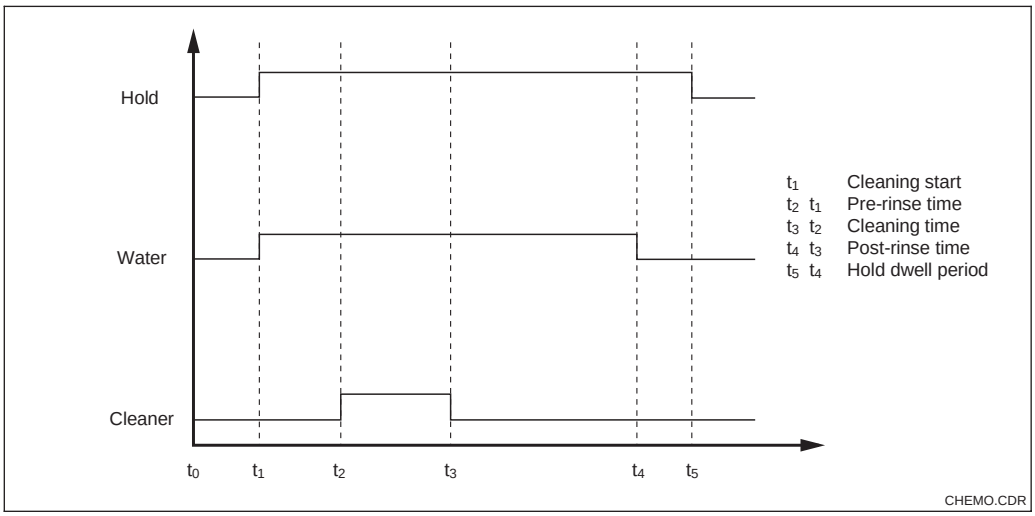


Fig. 5.13 Cleaning cycle sequence

5.5.5 USP function (conductive only)

The transmitter can measure and monitor the uncompensated conductivity (Field R2(6)) according to USP ("United States Pharmacopeia") guidelines.

The measurement is performed as follows:
- Measurement of uncompensated conductivity
- Compare the actual measured value with a monitoring value for pure water (see table)
- Temperature measurement at place of conductivity measurement
- Rounding temperature to the next 5 °C step
- Determination of applicable monitoring value from a table (see below)
- Alarm signalling in the event the monitoring value is exceeded.

Note:

- To use the USP function, the device must be equipped with relays and the Plus package.
- For alarm output, activate the fault-signalling contact or the error current in Field F5 - F7 (error code 151 and 153).
- The prealarm is only active, if you make the switch-on point (R262) greater than the switch-off point (R263).
- Should the measured values deviate from the table values, the error message E 151 is triggered.
- The instrument uses uncompensated values for the USP function even in case temperature compensated values are displayed.

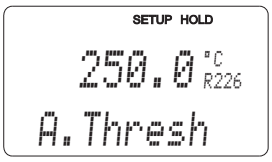
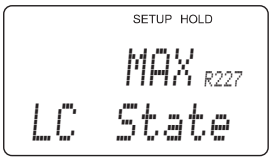
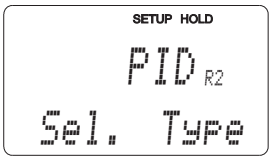
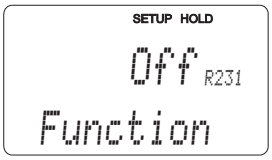
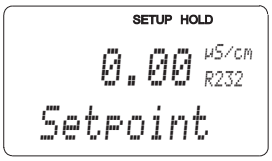
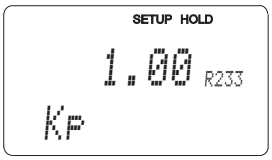
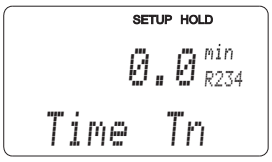
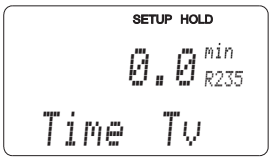
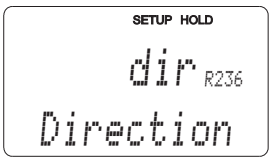
Temperature [°C]	Conductivity [µS/cm]	Temperature [°C]	Conductivity [µS/cm]
0	0.6	55	2.1
5	0.8	60	2.2
10	0.9	65	2.4
15	1.0	70	2.5
20	1.1	75	2.7
25	1.3	80	2.7
30	1.4	85	2.7
35	1.5	90	2.7
40	1.7	95	2.9
45	1.8	100	3.1

Coding	Field	Selection or range Factory setting (bold)	Display	Info
R	***Function group RELAY***		SETUP HOLD R RELAY	*Relay contacts can be selected and adjusted.*
R1	Selection of contact to be configured	**Rel1** *Rel2* *Rel3* *Rel4*	SETUP HOLD Rel1 R1 Sel.Relay	Rel3 (water) and Rel4 (cleaner) are only available on transmitter equipped accordingly. If ChemoClean is selected as the cleaning type, Rel4 is not available.
R2 (1)	Configuration limit contactor for conductivity, resistance or concentration measurement	**LC PV** = **Limit contactor cond.** (1) LC °C = Limit contactor T (2) PID = PID controller (3) Timer (4) *Clean = ChemoClean (5)* *USP (6)*	SETUP HOLD LC PV R2 Sel. Type	PV = Process value Selecting Rel4 in Field R1 means that Clean = ChemoClean cannot be selected. Confirmation with ENTER switches off a different, already switched-on function and its settings are reset to the default.
R211	Switch function of R2 (1) off or on	**Off** On	SETUP HOLD Off R211 Function	All settings are retained.
R212	Enter contact switch-on point	cond/ind: **9999 mS/cm** MOhm: **200 MΩ·cm** *Conc:* ***9999 %***	SETUP HOLD 9999 mS/cm R212 On value	Never set the switch-on point and switch-off point to the same value. (Only the operating mode selected in A1 appears.)
R213	Enter contact switch-off point	cond/ind: **9999 mS/cm** MOhm: **200 MΩ·cm** *Conc:* ***9999 %***	SETUP HOLD 9999 mS/cm R213 Off value	The switch-off point entry selects a max contact (switch-off point < switch-on point) or a min contact (switch-off point > switch-on point), thereby implementing an always required hysteresis function (see Fig. 5.5).
R214	Enter pickup delay	**0 s** 0 ... 2000 s	SETUP HOLD 0 s R214 On Delay	
R215	Enter dropout delay	**0 s** 0 ... 2000 s	SETUP HOLD 0 s R215 Off Delay	

Factory settings are printed in **bold** face;
base version does not include functions in *italic*.

LM253E5C.CHP

Coding	Field	Selection or range Factory setting (bold)	Display	Info
R216	Enter alarm threshold (as an absolute value)	cond/ind: **9999 mS/cm** MOhm: **200 MΩ·cm** *Conc:* ***9999 %***	SETUP HOLD 9999 mS/cm R216 A.Thresh	When the alarm threshold is exceeded/undershot, the transmitter issues an alarm with an error message and error current (note alarm delay in field F3). When defining the min contact, the alarm threshold must be set to a lower value than the switch-off point.
R217	Show status for limit contact	**MAX** MIN	SETUP HOLD MAX R217 LC State	Only display.
R2 (2)	Configure limit contactor for temperature measurement	LC PV = Limit contactor cond. (1) **LC PV °C** = **Limit contactor T** (2) PID = PID controller (3) Timer (4) *Clean = ChemoClean (5)* *USP (6)*	SETUP HOLD LC °C R2 Sel. Type	Confirmation with ENTER switches off a different, already switched-on function and its settings are reset to the default.
R221	Switch function of R2 (2) off or on	**Off** On	SETUP HOLD Off R221 Function	
R222	Enter switch-on temperature	**250.0 °C** –35.0 ... 250.0 °C	SETUP HOLD 250.0 °C R222 On Value	Never set switch-on point and switch-off point to the same value!
R223	Enter switch-off temperature	**60.0 C** 10.0 ... 60.0 C	SETUP HOLD 250.0 °C R223 Off Value	The switch-off point entry selects a max contact (switch-off point < switch-on point) or a min contact (switch-off point > switch-on point), thereby implementing an always required hysteresis function (see Bild 5.5)
R224	Enter pickup delay	**0 s** 0 ... 2000 s	SETUP HOLD 0 s R224 On Delay	
R225	Enter dropout delay	**0 s** 0 ... 2000 s	SETUP HOLD 0 s R225 Off Delay	

Coding	Field	Selection or range Factory setting (bold)	Display	Info
R226	Enter alarm threshold (as an absolute value)	**250.0 °C** –35.0 ... 250.0 °C		When the alarm threshold is exceeded/undershot, the transmitter issues an alarm with an error message and error current (note alarm delay). When defining the min contact , the alarm threshold must be set to a lower value than the switch-off point.
R227	Show status for limit contact	**MAX** MIN		Only display.
R2 (3)	P(ID) controller configuration	LC PV = Limit contactor cond. (1) LC °C = Limit contactor T (2) **PID = PID controller** (3) Timer (4) *Clean = ChemoClean (5)* *USP (6)*		Confirmation with ENTER switches off a different, already switched-on function and its settings are reset to the default.
R231	Switch function of R2 (3) off or on	**Off** On Basic PID+B		On = PID control Basic = only basic load dosage PID+B = PID control with basic load dosage
R232	Enter set point	cond/ind: **0.00 µS/cm** MOhm: **0.00 kΩ·cm** *Conc:* ***0.00 %***		The set point is the value to be maintained by the control. The controller will restore this value if there is a deviation up or down.
R233	Enter control gain K_p	**1.00** 0.01 ... 20.00		See chapter 5.5.2.
R234	Enter integral action time T_n (0.0 = no I component)	**0.0 min** 0.0 ... 999.9 min		See chapter 5.5.2. Each hold sets the I component to zero. Hold can be deactivated in S2, but not for ChemoClean and timer!
R235	Enter derivative action time T_v (0.0 = no D component)	**0.0 min** 0.0 ... 999.9 min		See chapter 5.5.2.
R236	Selection of controller characteristic	**dir** = **direct** inv = inverted		Setting may or may not be required depending on control deviation (up or down deviation, see chapter 5.5.2).

Factory settings are printed in **bold** face;
base version does not include functions in *italic*.

LM253E5C.CHP

Coding	Field	Selection or range Factory setting (bold)	Display	Info
R237	Selection of pulse length or pulse frequency	**len** = **Pulse length** freq = Pulse frequency curr = Current output2	SETUP HOLD len R237 Oper.Mode	Pulse length e.g. for solenoid valve, pulse frequency e.g. for solenoid-operated metering pump (see chapter 5.5.2). Selection of current output 2 is only possible, if field O2 = Contr is selected.
R238	Enter pulse interval	**10.0 s** 0.5 ... 999.9 s	SETUP HOLD 10.0 s R238 PulsePer.	This field only appears if pulse length is selected in R237. When pulse frequency is selected, R238 is skipped and input continues in R239.
R239	Enter maximum pulse frequency of actuator	**120 min^{-1}** 60 ... 180 min^{-1}	SETUP HOLD 120 1/min R239 Max.PFreq	This field only appears if pulse frequency is selected in R237. When pulse length is selected, R239 is skipped, and input continues in R2310.
R2310	Enter minimum ON time t_{ON}	**0.3 s** 0.1 ... 5.0 s	SETUP HOLD 0.3 s R2310 Min.PTime	This field only appears if pulse length is selected in R237.
R2311	Enter basic load	**0%** 0 ... 40%	SETUP HOLD 0 % R2311 BasicLoad	Selecting the basic load, you choose the desired dosage quantity. 100% basic load corresponds to: steadily on at R237 = on F_{max} at R237 = freq 20 mA at R237 = curr
R2 (4)	Configure cleaning function (timer)	LC PV = Limit contactor cond. (1) LC °C = Limit contactor T (2) PID = PID controller (3) **Timer** (4) *Clean = ChemoClean (5)* *USP (6)*	SETUP HOLD Timer R2 Sel. Type	Cleaning is performed using only *one* cleaning agent (usually water); see Fig. 5.10. Confirmation with ENTER switches off a different, already switched-on function and its settings are reset to the default.
R241	Switch function of R2 (4) off or on	**Off** On	SETUP HOLD Off R241 Function	
R242	Enter rinse / cleaning time	**30 s** 0 ... 999 s	SETUP HOLD 30 s R242 RinseTime	The hold and relay settings are activated for the period of time specified here.
R243	Enter pause time	**360 min** 1 ... 7200 min	SETUP HOLD 360 min R243 PauseTime	The pause time is the time between two cleaning cycles (see chapter 5.5.4).

Factory settings are printed in **bold** face;
base version does not include functions in *italic*.

Coding	Field	Selection or range Factory setting (bold)	Display	Info
R244	Enter minimum pause time	**120 min** 1 ... 3600 min	SETUP HOLD 120 min R244 Min.Pause	The minimum pause time prevents continuous cleaning when the cleaning trigger is present.
R2 (5)	*Configure cleaning with ChemoClean (on version with four contacts and appropriate assignment of contacts 3 and 4)*	LC PV = Limit contactor cond. (1) LC °C = Limit contactor T (2) PID = PID controller (3) Timer (4) ***Clean = ChemoClean (5)*** *USP (6)*	SETUP HOLD Clean R2 Sel. Type	*See chapter 5.5.5.* *Contact 3 = Water, Contact 4 = Cleaner.* *Confirmation with ENTER switches off a different, already switched-on function and its settings are reset to the default.*
R251	Switch function of R2 (5) off or on	**Off** On	SETUP HOLD Off R251 Function	
R252	Selection of start pulse	**int** = **internal (timer-contr.)** ext = external (digital input 2) i+ext = intern. + extern. i+stp = internal, suppressed by external	SETUP HOLD int. R252 CleanTrig	The “int” cycle is triggered by the end of the pause time (R257). There is no real-time clock. External suppression is required for irregular time intervals (e.g. weekends).
R253	Enter pre-rinse time	**20 s** 0 ... 999 s	SETUP HOLD 20 s R253 PreRinse	Water is used for rinsing.
R254	Enter cleaning time	**10 s** 0 ... 999 s	SETUP HOLD 10 s R254 CleanTime	Cleaning agent and water are used for cleaning.
R255	Enter post-rinse time	**20 s** 0 ... 999 s	SETUP HOLD 20 s R255 PostRinse	Water is used for rinsing.
R256	Enter number of repeat cycles	**0** 0 ... 5	SETUP HOLD 0 R256 Rep. Rate	R253 ... R255 is repeated.
R257	Enter pause time	**360 min** 1 ... 7200 min	SETUP HOLD 360 min R257 PauseTime	The pause time is the time between two cleaning cycles.

Factory settings are printed in **bold** face;
base version does not include functions in *italic*.

LM253E5C.CHP

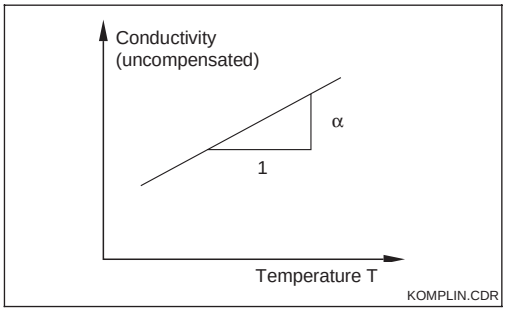
Coding	Field	Selection or range Factory setting (bold)	Display	Info
R258	Enter minimum pause time	**120 min** 1 ... R357 min	SETUP HOLD 120 min R258 Min.Pause	The minimum pause time prevents continuous cleaning when the external cleaning trigger is present.
R259	Enter number of cleaning cycles without cleaning agent (Economy function)	**0** 0 ... 9	SETUP HOLD 0 R259 EconomyCl	Cleaning with cleaner can be followed by up to 9 cleaning cycles that use only water until the next cleaning cycle with cleaner is performed.
R2 (6)	*Configure USP contact*	LC PV = Limit contactor cond. (1) LC °C = Limit contactor T (2) PID = PID controller (3) Timer (4) *Clean = ChemoClean (5)* ***USP** (6)*	SETUP HOLD USP R2 Sel. Type	*The USP contact can be configured as a pre-alarm, i.e., it issues an alarm before the limit is reached.* *When an alarm is output, the error no. E151 is displayed.* *Confirmation with ENTER switches off a different, already switched-on function and its settings are reset to the default.*
R261	Switch function of R2 (6) off or on	**Off** On	SETUP HOLD Off R261 Function	
R262	Alarm threshold: Enter switch-on point	**80.0 %** 00 ... 100.0 %	SETUP HOLD 80.0 % R262 On Value	The pre-alarm effects a contact query. Should the alarm value be reached (100.0 %) the alarm relay also responds. Example: At 15 °C and 1.0 µS/cm with the setting 80.0 %, a prealarm is also triggered at 0.8 µS/cm (comp. table chap. 5.5.3).
R263	Alarm threshold: Enter switch-off point	**75.0 %** 0.0 ... 100.0 %	SETUP HOLD 75.0 % R263 Off Value	Prealarm is only active if value R262 > R263.
R264	Alarm threshold: Enter pickup delay	**0 s** 0 ... 2000 s	SETUP HOLD 0 s R264 On Delay	
R265	Alarm threshold: Enter dropout delay	**0 s** 0 ... 2000 s	SETUP HOLD 0 s R265 Off Delay	

5.6 Temperature compensation

The temperature coefficient specifies the change in conductivity per degree of temperature change. It depends on the chemical composition of the medium and the temperature itself. In order to compensate for this dependence, four different compensation types can be selected in the transmitter (see field B2):

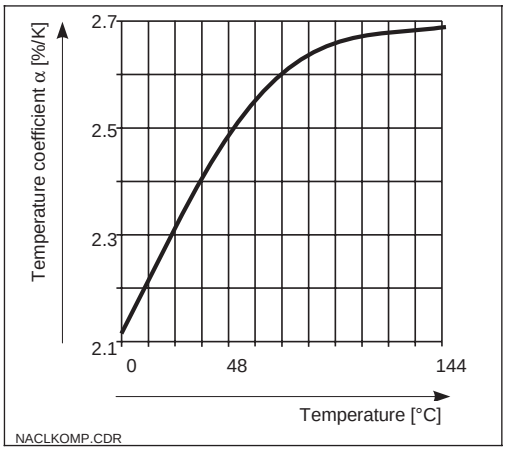
Linear compensation

The change between two temperature points is considered to be constant, i.e. α = const. The α value can be edited for the linear compensation type. The default value for the reference temperature is 25 °C.



NaCl compensation

The NaCl compensation (according to IEC 746) based on a fixed nonlinear curve that defines relationship between the temperature coefficient and the temperature. This curve is used for small concentrations.



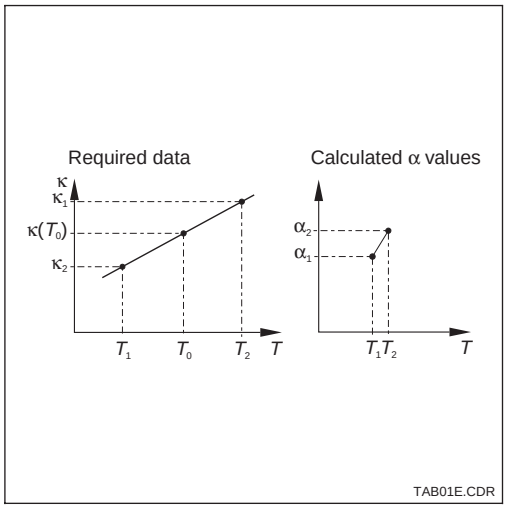
Ultrapure water compensation

Just like the NaCl compensation, the ultrapure water compensation is based on a nonlinear curve stored in the instrument.
This curve is split up into NaCl solution and ultrapure water compensation. These are calculated separately but then used together to determine in the overall relationship.

Temperature compensation with table

With using the alpha table function for temperature compensation the following conductivity data of the process medium to be measured is required:

Value pairs from temperature T and conductivity κ for T_0 = 25 °C and for temperatures, which occur in the process.



For the temperatures relevant in your process, use the following equation to calculate the α values (not to determine a α value for 25 °C is neither sensible, nor could you edit a table without this value).

$$\alpha = \frac{100}{\kappa(T_0)} \cdot \frac{\kappa(T) - \kappa(T_0)}{T - T_0};\ T \neq T_0.$$

The T-α value pairs obtained are edited in the table in the measuring device and then you can commence measurement.

LM253E5C.CHP

Coding		Field	Selection or range Factory setting (bold)	Display	Info
T		**Function group ALPHA TABLE**		SETUP HOLD T ALPHA TAB	
	T1	Selection of table option	**read** edit	SETUP HOLD read T1 Sel.Table	
	T2	Enter number of table value pairs	**1** 1 ... 10	SETUP HOLD 1 T2 No.Elem.	Up to 10 value pairs can be entered in the α table. These are numbered from 1 ... 10 and can be edited individually or in sequence.
	T3	Selection of table value pair	**1** 1 ... Quantity of table value pairs Asign	SETUP HOLD 1 T3 Sel.Elem.	The function chain T3 ... T5 will run through as many times as correspond to the value in T2. “Asign” appears as the last step. After confirmation, the system jumps to T6.
	T4	Enter temperature value (x value)	**0.0 °C** –35.0 ... 250.0 °C	SETUP HOLD 0.0 °C T4 Temp.val.	The temperature values must have a minimum distance of 1 K. Factory setting for the x value of the table value pairs: 0.0 °C; 10.0 °C; 20.0 °C; 30.0 °C ...
	T5	Enter temperature coefficient α (y value)	**2.10 %/K** 0.00 ... 20.00 %/K	SETUP HOLD 2.10 %/K T5 Alpha val	
	T6	Message whether or not the table status is ok	**yes** no	SETUP HOLD yes T6 Status ok	Only display. If status = “no”, then set table correctly (all previous settings are kept) or back to measurement mode (this makes the table invalid).

Factory settings are printed in **bold** face;
base version does not include functions in *italic*.

5.7 Concentration measurement

The function group CONCENTRATION is only accessible for instruments equipped with the Plus packet.

The transmitter can convert conductivity values to concentration values. For this, set the operating mode to Concentration Measurement (see Field A1).

Then, you must enter to which basic data the concentration calculation should be based into the measuring device. For the most common substances, the required data is already saved in your device. You can select one of these substances in Field K1.

If you want to specify the concentration of a sample, which is not saved in the device, this is also possible. In this case, you require the conductivity characteristics of the medium. If you do not have this data in the datasheets, you can also determine the characteristics yourself quite simply: Produce samples of the medium in the concentrations in which they appear in the process. Measure the uncompensated conductivity of these samples at temperatures which also occur in the process.

Process temperature changeable:
Should these temperature changes be included in the concentration measurement, then the conductivity of *each* sample created must be measured at least *two different temperatures* (minimum and maximum temperatures of the process).

Process temperature constant:
Measure the differently concentrated samples at this process temperature.

Then you should obtain measuring data looking as follows:

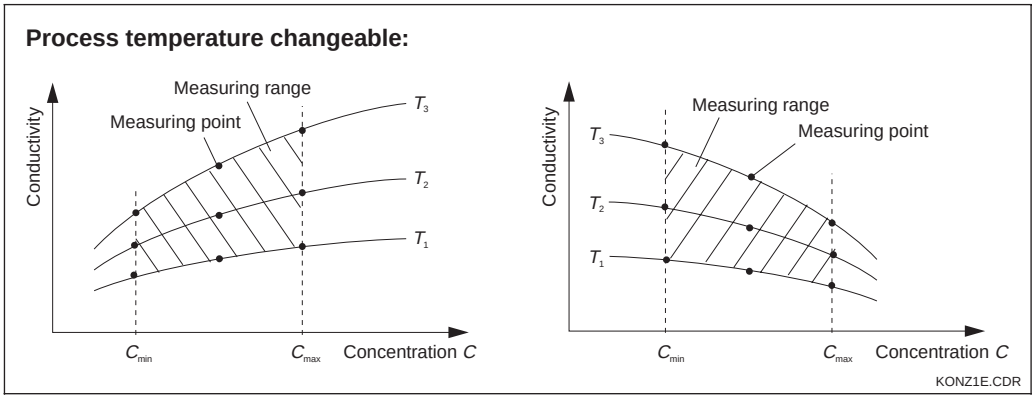


Fig. 5.14 Measured data in the case of changeable temperature (represented qualitatively)

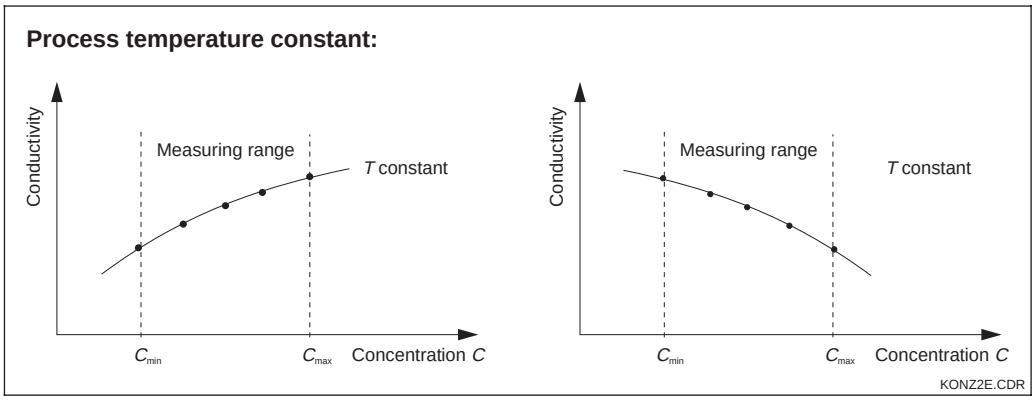


Fig. 5.15 Measured data in the case of constant temperature (represented qualitatively)

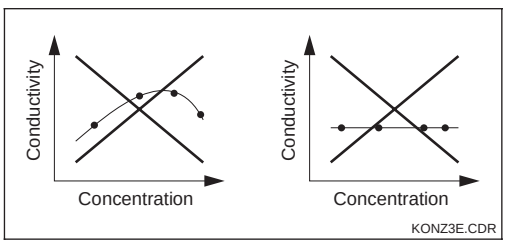


Fig. 5.16 Unpermitted curve shapes

The characteristics obtained from the measuring points must have strictly monotonous rising or falling slope in the range of the process conditions, i.e. the may not show the maximum, minimum or ranges of constant behaviour. The curves in the diagram to the left are therefore unpermissible.

LM253E5D.CHP

Value entry

Now enter the three parameters in Fields K6 to K8 for each measured sample (value triplet of conductivity, temperature and concentration).

Process temperature changeable:
At least two samples, i.e. two different concentrations, are required. For *each* of these samples, you must enter values for *at least two temperatures* (minimum distance 0.5 °C). The temperature values of the differently concentrated samples must be identical (isothermic characteristics). This provides a minimum of four value triplets.

Process temperature constant:
Enter at least two value triplets in the device. These temperature values of the triplets you enter must be identical.

Note:

If the measured values for conductivity or temperature in measuring operation lie outside the values entered in the concentration table (see Fig. 5.12 and 5.15), this has a negative effect on accuracy and the device generates an error message. Therefore, when determining the characteristics, you should observe the limit values of the process.

If you enter an additional value triplet of 0 µS/cm and 0% for each temperature used, you can work from the start of measuring range with sufficient accuracy and without an error message.

Coding		Field	Selection or range Factory setting (bold)	Display	Info
K		***Function group CONCENTRATION***		SETUP HOLD K CONCENTRA	*Four different concentration fields can be entered in this function group.*
	K1	*Selection of concentration curve, to be used to calculate the display value*	***1*** *1 ... 4*	SETUP HOLD 1 K1 act.Curve	*The curves are independent of each other. Therefore, four different curves can be defined.*
	K2	*Selection of table to be edited*	***1*** *1 ... 4*	SETUP HOLD 1 K2 Table	*When editing a curve, another curve should be used to calculate the corresponding values (see K1).*
	K3	*Selection of table option*	***Read*** *Edit*	SETUP HOLD read K3 Table	*This selection applies to all concentration curves.*
	K4	*Enter number of triplets*	***1*** *1 ... 10*	SETUP HOLD 1 K4 No.Elem.	*Each triplet consists of three numeric values.*
	K5	*Selection of triplet*	**1** *1 ... Number of triplets in K4*	SETUP HOLD 1 K5 Sel.Elem.	*Any triplet can be edited.*

Factory settings are printed in **bold** face;
base version does not include functions in *italic*.

Coding		Field	Selection or range Factory setting (bold)	Display	Info
	K6	*Enter uncompensated conductivity value*	***0.0 µS/cm*** *0.0 ... 9999 mS/cm*	SETUP HOLD 0.0 µS/cm K6 conduct.	*The function chain K5 ... K8 will run through automatically as many times as corresponds to the value in K4. Then the system jumps to K9.*
	K7	*Enter concentration value for K6*	***0.00 %*** *0.00 ... 99.99 %*	SETUP HOLD 0.0 % K7 concentr.	*Measuring unit selected as in A2.*
	K8	*Enter temperature value for K6*	***0.0 °C*** *–35.0 ... 250.0 °C*	SETUP HOLD 0.0 °C K8 Temp.val.	
	K9	*Message whether or not the table status is ok*	***yes*** *no*	SETUP HOLD yes K9 Status ok	Only display If not, then set table correctly (all previous settings are kept) or back to measurement mode (this makes the table invalid).

5.8 Service

Coding		Field	Selection or range Factory setting	Display	Info
S		**Function group SERVICE 1**		SETUP HOLD S SERVICE	
	S1	Selection of language	**ENG = English** GER = German FRA = French ITA = Italian NEL = Dutch ESP = Spanish	SETUP HOLD ENG S1 Language	This field must be set configured once during device start-up. After confirmation with ENTER you can exit S1 and continue.
	S2	Hold configuration	**S+C = during setup and calibration** CAL = during calibration Setup = during setup No = no hold	SETUP HOLD S+C S2 Auto HOLD	S = setup, C = calibration.

Factory settings are printed in **bold** face;
base version does not include functions in *italic*.

LM253E5D.CHP

Coding	Field	Selection or range Factory setting	Display	Info
S3	Manual hold	**Off** On	SETUP HOLD off S3 Man. HOLD	The setting remains active even after a power failure.
S4	Enter hold dwell period	**10 s** 0 ... 999 s	SETUP HOLD 10 s S4 Cont.Time	
S5	SW upgrade: Enter release code for Plus packet	**0000** 0000 ... 9999	SETUP HOLD 0000 S5 PlusCode	The code is located on the nameplate (see Figs. 1.1 and 1.2). Entry of an incorrect code returns you to the measurement menu. The number is edited with the PLUS or MINUS key and confirmed with the ENTER key. “1" is displayed in case of active code.
S6	SW upgrade: Enter release code for Chemoclean	**0000** 0000 ... 9999	SETUP HOLD 0000 S6 CleanCode	The code is located on the nameplate (see Figs. 1.1 and 1.2). Entry of an incorrect code returns you to the measurement menu. The number is edited with the PLUS or MINUS key and confirmed with the ENTER key. “1" is displayed in case of active code.
S7	Order code is displayed		SETUP HOLD order S7 CD0005	The order code is changed automatically to reflect an upgrade.
S8	Serial number is displayed		SETUP HOLD SerNo S8 12345678	
S9	Reset of instrument (restore default values) ⚠	**no** Sens = Sensor data Facty = Factory settings	SETUP HOLD no S9 S.Default	Facty = All data except Language (Field S1) are erased and reset to the factory setting! Sens = The sensor data are erased.
S10	Perform instrument test	**no** displ = display test	SETUP HOLD no S10 Test	

Factory settings are printed in **bold** face;
base version does not include functions in *italic*.

5.9 Service 2

Coding	Field	Selection or range Factory setting (bold)	Display	Info
E	**Function group SERVICE 2**		SETUP HOLD E SERVICE	
E1	Selection of module	**Contr** = **controller** (1) Trans = transmitter (2) Main = power unit (3) Rel = relay (4)	SETUP HOLD Contr E1 Select	
E111 E121 E131 E141	Software version is displayed		SETUP HOLD xx.xx E111 SW-Vers.	This field cannot be edited. If E1 = Contr: Instrument software If E1 = Trans, Main, Rel: Module firmware
E112 E122 E132 E142	Hardware version is displayed		SETUP HOLD xx.xx E112 HW-Vers.	This field cannot be edited.
E113 E123 E133 E143	Serial number is displayed		SETUP HOLD SerNo E113 12345678	This field cannot be edited.
E114 E124 E134 E144	Module name is displayed		SETUP HOLD LSG E114 Modul-ID	This field cannot be edited.

5.10 Interfaces

Coding	Field	Selection or range Factory setting (bold)	Display	Info
I	**Function group INTERFACE**		SETUP HOLD I INTERFACE	
I1	Entry of address	Address HART: **0** ... 15 or PROFIBUS: 1 ... **126**	SETUP HOLD 126 I1 Address	For communication only.
I2	Tag description		SETUP HOLD Tag I2 @@@@@@@@	Only for communication.

Factory settings are printed in **bold** face;
base version does not include functions in *italic*.

LM253E5D.CHP

5.11 Calibration

This function group is used to calibrate the transmitter. Two different types of calibration are possible:

- Calibration by measurement in a calibration solution of a known conductivity.
- Calibration by entry of the exact cell constant of the conductivity sensor.

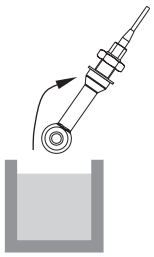
Note:

- **For conductive sensors, only menu points C121 to C126 are relevant.**
- The instrument is automatically switched to hold during calibration (factory setting).

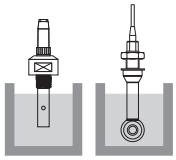
Note:

- If the calibration procedure is aborted by pressing the PLUS and MINUS keys at the same time (return to C114, C126 or C136) or if the calibration is faulty, then the previous calibration data are reinstated. A calibration error is indicated by the “ERR” message and flashing of the sensor symbol on the display. Repeat calibration!
- After calibration, the system returns to measuring mode. During the hold delay time (Field S4), the Hold symbol appears in the display.

For access to the CALIBRATION menu, please enter Code 22.

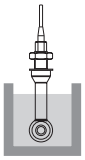
Coding	Field	Selection or range Factory setting (bold)	Display	Info
C	**Function group CALIBRATION**		CAL HOLD C CALIBRAT	For conductive measurement, Airs and InstF are not available.
C1 (1)	Calibration of inductive cells with a ring-shaped opening	**Airs** = **Airset** (1) Cellc = Cell constant (2) *InstF* = *Installation factor (3)*	CAL HOLD AirS C1 Calibrat	When commissioning measuring cells, you must always carry out an airset. The calibration of the cell is to be performed in air and the cell must be dry.
Remove sensor from the medium and dry **completely**.				
C111	Residual coupling Start calibration (Airset)	**Current measured value**	CAL HOLD 0.0 µS/cm C111 AirSet	Start calibration with CAL.
C112	Residual coupling is displayed (Airset)	–80.0 ... 80.0 µS	CAL HOLD 5.3 µS/cm C112 AirSetVal	Residual coupling of measuring system (sensor and transmitter).

Factory settings are printed in **bold** face;
base version does not include functions in *italic*.

Coding	Field	Selection or range Factory setting (bold)	Display	Info
C113	Calibration status is displayed	o.k. E xxx	CAL READY HOLD o.k. C113 Status	If the calibration status is not o.k., then the second display line shows an explanation of the error.
C114	Store calibration result	**yes** no new	CAL READY HOLD yes C114 Store	If C113 = E xxx, then only no or **new.** If new, return to C. If yes/no, return to "Measurement".
C1 (2)	Calibration of cell constant	Airs = Airset (1) **Cellc** = **Cell constant** (2) *InstF = Installation factor (3)*	CAL HOLD cellc C1 Calibrat	
Immerse sensor in the calibration solution.				The sensor should be immersed at a sufficient distance from the vessel wall (installation factor has no influence).
C121	Enter calibration temperature (MTC)	**25.0 °C** –35.0 ... 250.0 °C	CAL HOLD 25.0 °C C121 MTC temp.	Only exists, if B1 = fixed.
C122	Enter α value of the calibration solution	**2.10 %/K** 0.00 ... 20.00 %/K	CAL HOLD 2.10 C122 alpha val	This value is given with each calibration solution.
C123	Enter correct conductivity value of the calibration solution	**Current measured value** 0.0 µS/cm ... 9999 mS/cm	CAL HOLD 10.30 mS/cm C123 Real val.	The praticable range is depends on the sensor, i.e. the calibration solution should be approx. 40 % of the measuring range determined by the cell (see chapter 9, Fig. 9.1).
C124	Calculated cell constant is displayed	0.0025 ... 99.99 cm^{-1}	CAL HOLD 1.000 1/cm C124 cellconst	The calculated cell constant is displayed and entered to A5.
C125	Calibration status is displayed	o.k. E xxx	CAL READY HOLD o.k. C125 Status	If the calibration status is not o.k., then the second display line shows an explanation of the error.

Factory settings are printed in **bold** face;
base version does not include functions in *italic*.

LM253E5D.CHP

Coding	Field	Selection or range Factory setting (bold)	Display	Info
C126	Store calibration result	**yes** no new	CAL READY HOLD yes C126 Store	If C125 = E xxx, then only no or **new.** If new, return to C. If yes/no, return to "Measurement".
C1 (3)	Calibration with sensor adaptations for inductive sensors (only with Plus package)	Airs = Airset (1) Cellc = Cell constant (2) ***InstF*** = ***Installation factor*** *(3)*	CAL HOLD InstF C1 Calibrat	Sensor calibration with compensation of wall influences.
The sensor remains at the place of installation.				
C131	Enter calibration temperature (MTC)	**25.0 °C** –35.0 ... 250.0 °C	CAL HOLD 25.0 °C C131 MTC temp.	Only exists, if B1 = fixed.
C132	Enter α value of calibration solution	**2.10 %/K** 0.00 ... 20.00 %/K	CAL HOLD 2.10 C132 alpha val	This value is determined by the calibration solution.
C133	Enter correct conductivity value of calibration solution	**Current measured value** 0.0 µS/cm... 9999 mS/cm	CAL HOLD 10.30 mS/cm C133 Real val.	The practicable range is depends on the sensor, i.e. the calibration solution should be approx. 40 % of the measuring range determined by the cell (see chapter 9, Fig. 9.1).
C134	Calculated installation factor is displayed	**1** 0.10 ... 5.00	CAL HOLD 1 C134 InstFact	
C135	Calibration status is displayed	o.k. E xxx	CAL READY HOLD o.k. C135 Status	If the calibration status is not o.k., an explanation of the error is displayed in the second line of the display.
C136	Store calibration result	**yes** no new	CAL READY HOLD yes C136 Store	If C135 = E xxx, then only no or **new.** If new, return to C. If yes/no, return to "Measurement".

Factory settings are printed in **bold** face;
base version does not include functions in *italic*.

6 Interfaces

For instruments equipped with a communication interface, please refer to separate Operating Instructions BA 208e00 (HART®) or BA 209e00 (PROFIBUS®).

LM253E07.CHP

7 Maintenance and troubleshooting

Maintenance:

Please take all measures in due time which will guarantee the safety of operation and reliability of the entire measuring device.

Maintenance of OLM 223 / 253 comprises:
- Calibration (see chapter 5.11)
- Cleaning of assembly and sensor
- Checking of cables and connections

Troubleshooting:

Determination and elimination of the cause of the problem in the case of an operating fault. Troubleshooting refers to measures that can be performed without intervention in the instrument (for instrument defects, see chapter 8, Corrective maintenance).

Troubleshooting of the OLM 223/253 and the measuring system is performed with the aid of the troubleshooting table in chapter 7.1.

Warning:

- Please be aware of effects work performed on the instrument might have on the process control system or the process itself.
- When removing the sensor during maintenance or calibration, please consider potential hazards due to pressure, high temperatures and contamination.

Note:

- Please contact your Sales Office or your Service Organization for queries.

7.1 Troubleshooting common problems

Error	Possible cause	Remedy	Equipment needed, spare parts
Instrument cannot be operated, value 9999	– Operation locked	Press CAL and MINUS key simultaneously	See chap. 4.3
Incorrect display compared with comparison measurement	– Device incorrectly calibrated	Calibrate device acc. to chap. 4.8	Calibration solution or sensor certificate
	– Sensor soiled	Clean sensor	See chap. 8.8.1
	– Temperature measurement incorrect	Check temperature value for measuring device and comparison device	Temperature measurement device, Thermometer
	– Temperature compensation incorrect	Check compensation method (no / ATC / MTC) and compensation type (linear / material / own table)	Please note: the transmitter has a separate setting for a calibration temperature coefficient.
	– Comparison measurement is incorrectly calibrated	Calibrate comparison measuring device or use checked device.	Calibration solution, operating manual of comparison device
	– Comparison device has incorrectly set ATC	Compensation method and type must be identical for both devices.	Operating manual of comparison device
	– Polarisation error	Use suitable sensor: – Use larger cell constant – Use graphite instead of stainless steel (check resistance)	Measuring range tables e.g. in SI “Conductivity” or technical data of conductivity sensors
	– Incorrect line resistance in field A6	Enter correct value	For determination of line resistance see chap. 3.5

Error	Possible cause	Remedy	Equipment needed, spare parts
Implausible measured values in general: – Constant measured flow overflow – Constant measured value 000 – Measured value too low – Measured value too high – Measured value frozen – Current output value incorrect	– Short in sensor	Check sensor	see chap. 8.8.4 / 8.8.5
	– Short in cable or junction box	Check cable and junction box	see chap. 8.8.2 / 8.8.3
	– Interruption in sensor	Check sensor	see chap. 8.8.4 / 8.8.5
	– Interruption in cable or junction box	Check cable and junction box	see chap. 8.8.2 / 8.8.3
	– Cell constant incorrectly set	Check cell constants	Sensor nameplate or certificate
	– Incorrect output assignment	Check current assignment	
	– Incorrect output function	Check preselection 0–20 / 4–20 mA	
	– Air cushion in assembly	Check assembly and installation	
	– Grounding short on or in device	Measure in insulated container	Plastic container, calibration solutions
	– Transmitter module defective	Simulation directly at instrument	For diagnosis ans spare parts see chap. 8
	– Impermissible instrument operating state (no response to key actuation)	Switch instrument off and back on	EMV problem: if problem persists, check grounding and cable run
Incorrect temperature value	– Sensor connection incorrect	Check connections using wiring diagram; Three-line connection always required	Connection diagram chap. 3.4
	– Measuring cable defective	Check cable for interruption / short circuit / shunt	Ohm meter; see also chap. 8.8.2 / 8.8.3
	– Incorrect sensor type	Set type of temperature sensor on device (Field B1)	
Cond. measured value incorrect in process	– No / incorrect temperature compensation	ATC: Select compensation type, if linear, set suitable coefficients. MTC: Set process temperature	
	– Incorrect temperature measurement	Check temperature value	Ref. measuring device / thermo-meter
	– Bubbles in medium	Suppress bubble formation – Gas bubble trap – Back-presssure creation (orifice plate) – Measurement in bypass	
	– Polarisation effects (only with conductive sensors)	Use suitable sensor: – Use larger cell constant – Use graphit instead of stainless steel (check resistance)	Measuring range tables e.g. in SI “Conductivity” or technical data of conductivity sensors
	– Flow too high (can lead to bubble formations	Reduce flow rate or select installa-tion location with less turbulence	
	– Voltage potential in medium (only when conductive)	Ground sensor as near to medium as possible	Problem occurs primarily in plastic lines and tanks
	– Sensor soiled or coated	Clean sensor (see chap. 8.6.2)	For contaminated media: Use spray cleaning
	– Incorrect line resistance in field A6	Enter correct value	For determination of line resistance see chap. 3.5
Measured value variations	– Faults on measuring cable	Connect cable screening according to wiring diagram	See chap. 3.5
	– Faults on signal output line	Check line routine, if necessary route line separately	Lines signal output, isolate measuring input and power supply
	– Fault potential in medium	Remove source of fault or ground medium as neas as possible to cond. sensor	
Controller or time cannot be activated	– No relay module available	Install module LSR1-2 or LSR1-4	See chap. 8.2 and 8.3

LM253E07.CHP

Error	Possible cause	Remedy	Equipment needed, spare parts
Controller / limit contact not working	– Controller switched off	Activate controller	See chap. 5.5 or fields R2xx
	– Controller in “Manual / Off” mode	Choose “Auto” or “Manual / On” mode	Keypad REL key
	– Pickup delay setting too long	Disable or shorten pickup delay	See fields R2xx
	– Function “Hold” active	“Auto Hold” during by calibration, “Hold” input activated; “Hold” via keypad active	See fields S2 to S4
Controller / limit contacts work continuously	– Controller in “Manual / On” mode	Set controller to “Manual / Off” or “Auto”	Keypad, REL and AUTO keys
	– Dropout delay setting too long	Shorten dropout delay	See fields R2xx
	– Control loop interruption	Check measured value, current output value, actuators, chemical supply	
No conductivity current output signal	– Line open or short-circuited	Disconnect line and measure directly on instrument	mA meter 0–20 mA
	– Output defective	See chap. 8.1	
Fixed current output signal	– Current simulation active	Switch off simulation	See field O2
	– Processor system out of snyc	Switch instrument off and back on	EMV problem: if problem persists, check installation
Incorrect current output signal	– Incorrect current assignment	Check current assignment: 0–20 mA oder 4–20 mA?	Field O211
	– Total load in current loop excessive (> 500 Ω)	Disconnect output and measure directly on instrument	mA meter for 0–20 mA DC
Current output table not accepted	– Value interval too small	Use sensible intervals	
No temperature output signal	– Instrument has only one current output	Check variant using nameplate, if necessary replace module LSCH-x1	Module LSCH-x2, see chap. 8.2.4 and 8.3.4
Chemoclean function not available	– No relay module (LSR1-x) installed or only LSR1-2 available or Chemoclean release code not entered (handling as with Plus packet, see next line)	Install module LSR1-4. Chemoclean is released with release code. With Cheomoclean upgrade: Code received from manufacturer ⇒ enter	Module LSR1-4, see chap. 8.2.4 and 8.3.4
Plus Package functions not available	– Plus package not enabled (enable with code that depends on serial number and is received from manufacturer with order of Plus package)	– Plus package upgrade: code received from manufacturer ⇒ enter – Following replacement of defective LSCH/LSCP module: First enter instrument serial number (see nameplate) manually, then enter code number.	Detailed description see chap. 8.3.5

7.2 Troubleshooting using the error messages

Display and select error messages by pressing the MINUS key.

Error no.	Cause	Measures	Contact		Error current		Automatic cleaning trigger	
			Fact	User	Fact	User	Fact	User
E001	EEPROM memory error	Switch instrument off and back on, return instrument to your local Sales Agency for repair or replace instrument. Load software compatible with hardware. Load measuring parameter specific instrument softeware.	yes		no		—	—*
E002	Instrument not calibrated, calibration data invalid, no user data available or user data invalid (EEPROM error). Instrument software not suitable for hardware (Controller)		yes		no		—	—*
E003	Download error	Invalid configuration. Repeat download, check optoscope.	yes		no		—	—*
E004	Instrument software version not compatible with module hardware version	Load software compatible with hardware. Load measuring parameter specific instrument softeware.	yes		no		—	—*
E007	Transmitter malfunction Software not compatible with hardware (transmitter)		yes		no		—	—*
E008	Sensor or sensor connection faulty	Check sensor and sensor connection (Service).	yes		no		no	
E010	No temperature sensor connected or temperature sensor short-circuited	Check temperature sensor and connections; if necessary, check instrument with temperature simulator.	yes		no		no	
E025	Limit for Airset offset exceeded	Repeat Airset (in air) or replace sensor. Dry cell.	yes		no		no	
E036	Calibration range of sensor exceeded	Clean sensor and recalibrate; if necessary, check sensor and connections.	yes		no		no	
E037	Below calibration range of sensor		yes		no		no	
E045	Calibration aborted	Recalibrate.	yes		no		—	—*
E049	Calibration range of installation factor exceeded	Check pipe diameter, clean sensor and recalibrate.	yes		no		—	—*
E050	Below calibration range of installation factor	Check pipe diameter, clean sensor and recalibrate.	yes		no		—	—*
E055	Below measuring range of main parameter	Immerse sensor in conductive medium or perform Airset.	yes		no		no	
E057	Measuring range of main parameter exceeded	Check measurement, control and connections.	yes		no		no	
E059	Below temperature measuring range		yes		no		no	
E061	Temperature measuring range exceeded		yes		no		no	
E063	Below current output range 1	Check configuration.	yes		no		no	
E064	Current output range 1 exceeded	Check measured value and current assignment.	yes		no		no	
E065	Below current output range 2		yes		no		no	

LM253E07.CHP

Error no.	Cause	Measures	Contact		Error current		Automatic cleaning trigger	
			Fact	User	Fact	User	Fact	User
E066	Current output range 2 exceeded	Check measured value and current assignment.	yes		no		no	
E067	Alarm threshold limit contactor 1 exceeded	Check configuration.	yes		no		no	
E068	Alarm threshold limit contactor 2 exceeded		yes		no		no	
E069	Alarm threshold limit contactor 3 exceeded		yes		no		no	
E070	Alarm threshold limit contactor 4 exceeded		yes		no		no	
E071	Inaccurate measurement/ polarisation	Clean sensor; check table; choose suitable sensor	yes		no		no	
E077	Temperature outside α value table range	Clean sensor; check table.	yes		no		no	
E078	Temperature outside concentration table		yes		no		no	
E079	Conductivity outside concentration table		yes		no		no	
E080	Current output 1 parameter range too small	Spread current output.	no		no		—	—*
E081	Current output 2 parameter range too small	Spread current output.	no		no		—	—*
E100	Current simulation active		no		no		—	—*
E101	Service function yes	Switch service function off or switch instrument off and back on.	no		no		—	—*
E102	Manual mode active		no		no		—	—*
E106	Download yes	Wait for download to end.	no		no		—	—*
E116	Download error	Repeat download.	no		no		—	—*
E150	Distance between temp. values in α value table too small or not monotonically increasing	Enter correct values in α value table (minimum distance between temperature values of 1 K required).	no		no		no	
E151	USP error		no		no		no	
E152	PCS alarm	Check sensor sensor connection.	no		no		no	
E153	USP temperature error		no		no		no	

.
When this error is present, the cleaning function cannot be started.
(Field F8 does not exist for this error.)

Error no.	Cause	Measures	Contact		Error current		Automatic cleaning trigger	
			Fact	User	Fact	User	Fact	User
E154	Below lower alarm threshold for period exceeding alarm delay	If necessary perform manual reference measurement. Repair sensor and recalibrate.	yes		no		no	
E155	Above upper alarm threshold for period exceeding alarm delay		yes		no		no	
E156	Actual value undershoots monitoring point for longer than the set permissible maximum period		yes		no		no	
E157	Actual value exceeds monitoring point for longer than the set permissible maximum period		yes		no		no	
E162	Dosage stop	Check settings in CURRENT INPUT or CHECK function group.	yes		no		no	
E171	Flow in main stream loo low or zero	Restore flow.	yes		no		no	
E172	Switch-off limit for current iput exceeded	Check process variables at sending measuring instrument.	yes		no		no	
E173	Current input < 4 mA	Check process variables at sending measuring instrument. Change range assignment if required.	yes		no		no	
E174	Current input > 20 mA	Check process variables at sending measuring instrument. Change range assignment if required.	yes		no		no	

LM253E08.CHP

8 Diagnosis and corrective maintenance

Diagnosis:

- Diagnosis refers to the identification of instrument malfunctions and defects.

Corrective maintenance:

- replacement of parts diagnosed to be defective;
- testing of instrument and measuring system function;
- restoration of complete functionality.

Diagnosis based on the error table below and depending on difficulty and measuring equipment at hand is to be performed by:

- trained operator personnel
- operator's electricians
- company responsible for system installation/ operation
- your Service Organization.

Select the required spare parts using the tables in chapter 8.2 and 8.3.

Warning:

- Disconnect the instrument from the power source before opening it up. Work with live lines may only be performed by trained electricians.
- Switching contacts may be supplied from external circuits. These circuits must also be de-energised before work on the terminals is performed.

Caution: ESD!

- Electronic components are sensitive to electrostatic discharges. Personal protective measures, such as discharge via PE or permanent grounding using a wrist strap, are to be taken.
- For your own safety, use only original spare parts. Original parts will guarantee functionality, accuracy and reliability after repairs.

8.1 Diagnosis

The table below will help you diagnose problems and provides information about spare parts required. You can find information concerning the exact spare part designations and the installation of these parts in chapters 8.2.3 and 8.3.3.

Error	Possible cause	Tests and / or remedial measures	Equipment, spare parts, personnel
Display dark, no LEDs active	– No mains voltage	Check if mains voltage is available	Electrician / e.g. multimeter
	– Incorrect supply voltage / voltage too low	Compare mains voltage and rating on nameplate	Operator (utility company specification or multimeter)
	– Connection fault	Terminal not tightened; insulation clamped in terminal; incorrect terminal used	Electrician
	– Device fuse defective	Replace fuse, also compare mains voltage and nameplate data	Electrician / suitable fuse; s. Figs. 8.2.1 and 8.3.1
	– Power unit defective	Replace power unit, pay close attention to versions	Diagnosis by Service on-site (test module required)
	– Controller defective	Replace controller, note versions especially	Diagnosis by Service on-site (test module required)
	– OLM 253: Ribbon cable Pos. 310 loose or defective Replace ribbon cable if necessary	see OLM 253 spare parts	
Display dark, but LED(s) active	– Controller defective (Module: LSCH/LSCP)	Replace controller	Diagnosis by Service on-site (test module required)

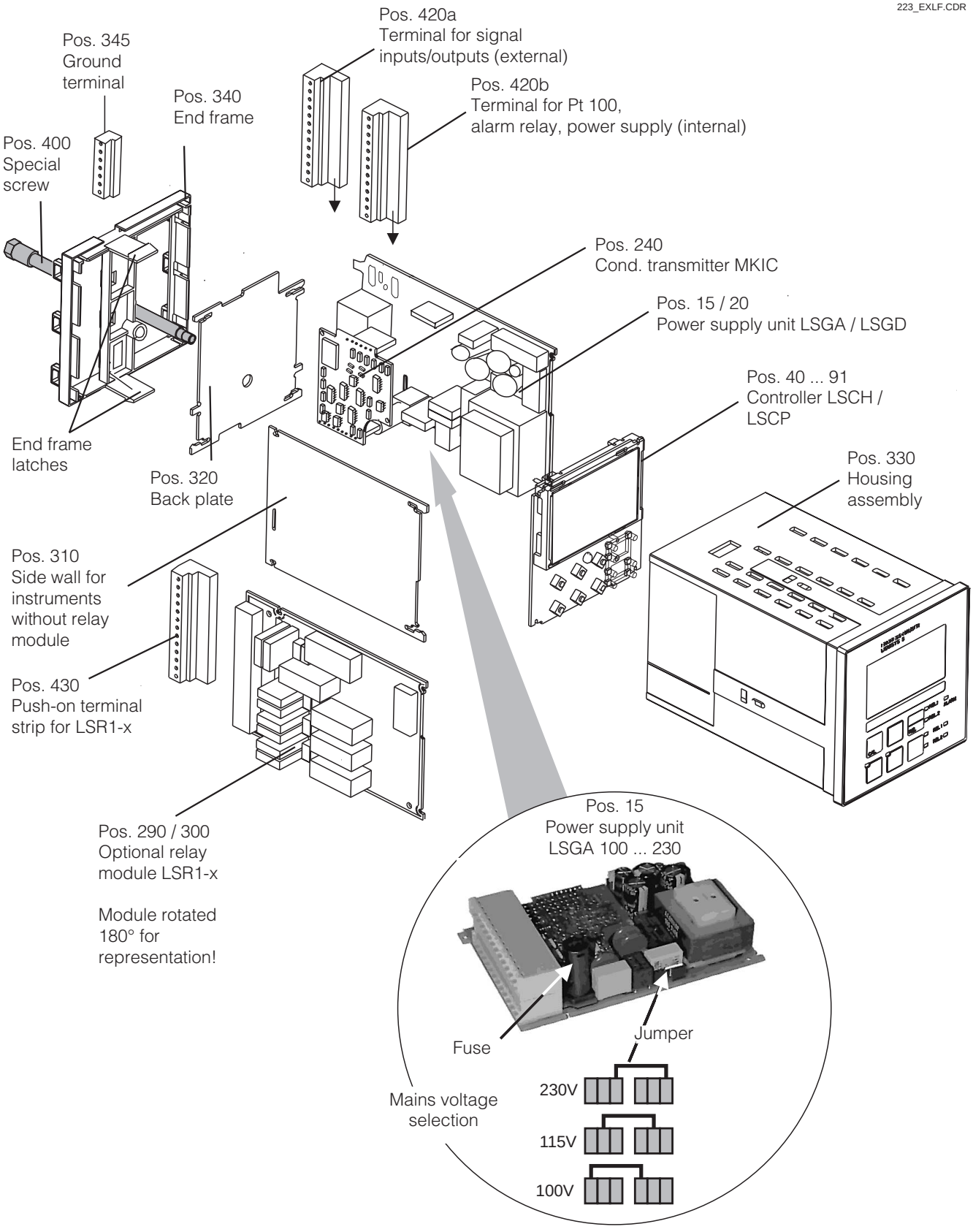
Error	Possible cause	Tests and / or remedial measures	Equipment, spare parts, personnel
Display working, but – no change in the display and / or – device cannot be operated	– Device or module in the device incorrectly mounted	OLM 223: Re-install plug-in module OLM 253: Remount display module	Implementation with the help of the assemblydrawings chapter 8.2.1 and 8.3.1
	– Impermissible operating system state	Switch device off and back on	Possible EMC problem: if problem persists, call Service to have installation checked
Device gets hot	– Voltage incorrect / too high	Compare mains voltage and nameplate data	
	– Power supply unit defective	Replace power supply unit	Can only be diagnosed by Service
Incorrect meas. Cond./MΩ and/or temperature	– Transmitter module defective (Module: MKIC), please perform tests and take measures according to chap. 7.1	Testing the measurement inputs: – connect resistor in place of conductivity sensor, see table chapter 8.8.1 – Resistance 100 Ω to terminals 11/12 + 13 = Display 0 °C	If test negative: 8.2.1 and 8.3.1. 8.2.1 and 8.3.1
Current output, current value incorrect	– Calibration incorrect	Check with built-in currentsimulation, connect mA meter directly to current output	If simulation value incorrect: recalibration at factory or new LSCxx module required.If simulation value is correct:
	– Load excessive		
	– Shunt / short-circuit to frame in current loop		Check current loop for load and shunts.
	– Incorrect operating mode	Check whether 0–20 mA or 4–20 mA has been selected	
No current output signal	– Current output stage defective (module: LSCH/LSCP)	Check with built-in current simulation, connect mA meter direct to the current output	If test negative: Replace controller (using correct variant)
Additional relay does not function	– OLM 253: Ribbon cable Pos. 320 loose or defective	Check ribbon cable base, if necessary replace cable	Replace cable
Only 2 additional relays accessible	– Relay module LSR1-2 with 2 relays built-in	Upgrade to LSR1-4 with 4 relays	User, Service
Enhanced functions (Plus package) not available	– No or incorrect release code used	If upgraded: verify that correct serial number has been used to order the Plus package.	Handled by Sales Agency
	– Incorrect serial number of the LSCH-/LSCP module	Check whether serial number on the nameplate corresponds to SNR LSCH/LSCP (field S8).	The LSCH/LSCP module serial number is required to enable the Plus package .
Enhanced functions (Plus package and/or Chemoclean) are not available after replacement of LSCH/LSCP module	– Plus-package or Chemoclean has not been enables with release codes	For brand new LSCH / LSCP with SNR you can enter a device serial number **once** in fields E115 to E117. Then, if necessary, enter release codes for Plus packet and / or Chemoclean.	A detailed description can be found in chapter 728.3.5
No HART or PROFIBUS interface function	– Wrong central module	HART: LSCH-H1 or -H2 PROFIBUS-PA/-DP: LSCP-PA/-DP module, see field E112	Replace central module; operator or Service
	– Incorrect software	Device software see field E111	
	– Bus problem	Remove some devices and repeat testing	Contact Service for support

LM253E08.CHP

8.2 Corrective maintenance of OLM 223

8.2.1 Exploded view

223_EXLF.CDR



8.2.2 Disassembly of OLM 223

- Consider potential effects on process when removing the instrument from service!
- First pull off the terminal block (Pos. 420b) on the rear side of the device, to make the device voltage-free.
- First pull off the terminal blocks (Pos. 420a and if necessary 430) on the rear of the instrument. You can now remove the instrument.
- Press the latches of the end frame (Pos. 340) inwards and pull off the frame towards the rear.
- Loosen the special screw (Pos. 400) by turning it counterclockwise.
- Remove the complete electronics block from the housing. The modules are plugged together mechanically and can be easily separated:
  – Simply pull the central/ LCD module to the front.
  – Gently pull the flaps of the backplane outwards, to remove the side modules.

8.2.3 Assembly of OLM 223

- Reverse the dismantling sequence for assembly.
- Hand-tighten the special screw without using a tool.
- Incorrect assembly is not possible! A module block which has been plugged together incorrectly cannot be inserted in the housing.

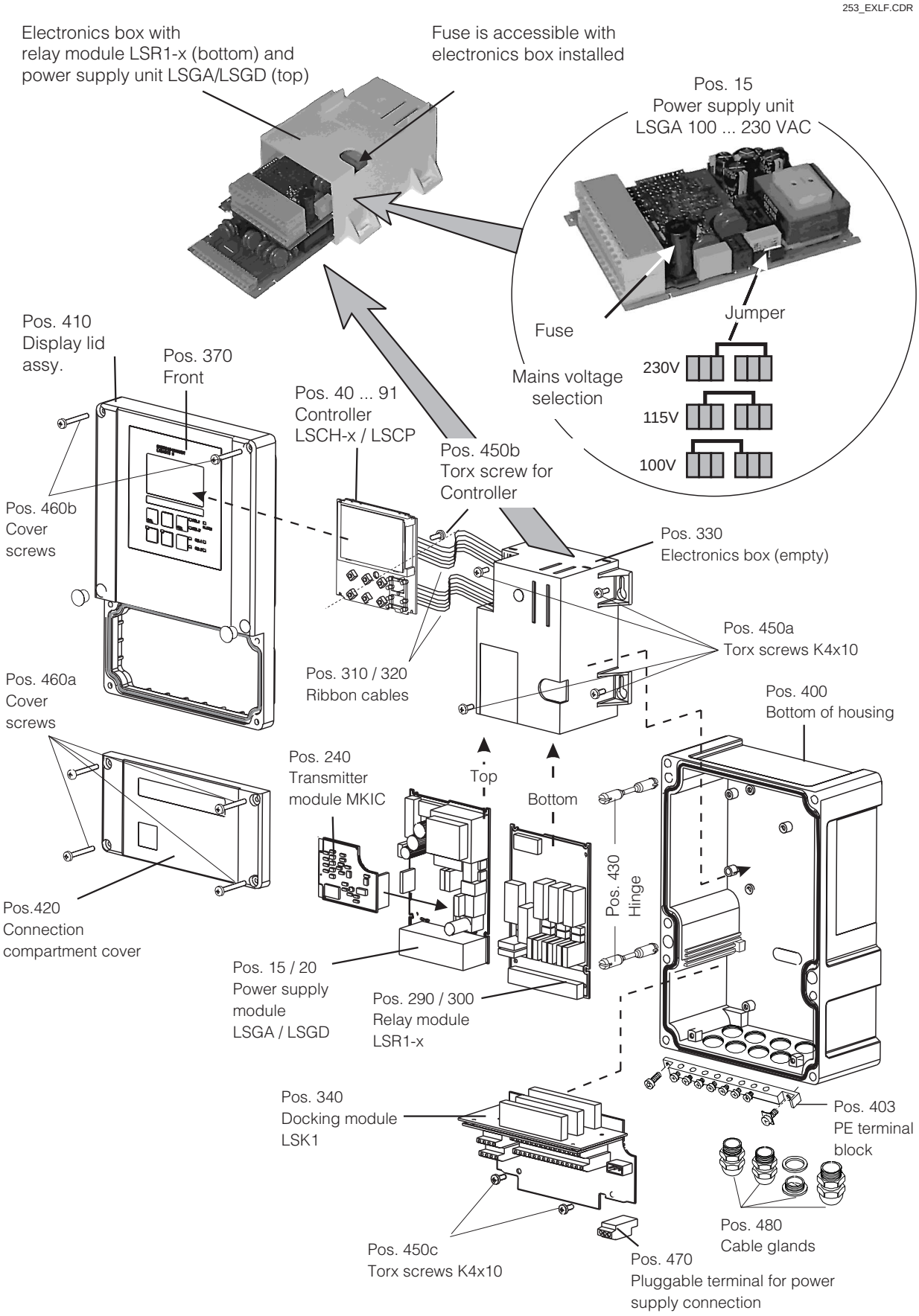
LM253E08.CHP

8.2.4 Spare parts for OLM 223

Pos.	Designation	Name	Function	Order number
15	Power supply unit	LSGA	100/115/230 V AC	51500317
20	Power supply unit	LSGD	24 V AC + DC	51500318
290	Relay module	LSR1-2	2 relays	51500320
300	Relay module	LSR1-4	4 relays	51500321
40	Controller conductive	LSCH-S1	1 current output	51501210
50	Controller conductive	LSCH-S2	2 current outputs	51501212
41	Controller inductive	LSCH-S1	1 current output	51501216
51	Controller inductive	LSCH-S2	2 current outputs	51501218
240	Cond. transmitter	MKIC	Cond. + temperature input	51501206
310	Side panel		Kit with 10 side panels	51502124
330, 340	Housing module		With front membrane, plunger-operated probes, seal, special screw, clamping tappets, all signs	51501075
310, 320, 340, 400	Mechanical parts Housing		Backplate, side wall, end frame, special screw	51501076
420a, 420b	Complete terminal strip set		Terminal strip set inputs/outputs, power supply, alarm relay	51501203
430	Terminal strip		Terminal strip for relay module	51501078
345	Grounding terminal strip		PE and screening connections	51501086

8.3 Corrective maintenance of OLM 253

8.3.1 Exploded view



8.3.2 Disassembly of OLM 253

- Open and remove the connection compartment cover (Pos. 420).
- Pull out the mains terminal (Pos. 470) to make the device voltage-free.
- Open the display cover (Pos. 410) and loosen the ribbon cable (Pos. 310 / 320) on the electronics box (Pos. 330).
- Dismantling the controller (Pos. 40): Loosen screw (Pos. 450b) in the display lid.
- Removal of electronics box (Pos. 330): Loosen screws (Pos. 450a) in the bottom of the housing 2 revolutions, then slide entire box backward and remove towards the top. Make absolutely sure that the module locks do not open!
- Now bend the module latches outward and remove the module(s).
- Dismantling the docking module (Pos. 340): Loosen screws (Pos. 450c) in the bottom of the housing and remove entire module towards the top.

8.3.3 Assembly of OLM 253

- Insert the module(s) in the electronics box guide rails carefully and latch into the lateral lugs in the box.
- Incorrect assembly is not possible! Modules inserted in the electronics box incorrectly are not operable since the ribbon cables cannot be inserted.
- Make sure that the cover gaskets are intact since they are required to guarantee protection class IP 65.

8.3.4 Spare parts for OLM 253

Pos.	Designation	Name	Function	Order number
15	Power supply unit	LSGA	100/115/230 V AC	51500317
20	Power supply unit	LSGD	24 V AC + DC	51500318
290	Relay module	LSR1-2	2 relays	51500320
300	Relay module	LSR1-4	4 relays	51500321
40	Controller conductive	LSCH-S1	1 current output	51501210
50	Controller conductive	LSCH-S2	2 current outputs	51501212
41	Controller inductive	LSCH-S1	1 current output	51501216
51	Controller inductive	LSCH-S2	2 current outputs	51501218
240	Cond. transmitter	MKIC	Cond. + temperature input	51501206
370, 410, 420, 430	Housing cover assy.		Display cover, connection compartment cover, front membrane, hinge	51501068
400, 480	Lower housing section (mechanics)		Lower section, screw union	51501072
330, 340, 450	Internal housing parts		Docking assembly, empty electronics box, small parts	51501073
310, 320	Ribbon cables		2 ribbon cables	51501074
430	Hinges		2 pairs of hinges	51501069
470	Power supply terminal strip		Terminal strip 2-pin	51501079
403	PE terminal block		PE and screening connections	51501087

8.3.5 Special case: replacement of central module

Note:

- After controller replacement all the editable data are reset to the factory settings.
- The serial number can only be entered – and **only once** – in the case of a new module from the factory with serial number 0000! Make sure that your entry is correct before confirming with ENTER! Entry of an incorrect code will prevent the enhanced functions from being enabled. An incorrect serial number can only be corrected at the factory.

Proceed as described below after central module replacement:

- If possible, record the user settings of the instrument, e.g.:
  – Calibration data
  – Current assignment cond./MΩ and temperature
  – Relay function selections
  – Limit / controller settings
  – Cleaning settings
  – Monitoring functions
  – Interface parameters
- Dismantle the instrument as described in chap. 8.2.2 or 8.3.2.
- Refer to the part no. of the central module to determine whether the new module has the same part no. as the old one.
- Reassemble the instrument with the new module, as described in chap. 8.2.3 or 8.3.3.
- Start up the instrument and test its basic functions (e.g. meas. value and temperature display, operation via keyboard).
- Enter the instrument serial number:
  – Read the serial number (“user-no.”) of the device from the nameplate.
  – Enter this number in the fields E115 (year, one-digit), E116 (month, one-digit), E117 (sequence number, four-digit).
  – Field E118 displays the complete number for verification; acknowledge with ENTER or abort and re-enter.
- Verify that the Plus package is enabled (e.g. by accessing function group CHECK / Code P) or the Chemoclean function.
- Check the Plus package release (e.g. by opening the function group CHECK / Code P) or the Chemoclean function.
- Restore the user settings of the instrument.

8.4 Spare parts orders

Spare parts are to be ordered from your local Sales Agency. The address is on the back cover of these operating instructions. Use the order numbers listed in chapters 8.2.4 or 8.3.4.
To be on the safe side, you should **always** specify the following data with spare parts orders:

- Instrument order code (order code)
- Serial number (ser-no.)
- Software version where available

Refer to the nameplate for the order code and serial number. The software version is displayed in field E111 when the instrument processor system is functional.

8.5 Service equipment “Optoscope” with “Scopeware”

The Optoscope together with the “Scopeware” software offers the following possibilities, **without** having to remove or open the transmitter and **without** galvanic connection to the instrument:

- Documentation of the instrument settings in conjunction with Commuwin II
  Software update by the service technician
- Upload/download a hex dump to duplicate configurations.

The optoscope serves as an interface between the transmitter and PC / laptop. The information exchange takes place via the optical interface on the transmitter and via an RS 232 interface on the PC / laptop.

Handling and operation are described in the optoscope operating instructions. The user-friendly Windows software required for the PC or laptop is supplied with the optoscope.

The optoscope is supplied in a sturdy case with all the accessories required.

Order number of optoscope: 51500650

8.6 Corrective maintenance of measuring system

8.6.1 Conductivity transmitter

Cleaning the front panel

To clean the front panel, only use standard cleaning agents.

The front panel is resistant to the following cleaning agents (nach Testmethode DIN 42 115):
- Isopropanol
- Thinned acids (3 %)
- Thinned alkalis (5 %)
- Ester
- Hydrocarbons
- Ketone
- Household cleaners

Caution!

Do not use any concentrated mineral acids or alkalis, benzyl-alcohol, methylene chloride or high-pressure water vapour at over 100 °C.

8.6.2 Conductivity sensors

Clean recognisable **soilings on the conductivity sensors** as follows:

- Clean *oil and greasy coatings* with detergent (grease remover, alcohol or washing-up liquid).

Warning:

Hands, eyes and clothes are to be protected when using the cleaning agents described below.

- *Lime and metal hydroxide coatings*
  Dissolve coatings with diluted hydrochloric acid (3%) and then rinse carefully.
- *With sulphurous coatings (from REA or sewage treatment works)*
  Use a mixture of hydrochloric acid (0.5 %) and thiocarbamide (8 %), and then rinse carefully.
- *Coatings containing proteins (food industry)*
  Use a mixture of hydrochloric acid (0.5 %) and pepsin (1 %), and then rinse carefully.

8.6.3 Simulation of conductive sensors for device test

Check a measuring device for conductivity buy replacing the measuring section and temperature sensor with resistors. Simulation accuracy is dependent on the accuracy of the resistors.

For conductivity, the values in the right-hand table are valid, if the cell constant k is set to the nominal value according to column 2. Otherwise: Display cond.$_{[mS/cm]} = k \cdot 1/R_{[k\Omega]}$.

The values in the following table are valid for temperature, if no temperature offset is set on the transmitter.
Also connect the temperature equivalent resistor in a three-line system.

- To connect decade resistors instead of the conductivity sensor to the plug of a conductivity measuring cable, you can use the “Conductivity Test Adapter” service kit. **Order number: 51500629.**

Pt 100 replacement resistances:

Temperature	Resistance value
–20 °C	92,13 Ω
–10 °C	96,07 Ω
0 °C	100,00 Ω
10 °C	103,90 Ω
20 °C	107,79 Ω
25 °C	109,73 Ω
50 °C	119,40 Ω
80 °C	130,89 Ω
100 °C	138,50 Ω
200 °C	175,84 Ω

With the temperature sensor type Pt 1000, all the resistance values are increased by a factor of 10 .

LM253E08.CHP

Replacement resistances:

Resistance *R*	Cell constant *k*	Display for conductivity	Display for MΩ
10 Ω	1 cm^{-1}	100 mS/cm	
	10 cm^{-1}	1000 mS/cm	
100 Ω	0.1 cm^{-1}	1 mS/cm	1 kΩ · cm
	1 cm^{-1}	10 mS/cm	
	10 cm^{-1}	100 mS/cm	
1000 Ω	0.1 cm^{-1}	0.1 mS/cm	10 kΩ · cm
	1 cm^{-1}	1 mS/cm	
	10 cm^{-1}	10 mS/cm	
10 kΩ	0.01 cm^{-1}	1 µS/cm	1 MΩ · cm
	0.1 cm^{-1}	10 µS/cm	100 kΩ · cm
	1 cm^{-1}	100 µS/cm	
	10 cm^{-1}	1 mS/cm	
100 kΩ	0.01 cm^{-1}	0.1 mS/cm	10 MΩ · cm
	0.1 cm^{-1}	1 µS/cm	1MΩ · cm
	1 cm^{-1}	10 µS/cm	
1 MΩ	0.01 cm^{-1}	0.01 µS/cm	100 MΩ · cm
	0.1 cm^{-1}	0.1 µS/cm	10 MΩ · cm
	1 cm^{-1}	1 µS/cm	
10 MΩ	0.01 cm^{-1}	0.001µS/cm	
	0.1 cm^{-1}	0.01 µS/cm	100 MΩ · cm

Note:

The MΩ measurement is normally used for pure and ultrapure water and therefore is only wise for cell constants where k = 0.01 or poss. k = 0.1.

8.6.4 Simulation of inductive conductivity sensors for device test

An inductive sensor can not be formed by resistors.

However, it is possible to check the complete system OLM 2x3-ID including the inductive sensor using replacement resistances. Note the cell constant k (e.g. $k_{nominal}$ = 2 for CLS 50, $k_{nominal}$ = 5.9 for CLS 52).

For an accurate simulation, you must use the cell constant actually used (readable in Field C124) for the calculation of the display value: Display cond.$_{[mS/cm]} = k \cdot 1/R_{[k\Omega]}$.

Guide values for the simulation CLS 50 at 25 °C:

Simulation resistance *R*	Cell constant *k*	Display cond.
2 Ω	2.00 cm^{-1}	1000 mS/cm
10 Ω	2.00 cm^{-1}	200 mS/cm
100 Ω	2.00 cm^{-1}	20 mS/cm
1 kΩ	2.0 cm^{-1}	2 mS/cm

- Executing the simulation:
  Pull a line through the sensor opening and thenconnect it to a decade resistor, for example.

8.6.5 Check of conductive conductivity sensors

- Measuring surface connection:
  The measuring surfaces are directly connected to the connections of the sensor connector.
  Check with ohmmeter at < 1 Ω.
- Measuring surface shunt:
  There may not be any shunt between the measuring surfaces.
  Check with ohmmeter at > 20 MΩ.
- Temperature sensor shunt:
  There may not be any shunt between the measuring surfaces and the temperature sensor.
  Check with ohmmeter at > 20 MΩ.
- Temperature sensor:
  You can discover the type of the temperature sensor being used by consulting the sensor nameplate.
  The sensor can be checked at the sensor connector with an ohmmeter:
  – Pt 100 at 25 °C = 109.79 Ω
  – Pt 1000 at 25 °C = 1097.9 Ω
  – NTC 10 k at 25 °C = 10 kΩ.
- Connection:
  For sensors with a terminal connection (CLS 12/13) check the assignment of the terminals for reversals and the tightness of the terminal screws.

8.6.6 Check of inductive conductivity sensors

The following data is valid for the sensors CLS 50 and CLS 52.

- Test send coil and receive coil (Red and white coaxial cable, measure each between the inner connector and screen):
  – Ohmic resistance approx. 0.5 ... 2 Ω
  – Inductivity approx. 260 ... 450 mH (at 2 kHz).
- Test coil shunt:
  There may be not shunt between the coils (from coax red to coax white).
  Check with ohmmeter at > 20 MΩ.
- Temperature sensor test:
  To test the Pt 100, use the table in chap. 8.6.4.
  The resistance values between the green and white wires and the green and yellow wires must be identical.
- Test temperature sensor shunt:
  There may be no shunts between the temperature sensor (green, white or yellow lines) and the coils (red coaxial cable and white coaxial cable).
  Check with ohmmeter at > 20 MΩ.

8.6.7 Connecting lines and junction boxes

- For a rapid and function check from the sensor connector (with conductive sensors) or from the sensor (with inductive sensors) to the measuring device, use the methods described in chap. 8.6.3 or 8.6.4. Connect the decade resistors simply with the service kit “Cond. Test Adapter” Order number: 51500629.
- Check the junction boxes for:
  – Humidity (influence at low conductivity or MΩ measurement, if necessary dry box, replace seals, insert dehydrating bag)
  – Correct connection of all lines
  – Connection of the outer screening
  – Tightness of the terminal screws.

LM253E09.CHP

9 Accessories

Mounting accessories

- Weather protection cover OYY 101
  For mounting on field housing, for outdoor installation.
  Dimensions (H × W × D):
  320 × 300 × 270 mm
  Material: Stainless steel SS 304
  Order no.: OYY 101-A

- Universal upright post OYY 102
  Square tube for mounting of field housing.
  Dimensions (H × W × D):
  1495 × 60 × 60 mm
  Material: Stainless steel SS 304
  Order no.: OYY 102-A

Sensors

- ConduMax W OLS 12
  Conductive conductivity sensor
  Technical Information TI 082e00

- OLS 15
  Conductive conductivity sensor
  Technical Information TI 109e00

- OLS 16
  Conductive conductivity sensor
  Technical Information TI 227e00

- OLS 19
  Conductive conductivity sensor
  Technical Information TI 110e00

- OLS 20
  Conductive conductivity sensor
  Technical Information TI 084e00

- OLS 21
  Conductive conductivity sensor
  Technical Information TI 085e00

- OLS 30
  Conductive conductivity sensor
  Technical Information TI 086e00

- OLS 50
  Inductive conductivity sensor
  Technical Information TI 182e00

- OLS 52
  Inductive conductivity sensor
  Technical Information TI 167e00

Connection accessories

- Extension cable OLK 5
  non-terminated measuring cable for inductive sensors (by the meter)
  Order no.: 50085473

- Extension cable OYK 71
  Non-terminated measuring cable for conductivity sensors (by the meter)
  Order no.: 50085333

- Junction box VBM
  Junction box for measuring cable extension between sensors and instrument. Pg 13.5 cable entries.
  Material: cast aluminium;
  Ingress protection: IP 65
  Order no.: 50003987

Assemblies

OLA 111
Immersion assembly for G1 and G¾ conductivity sensors.
Technical Information TI 135e00

Instrument upgrade

(Order only possible with serial number of relevant device)

- Plus package
  Order no.: 51500385

- ChemoClean
  Order no.: 51500963

- Two-relay card (standard version)
  Order no.: 51500320

- Two-relay card (CSA version)
  Order no.: 51511446

- Four-relay card (standard version)
  Order no.: 51500321

- Four-relay card (CSA version)
  Order no.: 51511447

- Two-relay card with current input (standard version / CSA version)
  Order no.: 51504304

- Four-relay card with current input (standard version / CSA version)
  Order no.: 51504305

Conductivity sensors

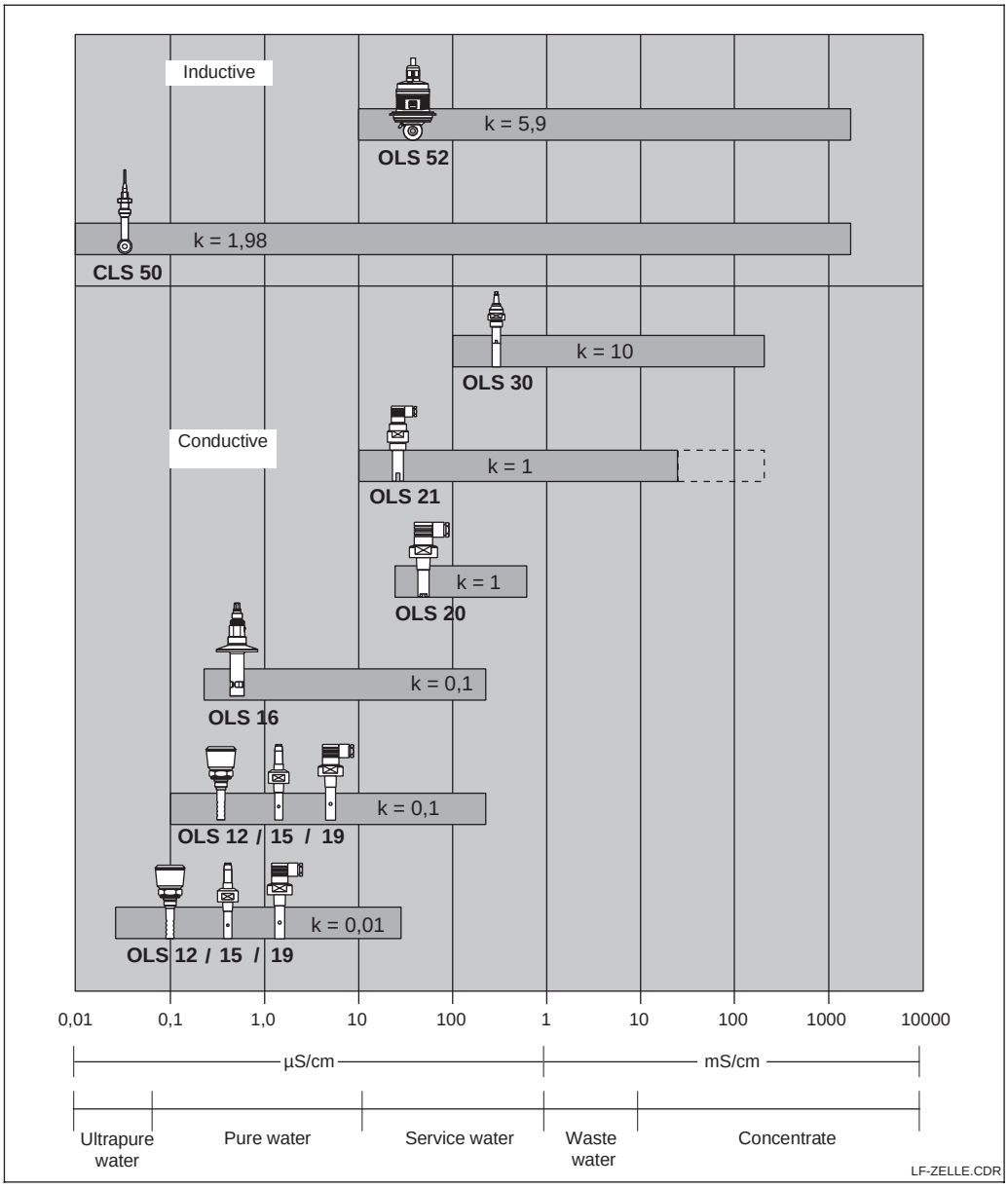


Fig. 9.1 Overview of the measuring ranges of conductivity sensors

- - - - Limited accuracy

LM253E10.CHP

10 Technical data

General specifications

Device name	OLM 223 OLM 253

Input

Measuring parameters	Conductivity, resistance, concentration, temperature

Min. spacing for 0 / 4 ... 20 mA signal

Conductivity measurement	Measured value 0 ... 19.99 µS/cm: 2 µS/cm Measured value 20 ... 199.9 µS/cm: 20 µS/cm Measured value 200 ... 1999 µS/cm: 200 µS/cm Measured value 2 ... 19.99 mS/cm: 2 mS/cm Measured value 20 ... 2000 mS/cm: 20 mS/cm
Resistance measurement	Measured value 0 ... 199.9 kΩ·cm: 20 kΩ·cm Measured value 200 ... 1999 kΩ·cm: 200 kΩ·cm Measured value 2 ... 19.99 MΩ·c: 2.0 MΩ·cm Measured value 20 ... 200 MΩ·cm: 20 MΩ·cm
Concentration measurement	no minimum spacing

Conductive conductivity / resistance measurement

Measuring range		Conductivity: 0 ... 600 mS/cm (uncompensated) Resistance: 0 ... 200 MΩ·cm Concentration: 0 ... 9999 %
Usable cell constant		k = 0.0025 ... 99.99 cm^{-1}
Maximum cable length to sensors		Conductivity: 100 m Resistance: 15 m
Line resistance of measuring cable CYK 71		60 Ω·km^{-1}
Required conductor cross-section	OLM 223 OLM 253	0.75 mm^2 / AWG 18 1.50 mm^2 / AWG 14
Terminal cross-section		2.5 mm^2
Measuring frequency		Conductivity: 170 ... 2000 Hz Resistance: 170 ... 2000 Hz

Inductive conductivity measurement

Measuring range		0 ... 2000 mS/cm (uncompensated)
Usable cell constant		k = 0.0025 ... 99.99 cm^{-1}
Maximum cable length to sensor		55 m (CLK 5)
Required conductor cross-section	OLM 223 OLM 253	0.75 mm^2 / AWG 18 1.50 mm^2 / AWG 14
Terminal cross-section		2.5 mm^2
Measuring frequency		2 kHz

Temperature measurement

Temperature sensor	Pt 100, Pt 1000, NTC
Measuring range	–35 ... +250 °C
Temperature offset range	±5.0 °C

Temperature compensation

Compensation types	linear, NaCl, table; only conductive: ultrapure water
Range	–35 ... +250 °C
Reference temperature	25 °C

Digital inputs 1 and 2

Voltage	10 ... 50 V
Current consumption	max. 10 mA

Current input

Current range	4 ... 20 mA, galvanically separated
Load	260 Ω at 20 mA (voltage drop 5.2 V)

Output

Conductivity / resistance signal output

Current range	0 / 4 ... 20 mA, galvanically isolated; error current 2.4 / 22 mA
Load	max. 500 Ω
Maximum resolution	700 digits/mA
Output range	adjustable
Separation voltage	max. 350 V_{rms} / 500 V DC
Overvoltage (lightning) protection	acc. to EN 61000-4-5:1995

Temperature signal output (optional)

Current range	0 / 4 ... 20 mA, galvanically isolated
Load	max. 500 Ω
Maximum resolution	700 digits/mA
Output range	adjustable, Δ 10 ... Δ 100 % from measuring range end
Separation voltage	max. 350 V_{rms} / 500 V DC
Overvoltage (lightning) protection	acc. to EN 61000-4-5:1995

Auxiliary voltage output

Output voltage	15 V ± 0.6 V
Output current	max. 10 mA

Contact outputs (floating changeover contacts)

Switching current with ohmic load (cos φ = 1)	max. 2 A
Switching current with inductive load (cos φ = 0.4)	max. 2 A
Switching voltage	max. 250 V AC, 30 V DC
Switching power with ohmic load (cos φ = 1)	max. 500 VA AC, 60 W DC
Switching power with inductive load (cos φ = 0.4)	max. 500 VA AC, 60 W DC

Limit contactor

Pickup / dropout delay	0 ... 2000 s

Controller

Function (adjustable)	Pulse length / pulse frequency controller
Controller response	P, PI, PD, PID
Controller gain K_p	0,01 ... 20.00
Integral action time T_n	0.0 ... 999.9 min
Derivative action time T_v	0.0 ... 999.9 min
Period for pulse length controller	0.5 ... 999.9 s
Frequency for pulse frequency controller	60 ... 180 min^{-1}

Alarm

Function (switchable)	Steady / fleeting contact
Alarm threshold adjustment range	Conductivity / resistance / concentration / temperature / USP: total measuring range
Alarm delay	0 ... 2000 s (min)

LM253E10.CHP

Accuracy

Conductivity measurement

Measuring error[1] Display	max. 0.5 % of measured value ± 4 digits
Repeatability	max. 0.2 % of measured value ± 2 digits
Measuring error[1] conductivity of signal output	0.75 % of current output range

Resistance measurement

Measuring error[1]display	max. 0.5 % of measured value ± 4 digits
Repeatability	max. 0.2 % of measured value ± 2 digits
Measuring error[1]resistance of signal output	0.75 % of current output range

Temperature measurement

Measured value resolution	0.1 °C
Measured error[1] display	max. 1.0 % of measuring range
Measured error[1] temperature signal output	max. 1.25 % of current output range

Ambient conditions

Ambient temperature (nominal operating conditions)	–10 ... +55 °C
Ambient temperature (limit operating conditions)	–20 ... +60 °C
Storage and transportation temperature	–25 ... +65 °C
Relative humidity (nominal operating conditions)	10 ... 95 %, non-condensing
Ingress protection of panel-mounted instrument	IP 54 (front panel), IP 30 (enclosure)
Ingress protection of field instrument	IP 65
Pollution degree	2 acc. to IEC 61010-1
Installation category	II
Maximum altitude	2000 m above sea level
Electromagnetic compatibility	Interference emission and immunity to EN 61326: 1997/ A1: 1998

Mechanical construction

Dimensions of panel-mounted unit (H × W × D)	96 × 96 × 145 mm
Installation depth	approx. 165 mm
Dimensions of field instrument (H × W × D)	247 × 170 × 115 mm
Weight of panel-mounted unit	max. 0.7 kg
Weight of field instrument	max. 2.3 kg
Measured value display	LC display, 2-line, 5- and 9-digit with status indicators

Materials

Housing of panel-mounted unit	Polycarbonate
Front membrane	Polyester, UV-resistant
Field housing standard versions CSA GP version	ABS PC Fr Polycarbonate

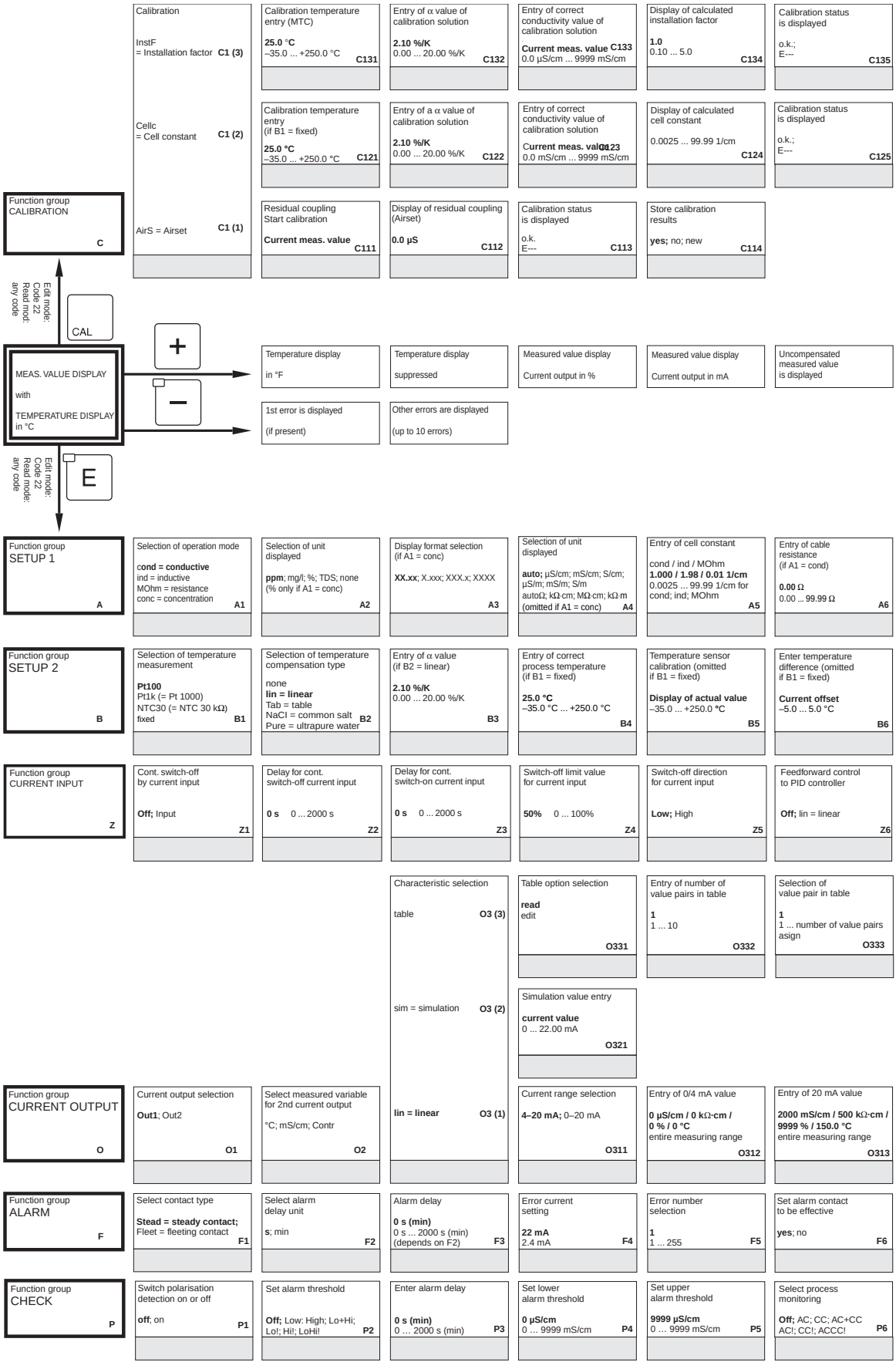
Power supply

Supply voltage	100 / 115 / 230 V AC +10 / –15 %, 48 ... 62 Hz 24 V AC/DC +20 / –15 %
Power consumption	max. 7.5 VA
Mains fuse	Fine-wire fuse, medium time-lag 250 V / 3.15 A

[1]According to IEC 746-1, for nominal operating conditions

Subjects to modifications.

11 Appendix


Function group CALIBRATION C
Edit mode: Code 22 Read mod: any code
CAL
MEAS. VALUE DISPLAY with TEMPERATURE DISPLAY in °C
+
–
Edit mode: Code 22 Read mode: any code
E
Function group SETUP 1 A
Function group SETUP 2 B
Function group CURRENT INPUT Z
Function group CURRENT OUTPUT O
Function group ALARM F
Function group CHECK P
Calibration
InstF = Installation factor C1 (3)
Cellc = Cell constant C1 (2)
AirS = Airset C1 (1)
Calibration temperature entry (MTC) 25.0 °C –35.0 ... +250.0 °C C131
Calibration temperature entry (if B1 = fixed) 25.0 °C –35.0 ... +250.0 °C C121
Residual coupling Start calibration Current meas. value C111
Entry of α value of calibration solution 2.10 %/K 0.00 ... 20.00 %/K C132
Entry of a α value of calibration solution 2.10 %/K 0.00 ... 20.00 %/K C122
Display of residual coupling (Airset) 0.0 µS C112
Entry of correct conductivity value of calibration solution Current meas. value C133 0.0 µS/cm ... 9999 mS/cm
Entry of correct conductivity value of calibration solution Current meas. value C123 0.0 mS/cm ... 9999 mS/cm
Calibration status is displayed o.k. E--- C113
Display of calculated installation factor 1.0 0.10 ... 5.0 C134
Display of calculated cell constant 0.0025 ... 99.99 1/cm C124
Store calibration results yes; no; new C114
Calibration status is displayed o.k.; E--- C135
Calibration status is displayed o.k.; E--- C125
Temperature display in °F
Temperature display suppressed
Measured value display Current output in %
Measured value display Current output in mA
Uncompensated measured value is displayed
1st error is displayed (if present)
Other errors are displayed (up to 10 errors)
Selection of operation mode cond = conductive; ind = inductive; MOhm = resistance; conc = concentration A1
Selection of unit displayed ppm; mg/l; %; TDS; none (% only if A1 = conc) A2
Display format selection (if A1 = conc) XX.xx; X.xxx; XXX.x; XXXX A3
Selection of unit displayed auto; µS/cm; mS/cm; S/cm; µS/m; mS/m; S/m; autoΩ; kΩ·cm; MΩ·cm; kΩ·m (omitted if A1 = conc) A4
Entry of cell constant cond / ind / MOhm 1.000 / 1.98 / 0.01 1/cm 0.0025 ... 99.99 1/cm for cond; ind; MOhm A5
Entry of cable resistance (if A1 = cond) 0.00 Ω 0.00 ... 99.99 Ω A6
Selection of temperature measurement Pt100; Pt1k (= Pt 1000); NTC30 (= NTC 30 kΩ) fixed B1
Selection of temperature compensation type none; lin = linear; Tab = table; NaCl = common salt; Pure = ultrapure water B2
Entry of α value (if B2 = linear) 2.10 %/K 0.00 ... 20.00 %/K B3
Entry of correct process temperature (if B1 = fixed) 25.0 °C –35.0 °C ... +250.0 °C B4
Temperature sensor calibration (omitted if B1 = fixed) Display of actual value –35.0 ... +250.0 °C B5
Enter temperature difference (omitted if B1 = fixed) Current offset –5.0 ... 5.0 °C B6
Cont. switch-off by current input Off; Input Z1
Delay for cont. switch-off current input 0 s 0 ... 2000 s Z2
Delay for cont. switch-on current input 0 s 0 ... 2000 s Z3
Switch-off limit value for current input 50% 0 ... 100% Z4
Switch-off direction for current input Low; High Z5
Feedforward control to PID controller Off; lin = linear Z6
Characteristic selection table O3 (3); sim = simulation O3 (2); lin = linear O3 (1)
Table option selection read; edit O331
Simulation value entry current value 0 ... 22.00 mA O321
Entry of number of value pairs in table 1 1 ... 10 O332
Selection of value pair in table 1 1 ... number of value pairs asign O333
Current output selection Out1; Out2 O1
Select measured variable for 2nd current output °C; mS/cm; Contr O2
Current range selection 4–20 mA; 0–20 mA O311
Entry of 0/4 mA value 0 µS/cm / 0 kΩ·cm / 0 % / 0 °C entire measuring range O312
Entry of 20 mA value 2000 mS/cm / 500 kΩ·cm / 9999 % / 150.0 °C entire measuring range O313
Select contact type Stead = steady contact; Fleet = fleeting contact F1
Select alarm delay unit s; min F2
Alarm delay 0 s (min) 0 s ... 2000 s (min) (depends on F2) F3
Error current setting 22 mA 2.4 mA F4
Error number selection 1 1 ... 255 F5
Set alarm contact to be effective yes; no F6
Switch polarisation detection on or off off; on P1
Set alarm threshold Off; Low: High; Lo+Hi; Lo!; Hi!; LoHi! P2
Enter alarm delay 0 s (min) 0 … 2000 s (min) P3
Set lower alarm threshold 0 µS/cm 0 … 9999 mS/cm P4
Set upper alarm threshold 9999 µS/cm 0 … 9999 mS/cm P5
Select process monitoring Off; AC; CC; AC+CC AC!; CC!; ACCC! P6

LM253E11.CHP

Store calibration
results

yes; no; new

C136

Store calibration
results

yes; no; new

C126

Entry of measured
value damping

1 (no damping)
1 ... 60

A7

Entry of
reference temperature

25 °C
–35 ... 250 °C

B7

Feedforward control = 1
at

50%
0 ... 100%

Z7

x value entry
(measured value)

0 µS/cm / 0 kΩ·cm /
0 % / 0 °C
entire measuring range

O334

y value entry
(current value)

0.00 mA
0 ... 20.00 mA
entire measuring range

O235

Table status ok

yes; no

O236

Field for customer settings

Activate error current
for previously set
error

no; yes **F7**

Automatic start of
cleaning function
no; yes
(not always displayed,
see error messages) **F8**

Select "next error"
or return to menu

next = next error;
←R **F9**

Set max. perm. period
for lower limit exceeded

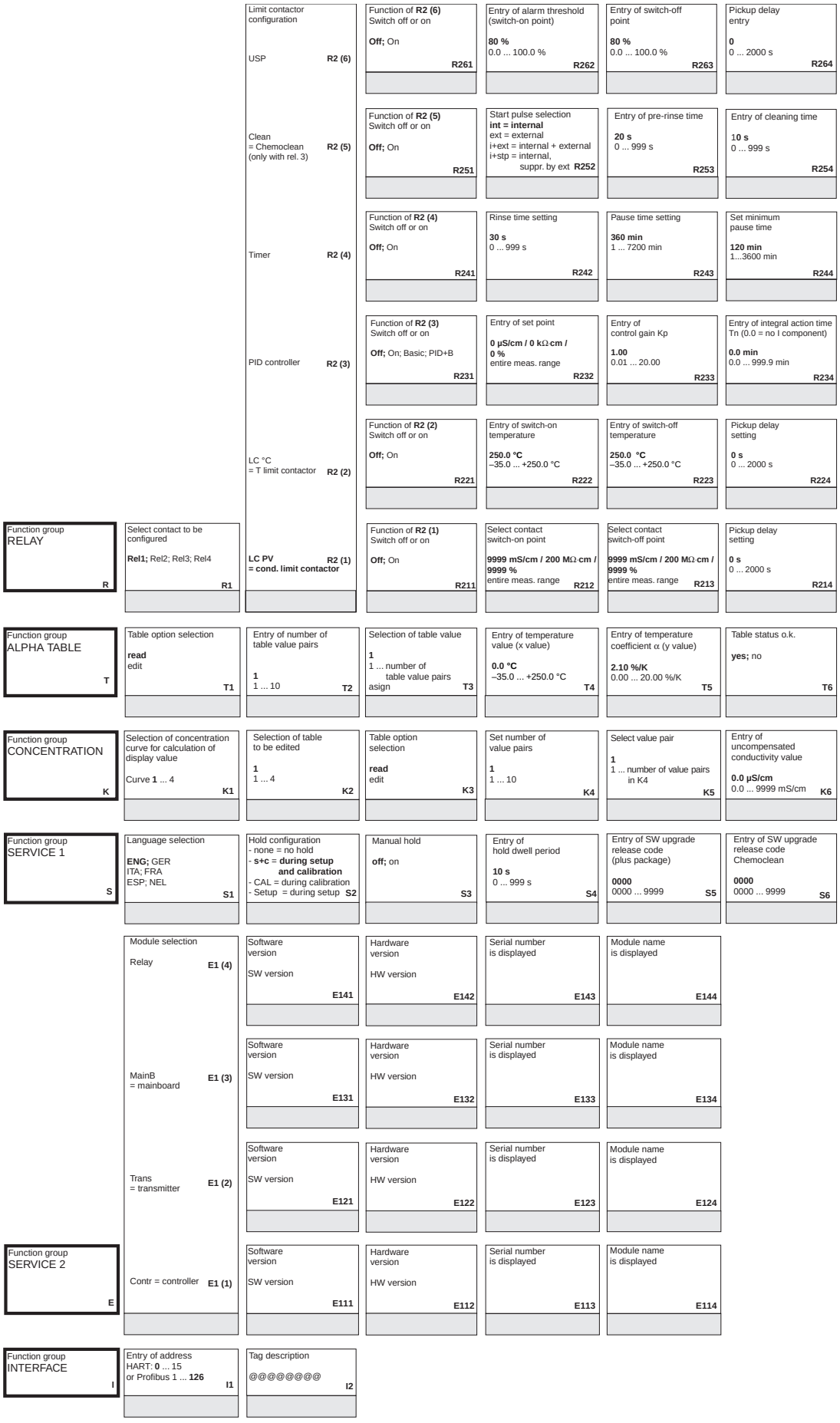
60 min 0 ... 2000 min **P7**

Set max. perm. period
for upper limit exceeded

120 min 0 ... 2000 min **P8**

Set monitoring
value

1000 µS/cm
0 ... 9999 mS/cm **P9**


Limit contactor configuration
USP R2 (6)
Function of R2 (6) Switch off or on
Off; On
R261
Entry of alarm threshold (switch-on point)
80 %
0.0 ... 100.0 %
R262
Entry of switch-off point
80 %
0.0 ... 100.0 %
R263
Pickup delay entry
0
0 ... 2000 s
R264
Clean = Chemoclean (only with rel. 3) R2 (5)
Function of R2 (5) Switch off or on
Off; On
R251
Start pulse selection
int = internal
ext = external
i+ext = internal + external
i+stp = internal, suppr. by ext
R252
Entry of pre-rinse time
20 s
0 ... 999 s
R253
Entry of cleaning time
10 s
0 ... 999 s
R254
Timer R2 (4)
Function of R2 (4) Switch off or on
Off; On
R241
Rinse time setting
30 s
0 ... 999 s
R242
Pause time setting
360 min
1 ... 7200 min
R243
Set minimum pause time
120 min
1...3600 min
R244
PID controller R2 (3)
Function of R2 (3) Switch off or on
Off; On; Basic; PID+B
R231
Entry of set point
0 µS/cm / 0 kΩ·cm / 0 %
entire meas. range
R232
Entry of control gain Kp
1.00
0.01 ... 20.00
R233
Entry of integral action time Tn (0.0 = no I component)
0.0 min
0.0 ... 999.9 min
R234
LC °C = T limit contactor R2 (2)
Function of R2 (2) Switch off or on
Off; On
R221
Entry of switch-on temperature
250.0 °C
–35.0 ... +250.0 °C
R222
Entry of switch-off temperature
250.0 °C
–35.0 ... +250.0 °C
R223
Pickup delay setting
0 s
0 ... 2000 s
R224
Function group RELAY R
Select contact to be configured
Rel1; Rel2; Rel3; Rel4
R1
LC PV = cond. limit contactor R2 (1)
Function of R2 (1) Switch off or on
Off; On
R211
Select contact switch-on point
9999 mS/cm / 200 MΩ·cm / 9999 %
entire meas. range
R212
Select contact switch-off point
9999 mS/cm / 200 MΩ·cm / 9999 %
entire meas. range
R213
Pickup delay setting
0 s
0 ... 2000 s
R214
Function group ALPHA TABLE T
Table option selection
read
edit
T1
Entry of number of table value pairs
1
1 ... 10
T2
Selection of table value
1
1 ... number of table value pairs
asign
T3
Entry of temperature value (x value)
0.0 °C
–35.0 ... +250.0 °C
T4
Entry of temperature coefficient α (y value)
2.10 %/K
0.00 ... 20.00 %/K
T5
Table status o.k.
yes; no
T6
Function group CONCENTRATION K
Selection of concentration curve for calculation of display value
Curve 1 ... 4
K1
Selection of table to be edited
1
1 ... 4
K2
Table option selection
read
edit
K3
Set number of value pairs
1
1 ... 10
K4
Select value pair
1
1 ... number of value pairs in K4
K5
Entry of uncompensated conductivity value
0.0 µS/cm
0.0 ... 9999 mS/cm
K6
Function group SERVICE 1 S
Language selection
ENG; GER
ITA; FRA
ESP; NEL
S1
Hold configuration
- none = no hold
- s+c = during setup and calibration
- CAL = during calibration
- Setup = during setup
S2
Manual hold
off; on
S3
Entry of hold dwell period
10 s
0 ... 999 s
S4
Entry of SW upgrade release code (plus package)
0000
0000 ... 9999
S5
Entry of SW upgrade release code Chemoclean
0000
0000 ... 9999
S6
Module selection
Relay E1 (4)
Software version
SW version
E141
Hardware version
HW version
E142
Serial number is displayed
E143
Module name is displayed
E144
MainB = mainboard E1 (3)
Software version
SW version
E131
Hardware version
HW version
E132
Serial number is displayed
E133
Module name is displayed
E134
Trans = transmitter E1 (2)
Software version
SW version
E121
Hardware version
HW version
E122
Serial number is displayed
E123
Module name is displayed
E124
Function group SERVICE 2 E
Contr = controller E1 (1)
Software version
SW version
E111
Hardware version
HW version
E112
Serial number is displayed
E113
Module name is displayed
E114
Function group INTERFACE I
Entry of address
HART: 0 ... 15
or Profibus 1 ... 126
I1
Tag description
@@@@@@@@
I2

LM253E11.CHP

Dropout delay
entry

0
0 ... 2000 s
R265

Entry of post-rinse time

20 s
0 ... 999 s
R255

Number of repeat cycles

0
0 ... 5
R256

Set interval between
two cleaning cycles
(pause time)

360 min
1 ... 7200 min **R257**

Set minimum pause
time

120 min
1 ... R357 min
R258

Number of cleaning
cycles without
cleaning agent

0
0 ... 9 **R259**

Entry of derivative
action time Tv
(0.0 = no D component)

0.0 min
0.0 ... 999.9 min
R235

Selection of
control characteristic

dir = direct;
inv = inverted
R236

Selection

len = pulse length
freq = pulse frequency
curr = current input 2
R237

Entry of
pulse interval

10.0 s
0.5 ... 999.9 s
R238

Entry of max.
pulse frequency

120 1/min
60 ... 180 1/min
R239

Entry of min. ON time
t_{ON}

0.3 s
0.1 ... 5.0 s
R2310

Enter basic load

40%
0 ... 40%
R2311

Dropout delay
setting

0 s
0 ... 2000 s
R225

Setting of
alarm threshold

250.0 °C
–35.0 ... +250.0 °C
R226

Display of LC status

MAX
MIN
R227

Dropout delay
setting

0 s
0 ... 2000 s
R215

Setting of alarm threshold
(as an absolute value)

9999 mS/cm / 200 MΩ cm /
9999 %
entire meas. range **R216**

Display of LC status

MAX
MIN
R217

Entry of associated
concentration value

0.00 %
0 ... 99.99 %
K7

Entry of
associated
temperature value

0.0 °C
–35.0 ... 250.0 °C **K8**

Table status o.k.

yes; no
K9

Order number is
displayed

S7

Serial number is
displayed

S8

Reset instrument
(restore default values)

no;
Sens = sensor data;
Facty = factory settings **S9**

Perform instrument test

no;
Displ = display
S10

12 Index

LM253E12.CHP

Declaration of contamination

Dear customer,
Because of legal determinations and for the safety of our employes and operating equipment we need this "Declaration of contamination" with your signature before your order can be handled. Please put the completely filled in declaration to the instrument and to the shipping documents in any case. Add also safety sheets and/or specific handling instructions if necessary.

type of instrument / sensor: _____ serial number: _____

medium / concentration: _____ temperature: _____ pressure: _____

cleaned with: _____ conductivity: _____ viscosity: _____

Warning hints for medium used:

☐ radioactive	☐ explosive	☐ caustic	☐ poisonous	☐ harmful of health	☐ biological hazardous	☐ inflammable	☐ safe

Please mark the appropriate warning hints.

Reason for return:

_____

_____

Company data:

company: _____ contact person: _____

_____ _____

_____ department: _____

address: _____ phone number: _____

_____ Fax/E-Mail: _____

_____ your order no.: _____

I hereby certify that the returned equipment has been cleaned and decontaminated acc. to good industrial practices and is in compliance with all regulations. This equipment poses no health or safety risks due to contamination.

_____ _____

(Date) (company stamp and legally binding signature)

51512417

BA 193e00/07.02