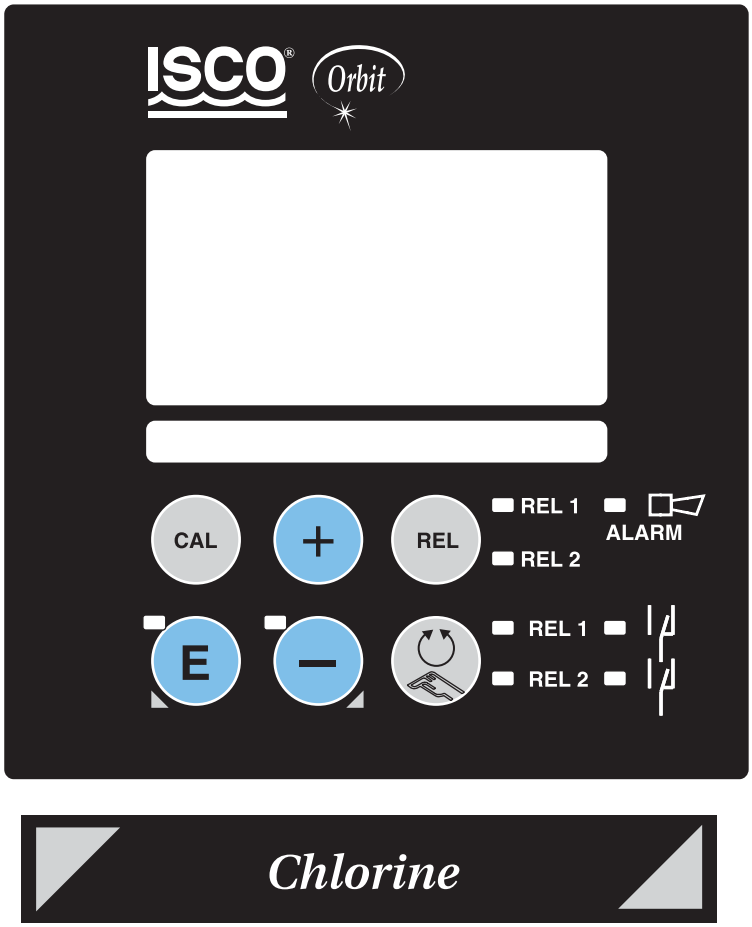
Orbit OCM 223 / 253

Transmitter for Free Chlorine/Chlorine Dioxide
Installation and Operation Guide



Isco Part # 69-0043-002
51513336

Isco, Inc.

Foreword

This instruction manual is designed to help you gain a thorough understanding of the operation of the equipment. Isco recommends that you read this manual completely before placing the equipment in service.

Although Isco designs reliability into all equipment, there is always the possibility of a malfunction. This manual may help in diagnosing and repairing the malfunction.

If the problem persists, call or email the Isco Customer Service Department for assistance. Contact information is provided below. Simple difficulties can often be diagnosed over the phone. If it is necessary to return the equipment to the factory for service, please follow the shipping instructions provided by the Customer Service Department, including the use of the **Return Authorization Number** specified. **Be sure to include a note describing the malfunction.** This will aid in the prompt repair and return of the equipment.

Isco welcomes suggestions that would improve the information presented in this manual or enhance the operation of the equipment itself.

Isco is continually improving its products and reserves the right to change product specifications, replacement parts, schematics, and instructions without notice.

Contact Information

Phone:	(800) 228-4373	(USA, Canada, Mexico)
	(402) 464-0231	(Outside North America)
Repair Service:	(800) 775-2965	(Analytical and Process Monitoring Instruments)
	(800) 228-4373	(Samplers and Flow Meters)
Fax:	(402) 465-3022	
Email address:	info@isco.com	
Website:	www.isco.com	

Return equipment to: 4700 Superior Street, Lincoln, NE 68504-1398

Other correspondence: P.O. Box 82531, Lincoln, NE 68501-2531

Revised February 12, 2003

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1 Safety

1.1 Safety symbols

Warning!
This symbol alerts you to hazards which could cause serious injuries as well as damage to the instrument if ignored.

Caution!
This symbol alerts you to possible faults which could arise from incorrect operation. They could cause damage to the instrument if ignored.

Note!
This symbol indicates important items of information.

1.2 Intended application

OCM 223 / 253 is a field-tested and reliable transmitter which determines the amount of free chlorine or chlorine dioxide dissolved in water.
It is specially designed for applications in the following industries:
- Drinking water
- Water treatment
- Cooling water
- Gas scrubbers
- Reverse osmosis
- Food processing
- Swimming pool and bathing pool water.

1.3 Installation, start-up, operation

Warning!
- Installation, electrical connection, start-up, operation and maintenance of the measuring instrument must be carried out exclusively by trained specialists authorised by the system operator.
- This personnel must have read and understood the instructions in this manual and must adhere to them.
- Before connecting the instrument ensure that the power supply complies with the ratings specified on the nameplate.
- A clearly marked mains disconnecting device must be installed in the vicinity of the instrument.
- Live components in the interior of the instrument can be touched through the ventilation slits and the slit openings on the instrument back. Do not insert any tools or wires into these slits (only OCM 223)!
- Before switching on the system check all the connections again for correctness.
- Do not operate damaged instruments which could pose a danger, and mark them as defective.
- Measuring point faults may only be repaired by authorised and trained personnel.
- If faults cannot be repaired, the instrument must be taken out of service and secured against unintentional start-up.
- Repairs may only be carried out by the manufacturer or by your Service Organisation.

1.4 Operational safety

The instrument has been designed according to the state of the art and complies with the applicable regulations and EN standards (see “Technical Data”). It is built in accordance with EN 61010-1 and left our factory in perfect condition with regard to safety aspects.
However, if it is used improperly or other than for its intended purpose, it may pose a hazard, e.g. due to improper connection.

Warning!
- If the device is used for any application other than those described in this manual, it may lead to unsafe and improper functioning of the measuring system and is therefore strictly prohibited.
- Make sure you strictly adhere to the safety instructions and warnings in this manual.

Monitoring and safety devices
The instrument is protected against external influences and damage by the following design measures:
- Rugged housing
- Housing protection IP 65 (OCM 253)
- UV resistance.

If system faults or a power failure occur, an alarm is triggered by a fault-signalling contact.

Fail-safety
This instrument has been tested for electromagnetic compatibility in industrial use according to applicable European standards. It is protected against electromagnetic interference by the following design measures:
- Galvanic isolation at input and output
- Interference suppression filter
- Hardware and software design meeting EMC requirements.

Warning!
Protection against interference as specified above is valid only for an instrument connected according to the instructions in this manual.

1.5 Return to manufacturer

If the instrument has to be repaired by the manufacturer, please return it **cleaned** to the sales centre responsible. Please use the original packaging.

2 Identification

2.1 Equipment name

2.1.1 Nameplate

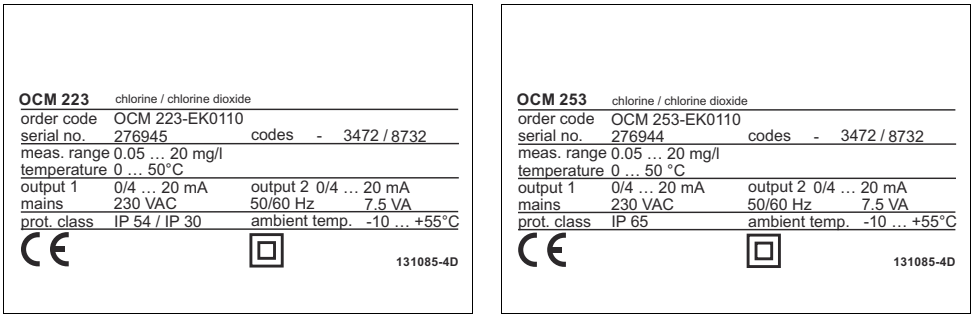


Fig. 2.1: Nameplate of OCM 223 (panel-mounted instrument, left) and OCM 253 (field instrument, right). "Codes" lists the release code for software upgrades for ChemoClean (left of slash) or Plus package (right of slash).

2.1.2 Product structure

	Version	
	EK	Measurement of free chlorine / chlorine dioxide
	ES	Measurement of free chlorine / chlorine dioxide with extended features
	EP	Measurement of free chlorine / chlorine dioxide with extended features, in addition pH or redox measurement (switchable)

		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 V AC
		7	Power supply 24 V AC/DC, CSA Gen. Purp.
		8	Power supply 24 V AC/DC

			Measurement output	
			0	1 output signal: Chlorine / chlorine dioxide
			1	2 output signals : Chlorine / chlorine dioxide and temperature / chlorine (with EP version optionally pH / redox / chlorine) or chlorine dioxide / set value

				Contacts	
				05	No additional contacts
				10	2 contacts (limit / P(ID) / timer)
				15	4 contacts (limit / P(ID) / ChemoClean / three-point step controller for Cl_2/ClO_2)
				16	4 contacts (limit / P(ID) / timer / three-point step controller for Cl_2/ClO_2)
				20	2 contacts with current input (limit / P(ID) / timer)
				25	4 contacts with cleaning, current input (limit / P(ID) / ChemoClean / three-point step controller for Cl_2/ClO_2)
				26	4 contacts with timer, current input (limit / P(ID) / timer / three-point step controller for Cl_2/ClO_2)
OCM 223- OCM 253-					complete order code

2.2 Additional functions of ES and EP versions

ES version
Compared to the basic EK version, this version is extended by the Plus package:
- Manual pH compensation for free chlorine, fields B2 and B3
- Current output table, fields O33x
- Sensor and process monitoring, function group P
- Automatic start of cleaning function, field F8.

EP version
This version includes the functions of the ES version and in addition:
- Optional pH or redox measurement, field B1
- Automatic pH compensation for free chlorine
- Sensor and process monitoring even for pH or redox, fields P12x
- Limit contact for pH or redox, fields R22x
- pH value control, fields R25x.

2.3 Scope of supply

Caution!
- Make sure the packaging is undamaged! If any damage is found, contact your postal service or forwarding agent. Keep any damaged packaging until matters have been clarified.
- Make sure the contents are undamaged! If any damage is found, contact your postal service or forwarding agent and inform the suppliers. Keep any damaged goods until matters have been clarified.
- Inspect the delivery for completeness and quantity according to the delivery papers, and the instrument type and version as shown on the nameplate.

The following items are included in the delivery:
- Transmitter OCM 223 (panel-mounted instrument) or OCM 253 (field instrument)
- Operating instructions BA 214e00
- Panel-mounted instrument:
  – 1 set of plug-in screw terminals
  – 2 clamping screws for panel mounting
  additional for EP version:
  – 1 BNC connector (solderless)
- Field instrument:
  – 1 plug-in screw terminal
  – 1 × cable gland Pg 7
  – 1 × cable gland Pg 16, tapered
  – 2 × cable gland Pg 13.5.

In case of any queries please contact your supplier or your Sales Agency.

3 Installation

The following procedure should be followed for a complete measuring system installation:
1. Installation or attachment of transmitter (see chapter 3.3)
2. Selection and connection of cables and sensor (see chapter 4.2)
3. Start-up (see chapter 6.1).

3.1 Measuring system

A complete measuring system comprises:
- the OCM 223 or OCM 253 chlorine / chlorine dioxide transmitter
- a OCS 140 / 141 membrane-covered sensor for Cl_2 or OCS 240 / 241 for ClO_2 or a 963 open sensor for Cl_2
- a OCA 250 flow assembly (not required for 963 sensor).

Options:
- pH or redox electrode (e.g. OPS 31, OPS 12, OPS 32)
- INS proximity switch for flow monitoring (omitted with 963 sensor)
- OMK extension cable for chlorine measurement
- OYK 71 extension cable for pH/redox measurement if required
- MK extension cable for INS proximity switch
- VBC junction box.

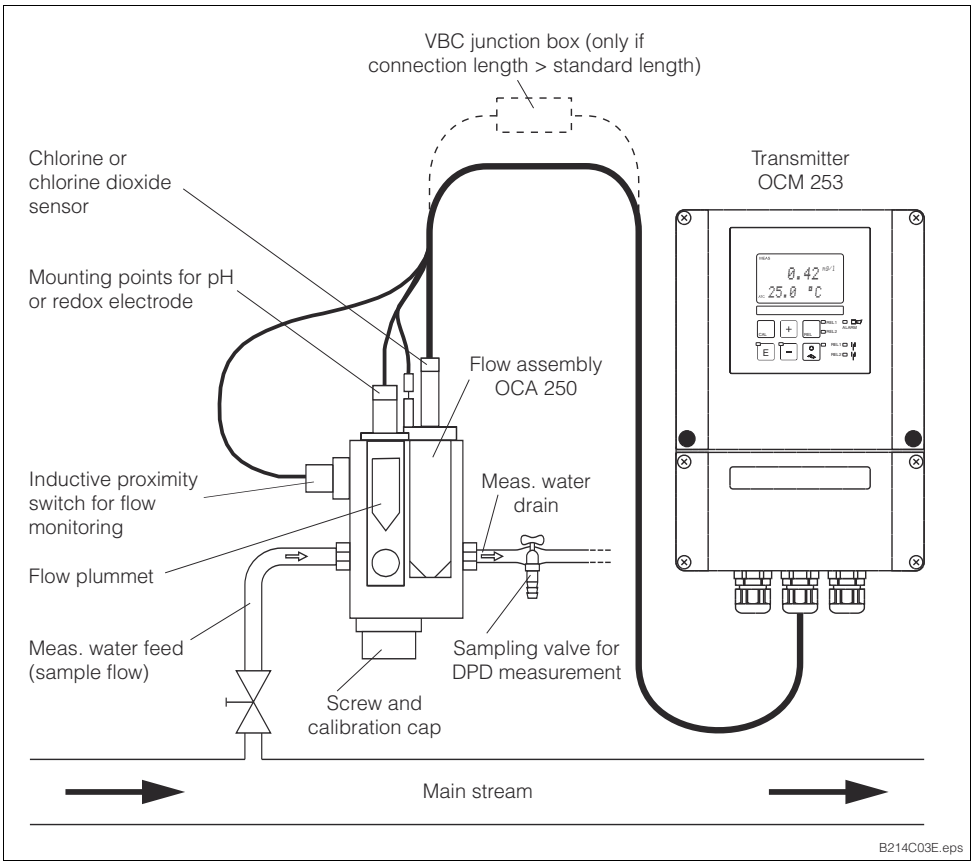
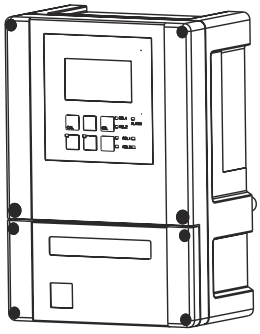


Fig. 3.1: Complete measuring system with OCM 253

3.2 Dimensions



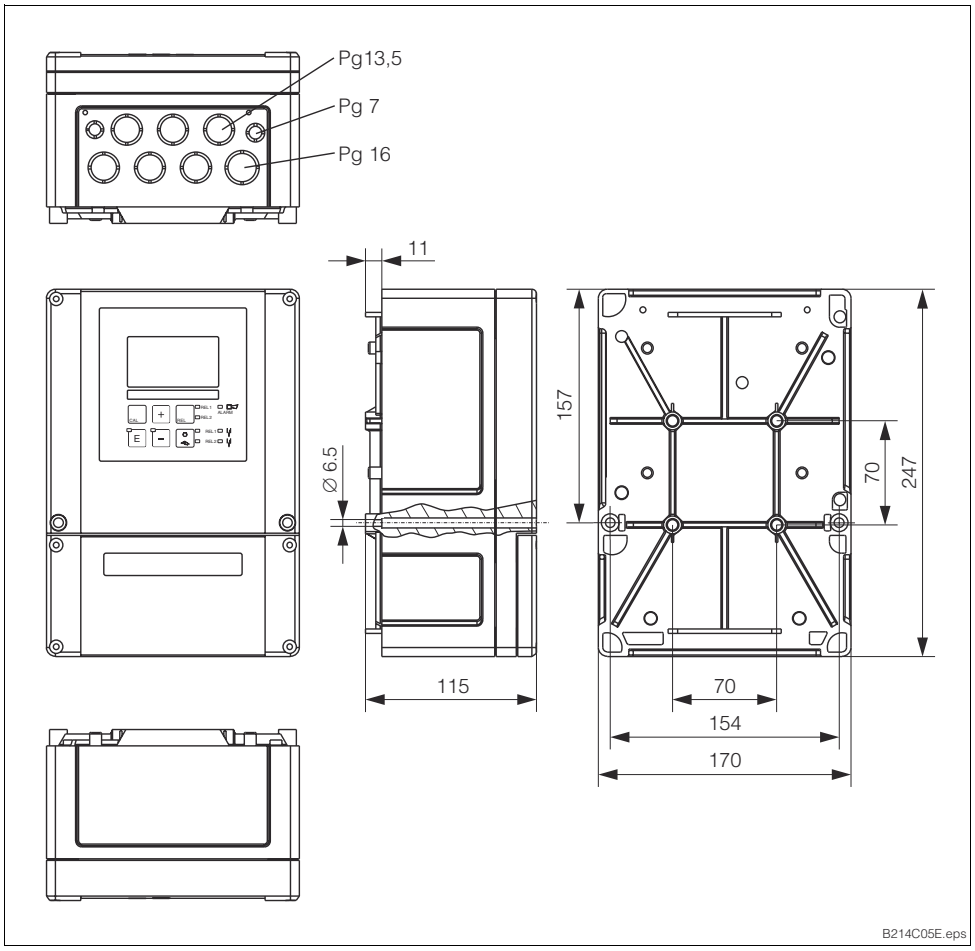


Fig. 3.2: Dimensions of OCM 253

Note!
There is a hole in the punching for Pg 16 cable entry. Itr 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.

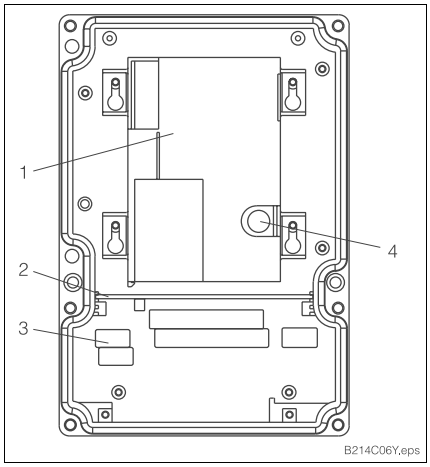
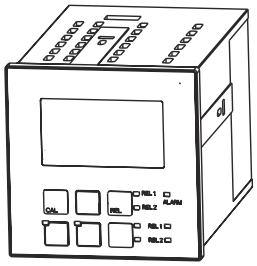


Fig. 3.3: Interior view of OCM 253 housing
1 Removable electronics box; 2 Partition plate; 3 Terminal blocks; 4 Fuse



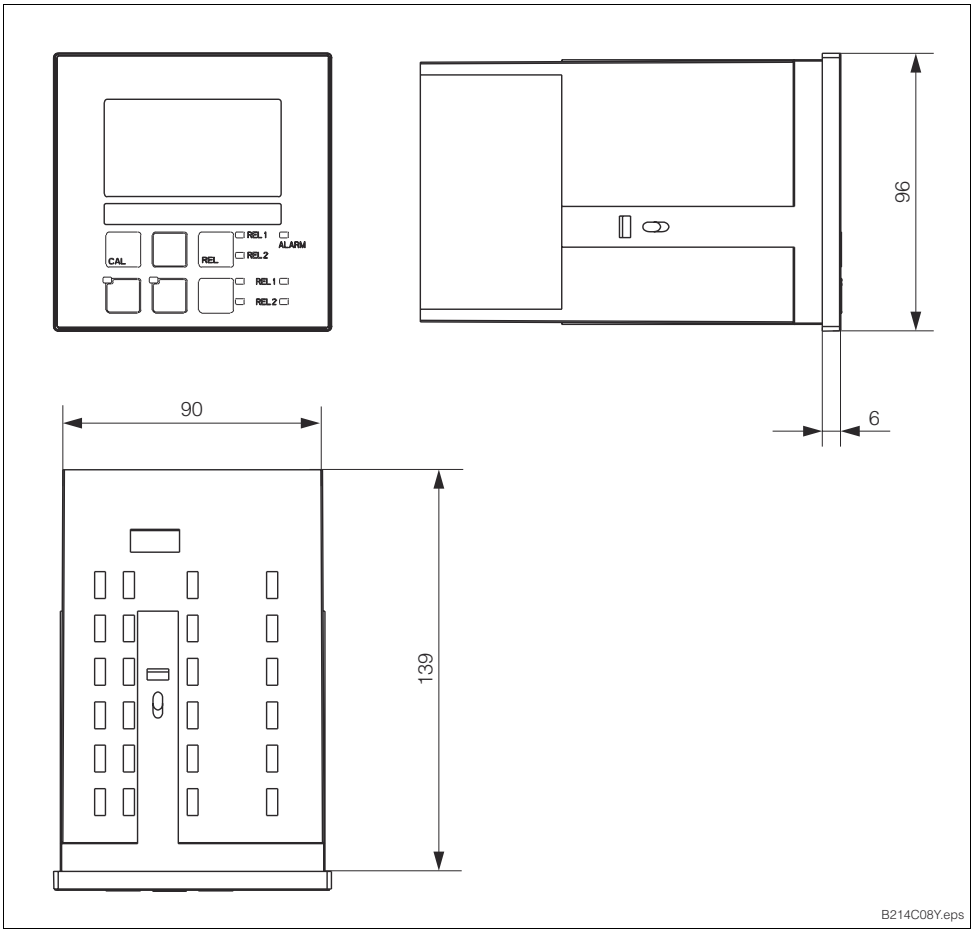


Fig. 3.4: Dimensions of OCM 223

3.3 Mounting

3.3.1 Field instrument

There are several mounting options for the field instrument version of the transmitter:
- Mounting on round posts
- Mounting on square posts
- Wall mounting.

When installing the instrument outdoors, you require weather protection cover OYY 101 for all mounting options.

Caution!
In case of direct exposition to weather factors, the weather protection cover is indispensable.

Weather protection cover OYY 101
Weather protection cover for outdoor operation, for mounting on field instrument;
Material: stainless steel 1.4301 (AISI 304).
For post or pipe mounting, the post mounting kit is additionally required.

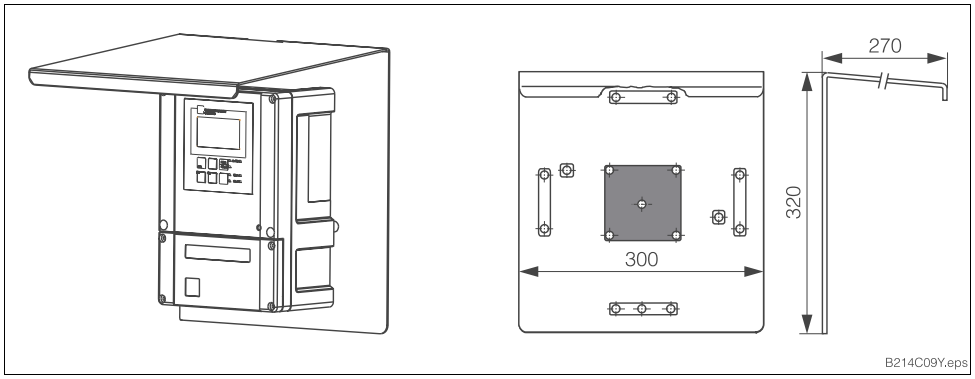


Fig. 3.5: Weather protection cover for field instruments

Post mounting kit
Mounting kit for mounting the field housing on horizontal and vertical pipes (max. ∅ 60 mm); is also used for attachment of the weather protection cover. Material: stainless steel 1.4301 (AISI 304)

Universal mounting post OYY 102
Square pipe for mounting transmitters; Material: stainless steel 1.4301 (AISI 304)

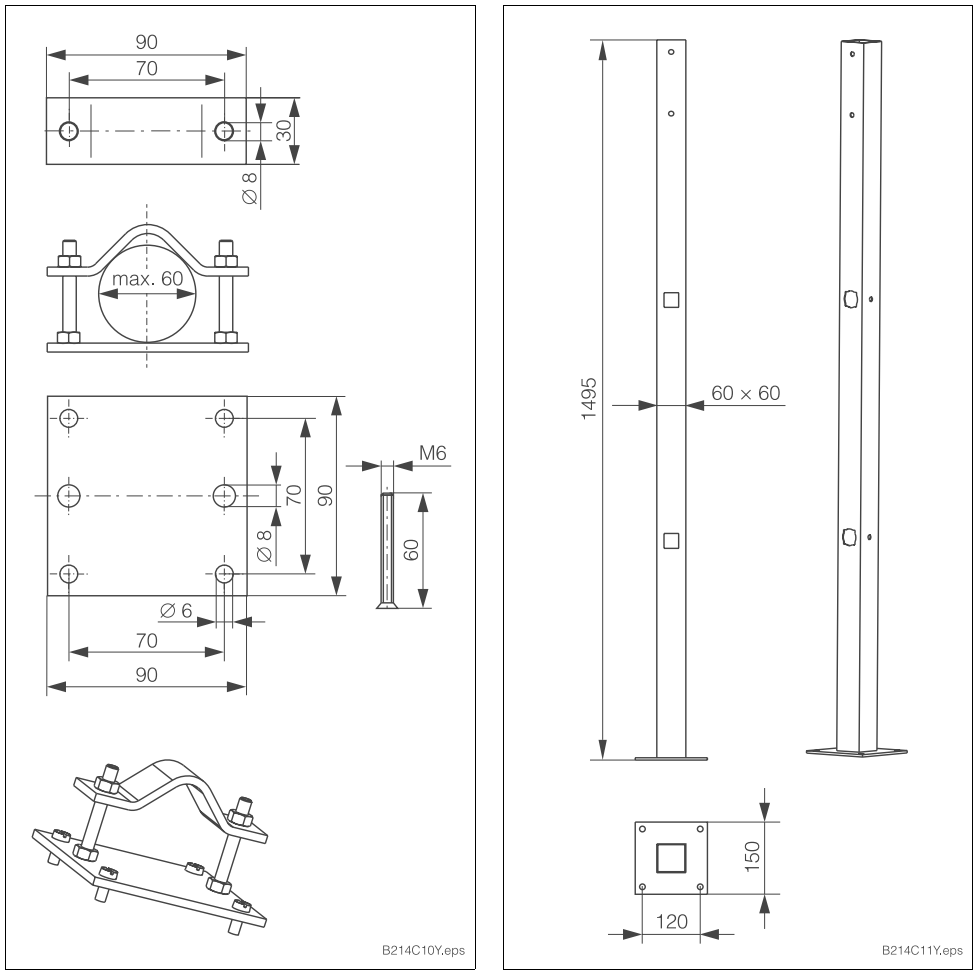


Fig. 3.6: Mounting kit for mounting on round posts (left)
Square mounting post (right)

3.3.2 Mounting examples

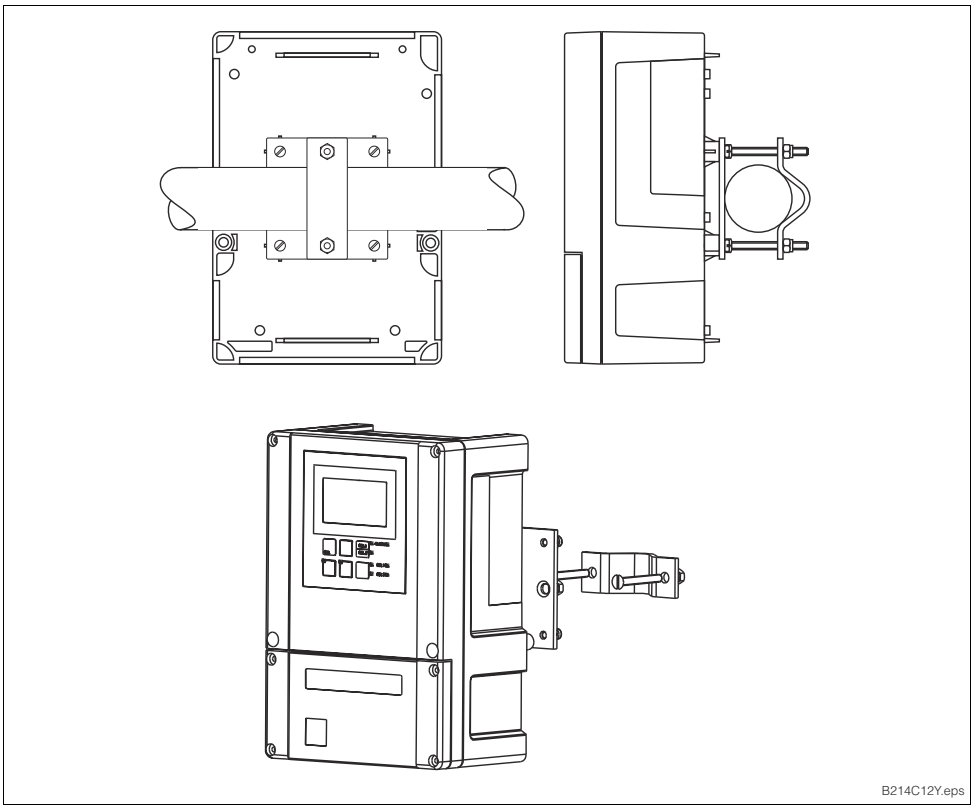
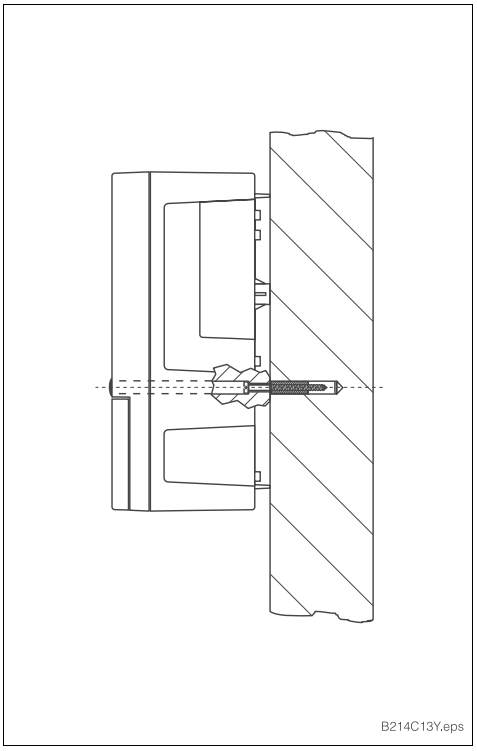


Fig. 3.7: Field instrument: pipe mounting



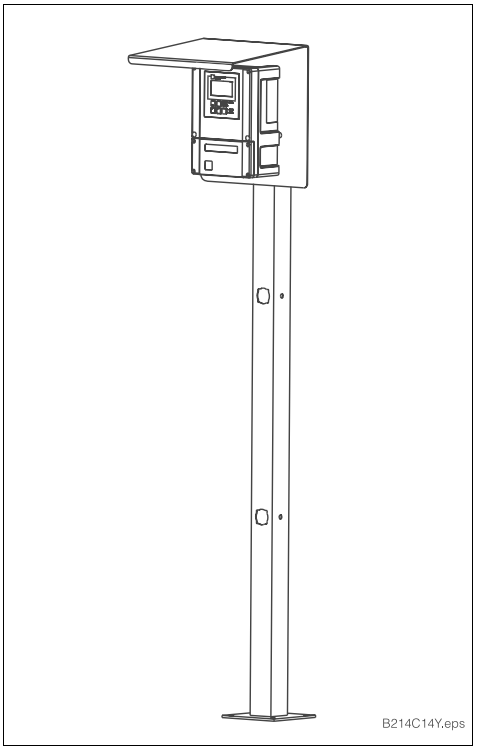


Fig. 3.8: Field instrument:
Wall mounting (left), mounting with universal mounting post and weather protection cover (right)

3.3.3 Panel-mounted instrument

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

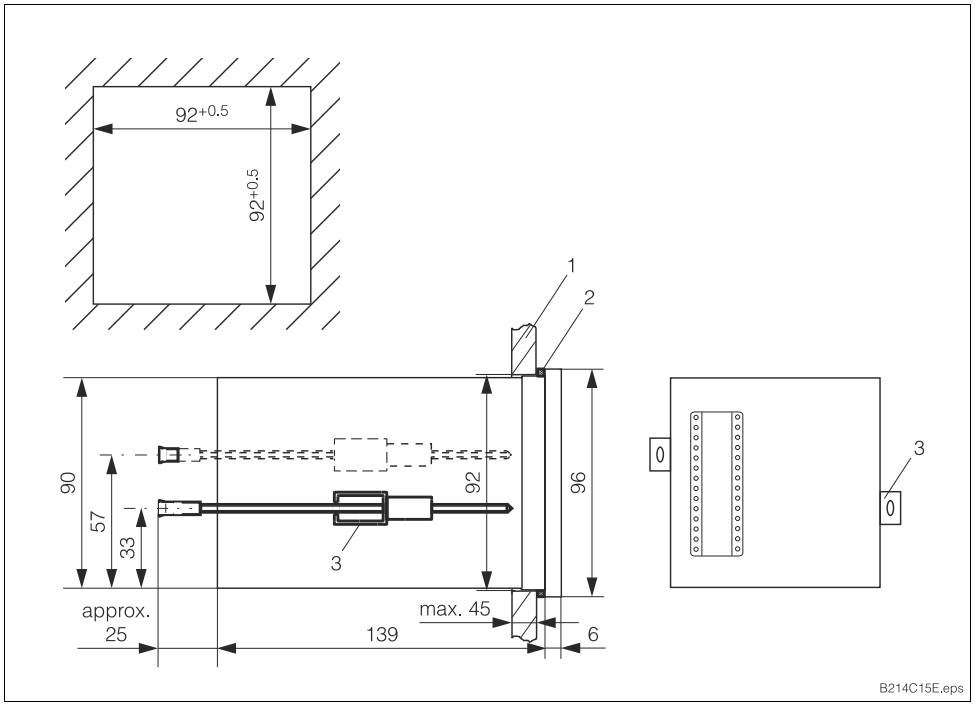


Fig. 3.9: Attachment of panel-mounted instrument
1 Wall of control cabinet
2 Seal
3 Clamping screws

4 Wiring

4.1 Electrical connection

4.1.1 Terminal diagram

The terminal diagram depicted in Fig. 4.1 shows the connections for the membrane-covered OCS 140 / 141 / 240 / 241 sensor or the open 963 sensor.

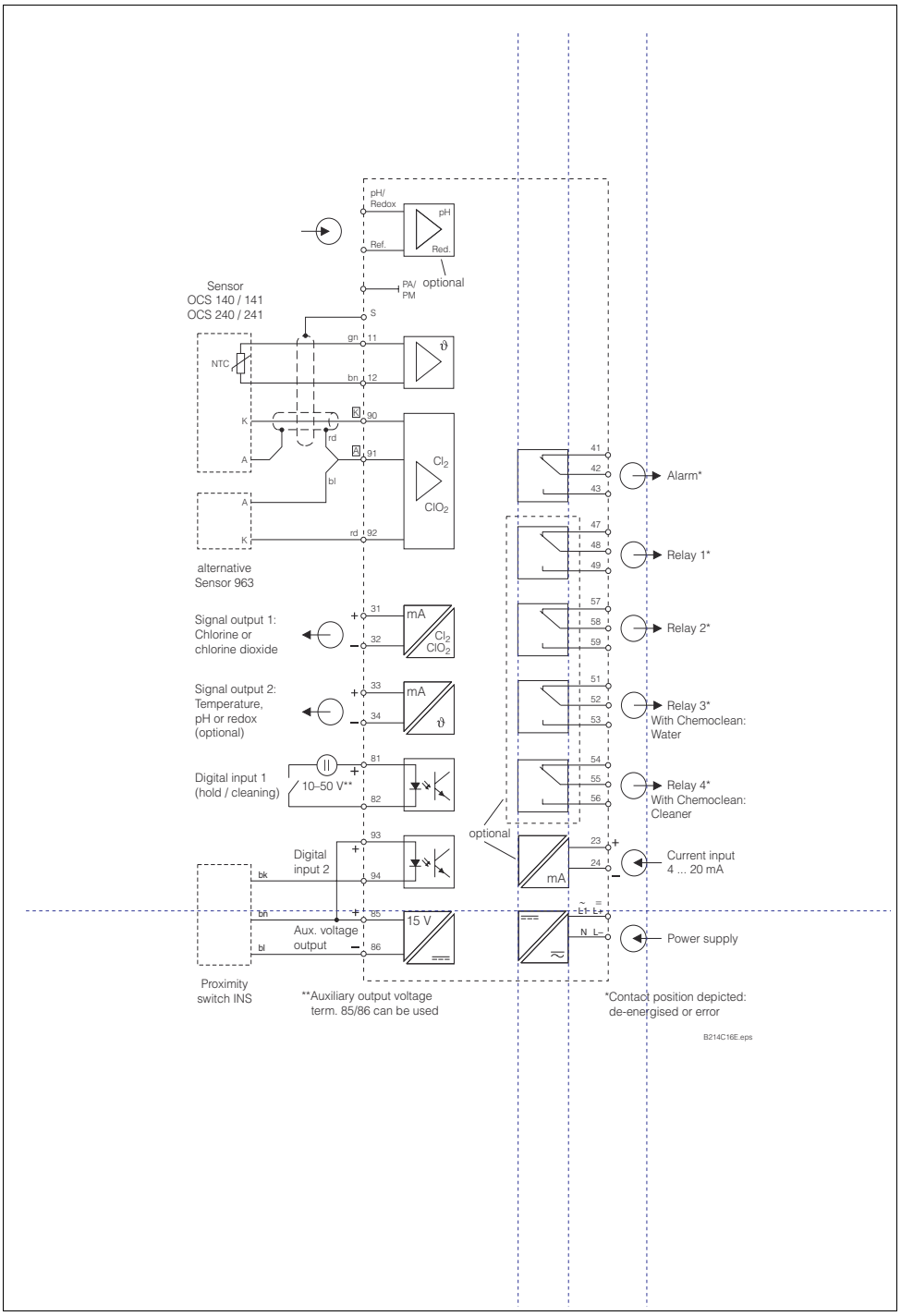


Fig. 4.1: Electrical connection of OCM 223 / 253 (full wiring)

Note!
The instrument has protection class II and is usually operated without protective earth connection.

Connecting the chlorine sensor 963
The chlorine sensor 963 is delivered from the factory without an integrated temperature sensor for measuring the temperature. Therefore connect the temperature input (terminals 11/12) as follows:

- *No temperature measurement required:*
  Connect supplied equivalent resistor 10 kΩ (Part No. 50061891). The display reading then shows a constant 25 °C.

- *Temperature measurement required:*
  Screw in NTC temperature sensor 10 kΩ / 25 °C, 120 mm mounting version (TSP 3692) in the chlorine sensor 963 and connect using connecting cable OPK 1.

Connecting the pH or redox electrode
pH or redox electrodes can be connected either symmetrically or asymmetrically. However, the OCM 223 / 253 is always connected **symmetrically** to prevent a mutual interference of several sensors mounted in the OCA 250 assembly. Do not connect asymmetrically!

Symmetrical connection requires an potential matching pin. It is integrated as standard in the OCA 250 flow assembly and is connected to the PA/PM terminal by a potential matching line.

Note!
When the pH or redox electrode is calibrated outside the OCA 250 assembly, remove the potential matching line from the assembly, extend it if required and immerse it in the buffer solution.

Three-point step controller for Cl_2/ClO_2
Use the following arrangement for activating continuously variable motor valves:
- Relay 3: Connect to the NO contact of the motor valve
- Relay 4: Connect to the NC contact of the motor valve.

Use of the digital inputs
- Digital input 1 operates as hold input. On the ES / EP versions, it is switchable as cleaning trigger input.
- Digital input 2 is used for flow monitoring in the OCA 250 assembly. This requires an inductive proximity switch INS. Flow monitoring can be switched on or off by an operating function.

Use of the current input
The current input has two independent usabilities (see chapter 6.3):
- Monitoring the flow rate in the main stream
- Feedforward control to PID controller.

4.1.2 Terminals on field instrument

Insert the measuring cable through the cable glands of the field instrument and connect the wires as shows in the terminal diagram in Fig. 4.1 and 4.2.

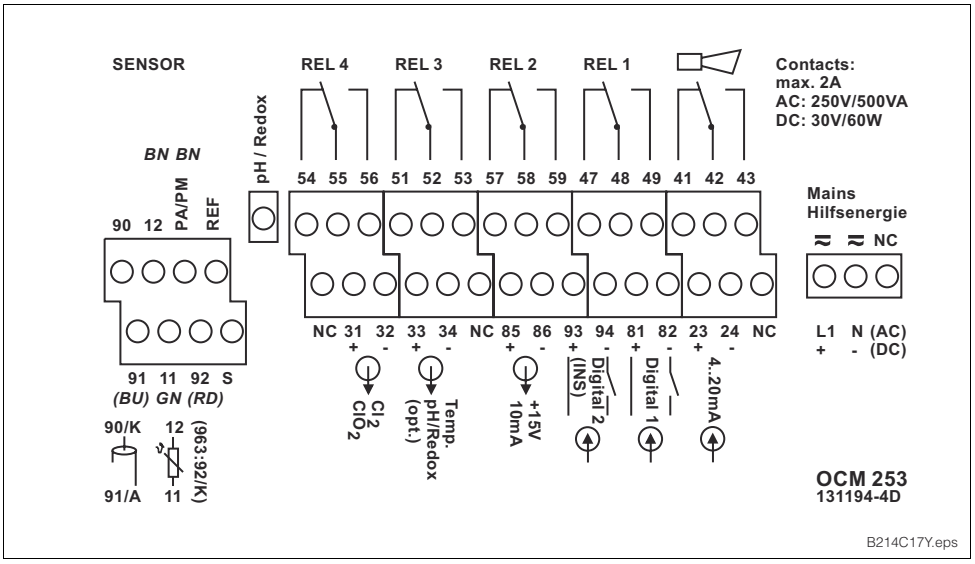


Fig. 4.2: Connection compartment sticker for OCM 253 field instruments

4.1.3 Terminals on panel-mounted instrument

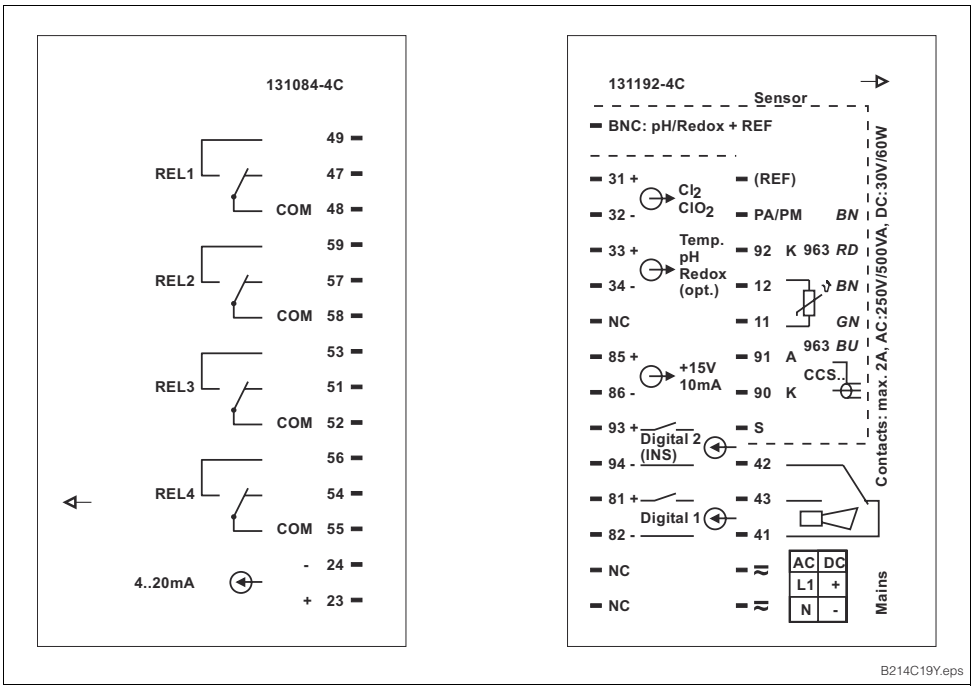


Fig. 4.3: Connection compartment stickers for OCM 223 panel-mounted instruments

4.2 Installing the sensor and connecting the measuring cable

4.2.1 Connecting the measuring cable

The OCS 140 / 141 / 240 / 241 chlorine / chlorine dioxide sensors are equipped with 3 m fixed cable and can be connected to the transmitter. Connecting cables are required for the open chlorine sensor 963 and for the pH or redox electrode in the case of the EP instrument version. A VBC junction box and the associated extension cable (see chapter 9) must be used to extend the measuring cable.

Required special measuring cable for connecting sensors		
Sensor type	**Cable**	**Extension**
Chlorine / chlorine dioxide sensors OCS140/141/240/241	3 m OMK permanently connected	VBC box + OMK
Chlorine sensor 963	– (luster terminal)	VBC box + MK
pH or redox electrode without temperature sensor	OPK 1 for electrodes with GSA plug-in head OPK 9 for electrodes with ESA plug-in head	VBC box + OYK 71
Maximum cable length		
Chlorine / chlorine dioxide	max. 30 m with cable OMK / MK	
pH/redox measurement	max. 50 m with cable OYK 71	

4.2.2 Make-up and termination of the measuring cable

Factory termination of the sensor cable

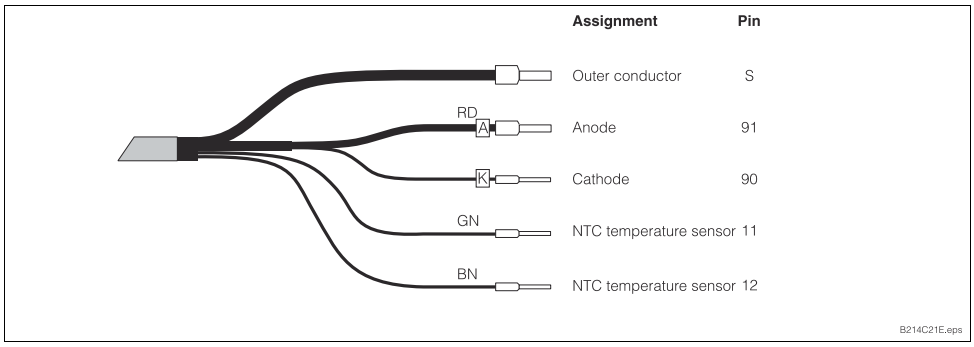


Fig. 4.4: Terminal cable end of sensors OCS 140 / 141 / 240 / 241

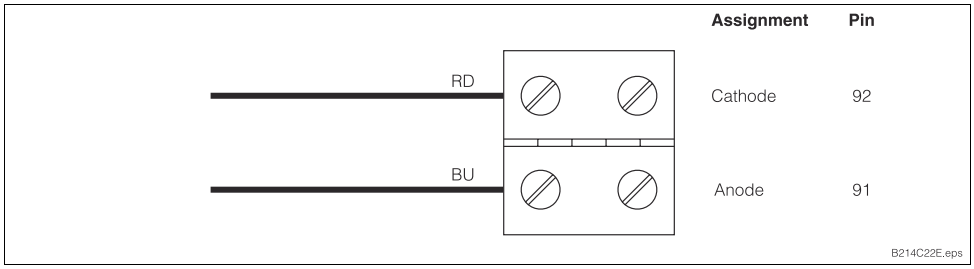


Fig. 4.5: Connection of sensor 963

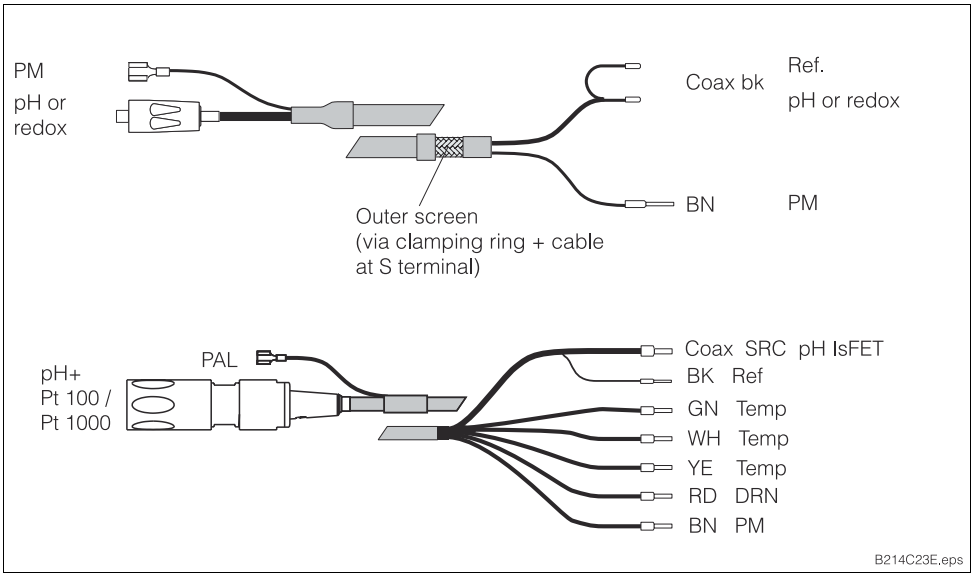
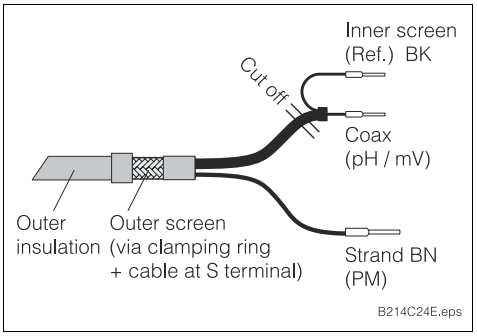


Fig. 4.6: Make-up of special measuring cable OPK 1 (above) and OPK 9 (below)

Cable termination for panel-mounted OCM 223 with solder-free BNC connector



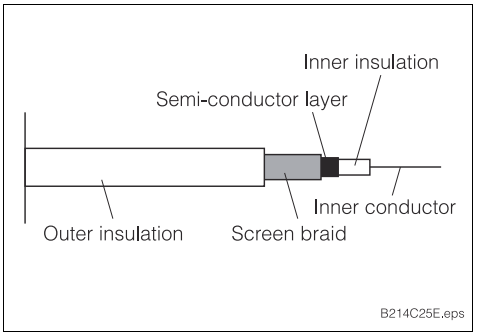
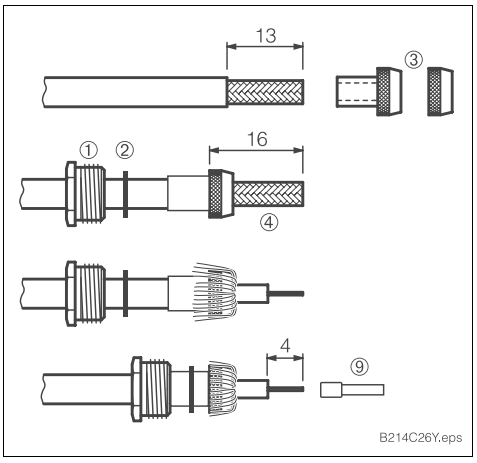


Fig. 4.7: Cutting off the cable end (left) and make-up of inner coaxial cable (right)



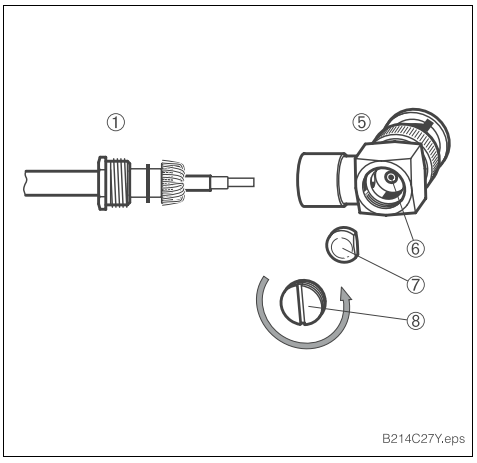


Fig. 4.8: Termination of pH terminal wire for mounting the BNC angular connector (left)
Mounting the pH terminal wire in the BNC angular connector (right)

1. Cut off terminated end of the inner coaxial cable (see Fig. 4.7).
2. Push cable gland (①) and disc (②) onto coaxial cable, strip outer insulation (13 mm), then screw clamping ring (③) onto insulation.
   Note: Parts ① to ③ are supplied for cable diameters of 3.2 mm and 5 mm. For CPK 1, CPK 9 and CYK 71, a diameter of 3.2 mm is required.
3. Mould screen wire braid (④) over clamping ring and cut off projecting ends.
4. Remove black semiconductor layer up to screen (reference signal).
5. Remove inner insulation (4 mm). Attach supplied wire end ferrule (⑨) onto inner conductor. If you use a non-supplied cable, then a wire end ferrule is only required with wire strands.
6. Push BNC connector receptacle (⑤) over cable (inner conductor or end sleeve must be in the clamping notch (⑥) of the connector pin). Tighten cable gland (①). Clamp the inner conductor tightly to the clamping notch by inserting the clamping piece (⑦) and tightening the connector cover (⑧). This produces the contact.

VBC junction box

Note!
The maximum connecting cable length between the sensor and the instrument is 30 m.

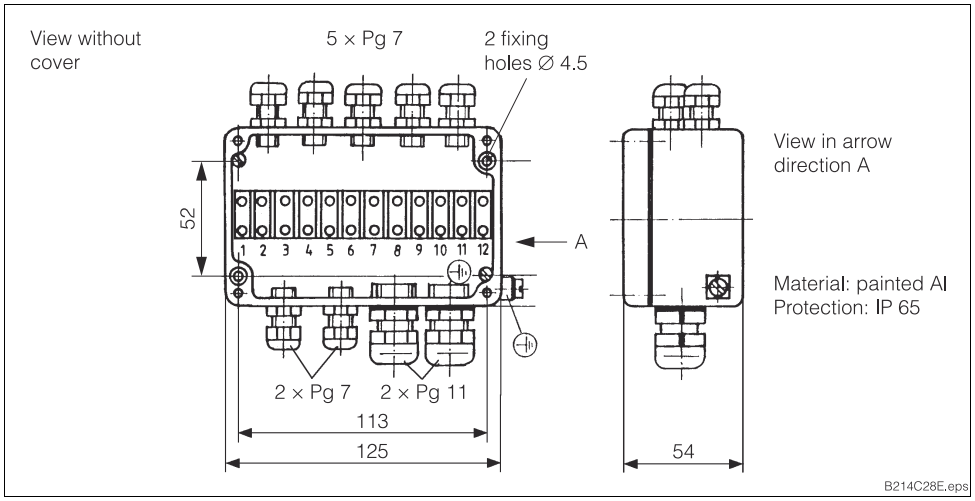


Fig. 4.9: VBC junction box, with earthing point; size: 125 × 80 × 54 mm (w × h × d)

Cable termination of OMK and OYK 71 extension cables

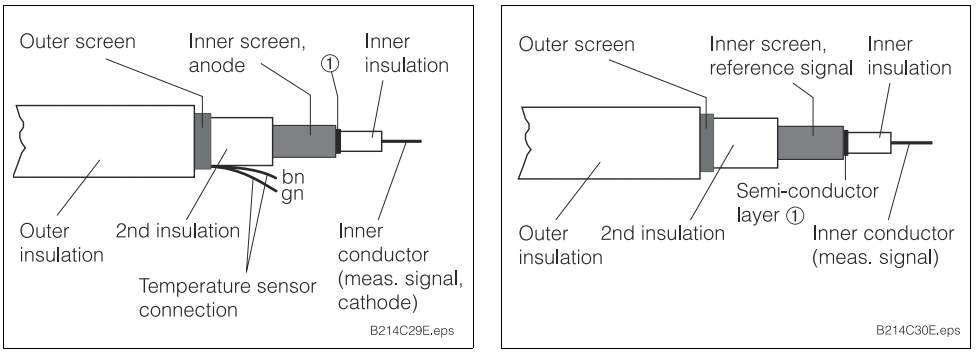


Fig. 4.10: Make-up of OMK (for sensors OCS x4x, left) and OYK 71 (for pH/redox, right) cables

Caution!
Do not forget to remove the black semiconductor layer (①) up to the inner screen when performing termination work!

5 Operation

5.1 User interface

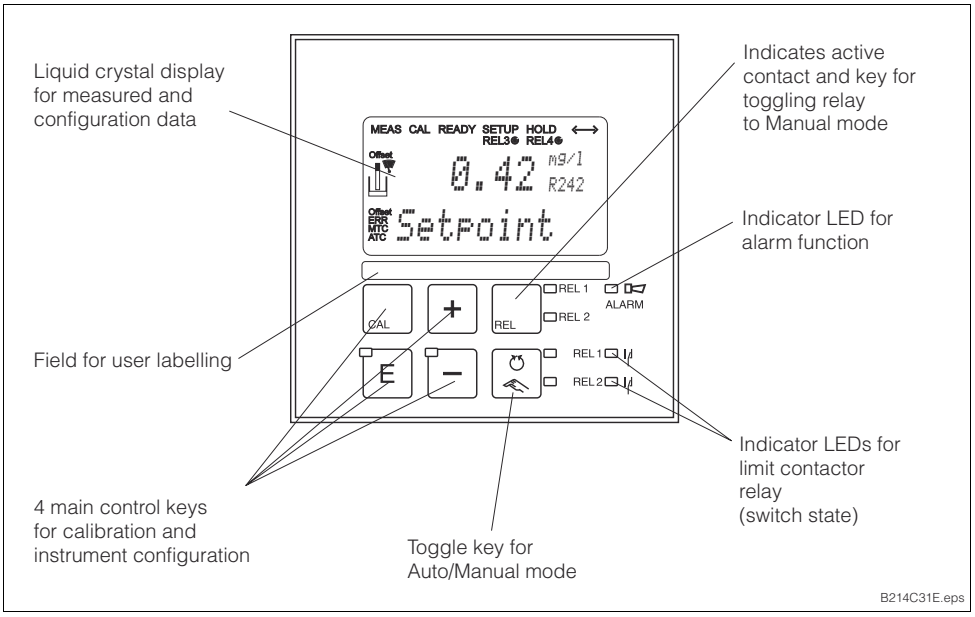


Fig. 5.1: Operating elements

5.2 Display

5.2.1 LED indicators

	Display of current operating mode: auto (green LED) or manual (yellow LED)
REL	Display of triggered relay in manual mode (red LED)
REL 1 REL 2	Display of operating state of relays 1 and 2 Green LED: Relay inactive Red LED: Relay active
ALARM	Alarm display, e.g. on upper limit violation, failure of temperature sensor or system fault (see Fault Diagnosis Chart in chapter 7.2)

5.2.2 Liquid crystal display

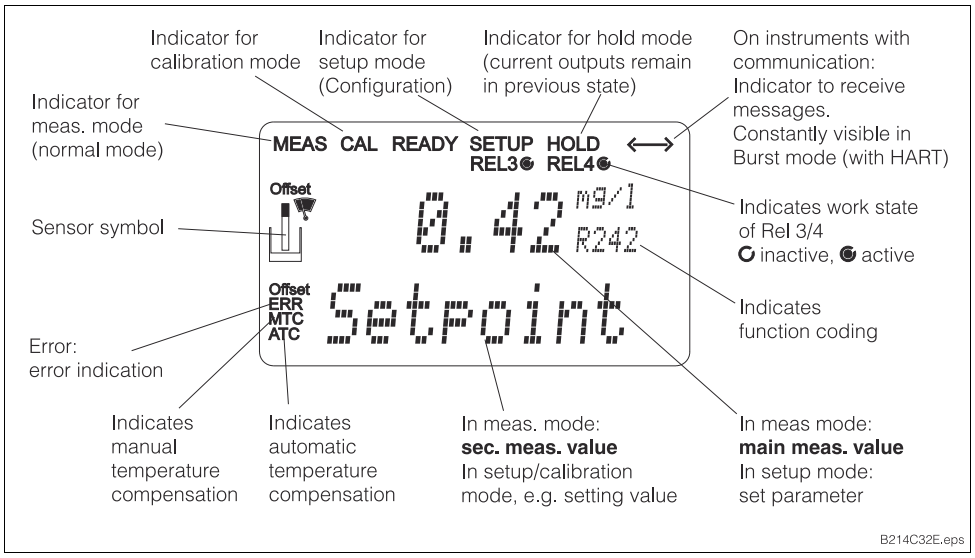
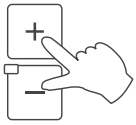
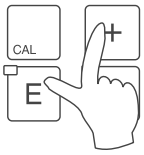
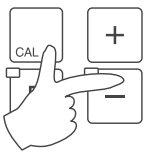


Fig. 5.2: Liquid crystal display

5.3 Key functions

CAL	**CAL key** After you press CAL 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 acknowlegde the calibration data or to proceed within the calibration menu.
E	**ENTER key** The ENTER key has the following functions: • Starts Setup menu from measuring mode • Stores (confirms) input data in Setup mode • Switches to the next function within the function groups.

	**PLUS key and MINUS key** The PLUS and MINUS keys have the following functions: • Select function groups • Set parameters and numerical values (when held down, increases setting speed). • Operate relays in manual mode (see chapter 5.2) Pressing the **PLUS key** allows you to switch between the current input in mA and %. Repeatedly pressing the **PLUS key** displays the following settings in sequence as secondary values: • Temperature display in °F • Hide temperature display • pH value or redox potential (only on EP version) • pH sensor signal in mV (only on EP version) • Measured value display of Cl_2 / ClO_2 in nA • Measured value display of current input in % • Measured value display of current inputs in mA Repeatedly pressing the **MINUS key** outputs errors: • The current errors are displayed one after the other (max. 10) • After all the errors are displayed, the standard display is unhidden. In function group F, you can define an alarm for each error code seperately.
	**REL key** The REL key toggles between the relay and manual cleaning start in manual mode. In automatic mode you can output the corresponding switching points (limit contact) 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** This key toggles between automatic and manual modes.
	**Escape function** Press the PLUS and MINUS keys simultaneously to return to the main menu (in calibration mode: at the end of calibration). Press the PLUS and MINUS keys again to return to measuring mode.
	**Locking the keypad** Access to field operation can be locked completely for communication via HART® or PROFIBUS®. Press the PLUS and ENTER keys together for minimum 3s to lock the instrument. The code prompt displays the code 9999.
	**Unlocking the keypad** To unlock, press the CAL and MINUS keys together for minimum 3s. The code prompt displays the code 0.

5.4 Auto / Manual operating modes

Auto mode
In this mode the relays are controlled by the transmitter.

Manual mode
In this mode all relays can be controlled manually.

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 following key sequence is used to switch over to manual mode and set the relay:

1. Press AUTO key.

2. Enter Code 22. Confirm with ENTER key.

3. Select relay or function. Press the REL key to toggle between the relays. The display shows the selected relay ant the switching status (ON / OFF) in the second line.
   In manual mode, the measuring value is continuously displayed (e.g. for monitoring during dosage).

4. Set the relays. Switch on by pressing PLUS, switch off by pressing MINUS. The relay remains in its switched state until it is switched over again.

   Special case: three-point step controller
   When you select relay 3, press PLUS to activate the NO contact of the motor valve, and press MINUS to stop it again. When you select relay 4, the NC contact of the motor valve is analogously activated or stopped. If one of the two contacts is switched on, then a trial to switch on the other contact (first pressure on ENTER) will first switch off the former.

5. Press the AUTO key to return to the measuring mode. All relays are controlled by the transmitter again.

Note!
- The manual operating mode is retained even after a power failure.
- Manual mode has priority over all other automatic functions).
- The hardware cannot be locked in manual mode.
- Manual settings are retained until they are reset or until automatic mode is selected again.
- In manual mode, error code E102 is displayed.

5.5 Operating concept

5.5.1 Operating modes

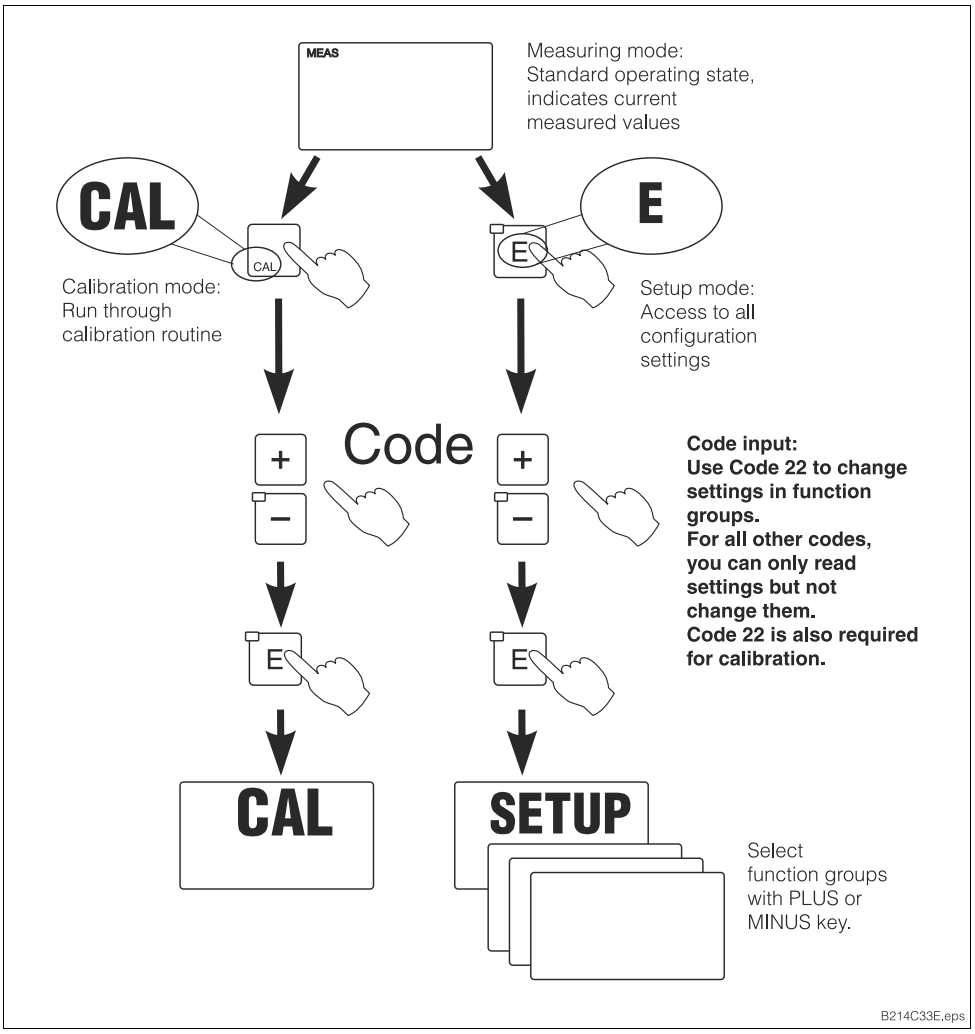


Fig. 5.3: Description of possible operating modes

Note!

- When you perform calibration and parameterisation, you can select the hold state for functions and contacts (see chapter 6.7, field S2) and you can change the hold period.
- If you do not press a key in Setup mode for approx. 15 min, the LCD returns automatically to Measuring mode. An active hold function (hold at setup) is then reset.

5.5.2 Menu structure

The configuration and calibration functions are arranged in a menu structure by function groups.
Select a function group in Setup mode by pressing the PLUS and MINUS keys. Within a function group, you can switch from function to function by pressing the ENTER key. Select the option you want or edit by pressing the PLUS and MINUS keys. Confirm and move on simultaneously by pressing ENTER.
Press the PLUS and MINUS keys at the same time (Escape function) to end the programming session (return to the main menu).

Note!
- If you make a change but do not confirm by pressing ENTER, the previous setting is retained.
- The annex of these instructions contains an overview of the menu structure.

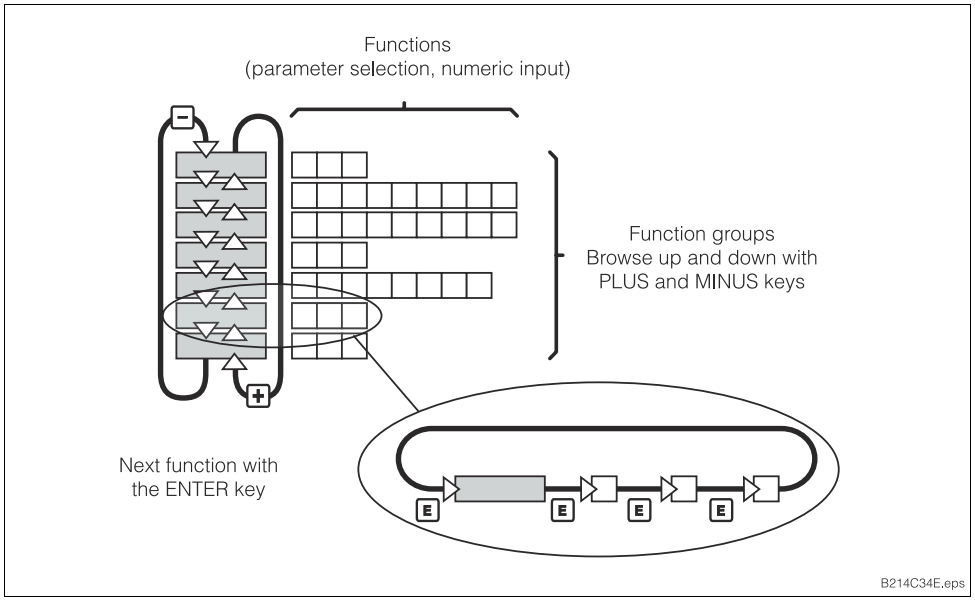


Fig. 5.4: Chart of menu structure

5.5.3 Hold function: “Freezes” the outputs

You can “freeze” the current output in both set-up and calibration modes, i.e. the last current value is displayed constantly. Hold is then displayed (for settings for hold, see chapter 6.7).

Note!
- During hold all contacts go to normal position.
- An active hold has priority over all other functions.
- During each hold the I component of the controller is set to zero.
- An error delay that runs out is set to zero.
- The hold function can also be activated externally via the hold input (see terminal diagram Fig. 4.1; digital input 1).
- Manual hold (field S3) remains active in the event of a power failure.

5.6 Access codes

All instrument access codes are fixed and cannot be changed. The access codes can be requested as follows (cf. Fig. 5.3):

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

5.7 Calibration

Refer to chapter 6.10 for a description of the communication procedure.

5.8 Automatic controller switch-off

Depending on the version, the instrument has a number of safety functions to prevent a chemical overdose in the event of an error:
- Flow reduction or no flow in the sample stream (field A2 = INS)
- Flow reduction or no flow in the main stream (field A2 = Input)
- Alarm by one or several check functions (fields P111, P115, P121, P125 = xxxx!).

If the instrument is in controller switch-off state, the main and secondary measured value flash in the LCD.

6 Instrument configuration

After switching the instrument on, the instrument performs a self-test and then starts up in measuring mode. Now the instrument can be configured and calibrated.

The following function groups are available in the transmitter (the groups only available in the ES and EP versions are marked accordingly in the functional descriptions).

Setup mode

- SETUP 1 (A) see chapter 6.2.1
- SETUP 2 (B) see chapter 6.2.2
- CURRENT INPUT (Z) see chapter 6.3
- CURRENT OUTPUT (O) see chapter 6.4
- ALARM (F) see chapter 6.5.1
- CHECK (P) see chapter 6.5.2
- RELAY (R) see chapter 6.6
- SERVICE 1 (S) see chapter 6.7
- SERVICE 2 (E) see chapter 6.8
- INTERFACE (I) see chapter 6.9

Calibration mode

- CALIBRATION (C) see chapter 6.10

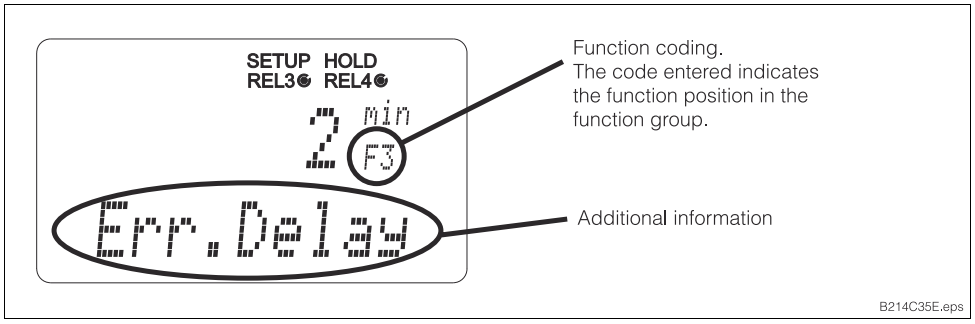


Fig. 6.1: Example of display in Setup mode

To help you to select and find function groups and functions, each function is provided with a code for the related field. The format of this code is explained in Fig. 6.2.
The first column contains letters denoting the function groups (see function group names). The functions in each of the groups increments in each column and row.

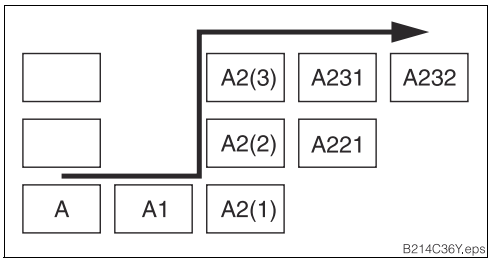


Fig. 6.2: Function codes

Factory settings
All the factory settings are active when the instrument is switched on for the first time. The table below lists all the main settings.
For all further factory settings, refer to the description of the function groups in chapter 6 (there the factory setting is printed in **bold**).

Type of measurement	• Content of free chlorine in mg/l • Temperature in °C • pH value (EP version)
Sensor setting	OCS 140 for free chlorine
Alarm contact	Steady contact
Alarm delay	Setting in minutes
Error current for alarm	22 mA
Check functions*	Off; can be switched on one by one as required
Limits 1 and 2 for chlorine / chlorine dioxide	0.5 mg/l
Limits 1 and 2 for pH*	pH 7.2
Limits 1 and 2 for redox*	750 mV
Limits 1 and 2 for temperature	50 °C
Current outputs 1 and 2	4 … 20 mA
Current output 1: measured value at 4 mA signal current	0.00 mg/l
Current output 1: measured value at 20 mA signal current	2.0 mg/l
Current output 2: measured value at 4 mA signal current*	0 °C
Current output 2: measured value at 20 mA signal current*	50 °C

* with appropriate version

Alarm contact

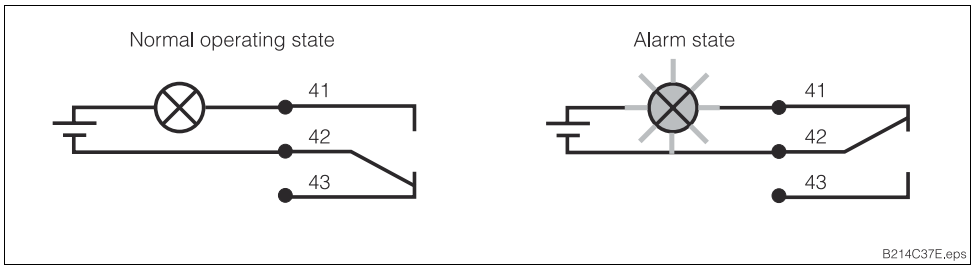


Fig. 6.3: Recommended fail-safe circuit for the alarm contact

Normal operating state	Alarm state
• Instrument in operation • No error message present (alarm LED green)	• Error message present (alarm LED red) or • Instrument defective or dead (alarm LED off)
→ Relay energised → Contact 42/43 closed	→ Relay de-energised → Contact 41/42 closed

6.1 Start-up

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

- **SERVICE (S) function group**
  S1: Select language and exit function group (not required for English).
- **SETUP 1 (A) function group**
  Enter all setting in this group, see chapter 6.2.1.
- **SETUP 2 (B) function group**
  Enter all setting in this group, see chapter 6.1.

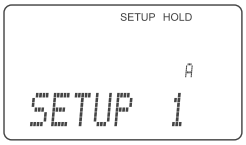
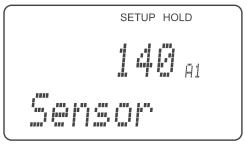
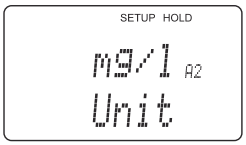
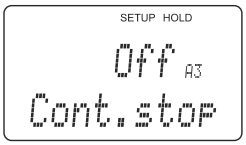
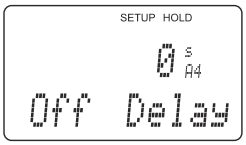
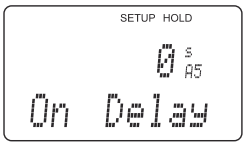
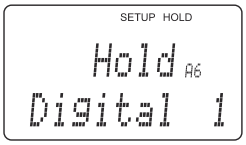
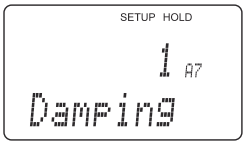
Other configuration options are explained for each of the menus in the following sections.

6.2 System configuration

Carry out the system configuration in function groups SETUP 1 and SETUP 2. This is where the main basic settings, e.g. sensor type (Cl_2 / ClO_2) or operating mode (pH / redox) are made on the EP version.
Make sure that you enter all the settings in both function groups, otherwise errors may occur in the measurement or the instrument may be unable to perform a measurement.

6.2.1 Setup 1 (Chlorine / Chlorine dioxide)

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

Coding	Field	Selection or range Factory setting (bold)	Display	Remarks
A	**Function Group SETUP 1**			Initial display in function group SETUP 1.
A1	Select connected sensor type	**140 = OCS 140** 141 = OCS 141 240 = OCS 240 241 = OCS 241 963		**Sensor type setting is not changed in field S9 when the instrument is reset.**
A2	Select display unit	**mg/l** ppm ppb		
A3	Select flow monitoring of sample stream through assembly OCA 250 (with controller switch-off)	**Off** INS		Only switch on when proximity switch INS is connected.
A4	Enter delay for controller switch-off by sample stream	**0 s** 0 … 2000 s		Short-term flow rate undershoots can be suppressed by this delay and will not cause controller switch-off.
55	Enter delay for controller switch-on by sample stream	**0 s** 0 … 2000 s		With chlorine / chlorine dioxide control, a delay up until reception of a representative measured value is preferred after a long flow rate failure.
A6	Select digital input 1	**Hold = external hold** Clean = Cleaning trigger		
A7	Enter measured value damping	**1** 1 … 60		Measured value damping causes the calculation of a mean value from the total of individual measured values entered. This stabilises the display if the measurement is unstable. Enter “1” to disable the damping function.

Flow monitoring in sample stream (see Fig. 3.1)
If a flow rate drops below 30 l/h or there is a total flow failure in the sample stream through the OCA 250 assembly, an alarm is triggered if the INS proximity switch is installed. The alarm becomes active on expiry of the switch-off delay time (field A3). The alarm signal cancels as soon as the required flow rate is restored.
While the alarm period lasts, the instrument automatically stops chemical dosing and the ChemoClean cleaning function. All the relays assigned with PID controllers or cleaning functions revert to normal position; on the three-point step controller the NO contact closes. Dosing and cleaning resume once the switch-on delay time expires (field A4).
The LCD reading flashes for the period of controller switch-off so that you can immediately recognise the situation.

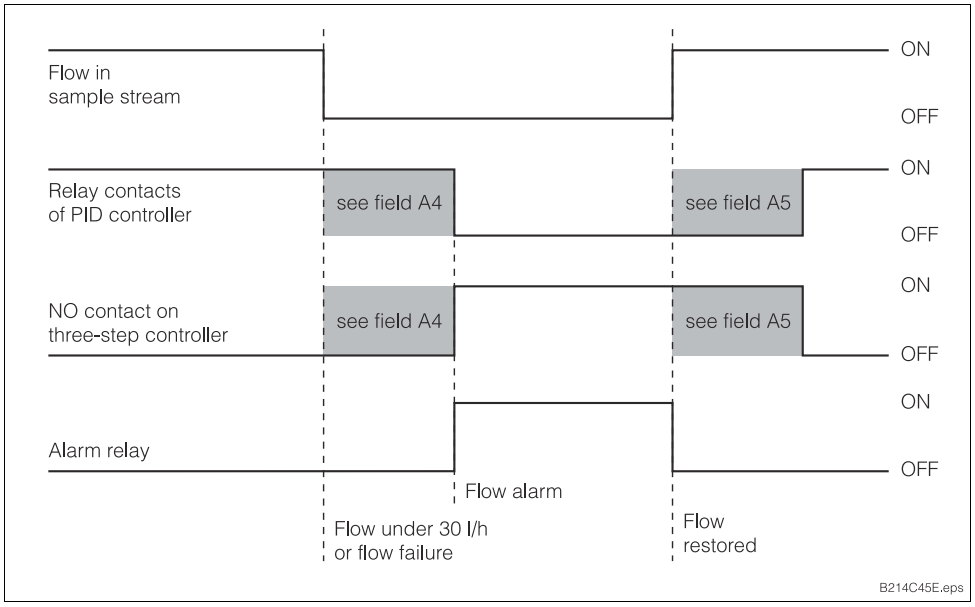
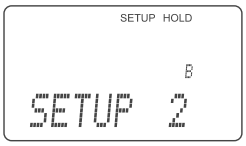
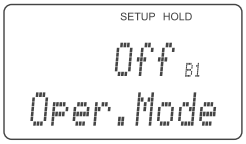
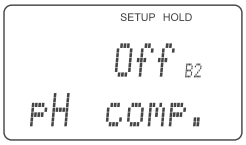
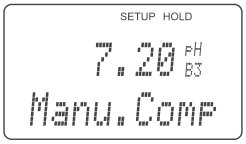
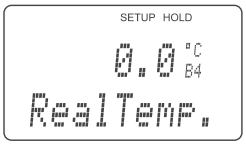
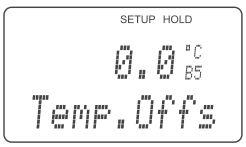


Fig. 6.4: Alarm signalling and dosing switch-off by the sample stream

6.2.2 Setup 2 (Temperature or pH / Redox)

Coding	Field	Selection or range Factory setting (bold)	Display	Remarks
B	**Function Group SETUP 2**			Initial display in function group SETUP 2.
B1	Select operating mode	**Off** pH ORPmV		Field only exists on EP version. ORPmV = redox potential in mV (**O**xidation-**R**eduction **P**otential). If the operation mode changes, all user settings are automatically reset to the basic settings. **The operating mode setting is not changed in field S9 when the instrument is reset.**
B2	Select pH compensation	**Off** Manu Auto		Field only exists on ES and EP versions
B3	Enter value for manual pH compensation	**last compensation value** pH 4.00 … 9.00		Field only exists if you selected “manual” (Manu) in field B2
B4	Enter correct process temperature	**current measured value** 0 … 50 °C		You can edit the displayed value. An adjustment of maximum ±5 °C is possible. Due to high accuracy, an adjustment is usually not required.
B5	Enter temperature difference (offset)	**current offset** –5.0 … 5.0 °C		The offset is the difference between measured and entered temperature.

Forms of chlorine
A distinction is made between free chlorine and bonded chlorine.

Free chlorine
Free chlorine refers to the sum of elementary chlorine (Cl_2), hypochlorous acid (HOCl) and hypochlorite ions (OCl^-).
These forms of chlorine are capable of killing bacteria, deactivating viruses and oxidising organic substances within a short period of time.

Bonded chlorine
Bonded chlorine refers to the forms of chlorine in water and consist of chemical compounds made up of chlorine and ammoniac (NH_3) or ammonium (NH_4^+).

Total chlorine
The sum of free and bonded chlorine is referred to as total chlorine.
Molecular chlorine (Cl2) has pH values of < 4. Hypochlorous acid (HOCl) and hypochlorite (OCl^-) remain within the range of pH 4 … 11 as components of free chlorine. As hypochlorous acid dissociates as the pH value rises to form hypochlorite ions (OCl^-) and hydrogen ions (H^+), the amounts of the individual components in free chlorine change with the pH value (see Fig. 6.5). For example, if the amount of hypochlorous acid is 97% at pH 6, it drops to about 3% at pH 9.

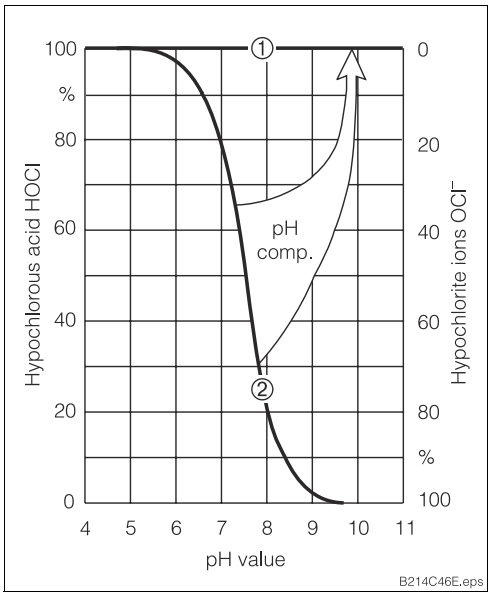


Fig. 6.5: Schematic diagram of pH compensation
*① Measured value **with** pH compensation*
*② Measured value **without** pH compensation*

The OCS 140 or OCS 141 chlorine sensors only measure the amount of hypochlorous acid selectively in the amperometric measurement. This has a highly disinfecting effect in an aqueous solution. On the other hand, the disinfection effect of hypochlorite is extremely low. Accordingly, it is not practical to use chlorine as a disinfection agent at high pH values. Since hypochlorite ions cannot wander through the sensor membrane, the sensors cannot sense this amount.

pH compensation of chlorine sensor signal
(only on ES and EP versions, for OCS 140 / 141 sensors)

To calibrate and inspect the chlorine measuring system, a colorimetric reference measurement must be carried out using the DPD method. Free chlorine reacts with **d**iethyl-p-**p**henylene**d**iamine and forms a red dye. The intensity of the red pigmentation increases proportionally to the chlorine content. In the DPD method the measuring water buffers constantly to a pH value of about 6.3. Therefore, the pH value of the measuring water is not included in the DPD measurement. Due to the buffer function in the DPD method, all the components of free chlorine are detected and thus the **total free chlorine** is measured.

If you select pH compensation in fields B2 or B3, the sum of hypochlorous acid and hypochlorite corresponding to the DPD measurement is calculated from the chlorine sensor measuring signal which corresponds to hypochlorous acid (HOCl) by including the pH value in the region of pH 4 … 9. The curve as depicted in Fig. 6.5 is therefore stored in the transmitter.

Note!
When free chlorine is measured with the pH compensation function on, always perform calibration in the pH-compensated operating mode.

When you use pH compensation, the chlorine measured value displayed and applied to the instrument output corresponds to the DPD measured value **even if the pH values fluctuate.** If you do not use pH compensation, the chlorine measured value only corresponds to the DPD measurement if the pH value remains unchanged compared with the calibration. Without pH compensation the chlorine measuring system must be recalibrated when the pH value changes.

pH compensation can take place both automatically using the connected pH electrode (EP version) or manually (ES version) by entering the current pH value in field B3.

Measuring chlorine dioxide is not pH-dependent, therefore, it requires no pH compensation.

Accuracy of pH compensation
The accuracy of the pH compensated chlorine measured value derives from the sum of several single measured deviations (chlorine, pH, Temperature, DPD measurement etc.).

High amounts of hypochlorous acid (HOCl) during chlorine calibration have positive effects on the accuracy whereas low amounts of hypochlorous acid have negative effects.

Inaccuracy of the pH compensated chlorine value increases the bigger the pH difference between operation and calibration get or the more inaccurate the single measured values are.

6.3 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 OCM 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

6.3.1 Monitoring the flow rate in the main stream

This arrangement is highly practical when the sample stream flowing through the OCA 250 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.
This function method is the same as monitoring the flow rate in the sample stream (see SETUP 1).

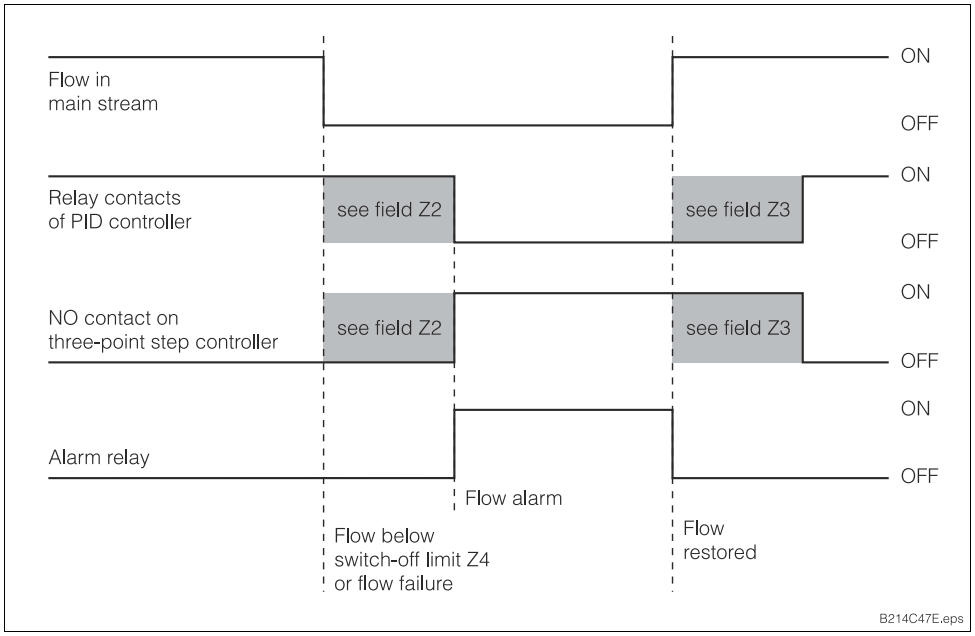


Fig. 6.6: Alarm signalling and dosing switch-off by the main stream

6.3.2 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 (see Fig. 6.7).

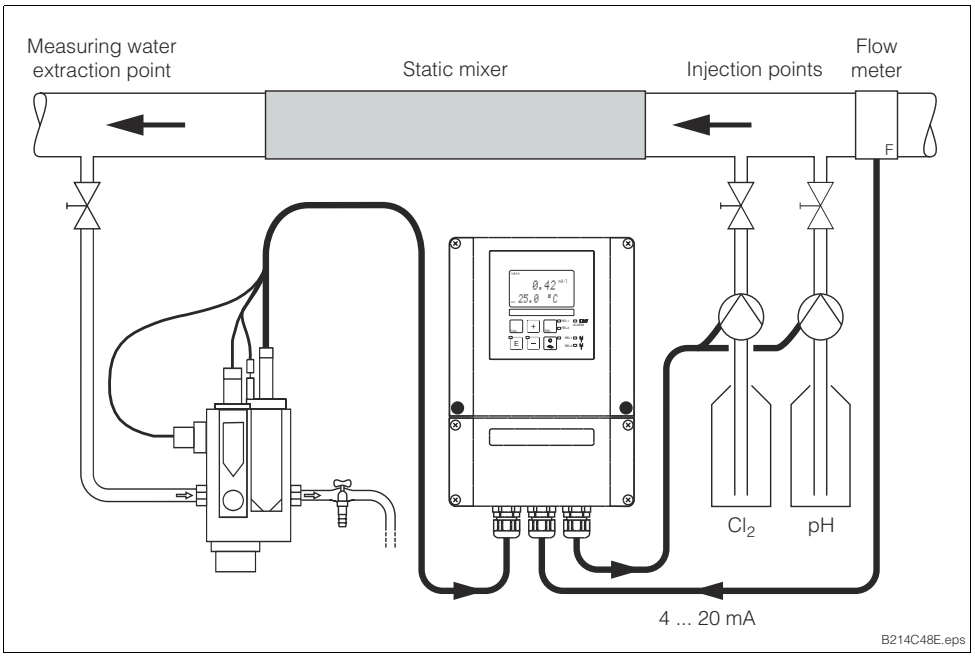


Fig. 6.7: Arrangement example for feedforward control of the flow rate in the main stream to the PID controller(s)

Feedforward control is a multiplying function as depicted in Fig. 6.8 (factory setting as example):

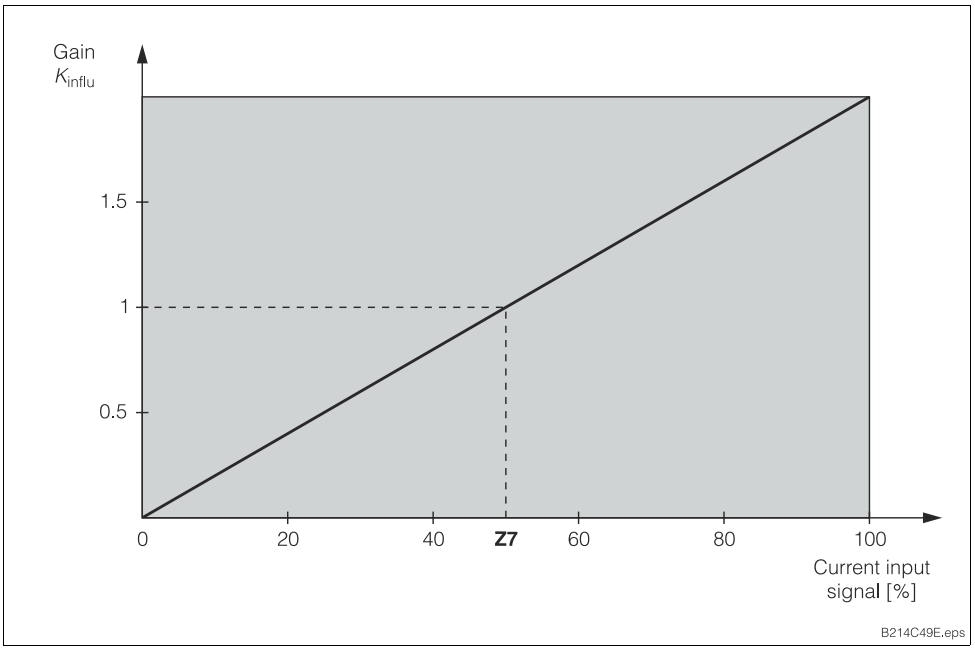
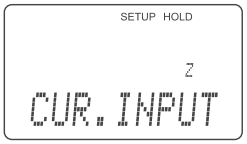
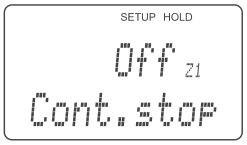
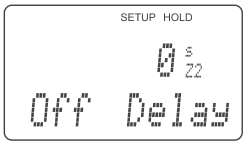
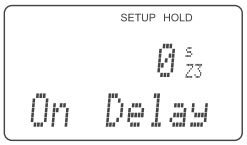
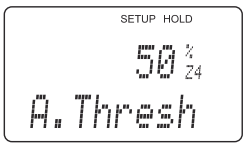
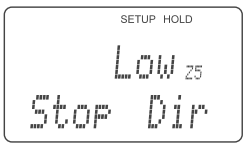
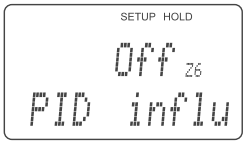
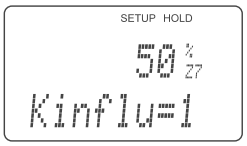


Fig. 6.8: Multiplying feedforward control

Coding	Field	Selection or range Factory setting (bold)	Display	Remarks
Z	**Function Group CURRENT INPUT**			This function group only exists if a relay card with current input is installed.
Z1	Select flow rate monitoring of main stream (with controller switch-off)	**Off** Input		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		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		With chlorine / chlorine dioxide control, a delay up until reception of a representative measured value is preferred after a long flow rate failure.
Z4	Enter switch-off threshold for current input	**50%** 0 … 100%		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		If the value entered in Z4 is exceeded low or high, the controller switches off.
Z6	Select feedforward control to PID controller	**Off** lin = linear Basic		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%		When the value is set, the controller manipulated value with feedforward control on is identical to feedforward control off.

6.4 Current outputs

The CURRENT OUTPUT function group is used to configure the individual outputs. You can either select a linear (O3(1)) or, on the ES and EP versions, you can define a current output characteristic yourself (O3(3). A current output value can also be simulated (O3(2)) to check current outputs. The controller set value in field R 247 / R 257 can be output via current output 2, if available.

Example for user-defined current output table

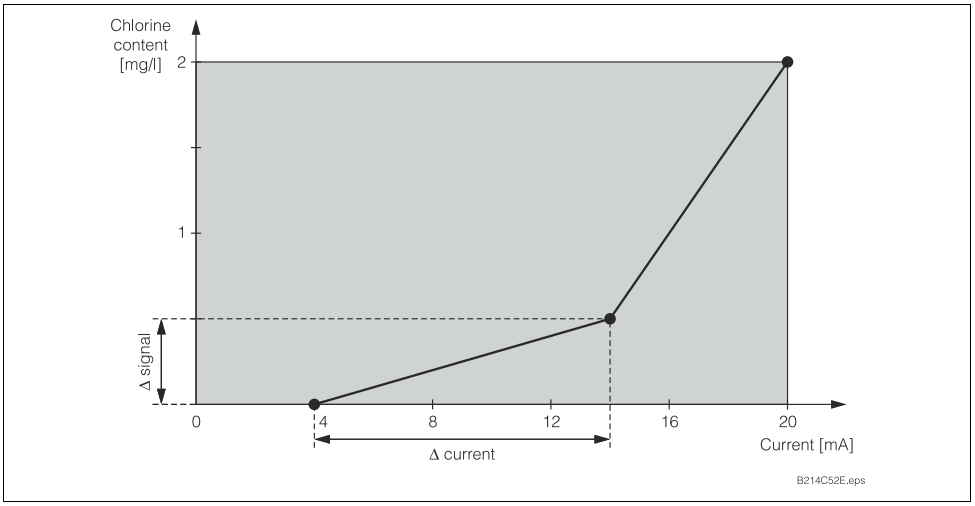
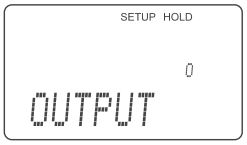
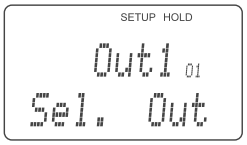
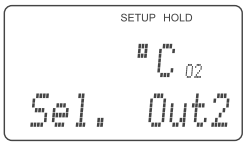
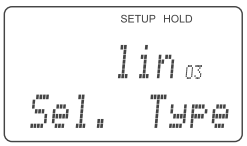
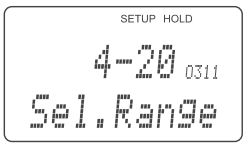
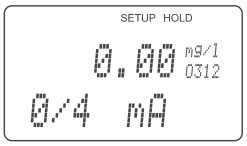
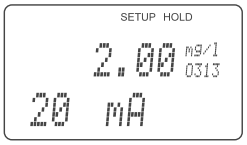


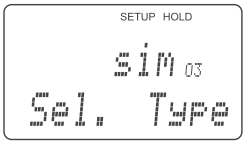
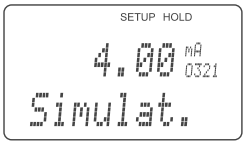
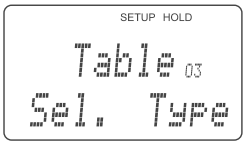
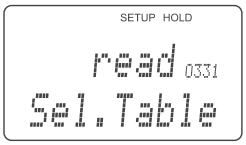
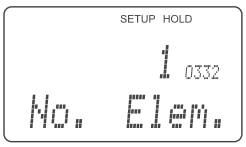
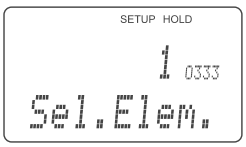
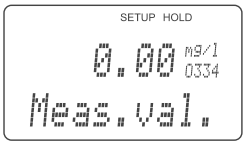
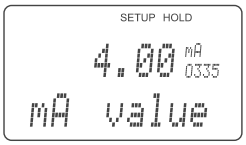
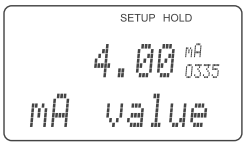
Fig. 6.9: User-defined current output characteristic

The distance Δ signal **per mA** between two table value pairs must exceed:
- Cl_2/ClO_2: 0.01 mg/l (OCS 140 / 240) or 0.003 mg/l (OCS 141 / 241 and 963)
- pH: pH 0.03
- Redox: 5 mV
- Temperature: 0.25 °C

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

	Current output 1			**Current output 2**		
Value pair	**..... [ ]**	**Current [mA]**	**Distance per mA**	**..... [ ]**	**Current [mA]**	**Distance per mA**
1			—			—
2						
3						
4						
5						
6						
7						
8						
9						
10						

Coding	Field	Selection or range Factory setting (bold)	Display	Remarks
O	**Function Group CURRENT OUTPUT**			Initial display in function group CURRENT OUTPUT
O1	**Select current output**	**Out1** Out2		Out2 only with appropriate equipment You can select a separate characteristic for each output.
O2	**Select measured quantity for 2nd current output**	**°C** mg/l ppm ppb pH ORPmV Contr		pH or ORPmV only on EP version and depending on selection in B1. Selection of Curr (=current output 2) in R247 or R 257 is only possible, if O2 = Contr is selected.
O3(1)	**Enter or output linear characteristic**	**lin = linear**		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	Select current range	**4–20 mA** 0–20 mA		
O312	Enter 0/4 mA value	**0 ppb** 0 ... 20000 ppb **0.00 ppm** 0 ... 20 ppm **0.00 mg/l** 0 … 20 (5) mg/l **pH 4.00** pH 4 … 9 **0 mV** 0 … 1500 mV **0 °C** 0 … 50 °C		Here enter the measured value at which the minimum current value (0/4 mA) is applied to the transmitter output. Minimum amount between 0/4 mA and 20 mA value: see field O313. This field is not available if O2= Contr is selected.
O313	Enter 20 mA value	**2000 ppb** 0 ... 20000 ppb **2.00 ppm** 0 ... 20 ppm **2.00 (0.50) mg/l** 0 … 20 (5) mg/l **pH 9.00** pH 4 … 9 **1000 mV** 0 … 1500 mV **50 °C** 0 … 50 °C		Here enter the measured value at which the maximum current value (20 mA) is applied to the transmitter output. Minimum amount between 0/4 mA and 20 mA value must be: • Cl_2/ClO_2: 0.2 (0.05) mg/l • pH: pH 0.5 • Redox: 100 mV • Temperature: 5 °C This field is not available if O2= Contr is selected.

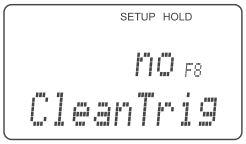
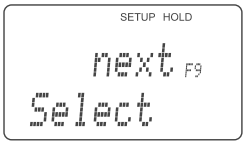
Coding	Field	Selection or range Factory setting (bold)	Display	Remarks
O3(2)	**Simulate current output**	sim = simulation		Simulation only ends when you select O3(1) or O3(3).
O321	Enter simulation value	**current value** 0.00 … 22.00 mA		When you enter a current value, it is output directly at the current output.
O3(3)	**Enter current output table**	**Tab = table**		Only on ES and EP versions. You can add or change values later. The values you enter are automatically sorted by ascending current value.
O331	Select table option	**read** Edit		
O332	Enter number of table value pairs	**1** 1 … 10		Here enter the number of pairs from x and y values (measured value and current value).
O333	Select table value pair	**1** 1 … number of table value pairs asign		The functional chain O333 … O335 is automatically passed as often as set in O232. “asign” is displayed as the last step. After confirmation, the display jumps to O236.
O334	Enter x value	**0 ppb** 0 ... 20000 ppb **0.00 ppm** 0 ... 20 ppm **0.00 mg/l** 0 … 20 (5) mg/l **pH 4.00** pH 4 … 9 **0 mV** 0 … 1500 mV **0 °C** 0 … 50 °C		x value = measured value defined by user.
O335	Enter y value	**4.00 mA** 0.00 … 20.00 mA		y value = current value defined by user and belonging to O334.
O336	Message whether table status is okay	**yes** no		Back to O3. If no, then set table correctly (all previous settings are retained) or back to measuring mode (then the table is invalid).

6.5 Monitoring functions

Use the monitoring functions to define various alarms and set output contacts. You can set each error separately as active or inactive (at the contact or as an error current). When there is an alarm, you can also activate a cleaning function (F8).

6.5.1 Alarm

Coding	Field	Selection or range Factory setting (bold)	Display	Remarks
F	**Function Group ALARM**		SETUP HOLD F ALARM	Settings for alarm functions.
F1	Select contact type	**Stead = steady contact** Fleet = fleeting contact	SETUP HOLD Stead F1 Cont.Type	
F2	Select time unit	**min** s	SETUP HOLD min F2 Time Unit	
F3	Enter error delay	**0 min (s)** 0 … 2000 min (s)	SETUP HOLD 0 min F3 Err.Delay	Depending on your selection in F2, you can enter the error delay in min or s.
F4	Select error current	**22 mA** 2.4 mA	SETUP HOLD 22mA F4 Err.Curr	This selection is also required if all the error messages in F5 are switched off. Caution! If “0–20 mA” was selected in O311, then “2.4 mA” must not be used.
F5	Select error	**1** 1 … 255	SETUP HOLD 1 F5 Sel.Error	Using error numbers, select all the errors which should initiate an alarm message. The error number are listed in the table in chapter 7.2. All faults that are not edited remain at factory setting.
F6	Activate alarm contact for selected select	**yes** no	SETUP HOLD yes F6 Rel.Assg	If you select “no”, the other settings for the alarm are inactive (e.g. error delay). The settings themselves are retained. This setting **only** applies to the errors selected in F5. As of E080 factory setting **no!**
F7	Activate error current for selected error	**no** yes	SETUP HOLD no F7 Curr.Assg	In the event of an error, your selection from F4 is activated or deactivated. This setting **only** applies to the errors selected in F5.

Coding	Field	Selection or range Factory setting (bold)	Display	Remarks
F8	Automatic start of cleaning function?	**no** yes		This field does not exist for some errors, see chapter 7.2.
F9	Select next error or return to menu	**next = next error** <---R		If you select next you return to F5, if <---R to F.

6.5.2 Check

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

This function group is used to select and configure the monitoring functions.

Note!
All the monitoring functions are off in the factory setting.

The Sensor Check System adapts to the current application conditions by adding and setting suitable functions, either with or without controller switch-off when an alarm is signalled.

Alarm threshold monitoring
When you perform a chlorine or chlorine dioxide measurement **without** chemical entrainment control, sensor errors result in an incorrect reading but this has no impact on the process medium (example: monitoring measurement in waterworks). Sensor errors normally cause high or low readings that are implausible. This is detected and signalled by user-definable alarm thresholds.

Controller check
When you perform chlorine or chlorine dioxide measurements **with** simultaneous chemical entrainment control, sensor errors do not result in incorrect measured values but have direct impacts on the state of the process medium.
In particular in the case of controlled water disinfection, there is a process-related that chemical dosing is not switched on due to a permanently high measured value. This causes considerable danger to process stability, or even a serious health hazard for humans. On the other hand a measured value that is permanently too low due to the resultant interruption in chemical dosing results is higher running costs and a risk of corrosion.
These cases are detected and signalled due to user-definable monitoring times for maximum permitted controller switch-on and switch-off times.

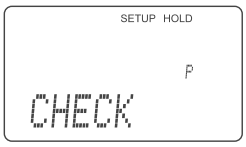
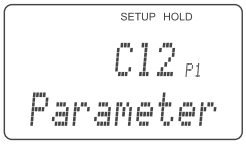
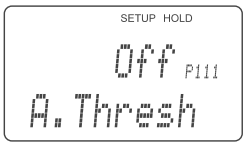
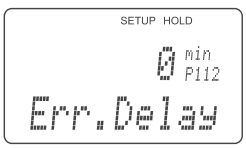
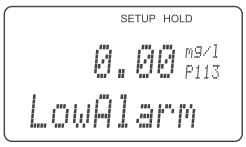
Sensor alternation check
Impacts of the process medium on the sensor can also result in incorrect measured values. For example, a strong deposit on the sensor membrane can lead to a highly sluggish or even a constant measuring signal that no longer changes. This is detected and signalled by continuously monitoring the signal.

Overview of monitoring functions

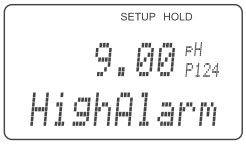
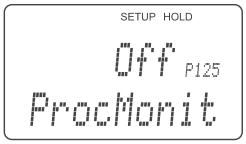
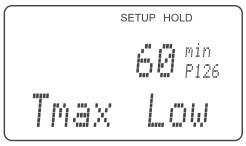
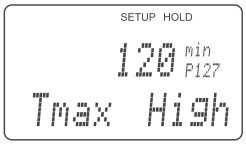
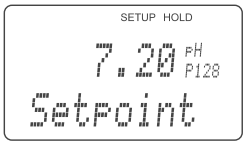
	Function	Possible setting	Alarm event	Application
Alarm threshold monitoring	User-definable lower alarm threshold (AT) User-definable upper alarm threshold (AT)	Off	—	Applications **with** or **without** chemical entrainment control
		Only lower AT	Lower AT reached or exceeded	
		Only upper AT	Upper AT reached or exceeded	
		Lower and upper AT	Lower AT reached or exceeded or upper AT reached or exceeded	
Controller monitoring (CC: Controller Check)	Monitoring the duration of exceeded lower or upper setpoint	Off	—	Applications **with** chemical entrainment control
		On	Maximum duration setting for permanently exceeded upper or lower setpoint reached	
Process monitoring (AC: Alternation Check)	Monitoring for signal change	Off	—	Applications **with** or **without** chemical entrainment control
		On	Change within one hour less than • ±0.01 mg/l (OCS 140 / 240, sensor 963) • ±0.005 mg/l (OCS 141 / 241) • pH ±0.01 • ±1 mV	

Troubleshooting

For further information on troubleshooting when sensor and process alarms are recognised, refer to chapter 7.2.

Coding	Field	Selection or range Factory setting (bold)	Display	Remarks
P	**Function Group CHECK**			Settings for sensor and process monitoring.
P1(1)		**Cl2** ClO2		Cl2 at A1 = “140”, “141”, “963”. ClO2 at A1 = “240”, “241”.
P111	Select alarm threshold monitoring	**Off** Low High Lo Hi = Low and High Low! High! LoHi!		Alarm signalling optionally with or without simultaneous controller switch-off. xxxxx = without controller switch-off, xxxx! = with controller switch-off.
P112	Enter error delay	**0 min (s)** 0 … 2000 min (s)		Depending on your selection in F2, you can enter the error delay in min or s. Only after this period does a high or low limit violation cause an alarm as per field P113 / P114.
P113	Enter lower alarm threshold	**0 ppb** 0 ... 20000 ppb **0.00 ppm** 0 ... 20 ppm **0.00 mg/l** 0 … 20 (5) mg/l		Omitted when P111 = Off.

Coding	Field	Selection or range Factory setting (bold)	Display	Remarks
P114	Enter upper alarm threshold	**20000 ppb** 0 ... 20000 ppb **20.00 ppm** 0 ... 20 ppm **20.00 (5.00) mg/l** 0 … 20 (5) mg/l	SETUP HOLD 20.00 mg/l P114 HighAlarm	Omitted when P111 = Off.
P115	Select process monitoring	**Off** AC CC AC CC AC! CC! ACCC!	SETUP HOLD Off mg/l P115 ProcMonit	AC = Sensor alternation check, CC = Controller check. Alarm signalling optionally with or without simultaneous controller switch-off. xxxxx = without controller switch-off, xxxx! = with controller switch-off.
P116	Enter maximum permissible period for lower limit violation	**60 min** 0… 2000 min	SETUP HOLD 60 min P116 Tmax Low	Only when P115 = CC or AC CC.
P117	Enter maximum permissible period for upper limit violation	**120 min** 0 … 2000 min	SETUP HOLD 120 min P117 Tmax High	Only when P115 = CC or AC CC.
P118	Enter limit	**500 ppb** 0 ... 20000 ppb **0.5 ppm** 0 ... 20 ppm **0.5 (0.1) mg/l** 0 … 20 (5) mg/l	SETUP HOLD 0.5 mg/l P118 Setpoint	
P1(2)		**pH** ORPmV	SETUP HOLD pH P1 Parameter	Only on EP version. Depending on the operating mode you select in field B1, pH or ORPmV appears.
P121	Select alarm threshold monitoring	**Off** Low High Lo Hi = Low and High Low! High! LoHi!	SETUP HOLD Off P121 A.Thresh	Alarm signalling optionally with or without simultaneous controller switch-off. xxxxx = without controller switch-off, xxxx! = with controller switch-off.
P122	Enter error delay	**0 min (s)** 0 … 2000 min (s)	SETUP HOLD 0 min P122 Err.Delay	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 P123 / P124.
P123	Enter lower alarm threshold	**pH 4.00** pH 4 … 8.9 **0 mV** 0 … 1490 mV	SETUP HOLD 4.00 pH P123 LowAlarm	Omitted when P121 = Off.

Coding	Field	Selection or range Factory setting (bold)	Display	Remarks
P124	Enter upper alarm threshold	**pH 9.00** pH 4.1 … 9 **1500 mV** 10 … 1500 mV		Omitted when P121 = Off.
P125	Select process monitoring	**Off** AC CC AC CC AC! CC! ACCC!		AC = Sensor alternation check, CC = Controller check. Alarm signalling optionally with or without simultaneous controller switch-off. xxxxx = without controller switch-off, xxxx! = with controller switch-off. Select CC, AC CC, CC! and ACCC! only if you selected pH in field P1(2).
P126	Enter maximum permissible period for lower limit violation	**60 min** 0… 2000 min		Only when P125 = CC or AC CC.
P127	Enter maximum permissible period for upper limit violation	**120 min** 0 … 2000 min		Only when P125 = CC or AC CC.
P128	Enter limit	**pH 7.20** pH 4 … 9		

6.6 Relay contact configuration

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

The relay contacts described below are freely selectable and configurable (max. four contacts, depending on options installed):
- Limit contact for chlorine / chlorine dioxide measured value: R2(1)
- Limit contact for pH/redox measured value: R2(2)
- limit contact for temperature: R2(3)
- P(ID) controller for chlorine / chlorine dioxide: R2(4)
- P(ID) controller for pH: R2(5)
- Cleaning function (timer): R2(6)
- ChemoClean function: R2(7)
- Three-point step controller for chlorine / chlorine dioxide: R2(8).

Only one function can be assigned to each relay. If a relay function is already switched on (R211 to R281), then after selection of another function by confirmation with ENTER (R2(1) to R2(8)) the former is automatically switched off.

Note!
Pressing the REL key allows you to display the corresponding setpoint to every relay function.

6.6.1 Limit contact for chlorine / chlorine dioxide measured value and temperature or pH or redox measured value

The transmitter has a number of options to assign a contact.
The limit contact can be assigned to a switch-on and switch-off point, as well as a pickup and dropout delay. In addition, an error message can be generated when an alarm threshold is set and started in conjunction with cleaning function.
These functions can be used for chlorine / chlorine dioxide measurement or for temperature or pH or redox measurement.
To illustrate the contact states of any relay or alarm contact, refer to Fig. 6.10.
When measured values (max function) rise, the relay contact closes at t_2 after the switch-on point (t_1) is exceeded and the pickup delay ($t_2 - t_1$) expires. Then the alarm threshold (t_3) is reached and the error delay ($t_4 - t_3$) also expires, the alarm contact switches.
If the measured values decrease, the alarm contact re-opens when the alarm threshold (t_5) is reached and the relay contact (t_7, also opens after the dropout delay $t_7 - t_6$) expires.
If the pickup and dropout delays are set to 0 s, the switch-on and switch-off points are the switching points of the contacts.
You can make identical settings for a min function similar to the max function.

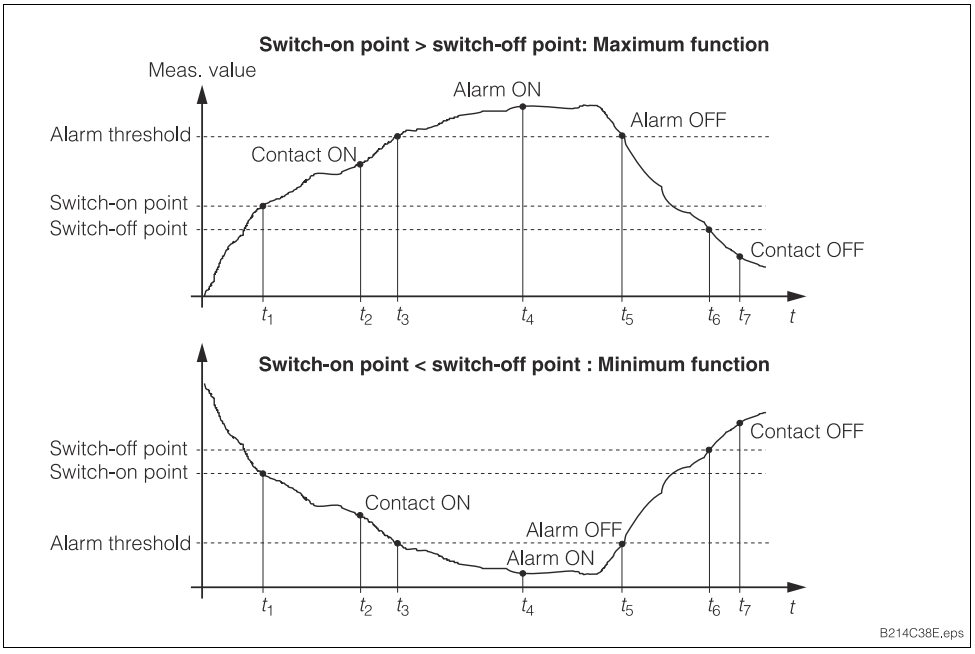


Fig. 6.10: Relationship between switch-on and switch-off points and between pickup and dropout delays

Note!
The selected limit contact status (MIN / MAX) is displayed in the fields R 217 and R 237.

6.6.2 P(ID) controller

You can define various controller functions on the transmitter. Starting with the PID controller, you can implement P, PI, PD and PID controllers.
To obtain the best possible control, you must select the right controller to match the application.

Output of actuating signal
Depending on the selection in field R247 or R 257, the actuating signal can be output via the relay or via the current output 2.

P controller
This is used for simple linear control with minor control deviations. Harmonics may result when you try to compensate for strong fluctuations. You may also have to expect a permanent control deviation.

PI controller
Used in processes where harmonics must be avoided and no permanent control deviation may occur.

PD controller
Used for processes which require rapid changes and whose peaks require compensation.

PID controller
Used for processes where a P, PI or PD controller provides insufficient control.

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

Control and fine-optimisation of set parameters using a recorder

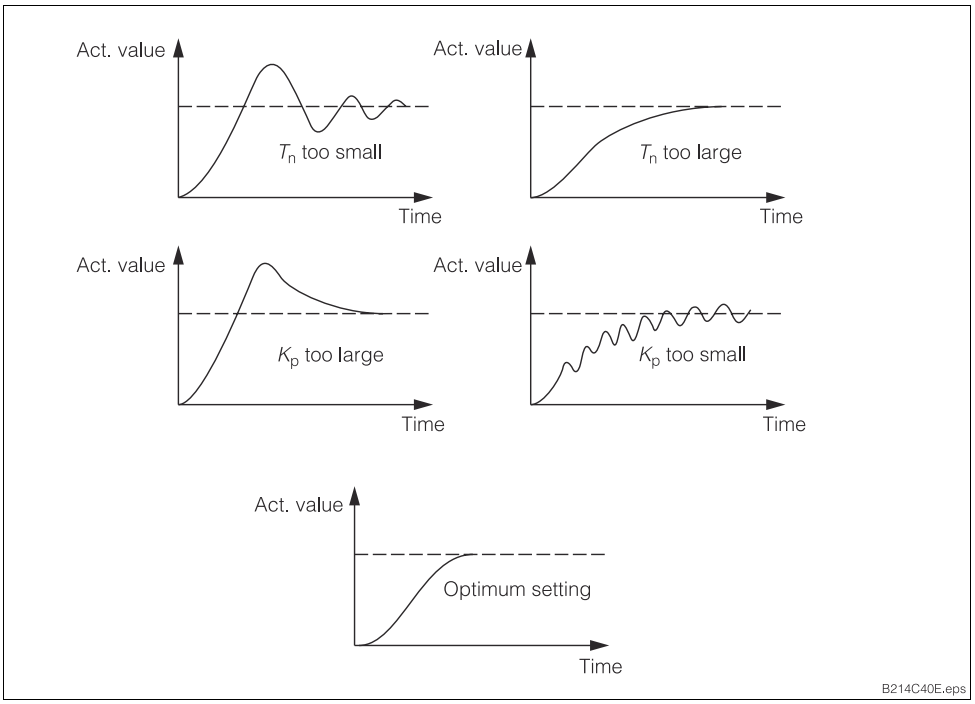


Fig. 6.11: Setting optimisation T_n and K_p

Actuating signal outputs (R247 to R2410 and R257 to R2510)
Each control contact outputs a clocked signal whose intensity corresponds to the controller's manipulated variable. A distinction is made according to the type of signal clock:

Pulse-length controller
The greater the calculated manipulated variable, the longer the related contact remains picked up (t_{ON}). You can set the period T between 0.5 and 999.9 s. Pulse-length outputs are intended to control solenoid valves.

Pulse-frequency controller
The greater the calculated manipulated variable, the higher the switching frequency of the related contact. You can set the maximum switching frequency $1/T$ between 60 and 180 min^{-1}. The switch-on period t_{ON} is constant. Pulse-frequency outputs are intended for controlling solenoid-operated dosing pumps.

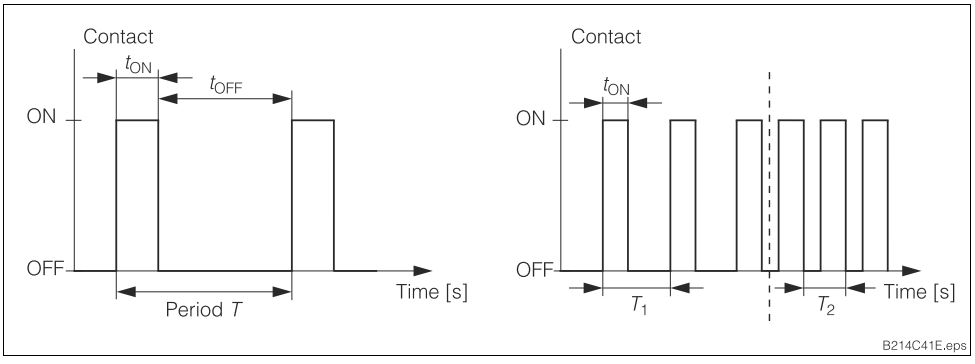


Fig. 6.12: Signal of a pulse-length (left) and a pulse-frequency control contact (right)

Control characteristic for direct and inverse control action
In fields R246 and R256 you can select between two control characteristics whose actions are depicted below.

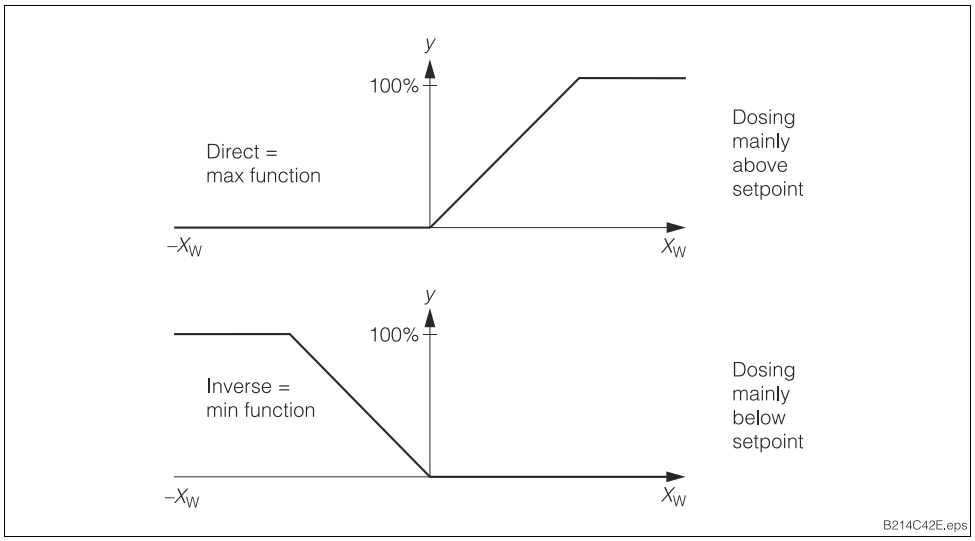


Fig. 6.13: Control characteristic of a proportional-action controller with direct and inverse control action
X = setpoint, X_W = control deviation, y = set value

6.6.3 Timer for cleaning function

This function contains a simple cleaning option. You can define the time interval for the start of the cleaning action. You can therefore only search for a regular pattern of intervals. There are other cleaning functions in conjunction with the ChemoClean function (requires four contacts, see chapter 6.6.4).

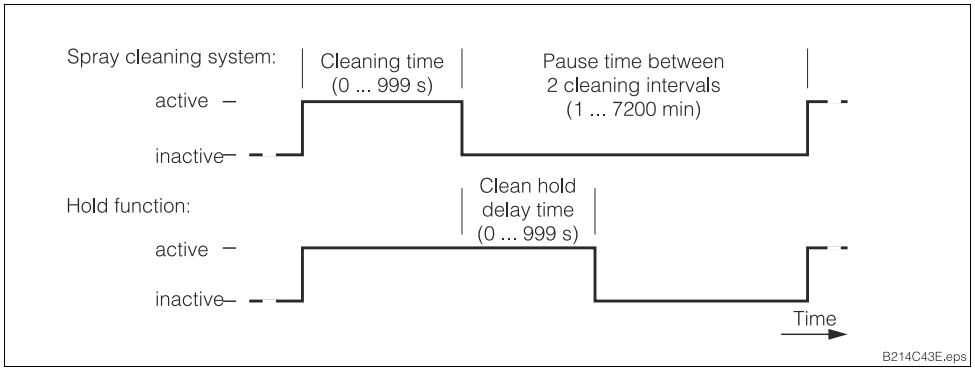


Fig. 6.14: Relationship between cleaning time, pause time and hold delay time

Note!
Timer and ChemoClean do not work independently of each other. While one of the two functions is active, the other cannot be started.

6.6.4 ChemoClean function

As for the time function, ChemoClean can also start a cleaning action. By comparison, the function scope is extended by an option for defining cleaning and rinsing intervals. You can therefore clean at irregular intervals at various repetition cycles and set separate cleaning times and rinsing times.

Note!
- Use relays 3 (water) and 4 (cleaner) for the ChemoClean function.
- If the cleaning operation is aborted prematurely, a post-rinse time always runs.
- In the “Economy” setting, cleaning only takes place with water.

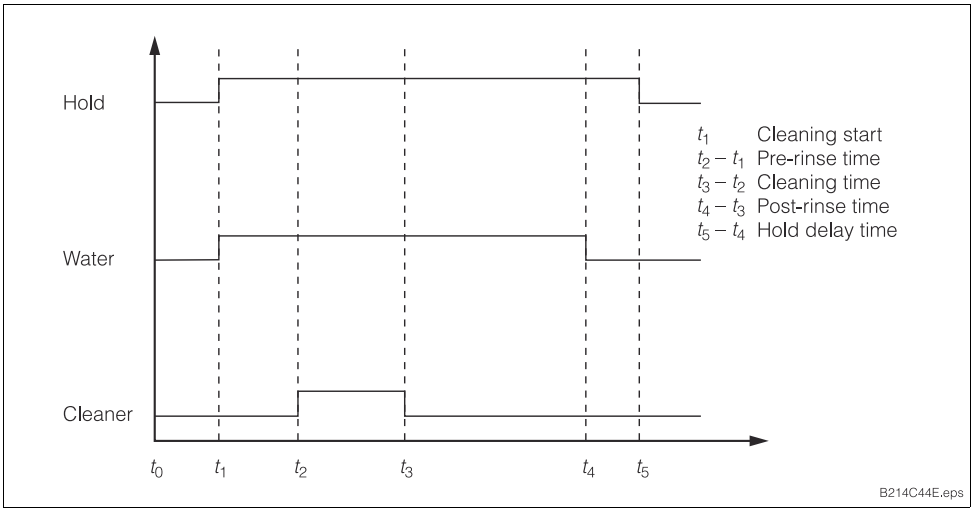


Fig. 6.15: Cleaning cycle curve

6.6.5 Three-point step controller

This controller type is used for triggering motor valves for chlorine dosing. When the controller activates relay 3, the motor valve closes. When the controller activates relay 4, the motor valve opens.

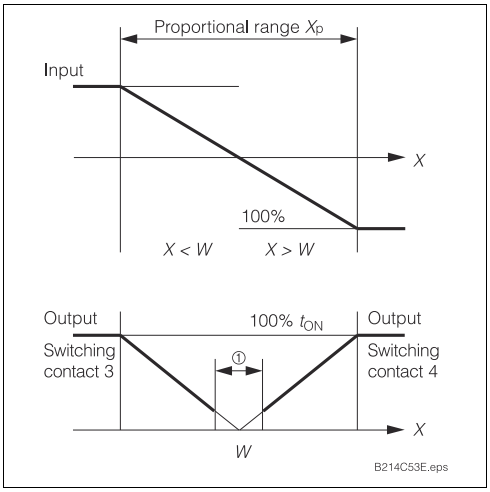
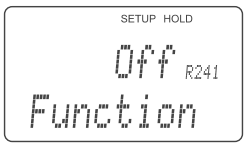
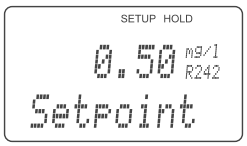
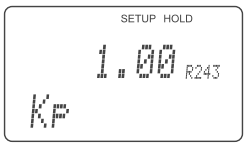
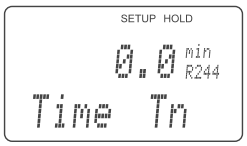
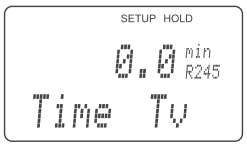
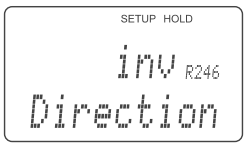
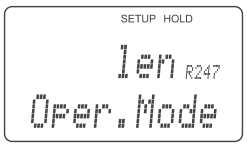
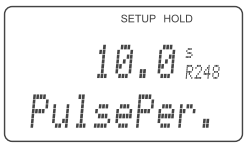
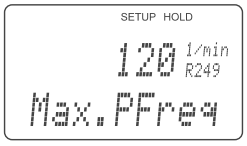
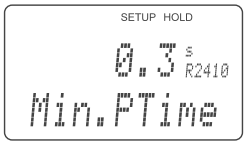


Fig. 6.16: P transfer characteristic of the three-point step controller
Relative on-time = (t_{ON}/T) · 100%
① Neutral zone
W = Set point
X = Measured value

Coding	Field	Selection or range Factory setting (bold)	Display	Remarks
R	**Function Group RELAY**		SETUP HOLD R RELAY	Select and set relay contacts.
R1	**Select contact to be configured**	**Rel1** Rel2 Rel3 Rel4	SETUP HOLD Rel1 R1 Sel.Relay	
R2(1)	**Configure limit contact for Cl_2 / ClO_2**	**Sel. Type = limit contact Cl_2 / ClO_2**	SETUP HOLD LC PV R2 Function	PV = process value of main measuring parameter. Confirmation with ENTER switches off another relay function which has already been switched on.
R211	Switch function R2(1) on or off	**Off** On	SETUP HOLD Off R211 Function	Settings you have made for the limit contact are not deleted when you switch the function off.
R212	Enter contact switch-on point	**20000 ppb** 0 ... 20000 ppb **20 ppm** 0 ... 20 ppm **20 (5) mg/l** 0 … 20 (5) mg/l	SETUP HOLD 20 mg/l R212 On Value	Caution! Never set switch-on point and switch-off point to the same value!
R213	Enter contact switch-off point	**20000 ppb** 0 ... 20000 ppb **20 ppm** 0 ... 20 ppm **20 (5) mg/l** 0 … 20 (5) mg/l	SETUP HOLD 20 mg/l R213 Off Value	The switch-off point entry selects either a max contact (switch-on point > switch-off point) or a min contact (switch-on point < switch-off point) and this implements an always required hysteresis (see Fig. 6.10).
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	
R216	Enter alarm threshold (as absolute value)	**20000 ppb** 0 ... 20000 ppb **20 ppm** 0 ... 20 ppm **20 (5) mg/l** 0 … 20 (5) mg/l	SETUP HOLD 20 mg/l R216 A.Thresh	If the alarm threshold is exceeded, an alarm is triggered on the measuring instrument with alarm message and error current (note error delay). Caution! If you define a min contact, then you must set the alarm threshold to a less value than the switch-off point!

Coding	Field	Selection or range Factory setting (bold)	Display	Remarks
R217	Display status of limit contact	**MAX** MIN	SETUP HOLD MAX R217 LC State	
R2(2)	**Configure limit contact for pH or redox mV**	**LC pH = limit contact pH** LCORP = limit contact redox mV	SETUP HOLD LC pH R2 Function	Only on EP version. Depending on the operating mode you select in field B1, you configure for pH or redox. Confirmation with ENTER switches off another relay function which has already been switched on.
R221	Switch function R2(2) on or off	**Off** On	SETUP HOLD Off R221 Function	Settings you have made for the limit contact are not deleted when you switch the function off.
R222	Enter contact switch-on point	**pH 9** pH 4 …9 **1500 mV** 0 … 1500 mV	SETUP HOLD 9.00 pH R222 On Value	Caution! Never set switch-on point and switch-off point to the same value!
R223	Enter contact switch-off point	**pH 9** pH 4 …9 **1500 mV** 0 … 1500 mV	SETUP HOLD 9.00 pH R223 Off Value	The switch-off point entry selects either a max contact (switch-on point > switch-off point) or a min contact (switch-on point < switch-off point) and this implements an always required hysteresis (see Fig. 6.10).
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	
R226	Enter alarm threshold (as absolute value)	**pH 5.00** pH 0 … 5 **1500 mV** 0 … 1500 mV	SETUP HOLD 5.00 pH R226 A.Thresh	If the alarm threshold is exceeded, an alarm is triggered on the measuring instrument with alarm message and error current (note error delay). Caution! If you define a min contact, then you must set the alarm threshold to a less value than the switch-off point!
R227	Display status of limit contact	**MAX** MIN	SETUP HOLD MAX R227 LC State	

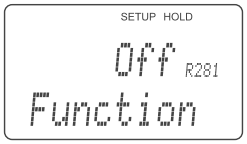
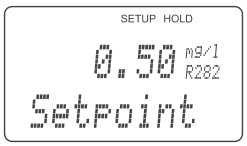
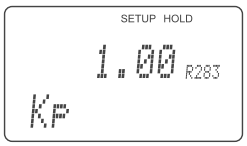
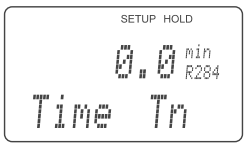
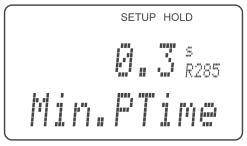
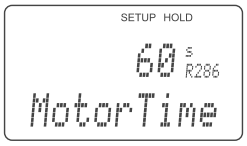
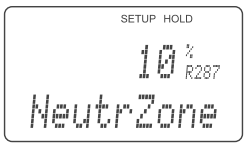
Coding	Field	Selection or range Factory setting (bold)	Display	Remarks
R2(3)	**Configure limit contact for temperature**	LC °C = limit contact temperature	SETUP HOLD LC °C R2 Function	Confirmation with ENTER switches off another relay function which has already been switched on.
R231	Switch function R2(3) on or off	**Off** On	SETUP HOLD Off R231 Function	Settings you have made for the limit contact are not deleted when you switch the function off.
R232	Enter switch-on temperature	**50 °C** 0 … 50 °C	SETUP HOLD 50.0 °C R232 On Value	Caution! Never set switch-on point and switch-off point to the same value!
R233	Enter switch-off temperature	**50 °C** 0 … 50 °C	SETUP HOLD 50.0 °C R233 Off Value	The switch-off point entry selects either a max contact (switch-on point > switch-off point) or a min contact (switch-on point < switch-off point) and this implements an always required hysteresis (see Fig. 6.10).
R234	Enter pickup delay	**0 s** 0 … 2000 s	SETUP HOLD 0 s R234 On Delay	
R235	Enter dropout delay	**0 s** 0 … 2000 s	SETUP HOLD 0 s R235 Off Delay	
R236	Enter alarm threshold (as absolute value)	**50 °C** 0 … 50 °C	SETUP HOLD 50.0 °C R236 A.Thresh	If the alarm threshold is exceeded, an alarm is triggered on the measuring instrument with alarm message and error current (note error delay). Caution! If you define a min contact, then you must set the alarm threshold to a less value than the switch-off point!
R237	Display status of limit contact	**MAX** MIN	SETUP HOLD MAX R237 LC State	
R2(4)	**Configure P(ID) controller for Cl_2 / ClO_2**	PIDPV	SETUP HOLD PIDPV R2 Function	PV = process value of main measuring parameter. Confirmation with ENTER switches off another relay function which has already been switched on.

Coding	Field	Selection or range Factory setting (bold)	Display	Remarks
R241	Switch function R2(4) on or off	**Off** On Basic PID+B		On =PID control Basic = only basic load dosage PID+B = PID control with basic load dosage
R242	Enter setpoint	**500 ppb** 0 ... 20000 ppb **0.5 ppm** 0 ... 20 ppm **0.5 (0.1) mg/l** 0 … 20 (5) mg/l		The setpoint is the value which the controller has to hold. The controller will restore this value if there is a deviation up or down.
R243	Enter control gain K_p	**1.00** 0.01 … 100.00		see chapter 6.6.2
R244	Enter integral action time T_n (0.0 = no I component)	**0.0 min** 0.0 … 999.9 min		see chapter 6.6.2 Note! Each hold sets the I component to zero. Hold can be deactivated in S2 but not for ChemoClean or timer!
R245	Enter derivative action time T_v (0.0 = no D component)	**0.0 min** 0.0 … 999.9 min		see chapter 6.6.2
R246	Select control characteristic	**inv = inverted (default for sodium hypochlorite)** dir = direct		This setting is required depending on the desired dosing direction (dosing above or below setpoint, see chapter 6.6.2).
R247	Select pulse length or pulse frequency	**len = pulse length** freq = pulse frequency curr = current output 2		Pulse length e.g. for solenoid valve, pulse frequency e.g. for solenoid operated dosing pump (see chapter 6.6.2). Selection of current output 2 is only possible, if field O2 = Contr is selected.
R248	Enter pulse period	**10.0 s** 0.5 … 999.9 s		This field only appears when you select pulse length in R247. If you select pulse frequency, R248 is skipped and you can continue your inputs R249.
R249	Enter maximum pulse frequency of the actuator	**120 min^{-1}** 60 … 180 min^{-1}		This field only appears when you select pulse length in R247. If you select pulse frequency, R249 is skipped and you can continue your inputs in R2410.
R2410	Enter minimum switch-on time t_{ON}	**0.3 s** 0.1 … 5.0 s		This field only appears when you select pulse length in R247.

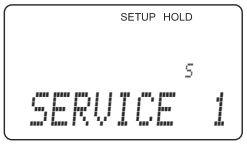
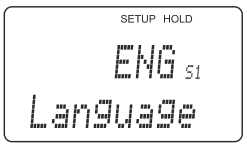
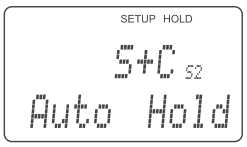
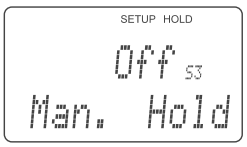
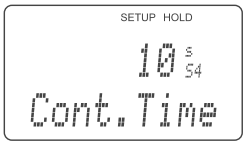
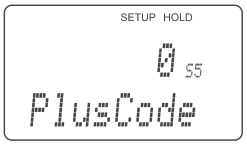
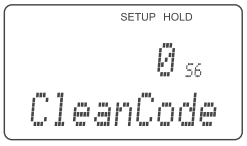
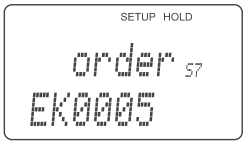
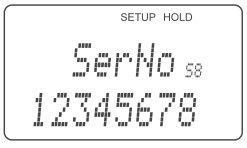
Coding	Field	Selection or range Factory setting (bold)	Display	Remarks
R2411	Enter basic load	**0%** 0 … 40%	SETUP HOLD 0 % R2411 BasicLoad	Selecting the basic load, you choose the desired dosage quantity. 100% basic load corresponds to: steadily on at R247 = on F_{max} at R247 = freq 20 mA at R247 = curr
R2(5)	**Configure P(ID) controller for pH**	PIDpH	SETUP HOLD PIDpH R2 Function	Confirmation with ENTER switches off another relay function which has already been switched on.
R251	Switch function R2(5) on or off	**Off** On Basic PID+B	SETUP HOLD Off R251 Function	On =PID control Basic = only basic load dosage PID+B = PID control with basic load dosage
R252	Enter setpoint	**pH 7.20** pH 4 … 9	SETUP HOLD 7.20 pH R252 Setpoint	The setpoint is the value which the controller has to hold. The controller will restore this value if there is a deviation up or down.
R253	Enter control gain K_p	**1.00** 0.01 … 100.00	SETUP HOLD 1.00 R253 Kp	
R254	Enter integral action time T_n (0.0 = no I component)	**0.0 min** 0.0 … 999.9 min	SETUP HOLD 0.0 min R254 Time Tn	see chapter 6.6.2 Note! Each hold sets the I component to zero. Hold can be deactivated in S2 but not for ChemoClean or timer!
R255	Enter derivative action time T_v (0.0 = no D component)	**0.0 min** 0.0 … 999.9 min	SETUP HOLD 0.0 min R255 Time Tv	see chapter 6.6.2
R256	Select control characteristic	**inv = inverted** dir = direct (default for acid)	SETUP HOLD inv R256 Direction	This setting is required depending on the desired dosing direction (dosing above or below setpoint, see chapter 6.6.2).
R257	Select pulse length or pulse frequency	**len = pulse length** freq = pulse frequency curr = current output 2	SETUP HOLD len R257 Oper.Mode	Pulse length e.g. for solenoid valve, pulse frequency e.g. for solenoid-operated dosing pump (see chapter 6.6.2). Selection of current output 2 is only possible, if field O2 = Contr is selected.
R258	Enter pulse period	**10.0 s** 0.5 … 999.9 s	SETUP HOLD 10.0 s R258 PulsePer.	This field only appears when you select pulse length in R257. If you select pulse frequency, R258 is skipped and you can continue your inputs in R259.

Coding	Field	Selection or range Factory setting (bold)	Display	Remarks
R259	Enter maximum pulse frequency of the actuator	**120 min^{-1}** 60 … 180 min^{-1}	SETUP HOLD 120 1/min R259 Max.PFreq	This field only appears when you select pulse frequency in R257. If you select pulse length, R259 is skipped and you can continue your inputs in R2510.
R2510	Enter minimum switch-on time t_{ON}	**0.3 s** 0.1 … 5.0 s	SETUP HOLD 0.3 s R2510 Min.PTime	This field only appears when you select pulse length in R257.
R2511	Enter basic load	**0%** 0 … 40%	SETUP HOLD 0 % R2411 BasicLoad	This field only appears with version EP. Selecting the basic load, you choose the desired dosage quantity. 100% basic load corresponds to: steadily on at R257 = on F_{max} at R257 = freq 20 mA at R257 = curr
R2(6)	**Configure cleaning function (timer)**	Timer	SETUP HOLD Timer R2 Function	Cleaning only takes place with one cleaning agent (normally water); see Fig. 6.14. Confirmation with ENTER switches off another relay function which has already been switched on.
R261	Switch function R2(6) on or off	**Off** On	SETUP HOLD Off R261 Function	
R262	Enter rinse/cleaning time	**30 s** 0 … 999 s	SETUP HOLD 30 s R262 RinseTime	The settings for hold and relay are activated for the period of time specified here.
R263	Enter pause time	**360 min** 1 … 7200 min	SETUP HOLD 360 min R263 PauseTime	The pause time is the time between two cleaning cycles (see chapter 6.6.3).
R264	Enter minimum pause time	**120 min** 1 … 3600 min	SETUP HOLD 120 min R264 Min.Pause	The minimum pause time prevents continuous cleaning when the external cleaning trigger is present.
R2(7)	**Configure cleaning with ChemoClean**	Clean	SETUP HOLD Clean R2 Function	Only with relays 3 (water) and 4 (cleaner); see chapter 6.6.4. Confirmation with ENTER switches off another relay function which has already been switched on.

Coding	Field	Selection or range Factory setting (bold)	Display	Remarks
R271	Switch function R2(7) on or off	**Off** On	SETUP HOLD Off R271 Function	
R272	Select type of start pulse	**int = internal (timed)** ext = external i+ext = internal + external i+stp = internal, suppressed by external	SETUP HOLD int R272 CleanTrig	There is no real-time clock. External suppression is required for irregular time intervals (e.g. weekend).
R273	Enter pre-rinse time	**20 s** 0 … 999 s	SETUP HOLD 20 s R273 PreRinse	Water is used for pre-rinsing.
R274	Enter cleaning time	**10 s** 0 … 999 s	SETUP HOLD 10 s R274 CleanTime	Cleaning agent and water are used for cleaning.
R275	Enter post-rinse time	**20 s** 0 … 999 s	SETUP HOLD 10 s R275 PostRinse	Water is used for pre-rinsing.
R276	Enter number of repeat cycles	**0** 0 … 5	SETUP HOLD 0 R276 Rep. Rate	R273 to R275 are repeated.
R277	Enter pause time	**360 min** 1 … 7200 min	SETUP HOLD 360 min R277 PauseTime	The pause time is the time between two cleaning cycles (see chapter 6.6.4).
R278	Enter minimum pause time	**120 min** 1 … 3600 min	SETUP HOLD 120 min R278 Min.Pause	The minimum pause time prevents continuous cleaning when the external cleaning trigger is present.
R279	Enter number of cleaning cycles without cleaning agent (economy function)	**0** 0 … 9	SETUP HOLD 0 R279 EconomyCl	After cleaning with agent, up to 9 cleaning operations can take place before the next cleaning operation with agent.
R2(8)	**Configure three-point step controller for Cl_2 / ClO_2**	3PSt	SETUP HOLD 3PSt R2 Function	Only with relays 3 and 4. Confirmation with ENTER switches off another relay function which has already been switched on.

Coding	Field	Selection or range Factory setting (bold)	Display	Remarks
R281	Switch function R2(8) on or off	**Off** On		
R282	Enter setpoint	**500 ppb** 0 ... 20000 ppb **0.5 ppm** 0 ... 20 ppm **0.5 (0.1) mg/l** 0 … 20 (5) mg/l		The setpoint is the value which the controller has to hold. The controller will restore this value if there is a deviation up or down.
R283	Enter control gain K_p	**1.00** 0.01 … 100.00		see chapter 6.6.2
R284	Enter integral action time T_n	**0.0 min** 0.0 … 999.9 min		see chapter 6.6.2
R285	Enter minimum switch-on time t_{ON}	**0.3 s** 0.1 … 5.0 s		
R286	Enter motor run time	**60 s** 10 … 999 s		Actuator motor run time from “fully closed” state to “fully open” state.
R287	Enter neutral zone	**10%** 0 … 40%		

6.7 Service 1

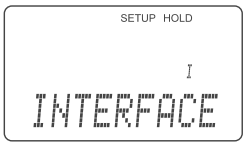
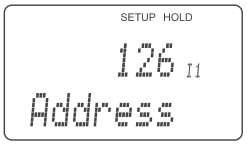
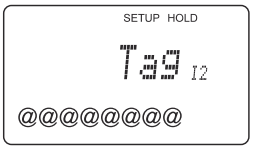
Coding	Field	Selection or range Factory setting (bold)	Display	Remarks
S	**Function Group SERVICE 1**			
S1	Select language	**ENG = English** GER = German FRA = French ITA = Italian NEL = Dutch ESP = Spanish		This field must be set once during instrument configuration. Then exit S1 and continue.
S2	Configure hold	**S+C = during setup and calibration** CAL = during calibration Setup = during setup none = no hold		S = setup C = calibration The current output is frozen and all relays go to normal position.
S3	Manual hold	**Off** On		This setting is retained in the event of a power failure.
S4	Enter hold delay time	**10 s** 0 … 999 s		
S5	Enter release code for software upgrade to plus package	**0** 0 … 9999		The code is on the nameplate (see Fig. 2.1). If you enter the wrong code, you return to the measuring menu. Edit the figure using the PLUS or MINUS key and confirm by pressing ENTER.
S6	Enter release code for software upgrade to ChemoClean	**0** 0 … 9999		The code is on the nameplate (see Fig. 2.1). If you enter the wrong code, you return to the measuring menu. Edit the figure using the PLUS or MINUS key and confirm by pressing ENTER.
S7	Display order code			When you upgrade the instrument, the order code is not changed. The delivery state is displayed.
S8	Display serial number			

Coding	Field	Selection or range Factory setting (bold)	Display	Remarks
S9	Reset the instrument (to default values)	**no** Sens = sensor dates Facty = factory settings	SETUP HOLD no S9 S.Default	Caution! Facty = All data **except for sensor type (field A1), operating mode (field B1) and language (field S1)** are deleted and reset to the basic settings! Sens = The previous calibration is deleted and reset to factory settings.
S10	Perform instrument test	**no** Displ = display test	SETUP HOLD no S10 Test	

6.8 Service 2

Coding	Field	Selection or range Factory setting (bold)	Display	Remarks
E	**Function Group SERVICE 2**		SETUP HOLD E SERVICE 2	
E1(1) **E1(2)** **E1(3)** **E1(4)**	**Select module**	**Contr = controller (1)** Trans = transmitter (2) MainB = mainboard (3) Rel = relay (4)	SETUP HOLD Contr E1 Select	
E111 E121 E131 E141	Software version is displayed		SETUP HOLD xx.xx E111 SW-Vers.	No editing possible.
E112 E122 E132 E142	Hardware version is displayed		SETUP HOLD xx.xx E112 HW-Vers.	No editing possible.
E113 E123 E133 E143	Serial number is displayed		SETUP HOLD SerNo E113 12345678	No editing possible.
E114 E124 E134 E144	Module identification is displayed		SETUP HOLD LSG E114 Module ID	No editing possible.

6.9 Interfaces

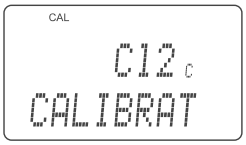
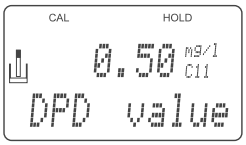
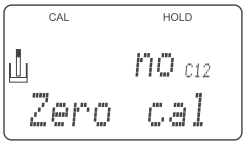
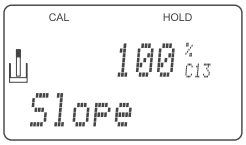
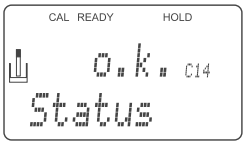
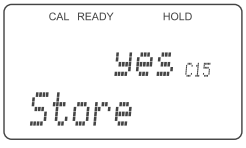
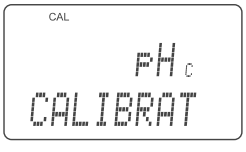
Coding	Field	Selection or range Factory setting (bold)	Display	Remarks
I	**Function Group INTERFACE**			Only for instruments equipped with communication interface.
I1	Enter address	HART: **0** … 15 or PROFIBUS: 1 … **126**		
I2	Display of tag number			

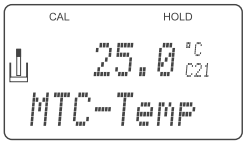
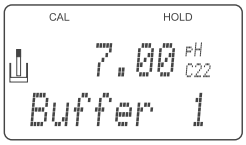
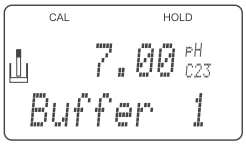
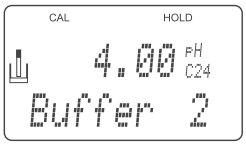
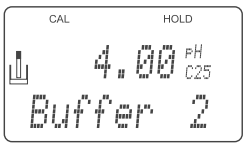
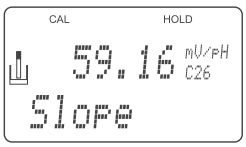
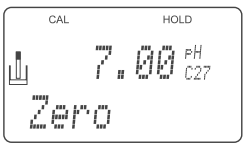
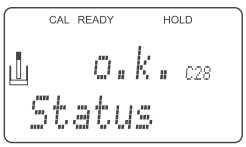
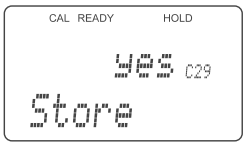
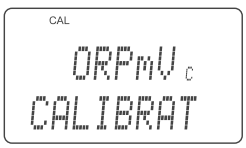
6.10 Calibration

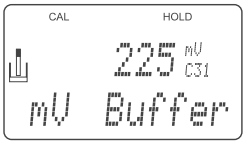
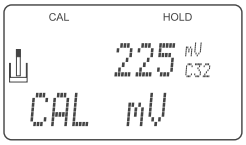
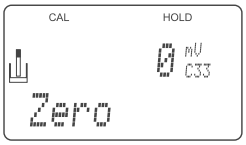
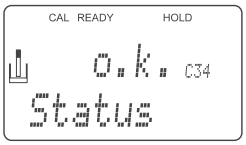
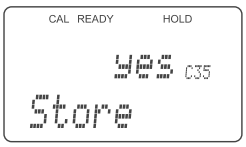
For access to the CALIBRATION menu, please enter Code 22.

Note!
Hinweis!

- For chlorine and chlorine dioxide calbration you need a photometer, e.g. OCM 181 or OCM 182 (see chapter 9, Accessories). To calibrate chlorine and chlorine dioxide for trace detection (< 0.1 mg/l), use a photometer with higher accuracy and lower detection limits.
- If the calibration is aborted by pressing the PLUS and MINUS keys at the same time (return to C15, C29 or C35) or if the calibration is faulty, the original calibration data will continue to be used. A calibration error is indicated by an “ERR” and a flashing sensor symbol on the LCD. In this case, repeat the calibration!
- The end of calibration is followed by a return to the measuring mode. During the hold delay time (field S4), the hold symbol is displayed.

Coding	Field	Selection or range Factory setting (bold)	Display	Remarks
C(1)	**Function Group CALIBRATION: Calibration Cl_2/ClO_2**	**Cl2** ClO2		Cl2 at A1 = “140”, “141”, “963”. ClO2 at A1 = “240”, “241”.
C11	Enter DPD calibration value	**Value of previous calibration**		Minimum values for calibration • for OCS 140 / 240 and sensor 963: **0.05 mg/l** • for OCS 141 / 241: **0.01 mg/l**
C12	Zero calibration?	**no** yes		Only for A1 = “963”. Zero calibration: 1. Send non-chlorinated water through the assembly. 2. Wait 10 min. 3. Adopt by selecting “yes” and press ENTER.
C13	Display slope	**100%** minimum 25% (3%) maximum 500%		Minimum permitted slope • for OCS 140 / 141 with pH compensation and for OCS 240 / 241: **25%** • for OCS 140 / 141 without pH compensation and for sensor 963: **3%**
C14	Calibration status is displayed	**o.k.** E xxx		
C15	Store calibration result?	**yes** no new		If C14 = E xxx, then only no or **new.** If new, then return to C. If yes/no, then return to “Measurement”.
C(2)	**Function Group CALIBRATION: Calibrate pH**	pH		

Coding	Field	Selection or range Factory setting (bold)	Display	Remarks
C21	Enter calibration temperature	**25.0 °C** 0 … 50 °C		This field is only used for registration of the calibration temperature. Input not imperative.
C22	Enter pH value of first buffer solution	**Buffer value of previous calibration** pH 3.50 … 9.50		Press the ENTER key to display the current measuring value. Press the ENTER key again as soon as the measuring value has approximated the buffer value.
C23	Calibration takes place			Stability control: Adopt if stability ≤ pH ±0.05 for more than 10 s.
C24	Enter pH value of second buffer solution	**Buffer value of previous calibration** pH 3.50 … 9.50		Buffer 2 must have a different value than buffer 1. Plausibility check takes place. Press the ENTER key and proceed as in field C 23.
C25	Calibration takes place			Stability control: Adopt if stability ≤ pH ±0.05 for more than 10 s.
C26	Display slope	**59.16 mV/pH** 38.00 … 65.00 mV/pH		
C27	Zero point is displayed	**pH 7.00** pH 5.00 … 9.00		
C28	Calibration status is displayed	**o.k.** E xxx		
C29	Store calibration result?	**yes** no new		If C28 = E xxx, then only no or **new.** If new, then return to C. If yes/no, then return to “Measurement”.
C(3)	**Function Group CALIBRATION: Calibration redox mV**	ORPmV		

Coding	Field	Selection or range Factory setting (bold)	Display	Remarks
C31	Enter value of redox buffer	**Buffer value of previous calibration** 0 … 1500 mV		Press the ENTER key to display the current measuring value. Press the ENTER key again as soon as the measuring value has approximated the buffer value.
C32	Calibration takes place			Stability control: Adopt if stability ≤ ±1 mV for more than 10 s.
C33	Zero point is displayed	–100 … +100 mV		
C34	Calibration status is displayed	**o.k.** E xxx		
C35	Store calibration result?	**yes** no new		If C34 = E xxx, then only no or **new.** If new, then return to C. If yes/no, then return to “Measurement”.

7 Diagnosis and corrective maintenance

Maintenance
Maintenance means that all measures which will guarantee the safety of operation and reliability of the entire measuring system are taken in due time.

Maintenance of OCM 223 / 253 includes:
- Calibration (see chapter 6.10)
- 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 OCM 223/253 and the measuring system is performed with the aid of the troubleshooting table in chapter 7.1.

Warning!
- Remember that any work on the instrument may have impacts on process control and the process itself.
- If you have to remove the sensor for servicing or calibration work, pay attention to the hazards caused by pressure, temperature and contamination.

Note!
Please contact your Service Organisation for queries.

7.1 Troubleshooting and remedial action based on common problems

Error	Possible cause	Remedial action	Equipment needed, spare parts
No instrument function	• Instrument fuse defective • No power supply	• Replace fuse • Establish power supply	• Fine-wire fuse, M 250 V / 3.15 A • Check with voltmeter
Display flashes	• Automatic controller switch-off due to alarm • Current output simulation	• Determine cause using error code Exxx and remedy • End simulation	
Chlorine measurement: Slope too shallow	Sensor was in chlorine-free water or in air	Short conditioning above (not in!) chlorine bleach, wait for conditioning time in water before calibration	Chlorine bleach / chlorine parent solution
No match with DPD check measurement	Measurement takes place without pH compensation, whereas DPD measurement is always buffered to pH 6.3	Measure chlorine value pH-compensated	Select OCM 223 / 253 with ES (manual compensation) or EP (automatic compensation) option
DPD measured value much too high	Organic chlorination agent (may also be used only at times or for shock chlorination). Here no correlation between actual free chlorine, DPD measurement and amperometric measurement. DPD value up to factor 5 too high.	Use free (gaseous) chlorine or chlorine from inorganic chlorine compounds	If organic chlorination agent was used previously, the entire system must be evacuated and carefully cleaned!
Chlorine value too high	• Membrane defective • Polarisation incomplete • Foreign oxidant • Shunt in chlorine sensor	• Replace membrane cap • Wait until polarisation time ends • Analyse measuring water • Replace sensor	• Replacement cartridges OCY 14-WP • Be patient • Detailed knowledge of the process • Replacement sensor

Error	Possible cause	Remedial action	Equipment needed, spare parts
Chlorine value too low	• Measuring chamber not closed • Air cushion outside in front of membrane • Air cushion under membrane	• Refill and carefully screw tight • Remove air bubble, possibly choose better installation position • Refill and carefully screw tight bubble-free	• Electrolyte OCY 14-F or OCY 24-F
Chlorine value wrong / no calibration possible; zero current too large	• Wrong polarisation voltage • Wrong sensor type selected	• Measure polarisation voltage, replace MKC1 module if required • Check sensor selection	• DVM at S (–) and 91 (+) OCS 140 / 141: –20 mV OCS 240 / 241: +120 mV
pH/mV measurement: Measuring chain zero point not adjustable	• Reference system poisoned • Membrane blocked • Measuring line broken • Asymmetrical voltage of sensor too high • Potential matching (PM) ⇔ medium incorrect	• Test with new sensor • Clean / grind membranes (not with TEFLON® membranes) • Short-circuit pH input and connect to PM ⇒ reading pH 7 • Clean membranes or test with different sensor • OCM 223 / 253 Always connect symmetrically to PM!	• pH/mV sensor • HCl 3%, key file (only file in one direction); new sensor • HCl 3%, file (only file in one direction); new sensor • Terminal diagrams see chapter 4
No or slow change of readings	• Sensor dirty • Sensor aged • Sensor defective (reference outgoing lead)	• Clean sensor, see chapter 8.6.2 • Replace sensor • Replace sensor	• Cleaning agent • New sensor • New sensor
Measuring chain slope not adjustable / **slope too shallow**	• Connection not at high impedance (humidity, dirt) • Instrument input defective • Sensor aged	• Test cable, connector and junction boxes • pH measurement directly on the instrument • Replace sensor	• pH simulator, insulation tester • pH simulator • pH sensor
Measuring chain slope not adjustable / **No slope**	• Hairline crack in glass membrane • Connection not at high impedance	• Replace sensor • Test cable, connector and junction boxes	• pH sensor • pH simulator, insulation tester
Permanent, incorrect reading	• Sensor not immersed or protective cap not removed • Air cushion in assembly • Earth fault at or in the instrument • Hairline crack in glass membrane • Instrument in impermissible operating state (no response to key actuation)	• Check installation position, remove protective cap • Check assembly and installation position • Test measurement in insulated vessel, possibly with buffer solution • Replace sensor • Switch instrument off and on	• Plastic vessel, buffer solutions • pH sensor • possibly EMC problem: If repeated, check earthing and wire routing
Incorrect temperature reading	• Incorrect sensor connection • Sensor or measuring cable defective	• Check connections • Test sensor and cable	• Terminal diagrams see chapter 4 • Ohmmeter, see chapter 8.7.2
pH value in process incorrect	• Flow rate too high • Potential in medium • Sensor covered in dirt or deposits	• Reduce flow rate or measure in a bypass • possibly earth with / at PM pin (connect PA/PM to PE) • Clean sensor, see chapter 8.6.2	• Problem mainly occurs in plastic lines • For highly polluted media: Use spray cleaning
Measured values fluctuate	• Interference in measuring cable • Interference in signal output line • Interference potential in medium • No potential matching on symmetrical input	• Connect cable screen as per terminal diagram • Check line installation, possible route line separately • Eliminate interfering potential • Connect PM pin in assembly to instrument terminal PA/PM	• Terminal diagrams see chapter 4 • Route signal output and measuring input lines separately • Possibly earth medium by connecting PA/PM to PE
Controller or timer cannot be activated	No relay module installed	Install LSR1-2 or LSR1-4 module	see chapter 8.2 and 8.3

Error	Possible cause	Remedial action	Equipment needed, spare parts
Controller / limit contact do not work	• Controller switched off • Controller in "Manual / Off" mode • Pickup delay setting too long • Hold function active	• Activate controller • Select "Manual / On" or "Auto" mode • Switch off or shorten pickup delay • Auto hold during calibration, hold input activated; hold active via keyboard	• see chapter 6.6 or fields R2xx • Keyboard, REL key • see fields R2xx • see fields S2 to S4
Controller / limit contact work continuously	• Controller in "Manual / On" mode • Dropout delay setting too long • Control loop interrupted	• Select "Manual / Off" or "Auto" mode • Switch off or shorten dropout delay • Check measured value, output, contacts, actuators, chemical supply	• Keyboard, REL and AUTO keys • see fields R2xx
No current output signal	• Line open or short-circuited • Output defective	• Disconnect line and measure directly on instrument • see chapter 8.1	mA Meter for 0–20 mA DC
Fixed current output signal	• Current simulation active • Processor system out of sync	• Switch off simulation • Switch instrument off and on	• see field O3 • possibly EMC problem: If repeated, check installation
Incorrect current output signal	• Incorrect current assignment • Total load in current loop too high (> 500 kΩ)	• Preselect 0–20 mA or 4–20 mA? • Disconnect output and measure directly on instrument	• see field O311 • Ohmmeter
No output signal for temperature or pH/mV	• Instrument has only 1 current output	• Check nameplate for version, possibly replace LSCH-x1 module	• LSCH-x2 module, see chapter 8.2.4 and 8.3.4
ChemoClean function not available	• No relay module LSR1-4 equipped or only LSR1-2 present • ChemoClean not enabled	• Install LSR1-4 module • ChemoClean is enabled with a code number which is entered by manufacturer on retrofitting ⇒ enter (field S6)	• LSR1-4 module, see chapter 8.2.4 and 8.3.4 • For detailed description see chapter 8.3.5
Functions from Plus package not available	Plus package not enabled (Enable Plus package and ChemoClean using a code number which depends on the serial number and is received from supplier after ordering a Plus package)	• When retrofitting Plus package: Enter code number provided by supplier ⇒ enter (field S5) • After replacing a module LSCH / LSCP: Enter first instrument serial number (see nameplate) manually, then enter code number	• see chapter 6.7 • For detailed description see chapter 8.3.5

7.2 Troubleshooting based on error messages

Error No.	Cause	Action	Contact		Error current		Automatic cleaning start	
			Fact.	User	Fact.	User	Fact.	User
E001	EEPROM memory error	• Switch instrument off and back on again, return transmitter to your local sales agency for repair or replace instrument. • Load software compatible with hardware. • Load instrument software specific to parameter measured. • On E003: invalid configuration, download attempt was performed with invalid parameter set.	yes		no		—	—*
E002	Instrument not calibrated, calibration data invalid, no user data or user data invalid (EEPROM error)		yes		no		—	—*
E003	Download error		yes		no		—	—*
E004	Instrument software version incompatible with hardware version of module		yes		no		—	—*
E007	• Transmitter malfunction • Instrument software does not match hardware (transmitter)		yes		no		—	—*
E010	Temperature sensor defective	Check temperature sensor and connections; if necessary, check measuring cable using temperature simulator (see chapter 8.7).	yes		no		no	
E032	Upper or lower pH slope range exceeded	Repeat calibration and replace buffer solution; if necessary, replace electrode and check instrument and measuring cable using simulator (see chapter 8.7).	yes		no		—	—*
E033	pH value zero point too low or too high		yes		no		—	—*
E034	Upper or lower redox offset range exceeded		yes		no		—	—*
E035	Sensor 963 zero point signal outside permitted range	• Service sensor (acc. to sensor instructions). • Check connections. • Check active charcoal filter.	yes		no		—	—*
E038	Cl sensor signal outside permitted range during slope calibration	• Service sensor (acc. to sensor instructions). • Check connections. • Check DPD measuring instrument. • Do not use organic chlorination agent.	yes		no		—	—*
E041	Calibration parameter calculation aborted	Repeat calibration and replace buffer solution; if necessary, replace sensor and check instrument and measuring cable.	yes		no		—	—*
E042	Distance between buffer value and zero point (pH 7) too small (single-point calibration)	For slope calibration, use a buffer solution which has at least a distance of ΔpH = 2 to the electrode zero point.	yes		no		—	—*
E043	Distance between buffer 1 and buffer 2 calibration values too small (two-point calibration)	Use buffer solution which are at least ΔpH = 2 apart.	yes		no		—	—*
E044	Stability factor not met during calibration	Repeat calibration and replace buffer solution; if necessary, replace sensor and check instrument and measuring cable using simulator.	yes		no		—	—*
E045	Calibration aborted	Repeat calibration, if necessary replace buffer solution; if necessary, replace sensor and check instrument and measuring cable	yes		no		—	—*

Error No.	Cause	Action	Contact		Error current		Automatic cleaning start	
			Fact.	User	Fact.	User	Fact.	User
E055	Lower Cl/ClO_2 measuring range exceeded	Check measurement and connections; if necessary, check instrument and measuring cable using simulator (see chapter 8.7).	yes		no		no	
E056	Lower pH/mV measuring range exceeded		yes		no		no	
E057	Upper Cl/ClO_2 measuring range exceeded		yes		no		no	
E058	Upper pH/mV measuring range exceeded		yes		no		no	
E059	Lower temperature measuring range exceeded		yes		no		no	
E061	Upper temperature measuring range exceeded		yes		no		no	
E063	Lower current output range 1 exceeded	Check measured value and current assignment.	yes		no		no	
E064	Upper current output range 1 exceeded		yes		no		no	
E065	Lower current output range 2 exceeded		yes		no		no	
E066	Upper current output range 2 exceeded		yes		no		no	
E067	Alarm threshold for limit contact 1 exceeded	Check configuration in “limit contact” menu.	yes		no		no	
E068	Alarm threshold for limit contact 2 exceeded		yes		no		no	
E069	Alarm threshold for limit contact 3 exceeded		yes		no		no	
E070	Alarm threshold for limit contact 4 exceeded		yes		no		no	
E080	Current output 1 range too small	Increase range in “Current output” menu.	no		no		—	—*
E081	Current output 2 range too small		no		no		—	—*
E100	Current simulation active	Enter correct parameters for current output.	no		no		—	—*
E101	Service function active	Switch off service function or switch instrument off and back on.	no		no		—	—*
E102	Relay simulation active	Check relay configuration.	no		no		—	—*
E106	Download active	Wait for download to end.	no		no		—	—*
E116	Download error	Repeat download; if necessary, check connections and instruments.	no		no		—	—*
E152	Measuring signal Cl/ClO_2 sluggish or frozen	• Check sensor and connection, service, if necessary, replace. • Check whether measuring water has really changed or not.	yes		no		no	
E153	Measuring signal pH/mV sluggish or frozen		yes		no		no	

Error No.	Cause	Action	Contact		Error current		Automatic cleaning start	
			Fact.	User	Fact.	User	Fact.	User
E154	Cl/ClO_2 below lower alarm threshold for longer than maximum period set	• If necessary, perform manual reference measurement. • Service sensor (acc. to sensor manual). • Recalibrate measuring instrument. • Check flow rate. • Check chemical supply • Check dosing devices.	yes		no		no	
E155	Cl/ClO_2 above upper alarm threshold for longer than maximum period set		yes		no		no	
E156	Cl/ClO_2 below alarm threshold for longer than permitted maximum period		yes		no		no	
E157	Cl/ClO_2 above alarm threshold for longer than permitted maximum period		yes		no		no	
E158	pH/mV below lower alarm threshold for longer than maximum period set		yes		no		no	
E159	pH/mV above upper alarm threshold for longer than maximum period set		yes		no		no	
E160	pH/mV below alarm threshold for longer than permitted maximum period		yes		no		no	
E161	pH/mV above alarm threshold for longer than permitted maximum period		yes		no		no	
E162	Dosage stop	Check settings in CURREBNT INPUT or CHECK function group.	yes		no		no	
E163	Compensated chlorine value too imprecise since pH value > 9	Check pH value and adjust according to system requirements. For pH values > 9, the disinfection effect is questionable since the chlorine now exists as the less effective OCl^-.	yes		no		no	
E170	Flow rate through assembly too small or zero	Restore flow, check measuring water line.	yes		no		no	
E171	Flow in main stream too low or zero	Restore flow.	yes		no		no	
E172	Switch-off limit for current input 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	
9999	Instrument in field is locked to prevent operation.	To unlock: press the CAL and MINUS keys together.						

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

8 Diagnosis and corrective maintenance

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

Corrective maintenance
- replacing a part diagnosed to be defective
- testing instrument and measuring point for proper functioning and thus
- restoring full functionality.

Diagnosis using the table below is performed – depending on the level of difficulty and the measuring instruments available – by:
- Operator's qualified personnel
- Operator's qualified electrical personnel
- Company responsible for system installation / operation
- Service Organisation.

Select the necessary spare parts using the tables in chapter 8.2.4 and 8.3.4.

Warning!
- De-energise the instrument before you open it. Work with live lines may only be performed by trained electricians.
- Switch contacts may be powered by separate circuits. Also de-energise these circuits before you work on the terminals.

- Caution: ESD!
  Electronic components are sensitive to electrostatic discharge. Take personal precautions such as discharge yourself by touching a PE or wear a permanent earthing device such as a wriststrap.
- For your own safety, always use original spare parts. This ensures the correct function, precision and reliability after corrective maintenance.

8.1 Diagnosis

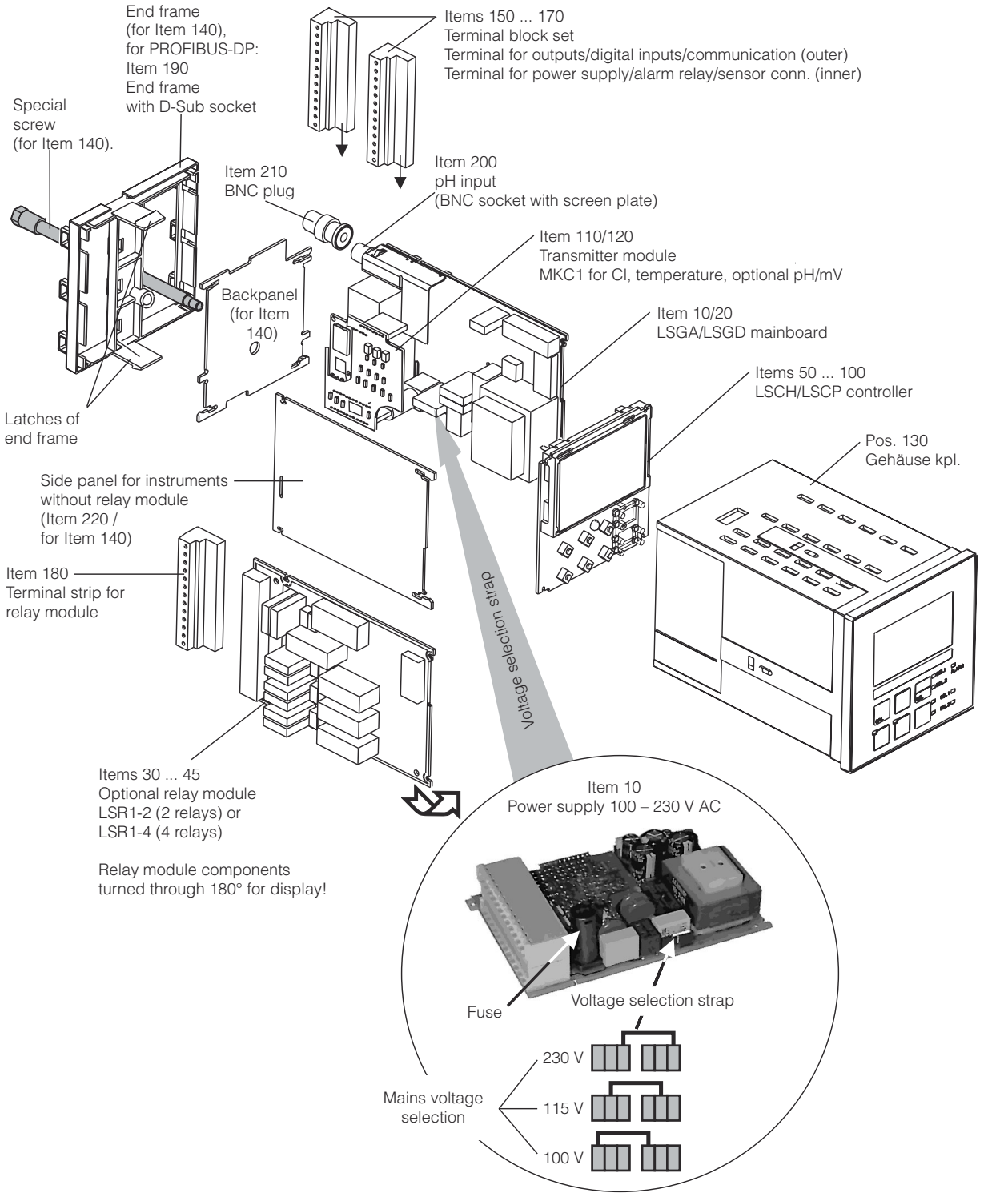
The table below will help you diagnose problems and specifies the spare parts required. Refer to chapter 8.2.4 and 8.3.4 for information on the exact spare part names and how to install them.

Error	Possible cause	Tests and/or remedial action	Equipment, spare parts, personnel
Display dark, no LEDs active	• No mains voltage • In correct supply voltage or too low • Terminal defective • Fuse blown • Mainboard defective • Controller defective • OCM 253: ribbon cable loose or defective	• Check whether mains voltage is applied • Compare actual mains voltage with nameplate rating • Terminal not tightened • Insulation clamped in terminal • Wrong terminals used • Replace fuse after comparing mains voltage and nameplate rating • Replace mainboard, pay attention to variant • Replace controller, pay attention to variant • Check ribbon cable, if necessary, replace	• Electrician / e.g. multimeter • Operator (utility company specification or multimeter) • Electrician • Electrician / see drawings chapter 8.2.1 and 8.3.1 for correct fuses • On-site diagnose by Service (test module required) • On-site diagnose by Service (test module required) • see Spare parts for OCM 253
Display dark, but LEDs active	Controller defective (module: LSCH/LSCP)	Replace controller	On-site diagnose by Service (test module required)
Display shows reading but • no change in display and/or • instrument not operable	• Instrument not correctly installed • Operating system in impermissible state	• OCM 223: reinstall module • OCM 253: reinstall display module • Switch instrument off and on	• Refer to assembly drawings in chapter 8.2.1 and 8.3.1 • Possible EMC problem: if problem persists, have installation checked by Service
Instrument gets hot	• Incorrect voltage or too high • Mainboard defective	• Compare mains voltage and nameplate rating • Replace mainboard	• Correct voltage setting, see chapter 8.2.1 and 8.3.1 • Diagnosis only possible by Service
Incorrect Cl/ClO_2 measured value and/or temperature measured value	Transmitter module defective (module: MKC1). First carry out tests and action as per chapter 7.1.	Test measuring inputs: • Chlorine input open = reading 0.00 mg • Resistance 10 kΩ at terminals 11/12 and 13 = reading 25 °C	If test negative: replace module (pay attention to variant), refer to explosion drawings chapter 8.2.1 and 8.3.1
pH/mV measured value incorrect	PA/PM terminal incorrect: pH/mV terminal always symmetrical with PM	MKC1-Test: Short-circuit pH input and connect to PM: reading pH 7.00	See terminal diagram
Current output, current value incorrect	• Calibration incorrect • Load too high • Shunt / short-circuit to frame in current loop • Incorrect operating mode • Incorrect assignment	• Test with integrated current simulation, connect mA meter directly to current output • Check whether you selected 0–20 mA or 4–20 mA • Output 2 can be assigned to temperature or pH	• If simulation value incorrect: this requires calibration at factory or new LSCxx module • If simulation value correct: check current loop for load and shunts • If output, check assigned parameters
No current output signal	Current output stage defective (only on LSCH module; LSCP module has no current output)	Test with integrated current simulation and connect mA meter directly to current output	If test negative: replace controller (pay attention to variant)
Additional relays do not work	OCM 253: ribbon cable Item 320 loose or defective	Check proper connection of ribbon cable, if necessary, replace cable	See spare parts for OCM 253
Only 2 additional relays addressable	Relay module LSR1-2 installed with 2 relays	Upgrade to LSR1-4 with 4 relays	Operator, Service

Error	Possible cause	Tests and/or remedial action	Equipment, spare parts, personnel
Additional functions are missing (“Plus package” or “ChemoClean” options)	• No or incorrect release code used • Incorrect instrument serial number	• On retrofit: check whether the correct serial number was used for ordering options • Check whether the serial number on the nameplate is identical with the entry in field S8	• Contact your supplier. Order codes see chapter 9.5. • For the Plus package, the instrument serial number is significant.
Additional functions (Plus package and/or ChemoClean) are missing after replacing LSCH / LSCP module	No releases for Plus package or ChemoClean.	On brand-new LSCH / LSCP, an instrument serial number may be entered **once** in fields E115 to E117. Then enter, if necessary, release code for Plus package and/or ChemoClean.	For detailed description see chapter 8.3.5

8.2 Corrective maintenance of OCM 223

8.2.1 Exploded view



8.2.2 Disassembly of OCM 223

Caution!
Remember the impacts on the process when you switch the instrument off.

1. First pull off the terminal blocks (items 150 … 180) from the instrument rear to de-energise the instrument. Now you can dismount the instrument.
2. Press the end frame latches inwards and pull off the frame towards the rear.
3. Slacken the special screw by turning it counterclockwise.
4. Remove the complete electronics block from the housing. The modules are only plugged in and can be easily unplugged:
   – Simply pull the processor / LCD module to the front
   – Pull the backpanel tabs outwards slightly to remove the side modules.
5. Removing the Cl transmitter (item 120) on instruments with pH/mV input:
   – Bend up the screen plate
   – Pull off the inserted strands from the BNC socket and remove the module upwards.

8.2.3 Assembly of OCM 223

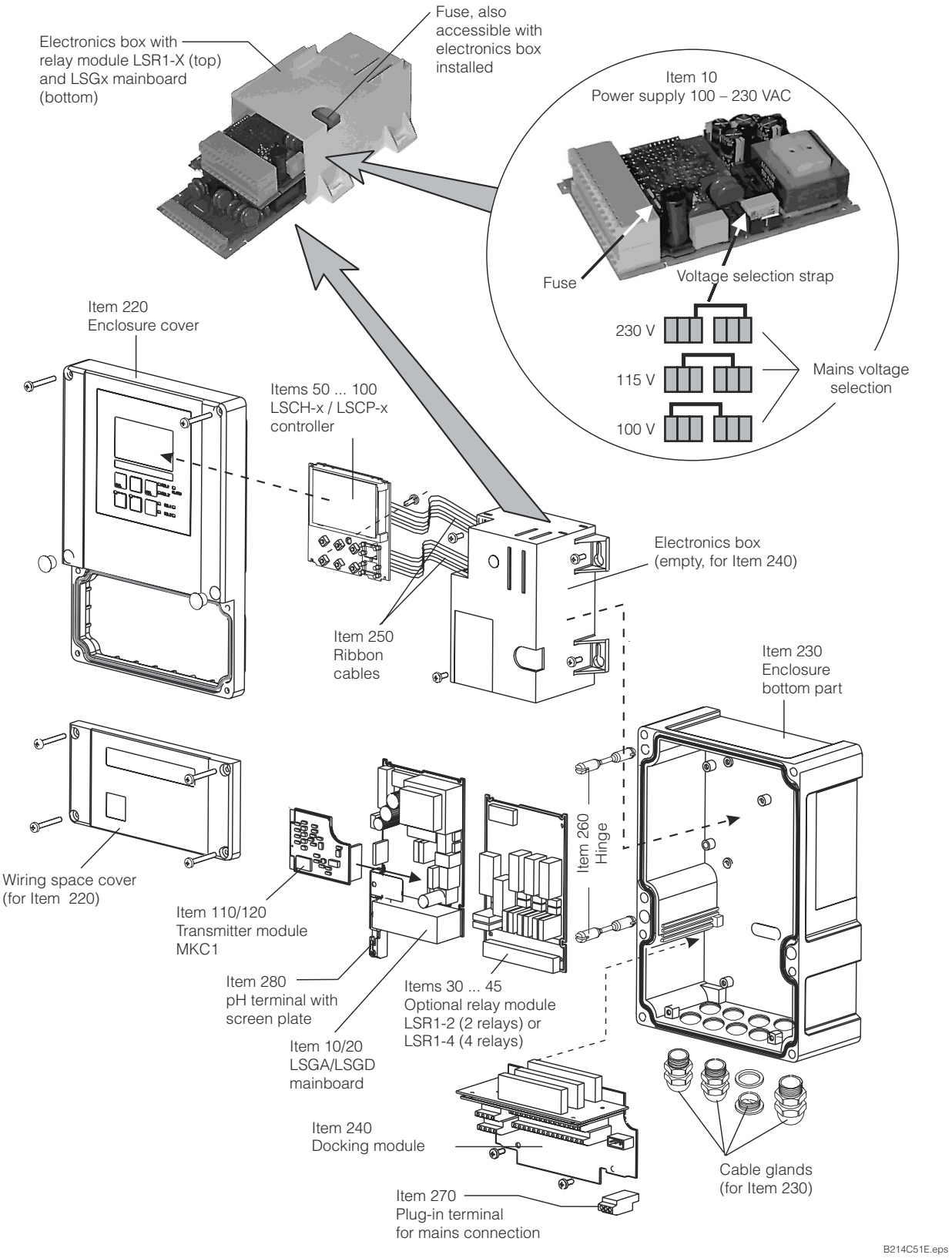
Assembly takes place in the opposite sequence.
- Tighten the special screw by hand without using a tool.
- You cannot assemble the instrument incorrectly! You cannot insert the module block in the housing if you have plugged it together incorrectly.

8.2.4 Spare parts kits for OCM 223

Item	Kit name	Name	Function	Order code
10	Mainboard	LSGA	100 / 115 / 230 V AC	51500317
20	Mainboard	LSGD	24 V AC + DC	51500318
30	Relay module	LSR1-2	2 relays	51500320
35	Relay module	LSR1-4	4 relays	51500321
40	Relay module	LSR1-2+IEIN	2 relays with current input	51504304
45	Relay module	LSR1-4+IEIN	4 relays with current input	51504305
50	Controller	LSCH-S1	1 current output	51502467
60	Controller	LSCH-S2	2 current outputs	51502468
110	Cl transmitter	MKC1	Input Cl and temperature	51502466
120	Cl /pH transmitter	MKC1	Input Cl, pH/mV, temperature	51502465
130	Enclosure complete		Enclosure with front membrane, key pins, seal, screw, clamping straps	51501075
140	Enclosure mechanical parts		Back panel, side panel, special screw, end frame	51501076
150	Terminal strip set, complete		Terminal strip set: inputs/outputs, supply, alarm relay	51502463
180	Terminal strips		Terminal strip for relay modules	51501078
200	pH input socket		Socket with screen plate	51501070
210	BNC connector		BNC easy solderless, angled	50074961
220	Side panel		Kit with 10 parts	51502124

8.3 Corrective maintenance of OCM 253

8.3.1 Exploded view



8.3.2 Disassembly of OCM 253

1. Open and remover the connection compartment cover.
2. Pull out the mains terminal (item 270) to de-energise the instrument.
3. Open the housing cover and remove the ribbon cable (item 250) on the electronics box.
4. Dismantling the controller (item 50 … 100):
   – Slacken the central screw on the LCD cover.
5. Dismantling the electronics box:
   – Slacken the four screws in the bottom housing part, then push the entire box to the rear and remove upwards.
   Make absolutely sure that the locks do not open!
   – After removing the box, bend out the module locks and remove the module(s).
6. Dismantling the docking module (item 240):
   – Remove the two screws in the bottom housing part and remove the entire docking module upwards.
7. Dismantling the Cl transmitter (item 120) on instruments with pH/mV input:
   – Bend up the screen plate
   – Remove the inserted strands from the BNC socket, then pull the module upwards.

8.3.3 Assembly of OCM 253

- Carefully insert the module(s) in the guide rails of the electronics box and engage it (them) in the side lugs on the box.
- You cannot assemble the instrument incorrectly! You cannot start up modules inserted incorrectly in the electronics box since you cannot insert the ribbon cable.

Caution!
Make sure that the cover seal is undamaged to ensure ingress protection IP 65.

8.3.4 Spare parts kits for OCM 253

Item	Kit name	Name	Function	Order code
10	Mainboard	LSGA	100 / 115 / 230 V AC	51500317
20	Mainboard	LSGD	24 V AC + DC	51500318
30	Relay module	LSR1-2	2 relays	51500320
40	Relay module	LSR1-4	4 relays	51500321
40	Relay module	LSR1-2+IEIN	2 relays with current input	51504304
45	Relay module	LSR1-4+IEIN	4 relays with current input	51504305
50	Controller	LSCH-S1	1 current output	51502467
60	Controller	LSCH-S2	2 current outputs	51502468
110	Cl transmitter	MKC1	Input Cl and temperature	51502466
120	Cl /pH transmitter	MKC1	Input Cl, pH/mV, temperature	51502465
220	Enclosure cover		Enclosure cover, connection compartment cover, front membrane, hinges, screws, sundry parts	51501068
230	Lower housing part		Lower part, screw unions	51501072
240	Docking module		Docking module, electronics box empty, sundry parts	51501073

Item	Kit name	Name	Function	Order code
250	Ribbon cables		1 set of ribbon cables	51501074
260	Hinges		2 pair of hinges	51501069
270	Terminal strip		Terminal strip for mains connection	51501079
280	pH terminal		pH terminal with screen plate	51501071

8.3.5 Special case: Replacing the controller

Note!
Since the serial number is linked to the release number to enable the Plus package and/or ChemoClean, an existing Plus package or ChemoClean cannot be active. In general all variable data are at factory setting when a controller is replaced.

If you replace a controller, proceed as follows:

1. If possible, note down the user settings on the instrument, e.g.:
   – calibration data
   – current assignments (CI, temperature, pH)
   – relay functions selected
   – limits/controller settings
   – cleaning settings
   – monitoring functions
   – interface parameters
2. Dismantle the instrument as described in chapter 8.2.2 or 8.3.2.
3. Check the part number on the controller to see whether it is the same as the previous module.
4. Re-assemble the instrument with the new module as described in chapter 8.2.3 or 8.3.3.
5. Start the instrument up and check the basic functions (e.g. measured value and temperature readings, operability using the keyboard).
6. Enter the instrument serial number:
   – Read the serial number (“ser-no.”) of the instrument from the nameplate.
   – Edit this number in fields E115 (year, one digit), E116 (month, one digit), E117 (sequence number, four digits).
   – Field E118 displays the complete number for verification. Then confirm by pressing ENTER or abort and re-enter.

Caution!
The serial number can be entered **only once** on a brand-new module! Therefore make sure your entry is correct before you press ENTER. If you enter the incorrect number the additional functions will not be enabled. An incorrect serial number can only be corrected at the factory.

7. Enter the release codes for Plus package and/or ChemoClean if existing.
8. Check the release of the Plus package (e.g. by retrieving the CHECK / Code P) function group or the ChemoClean function.
9. If possible, reset the user settings on the instrument.

8.4 Ordering spare parts

Order spare parts from your nearest sales centre. The address is on the rear of these operating instructions. Use the Order Number listed in chapter 8.2.4 or 8.3.4.

To be on the safe side, **always** quote the following information on the spare parts order:
- Instrument order code
- Serial number (ser-no.)
- Software version, if possible.

The order code and serial number are on the nameplate. The software version is in field E111, if the instrument processor system still works.

8.5 “Optoscope” service equipment with “Scopeware”

The Optoscope in conjunction with the “Scopeware” software opens the following possibilities **without** removing or opening the instrument and **without** making an electrical connection:
- 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 acts as an interface between the instrument and the PC / Laptop. Information is transferred via the optical interface on the instrument and via the RS 232 interface on the PC / Laptop.

Handling and operation are described in the Optoscope operating instructions. The required Windows “Scopeware” software comes in the scope of supply.

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

Order number of the Optoscope: 51500650.

8.6 Corrective maintenance of the complete measuring point

8.6.1 Chlorine sensors and chlorine flow assemblies

Corrective maintenance for chlorine sensors and assemblies is described in the operating instructions. Use and refer to the operating instructions relating to your measuring system:
- Use operating instructions BA 058e00 to service the OCS 140 / 141 chlorine sensors.
- Use the operating instructions BA 114e00 to service the OCS 240 / 241 chlorine dioxide sensors.
- Use operating instructions BA 039e00 to service the 963 chlorine sensor.
- Use the operating instructions BA 062e00 to assemble, connect and service the OCA 250 chlorine flow assembly.

8.6.2 pH/mV sensors (EP instrument option)

Visible contamination on the glass electrodes can be cleaned as follows:
- *Oily and fatty deposits*
  clean with detergent (grease solvent, alcohol, or washing detergent).

Warning!
Protect your hands, eyes and clothing when you use the following detergent.

- *Lime and metal hydroxide deposits*
  Remove deposits with diluted hydrochloric acid (3%), then carefully rinse.

Blocked membranes can be mechanically cleaned (does not apply to TEFLON® membranes and annular gap electrodes):
- Use a small key file.
- Only file in one direction.

Air bubbles in the electrode
Air bubbles indicate incorrect assembly; therefore check the installation position.
- Permitted: 15° to 165° to the horizontal.
- Not permitted: horizontal installation or installation with the plug-in head pointing downwards.

Redox electrodes
Carefully use mechanical means to clean metal pins or surfaces which have deposits on them.
Redox electrode may require some time in redox butter solution after cleaning and/or calibration in before they indicate the correct measured value again.

8.6.3 pH connecting lines and sockets (EP instrument option)

Check all cables and connections for moisture. Moisture is indicated by a shallow sensor slope. Possibly, no calibration is possible or the LCD may be even fixed at pH 7.
Check the following parts for humidity and contamination:
- Sensor head
- Sensor connector
- pH measuring cable
- Junction box, if fitted
- Outgoing pH measuring cable.

The sensor head and junction box can be cleaned and dried.

Caution!
Make sure you replace moist measuring cables!

8.7 Test and simulation

8.7.1 Chlorine sensors

Chlorine sensors work according to the amperometric principle and supply very small direct current as measuring signals.
A chlorine sensor can be simulated by a DC source. Due to the small currents, however, the simulation is highly sensitive. Lines should be screened and the simulator earthed.
You will find typical slope values in the table below.

Sensor	Typical slope value
OCS 140	approx. 25 nA per mg Cl/l
OCS 141	approx. 80 nA per mg Cl/l
OCS 240	approx. 100 nA per mg ClO_2/l
OCS 241	approx. 350 nA per mg ClO_2/l
963	approx. 20 µA per mg Cl/l

8.7.2 Temperature measurement

The OCM 223 / 253 is equipped with the NTC sensor of the chlorine sensor to measure temperature.
Due to the relatively high sensor resistance, a two-wire connection is sufficient.
Simulation can take place with a normal decade resistor. The table below contains some simulation values.

Temperature	NTC simulation value
0 °C	29.490 kΩ
10 °C	18.787 kΩ
20 °C	12.268 kΩ
25 °C	10.000 kΩ
30 °C	8.197 kΩ
40 °C	5.594 kΩ

Note!
In case of a defective temperature sensor, measurement is automatically continued with 25 °C.

8.7.3 pH/redox measurement

Simulation takes place with a pH/mV simulator or an mV voltage source.

Caution!
On the OCM 223 / 253, pH or mV must always be measured symmetrically. For this reason, each simulation requires potential matching with the simulator. Connect the reference signal of the simulators (normal screen of the pH coaxial measuring line) to the PA/PM terminal of the instrument.

Zero point rapid test
- On the OCM 223 connect the BNC inner conductor to the BNC receptacle and the PM terminal.
- On the OCM 253 connect the pH terminal, the Ref terminal and the PM terminal.
- For pH, the reading must be about 7, for redox about 0 mV.

Test with DC voltage source

pH value	Simulation
2	295 mV
4	177 mV
7	0 mV
9	–118 mV
12	–295 mV

8.7.4 Flow monitoring

Flow is monitored by an inductive proximity switch (INS) in the OCA 250 assembly. This switch is powered by 15 V from the auxiliary voltage output of the instrument.

Function of the INS

Flow	INS	INS output
yes	damped	low impedance
no	not damped	high impedance

Test or emergency mode
If you connect terminal 93 to terminal 85 and terminal 94 to terminal 86, this simulates an active proximity switch and thus a correct flow.

Caution!
Do not run the measuring system continuously in this state and switch the flow monitor back on as soon as possible!

9 Accessories

9.1 Connection accessories

- VBC junction box (see chapter 4.2.2)
  Junction box for lengthening measuring cable connection between sensor cable and transmitter. Ingress Protection IP 65.
  Order No. 50005181

- CMK extension cable
  Special measuring cable for OCS 140 / 141 and OCS 240 / 241 sensors to extend the line between the transmitter and the VBC junction box.
  Order No. 50005374

- pH measuring cable OPK 1
  Industry version with outer screen and coaxial conductor and with an electrode connector. PVC cable sheath, cable diameter 7.2 mm.
  Technical Information TI 118e00

- pH measuring cable OPK 9
  Industry version with outer screen and coaxial conductor and with TOP 68 electrode connector. PVC cable sheath, cable diameter 7.2 mm. Ingress protection IP 68.
  Technical Information TI 118e00

- Extension cable OYK 71
  For pH/redox electrodes or conductivity sensors with temperature sensor.
  Consisting of one coaxial conductor of low-noise quality and four auxiliary cores (0.75 mm^2 each) with common screen, outside diameter 7.2 mm.
  Minimum length 5 m.
  Order No. 50085333

- Extension cable MK
  Two-core signal line with additional screen and PVC insulation. Preferably for transmission of output signals of transmitters or input signals of controllers and for temperature measurement.
  Order No. 50000662

9.2 Mounting accessories

- Weather protection cover OYY 101
  Technical Information TI 092e00

- Post mounting kit for transmitter and weather protection cover
  Technical Information TI 092e00

- Universal mounting post OYY 102 for transmitter
  Technical Information TI 092e00

9.3 Sensors

- OCS 140
  Membrane-covered amperometric sensor for free chlorine in measuring range 0.05 … 20 mg/l
  Technical Information TI 058e00

- OCS 141
  Membrane-covered amperometric trace sensor for free chlorine in measuring range 0.01 … 5 mg/l
  Technical Information TI 058e00

- OCS 240
  Membrane-covered amperometric sensor for chlorine dioxide in measuring range 0.05 … 20 mg/l
  Technical Information TI 114e00

- OCS 241
  Membrane-covered amperometric trace sensor for chlorine dioxide in measuring range 0.01 … 5 mg/l
  Technical Information TI 114e00

- OPS 12
  Redox combination electrode with dirt-repellent PTFE membrane, polytex gel filling and encapsulated reference system, max. pressure 6 bar.
  Technical Information TI 028e00

- OPS 31
  pH combination electrode with ceramic membrane and maintenance-free electrolyte filling, for applications in drinking water and swimming pools, max. pressure 0.6 bar.
  Technical Information TI 030e00

- OPS 32
  Redox combination electrode with ceramic membrane and maintenance-free electrolyte filling, for applications in drinking water and swimming pools, max. pressure 0.6 bar.
  Available on request.

9.4 Calibration accessories

- OCM 182
  Photometer for chlorine/chlorine dioxide detection acc. to the DPD method
  Measuring range chlorine: 0 ... 6 mg/l
  Measuring rage chlorine dioxide: 0 ... 2.8 mg/l
  Technical Information TI 121e00

9.5 Instrument upgrade

Orders will only be accepted when you quote the serial number of the instrument on your order.

- Plus package
  Order No. 51502242

- ChemoClean
  Order No. 51502871

- 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

- pH package for EK version
  Order No. 51502460

- pH package for ES version
  Order No. 51503526

10 Technical data

General specifications	
Product designation	OCM 223 OCM 253
Input	
Measured values	Free chlorine or chlorine dioxide, temperature, pH or redox (optional)
Cl_2/ClO_2 measurement	
Display and measuring range	0 … 5 mg/l or 20 … mg/l
Application measuring range	0.05 … 20 mg/l for OCS 140 / 240 sensors 0.01 … 5 mg/l for OCS 141 / 241 sensors 0.05 … 5 mg/l for 963 sensor
Temperature compensation range	2 … 45 °C
pH compensation range for free chlorine	pH 4 … 9
Reference point for nominal slope	25 °C / pH 7.2
Cl_2/ClO_2 signal input	
OCS 140 / 141 / 240 / 241 sensors	0 … 5000 nA
963 sensor	–100 … 500 µA
Temperature measurement	
Temperature sensor (with OCS 140 / 141 / 240 /241)	NTC, 10 kΩ at 25 °C
Display range	0 … 50 °C
pH and redox measurement	
pH measuring range	pH 3.5 … 9.5
Redox measuring range	0 … 1500 mV
Zero point adjustment	±100 mV
Slope adjustment	38 … 65 mV/pH
Digital inputs 1 and 2	
Voltage	10 … 50 V DC
Current drain	max. 10 mA
Current input	
Current range	4 … 20 mA, galvanically isolated, passive
Load	Voltage drop 5.2 V [] load 260 Ω at 20 mA

Output	
Signal outputs Cl_2/ClO_2 or temperature/pH/redox (optional)	
Current range	0 / 4 … 20 mA, galvanically isolated, active; error current 2.4 / 22 mA
Min. distance 0 / 4 … 20 mA signal	min. 10% of respective measuring span
Load	max. 500 Ω
Max. resolution	700 digits/mA
Transfer range Cl_2/ClO_2	0 … 20 mg/l for OCS 140 / 240 sensors 0 … 5 mg/l for OCS 141 / 241 and 963 sensors
Temperature transfer range	0 … 50 °C
pH transfer range	pH 4 … 9
Redox transfer range	0 … 1500 mV
Isolation voltage	max. 350 V_{rms} / 500 V DC
Overvoltage 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 resistive 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 resistive 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 contact	
Pickup/dropout delay	0 … 7200 s
Controller	
Function (adjustable)	Pulse-length / pulse-frequency controller Three-point step controller for Cl_2/ClO_2
Controller response	P, PI, PD, PID
Control 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 length of pulse-length controller	0.5 … 999.9 s
Max. frequency of pulse-frequency controller	60 … 180 min^{-1}
Basic load	0 ... 40% of max. set value
Motor run time for three-point step controller	10 … 999 s
Neutral zone for three-point step controller	0 … 40%

Output (continued)	
Alarm	
Function (selectable)	Steady contact / fleeting contact
Alarm threshold adjustment range	Cl_2/ClO_2 / pH / redox / temperature: full measuring range
Error delay	0 … 2000 min (s)
Monitoring time for lower limit violation	0 … 2000 min
Monitoring time for upper limit violation	0 … 2000 min
Accuracy	
Cl_2/ClO_2 measurement	
Measured value resolution OCS 140 / 240 / 963	0.01 mg/l
Measured value resolution OCS 141 / 241	0.001 mg/l
Measurement deviation[1] display (pH, *T* = const)	max. 0.5% of measured value ± 4 digits
Reproducibility	max. 0.2% of measuring range
Measurement deviation[1] Cl_2/ClO_2 signal output	max. 0.75% of current output range
Deviation for Cl_2/ClO_2 measurement with 963 sensor	
Measurement deviation[1] display (pH, *T* = const)	max. 1% of measuring range ± 4 digits
Temperature measurement	
Measured value resolution	0.1 °C
Measurement deviation[1] display	± 0.3 K
Measurement deviation[1] temp. signal output	max. 1.25% of current output range
pH and redox measurement	
pH measured value resolution	pH 0.01
Redox measured value resolution	1 mV
Measurement deviation[1] pH display	pH 0.03
Measurement deviation[1] redox display	3 mV
Measurement deviation[1] pH signal output	max. 1.25% of current output range
Measurement deviation[1] redox 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 transport temperature	–25 … +65 °C
Relative humidity (nominal operating conditions)	10 … 95%, non-condensing
Ingress protection panel-mounted unit	IP 54 (front panel), IP 30 (housing)
Ingress protection field housing	IP 65
Electromagnetic compatibility	Interference emission and interference immunity acc. to EN 61326:1997 / A1:1998

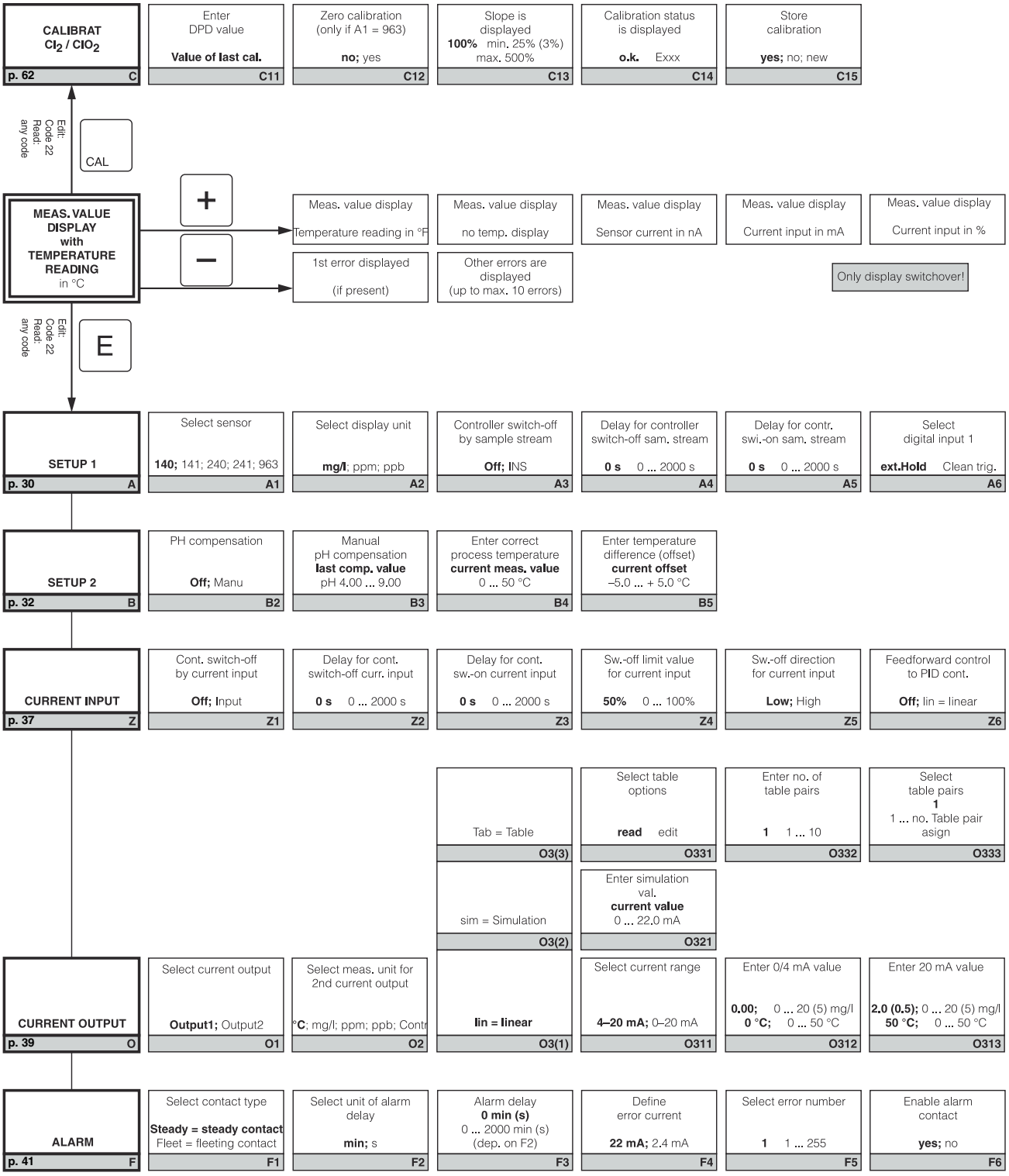
Physical data	
Dimensions of panel-mounted unit (h × w × d)	96 × 96 × 145 mm
Installation depth	approx. 165 mm
Dimensions of field housing (h × w × d)	247 × 170 × 115 mm
Weight of panel-mounted unit	max. 0.7 kg
Weight with field housing	max. 2.3 kg
Display	LC display, two lines, five- and nine-digit with status indicators
Materials	
Enclosure of panel-mounted unit	Polycarbonate
Front membrane	Polyester, UV-resistant
Field housing	ABS PC Fr
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
Fuse protection	Fine-wire fuse, medium time-lag 250 V / 3.15 A

[1]acc. to IEC 60746-1, at nominal operating conditions

Subject to modifications.

11 Annex

11.1 Operating matrix of EK and ES versions

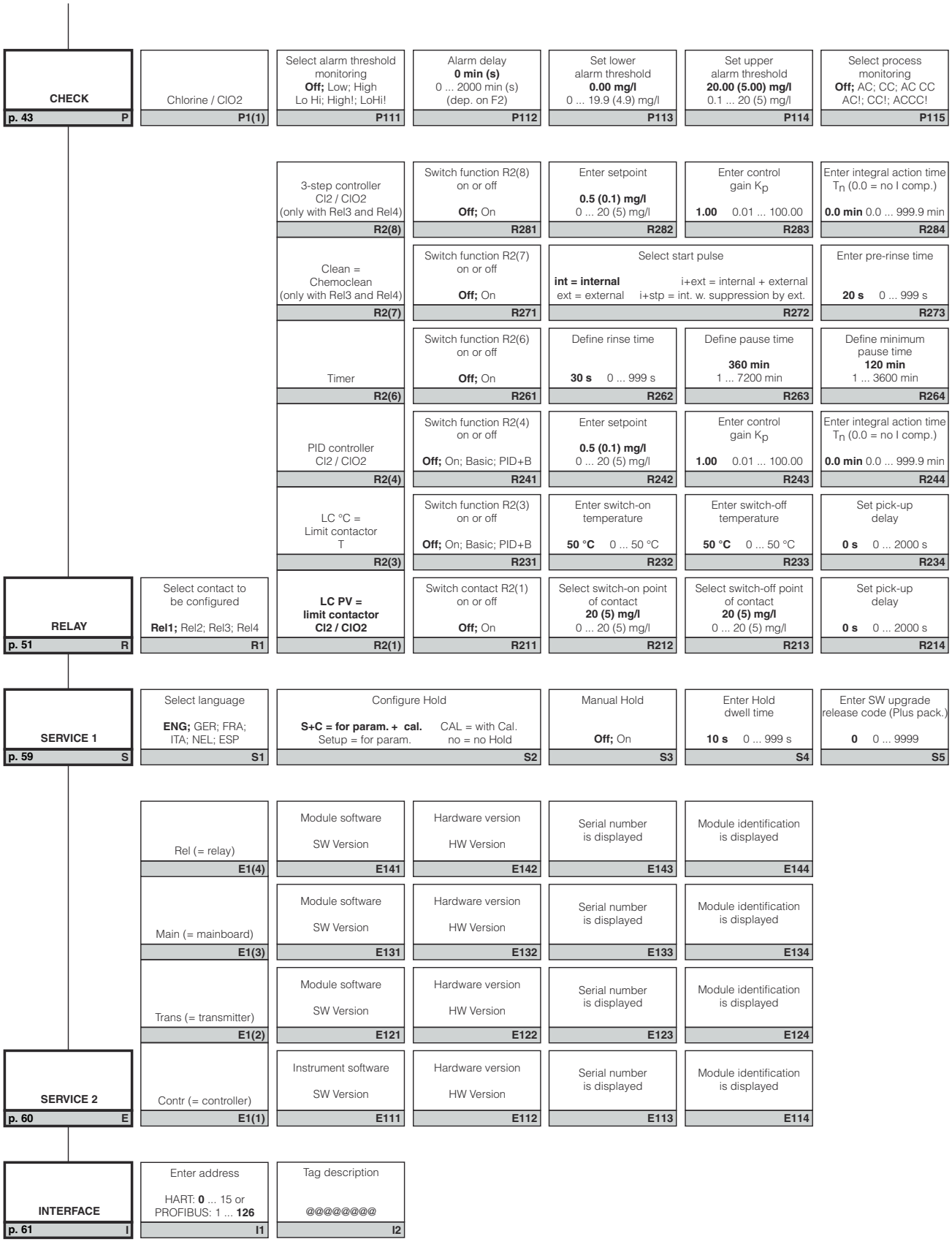


Enter meas. value damping **1** (no damping) 1 ... 60
A7

Feedforward control gain = 1 at **50%** 0 ... 100%
Z7

Enter x value (meas. val.)	Enter y value (current)	Table status o.k.
0.00; 0 ... 20 (5) mg/l **0 °C;** 0 ... 50 °C	**4.00 mA** 0 ... 20.00 mA	**yes;** no
O334	**O335**	**O336**

Enable error current for error just entered	Automatic start of cleaning function	Select “next error” or return to menu **next = next error**
no; yes	**no;** yes	<---R
F7	**F8**	**F9**


CHECK
p. 43 P
Chlorine / ClO2
P1(1)
Select alarm threshold monitoring
Off; Low; High
Lo Hi; High!; LoHi!
P111
Alarm delay
0 min (s)
0 ... 2000 min (s)
(dep. on F2)
P112
Set lower alarm threshold
0.00 mg/l
0 ... 19.9 (4.9) mg/l
P113
Set upper alarm threshold
20.00 (5.00) mg/l
0.1 ... 20 (5) mg/l
P114
Select process monitoring
Off; AC; CC; AC CC
AC!; CC!; ACCC!
P115
3-step controller Cl2 / ClO2 (only with Rel3 and Rel4)
R2(8)
Switch function R2(8) on or off
Off; On
R281
Enter setpoint
0.5 (0.1) mg/l
0 ... 20 (5) mg/l
R282
Enter control gain Kp
1.00 0.01 ... 100.00
R283
Enter integral action time Tn (0.0 = no I comp.)
0.0 min 0.0 ... 999.9 min
R284
Clean = Chemoclean (only with Rel3 and Rel4)
R2(7)
Switch function R2(7) on or off
Off; On
R271
Select start pulse
int = internal i+ext = internal + external
ext = external i+stp = int. w. suppression by ext.
R272
Enter pre-rinse time
20 s 0 ... 999 s
R273
Timer
R2(6)
Switch function R2(6) on or off
Off; On
R261
Define rinse time
30 s 0 ... 999 s
R262
Define pause time
360 min
1 ... 7200 min
R263
Define minimum pause time
120 min
1 ... 3600 min
R264
PID controller Cl2 / ClO2
R2(4)
Switch function R2(4) on or off
Off; On; Basic; PID+B
R241
Enter setpoint
0.5 (0.1) mg/l
0 ... 20 (5) mg/l
R242
Enter control gain Kp
1.00 0.01 ... 100.00
R243
Enter integral action time Tn (0.0 = no I comp.)
0.0 min 0.0 ... 999.9 min
R244
LC °C = Limit contactor T
R2(3)
Switch function R2(3) on or off
Off; On; Basic; PID+B
R231
Enter switch-on temperature
50 °C 0 ... 50 °C
R232
Enter switch-off temperature
50 °C 0 ... 50 °C
R233
Set pick-up delay
0 s 0 ... 2000 s
R234
RELAY
p. 51 R
Select contact to be configured
Rel1; Rel2; Rel3; Rel4
R1
LC PV = limit contactor Cl2 / ClO2
R2(1)
Switch contact R2(1) on or off
Off; On
R211
Select switch-on point of contact
20 (5) mg/l
0 ... 20 (5) mg/l
R212
Select switch-off point of contact
20 (5) mg/l
0 ... 20 (5) mg/l
R213
Set pick-up delay
0 s 0 ... 2000 s
R214
SERVICE 1
p. 59 S
Select language
ENG; GER; FRA; ITA; NEL; ESP
S1
Configure Hold
S+C = for param. + cal. CAL = with Cal.
Setup = for param. no = no Hold
S2
Manual Hold
Off; On
S3
Enter Hold dwell time
10 s 0 ... 999 s
S4
Enter SW upgrade release code (Plus pack.)
0 0 ... 9999
S5
Rel (= relay)
E1(4)
Module software
SW Version
E141
Hardware version
HW Version
E142
Serial number is displayed
E143
Module identification is displayed
E144
Main (= mainboard)
E1(3)
Module software
SW Version
E131
Hardware version
HW Version
E132
Serial number is displayed
E133
Module identification is displayed
E134
Trans (= transmitter)
E1(2)
Module software
SW Version
E121
Hardware version
HW Version
E122
Serial number is displayed
E123
Module identification is displayed
E124
SERVICE 2
p. 60 E
Contr (= controller)
E1(1)
Instrument software
SW Version
E111
Hardware version
HW Version
E112
Serial number is displayed
E113
Module identification is displayed
E114
INTERFACE
p. 61 I
Enter address
HART: 0 ... 15 or
PROFIBUS: 1 ... 126
I1
Tag description
@@@@@@@@
I2

Set max. perm. period of exceeded lower limit	Set max. perm. period of exceeded upper limit	Set limit value
60 min 0 ... 2000 min	**120 min** 0 ... 2000 min	**0.5 (0.1) mg/l** 0 ... 20 (5) mg/l
P116	**P117**	**P118**

Enter min. switch-on time t_{ON}	Motor run time	Neutral zone
0.3 s 0.1 ... 5.0 s	**60 s** 10 ... 999 s	**10%** 0 ... 40%
R285	**R286**	**R287**

3-p. step contr.: assigns 2 contacts, only permitted for contacts 3+4

Enter cleaning time	Enter post-rinse time	Define repeat times	Define period between two cleaning cycles (pause time)	Define min. pause time	Number of cleaning cycles without cleaning agent
10 s 0 ... 999 s	**20 s** 0 ... 999 s	**0** 0 ... 5	**360 min** 1 ... 7200 min	**120 min** 1 ... R287 min	**0** 0 ... 9
R274	**R275**	**R276**	**R277**	**R278**	**R279**

Chemoclean: assigns 2 contacts, only permitted for contacts 3+4

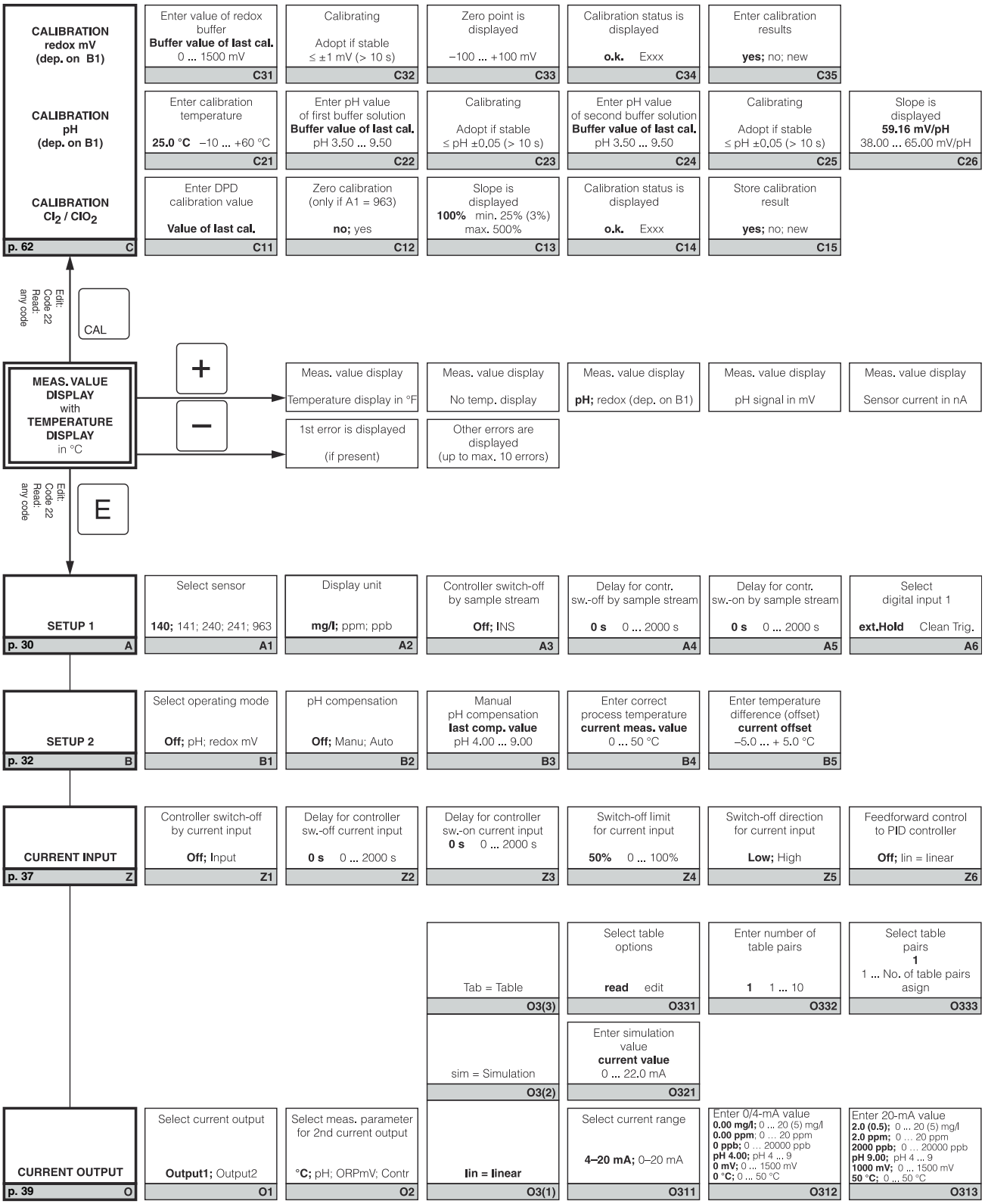
Enter deriv. action time T_V (0.0 = no D comp.)	Select control characteristic	Select	Enter pulse period	Enter max. pulse frequency	Enter min switch-on time t_{ON}	Enter basic load
0.0 min 0.0 ... 999.9 min	**inv;** dir	**len = pulse length** freq = pulse frequency curr = current output 2	**10.0 s** 0.5 ... 999.9 s	**120 1/min** 60 ... 180 1/min	**0.3 s** 0.1 ... 5.0 s	**0%** 0 ... 40%
R245	**R246**	**R247**	**R248**	**R249**	**R2410**	**R2411**

Set drop-out delay	Set alarm threshold (as abs. value)	Display LC status
0 s 0 ... 2000 s	**50 °C** 0 ... 50 °C	**MAX**; MIN
R235	**R236**	**R237**

Set dropout delay	Set alarm threshold (as abs. value)	Display LC status
0 s 0 ... 2000 s	**20 (5) mg/l** 0 ... 20 (5) mg/l	**MAX**; MIN
R215	**R216**	**R217**

Enter SW upgrade release code Chemocl.	Order number is displayed	Serial number is displayed	Reset instrument	Start instrument test
0 0 ... 9999			**no;** sens; factory	**no;** display
S6	**S7**	**S8**	**S9**	**S10**

11.2 Operating matrix of EP version



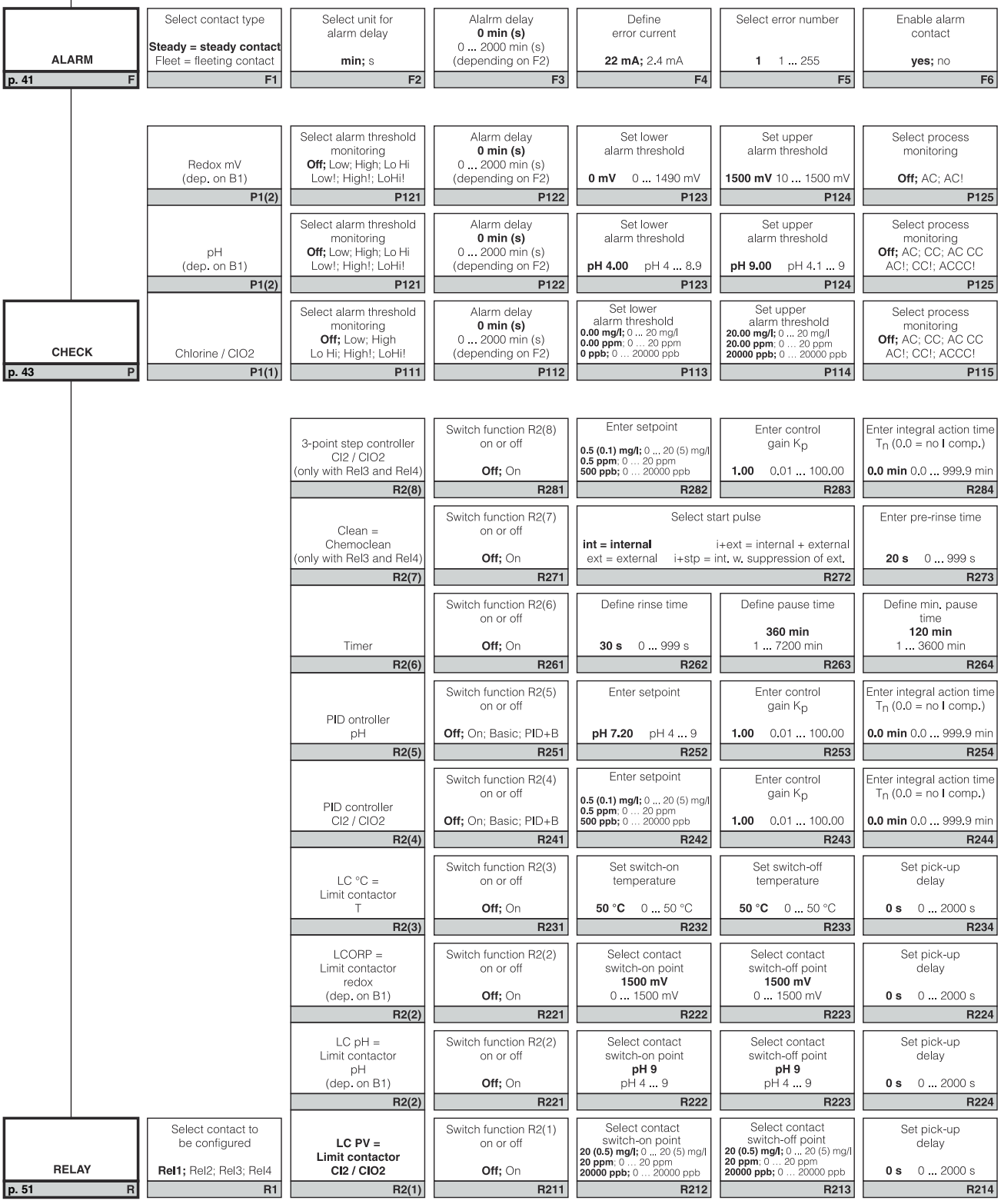
Zero point is displayed **pH 7.00** pH 5.00 ... 9.00	Calibration status is displayed **o.k.** Exxx	Store calibration results **yes;** no; new
C27	**C28**	**C29**

Meas. value display Current input in mA	Meas. value display Current input in %	Only LCD switchover!

Enter meas. value damping **1** (no damping) 1 ... 60
A7

Feedforward control gain = 1 at **50%** 0 ... 100%
Z7

Enter x value (meas. val.) **0.,00;** 0 ... 20 (5) mg/l **pH 4.00;** pH 4 ... 9 **0 mV;** 0 ... 1500 mV **0 °C;** 0 ... 50 °C	Enter y value (current) **4.00 mA** 0 ... 20.00 mA	Table status o.k. **yes;** no
O334	**O335**	**O336**


ALARM
p. 41 F
Select contact type
Steady = steady contact
Fleet = fleeting contact
F1
Select unit for alarm delay
min; s
F2
Alarm delay
0 min (s)
0 ... 2000 min (s)
(depending on F2)
F3
Define error current
22 mA; 2.4 mA
F4
Select error number
1 1 ... 255
F5
Enable alarm contact
yes; no
F6
CHECK
p. 43 P
Redox mV (dep. on B1)
P1(2)
Select alarm threshold monitoring
Off; Low; High; Lo Hi Low!; High!; LoHi!
P121
Alarm delay
0 min (s)
0 ... 2000 min (s)
(depending on F2)
P122
Set lower alarm threshold
0 mV 0 ... 1490 mV
P123
Set upper alarm threshold
1500 mV 10 ... 1500 mV
P124
Select process monitoring
Off; AC; AC!
P125
pH (dep. on B1)
P1(2)
Select alarm threshold monitoring
Off; Low; High; Lo Hi Low!; High!; LoHi!
P121
Alarm delay
0 min (s)
0 ... 2000 min (s)
(depending on F2)
P122
Set lower alarm threshold
pH 4.00 pH 4 ... 8.9
P123
Set upper alarm threshold
pH 9.00 pH 4.1 ... 9
P124
Select process monitoring
Off; AC; CC; AC CC AC!; CC!; ACCC!
P125
Chlorine / ClO2
P1(1)
Select alarm threshold monitoring
Off; Low; High Lo Hi; High!; LoHi!
P111
Alarm delay
0 min (s)
0 ... 2000 min (s)
(depending on F2)
P112
Set lower alarm threshold
0.00 mg/l; 0 ... 20 mg/l
0.00 ppm; 0 ... 20 ppm
0 ppb; 0 ... 20000 ppb
P113
Set upper alarm threshold
20.00 mg/l; 0 ... 20 mg/l
20.00 ppm; 0 ... 20 ppm
20000 ppb; 0 ... 20000 ppb
P114
Select process monitoring
Off; AC; CC; AC CC AC!; CC!; ACCC!
P115
3-point step controller Cl2 / ClO2 (only with Rel3 and Rel4)
R2(8)
Switch function R2(8) on or off
Off; On
R281
Enter setpoint
0.5 (0.1) mg/l; 0 ... 20 (5) mg/l
0.5 ppm; 0 ... 20 ppm
500 ppb; 0 ... 20000 ppb
R282
Enter control gain K_p
1.00 0.01 ... 100.00
R283
Enter integral action time T_n (0.0 = no I comp.)
0.0 min 0.0 ... 999.9 min
R284
Clean = Chemoclean (only with Rel3 and Rel4)
R2(7)
Switch function R2(7) on or off
Off; On
R271
Select start pulse
int = internal i+ext = internal + external
ext = external i+stp = int. w. suppression of ext.
R272
Enter pre-rinse time
20 s 0 ... 999 s
R273
Timer
R2(6)
Switch function R2(6) on or off
Off; On
R261
Define rinse time
30 s 0 ... 999 s
R262
Define pause time
360 min
1 ... 7200 min
R263
Define min. pause time
120 min
1 ... 3600 min
R264
PID ontroller pH
R2(5)
Switch function R2(5) on or off
Off; On; Basic; PID+B
R251
Enter setpoint
pH 7.20 pH 4 ... 9
R252
Enter control gain K_p
1.00 0.01 ... 100.00
R253
Enter integral action time T_n (0.0 = no I comp.)
0.0 min 0.0 ... 999.9 min
R254
PID controller Cl2 / ClO2
R2(4)
Switch function R2(4) on or off
Off; On; Basic; PID+B
R241
Enter setpoint
0.5 (0.1) mg/l; 0 ... 20 (5) mg/l
0.5 ppm; 0 ... 20 ppm
500 ppb; 0 ... 20000 ppb
R242
Enter control gain K_p
1.00 0.01 ... 100.00
R243
Enter integral action time T_n (0.0 = no I comp.)
0.0 min 0.0 ... 999.9 min
R244
LC °C = Limit contactor T
R2(3)
Switch function R2(3) on or off
Off; On
R231
Set switch-on temperature
50 °C 0 ... 50 °C
R232
Set switch-off temperature
50 °C 0 ... 50 °C
R233
Set pick-up delay
0 s 0 ... 2000 s
R234
LCORP = Limit contactor redox (dep. on B1)
R2(2)
Switch function R2(2) on or off
Off; On
R221
Select contact switch-on point
1500 mV
0 ... 1500 mV
R222
Select contact switch-off point
1500 mV
0 ... 1500 mV
R223
Set pick-up delay
0 s 0 ... 2000 s
R224
LC pH = Limit contactor pH (dep. on B1)
R2(2)
Switch function R2(2) on or off
Off; On
R221
Select contact switch-on point
pH 9
pH 4 ... 9
R222
Select contact switch-off point
pH 9
pH 4 ... 9
R223
Set pick-up delay
0 s 0 ... 2000 s
R224
RELAY
p. 51 R
Select contact to be configured
Rel1; Rel2; Rel3; Rel4
R1
LC PV = Limit contactor Cl2 / ClO2
R2(1)
Switch function R2(1) on or off
Off; On
R211
Select contact switch-on point
20 (0.5) mg/l; 0 ... 20 (5) mg/l
20 ppm; 0 ... 20 ppm
20000 ppb; 0 ... 20000 ppb
R212
Select contact switch-off point
20 (0.5) mg/l; 0 ... 20 (5) mg/l
20 ppm; 0 ... 20 ppm
20000 ppb; 0 ... 20000 ppb
R213
Set pick-up delay
0 s 0 ... 2000 s
R214

Enable error current for error just entered	Automatic start of clean function	Select “next error” or return to menu
no; yes	**no;** yes	**next = next error** <---R
F7	**F8**	**F9**

Set max. perm. period for lower alarm threshold	Set max. perm. period for upper alarm threshold	Set limit value
60 min 0 ... 2000 min	**120 min** 0 ... 2000 min	**pH 7.20** pH 4 ... 9
P126	**P127**	**P128**

Set max. perm. period for lower limit exceeded	Set max. perm. period for lower limit exceeded	Set limit value
60 min 0 ... 2000 min	**120 min** 0 ... 2000 min	**0.5 (0.1) mg/l;** 0 ... 20 (5) mg/l **0.5 ppm**; 0 ... 20 ppm **500 ppb;** 0 ... 20000 ppb
P116	**P117**	**P118**

Enter min. switch-on time t_{ON}	Motor run time	Neutral zone	**3-p. step controller:** assigns 2 contacts, only permitted for contacts 3+4
0.3 s 0.1 ... 5.0 s	**60 s** 10 ... 999 s	**10%** 0 ... 40%	
R285	**R286**	**R287**	

Enter cleaning time	Enter post-rinse time	Define repeat cycles	Define period between two cleaning cycles (pause time)	Define minimum pause time	Number of cleaning cycles without cleaning agent	**Chemoclean:** assigns 2 contacts, only permitted for contacts 3 (+4)
10 s 0 ... 999 s	**20 s** 0 ... 999 s	**0** 0 ... 5	**360 min** 1 ... 7200 min	**120 min** 1 ... R287 min	**0** 0 ... 9	
R274	**R275**	**R276**	**R277**	**R278**	**R279**	

Enter deriv. action time T_V (0.0 = no D comp.)	Select control characteristic	Select **len = pulse length** freq = pulse frequency curr = current output 2	Enter pulse period	Enter max. pulse frequency **120 1/min**	Enter min. switch-on time t_{ON}	Enter basic load
0.0 min 0.0 ... 999.9 min	**inv**; dir		**10.0 s** 0.5 ... 999.9 s	60 ... 180 1/min	**0.3 s** 0.1 ... 5.0 s	**0%** 0 ... 40%
R255	**R256**	**R257**	**R258**	**R259**	**R2510**	**R2511**

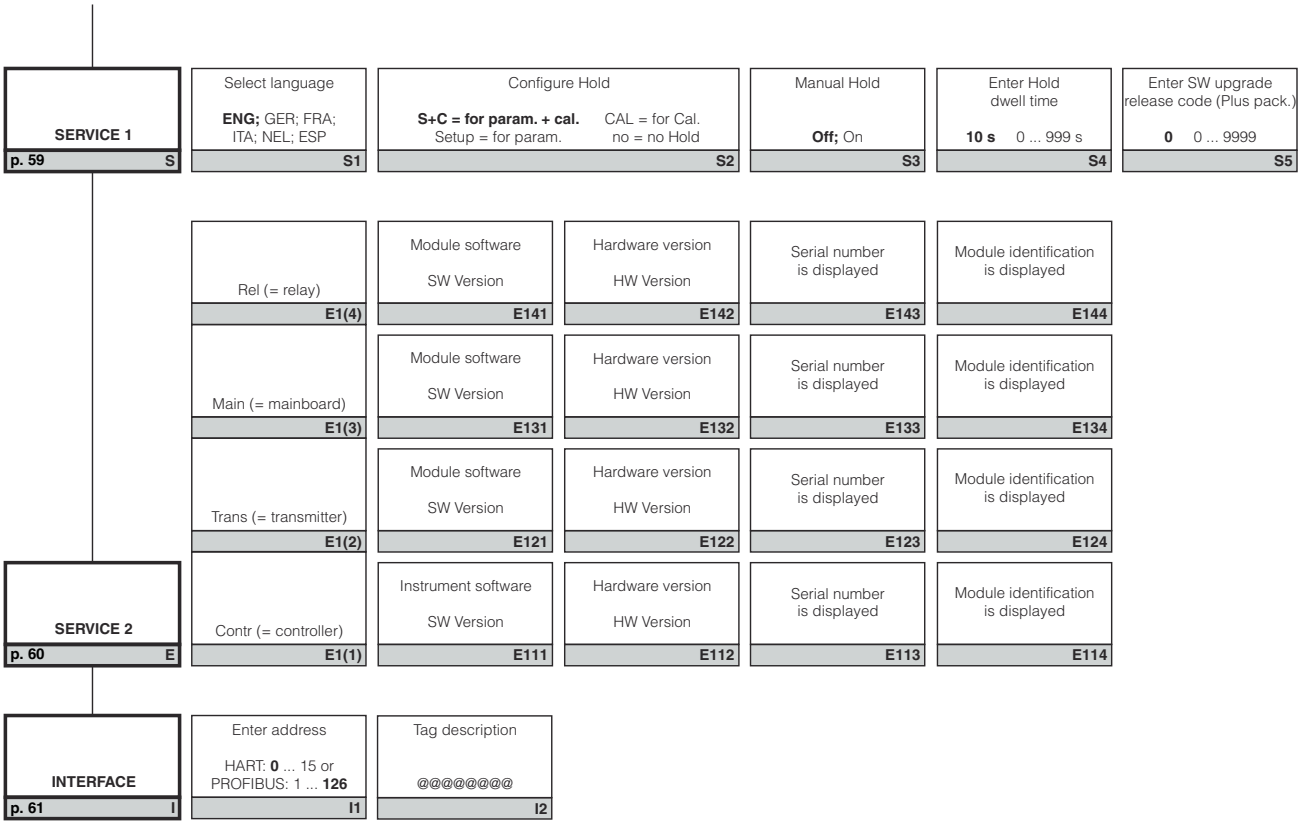
Enter deriv. action time T_V (0.0 = no D comp.)	Select control characteristic	Select **len = pulse length** freq = pulse frequency curr = current output 2	Enter pulse period	Enter max. pulse frequency **120 1/min**	Enter min. switch-on time t_{ON}	Enter basic load
0.0 min 0.0 ... 999.9 min	**inv;** dir		**10.0 s** 0.5 ... 999.9 s	60 ... 180 1/min	**0.3 s** 0.1 ... 5.0 s	**0%** 0 ... 40%
R245	**R246**	**R247**	**R248**	**R249**	**R2410**	**R2411**

Set drop-out delay	Set alarm threshold	Display of LC status
0 s 0 ... 2000 s	**50 °C** 0 ... 50 °C	**MAX**; MIN
R235	**R236**	**R237**

Set drop-out delay	Set alarm threshold	Display of LC status
0 s 0 ... 2000 s	**1500 mV** 0 ... 1500 mV	**MAX**; MIN
R225	**R226**	**R227**

Set drop-out delay	Set alarm threshold	Display of LC status
0 s 0 ... 2000 s	**pH 5.00** pH 0 ... 5	**MAX**; MIN
R225	**R226**	**R227**

Set drop-out delay	Set alarm threshold	Display of LC status
0 s 0 ... 2000 s	**20 (5) mg/l;** 0 ... 20 (5) mg/l **20 ppm**; 0 ... 20 ppm **20000 ppb;** 0 ... 20000 ppb	**MAX**; MIN
R215	**R216**	**R217**


SERVICE 1
p. 59 S
Select language
ENG; GER; FRA; ITA; NEL; ESP
S1
Configure Hold
S+C = for param. + cal. CAL = for Cal.
Setup = for param. no = no Hold
S2
Manual Hold
Off; On
S3
Enter Hold dwell time
10 s 0 ... 999 s
S4
Enter SW upgrade release code (Plus pack.)
0 0 ... 9999
S5
Rel (= relay)
E1(4)
Module software SW Version
E141
Hardware version HW Version
E142
Serial number is displayed
E143
Module identification is displayed
E144
Main (= mainboard)
E1(3)
Module software SW Version
E131
Hardware version HW Version
E132
Serial number is displayed
E133
Module identification is displayed
E134
Trans (= transmitter)
E1(2)
Module software SW Version
E121
Hardware version HW Version
E122
Serial number is displayed
E123
Module identification is displayed
E124
SERVICE 2
p. 60 E
Contr (= controller)
E1(1)
Instrument software SW Version
E111
Hardware version HW Version
E112
Serial number is displayed
E113
Module identification is displayed
E114
INTERFACE
p. 61 I
Enter address
HART: 0 ... 15 or PROFIBUS: 1 ... 126
I1
Tag description
@@@@@@@@
I2

Control SW upgrade release code Chemocl.	Order number is displayed	Serial number is displayed	Reset instrument	Start instrument test
0 0 **...** 9999			**no;** sens; factory	**no;** display
S6	**S7**	**S8**	**S9**	**S10**

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*Isco One Year Limited Factory Service Warranty **

Isco warrants covered products against failure due to faulty parts or workmanship for a period of one year (365 days) from their shipping date, or from the date of installation by an authorized Isco Service Engineer, as may be appropriate.

During the warranty period, repairs, replacements, and labor shall be provided at no charge. Isco's liability is strictly limited to repair and/or replacement, at Isco's sole discretion.

Failure of expendable items (e.g., charts, ribbon, tubing, glassware, seals and filters), or from normal wear, accident, misuse, corrosion, or lack of proper maintenance, is not covered. Isco assumes no liability for any consequential damages.

Isco specifically disclaims any warranty of merchantability or fitness for a particular purpose.

This warranty applies only to products sold under the Isco trademark and is made in lieu of any other warranty, written or expressed.

No items may be returned for warranty service without a return authorization number issued from Isco.

This warranty does not apply to the following products: Process Analyzers, SFX 3560 SFE Extractor, 6100 VOC Sampler.

The warrantor is Isco, Inc. 4700 Superior, Lincoln, NE 68504, U.S.A.

*** This warranty applies to USA customers. Customers in other countries should contact their Isco dealer for warranty service.**

In the event of instrument problems, always contact the Isco Service Department, as problems can often be diagnosed and corrected without requiring an on-site visit. In the U.S.A., contact Isco Service at the numbers listed below. International customers should contact their local Isco agent or Isco International Customer Service.

Return Authorization

A return authorization number must be issued prior to shipping. Following authorization, Isco will pay for surface transportation (excluding packing/crating) both ways for 30 days from the beginning of the warranty period. After 30 days, expense for warranty shipments will be the responsibility of the customer.

Shipping Address: Isco, Inc. - Attention Repair Service
4700 Superior Street
Lincoln NE 68504 USA

Mailing address: Isco, Inc.
PO Box 82531
Lincoln NE 68501 USA

Phone: Repair service: (800)775-2965 (lab instruments)
(800)228-4373 (samplers & flow meters)
Sales & General Information (800)228-4373 (USA & Canada)

Fax: (402) 465-3001

Email: service@isco.com

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Isco, Inc.
www.isco.com

For more Endress+Hauser product please visit: www.ainstru.com
Mail: Sales@ainstru.com

Isco, Inc.
4700 Superior Street
Lincoln NE 68504 USA
Phone: (402) 464-0231
USA and Canada: (800) 228-4373
Fax: (402) 465-3022
E-Mail: info@isco.com
Internet: www.isco.com