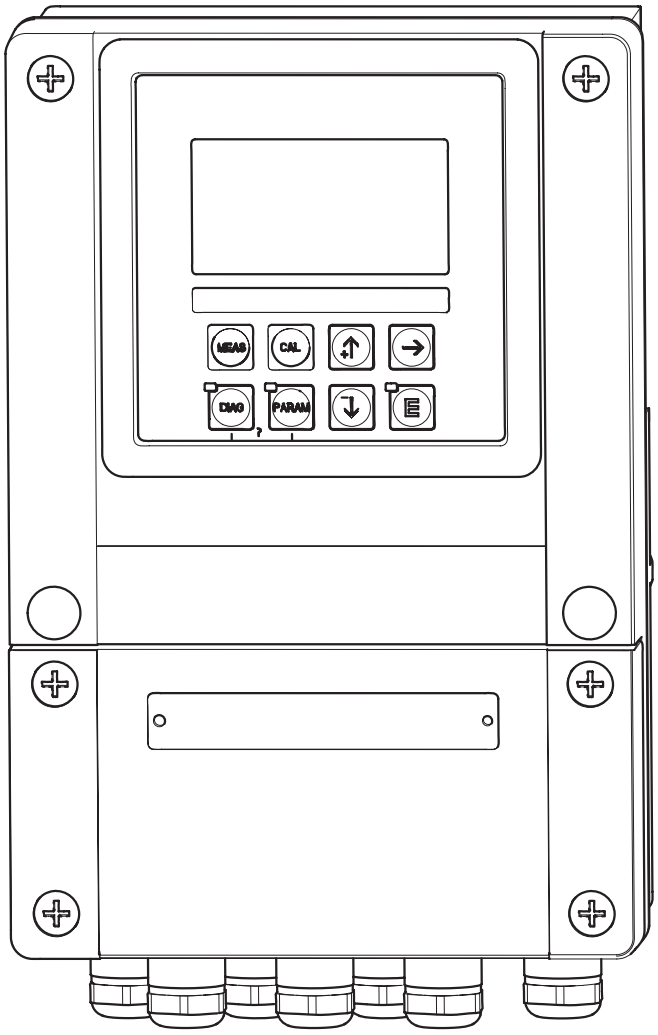
Level Pressure Flow Temperature Liquid Analysis Registration Systems Components Services Solutions

Operating Instructions

Mycom S CPM153

pH and Redox Transmitter



BA 233C/07/en/05.04
51503790
Software version 1.20 or later

Endress+Hauser

People for Process Automation

Brief overview

Here is how to use these Operating Instructions to commission your Mycom S quickly and safely:

Safety instructions

→ page 5 ff. General safety instructions
→ page 6 Explanation of the warning symbols
You can find special instructions at the appropriate position in the chapter in question. The significance is indicated with the icons ⚠ Warning, ☝ Caution, ✎ Note.

▼

Installation

→ page 10 ff. Mounting types, the steps for transmitter installation and transmitter dimensions can be found here.

▼

Mycom S wiring

→ page 13 ff. On these pages, you can find the required steps for electrical connection of your Mycom S and a complete wiring diagram.

▼

→ page 25 ff. **Display and operating elements**

Use this chapter to get familiar with the device operation.

▼

→ page 32 ff. **First start up**

First start up is automatically started when starting the instrument for the first time. It allows you to commission your instrument quickly and easily.

▼

→ page 89 ff. **Calibration**

Here, you can find the required steps for calibration of transmitter and sensor. Always perform a calbration during first commissioning.

▼

→ page 37 ff. **Customer-specific configuration**

This chapter explains how to configure additional functions via the software thus adapting the transmitter to your requirements.

▼

→ page 98 ff. **Maintenance**

Information on maintenance tasks and maintenance intervals can be found here.

▼

Troubleshooting

→ page 101 ff. If faults occur during operation, use the check lists to localise and eliminate the cause.

Contents

1 Safety instructions

1.1 Designated use

Mycom S CPM153 is a transmitter for measurement of pH value or redox potential.

It is designed for the following fields of application:

- Chemical process systems
- Pharmaceuticals
- Foodstuffs
- Water conditioning and monitoring
- Wastewater treatment
- Drinking water

The Ex version of the Mycom S CPM153 allows operation even in hazardous areas (refer to "Approvals" in the product structure on page 8).

The manufacturer is not liable for damage caused by improper or non-designated use.

1.2 Installation, commissioning and operation

Note the following points:

- If the transmitter is used improperly or other than for its designated use, it may pose a hazard, e.g. due to improper connection.
- Installation, electrical connection, start-up, operation and maintenance of the measuring system must therefore be carried out exclusively by trained specialists authorised by the system operator.
- Technical personnel must have read and understood these operating instructions and must adhere to them.
- Always follow the regulations in your country pertaining to the opening and repair of electrical instruments.

1.3 Operational safety

The instrument has been designed and tested according to the state of the art and left the factory in perfect functioning order. The instrument meets all the prevailing regulations and EC directives – see "Technical data".

Always pay attention to the following points:

- Measuring systems used in Ex areas have a separate document (XA 233C/07/en) which forms a component part of these Operating Instructions. Always follow the installation regulations and the – partly deviating – connection data of the Ex documentation as well. You can find the following symbols on the front page of the additional Ex documentation (according to approval and test centre (Ex Europe, FM USA, CSA Canada).
- The measuring device complies with the general safety requirements in accordance with EN 61010, the EMC requirements of EN 61326, and NAMUR Recommendation NE 21, 1998.
- The manufacturer reserves the right to change the technical data in line with technical progress at any time. You can obtain information on the current version of these Operating Instructions and possible additions from your responsible sales centre.

Fail-safety
This instrument has been checked for protection against electromagnetic interference in industrial use according to applicable European standards. It is protected against electromagnetic interference by appropriate design measures.

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

1.4 Return

If the transmitter has to be repaired, please return it cleaned to the sales centre responsible. For returns please use the original packaging.
Please enclose a filled-in copy of the "Declaration of Contamination" form with the instrument. You can find this form at the end of these Operating Instructions.

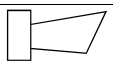
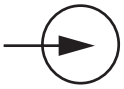
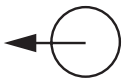
1.5 Safety symbols

To avoid damage to persons and property, always pay attention to the safety instructions in these Operating Instructions. The following symbols are used to provide you with important information:

General safety instructions

Symbol	Meaning
	**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.

Electrical symbols

Symbol	Meaning
	**DC voltage** A terminal at which DC voltage is applied or through which DC flows.
	AC voltage A terminal at which (sine-form) AC voltage is applied or through which AC flows.
	**Ground connection** A grounded terminal, which, from the user's point of view, is already grounded using a ground system.
	**Protective earth terminal** A terminal which must be grounded before other connections may be set up.
	**Equipotential connection** A connection which must be connected to the grounding system of the equipment. This can be, for example, a potential matching line of a star-shaped grounding system, depending on national or company practice.
	**Protective insulation** The equipment is protected with an additional insulation.
	**Alarm relay**
	**Input**
	**Output**

2 Identification

2.1 Instrument designation

2.1.1 Product structure

pH/redox transmitter in aluminium housing for wall mounting with one alarm and two output contacts for NAMUR, Chemoclean, and controller functions as well as three binary inputs, log-books, data log. Plain text operation. 247x167x111 mm / 9.72x6.57x4.37 inches (HxWxD). Ingress protection IP 65.

Approvals										
A	Basic equipment: non-Ex									
G	With Atex 100a approval, Atex II (1) 2G EEx em ib[ia] IIC T4									
O	With FM approval; NI Cl. I, Div. 2									
P	With FM approval; NI Cl. I, Div. 2, Sensor IS Cl. I, Div. 1									
S	With CSA approval; NI Cl. I, Div. 2, Sensor IS Cl. I, Div. 1									
T	With TIIS approval									
	Sensor input									
	1	1 measuring circuit for glass electrodes, pH/redox and temperature								
	2	1 measuring circuit for glass electrodes/ISFET pH sensors, pH/redox and temperature								
	3	2 measuring circuits for glass electrodes, pH/redox and temperature								
	4	2 measuring circuits for glass electrodes/ISFET pH sensors, pH/redox and temperature								
	5	1 measuring circuit for digital pH sensors (Memosens), pH and temperature								
	6	2 measuring circuits for digital pH sensors (Memosens), pH and temperature								
		Measurement output								
		A	2 current outputs 0/4 ... 20 mA, passive (Ex and non-Ex)							
		B	2 current outputs 0/4 ... 20 mA, active (non-Ex)							
		C	HART with 2 current outputs 0/4 ... 20 mA, passive (Ex and non-Ex)							
		D	HART with 2 current outputs 0/4 ... 20 mA, active (Ex and non-Ex)							
		E	PROFIBUS-PA, without current outputs							
			Contacts, current input							
			0	Without additional contacts						
			1	Three additional contacts						
			2	2 additional contacts, 1 passive current input (Ex and non-Ex)						
			3	2 additional contacts, 1 resistance input (non-Ex)						
			4	1 additional contact, 2 passive current inputs (Ex and non-Ex)						
			5	1 extra contact, 1 passive current input, 1 active resistance input (non-Ex)						
				Power supply						
				0	100 ... 230 V AC					
				8	24 V AC / DC					
					Language versions					
					A	E / D				
					B	E / F				
					C	E / I				
					D	E / ES				
					E	E / NL				
					F	E / J				
						Cable connection				
						0	Cable glands M 20 x 1.5			
						1	Adapter for cable gland NPT ½"			
						3	Cable glands M 20 x 1,5, PROFIBUS-PA M12 plug			
						4	Cable glands NPT 1/2", PROFIBUS-PA M12 plug			
							Additional equipment			
							0	Without additional equipment		
							1	Additional equipment: DAT module		
								Configuration		
								0	Factory settings	
CPM153-										Complete order code

2.1.2 Nameplate

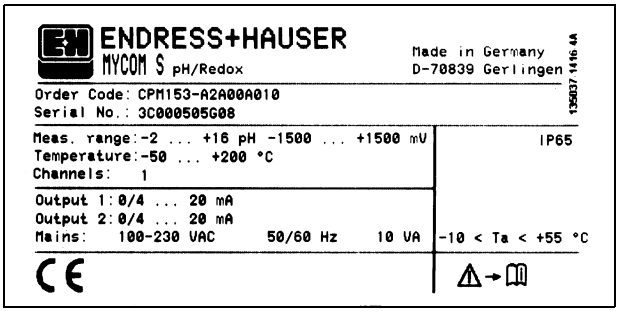


fig. 1: Example for a nameplate

2.2 Scope of delivery

The scope of delivery comprises:

- 1 CPM153 transmitter
- 1 mounting kit
- 4 cable glands
- 1 set for measuring point labelling
- 1 instrument identification card
- 1 operating instructions BA 233C/07/en
- Versions with HART communication:
  1 operating instructions Field communication with HART, BA 301C/07/en
- Versions with PROFIBUS interface:
  1 operating instructions Field communication with PROFIBUS PA, BA 298C/07/en
- Ex versions:
  Safety instructions for electrical equipment in explosion hazardous areas, XA 233C/07/a3

2.3 Certificates and approvals

Declaration of Conformity
The transmitter complies with the legal demands of the harmonised European standards. Endress+Hauser certifies the compliance with the standards by affixing the CE sign.

3 Installation

3.1 Incoming acceptance, transport, storage

- Make sure the packaging is undamaged!
  Inform the supplier about damage to the packaging.
  Keep the damaged packaging until the matter has been settled.
- Make sure the contents are undamaged!
  Inform the supplier about damage to the delivery contents.
  Keep the damaged products until the matter has been settled.
- Check that the scope of delivery is complete and agrees with your order and the shipping documents.
- The packaging material used to store or to transport the product must provide shock protection and humidity protection. The original packaging offers the best protection.
  Also, keep to the approved ambient conditions (see "Technical data").
- If you have any questions, please contact your supplier or your sales centre responsible (see back page of these Operating Instructions).

3.2 Installation conditions

3.2.1 Installation dimensions

You can find the dimensions of the transmitter in the "Technical data" on page 122 ff.

3.3 Installation instructions

3.3.1 Installation notes

- The standard installation method for the CPM153 transmitter is as a field instrument.
- The CPM153 transmitter can be fixed to vertical or horizontal posts using the round post fixture available from Endress+Hauser (see "Accessories"). When installing the instrument outdoors, you require the weather protection cover CYY101. This cover is compatible with all field instrument installation options.
- Always mount the transmitter horizontally so that the cable entries point downwards.
- The transmitter can be installed as a panel-mounted unit as well.

3.3.2 Wall mounting

Caution!
- Check that the temperature does not exceed the maximum permitted operating temperature range (–20° ... +60°C / -4 ... +140 °F). Avoid direct sunlight.
- Mount the wall mounting housing so that the cable entries always point downwards.

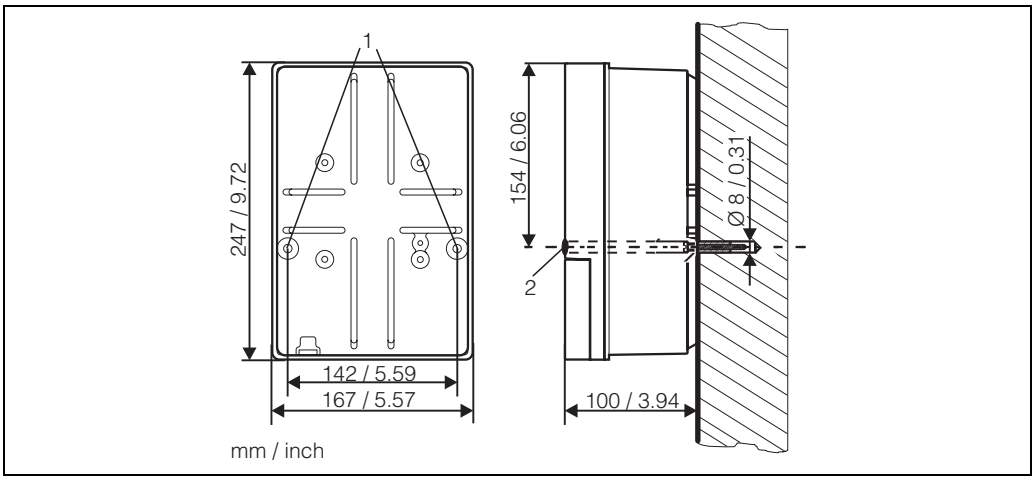


fig. 2: Dimensions for wall mounting: Fixing screw: ø 6 mm / 0.24", wall plug: ø 8 mm / 0.31"
1: Fixing drill holes
2: Plastic cover cap

For the wall mounting of the transmitter proceed as follows:

1. Prepare drill holes acc. to fig. 2.
2. Push both fixing screws through the appropriate fixing drill holes (1).
   – Fixing screws: max. Ø 6.5 mm / 0.26"
   – Screw head: max. Ø 10.5 mm / 0.41"
3. Mount the transmitter housing on the wall as shown.
4. Cover the drill holes with the plastic cover caps (2).

3.3.3 Post mounting and panel mounting

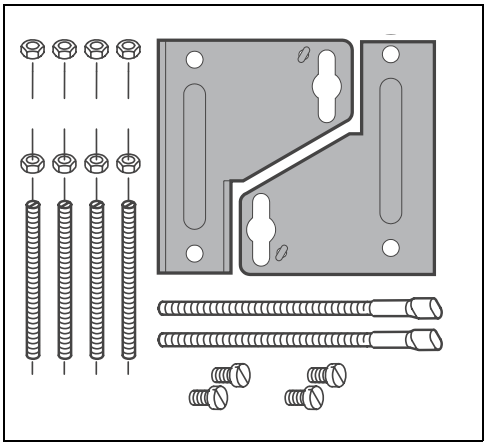


fig. 3: Mounting kit Mycom S CPM153

Mount the parts of the mounting kit (see accompanying figure) at the back of the housing as depicted in fig. 4.

Required mounting cutout:
161 x 241 mm / 6.34 x 9.49 inches
Installation depth: 134 mm / 5.28"
Pipe diameter: max. 70 mm / 2.76"

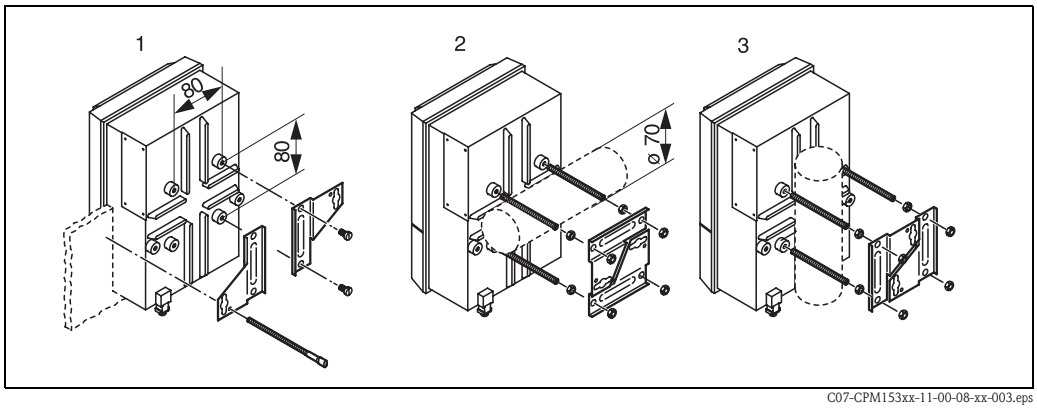


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fig. 4: Panel mounting (1) and post mounting for CPM153, horizontal (2) and vertikal (3)

Caution!
Danger of instrument damage by moisture and soiling. For outdoor use, the CYY101 weather protection cover is required (see fig. 5 and "Accessories").

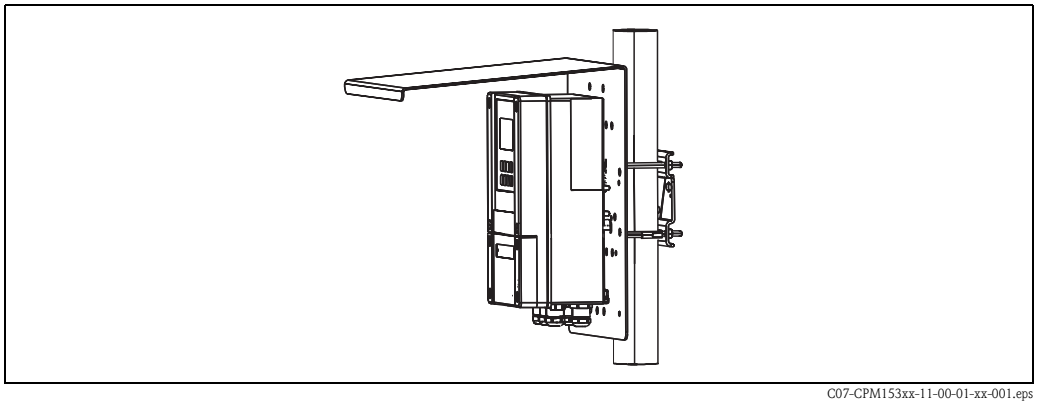

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fig. 5: Post mounting of the transmitter CPM153 with weather protection cover CYY101.

3.4 Checking the installation

After installing the transmitter, carry out the following checks:

Instrument status and specifications	**Remarks**
Is the transmitter damaged?	Visual inspection
Installation	**Remarks**
Are the measuring point number and the labelling correct?	Visual inspection
Process environment/conditions	**Remarks**
Is the transmitter protected against rainfall and direct sunlight?	For outdoor installation, the weather protection cover CYY101 is required (see "Accessories").

4 Wiring

4.1 Connecting the transmitter

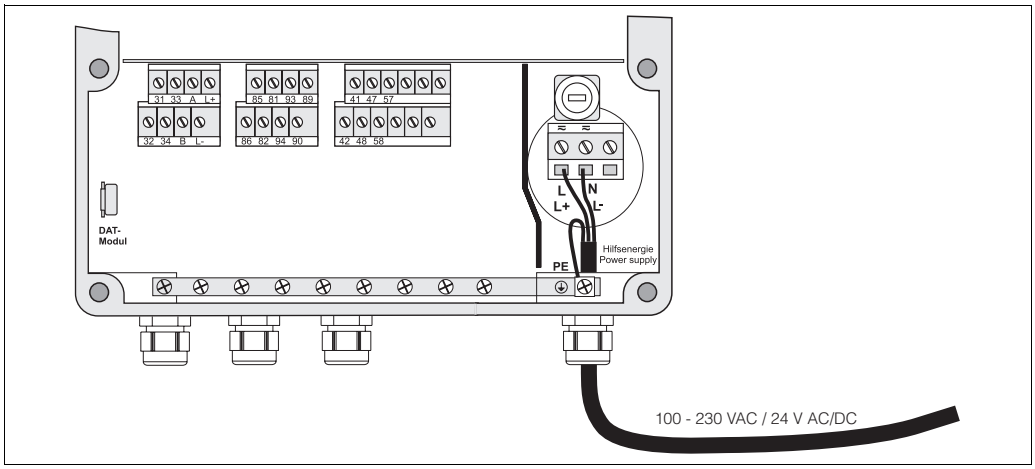

fig. 6: Connection of power supply

1. Insert the power cable through the right-hand Pg cable gland into the Mycom housing.
2. Connect the yellow-green wire to the PE terminal.
3. Connect the two other wires to the "L" and "N" terminals in the lower right-hand housing section.

4.2 Connecting analogue sensors

Symmetrical or unsymmetrical electrode connection
You can connect the sensor symmetrically or unsymmetrically, note the following differences:

Symmetrical (with PML)

With a symmetrical connection, the line to the potential matching pin (PML) must be connected to the potential matching terminal of the instrument. The PM pin must always be in contact with the medium, i.e. immersed in the buffer solution during calibration.

Benefits of symmetrical connection
Measurement is easier under difficult ambient conditions (e.g. strongly flowing or high-impedance media or partially soiled diaphragm).
Monitoring of the reference electrode by the SC system (s. page 57) is possible with symmetrical measurement.

Unsymmetrical (without PML)

If the instrument input is unsymmetrical, pH measuring chains connected to assemblies can be connected without an additional potential matching pin. If necessary, connect the available potential matching pin to terminal PE.

Disadvantages of unsymmetrical connection
The measuring chain reference system has a heavier load, meaning that measuring errors in limiting operating conditions are possible (see symmetrical connection).
Monitoring of the reference electrode by the SC system (s. page 57) is not possible with unsymmetrical measurement.

✎ Note!
Do not connect the PML with "unsymmetrical" measurement, otherwise there can be shunt excitations.

Note!
The instrument is preset for symmetrical measurement (= with PML, potential matching line). For unsymmetrical measurement, the setting must be changed accordingly (s. page 38, "Select connection type").

4.2.1 Preparing the cable

Caution!
Danger of inaccuracy.
Always protect plugs, terminals and cables against humidity.

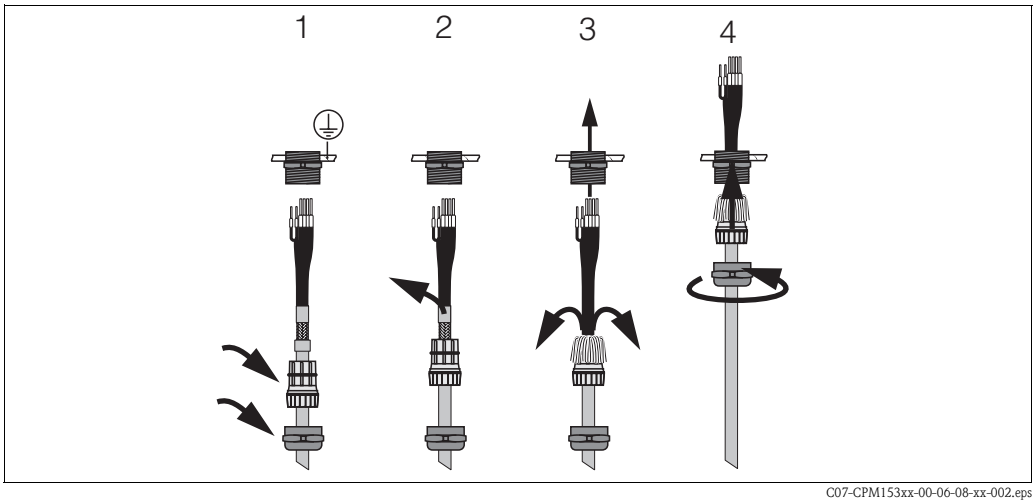

fig. 7: Outer screen connection for CPK1 to CPK12 with metal cable gland. The screen contact is within the cable gland.

1. Push the cable gland and the clamping ring over the cable.
2. Remove the inner insulation.
3. Loosen the outer screen from the cable and fold it back over the clamping ring.
4. Insert the sensor cable through the cable gland of Mycom S CPM153 and tighten the gland. The screen contact is thus established automatically.

Cable extension
If a cable extension is necessary, use
- junction box VBM

and the following types of non-terminated measuring cables:
- for CPK1, CPK9: Cable CYK71
- for CPK12: Cable CYK12

Note!
Remove the black plastic semi-conductor layer (arrow) from the inner coaxial cable. Each cable type has such a layer.

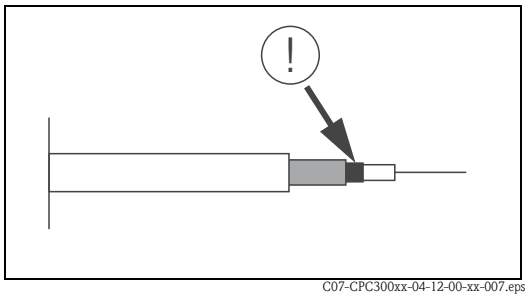

fig. 8: Design of coaxial line

4.2.2 To connect glass electrodes

Cable types
You can use the following multicore and preterminated cable types to connect glass electrodes:
- CPK1 for electrodes with standard plug-in head GSA (without Pt 100)
- CPK9 for electrodes with TOP68 plug-in heads (ESA / ESS) (with and without Pt 100)
- CPK12 for ISFET pH sensors and pH/redox glass electrodes with TOP68 plug-in heads (ESB) (with and without Pt 100 / Pt 1000)

Connect the wires as follows:

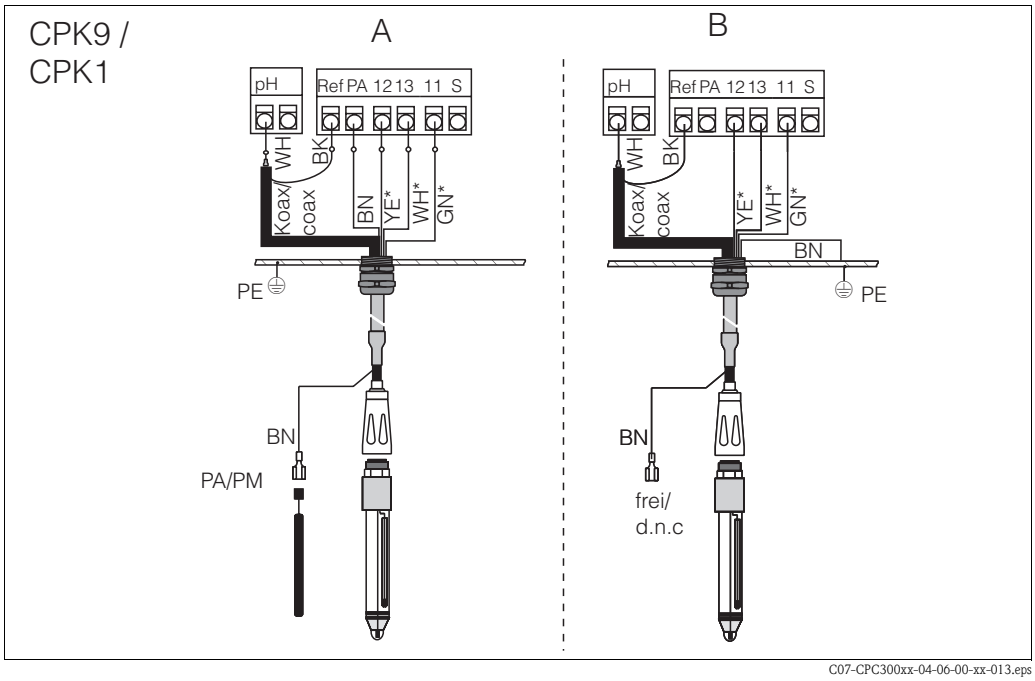

fig. 9: Electrode connection
A = symmetrical connection
B = unsymmetrical connection
** not applicable for CPK1*

Wire	Mycom terminal
Black coax wire (screen)	Terminal Ref
White coax wire (inner conductor)	Terminal pH
White (WH)	Terminal 13
Yellow (YE)	Terminal 12
Green (GN)	Terminal 11
Brown (BN)	■ Symmetrical connection (A): terminal PA Make sure that the potential matching pin is always in contact with medium. ■ Asymmetrical connection (B): PE rail
Outer screen	grounded via metal cable gland

4.2.3 To connect ISFET sensors

Cable types
To connect ISFET sensors, use the CPK12 multicore and preterminated cable for ISFET pH sensors and pH/redox glass electrodes with TOP68 plug-in heads (ESB) (with Pt 1000).

Connect the wires as follows:

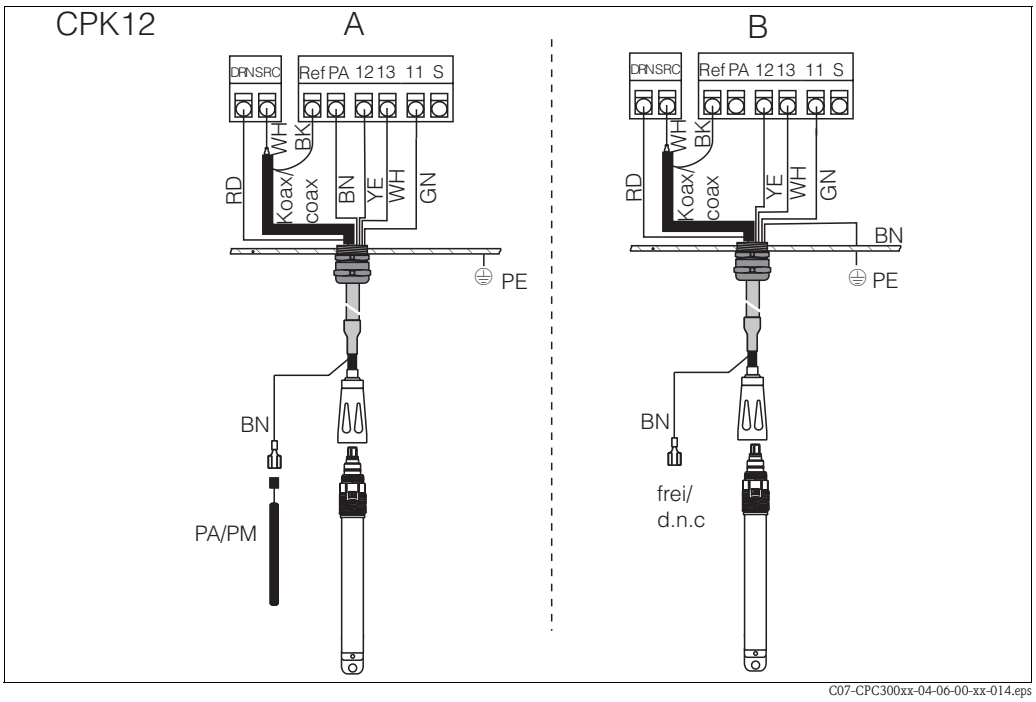

fig. 10: ISFET sensor connection
A = symmetrical connection
B = unsymmetrical connection

Wire	Mycom terminal
Red (RD)	Terminal DRN
Black coax wire (screen)	Terminal Ref
White coax wire (inner conductor)	Terminal SRC
White (WH)	Terminal 13
Yellow (YE)	Terminal 12
Green (GN)	Terminal 11
Brown (BN)	■ Symmetrical connection (A): PA terminal Make sure that the potential matching pin is always in contact with medium. ■ Unsymmetrical connection (B): PE rail
Outer screen	grounded via metal cable gland

Changing the pH input from glass electrode to ISFET sensor
The Mycom S version glass/ISFET (CPM153-xx2xxxxxxx, CPM153-xx4xxxxxxx) is factory set for measurement with glass electrodes.

To adapt the electrical connection, please proceed as follows:

1. Open the lower housing section of the CPM153.
2. If a glass electrode is connected, remove the wires of the electrode cable.
3. Remove the "pH" terminal located at the housing cover and replace it by the included terminal "DRN" / "SRC".

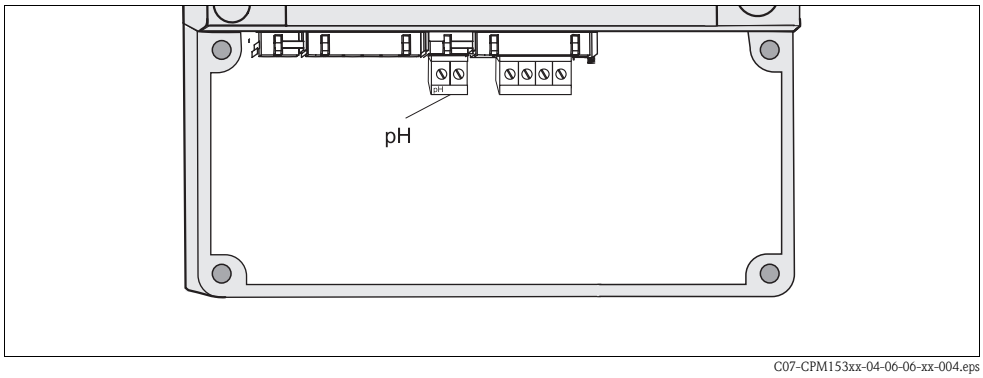

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fig. 11: pH terminal at the housing cover

4. Open the housing cover of the CPM153.
5. On the right side of the housing cover, pull off both ends of the red cable to the pH input (see fig. 12).
6. Pin up the jumpers included as shown in fig. 13.
7. Connect the sensor cable according to the wire assignment for ISFET sensors.
8. Change the setting "electrode type" in the First start up menu (p. 33) to "ISFET".

✎ Note!
Please switch from ISFET sensor to glass electrode correspondingly.

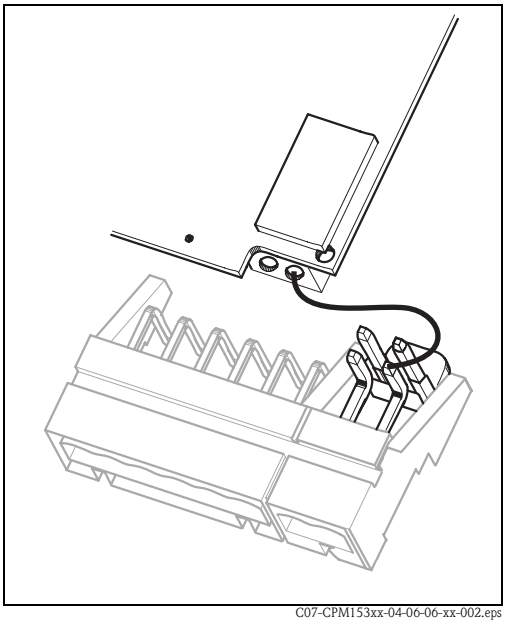

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fig. 12: pH input module and pH terminal set in housing cover with cable (red) for connection of pH / redox glass electrodes.

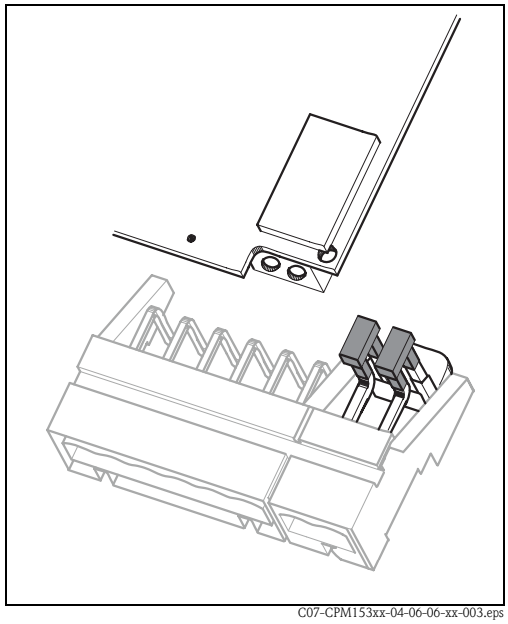

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fig. 13: pH input module and pH terminal set in housing cover with jumpers for connection of ISFET sensors

4.3 Connecting digital sensors with Memosens technology

4.3.1 Measuring cable

To connect digital sensors with Memosens technology to Mycom S CPM153, you require the CYK10 Memosens data cable with 2x2 wires, twisted pair, screen and PVC sheath.

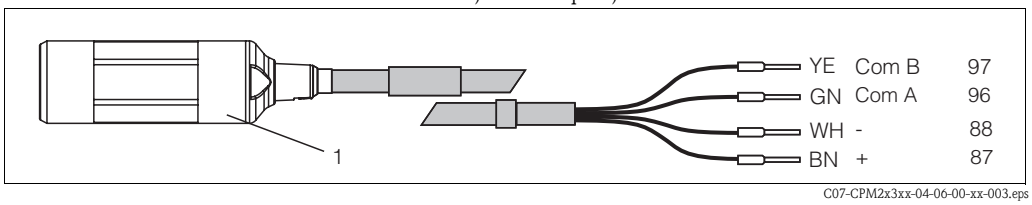

fig. 14: Design of CYK10 Memosens data cable

1 Coupling with integrated electronics for connection to the sensor

4.3.2 To connect digital sensors

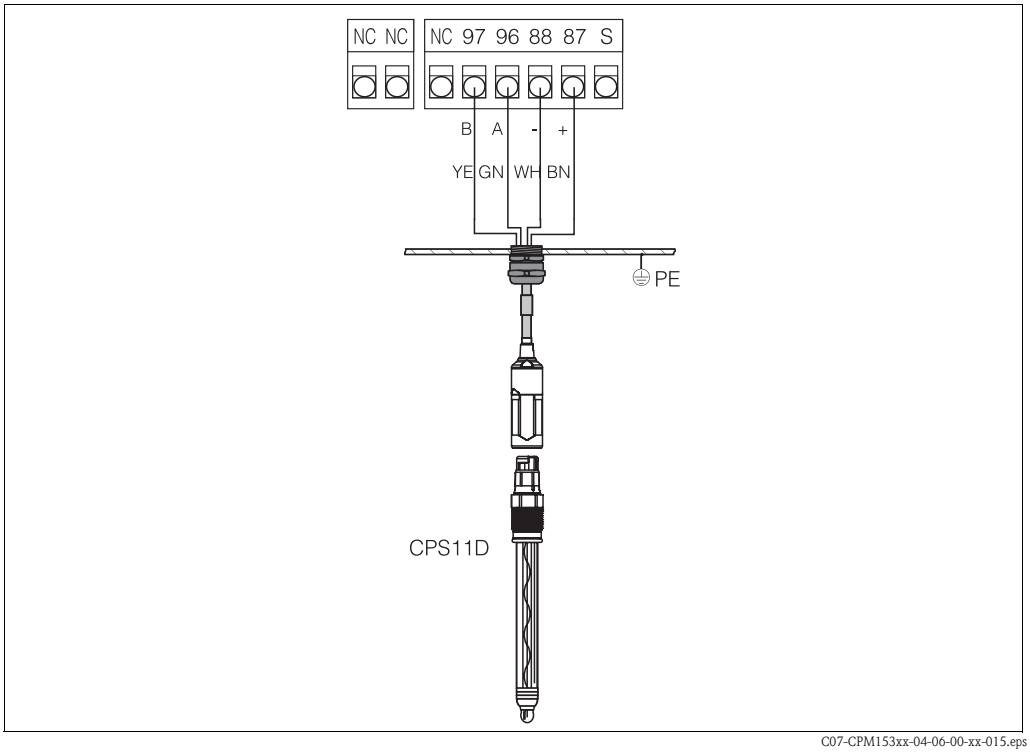

fig. 15: CPS11D connection with CYK10

Connect the wires as follows:

Wire	Mycom terminal
Yellow (YE)	Terminal 97
Green (GN)	Terminal 96
White (WH)	Terminal 88
Brown (BN)	Terminal 87
Screen	grounded via metal cable gland

Measuring signals are transmitted from the digital sensor with Memosens technology to the coupling of the CYK10 cable contactlessly via completely sealed-in coils. This offers the following benefits:

- Thanks to galvanic separation of sensor and transmitter, measuring signals are not influenced by interference potential. This means a symmetrical high-impedance connection is not necessary to guarantee accurate measurement.
- The sensor plug-in head and the cable coupling are completely free from leaks.
- There are no open contacts. Contact corrosion is eliminated.

4.4 Connecting current outputs and relays

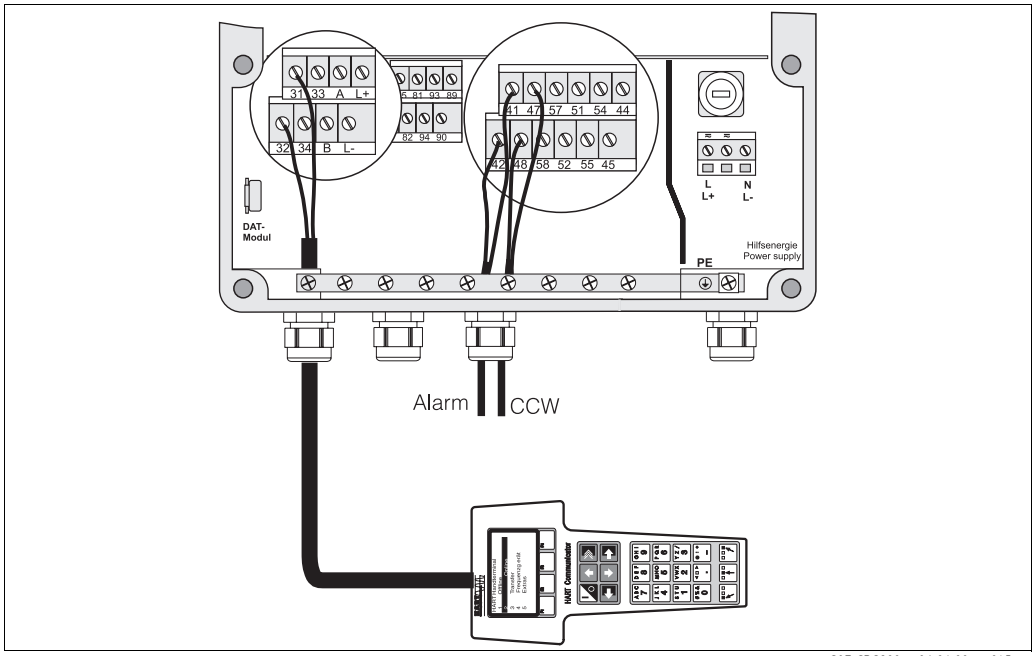

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fig. 16: Connection of current outputs (example: HART to output 1) and relays (example: alarm and Chemoclean water)

4.4.1 To connect current outputs

If you want to output measuring values to external evaluation devices or a PCS or you are using HART communication, you can connect these devices to the current outputs 1 and 2 of Mycom S. In addition, you can output an actuating variable via current output 2.

1. Connect the device to current output 1 as follows:

Wire	Mycom terminal
Positive wire	Terminal 31
Negative wire	Terminal 32

2. Connect the device to current output 2 as follows:

Wire	Mycom terminal
Positive wire	Terminal 33
Negative wire	Terminal 34

4.4.2 To connect relays

Mycom S CPM153 has one alarm contact and up to five additional contacts. Via these five contacts, you can control controller, limit contactor, water and cleaning agent supply for the Chemoclean function. To configure the additional contacts, select "Setup 1 > Relays", see page 44.

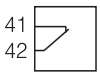
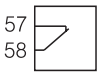
1. Connect the alarm contact to terminals "41" and "42".
2. Connect the additional contacts as follows:

Relay	Mycom terminal
Relay 1	Terminals 47 and 48
Relay 2	Terminals 57 and 58
Relay 3	Terminals 51 and 52
Relay 4	Terminals 54 and 55
Relay 5	Terminals 44 and 45

The function assignment (controller, limit contactor, etc.) to each relay can be selected according to your requirements.
When using the NAMUR assignment, for example, functions of the alarm relay and the first two additional relays are preset (see NAMUR assignment below). Without NAMUR assignment, you can assign any function to the first two additional relays.

✎ Note!
- You can assign up to three relays to the controller.
- You can switch the contact type "Active open" / "Active closed" via software.

NAMUR assignment
If you are using the NAMUR assignment (acc. to recommendations of the association for process control engineering of the chemical and pharmaceutical industry), the contacts are set to the relays as follows:

Relays	**Assignment NAMUR on**	**Terminal**
ALARM	Failure	
RELAY 1	Warning when maintenance required	
RELAY 2	Function check	

Function check assignment
Function check acc. to NAMUR is active when:
- The sensor is calibrated
- The assembly is in service position.
- Mycom is configured.
- A Topcal cleaning or calibration programme is running.
- A Chemoclean programme is running.
- An error occurs which triggers the function check (assignment see error list page 102).

4.5 Connecting external inputs (PCS to Mycom)

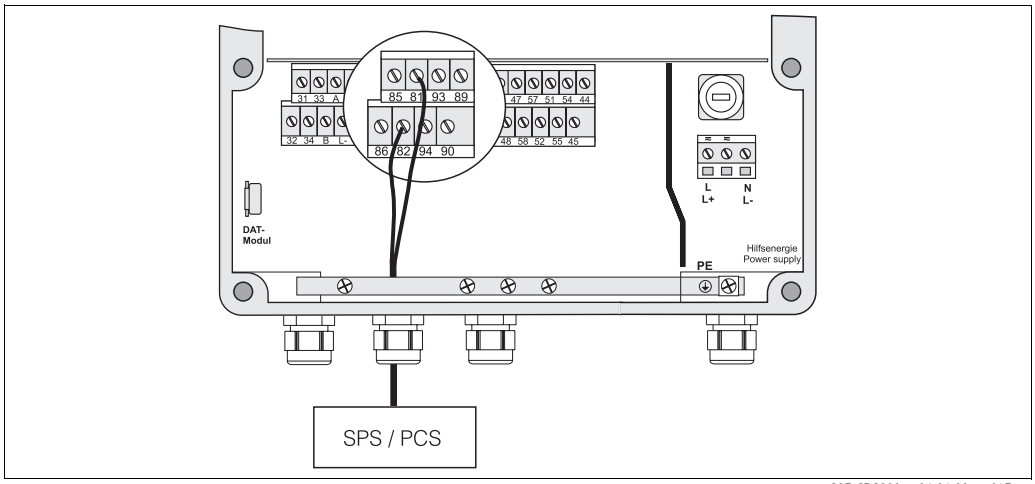
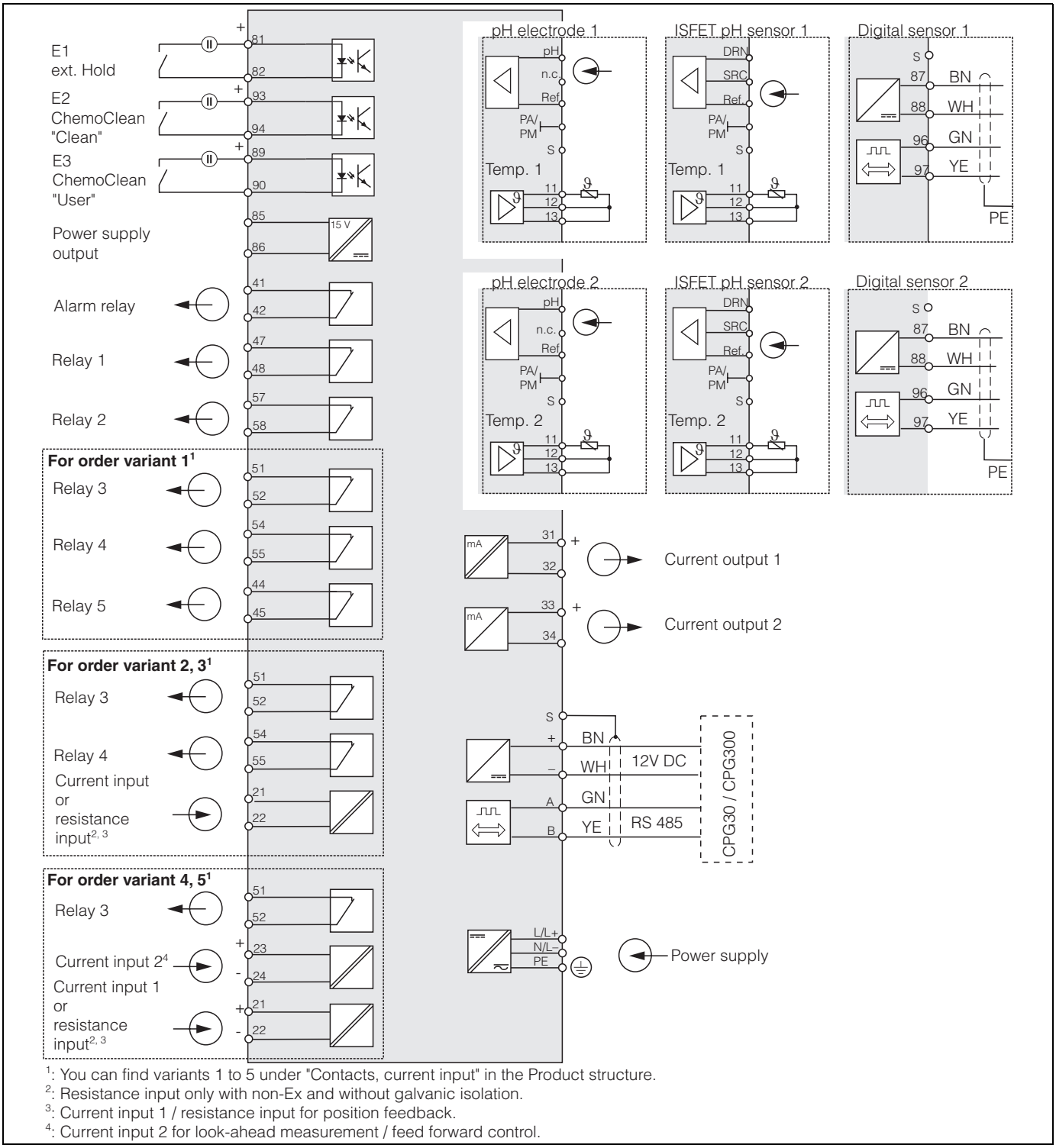


fig. 17: Connection of external hold for Mycom

If you want to activate the hold function for Mycom S CPM153, for example, via an external PCS, connect this input to Mycom terminals 81 and 82 (power supply required).

4.6 Wiring diagram non-Ex



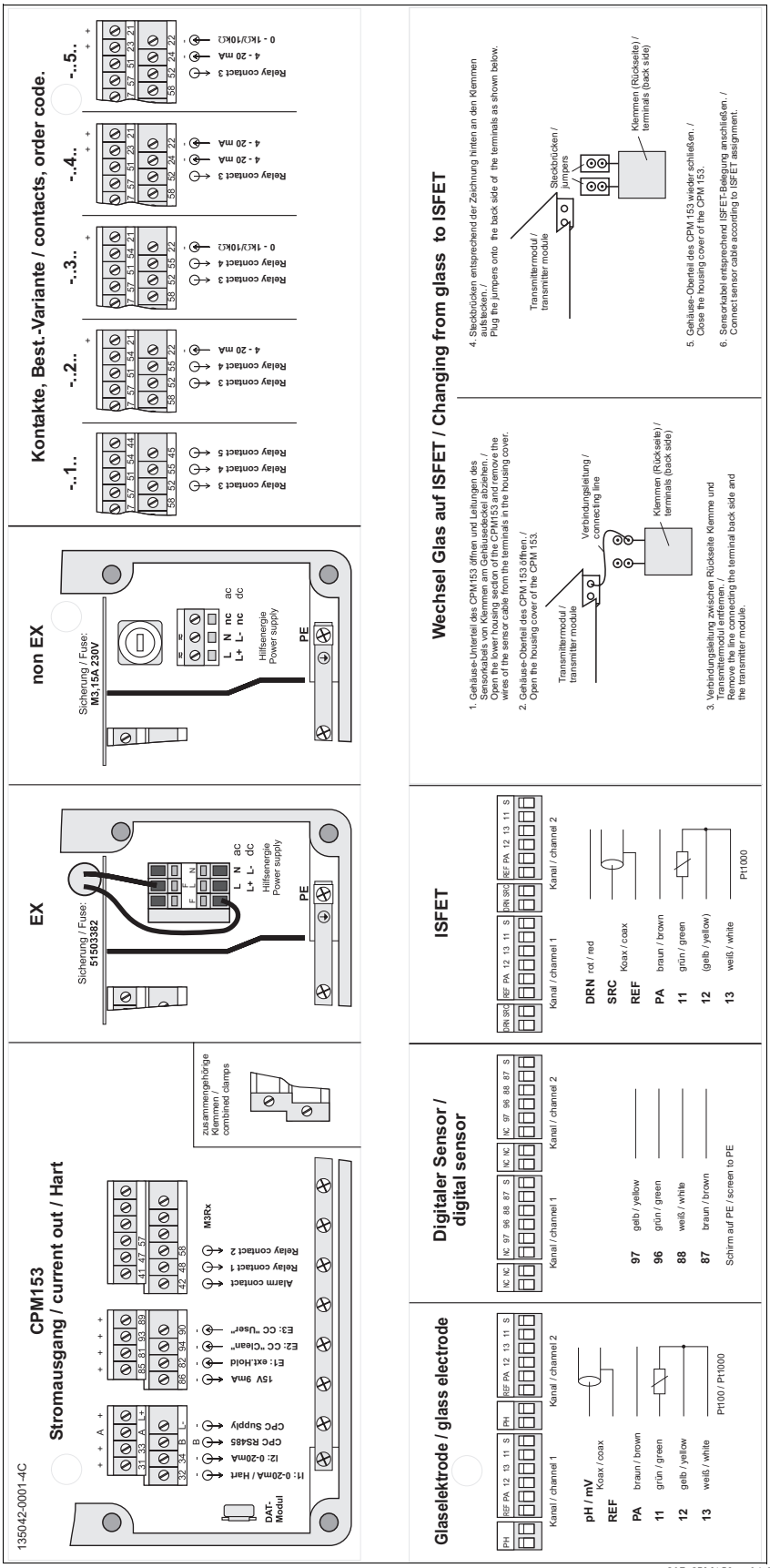
[1]: You can find variants 1 to 5 under "Contacts, current input" in the Product structure.
[2]: Resistance input only with non-Ex and without galvanic isolation.
[3]: Current input 1 / resistance input for position feedback.
[4]: Current input 2 for look-ahead measurement / feed forward control.

fig. 18: Electrical connection for CPM153

Warning!
A mains disconnecting device must be installed near the instrument and must be identified as the mains disconnection device for the Mycom S CPM153 (see EN 61010-1).

Note!
- Connect unused signal wires from input and output lines to the internal PE rail of the CPM153.
- The current and resistance inputs may only be connected using a screened cable. The screen must be connected to the PE rail of the transmitter.
- Make sure that the ground terminal in the lower housing cover is connected to the PE rail in the housing via a PE line.

4.6.1 Connection compartment sticker



C07-CPM153xx-04-06-00-xx-012.eps

fig. 19: Connection compartment sticker (you will find it in the connection compartment of the transmitter)
DRN = Drain, SCR = Source, REF = Reference

4.7 Post connection check

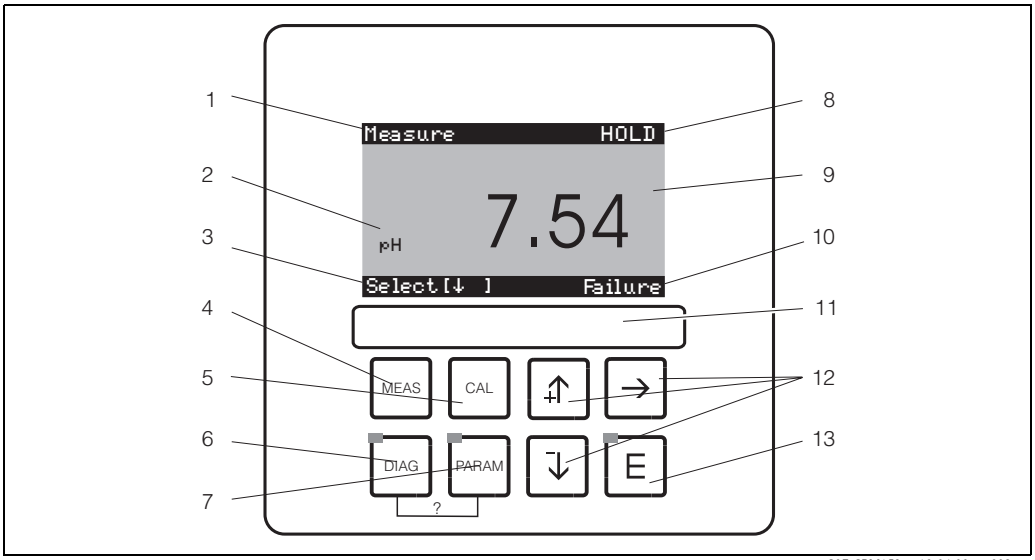
After wiring up the electrical connection of the measuring instrument, carry out the following checks:

Instrument status and specifications	Note
Is the measuring instrument or the cable damaged externally?	Visual inspection
Electrical connection	Notes
Does the supply voltage match the specifications on the nameplate?	100 V ... 230 V AC long-range 24 V AC / DC
Do the cables used fulfil the required specifications?	Use an original Endress+Hauser cable for electrode and sensor connection, see "Accessories".
Are the installed cables strain-relieved?	
Is the cable type route completely isolated?	Run the power supply and signal line cables separately along the whole cable length to avoid any mutual influence. Cable channels are best.
No loops and cross-overs in the cable run?	
Are the power supply and signal cable correctly connected according to the wiring diagram?	
Are all the screw terminals tightened?	
For connection with potential matching (PM): Is the PML connected to the medium?	✎ Note! During calibration, insert the PM pin into the buffer solution.
For connection without potential matching (PM): Is the potential matching line grounded?	
Are all the cable entries installed, tightened and sealed? Cable run with "water sag"?	"Water sag": cable circuit hanging down so that water can drip off.
Are all the housing covers installed and tightened?	Check seals for damage.

5 Operation

5.1 Display and operating elements

5.1.1 Display reading/symbols



C07-CPM153xx-19-06-00-en-002.eps

fig. 20: Mycom S CPM153 user interface

1 Current menu
2 Current parameter
3 Navigation bar: Arrow keys for scrolling, "E" for browsing, note for Cancel
4 MEAS Operation key
5 CAL Calibration key
6 DIAG Diagnosis menu key
7 PARAM Parameter entry menu key
8 HOLD display, if HOLD active
9 Current main measured value
10 "Failure" display, "Warning", if the NAMUR contacts respond
11 Labelling strip
12 Arrow keys for scrolling and editing
13 E ENTER key
? Press DIAG and PARAM simultaneously to open the help pages

5.1.2 Key assignment

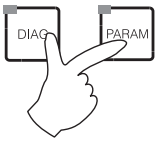
"PARAM" brings you to the configuration menu of the Mycom S CPM153.

✎ Note!
"PARAM" allows you to return to the previous "return field" from any point in the menu. These are marked in bold in the menu overview (see chap. 11.1).

LED: This is the send LED (IR) for the service adapter "Optoscope" (see "Accessories").

"DIAG" brings you to the instrument diagnosis menu.

LED: This is the receive LED for the service adapter "Optoscope" (see "Accessories").



Help:
Press the "DIAG" and "PARAM" keys simultaneously to open the help page.

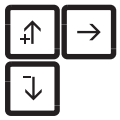
"MEAS" switches to operation. This displays the measured values. Use the arrow keys to scroll through the different measuring menus.

✎ Note!
Press "MEAS" to exit any of the "PARAM", "DIAG", "CAL" menus without terminating the settings / calibration.

"CAL" switches to the calibration menu of the electrodes.

E (Enter) moves you one step forward in a menu or confirms a selection you made.

LED is
green: everything OK.
red: an error has occurred.

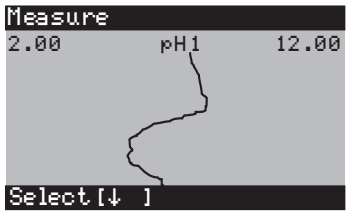


- You can scroll through the menu options with the arrow keys, and then highlight your selection (if there is a choice offered).
- Increment or decrement numbers by one step with "+" / "-".
  Move to the next digit with the "right arrow" (editor type 1).
- "Activate" with the "right arrow" and scroll through the selection with "+" / "-" (editor type 2) (for information on editor types, see page 28).

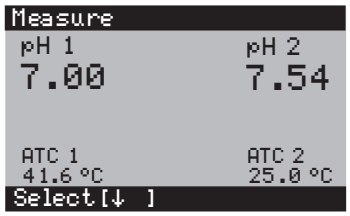
5.1.3 Measuring menus

You can choose between the different measuring menus. Use the arrow keys to scroll between the different menus. Switch between the measured value characteristic and the data log using the ENTER key E.

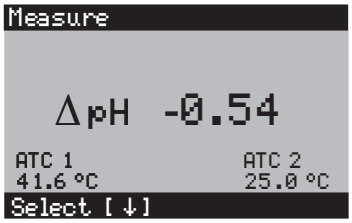
The current measured value of circuit 1 is displayed.



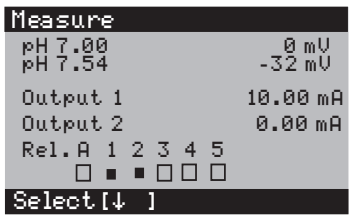
If you have activated the data log, you can see the current measured value characteristic here (record mode).
If you have activated both data logs, press the arrow key to switch to the view of the second measured value characteristic.



With a two-circuit device, in this measuring menu you can see both measured values next to each other and their corresponding temperatures.
With a one-circuit device, you can therefore only see one measured value with its temperature.



In this measuring menu, with a two-circuit device, you can display the measured value difference and their temperatures.

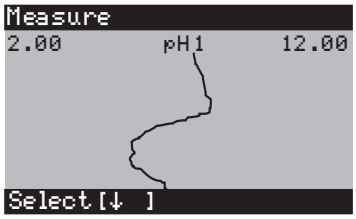


In this measuring menu, you can see the current and voltage values and the contact states of the relay at a glance.
Active relay = ■ (with function)
Inactive relay = ❒

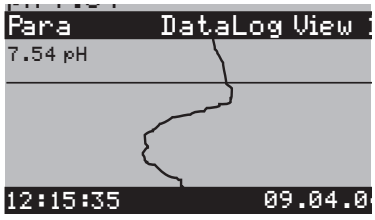
5.1.4 Data log

In the CPM153, you have two data logs available. With these data logs you can record
- one parameter with 500 sequential measuring points
- two parameters each with 500 sequential measuring points.

To be able to use the function, activate the data log in "PARAM" ➔ "Set up 2" ➔ "Data Log" (s. page 55). The function is active immediately.
You can view the measured values by scrolling through the different measuring menus (see above).
– The current measured values are recorded in record mode.
– In "PARAM" ➔ "Set up 2" ➔ "Data log" you can open saved data with date and time of their recording.



Record mode



Scroll mode

5.1.5 Operation access authorisation

To protect the transmitter against an unintended or undesired change in the configuration and calibration data, functions can be protected using four-digit access codes. As long as no codes are defined, all functions are freely accessible for modification.

Access authorisation has the following levels:

Read-only level (accessible without a code):
The complete menu can be viewed. The configuration cannot be altered. Calibration is not possible. On this level, only the controller parameters for new processes can be changed in the "DIAG" menu branch.

Service code

Operator level (can be protected by the service code):
This code allows access to the calibration menu.
Use this code to operate the temperature compensation item. The test functions and the internal data can be viewed.
Factory setting: Code = 0000, i.e. the level is not protected.
If you forgot or lost your service code, contact your service centre for a universally valid service code.

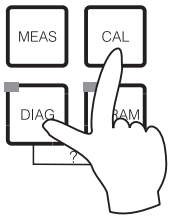
Specialist code

Specialist level (can be protected by the specialist code):
All menus can be accessed and changed.
Factory setting: Code = 0000, i.e. the level is not protected.
If you forgot or lost your specialist code, contact your service centre for a universally valid specialist code.

To activate the codes (= functions locked) see the item "PARAM"➔ "Set up 1" ➔ "Access codes" (page 40). Enter your desired code here. If the code is activated, you can only edit the protected areas with the rights mentioned above.

✎ Note!
- Note down the selected code as well as the universal code and keep it in a place where unauthorised persons do not have access to it.
- If you set the code back to "0000", all the levels are freely accessible for editing. The code can only be reset via the "specialist" menu.

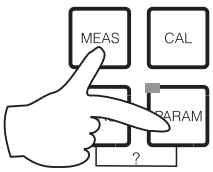
Locking the operation



To lock the instrument from in-field configuration operations, press CAL and DIAG simultaneously.

At the code prompt, the code appears as "9999". The settings in the "PARAM" menu can only be viewed.

Unlocking the operation



Press the MEAS and PARAM keys simultaneously to unlock the operation.

5.1.6 Menu editor types

At parameter setting, the functions can be selected in two different modes, depending on the setting type.

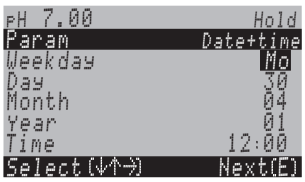
Editor type E1

Editor type 1 (E1) for functions, which can be directly selected from the display. The editing row shows "Edit".

- A selection can be highlighted with the arrow keys ↑ and ↓.
- Confirm the selection by pressing E.

Editor type E2

Editor type 2 (E2) for settings, which have to be defined more precisely, e.g. day, time. The editing row shows "Select".



- Use the arrow keys ↑ and ↓ to highlight a selection (e.g. "Mo").
- Activate the selected option with the right arrow key →. The highlighted option flashes.
- "Toggle": i.e. scroll through the selection (e.g. the weekdays) with the arrow keys ↑ and ↓.
- Confirm the selection by pressing E.
- After making your selection and confirming it by pressing E (no flashing display), you can exit the item by pressing E again.

5.1.7 Factory settings

All the factory parameters 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 (from page 37), there the factory setting is printed in **bold**.

Parameter		One-circuit instrument	Two-circuit instrument:
Select operating mode		pH	pH
Select measuring principle		One-circuit circuit 1	One-circuit circuit 1
Select two-circuit measurement		–	Two-circuit
Select electrode type 1		Glass electrode 7.0	Glass electrode 7.0
Select electrode type 2		–	Glass electrode 7.0
Select connection type		symmetrical	symmetrical
Select temperature display		Deg. C	Deg. C
Select temperature compensation circuit 1		ATC K1	ATC K1
Temperature measurement C 1		off	off
Select temperature compensation circuit 2		–	ATC K2
Temperature measurement C 2		off	off
Select temperature sensor		Pt 100	Pt 100
Contact functions		NAMUR	NAMUR
Select current output 1		pH/redox K1	pH/redox K1
Select current output 2		Temperature K1	pH/redox K2
Hold		PARAM, CAL: Active after entry of service or specialist code DIAG: Active after entry of service or specialist code for functions that require a code.	PARAM, CAL: Active after entry of service or specialist code DIAG: Active after entry of service or specialist code for functions that require a code.
Current output 1:	0/4 mA value: 20 mA value:	pH 2 / –1500 mV / 0.0 % / 0.0 °C pH 12 / +1500 mV / 100.0 % / 100.0 °C	Circuit 1: pH 2 / –1500 mV / 0.0 % / 0.0 °C pH 12 / +1500 mV / 100.0 % / 100.0 °C
Current output: 2	0/4 mA value: 20 mA value:	Temperature Circuit 1: 0.0 °C 100.0 °C	Circuit 2: pH 2 / –1500 mV / 0.0 % / 0.0 °C pH 12 / +1500 mV / 100.0 % / 100.0 °C

5.2 Replaceable memory

The DAT module is a memory device (EEPROM) which is plugged into the connection compartment of the transmitter. Using the DAT module you can

- save the complete settings, the logbooks and the data log of the CPM153
- copy the complete settings to other CPM153 measuring transmitters with have identical hardware functionality (if the transmitters have differing software versions, you need Parawin for conversion).

This considerably reduces the effort to install or service several measuring points.

6 Commissioning

6.1 Special features for measurement with digital sensors with Memosens technology

Commissioning
Digital sensors with Memosens technology save calibration data. Therefore, commissioning of these sensors differs from the commissiong of standard electrodes. Proceed as follows:

1. Install the transmitter and the assembly.
2. Connect the transmitter and the sensor cable.
3. Configure the transmitter according to your specific requirements (see »Description of functions« on page 37).
4. Connect the factory-calibrated sensor with Memosens technology and immerse it in the medium or buffer.
5. The saved sensor-specific calibration data are automatically transferred to the transmitter.
6. The measured value is displayed.

Data storage
Digital sensors are able to store the following data:

- Manufacturing data
  - Serial number
  - Order code
  - Date of manufacture
- Calibration data
  - Calibration date
  - Calibrated slope at 25 °C / 77 °F
  - Calibrated zero point at 25 °C / 77 °F
  - Temperature offset
  - Serial number of the transmitter used for the last sensor calibration
  - Buffer values of the last calibration
  - Change in slope compared to preceding calibration
  - Change in zero point compared to preceding calibration
- Application data
  - Temperature application range
  - pH application range
  - Operating hours at temperatures above 80 °C / 176 °F and 100 °C / 212 °F
  - Operating hours at very low and very high pH values (Nernst voltage below -300 mV, above +300 mV)
  - Number of sterilisations

To display these sensor data, select DIAG ➠ Ext. sensor data.

6.2 Special features for measurement with ISFET sensors

Switch-on behaviour
A closed control loop is created once the measuring system is switched on. During this time (approx. 5–8 minutes), the measured value adjusts to the real value. This settling behaviour occurs each time the liquid film between the pH-sensitive semiconductor and the reference lead is interrupted (e.g. caused by dry storage or intensive cleaning with compressed air). The settling time in question depends on how long the interruption lasts.

Sensitivity to light
Like all semiconductor elements, the ISFET chip is sensitive to light (measured value fluctuations). However only intense direct illumination impinges on the measuring value. For this reason, avoid direct exposure to sunlight during calibration. Normal ambient light does not affect measurement.

6.3 Installation and function inspection

Warning!
Before power-up, make sure there is no danger to the measuring point. Uncontrolled actuated pumps, valves or similar could lead to damage to instruments.

Caution!
- Before switching on, check all the connections again for correctness.
- Make sure that the pH or redox electrode and the temperature sensor are in the medium or in a buffer solution, otherwise no plausible measured value can be displayed.
- Make also sure that the connection check is carried out (see chap. 4.7).

6.4 Switching on the measuring device

Before first start-up, make sure you understand how to operate the transmitter. You should make particular reference to chapters 1 ("Safety instructions") and 5 ("Operation").

First start-up
On first start-up, the instrument starts automatically with the First start up menu. This asks you about the most important instrument settings. After you close the menu, the instrument is ready for use and measurement in its standard configuration.

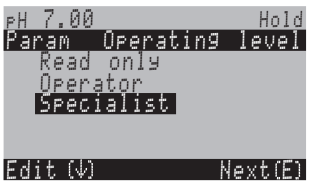
Note!
- You must completely run through the First start up menu. If you do not, the instrument will not be operational. If you interrupt the First start up, it will start again the next time you start the transmitter until **all** the menu options have been processed and completed.
- To set parameters, you have to enter the specialist code (default setting 0000).

6.5 First start up

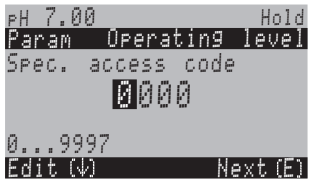
In this menu, configure the most important transmitter functions. The First start up is started automatically when commissioning the instrument. You can open the First start up at any time from the menu structure.

To enter the menu, proceed as follows:

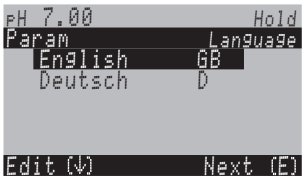
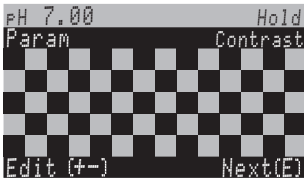
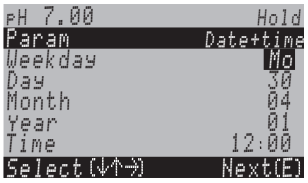
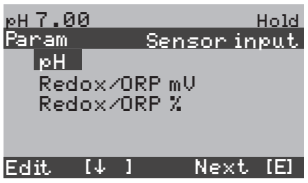
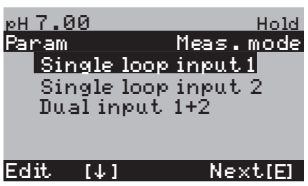
PARAM ⇒

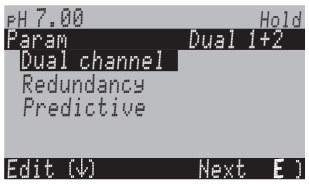
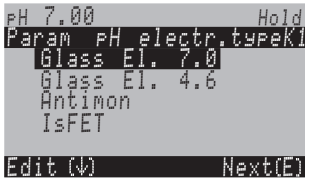
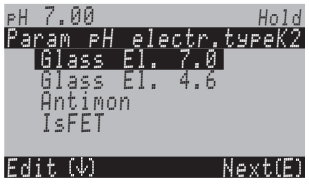
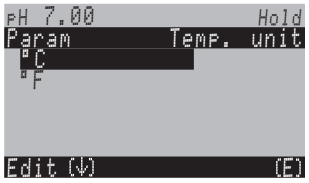
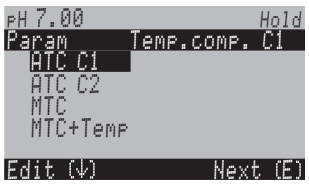


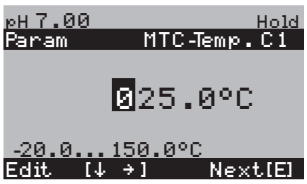
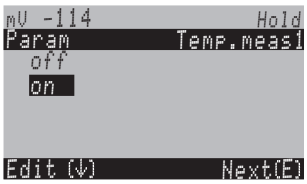
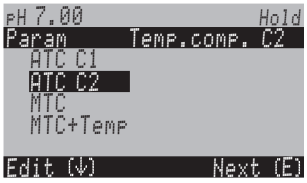
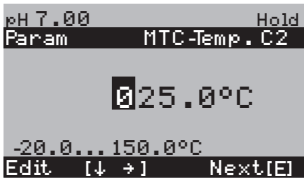
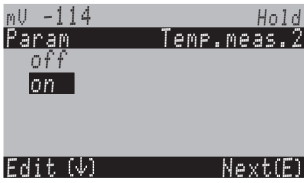
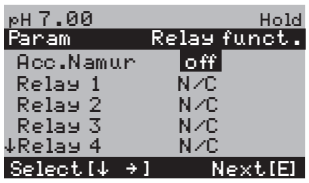
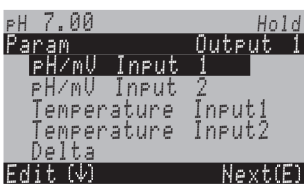
⇒

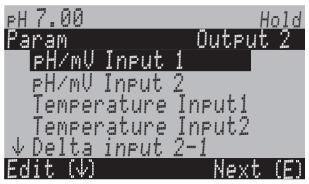
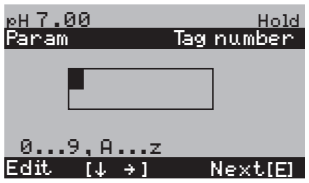


⇒

DISPLAY	CHOICE (default = bold)	INFO
	**E** D	**Select language** Depending on ordered language version Language version variants: -A: English / German -B: English / French -C: English / Italian -D: English / Spanish -E: English / Dutch -F: English / Japanese
		**Contrast setting as necessary** You can increase and reduce the contrast with the +/- keys.
	**Mo** **01** **04** **01** **12:00**	**Date and time entry** Enter the complete date and time here.
	**pH** Redox mV Redox %	**Operating mode selection** ✎ Note! ■ If you change the operating mode, all user settings are automatically reset! ■ For digital sensors, only the pH operating mode is available. ■ Here the use of the DAT module can be helpful for saving your settings.
	**Single loop input 1** Single loop input 2 Dual input 1+2	**Measuring mode selection** (single loop input 2 and dual input 1+2 only with two-circuit instrument) **Single loop input 1 / 2** = measurement via sensor input 1 **or** 2 **Dual input 1+2** = measurement via **both** sensor inputs

DISPLAY	CHOICE (default = bold)	INFO
	**Dual channel** Redundancy Predictive	**Selection (only two circuit)** **Dual channel**: 2 electrodes work completely independently of each other. **Redundancy**: Detection of electrode wear. **Predictive**: Early reaction to flow and pH changes. ✎ Note! The "Predictive" option is only available if a relay card with two analogue inputs is installed in the transmitter. For description, s. page 35.
	**Glass el. 7.0** Glass el. 4.6 Antimony ISFET	**Select electrode type 1** (pH only) ✎ Note! ■ In the event of a change from glass or antimony electrode to ISFET, the temperature sensor is reset to Pt 1000 as a default. Conversely, Pt 100 is selected. ■ The Mycom S versions glass / ISFET (CPM153-xx2xxxxxxx, CPM153-xx4xxxxxxx) are factory set for measurement with glass electrodes. ■ For digital sensors with Memosens technology, only the electrode type Glass el. 7.0 is available.
	**Glass el. 7.0** Glass el. 4.6 Antimony ISFET	**Select electrode type 2** (only with pH, two circuit)
	**solution ground** no solution ground	**Select connection type** **solution ground** = with potential matching connection (PML) **no solution ground** = without PML ✎ Note! The connection type selection is not displayed for digital sensors with Memosens technology. With digital data transmission there is no need for symmetrical high-impedance connections.
	**°C** °F	**Select temperature display**
	**ATC C1** ATC C2 MTC MTC+Temp	**Select temperature compensation C1** **ATC** = automatic temperature compensation **MTC** = manual temp. comp. (with fixed temperature, entered in the following field). **MTC+Temp.** = as MTC. The display, however, shows the value of the temperature sensor connected to the temperature input of the transmitter.

DISPLAY	CHOICE (default = bold)	INFO
	025.0°C	**Temperature value C1** (only with pH and selection of MTC or MTC+Temp. in the previous field)
	off **on**	**Temperature measurement 1** (only for redox)
	ATC C1 **ATC C2** MTC MTC+Temp	**Select temperature compensation C2** (only pH, two circuit)
	**025.0°C**	**Temperature value C2** (only for pH, two circuit and selection of MTC or MTC+Temp. in the previous field)
	off **on**	**Temperature measurement 2** (only for redox, two circuit)
	NAMUR **off** Relay 1: **N/C** Relay 2: **N/C** Relay 3: **N/C** Relay 4: **N/C** Relay 5: **N/C**	**Contact functions** Depending on the equipment available, you can assign the function of up to 5 relays here. The relays 1 and 2 will be assigned to an activated NAMUR function and won't be available for other functions (compare page 20). Selection: N/C / Controller / Limit / CCW / CCC **Controller**: Relay contact for controller output **Limit**: Limit contactor function **CCW**: Chemoclean water. Water supply for the Chemoclean function. **CCC**: Chemoclean cleaner. Cleaner supply for the Chemoclean function. (Together, CCC and CCW form the "Chemoclean" function. You can find information on Chemoclean on page 74.)
	**pH/mV Input 1** pH/mV Input 2 Temperature Input1 Temperature Input2	**Select current output 1** (Input 2 only for two-circuit) Selection of the parameter, which shall be output on the current output.

DISPLAY	CHOICE (default = bold)	INFO
	**pH/mV Input 1** pH/mV Input 2 Temperature Input1 Temperature Input2 Delta input 2-1 Continuous controller	**Select current output 2** (Input2 and Delta only for two-circuit) Selection of the parameter, which should be output at the current output. **Delta**: The difference between the two measuring circuits will be output at the current output (circuit 2 – circuit 1). **Continuous controller**: Control of a controlling actuator via the current output (See also Controller menu page 58).
	**(0...9; A...Z)**	**Enter your customer specific instrument number.** 32-digit tag number. The number is saved in the DAT module which is obtainable as an option.
	**restart** end	**Exit First start up?** **restart** = Run through settings the First start up again **end** = Save the settings and exit First start up.

Note!
The two-circuit instrument offers you the possiblity of connecting two electrodes using the following measuring modes:
- Completely independent measurement (**dual channel**)
- **Redundancy** measurement: It is always advisable when it is necessary to detect electrode wear at an early stage.
- **Predictive** measurement: Particularly in critical pipe neutralisations (inline), it is advisable to use a predictive pH/redox electrode connected to a flow meter. This gives the controller the opportunity of reacting to flow and pH changes at an early stage in the inflow.

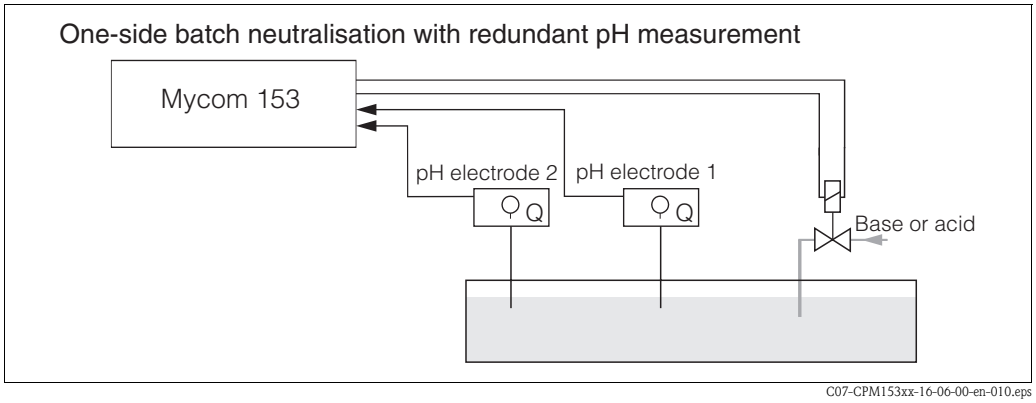


fig. 21: Scheme of a one-side batch process with a redundancy pH measurement

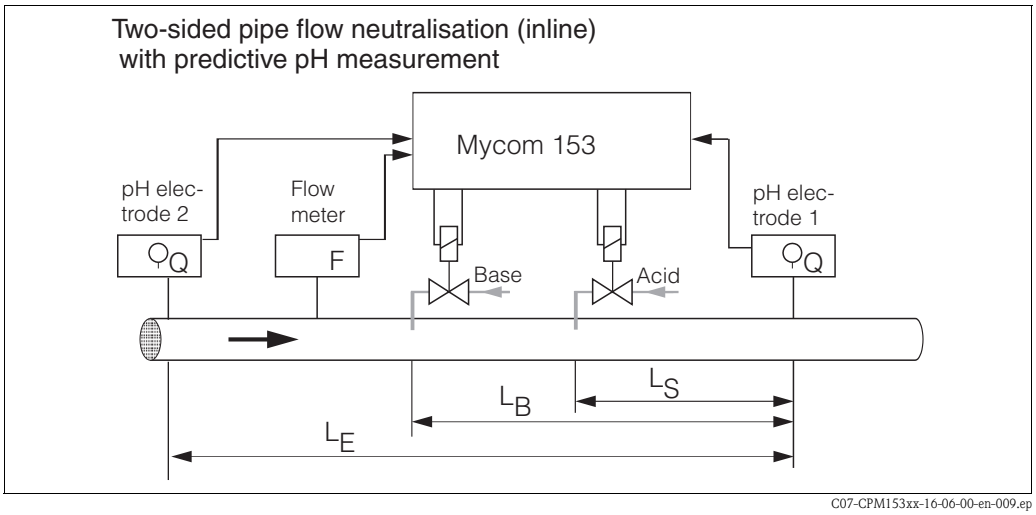


fig. 22: Scheme of a two-sided inline process with predictive pH measurement

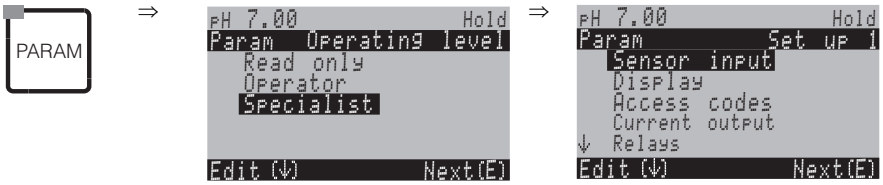
6.6 Description of functions

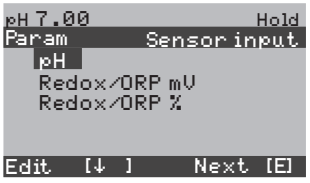
6.6.1 Set up 1 – Sensor input

In this menu, you can change the measured value acquisition settings, such as the operating mode, the measuring principle, or the electrode type.

Apart from the measured value attenuation, you have already made all the menu settings at the first commissioning in First start up (s. page 31). You can change the selected values in this menu.

To access the parameter setting menu, you have to insert your specialist code (s. page 27, page 40). Proceed as follows:



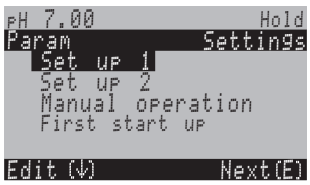
CHOICE (default = bold)		INFO
	**pH** Redox mV Redox %	**Operating mode selection** If the operating mode changes, the user settings are automatically reset. ✎ Note! For digital sensors with Memosens technology, only the pH operating mode is available.
	Single loop input 1 Single loop input 2 Dual input 1+2	**Measuring mode selection** (only with two circuit instrument) **Single loop input 1/2** = measurement via sensor input 1 **or** 2 **Dual input 1+2** = measurement via **both** sensor inputs ✎ Note! ■ If a two-circuit device is configured as such, it keeps these settings even if a transmitter (circuit) is removed or is defective. ■ If, with a defective transmitter, the error message E006, E007 is not required, then you can switch the device to "single loop". As each relay is assigned to a circuit (Alarm, Rel. 1, Rel. 2 to Circ.1; Rel. 3, 4, 5 to Circ. 2), you should keep in mind that, in such a case, functions which access the deactivated relay are no longer functionable.
	Dual channel Redundancy Predictive	**Selection (dual input only)** Electrodes measure with: **Dual channel**: completely independent of each other (you can set the "Delta Alarm" in the alarm menu, s. page 48). **Redundancy:** with two reference electrodes, to detect poisoning (only possible with electrodes of the same type, ISFET or glass). ✎ Note! If you select "Redundancy", the settings made for the measurement are valid both for circuit 1 and for circuit 2 (e.g. temperature compensation type). **Predictive**: for inline measurements with two electrodes. ✎ Note! Predictive is only available with two circuit transmitter and relay card with two current inputs. For further explanations, see page 35.

CHOICE **(default = bold)**		**INFO**
	Glass el. 7.0 Glass el. **4.6** ISFET Antimony 4.6	**Select electrode type 1** (pH only) ✎ Note! ■ If you change from glass or antimony electrode to ISFET, the temperature sensor is reset to Pt 1000 as a default. Conversely, Pt 100 is selected. ■ The Mycom S versions glass / ISFET (CPM153-xx2xxxxxxx, CPM153-xx4xxxxxxx) are factory set for measurement with glass electrodes. ■ For digital sensors with Memosens technology, only the Glass el. 7.0 electrode type is available.
	Glass el. 7.0 Glass el. **4.6** ISFET Antimony 4.6	**Select electrode type 2** (only with pH, two circuit)
	solution ground no solution ground	**Select connection type** **solution ground** = with potential matching (PM) **no solution ground** = without PM ✎ Note! ■ The connection type selection is not displayed for digital sensors with Memosens technology. With digital data transmission there is no need for symmetrical high-impedance connections. ■ For further information, see page 13.
	pH/ORP: **00s** Temperature: **00s** (00 ... 30s)	**Set measured value attenuation** The mean value over the set time is displayed. **00s** = no damping

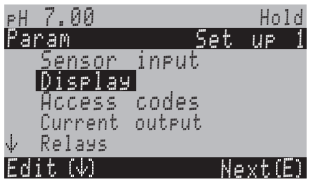
6.6.2 Set up 1 – Display

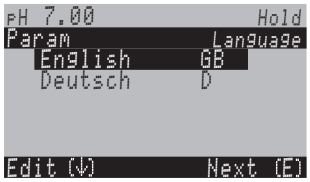
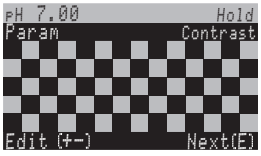
To enter the menu, proceed as follows:

⇒



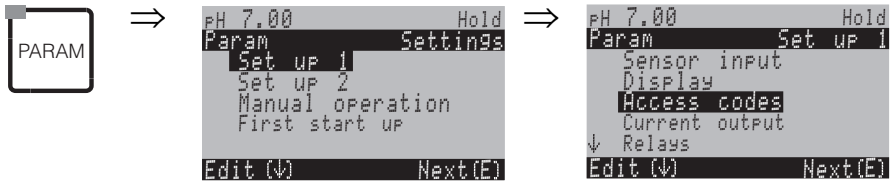
⇒

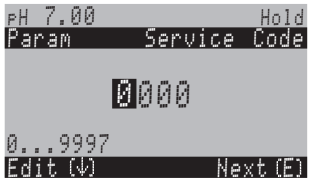


CHOICE (default = bold)			INFO
	**E** D		**Select language** Depending on ordered language version. Language version variants: -A: English / German -B: English / French -C: English / Italian -D: English / Spanish -E: English / Dutch -F: English / Japanese
			**Contrast setting as necessary** You can increase and reduce the contrast with the +/- keys.
	Weekday: Day: Month: Year: Time:	**Su** **01** **04** **01** **08:00**	**Date and time entry** The complete date and time is required here. These data are used as basis for the logbooks and automatic cleaning.
	pH pH	**00.00** 00.0	**Select of no. of decimal places** (pH measuring type only)
	°C °F		**Select temperature unit** °C: Degree Celsius °F: Degree Fahrenheit
	00000000 (0 ... 9; A ... Z)		**Enter your customer specific instrument number.** 32-digit tag number. This is saved in the DAT module. The DAT module is obtainable as an option.

6.6.3 Set up 1 – Access codes

To enter the menu, proceed as follows:

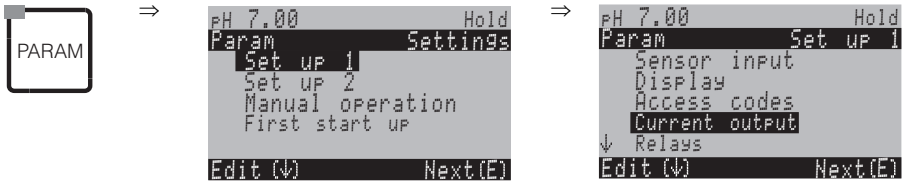


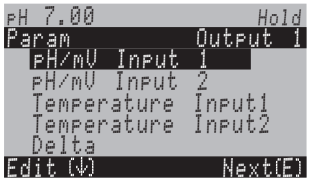
CHOICE (default = bold)		INFO (E1, 2 = editor types, s. page 28)
	**0000** (0 ... 9997)	**Enter service code** In the range 0000 ... 9997, the code can be freely selected. 0000 = no security Locking.
	0000 (0 ... 9997)	**Enter specialist code** In the range 0000 ... 9997, the code can be freely selected. 0000 = no security locking.

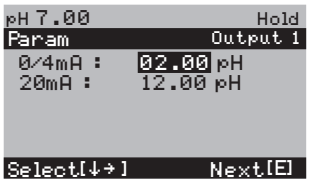
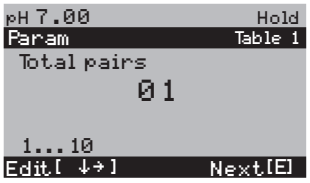
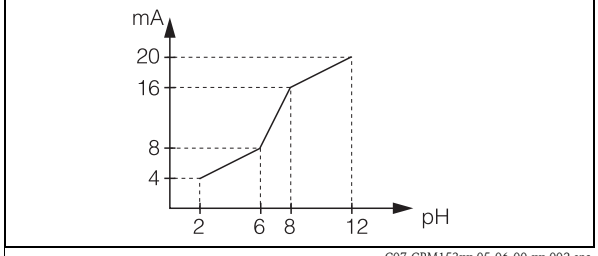
Note!
Danger of misuse.
Make sure that the codes you enter and the universal code (s. page 40) are protected against misuse by unauthorised persons. Note down the codes and keep them in a place where unauthorised persons do not have access.

6.6.4 Set up 1 – Current outputs

The transmitter is equipped with two current outputs.
To enter the menu, proceed as follows:



CHOICE (default = bold)		INFO
	Current output 1 Current output 2	**Select a current output** for which the settings apply.
Current output 1 (or 2):		
	**pH/mV Input1** pH/mV Input2 Temperature Input1 Temperature Input2 Delta Continuous controller	**Select measured value** which should be output at the current output. Selection possibilities depend on the instrument variant and the selected output. **Current output 1** (terminals 31+, 32-): – pH/mV – Temperature – Delta: The difference between the two measuring circuits will be output at the current output (circuit 2 – circuit 1). **Current output 2** (terminals 33+, 34-): – pH/mV – Temperature – Delta: The difference between the two measuring circuits will be output at the current output (circuit 2 – circuit 1). – Continuous controller: The controller actuating variable is output (see also controller menu on page 58). ✎ Note! Danger of data loss. If you change the assignment for the current output from "continuous controller" to a different function **after** you have configured the controllers, the **complete** controller settings (s. page 58) are reset to the default values.
	Caution! The configuration is changed.	**Note in display (for changed setting):** Cancel by pressing "PARAM" Continue (= confirm change) by pressing E.
	0 ... 20mA **4 ... 20mA**	**Current range selection**
	!!Caution!! Current output 0...20mA and error current = 2.4 mA is not permitted.	**Note in display:** Error current is in the measuring current range. When the current range is "0 ... 20 mA" and "Min" is selected under Alarm in field "Error current selection" (s. page 48). Recommended combinations: Current range 0...20 mA and error current max (22 mA) or Current range 4...20 mA and error current min (2.4 mA)
	linear table	**Characteristic selection** **linear:** The characteristic is linear from the lower to the upper value. **table:** When you do not want the current output characteristic to be linear, you can enter a customer-specific sequence of up to 10 value pairs in a table. Exact adaptation to the non-linear medium behaviour can achieve a higher level of accuracy.

CHOICE **(default = bold)**		**INFO**
linear		
	0/4 mA: **02.00 pH / 000.0°C / -0500 mV** 20 mA: **12.00 pH / 100.0°C / 0500 mV**	**Entry of the upper and lower measured value limits** The maximum measured value range is –2 ... +16 pH. The minimum distance from the upper to the lower measured value limit is 2 pH units. (Example.: 0/4 mA: pH 7 and 20 mA: pH 9)
	Linear characteristic active.	**Note in display:** The linear characteristic is activated after confirmation by pressing [E]. Cancel by pressing [PARAM].
Table:		
	**02** (2 ... 10)	**Entry of the number of support points (value pairs)**
	pH/Redox/°C/: **000.0** mA: **04.00**	**Value pair entry** pH/Redox/°C - mA (number of required value pairs = number of support points set in the previous field). Example of value pairs with 4 support points:  C07-CPM153xx-05-06-00-xx-002.eps *fig. 23: Example of entering a characteristic using a table*
	OK Delete element(s)	**Selection:** Are the value pairs OK or do you want to delete elements?
	pH/Redox/°C/: **000.0** mA: **04.00**	**Delete:** Select the row to be deleted, delete with [→] and confirm by pressing [E].
	Valid table	**Note in display (no entry)** Table status. If invalid, then back to previous field.
	Table active	**Note in display:** The table is active after confirmation by pressing [E]. Cancel by pressing [PARAM].

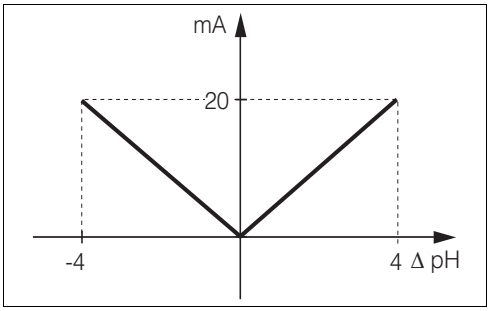
✎ Note!

- The controller function "continuous controller" can only be assigned to current output 2.

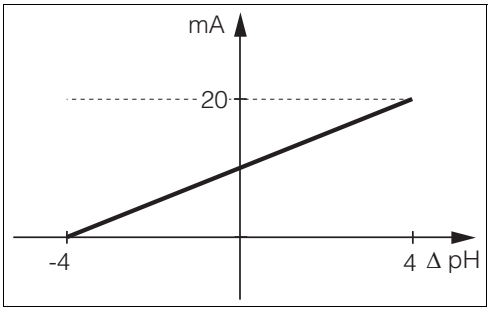
One circuit instrument		Two circuit instrument	
Current output1 (Terminals 31 +, 32 –)	**Current output2** (Terminals 33 +, 34 –)	**Current output1** (Terminals 31 +, 32 –)	**Current output2** (Terminals 33 +, 34 –)
pH/Redox Temperature	pH/Redox Temperature Continuous controller	pH/redox circuit 1 pH/redox circuit 2 Temperature circuit 1 Temperature circuit 2	pH/redox circuit 1 or 2 Temperature circuit 1 or 2 Delta pH Continuous controller

- 2-circuit device: There are two possibilities to put the difference between two pH values on the current outputs:
  - Delta pH as value on current output
    If the current outputs are only defined via positive delta pH values, the negative differences are output as value (see table left column).
  - Linear delta pH on current output
    If the current outputs are defined via positive and negative delta values, there is a linear output on the current outputs (see table right column).

Delta pH as value on current output		Linear delta pH on current output	
mA	**Delta pH**	**mA**	**Delta pH**
0/4 mA 20 mA	0 pH 4 pH	0/4 mA 20 mA	–4 mA 4 pH



C07-CPM153xx-05-06-00-xx-009.eps

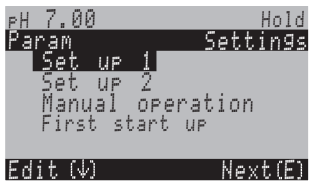


C07-CPM153xx-05-06-00-xx-010.eps

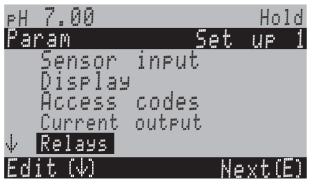
6.6.5 Set up 1 – Relays

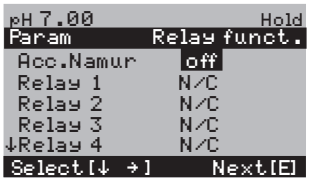
To enter the menu, proceed as follows:

⇒



⇒



SELECTION (default = bold)			INFO
	NAMUR: **off** Relay 1: **N/C** Relay 2: **N/C** Relay 3: **N/C** Relay 4: **N/C** Relay 5: **N/C**		**Relay functions** Depending on the equipment available, you can assign the function of up to 5 relays here. If you activate the NAMUR function, the relays 1 and 2 are assigned to this function and are not available for other functions (compare page 20). Selection: N/C / Controller / Limit / CCW / CCC **Controller**: Controller control using relay **Limit**: Limit contactor function **CCW**: Chemoclean water. Water supply for the Chemoclean function. **CCC**: Chemoclean cleaner. Cleaner supply for the Chemoclean function. (Together, CCC and CCW form the "Chemoclean" function. You can find information on Chemoclean on page 74.) The limit value/controller relays are configured in the "PARAM" ➔ "Set up 2" ➔ "Controller configuration". ✎ Note! ▪ Danger of data loss. If you change the relay allocation after configuring the controller and the number of relays available to the controller is reduced, the **complete** controller settings (s. page 58) are reset to the default values. ▪ If you change the relay assignment for the controller, you must use the controller menu (s. page 58) to reassign all the functions selected there to a relay. Example: Relays 4 and 5 are assigned to the controller and you change the controller assignment to relays 5 and 6 (number of relays remains 2), no data loss, providing the number of assigned relays is not reduced! ▪ You can only activate the NAMUR when the required relays 1 and 2 (s. page 20) are free.
	Active open contact **Active closed contact**		**Selection acc. to NAMUR:** (only, if NAMUR is activated) Assignment of NAMUR contacts as "Active open" contact (= normally closed contact, opens when relay active) or "Active closed" contact (= normally open contact, closes when relay active). If the NAMUR function is enabled, the alarm, relay 1 and relay 2 contacts are given the following functions: ▪ "Failure" = Fault signalling contact (terminals 41/42): Failure alarms are active if the measuring system is not working correctly or if process parameters have reached a critical value. ▪ "Maintenance required " = Relay 1 (terminals 47/48): Warning messages become active when the measuring system is working correctly but requires maintenance or a process parameter has reached a value which requires intervention. ▪ "Function check" = Relay 2 (terminals 57/58): This contact is active during calibration, maintenance, configuration and during the automatic cleaning / calibration cycle.
	Active open contact **Active closed contact**		**Selection of controller contacts as "Active open" contact or "Active closed" contact** (only, if controller is selected)
	Active open contact **Active closed contact**		**Selection of limit values as "Active open" contact or "Active closed" contact** (only, if limit values are selected)

SELECTION (default = bold)		INFO
	Active on Active pulse	**Contact type: Fault signalling contact** (only, when NAMUR function = off) **Active on** = active for as long as an error is present. **Active pulse** = active for 1 second when an alarm signal occurs
	Chemoclean is always an "Active closed" contact.	**Note in display** (only, when the full Chemoclean function is selected in field "Relay functions", which means CCC and CCW) With the Chemoclean function, the valves of CYR10 injector are effected with an "Active closed" contact.

6.6.6 Set up 1 – Temperature

The pH value requires temperature compensation for two reasons:

1. Temperature effect of the electrode:
   The electrode slope is dependent on the temperature. Therefore this effect must be compensated for temperature changes (temperature compensation, see below).
2. Temperature effect of the medium:
   The medium pH value is also temperature dependent. For high-accuracy measurements, the pH value related to temperature can be entered in table form (medium temperature compensation, see below).

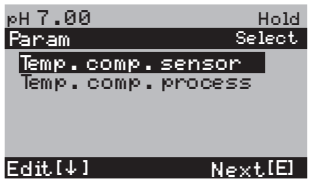
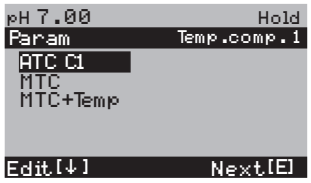
Temperature compensation
ATC: Automatic temperature compensation: The medium temperature is measured with a temperature sensor. This temperature is used via the temperature input in the Mycom S CPM153 to adjust the electrode slope to the medium temperature.

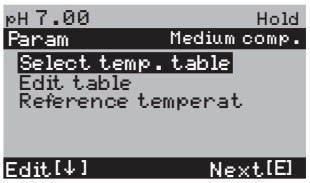
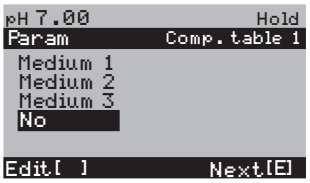
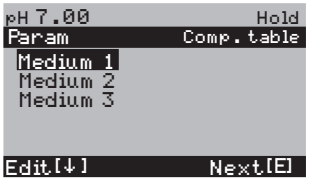
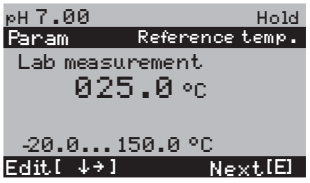
MTC: Manual temperature compensation: This is advisable in processes which run at a constant temperature. Enter the temperature value manually.

MTC+Temp.: The pH value is corrected with the manually entered temperature. The display, however, shows the value that the temperature sensor measures in the medium.

Medium temperature compensation
ATC tables for Medium 1...3:
For medium temperature compensation, tables can be created in the Mycom S CPM153 for three different media. Before starting the process, the most suitable table for the active medium can be selected.
Procedure:
- Take a sample from the process. The pH value should be as near as possible to the reference value of the process.
- In the laboratory, heat the sample to at least the process temperature.
- During cooling, record the value pairs for pH and temperature at those temperatures at which you later wish to take measurements (e.g. process temperature and ambient temperature in the laboratory).
- Enter these recorded value pairs in the table (Field "Value pair entry"). As a reference temperature (Field "Enter reference temperature") select the temperature, at which the reference value of the process is defined (e.g. ambient temperature in the laboratory).

To enter the menu, proceed as follows:

CODE	CHOICE (default = bold)	INFO
	**Temp. comp. sensor** Temp. comp. process	**Selection for temperature compensation** **Temp. comp. sensor** = automatic (ATC) or manual (MTC) temperature compensation. **Temp. comp. process** (pH only) = compensation of the medium temperature using customer-specific tables (see below).
Temperature compensation sensor:		
	**Measuring circuit 1** Measuring circuit 2	**Select measuring circuit** you wish to configure.
	Measuring circuit 1 (or 2, optional):	
	ATC C1 ATC C2 MTC MTC+Temp.	**Select temperature compensation** **ATC** = automatic temperature compensation with a temp. sensor circuit 1 or circuit 2 **MTC** = manual temp. comp. (with fixed temperature, entered in the following field) **MTC+Temp.** = as MTC. The display, however, shows the value of the temperature sensor connected to the temperature input of the transmitter.
	025.0°C (0 ... 100.0 °C)	**MTC temperature** (only pH, MTC) Temperature entry for manual compensation
	Off On	**Select temperature measurement** (only redox) The reference temperature can be adapted according to customer specifics in field "Enter reference temperature" (s. page 47).
	Pt 100 Pt 1000 NTC 30k none	**Select temperature sensor** ✎ Note! The temperature sensor selection is not available for digital sensors with Memosens technology.
	Actual temperature value (–20.0 ... 150.0°C)	**Enter actual temperature value for temperature calibration** The value currently measured by the temperature sensor can be changed/adapted. The temperature difference is stored internally as an offset value.
	0.0°C (-5.0 ... 5.0°C)	**Enter offset value** The offset value obtained from the previous field can be edited or reset here.

CODE	CHOICE (default = bold)	INFO
Temperature compensation process (pH only):		
	**Select temp. table** Edit table Reference temperature	**Selection** Enter / activate customer-specific temperature compensation tables. **Select temp. table** = select for activation
Select temperature table:		
	Medium 1 Medium 2 Medium 3 **off**	**Select a medium for measuring circuit 1** **off** = no medium compensation
	Medium 1 Medium 2 Medium 3 **off**	**Select medium for measuring circuit 2** (only two circuit instruments) **off** = no medium compensation
Edit table:		
	**Medium 1** Medium 2 Medium 3	**Select medium** Medium compensation curves can be entered as a table for three different media.
	02 (2 ... 10)	**Enter the number of support points (value pairs)** Value pair: pH/redox and temperature
	°C / pH 020.0°C / 02.00 025.0°C / 04.00	**Value pair entry** Enter pH/redox and temperature (number of required value pairs = number of support points set in the previous field).
	OK Delete element(s)	**Selection:** Are the value pairs OK or do you want to delete elements?
	°C / pH **020.0°C / 02.00** 025.0°C / 04.00	**Delete:** Select the row to be deleted, delete with → and confirm by pressing E.
	Valid table	**Note in display:** The table is active after confirmation by pressing E. Cancel by pressing PARAM.
Reference temperature:		
	For laboratory measurement: **25.0°C** (-20 ... +150 °C)	**Enter reference temperature** to which the medium temperature shall be compensated. Enter the temperature at which the pH reference value of the process is defined (e.g. the ambient temperature in the laboratory).

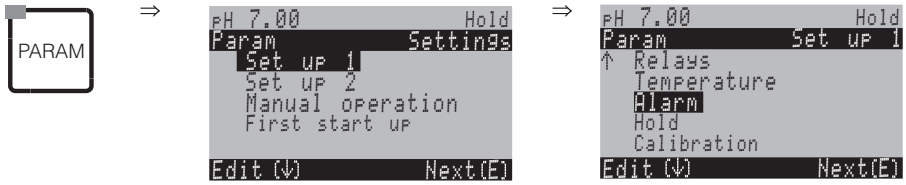
6.6.7 Set up 1 – Alarm

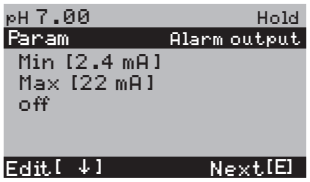
The CPM153 continuously monitors the most important functions. If an error occurs, an error message is set, which can trigger one of the following actions:

- The fault signalling contact is actived.
- Current output 1 und 2 output the set error current (2.4 or 22 mA):
  Exception: If current output 2 has been configured for the continuous controller function (s. page 41), it does not output an error current.
- Chemoclean cleaning is started.

In the list of error messages on page 102 you can see how the error numbers are assigned by default. In the "ALARM" menu, you have the option of outputting the error messages individually to the alarm relay, the current output or as a cleaning trigger.

To enter the menu, proceed as follows:



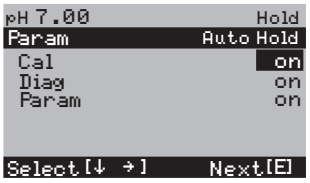
CHOICE (default = bold)		INFO
	Min (2.4 mA) **Max (22 mA)** Off	**Select error current** Set the error current at which an error message is active.
	!!Caution!! Current output 0...20 mA and error current = 2.4 mA is not permitted.	**Note in display:** Error current is in the measuring current range. When the current range is "0 ... 20 mA" and "Min" is selected under Alarm in the previous field. Recommended combinations: ■ Current range 0...20 mA and error current max (22 mA) ■ Current range 4...20 mA and error current min (2.4 mA)
	0000s (0 ... 2000s)	**Alarm delay entry** Delay between error occurrence and alarm trigger.
	Function **off** Maintenance **1.00** pH Failure **3.00** pH 0.10 ... 5.00 pH	**Delta Alarm** (only two-circuit) Monitoring of measured value difference for two-circuit measurement. Entry of maximum permitted difference at which the maintenance or failure alarm shall be triggered.
	No. E 025 A **on** I **on** CC **on**	**Error/contact assignment** Each error can be assigned individually: **No.**= error number E025 **A** = Assignment to alarm relay (activating/ deactivating). An activated error triggers an alarm. **I** = This error triggers an error current **CC** = Chemoclean®. This error triggers cleaning.
	Function: off Time input: 0000 s (2...9999 s)	**Dosing time alarm** **Function**: Switch on/off the function "Alarm when dosing time exceeded". **Time input**: Input of the maximum allowed dosing time. After this time has elapsed, an error is output.

6.6.8 Set up 1 – Hold

Hold function = "Freezing the outputs"
The current outputs can be "frozen" for each menu. This means that the value which you define in this menu is output. With hold, "Hold" appears in the display.
The hold function can also be activated externally via the hold input (see wiring diagram s. page 22, digital input E1). The on-site hold has a higher priority than an external hold.

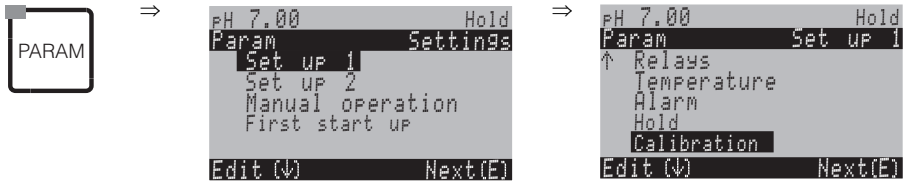
✎ Note!
- If a hold is active, no programme can be started.
- If current output 2 is configured for the controller, it complies with the controller hold (see last field of the table).

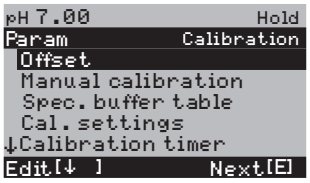
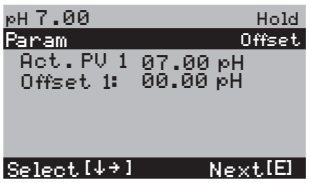
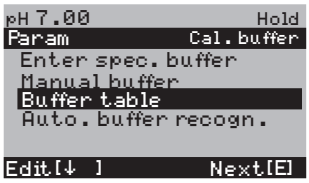
To enter the menu, proceed as follows:

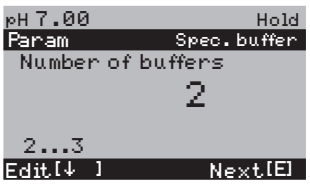
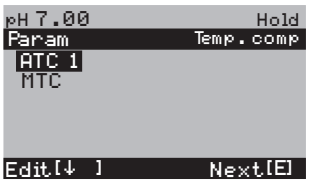
CHOICE (default = bold)		INFO
	CAL **on** DIAG **on** PARAM **on**	**Selection: automatic hold active when:** **CAL** = Calibration **DIAG** = Service/Diagnosis **PARAM** = Parameter entry menu
	Last Set Min (0/4 mA) Max (22 mA)	**Selection of current for hold** **Last** = The current value is "frozen". **Set** = The value set in the following field is output in a hold. **Min / Max** = The minimum or maximum current value is output.
	000% (0 ... 100%)	**Enter Hold current** (only for Set) Number settable from 0% = 0/4 mA to 100% = 20 mA
	010 s (0 ... 999 s)	**Enter hold delay time** The hold remains active for the given hold delay time after leaving the CAL, PARAM, DIAG menus. During the hold delay time, "Hold" flashes in the display.
	Freeze actuating variable: **yes** no	**Controller hold** Freeze actuating variable (dosing) : **Yes**: During an active hold, the last set value is output. **No**: During a hold, no dosing takes place. PWM or PFM relays remain in the dropped-out state. An actuator drive is controlled until it is closed. ✎ Note! If the set value is output via an actuator drive with feedback, the actuator remains active. It also reacts in the hold should the position suddenly change.

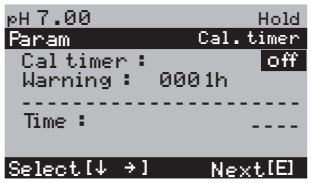
6.6.9 Set up 1 – Calibration

Operating mode pH
To enter the menu, proceed as follows:



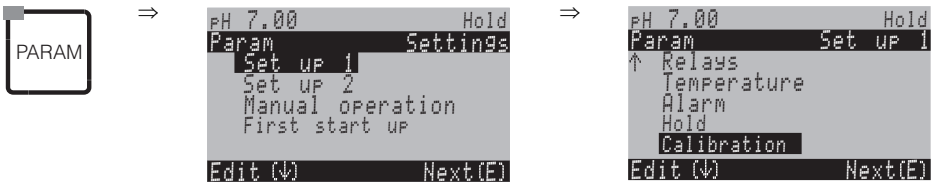
CHOICE (default = bold)		INFO
	**Offset** Manual calibration Special buffer table Cal. settings Calibration timer Autocal. Topcal	**Calibration menu selection** **Offset**: Entry of a fixed value by which the mV value is displaced. **Manual calibration**: Initial settings for the functions of the CAL key. **Special buffer table**: Edit tables for special buffers **Cal. settings**: General calibration settings **Calibration timer**: Clock for calibration **Autocal. Topcal**: Initial settings for the Topcal S calibration.
Offset:		
	Curr. PV 1/2: **07.00** pH Offset 1/2: **00.00** pH (Offset: -2.00 ... +2.00 pH)	**Enter offset value for pH value** **Curr. PV**: Display and entry of current measured value (primary value) with offset **Offset**: Display and entry of pH value difference When you enter the measuring mode while an offset is active, "OFFSET" will be shown on the right top of the display.
Manual calibration:		
	**Enter spec. buffer** Manual buffer Buffer table Auto. buffer recognition	**Calibration parameters** Sets the calibration type undertaken when the "CAL" key is pressed: **Data entry**: Entry of zero point and sensor slope. **Manual buffer**: During calibration, enter the buffer value. **Buffer table**: If the same buffer values are always used, you can select this function. **Auto. buffer recognition**: The Mycom S transmitter automatically recognises the used buffer values. ✎ Note! Automatic buffer recognition only functions if glass electrodes are connected to both measuring circuits. If you are using an ISFET sensor, please calibrate with a different calibration function.
	DIN 19267 Mettler **E+H** NBS / DIN 19266 Merck+Riedel Special buffer	**Select buffer type** (only buffer table, auto. buffer recognition) **Special buffer** = The special buffer tables defined in the option "Special buffer table" are used. ✎ Note! You can find the buffer tables for the buffers offered in the Appendix (s. page 138).

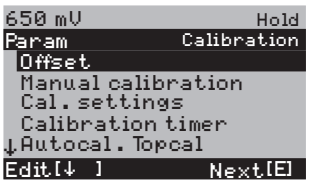
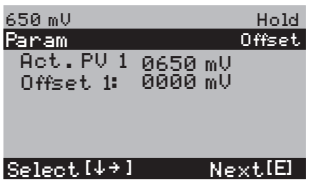
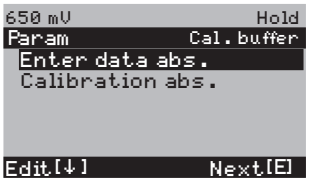
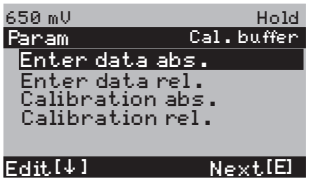
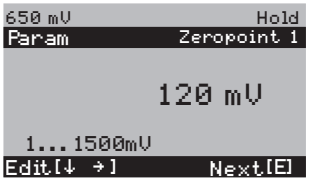
CHOICE (default = bold)			INFO
	Buffer 2.0 Buffer 4.01 Buffer 6.98 Buffer 9.18 Buffer 10.90 (values depend on buffer type)	**Buffer 1**	**Enter pH value for buffer 1 of the two-point calibration** (buffer table only)
	Buffer 4.01 Buffer 6.98 Buffer 9.18 Buffer 10.90 (values depend on buffer type)	**Buffer 2**	**Enter pH value for buffer 2 of the two-point calibration** (buffer table only)
Special buffer table:			
	**2** (2 ... 3)		**Enter the number of buffers** You can save min. 2 and max. 3 special buffers in a table. ✎ Note! The following four fields must be run through individually for each buffer.
	1 (1 ... 3)		**Edit table** Select a table for editing.
	10 (2 ... 10)		**Entry of the number of support points (value pairs)** Value pair: pH and temperature
	°C: **000.0** 005.0 ...	pH: **04.00** 04.05 ...	**Value pair entry** Enter temperature and pH/redox (number of required value pairs = number of support points set in previous field).
	OK Delete element(s)		**Selection:** Are the value pairs OK or do you want to delete any of them?
	°C: **000.0** 005.0 ...	pH: **04.00** 04.05 ...	**Delete:** Select the row to be deleted, delete it with → and confirm this with E.
	Valid table		**Note in display:** The table is active after confirmation by pressing E. Cancel by pressing PARAM.
Cal. settings:			
	**ATC 1** MTC		**Select the temperature compensation for the calibration** **ATC** = automatic temp. comp. **MTC** = manual temp. comp. ✎ Note! The setting is only active during calibration. In measuring mode, the setting selected in the "Temperature" menu.
	25.00 mV/pH (5.00 ... 57.00 mV/pH)		**Entry of difference to slope for alarm function** If the entered slope difference is exceeded, an alarm (error no. 032 / E035) can be triggered (error activation s. page 48). Ex.: The electrode has a slope of 59 mV/pH at 25 °C /77 °F. You enter a slope deviation value of 5 mV/pH. Then, an alarm can be triggered at measured slopes <53 mV/pH or >64 mV/pH.

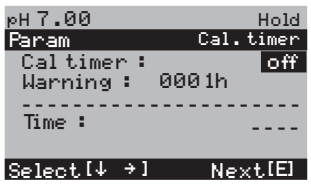
CHOICE (default = bold)			INFO
	pH 1.30 (0.05 ... 2.00 pH)		**Entry of pH value zero point deviation for the alarm function** If the zero point deviates from the reference zero point by the value entered here, an alarm (Error no. 033) can be triggered (error activation s. page 48). Ex.: The electrode has a zero point of 7.00 pH (for electrodes with inner buffer of 7 pH). You enter a zero point deviation value of 0.05 pH. Then, an alarm can be triggered at measured zero points <6.95 pH or >7.05 pH.
	off on		**SCC (Sensor Condition Check)** This function monitors the electrode status or the degree of electrode ageing. Possible status messages: "Electrode OK", "Low wear" or "Replace electrode". The electrode status is updated after each calibration. When the "Replace electrode" message appears, an error message may be displayed. ✎ Note! This function is only available for glass electrodes. If you are using a glass electrode and an ISFET sensor, you can use the SCC function without restriction. However, the SCC function only monitors the glass electrodes.
	Function1/2: Uis 1/2:	**off** on 00.00pH (0...16pH)	**Isothermic compensation** Activate the isotherm compensation and enter the isotherm intersection point (Uis). **Function off**: for E+H electrodes **Function on**: Only if the isotherm intersection point ≠ zero point of the electrode. The bigger the difference between isotherm intersection point and zero point, the bigger the measured error at temperature fluctuations. **Uis**: Enter the intersection point at which the isotherms of the electrode meet. ✎ Note! When you activate the isothermic compensation the electrode has to be calibrated before measuring.
	threshold length	**02 mV** 010s	**Stability** The calibration is only considered as stable, if the deviation of the mV value does not exceed the given threshold for the set period of time (length) during calibration. This function allows you to adjust calibration accuracy and timing individually to your process. ✎ Note! If your process requires extremely accurate calibration, reduce the threshold value and increase the period (length) to make sure that the pH value does not drift.
Calibration timer:			
	Cal timer: Warning: Time:	**on** **0001h** 0001:00	**Calibration timer** If no calibration is undertaken in the set time, an error message appears (E115). **Cal timer**: on = activate **Warning**: Enter the time within which a calibration must take place. **Time**: Displays the remaining time until an error message appears (count down).

Operating mode Redox

To enter the menu, proceed as follows:



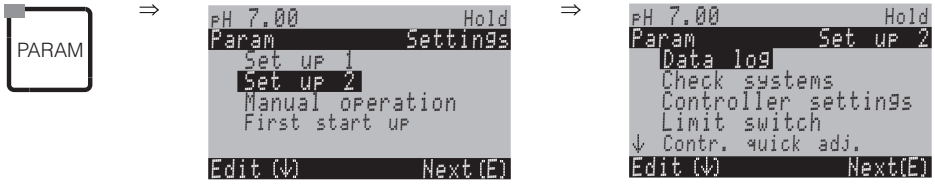
CHOICE (default = bold)		INFO
	**Offset** Manual calibration Cal. settings Calibration timer Autocal Topcal	**Calibration menu selection** **Offset**: Entry of a fixed value by which the mV value is displaced. **Manual calibration**: Initial settings for the function of the CAL key. **Cal. settings**: general calibration settings **Calibration timer**: Clock for calibration **Autocal Topcal**: Initial settings for the Topcal S calibration.
Offset:		
	Curr. PV 1/2: **0650 mV** Offset 1/2 **0000** mV	**Enter Offset value for redox value** **Curr. PV**: current measured value (primary value) **Offset**: redox value difference in mV When you enter the measuring mode while an offset is active, "OFFSET" will be shown on the right top of the display.
Manual calibration:		
	**For redox abs.** **Data entry abs.** Calibration abs.	**Calibration parameter** Sets the calibration type undertaken when the "CAL" key is pressed: **Data entry abs.**: Enter the electrode offset in mV. **Calibration abs.**: Use a redox buffer.
	**For: Redox %:** **Data entry abs.** Data entry rel. Calibration abs. Calibration rel.	**Calibration parameter** Sets the calibration type undertaken when the "CAL" key is pressed: **Data entry abs.**: Enter the electrode offset in mV. **Data entry rel.**: Entry of two % calibration points to which one mV value is assigned. **Calibration abs.**: Use a redox buffer. **Calibration rel.**: Use a non-toxic and an unchanged sample as buffer.
Cal. settings:		
	**0120 mV** (1 ... 1500 mV)	**Entry of offset deviation of the mV value for the alarm function** If the offset deviates from the reference offset by the value entered here, an alarm can be triggered.

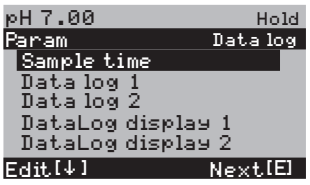
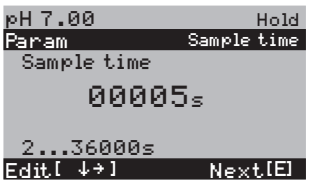
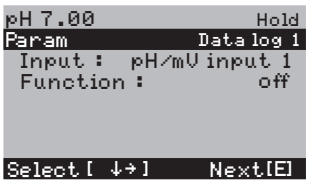
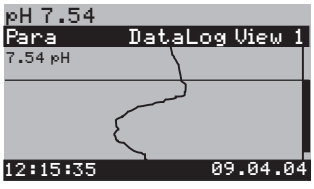
CHOICE (default = bold)			INFO
	off on		**SCC (Sensor Condition Check)** This function monitors the electrode status or the degree of electrode ageing. Possible status messages: "Electrode OK", "Low wear" or "Replace electrode". The electrode status is updated after each calibration. When the "Replace electrode" message appears, an error message may be displayed.
	threshold length	**02 mV** 010s	**Stability** The calibration is only considered as stable, if the deviation of the mV value does not exceed the given threshold for the set period of time (length) during calibration. This function allows you to adjust calibration accuracy and timing individually to your process. ✎ Note! If your process requires extremely accurate calibration, reduce the threshold value and increase the period (length) to make sure that the pH value does not drift.
Calibration timer:			
	Cal timer: Warning: _____ Time:	**on** **0001h** 0001:00	**Calibration timer** If no calibration is undertaken in the set time, an error message appears (E115). **Cal timer**: on = activate **Warning**: Enter the time within which a calibration must take place. **Time**: Displays the remaining time until an error message appears.

6.6.10 Set up 2 – Data Log

The data log records two freely selectable parameters with their date and time. You can start it using the measuring menus:
Use the arrow keys to scroll through the measuring menus until to you reach the Record mode of the data logger. Pressing the "Enter" key brings you to the Scroll mode of the data logger. Here you can open the saved measured values with their date and time.

To enter the menu, proceed as follows:



CHOICE (default = bold)			INFO
	**Sample time** Data log 1 Data log 2 DataLog display 1 DataLog display 2		**Data log settings** Using the data log you can record ▪ one parameter with 500 sequential measuring points or ▪ two parameters each with 500 sequential measuring points.
Sample time:			
	**00005s** (2 ... 36000 s)		**Enter sample time** Enter the time interval after which the next measured value is recorded in the data log.
Data log 1 (or 2):			
	Input: Function:	**pH/mV input 1** **off**	**Selection** Set the measured variable for recording (pH/redox , temp.) and activate recording using the "on" function.
	Min: Max:	-2.00 16.00	**Set recording range** Values outside the defined range are not recorded.
DataLog display 1 (or 2)			
			**View of recorded data** Measured value, date and time relate to current cursor position.

6.6.11 Set up 2 – Check

You can activate two monitoring functions in the "Check" menu.

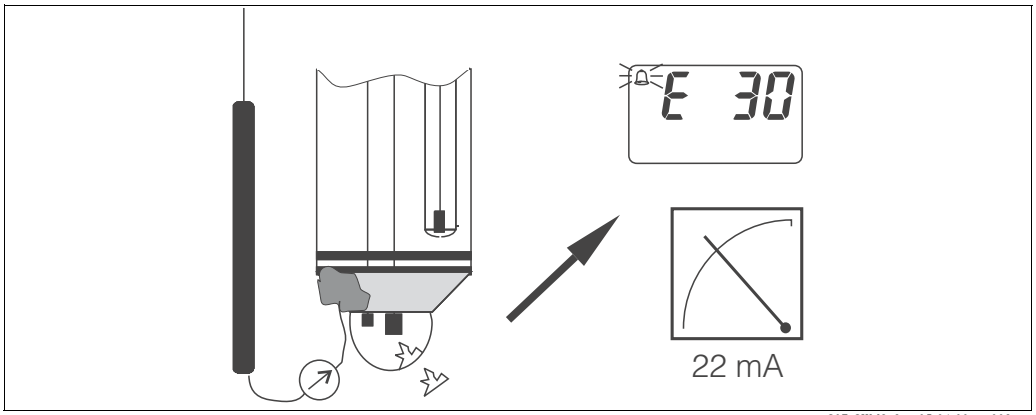
SCS electrode monitoring
The sensor check system monitors the pH and reference electrode for inaccurate measurement and total failure.

The SCS detects the following causes for inaccurate measurements:

- Breakage of electrode glass
- Fine short circuits in the pH measuring circuit, e.g. moisture or dirtbridges in clamping points
- Soiling or blocking of reference electrode
- Leakage current on ISFET sensor

The following three monitoring methods are used:

- Monitoring of pH electrode for high impedance (an alarm is triggered when the impendance drops below a minimum value of approx. 500 kW).
- Monitoring of reference electrode impedance (an alarm is triggered when the defined threshold is exceeded). This function can only be selected with a symmetrical connection.
- Monitoring of leakage current with ISFET sensors (pre-alert E168 at I_{Leak}>200 nA, error E008 at I_{Leak}>400 nA).

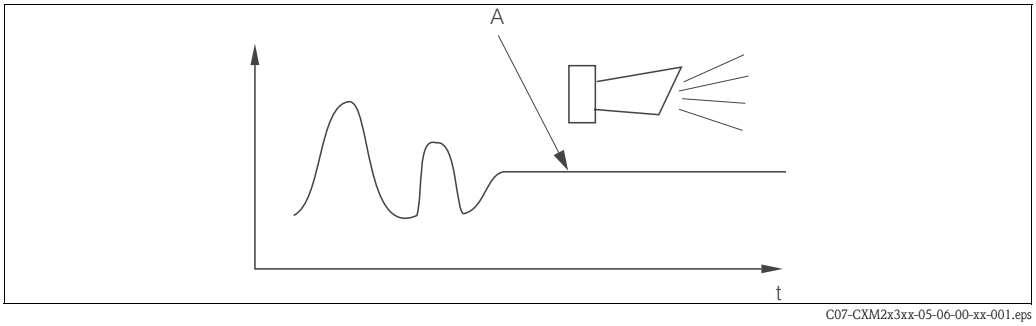


C07-CXM2x3xx-05-06-00-xx-002.eps

fig. 24: SCS alarm

Caution!
Do not remove the electrode from the process without Hold. Since the SCS is measured against PML, missing contact between the inner conductor and PML would trigger an alarm.

PCS alarm (Process Check System)
PCS monitors the measuring signal for deviations. If the measuring signal fluctuates less than 0.5 % (from the measuring range end value) for the given period of time, an alarm (E152) is triggered. This sensor behaviour may be caused by soiling, defective cable, etc.

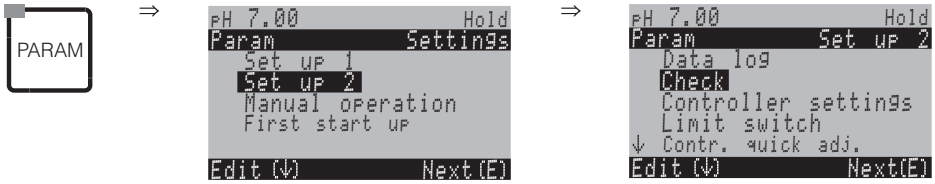


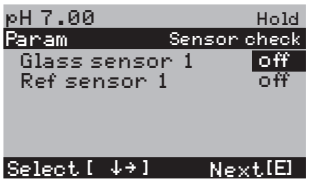
C07-CXM2x3xx-05-06-00-xx-001.eps

fig. 25: PCS alarm

A Constant measuring signal = Alarm is triggered after PCS alarm time has elapsed

To enter the menu, proceed as follows:



CHOICE **(default = bold)**		**INFO**
	Glass sensor 1: **off** Ref sensor 1: **light** Glass sensor 2: **off** Ref sensor 2: **medium**	**Select SCS (= Sensor Check System) mode for measuring circuits 1 and 2 for the two-circuit instrument:** SCS: Recognition of glass breakage (off; on) SCS Ref.: Blockage recognition (off, light, medium, heavy, very heavy blockage) ✎ Note! In an unsymmetrical connection (without PML) only the glass electrode can be monitored, the reference electrode cannot be monitored.
	PCS input 1: **off** PCS input 2: **off**	**PCS (= Process Check System) time** If the measuring signal does not change during the entered time for ±0,02 pH / ±5mV / ±0,25%, an alarm is signalled with error message E152. Settable times: off, 1h, 2h, 4h. ✎ Note! An active PCS alarm signal will be deleted automatically as soon as the sensor signal changes.

6.6.12 Set up 2 – Controller settings

Requirements for controller settings:
You have carried out the following settings **which are necessary for controller configuration** either in the First start up, page 31 or on the appropriate menu page.
If you have not yet made the settings, please do this **before** configuring the controller.
- Define the number of relays available to the controller (contact functions, page 34, or page 44) and/or
- Define current output **2** as continuous controller if you want to control the actuator via a 20 mA interface (see page 35 or page 41).

✎ Note!
- Danger of data loss.
  If you assign the relays which are used by the controller with another function (see page 44), the **complete** controller configuration is reset to the default values.
- If you change the relay assignment for the controller in the "Relays" menu (see page 44), you must use the controller menu to reassign all the functions selected there to a relay.
  Example: Relays 4 and 5 are assigned to the controller and you change the controller assignment to relays 5 and 6 (number of relays remains 2). No data loss, providing the number of assigned relays is not reduced!
- Relays 3, 4 and 5 are located on the additional plug-in card. If you have used one of these relays for the controller function and want/have to remove this card from the device, we recommend that you change the controller settings before removing the additionaly plug-in card, so that the controller works with the basic device equipment (relays 1 and 2). Otherwise, you cannot use the controller function while the additional plug-in card is not plugged into the device, as the controller needs to access the relays on the additional plug-in card.

Definition of terms

Actuators: Valves, gate valves, pumps and similar

Acid/base: The terms "acid" and "base" used **in the menu** are used here relating to the direction of action.
Acid = Dosing medium, which lowers the pH value.
Base = Dosing medium, which raises the pH value.
Example: A fluid (pH value 14) needs to be brought up to the reference value of pH 12 with a base (pH value 9). In the "Dosing" menu, choose "Acid" as the addition of this dosing medium, will lower the pH value of the fluid.

Process: The controller or the process (to simplify matters this will, from henceforth, be referred to as the "process") can be differentiated on account of their different features:

Direction of action, one or two-sided: One-sided control only works in one of two possible directions. This concerns, for example, a neutralisation process in which a dosing medium is used (acid or base).

With a two-sided process, control can generally work in two directions (use of acid and base). This means that you can both increase and decrease the value of the actuating variable (here = pH value). To implement this, the set reference value of your process must lay between the pH values of the two dosing media.

Batch or inline process arrangement: With active control, the batch and inline processes differ in their relationship to the medium flow:

Pure batch process: the batch container is filled with the medium. During the subsequent batch process, no additional medium is fed in. The change in pH value is determined only by the controller. To be able to compensate for possible so-called "overshoots", use a two-sided controller. For as long as the actual value is within the neutral zone, no additional dosing agent is added.

Pure inline process: Here, the control works with the medium flowing past. The pH value of the medium in the inflow may be subject to strong deviations for which the controller should compensate. The volume of medium which has already flowed past can no longer be influenced by the controller. For as long as the actual value corresponds to the set point, the actuating variable has a constant value.

In practice, the most common option is the semi-batch process. Depending on the ratio of inflow to tank size, this process shows the behaviour of an inline or a batch process.

The Mycom controller takes this differing behaviour into account. The internal handling of the integral part of the PI or PID controller is different for these settings.

Predictive pH measurement
To be able to solve the general problems of a pure inline process, the CPM153 is able to "look into the future" using a second pH electrode and a flowmeter. This means that the controller can react to strong variations in the inflow at an early stage.

Controlling the actuators
The CPM153 has four different methods for controlling the actuators (see above).

1. **PWM** (Pulse-width modulation, "pulse-length controller")
Pulse-width modulated outputs are used to control solenoid valves, for example. With PWM, the internal, continuous actuating variable is output to a relay as a rhythmic signal.
The larger the calculated actuating variable, the longer the appropriate contact remains picked up (i.e. the longer the switch-on period t_{ON}; see fig. 26). You can set the period length freely between 1 and 999.9 seconds. The minimum switch-on period is 0.4 seconds.
For a two-sided process, you can combine PWM with a second controlling method as follows:
- a PWM relay
- a PFM relay
- a three-point step controller

A single PWM relay can only output one actuating variable for a solenoid valve.
To avoid pulses which are too short, enter a minimum switch-on period. Pulses which are shorter than this period are not given to the relay/or the actuators. This benefits the actuator.

2. **PFM** (PFM; "pulse-frequency controller")
Pulse-frequency-modulated outputs are intended to control directly driven magnetic dosing pumps, for example. As with PWM, PFM is output as a rhythmic signal by the relay.
The greater the calculated actuating variable, the higher the frequency of the related contact. The maximum settable frequency 1/T is 120 min^{-1}. The switch-on period t_{ON} is a constant factor of the entered frequency (see fig. 26).
For 100 % dosing, the ratio of switch-on period and switch-off period is 50 : 50.
Here, you can combine PFM with a second controlling method for a two-sided process as follows:
- a PFM relays
- a PWM relay
- a three-point step controller

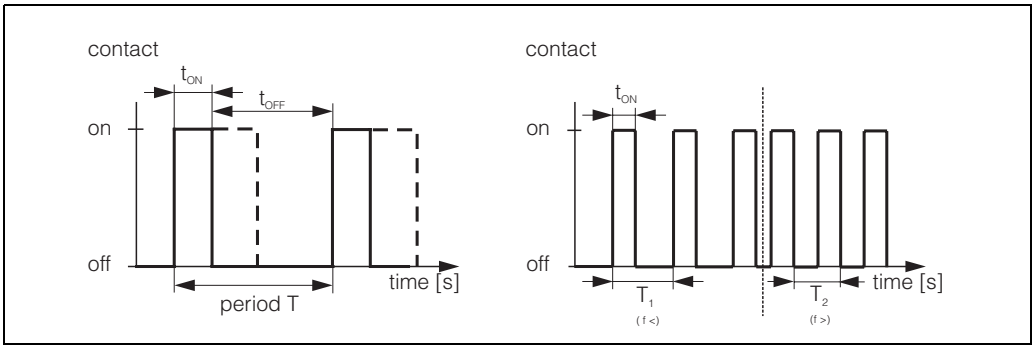


fig. 26: Left: pulse-width modulation (PWM)
Right: pulse-frequency modulation (PFM)

3. **Three-point step controller** (3-point step)
With the Mycom S, this type of control is only possible for one process side (acid or base). With two-sided processes, either PWM or PFM must be used for the other process side.
The three-point step controller can only be selected if an analogue input for the actuator feedback is available.
This type of actuator controller is intended for actuator drives (e.g. motor-driven valves, etc.) where a motor must be controlled directly. For this, two relays are required: one "+relay", which, by picking-up, opens the valve and one "–relay" which closes the valve. To set an actuating variable of, for example, 40% (valve 40% open), you must input the time that the "+relay" must be picked up to completely open a completely closed valve (= "motor on time").

✎ Note!
- If using a driven valve, gate valve or similar, you must determine the motor run time, before beginning with the menu settings.
- When commissioning your system, you need to fully open and close the valve so that Mycom S can adjust the position feedback.

4. **Analogue** (via current output 2, 20 mA)
The current output can be used to output the analogue actuating variable for one or two-sided processes and cannot be combined with the method described above.
- With one-sided processes, the actuating variable range 0% ... 100% (or –100% ... 0%) is represented on the selected current range (0 ... 20 mA or 4 ... 20 mA). The output current is proportional to the actuating variable.
- With a two-sided process, the complete actuating variable range from –100% ... +100% is represented on the given current range. An actuating variable of 0% leads to a current of 10 mA (at 0 ... 20 mA) or 12 mA (at 4 .. 20 mA) (see fig. 27).

✎ Note!
With a two-sided process, make sure that the actuator is able to use this method (also known as "split range").

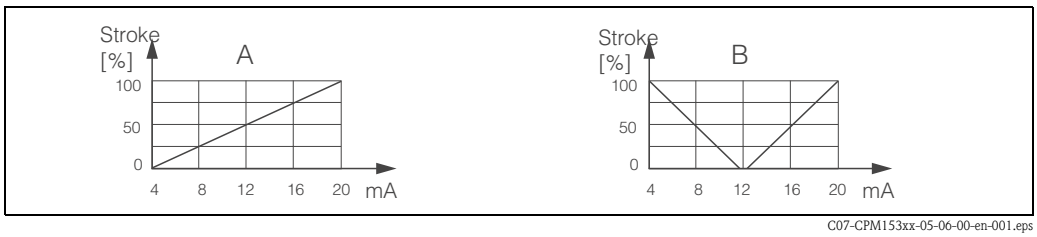


fig. 27: A: Stroke diagram for a control valve
B: Stroke diagram for two contrarotating control valves ("split range")

You can refer to the following selection aids to find the required hardware equipment level for your process.
This selection is not complete. If you wish to use additional functions such as NAMUR or Chemoclean, please check to see if you require additional relays (NAMUR: Alarm relay + 2 relays; Chemoclean: 2 relays).

Selection aid for online processes

Process	Path	Dosing actuators	Required hardware equipment for control			
			Circuits	Relay	Current inputs	Current outputs
1-sided control	looking-ahead · 2-circuit · flow	1 PWM	2	1	1	–
		1 PFM	2	1	1	–
		1 3-point step	2	2	2	–
		analogue	2	–	1	1
	not looking-ahead	1 PWM	1	1	–	–
		1 PFM	1	1	–	–
		1 3-point step	1	2	1	–
		analogue	1	–	–	1

Selection aid for online processes

Process	Path	Dosing actuators	Required hardware equipment for control			
			Circuits	Relays	Current inputs	Current outputs
2-sided control	looking-ahead · 2-circuit · flow	2 PWM	2	2	1	–
		2 PFM	2	2	1	–
		1 3-point step + 1 PWM or PFM	2	3	2	–
		current output split range	2	–	1	1
	not looking-ahead	2 PWM	1	2	–	–
		2 PFM	1	2	–	–
		1 3-point step + 1 PWM or PFM	1	3	1	–
		current output	1	–	–	1

Selection aid for batch processes or slow online processes

Process	Dosing actuators	Required hardware equipment for control: Circuits	Relays	Current inputs	Current outputs
1-sided control	1 PWM	1	1	–	–
	1 PFM	1	1	–	–
	1 3-point step	1	2	1	–
	analogue	1	–	–	1
2-sided control	2 PWM	1	2	–	–
	2 PFM	1	2	–	–
	1 3-point step + 1 PWM or PFM	1	3	1	–
	analogue split range	1	–	–	1

PWM = pulse length proportional
PFM = pulse frequency proportional
3-point step = three-point step controller

The controller in the CPM153:
The CPM153 contains a PID controller which is specially adapted to the pH neutralisation process. It has the following features:

- Separate configuration of both process sides
- Simple adaptation to batch or inline processes
- Switching option between constant and range-dependent modulation gain

Relating to the effect on the gain factor, a difference is made between two standard implementations:

- The factor $K_R(X)$ is the total gain (see fig. 28). This is implemented in the CPM153.
- The gain factor $K_P(X)$ is the purely proportional gain.

The following diagram shows the schematic structure of the CPM153 controller. To simplify the diagram, the Laplace transform of subfunctions is given.

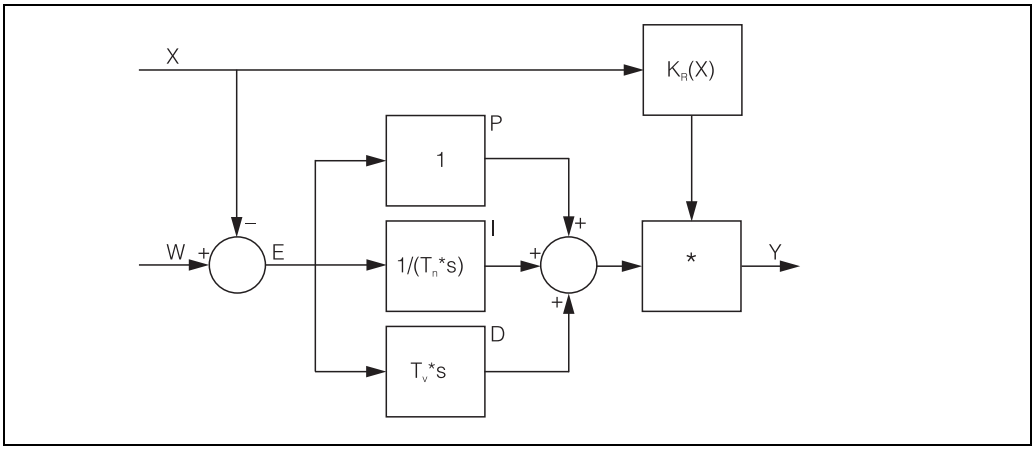
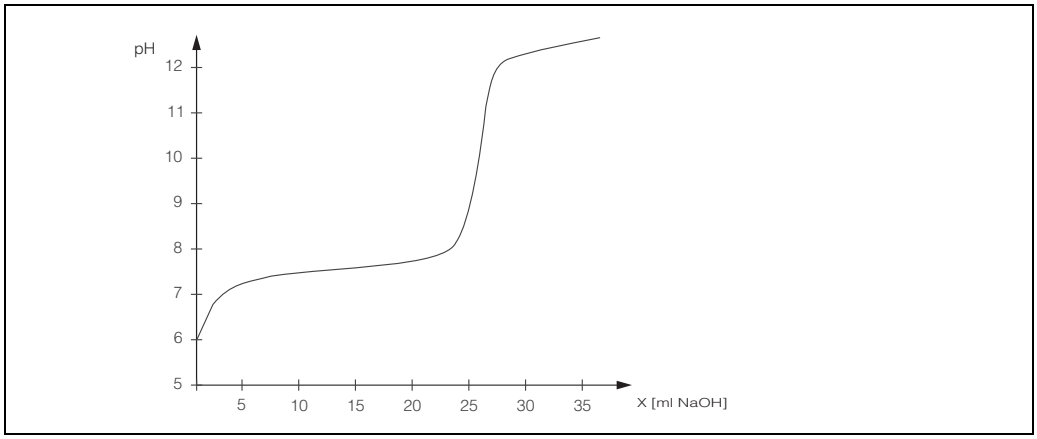


fig. 28: Schematic diagram of the CPM153 controller with $K_R(X)$ as the total gain

X *Actual value*
W *Set point*
E *Control difference*
Y *Set value*
K_R *Modulation gain (total gain)*
T_n *Integral action time (I component)*
T_v *Derivative action time (D component)*

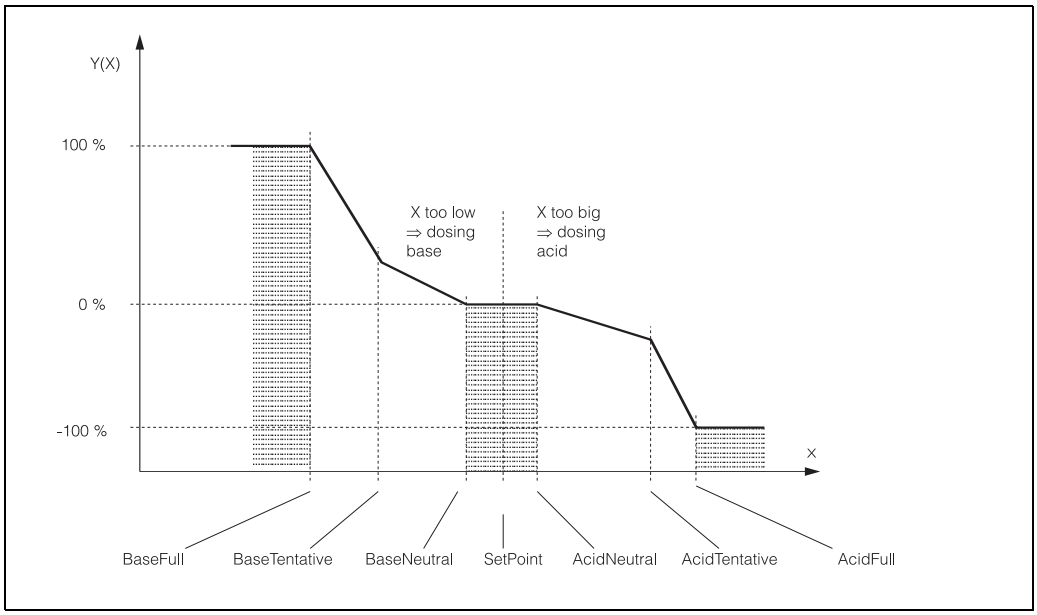
Range-dependent modulation gain
The majority of pH neutralisation processes are strongly non-linear (Example: titration curve). If you specify a strong base in portions to a fixed volume of a weak acid, the pH value changes. The change in pH value is, at the beginning, relatively small, larger in the area of the so-called equivalence point and then ever smaller.
In the following diagram, such a titration curve is represented for a weak acid with a strong base (y axis: pH value, x axis: volume units added to a strong base).



C07-CPM153xx-05-06-00-xx-008.eps

fig. 29: Schematic titration curve of a weak acid with a strong base.

For difficult neutralisations, the CPM153 controller gives you the option of partially compensating for the non-linearity by entering an inverse characteristic Y(X).



C07-CPM153xx-05-06-00-en-007.eps

fig. 30: Diagram to describe the most important corner points for control

With this characteristic, a reference set value is prescribed to the controller for each pH value.

Neutral zone:
If the actual value (X) is within the neutral zone, dosing takes place as follows:
- Dosing does not take place for the Batch process type.
- Dosing does also not take place for the Inline process type without an I component (Tn=0).
- If the controller is configured as a PI or PID controller for the Inline type, it depends on the pH value history if dosing takes place or not.

Points of the characteristic:
For constant control gain ("linear characteristic"), you require:
- Set point W
- Neutral zone
  - Two-sided: "Start of the neutral zone" and "End of neutral zone"
  - One-sided: only one of the two points

For range-dependent modulation gain ("segmented curve"), you require two-sided control of all the points.

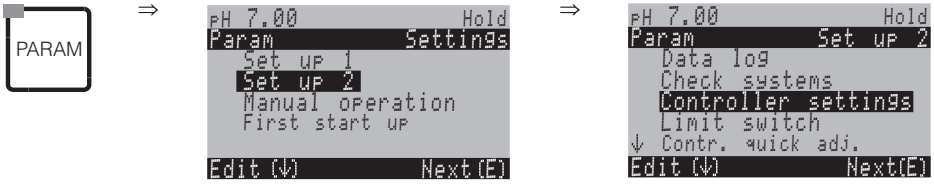
A point usually consists of two coordinates: an x coordinate (here = pH-value) and a y coordinate (here = set value). You only need enter the y coordinates for the optimisation points. For the other points, the CPM153 sets the y coordinates itself.
However, you cannot change the sequence of these defined points. It is, for example, not possible to enter a larger pH value for the "Start of the neutral zone" than for the set point.

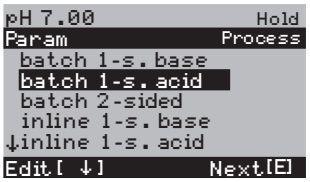
Configuring the CPM153
Configure the relays in the following sequence:

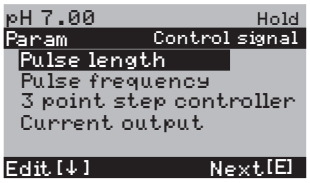
1. Actuators
2. Sensor technology
3. Feedback (e.g. predictive pH measurement, position feedback with three-point step controller, if available)
4. Characteristic curve

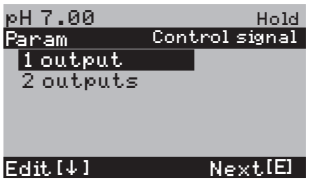
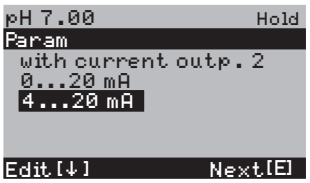
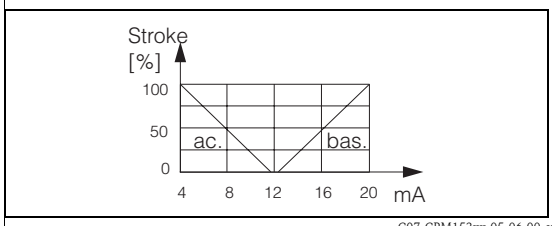
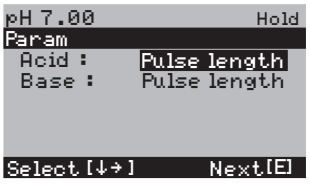
In the user settings (see below) you switch directly to an active measuring menu and can check the settings made and change them if necessary.

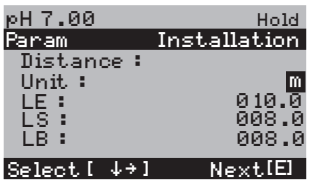
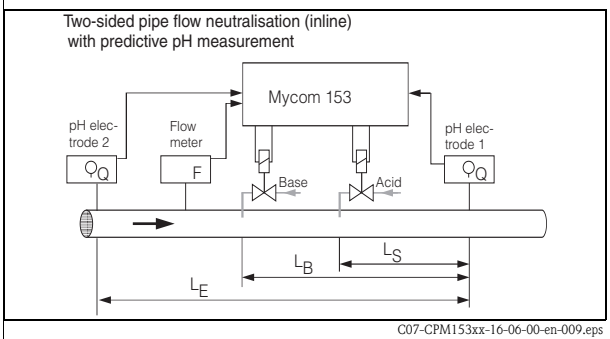
To enter the menu, proceed as follows:

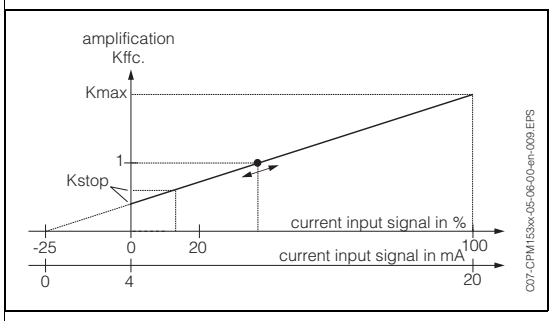
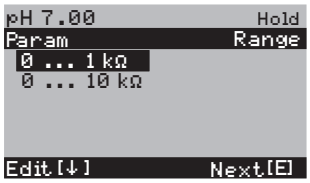


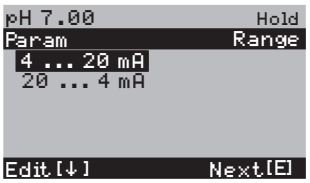
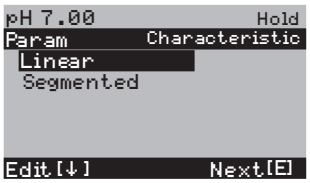
CHOICE (default = bold)		INFO
	**off** on	**Selection of Controller settings** ✎ Note! You must activate the controller settings **after** you have configured the controller in this menu branch.
	batch 1-s. base batch 1-s. acid batch 2-sided inline 1-s. base inline 1-s. acid inline 2-sided	**Select the process type,** which describes your process. **One-sided**: control using either acid or base **Two-sided**: control using acid and base. You can only select this function if you have defined two controllers (in the "Contacts" menu and/or via the current output).
	Predictive measurement: pH circuit 1 = controller pH circuit 2 = look-ahead	**Note in display:** (two-circuit transmitter and predictive measurement only) In the First start up, a process with predictive pH measurement was selected. ✎ Note! Control with predictive measurement is only possible in conjunction with a flowmeter and a two-circuit transmitter with analogue input.

CHOICE **(default = bold)**			**INFO**
	Control with: pH value CH1 pH value CH2		**Electrical assignment:** (two-circuit transmitter only, not for predictive measurement) Select the measured value to be used for control.
	Type Characteristic Feedback Sensor input		**Select external hardware** For correct operation, you must completely configure these four submenus. **Type**: Here, you can select and configure the methods which the controller uses to output the set values. **Characteristic**: Here, you enter the controller parameters (neutral zone, set point, etc.). With this selection, you can also reach the "active measuring menu". **Feedback**: Here you configure the position feedback of an actuator drive (only with the selection of 3-point step). **Sensor input**: Here you configure the predictive pH measurement or you switch channels (only with two-circuit).
Type: **With selection "one-sided" in field M1:**			
	Pulse length Pulse-frequency 3-point step controller Current output		**Select control type**
	+Relay –Relay Motor on Xdg	**n.c.** **n.c.** 060.0 s 4.0 %	**Relay selection** (for three-point step controller) **+Relay**: Open the valve further (= increase dosing) **–Relay**: Close the valve further (= reduce dosing) Selection: n.c. (= not connected). After this, those relays which are released in the Contacts menu are always offered as the default. ✎ Note! If you cannot select a relay here, use the "Contacts" menu to make relays available for the controller function. **Motor on time**: The time the motor drive requires to move the valve from completely closed to completely open. The CPM153 requires this value to be able to calculate the required pick-up time of the relay for a required position change. **Xdg**: Xdg is the dead zone of the actuator control. A deviation of the actuator position from the calculated set value is not corrected up to the % value that you set here. ✎ Note! The CPM153 expects feedback from the actuator drive about the current valve position via a current or resistance input.
	Relay: max. pulse frequency	**n.c.** 1/min.	**Relay selection** (for pulse frequency) **Relay**: Relay selection **max. pulse frequency**: Input of the maximum pulse frequency. (Pulses with a higher frequency are not forwarded to the relay). (Maximum setting: 120 1/min)
	Relay: Period: t_E min:	**n.c.** **000.0 s** **000.0 s**	**Relay selection** (for pulse length) **Relay**: Relay selection **Period**: Period length T in seconds (range 0.5 ... 999.9 s) **t_E min**: Minimum switch-on period. (Shorter pulses are not forwarded to the relay and treat therefore the actuators with care).

CHOICE (default = bold)			INFO
	0 ... 20 mA 4 ... 20 mA		**Current output** Selection of the current range, which should be output at the current output.
	0/4 mA 20 mA		**Current output** Assign the current value which corresponds to 100 % dosing medium provision.
Type: **With selection "two-sided":**			
	Dosing via: 2 outputs 1 output		**Control:** (This option is only displayed if you selected the constant controller under current output 2.) **1 output**: for control using the current output in the "split range" method. Control logics are required which can control two valves/pumps over one current input. **2 outputs**: If the valves are controlled with two relays.
1 Output:			
	0 ... 20 mA 4 ... 20 mA		**Current output** Selection of the current range, which should be output at current output 2. The neutral position (= current value which the controller outputs when it is not dosing) is in the middle of the selected range. For 0 ... 20 mA, the neutral position is at 10 mA, for 4 ... 20 mA at 12 mA.
	0 (or 4) mA 20 mA		**Current output 2** Assign the current value, corresponding to 100 % of the acid dosing. ✎ Note! From the current value selection for the dosing of 100 % acid, you can derive the current ranges for acid/base dosing (see below, fig. 31) in the "split range" method.  C07-CPM153xx-05-06-00-en-005.eps *fig. 31: Two-sided control over one current output*
2 outputs:			
	Acid: Base:	Pulse length Pulse length	**Dosing** Dosing can be carried be carried out using: Pulse length signal Pulse frequency signal Three-point step controller
	+Relay –Relay Motor on Xdg	**n.c.** **n.c.** 060.0 s 04.0 %	**Acid dosing: Relay selection** (for three-point step controller) Description see above

CHOICE (default = bold)			INFO
	Relay: max. pulse frequency	**n.c.** 1/min.	**Acid dosing: Relay selection** (for pulse frequency) Description see above
	Relay: Period: t_E min:	**n.c.** **000.0 s** **000.0 s**	**Acid dosing: Relay selection** (for pulse length) Description see above
	+Relay –Relay Motor on Xdg	**n.c.** **n.c.** 060.0 s 04.0 %	**Base dosing: Relay selection** (for three-point step controller) Description see above
	Relay: max. pulse frequency	**n.c.** 1/min.	**Base dosing: Relay selection** (for pulse frequency) Description see above
	Relay: Period: t_E min:	**n.c.** **000.0 s** **000.0 s**	**Base dosing: Relay selection** (for pulse length) Description see above
Sensor input:			
	L_B: L_S: L_E:	m m m	**System arrangement** (for predictive measurement) Enter electrode/dosing point distances: **L_S**: Distance between the controlling electrode and the acid dosing point **L_B**: Distance between the controlling electrode and the base dosing point **L_E**: Distance from the controlling electrode to the look-ahead electrode Remark on fig. 32: Electrode 1 is the controlling electrode, electrode 2 is the look-ahead electrode.  C07-CPM153xx-16-06-00-en-009.eps *fig. 32: Schematic diagram of two-sided control with predictive pH measurement*
	Unit: 4 mA value: 20 mA value: Pipe dia.	m^3/h ___ ___ mm	**Flow velocity flowmeter** (for predictive measurement) **Unit**: Entry of the length and time unit for flow velocity (e.g. m^3/h). **4 mA value**: Enter minimum flow velocity value. **20 mA value**: Enter maximum flow velocity value. **Pipe dia.**: Enter pipe diameter.

CHOICE (default = bold)			INFO
	Function Limit value Kffc=1: Kmax: Kstop:	**on** **050.0** **050.0** 1.7 1.0	**Feedforward control** (only if 2 current inputs are available) The feedforward control has a multiplying effect, i.e. the controller set value is multiplied with the modulation gain Kffc. **Limit value**: If the current input signal undershoots the set value, dosing is stopped (set value = 0). The dosing stop is not active if you enter 0 (= no limit value) here. (Range 0...100%) **Kffc=1**: Here, enter the current input value in % at which the feedforward gain shall have the value 1. At this point the output set value is the same for switched-on or switched-off feedforward control. (Range 0...100%) **Kmax**: Here, the value of Kffc is displayed for a current input signal of 100%. **Kstop**: Here, the value of Kffc is displayed for current input signal which is equal to the limit value.  *fig. 33: Multiplying feedforward control*
Feedback: The following selection is dependent on whether you have a resistance or a current input.			
With resistance input			
 	0 ... 1 kΩ 0 ... 10 kΩ		**Select range** for resistance.
	curr. resistance: ____ kΩ		**Assign a value for y = 0%** Drive the valve to y = 0%. The current resistance is displayed. You can change the valve position either manually or by pressing the arrow keys on the transmitter. Confirm the position for y = 0 % by pressing the E key. ✎ Note! If you cannot change the value using the arrow keys, please check the "Type" menu to see if the relays have been assigned to valve control.
	curr. resistance: ____ kΩ		**Assign a value for y = 100%** Drive the valve to y = 100%. Proceed as in the previous field.

CHOICE (default = bold)		INFO
For current input 1:		
	4 ... 20 mA 20 ... 4 mA	**Select current range**
	curr. mA value: ____ mA	**Assign a value for y = 0%** Drive the valve to y = 0%. The current current value is displayed. You can change the valve position either manually or by pressing the arrow keys on the transmitter. Confirm the position for y = 0 % by pressing [E]. ✎ Note! If you cannot change the value using the arrow keys, please check the "Type" menu to see if the relays have been assigned to valve control.
	curr. mA value: ____ mA	**Assign a value for y = 100%** Drive the valve to y = 100%. Proceed as in the previous field.
Characteristic:		
	Linear Segmented	**Characteristic type selection** **Linear characteristic**: corresponds to a constant control gain. **Segmented characteristic**: corresponds to a range-dependent control gain.
	Setpoint 07.00pH St.ntr. zone 06.50pH End ntr. zone 07.50pH K_R 1 01.00pH K_R 2 01.00pH	**Values for linear characteristic** (constant control gain) **Setpoint**: the value which should be set. **St.ntr. zone** (Start neutral zone) **End ntr. zone** (End neutral zone) **K_R 1** (only with base dosing): modulation gain for base dosing **K_R 2** (only with acid dosing): modulation gain for acid dosing
	Setpoint 07.00pH St.ntr. zone 06.50pH End ntr. zone 07.50pH O.pnt. X1 05.00pH O. pnt.Y1 00.20pH O.pnt. X2 09.00pH O. pnt.Y2 -00.20pH Ctrl.pnt.1 02.00pH Ctrl.pnt. 2 12.00pH	**Values for segmented characteristic** (range-dependent control gain) **Setpoint**: the value which should be set. **St.ntr. zone** (Start neutral zone) **End ntr. zone** (End neutral zone) **O. pnt 1 and 2** (optimisation point): entry with x and y coordinates **Ctrl. pnt. 1** (control point): The dosing is 100% base for measuring values < control point. **Ctrl. pnt. 2** (control point): The dosing is 100% acid for measuring values > control point.
	Fast process Standard process Slow process **User settings**	**Select process character** If you have no experience in setting parameters, these defaults fast / standard / slow process are intended as an aid to adapting the controller behaviour to the process. Select a default and use the "controller simulation" (see below) to check if these settings are suitable for your process. Enter all the characteristic values yourself with the user settings.

CHOICE (default = bold)		INFO
	K_R 1 = K_R 2 = Tn 1 = Tn 2 = Tv 1 = Tv 2 =	**Characteristic values for user settings:** (K_R 1 and K_R 2 only with linear curve; index 1 only for base dosing, index 2 only for acid dosing) **K_R 1**: modulation gain for base dosing **K_R 2**: modulation gain for acid dosing **Tn**: integral action time **Tv**: derivative action time
	Simulation **off** on	**Selection controller simulation** Here, you can switch a configuration loop on or off. The hold is removed with an active controller simulation. **Simulation on**: The characteristic values entered in the previous field are used in the next field to simulate the controller behaviour. **off**: Press [E] to leave the controller simulation.
	Function auto Set: 07.00pH Act.: 07.00pH y: 000	**Controller simulation** **Function**: Here, you set whether a set value calculated by the controller ("auto"), or a set value y entered by the user ("manual") is to be output. **Set**: Displays the current set point. If necessary, you can change the set point. The other points (start/end of neutral zone, optimisation points, control points) change accordingly. **Actual**: Displays the current actual/measured value. **y**: With the "auto" function: displays the set value determined by the controller. With the "manual" function, you can enter a set value here. Values < 0 % mean a dosing of acid, values > 0 % mean a dosing of base.

Note!
To best adapt the controller parameters to the process, we recommend the following:

1. Set the values for the controller parameters (field "Characteristic values for user settings")
2. Deflect process.
   Field "Controller simulation": set function to "manual" and enter a set value. Using the actual value, you can observe how the process is deflected.
3. Switch the function to "auto". Now you can observe how the controller returns the actual value to the set point.
4. If you want to set other parameters, press the "Enter" key and you will return to field "Characteristic values for user settings". During this time, the controller continues to run in the background. If you have made your settings, press the "Enter" key again to return to field "Selection controller simulation". There, you can continue or exit the simulation.

Only exit the controller simulation in field "Selection controller simulation" with "Simulation off". Otherwise, the simulation will continue to run in the background.

6.6.13 Set up 2 – Limit switch

The Mycom S has several possibilities for assigning a relay contact. The limit switch 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. You can trigger cleaning in connection with this error message (see Error/Contact Assignment, page 48).
These functions can be used both for pH/redox and temperature measurement.

The contact states of any relay or fault signalling contact are shown in fig. 34.
Two cases are possible here:

With increasing measured values, switch-on point > switch-off point = max. function:
– The relay contact closes after the switch-on point t_1 is exceeded and the pickup delay ($t_2 - t_1$) has expired.
– When the alarm threshold t_3 is reached and the error delay ($t_4 - t_3$) has expired, the fault signalling contact switches.
– With falling measured values, the fault signalling contact reopens when the alarm threshold is undershot at t_5. The corresponding error message is deleted.
– The relay contact opens again after the switch-off point is reached at t_6 and the dropout delay has elapsed ($t_7 - t_6$).

With falling measured values, switch-on point < switch-off point = min. function:
– The relay contact closes after the measured values have fallen below the switch-on point t_1 and the pickup delay has expired ($t_2 - t_1$).
– When the alarm threshold t_3 is reached and the alarm delay ($t_4 - t_3$) has expired, the fault signalling contact switches.
– With increasing measured values, the fault signalling contact reopens when the alarm threshold t_5 is exceeded. The corresponding error message is deleted.
– The relay contact opens again after the switch-off point is reached at t_6 and the dropout delay has elapsed ($t_7 - t_6$).

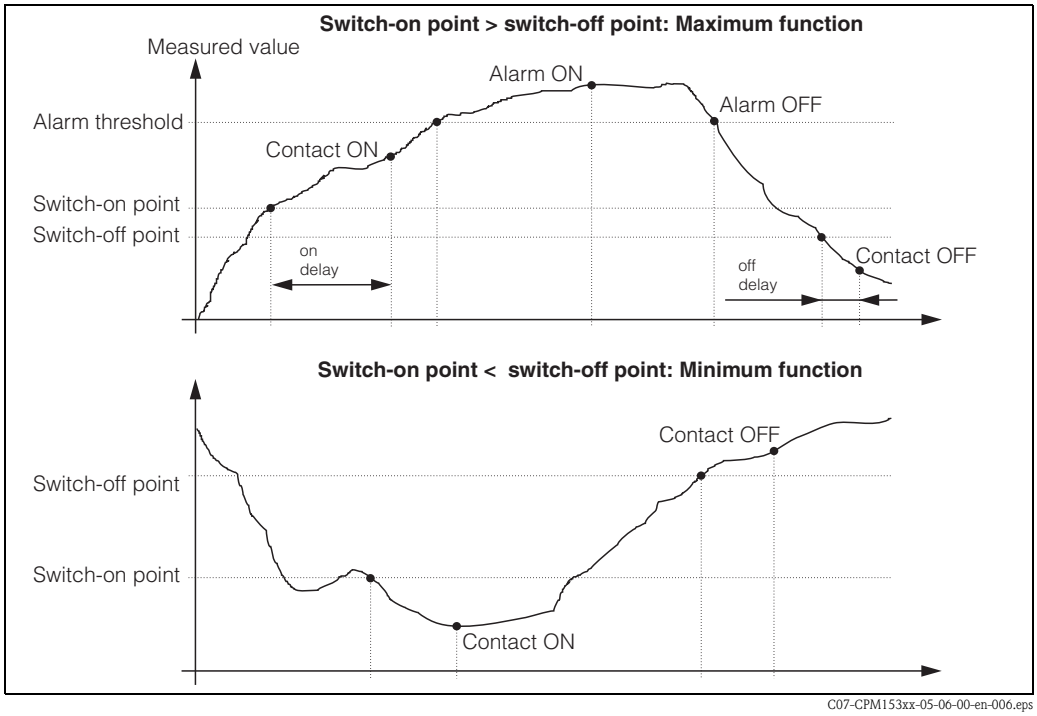
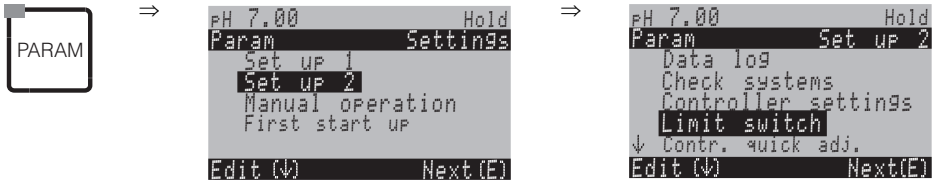
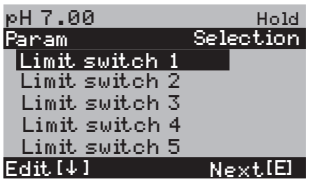
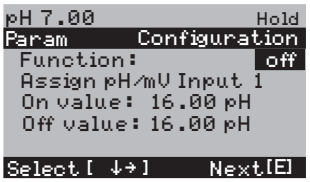


fig. 34: Diagram of the relationship between switch-on and switch-off points and on and off delay

✎ Note!
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.

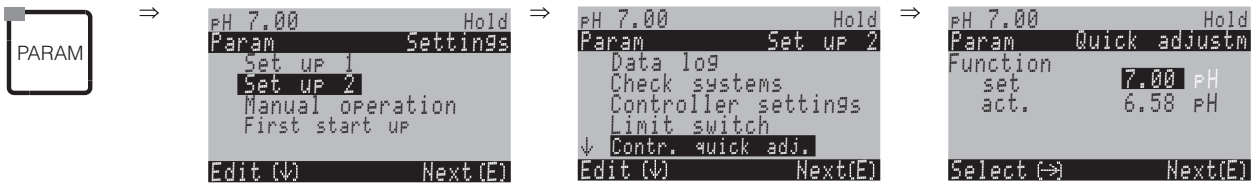
To enter the menu, proceed as follows:



CHOICE (default = bold)			INFO
	**Limit switch 1** Limit switch 2 Limit switch 3 Limit switch 4 Limit switch 5		**Select** the limit switch which you wish to configure. There are five limit switches available.
Limit switch 1 / 2 / 3 / 4 / 5:			
	Function Assignment On point: Off point:	**off** **pH/Redox** **pH 16.00 (1500mV/100%/150°C)** **pH 16.00 (1500 V/100%/150°C)**	**Limit switch configuration:** **Function**: activation of function as limit switch **Assignment**: Selection of the measured value which shall be valid for the limit value. Selection: pH/redox, temperature, Delta (only if operating mode = redundancy) **On point**: Entry of the value at which the limit value function is activated. **Off point**: Entry of the value at which the limit value function is deactivated. (Settable range: pH –2.00 ... 16.00 / –1500 mV ... +1500 mV / 0 ... 100% / –50 ... +150°C)
	On delay: Off delay: Alarm threshold:	**0000 s** **0000 s** **pH 16.00 (150°C)**	**Limit switch configuration:** **On delay**: Entry of the switch-on delay (Range 0 ... 2000 s) **Off delay**: Entry of the switch-off delay (Range 0 ... 2000 s) **Alarm threshold**: Entry of the value (alarm threshold) at which the fault signalling contact switches.

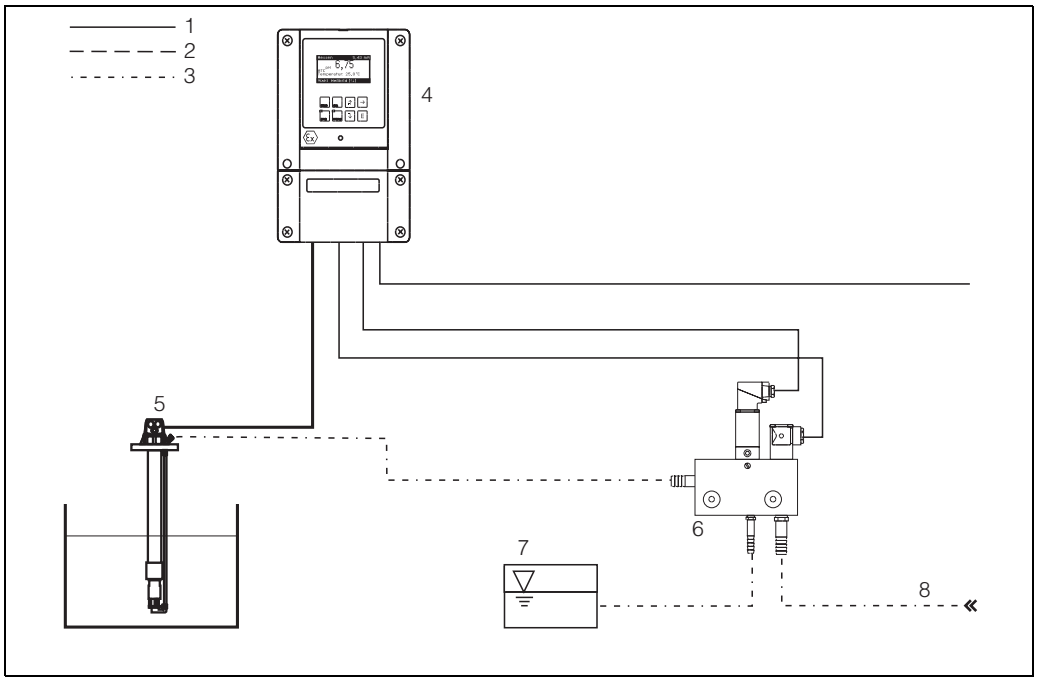
6.6.14 Set up 2 – Controller quick adjustment

In this menu you can adjust the controller setpoint.
To enter the menu, proceed as follows:



6.6.15 Set up 2 – Chemoclean

Chemoclean® is an automatic cleaning system for pH/redox electrodes. The injector (e.g. CYR10) conveys water and cleaner over two contacts to the electrode.



C07-CPM153xx-00-06-00-xx-001.eps

fig. 35: Chemoclean cleaning

1 Electric line
2 Compressed air
3 Water/cleaning fluid
4 CPM153 transmitter
5 Immersion assembly
6 Injector CYR10
7 Cleaning fluid
8 Motive water

Operation:

1. In the menu "Setup 1" ➔ "Relays" (s. page 44), the function Chemoclean® must be switched on and the appropriate contacts must be connected to the injector (see connection examples on page 136 ff.).
2. The cleaning processes are configured in the menu "PARAM" ➔ "Set up 2" ➔ "Chemoclean". Here, automatic or event-controlled cleaning can be adapted to the process conditions. One or more of the following controls are possible:
   – Automatic (see below): Any number of cleanings can be started on each weekday
   – External control: A start can be triggered via the digital inputs. For this, external control must be activated in the field "Select control levels": Ext. control "on")
   – Cleaning trigger: Cleaning is carried out when an SCS alarm occurs (see also "Set up 2" ➔ "Check systems")
   – Power failure: Cleaning is started after a power failure.

Manual operation:
Rapid on-site cleaning can be carried out with the menu:
"PARAM" ➔ "Manual operation" ➔ "Chemoclean" ➔ press 2 x [E] ("Start cleaning")

Automatic programming:
"PARAM" ➔ "Set up 2" ➔ "Chemoclean":
Each day can be programmed individually. The following programmes are available

- "Clean": Cleaning trigger by entering the start time
- "Clean Int": Cleaning is carried out at intervals with a defined spacing. This programme cannot be started directly via the binary inputs.
- "User": User-defined cleaning programmes (create in programme editor; s. page 77).

Programme sequences (cleaning example)
Monday:
2 x cleaning (at 11:00 and at 18:00) with 120 s. water, of which 60 s. additionally with cleaner.
Clean every 30 mins. between 18:20 and 24:00 (= 1800 s.) with 120 s. water, of which 60 s. additionally with cleaner.

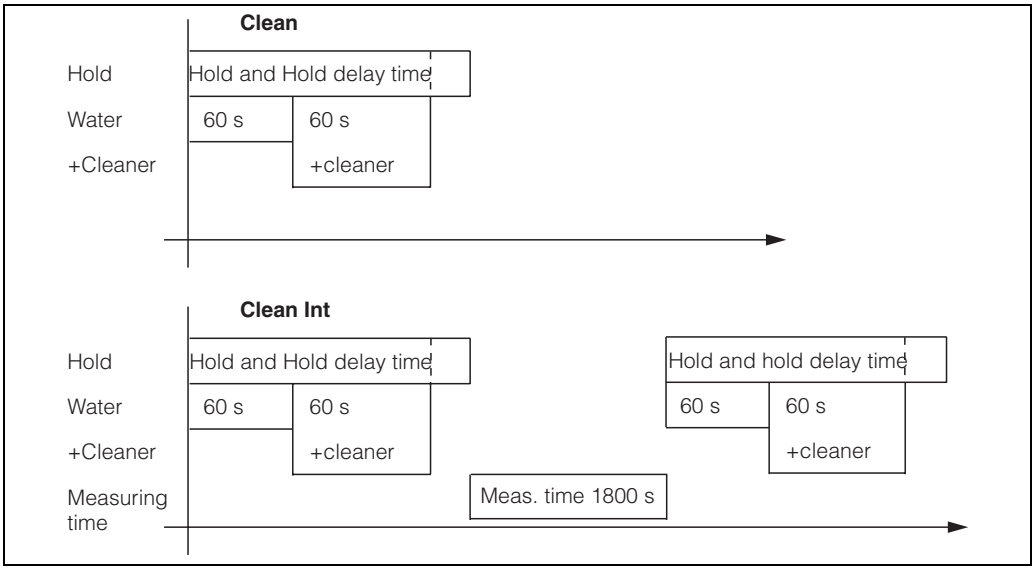


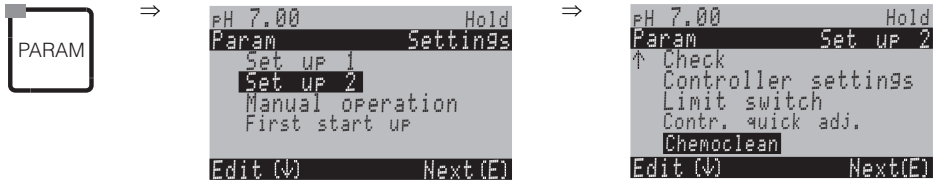
fig. 36: Graphic representation of the above example

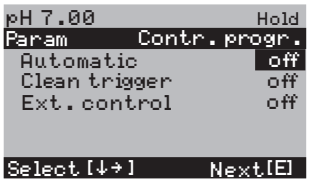
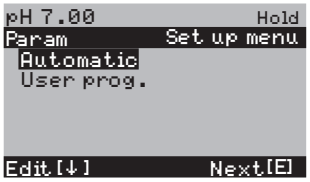
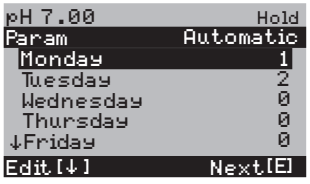
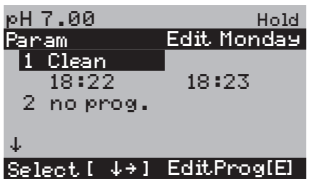
Required settings according to the example (bold: to be edited by user):

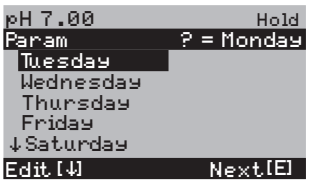
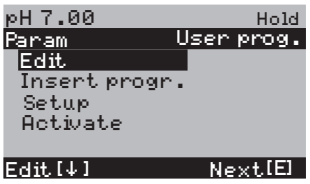
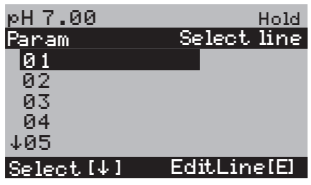
Field "Edit day"		Field "Select programme blocks" (with "Clean")		Field "Select programme blocks" (with "Clean Int")	
Clean		01 Water	**60 s**	01 Water	**60 s**
11:00	11:02	02 +Cleaner	**60 s**	02 +Cleaner	**60 s**
Clean		03 Water	**0 s**	03 Water	**0 s**
18:00	18:02	04 Rep. Clean	**0 x**	Measuring time	**1800 s**
Clean Int					
18:20	24:00				

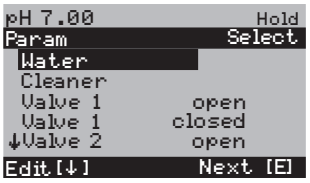
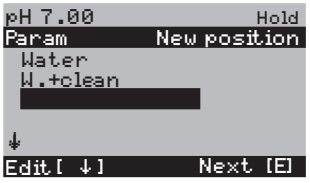
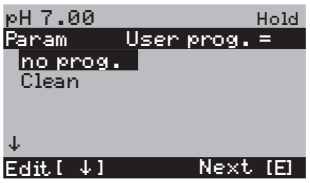
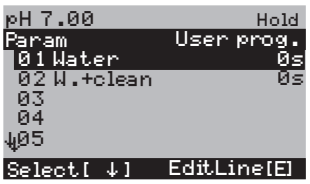
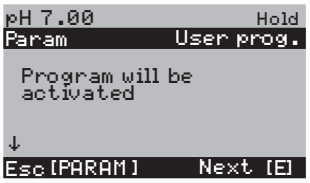
In this way, each day can be programmed (or copied) individually.

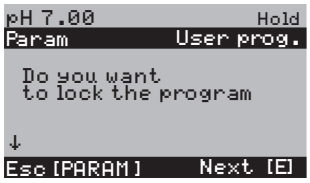
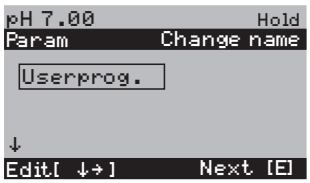
To enter the menu, proceed as follows:



CHOICE (default = **bold**)			INFO
	Automatic Clean trigger Ext. Control	**off** **off** **off**	**Select control levels** Select the function which will trigger Chemoclean cleaning.
	Automatic Clean trigger Ext. Control	**off** **off** **off**	**Note in display:** Displays the current system status
	**Automatic** User prg.		**Select the configuration menu** **Automatic**: Here, you can select a cleaning programme for each weekday. **User programme**: Here you create customer-specific programmes using the programme editor (see programme editor, p. 77).
Automatic:			
	Monday Tuesday ..... Sunday	1 2 ... 0	**Weekday selection menu** Select cleaning day. The number of cleaning triggers for the day is shown behind each day.
	Edit day? Copy day?		**Select day function** **Edit day**: You can edit the function for this day. **Copy day**: The day which you have selected in the previous field is copied to the day selected in the following field.
Edit day:			
	Clean 18:22 18:23 **no progr.**		**View/edit day programme** You can see the complete day programme or "no progr.". You can overwrite this point and the set programmes with a new selection. The start and finish times are always given. Example: **Clean**: 18:22 (start time) 18:23 (finish time) **User prog.**: use of a programme you created (see programme editor, p. 77)

CHOICE (default = bold)			INFO
	01 Water 0s 02 +Cleaner 30s 03 Water 30s 04 Rep. cleaning 0x		**Select programme blocks** The times for individual programme steps can be adjusted here. Select a block for editing by pressing [E]. **+Cleaner**: Cleaner will be delivered in addition to water. **Rep. cleaning**: Number of repetitions of steps 01 to 03 ✎ Note! ■ When you change one of this programme blocks the changes will affect every cleaning. ■ Leave this selection by pressing [PARAM].
	0010s (0 ... 9999s)		**Water / cleaner:** Enter the time during which the valve remains open to allow the conveyance of water or cleaner.
	Repeat x number of times **00** (0 ... 10)		**Repeat cleaning** How often should the previous step (cleaner or water) be repeated?
Copy day:			
	Tuesday Wednesday ... Sunday		**? = Monday** Select day to which you want to copy Monday (example). ✎ Note! Danger of data loss. When copying one day to another, the cleaning programmes of the target day are overwritten.
User programme: (Programme editor) With Chemoclean, one user programme is available.			
	**Edit** Insert progr. Setup Activate Lock Change name		**Select edit function** **Insert programme**: An installed programme (e.g. Clean) can be inserted into the user programme. ✎ Note! ■ After a programme has been locked, it can be activated again at any time. ■ Leave this item by pressing [PARAM].
Edit:			
	01 02		**Select line** The line with the selected position number can be edited with [E]. ✎ Note! Leave this selection by pressing [PARAM].
	Change Insert Move to Delete		**Select the edit function for the selected block** **Change**: The function is changed for the selected position **Insert**: A new block is inserted before the highlighted position. **Move to**: The highlighted function is moved to a different position. **Delete**: The highlighted function is deleted (there is **no** query whether you really want to delete!)

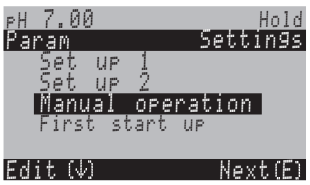
CHOICE (default = bold)		INFO
Change/insert:		
	**Water** +Cleaner Valve 1 open ... Wait Back to	**Select function** **Back to**: You can create a programme loop with this function (for repetitions). Possible selection: Water, +Cleaner, wait, back to
Move to:		
	(Displays blocks as list) 01 Water 02 +Cleaner 03 Wait	**Select rows** You move the function selected in field "Select line" to the highlighted position. ✎ Note! The highlighted position will be overwritten.
Insert programme:		
	User prog. = ? **no prog.** Clean _____	**Select the template** you want to copy to the user programme.
Setup:		
	01 Water 0s 02 W.+clean 0s ...	**Configure selected programme blocks** **Cleaner, water**: Enter the period of time for water or cleaner transport. **Wait**: Enter waiting time. **Back to**: Enter number of repetitions of the programme loop.
Activate programme		
	Programme wil be activated	**Note in display (no entry):** The created or edited programme is activated.
	User prog. (0 ... 9; A ... Z)	**Change name** 9-character name for your user programme, freely selectable.

CHOICE **(default = bold)**		**INFO**
Lock programme		
	Do you want to lock the programme?	**Query** Pressing E (= Continue) disables the programme. Pressing PARAM (= Cancel) takes you back without disabling the programme.
	The programme was locked.	**Note in display (no entry)**
Rename programme:		
	**Userprog.** (0 ... 9; A ... Z)	**Change name** 9-character name for your user programme, freely selectable.

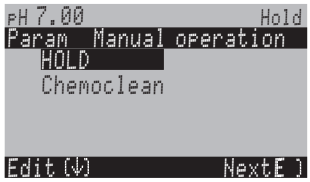
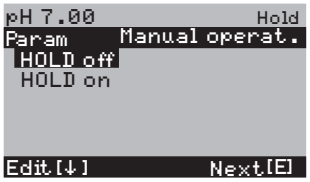
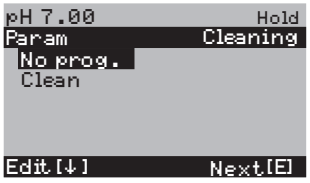
6.6.16 Manual operation

To enter the menu, proceed as follows:

⇒



⇒

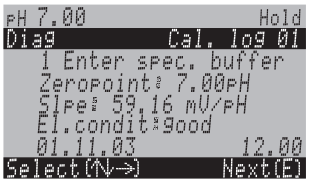
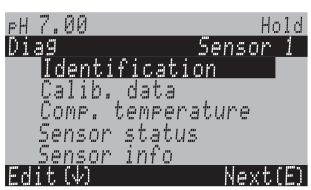
CHOICE (Default = bold)		INFO
	Chemoclean Hold	**Select manual operation** ✎ Note! ▪ Leave the manual operation menu by pressing PARAM, DIAG or MEAS. ▪ The settings are only active in this menu. Nothing is saved when you leave.
!!!Caution!! You are leaving manual operation.		**If you leave the manual operation:** Note in display Confirm with E: Leave the manual operation. Abortion with PARAM: Remain in manual operation mode.
HOLD:		
	**HOLD off** HOLD on	**Manual operation** Activate / deactivate Hold The "HOLD" function freezes the current outputs as soon as cleaning/calibration is undertaken. ✎ Note! If the controller function lies on current output 2, it follows the instructions of the defined "controller hold" (s. page 49).
Chemoclean:		
	Automatic off Clean trigger off Ext. Control off	**Note in display (no entry):** System status
	**No prog.** Clean	**Chemoclean cleaning** **No prog**: Here, each external programme start is suppressed. **Clean**: Here, you can start the Clean programme. ✎ Note! Leave this item by pressing PARAM.

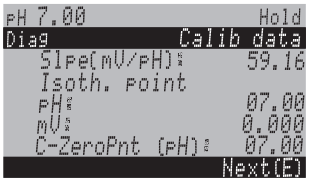
6.6.17 Diagnosis

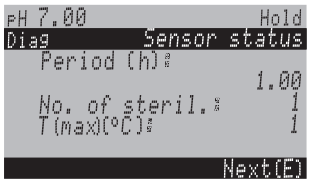
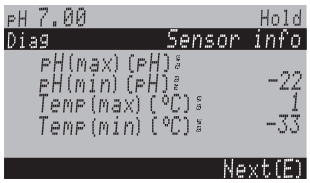
To enter the menu, proceed as follows:

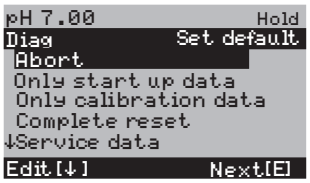
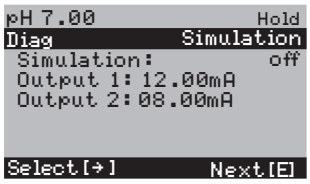
DIAG ⇒

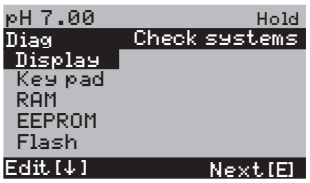
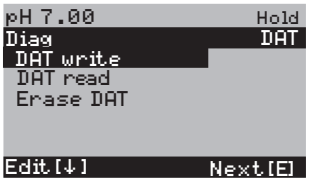
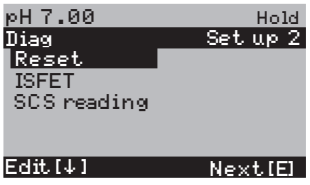
⇒

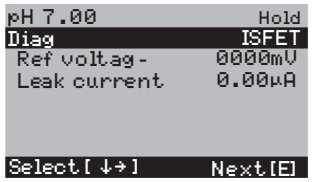
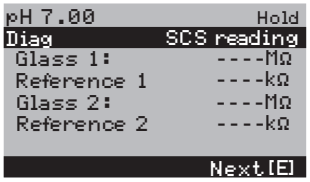
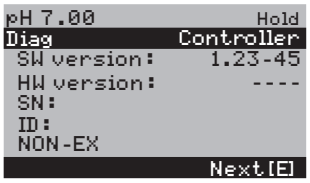
CHOICE (Default = bold)		INFO
U	**Error list** Error log Operation log Calibration log Ext. sensor data (digital sensors with Memosens technology) Service	**Error list**: Displays currently active errors. (Complete error list with description s. page 102.) **Error log**: Lists the last 30 signalled errors with date and time. **Operation log**: Lists the last 30 registered operating steps with date and time. **Calibration log**: Lists the last 30 calibrations undertaken with date and time. **Ext. sensor data**: Lists the data stored in the digital sensor, e.g. sensor identification, calibration data, operating hours, etc. ✎ Note! ▪ Use the arrow keys to scroll through the lists. ▪ Leave the lists by pressing E.
Calibration log		
	1 Enter spec. buffer Zero point Slpe El. condit. <date> <time>	**1 Enter spec. buffer**: Displays the used calibration method. **Zero point**: Displays the zero point calculated during calibration. **Slope**: Displays the slope calculated during calibration. **Electrode condition**: Displays the state of the electrode. **<date> <time>**: Displays calibration date and time
If you are using a digital sensor with Memosens technology, the following data are displayed when you press →:		
	SN Sensor change date <date> <time>	**SN**: Serial number of the calibrated sensor. **Sensor change date**: Date and time when the sensor was changed.
Ext. sensor data (digital sensors with Memosens technology only): When you select "Ext. sensor data", the transmitter indicates that the sensor data are read from the sensor. When reading is finished, the display automatically switches to the next menu point. If it does not switch automatically, you can display former sensor data by pressing E or return to measuring mode by pressing MEAS.		
	**Identification** Calib. data Comp. temperature Sensor status Sensor info	**Display of all data stored in the digital sensor** ✎ Note! External sensor data can only be displayed for digital sensors with Memosens technology.

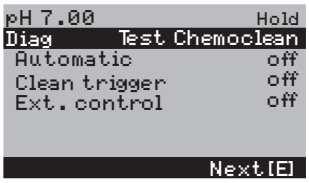
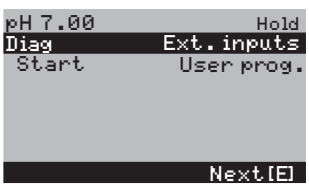
CHOICE **(Default = bold)**		**INFO**
Identification		
	ID SW ID HW version SW version	**ID**: Module ID of the digital sensor. **SW ID**: Software ID of the digital sensor. **HW version**: Hardware version of the digital sensor. **SW version**: Software version of the digital sensor.
	Check date SAP SN	**Check date**: Date of the sensor's factory inspection. **SAP**: SAP number of the sensor. **SN**: Serial number of sensor electronics.
Calibration data		
	Slpe [mV/pH] Isoth. point – pH – mV C-ZeroPnt [pH]	**Slope**: Slope of the digital sensor. **Isoth. point**: mV and pH components of the isothermic intersection point. **Chain zero point**: Chain zero point of the digital sensor.
	Method No. of cal. Snlc Calibration date	**Method**: Calibration method used for the digital sensor. You can select the calibration method in "Setup 1 > Calibration". **No. of cal.**: Number of calibrations carried out for the sensor. **Snlc**: Serial number of the transmitter used for the last sensor calibration. **Calibration date**: Date of the last sensor calibration.
	Buffer 1 Buffer 2 D. slp [mV/pH] D. zropnt [pH]	**Buffer 1**: pH value of the first buffer used for the last sensor calibration. **Buffer 2**: pH value of the second buffer used for the last sensor calibration. **D. slp**: Change in slope compared to the preceding calibration. **D. zropnt**: Change in chain zero point compared to the preceding calibration.
Temperature compensation		
	1 pnt delta [°C] Snlc Cal. date	**1 pnt. delta**: Calibrated temperature offset. **Snlc**: Serial number of the transmitter used for the last temperature calibration. **Calibration date**: Date of the last temperature calibration.

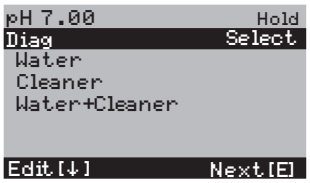
CHOICE **(Default = bold)**		**INFO**
Sensor status		
	Period (h) No. of steril. T (max) [°C]	**Period**: Total operating hours of the sensor. **No. of steril.**: Number of sterilisations applied to the sensor: T > 135 °C / 275 °F, min. 20 minutes **T (max)**: Maximum temperature under which the sensor was operated. ✎ Note! During sterilisations (T > 135 °C / 275 °F) the transmitter goes into hold and the display shows "SIP" (Sterilisation in place).
	Operating time (h) – over 80 °C – over 100 °C – <- 300 mV – > 300 mV	Operating hours of the sensor under the following conditions: – At temperatures over 80 °C / 176 °F – At temperatures over 100 °C / 212 °F – At pH values below -300 mV (= pH 12 @ 25 °C / 77 °F) – At pH values over +300 mV (= pH 2 @ 25 °C / 77 °F)
	1. use Ri GSCS [Ohm]:	**1. use**: Date when the sensor was connected to a transmitter for the first time. **Ri GSCS**: Current glass membrane impedance.
Sensor info:		
	pH (max) [pH] pH (min) [pH] Temp (max) [°C] Temp (min) [°C]	**pH (max)**: Maximum pH value of the specified sensor application range. **pH (min)**: Minimum pH value of the specified sensor application range. **Temp (max)**: Maximum temperature of the specified sensor application range. **Temp (min)**: Minimum temperature of the specified sensor application range.
	Order code OVSN Check date	**Order code**: Order code of the sensor. **OVSN**: Overall serial number of the sensor. **Check date**: Date of the sensor's factory inspection.
Service:		
	**Factory reset** Simulation Instrument check DAT download Set up 2 Instrument version Chemoclean Factory function	**Select service diagnosis** **Factory reset**: Different data groups can be reset to the factory settings. **Simulation**: The transmitter behaviour can be simulated after entering various parameters. **Instrument check**: The instrument functions (display, keys, etc.) can be tested individually. **DAT download**: Copy data into/out of the DAT module. **Set up 2**: Instrument reset (="soft reset"), ISFET values and SCS values **Instrument version**: Device-internal data e.g. serial number can be queried. **Chemoclean** (only, if the complete Chemoclean function is activated): Inspecting programmes, inputs, mechanics. **Reset count**: Reset counter, write access

CHOICE (Default = bold)		INFO
Factory reset:		
	**Abort** Only start up data Only calibration data Complete reset Service data Operation logbook Error logbook Calibration logbook	**Set default** Here you can select the data which you wish to reset to the factory settings. ✎ Note! Danger of data loss. Selecting a point and confirming with [E] deletes all the settings you made in this area! Pressing "Abort" leaves this field without changing the values. **Calibration data**: All saved data for calibrations such as zero point, slope, and offset. **Start up data**: The remaining data to be set. **All data**: Calibration data + setting data **Service data**: All data + logbooks + reset counters. ✎ Note! Service data / logbooks: These functions are for authorised service personnel only. The service code is required.
Service data / logbooks:		
	**0000**	**Service code entry required** ✎ Note! For service access code, see p. 40.
	Incorrect service code entered.	**Note in display** (back to the last field)
Simulations:		
	Simulation: **off** Output 1: 12.00 mA Output 2: 00.00 mA	**Adapt simulation (current outputs)** **Simulation off**: The frozen values from the last measurement are used for the simulation. **Simulation on**: The current values for the outputs can be changed (output 1, output 2)
	Simulation: **off** Measured value 1: pH 07.00 Temperature: 025.00°C Measured value 2: pH 00.00 Temperature: 000.00°C	**Adapt simulation (measured value/temperature)** **Simulation off**: The frozen values from the last measurement are used for the simulation. **Simulation on**: The values (measured value/temperature) can be changed.
	Simulation: **off** Failure contact: off Contact 1: off Contact 2: off ...	**Adapt simulation (contacts)** **Simulation off**: The last statuses are frozen and used for the simulation. **Simulation on**: The contacts can either be opened (on) or closed (off). ✎ Note! If you return to the measurement mode with the simulation switched on, "Simul" and "Hold" flash in the display.

CHOICE (Default = bold)		INFO
Instrument check		
	Display Keypad RAM EEPROM Flash	**Select check** **Display**: All fields are queried alternately. Defective cells become visible. **Keypad**: All keys must be pressed one after the other. If the system is functioning perfectly, the corresponding symbols appear in the display. **RAM**: "RAM O.K" message if there are no errors. **EEPROM**: "EEPROM O.K" message if there are no errors. **Flash** (memory): "Flash OK" message if there are no errors. ✎ Note! Leave this item by pressing PARAM.
DAT download (only available if DAT module is plugged in):		
	**DAT write** DAT read Erase DAT	**DAT selection** **DAT write**: You can save both the configuration and the logbooks of your transmitter to the DAT module. **DAT read**: Copy the configuration saved on the DAT module into the EEPROM of the transmitter. **Erase DAT**: Delete all data on the DAT module. ✎ Note! ▪ You can cancel all DAT processes by pressing PARAM. ▪ After the "DAT read" copying procedure, a reset is triggered automatically, and the device is configured with the copied values. (See below for reset.)
DAT write:		
	!!Caution!! All data on the DAT module will be deleted.	**Note in display** For safety reasons, you are asked if you really want to overwrite the existing data.
	in progress	**Data are written to the DAT module**
DAT read:		
	!!Caution!! All data in Mycom S will be deleted.	**Note in display** For safety reasons, you are asked if you really want to overwrite the existing data of Mycom S.
	in progress	**Data from the DAT module are copied to the EEPROM of the transmitter.**
Erase DAT:		
	!!Caution!! All data on the DAT module will be deleted.	**Note in display** For safety reasons, you are asked if you really want to delete the existing data.
Set up 2		
	**Reset** ISFET SCS reading	**Select function** ISFET is only available, if function is activated.

CHOICE (Default = bold)		INFO
Reset:		
		Reset You can restart the Mycom S with this function. You can use this function if the Mycom S does not react as expected. ✎ Note! This reset does not change saved data.
ISFET:		
	Ref. voltage CH 1: **0000 mV** Leak. current: 0.00 µA	**View current ISFET sensor data**
SCS reading:		
	Glass 1: —— MΩ Reference 1: —— kΩ Glass 2: —— MΩ Reference 2: —— kΩ	**View current Sensor Check System (SCS) values**
Instrument version:		
	SW Version: 1.20-01 HW Version: 1.00 Serial No.: 12345678 Card ID: M3Cxxx ----	**Controller data** Open controller data and the hardware version. **SW version**: current version of instrument software
	SW Version: ---- HW Version: 1.00 Serial No.: 12345678 Card ID: M3G-xx Non-Ex	**Basic module data**
	SW Version: ---- HW Version: 1.04 Serial no.: 12345678 ID: M3K-xx ----	**Connector PCB data**
	SW Version: 1.22 HW Version: 1.11 Serial No.: 12345678 Card ID: MKPx Ex	**Transmitter 1 data** Open transmitter data (1).
	SW Version: 1.2 HW Version: 1 Serial No.: 12345678 Card ID: MKPx Ex	**Transmitter 2 data** Open transmitter data (2).

CHOICE (Default = bold)			INFO
	SW Version: HW Version: Serial No.: Card ID: Ex	---- 1.00 12345678 M3DC	**DC-DC converter** (only for two-circuit)) Module for power supply of transmitter 2
	SW Version: HW Version: Serial No.: Card ID: Ex	---- 1.00 12345678 M3D-xx	**Relay data**
	SW version: HW version: Serial no.: ID: SW ID: Check date:	1.00 1.20 12345678 A1B D1C 01.01.00	**Sensor data 1** Display sensor data (1) ✎ Note! These data are only displayed for digital sensors with Memosens technology
	SW version: HW version: Serial no.: ID: SW ID: Check date:	1.00 1.20 12345678 A1B D1C 01.01.00	**Sensor data 2** Display sensor data (2) ✎ Note! These data are only displayed for digital sensors with Memosens technology
	12345678901234		**Enter serial number** 14 digit number consisting of 0 ... 9 and A ... Z
	CPM153-A2B00A010		**Order Code** 15 digit number consisting of 0 ... 9 and A ... Z
Chemoclean:			
	Automatic Clean trigger Ext. Control	off off off	**Note in display (no entry):** System status
	With E running programme is aborted.		**Note in display (no entry):** To be able to carry out the diagnosis, you must abort the currently running programme by pressing [E].
	Ext. Inputs Hardware		**Selection Chemoclean check**
Ext. Inputs:			
	Start	Userprog	**Info field:** status of external digital inputs

CHOICE **(Default = bold)**		**INFO**
Hardware:		
	Water Cleaner Water and cleaner	**Selection hardware** Select a function which shall be tested.
	Automatic off Clean trigger off Ext. Control off	**Note in display (no entry):** System status
Reset count:		
	**0**	**Reset count** (only triggered by watchdog) Can be reset via Set Default ➔ service data.
	1	**Write count** Displays number of write accesses to the EEPROM.

6.6.18 Calibration

Calibration is necessary:

- After electrode replacement
- After downtimes (Caution: a pH glass electrode may not be stored in a dry environment.)
- At reasonable intervals, dependent on the process. The required interval can range between several times a day to once every three months. At the start, calibrate more often, and keep the results in the operations logbook. The data of the last 30 calibrations are also saved in the calibration logbook. Slowly extend the intervals depending on the deviations which occur during calibration.

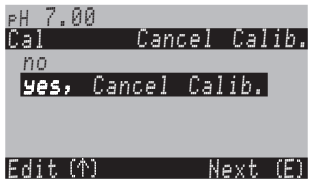
✎ Note!
The defaults for the on-site calibration are set in the menu
"PARAM" ➔ "Set up 1" ➔ "Calibration" (s. page 90 for pH / page 92 for redox).

The calibration can be protected with the maintenance and the specialist codes. No calibration can be carried out at the read-only level (compare with page 40).

Procedure:

1. Move assembly to service position (when a rectractable assembly is used).
2. Remove electrode.
3. Clean electrode before calibration.

✎ Note!
- Note the necessary preparatory work for calibration (page 99, pH and page 100, redox).
- For measurements with PM (potential matching), the PM line must be immersed in the calibration solution.
- If automatic temperature compensation is selected for calibration (ATC), the corresponding temperature sensor must also be immersed in the calibration solution.
- The instrument switches automatically to Hold (factory setting) whenever it is calibrated.
- Cancel calibration by pressing the "MEAS" key.



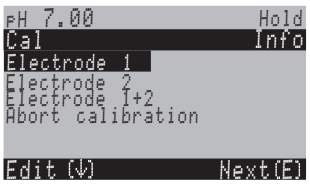
- If you confirm with "yes, cancel calib.", you return to the measuring mode.
- If you select "no", calibration is continued.

The following section describes the calibration procedures for:

pH calibration	➔	"Manual data entry" (s. page 90)
	➔	"Manual calibration with buffer" (s. page 91)
	➔	"Calibration with buffer table" (s. page 91)
	➔	"Calibration with automatic buffer recognition" (s. page 91)
Redox absolute calibration	➔	"Absolute data entry" (s. page 92)
	➔	"Absolute calibration" (s. page 93)
Redox relative calibration	➔	"Absolute data entry" (s. page 94)
	➔	"Relative data entry" (s. page 96)
	➔	"Absolute calibration" (s. page 95)
	➔	"Relative calibration" (s. page 97)

To enter the menu, proceed as follows:

CAL ⇒



⇒

pH calibration

"Manual data entry" ()
The numeric values for electrode zero point and slope are entered by hand.

CHOICE **(default = bold)**	**INFO**
Electrode 1 Electrode 2 Electrode 1+2 Abort calibration	**Selection for calibration** (only two-circuit) Select electrode 1 or 2, and then run through calibration for each individual electrode.
Calibration with data entry	**Note in display** Display of the type of on-site calibration selected in the calibration settings.
025.0 °C (–20.0 ... +150.0 °C)	**Entry of temperature,** at which zero point and slope have been determined.
07.00 (pH –2.00 ... +16.00) ISFET: **act.value** (–500 ... +500mV)	**Entry of the electrode zero point 1 / 2** Confirm by pressing E.
59.16 mV/pH (5.00 ... 99.00 mV/pH)	**Entry of the electrode slope 1 / 2** Confirm by pressing E.
Accept Cancel Repeat calibration	**End of calibration** **Accept**: Pressing E accepts the new calibration data. **Cancel**: The data is not accepted and the device is not recalibrated. **Repeat calibration**: The data is rejected and calibration is restarted.
Waiting for sensor response	**Communication to the sensor** (digital sensors with Memosens technology only) Mycom S transmits calibration data to the sensor.
Data saved Data NOT saved	**Note in display** (digital sensors with Memosens technology only) Displays if calibration data were successfully saved to the sensor. If data saving failed, recalibrate the sensor.
Electrode in medium?	**Note in display:** Is the electrode back in the medium, so that measurement can take place?

pH calibration

"Calibration with manual buffer" / "Calibration with buffer table" / "Calibration with automatic buffer recognition"
Manual buffer: The buffer pH value is entered manually. The display then shows the current measured value.
Buffer table: In the calibration menu from page 50 onwards, you can set two buffer solutions or define them yourself. The selected pH value and buffer type are displayed.
Automatic buffer recognition: The device automatically recognises the used buffer. Select the buffer types (e.g. E+H) in the Calibration menu.

✎ Note!
Automatic buffer recognition is only possible with glass electrodes.

CHOICE **(default = bold)**	**INFO**
Electrode 1 Electrode 2 Shared Abort calibration	**Selection for calibration** (only two-circuit) Select electrode 1 or 2, and then run through calibration for each individual electrode.
Calibration with manual buffer (with buffer table / automatic buffer recognition)	**Note in display** Display of the type of on-site calibration selected in the calibration settings.
025.0 °C (–20.0 ... +150.0 °C)	**Enter temperature,** (only if "Calibrate with MTC" is selected) Confirm by pressing [E].
025.0 °C (–20.0 ... +150.0 °C)	**Enter buffer temperature** (only if "Calibrate with MTC" is selected) Confirm by pressing [E].
Immerse pH electrode in buffer 1/2	**Handling instructions** Immerse the electrode in buffer 1 / 2. Confirm by pressing [E].
Temperature 1: 25.0 °C **07.00** (pH –2.00 ... +16.00)	**Enter pH value of buffer 1 / 2** (only with manual buffer) Confirm by pressing [E].
Time: 10 s **MTC** pH 1: 7.00 mV 1: 0 °C: 25.0	**Checks the stability of the calibration** Wait until the pH measurement is stable: Time does not count down, pH value no longer flashes, display "Measured value stable". Confirm by pressing [E].
Invalid calibration value	**Note in display:** If an error is present (e.g. incorrect buffer used), this message is displayed.
Zero point 07.00 Good Slope 59.00 Good	**Note in display:** Info on electrode 1 / 2. Data on the zero point, slope and calibration quality.
Electrode status C1 good	**Note in display:** Electrode status circuit 1 / 2: There are three status messages for the electrode status: "good", "OK", "bad". If the status "bad" is displayed, electrode replacement is recommended to ensure the quality of the pH measurement.
Accept Cancel Repeat calibration	**End of calibration** **Accept**: Pressing [E] accepts the new calibration data. **Cancel**: The data is not accepted and the device is not recalibrated. **Repeat calibration**: The data is rejected and calibration is restarted.

CHOICE (default = bold)	INFO
Waiting for sensor response	**Communication to the sensor** (digital sensors with Memosens technology only) Mycom S transmits calibration data to the sensor.
Data saved Data NOT saved	**Note in display** (digital sensors with Memosens technology only) Display if calibration data were successfully saved to the sensor. If data saving failed, recalibrate the sensor.
Electrode in medium?	**Note in display:** Is the electrode back in the medium, so that measurement can take place?

Calibration redox absolute

"Absolute data entry"
The transmitter has a calibrated mV display range. One absolute mV value is set with a single buffer solution (adaptation of the measuring chain offset). A buffer solution preferably with 225 or 475 mV is used.

CHOICE (default = bold)	INFO
Electrode 1 Electrode 2 Shared Abort calibration	**Selection for calibration** (only two-circuit) Select electrode 1 or 2, and then run through calibration for each individual electrode.
Calibration with abs. data entry	**Note in display** Display of the type of on-site calibration selected in the calibration settings.
0000 mV (–1500 ... +1500 mV)	**Entry of offset value circuit 1 / 2** Enter the mV value for the electrode offset (electrode offset = deviation of the measured value display from buffer solution mV value) Confirm by pressing [E]. The entered value is effective immediately. The maximum offset is 400 mV.
Offset too high / too low	**Note in display:** Error message if the entered offset leaves the maximum range.
Accept Cancel Repeat calibration	**End of calibration** **Accept**: Pressing [E] accepts the new calibration data. **Cancel**: The data is not accepted and the device is not recalibrated. **Repeat calibration**: The data is rejected and calibration is restarted.
Electrode in medium?	**Note in display:** Is the electrode back in the medium, so that measurement can take place?

Calibration redox absolute

"Calibration absolute"
The transmitter has a calibrated mV display range. One absolute mV value is set with a single buffer solution (adaptation of the measuring chain offset). A buffer solution preferably with 225 or 475 mV is used.

CHOICE (default = bold)	**INFO**
Electrode 1 Electrode 2 Shared Abort calibration	**Selection for calibration** (only two-circuit) Select electrode 1 or 2, and then run through calibration for each individual electrode.
Calibration with abs. calibration	**Note in display** Display of the type of on-site calibration selected in the calibration settings.
Immerse electrode in buffer	**Handling instructions** Immerse the electrode in the buffer. Confirm by pressing [E].
0225 mV (–1500 ... +1500 mV)	**Enter buffer** During calibration, enter the buffer mV value.
Time: 10 s mV 1: 225	**Checks the stability of the calibration** Wait until the measurement is stable: Time does not count down, mV value no longer flashes, Display "Measured value stable" Confirm by pressing [E].
Invalid calibration value	**Note in display:** Error message if the offset is too large.
Offset 0005 mV Good	**Note in display:** Info on electrode 1. Data on the offset and calibration quality.
Accept Cancel Repeat calibration	**End of calibration** **Accept**: Pressing [E] accepts the new calibration data. **Cancel**: The data is not accepted and the device is not recalibrated. **Repeat calibration**: The data is rejected and calibration is restarted.
Electrode in medium?	**Note in display:** Is the electrode back in the medium, so that measurement can take place?

Calibration redox relative

"Absolute data entry"
The transmitter has a calibrated mV display range. One absolute mV value is set with a single buffer solution (adaptation of the measuring chain offset). A buffer solution preferably with 225 or 475 mV is used.

CHOICE (default = bold)	**INFO**
Electrode 1 Electrode 2 Shared Abort calibration	**Selection for calibration** (only two-circuit) Select electrode 1 or 2, and then run through calibration for each individual electrode.
Calibration with abs. data entry	**Note in display** Display of the type of on-site calibration selected in the calibration settings.
0000 mV (–1500 ... +1500 mV)	**Entry of offset value circuit 1 / 2** Enter the mV value for the electrode offset (electrode offset = deviation of the measured value display from buffer solution mV value) Confirm by pressing [E]. The entered value is effective immediately. The maximum offset is 400 mV.
Offset too high / too low	**Note in display:** Error message if the entered offset leaves the maximum range.
Accept Cancel Repeat calibration	**End of calibration** **Accept**: Pressing [E] accepts the new calibration data. **Cancel**: The data is not accepted and the device is not recalibrated. **Repeat calibration**: The data is rejected and calibration is restarted.
Electrode in medium?	**Note in display:** Is the electrode back in the medium, so that measurement can take place?

Calibration redox relative

"Calibration absolute"
The transmitter has a calibrated mV display range. One absolute mV value is set with a single buffer solution (adaptation of the measuring chain offset). A buffer solution preferably with 225 or 475 mV is used.

CHOICE (default = bold)	**INFO**
Electrode 1 Electrode 2 Shared Abort calibration	**Selection for calibration** (only two-circuit) Select electrode 1 or 2, and then run through calibration for each individual electrode.
Calibration with abs. calibration	**Note in display** Display of the type of on-site calibration selected in the calibration settings.
Immerse electrode in buffer	**Handling instructions** Immerse the electrode in the buffer. Confirm by pressing [E].
0225 mV (–1500 ... +1500 mV)	**Enter buffer** During calibration, enter the buffer mV value.
Time: 10 s mV 1: 225	**Checks the stability of the calibration** Wait until the measurement is stable: Time does not count down, mV value no longer flashes, Display "Measured value stable" Confirm by pressing [E].
Invalid calibration value	**Note in display:** Error message if the offset is too large.
Offset 0005 mV Good	**Note in display:** Info on electrode 1 / 2 Data on the offset and calibration quality.
Accept Cancel Repeat calibration	**End of calibration** **Accept**: Pressing [E] accepts the new calibration data. **Cancel**: The data is not accepted and the device is not recalibrated. **Repeat calibration**: The data is rejected and calibration is restarted.
Electrode in medium?	**Note in display:** Is the electrode back in the medium, so that measurement can take place?

Calibration redox relative

"Data entry relative"
Entry of two % calibration points to which an mV value is assigned.

CHOICE (default = bold)	INFO
Electrode 1 Electrode 2 Shared Abort calibration	**Selection for calibration** (only two-circuit) Select electrode 1 or 2 and then run through calibration for each individual electrode.
Calibration with rel. data entry	**Note in display** Display of the type of on-site calibration selected in the calibration settings.
1. (0...30%): **20 %** 1. Voltage **0600 mV** 2. (70...100%) **80 %** 2. Voltage **-0600 mV**	**Enter calibration points circuit 1 / 2** In this field, create two measured value pairs (pair 1 and pair 2). Measured value pair 1 in the range 0...30%: assign, for example, the voltage 0600 mV to the percentage value 20 %. Measured value pair 2 in the range 70...100%: assign, for example, the voltage –0600 mV to the percentage value 80 %. The settings made become effective immediately after confirmation with [E].
Offset too high / too low	**Note in display:** Error message if the offset leaves the maximum range.
Accept Cancel Repeat calibration	**End of calibration** **Accept**: Pressing [E] accepts the new calibration data. **Cancel**: The data is not accepted and the device is not recalibrated. **Repeat calibration**: The data is rejected and calibration is restarted.
Electrode in medium?	**Note in display:** Is the electrode back in the medium, so that measurement can take place?

Calibration redox relative

"Calibration relative"
For calibration, two tanks are filled with a sample of the medium. The contents of the first tank are detoxified and are called buffer 1.
The contents of the second tank are left unchanged and are called buffer 2.

CHOICE (default = bold)	**INFO**
Electrode 1 Electrode 2 Shared Abort calibration	**Selection for calibration** (only two-circuit) Select electrode 1 or 2, and then run through calibration for each individual electrode.
Calibration with rel. calibration	**Note in display** Display of the type of on-site calibration selected in the calibration settings.
Immerse electrode in buffer 1	**Handling instructions** Immerse the electrode in buffer 1 / 2 (detoxified sample, see above). Confirm by pressing [E].
20 % (0 ... 30 %)	**Enter buffer** Enter the relative redox value of buffer 1 / 2 (detoxified sample) in percent.
Time: 10 s mV 1: 225	**Checks the stability of the calibration** Wait until the measurement is stable: Time does not count down, mV value no longer flashes, display "Measured value stable". Confirm by pressing [E].
Invalid calibration value	**Note in display:** Error message if the offset is too large.
Accept Cancel Repeat calibration	**End of calibration** **Accept**: Pressing [E] accepts the new calibration data. **Cancel**: The data is not accepted and the device is been recalibrated. **Repeat calibration**: The data is rejected and calibration is restarted.
Electrode in medium?	**Note in display:** Is the electrode back in the medium, so that measurement can take place?

7 Maintenance

CPM153 does not contain wear parts and is maintenance free.
Measuring point maintenance comprises:

- cleaning the assembly and electrode
- inspecting cables and connections
- calibration (see page 89).

Warning!
Danger of injury.
If you have to remove the electrode for servicing or calibration work, pay attention to the hazards caused by pressure, temperature and contamination.

Caution!
Remember that any maintenance work on the instrument, assembly or electrodes may have impacts on process control and the process itself.

7.1 Maintaining the measuring system

7.1.1 Cleaning

- Dependent on the process, and as far as necessary, the assembly, cable and electrode must be cleaned externally before inspection and calibration. For your own safety, always follow the safety instructions (see above). If necessary, wear protective clothing.
- Cleaning the sensors see chap. 7.1.3.

7.1.2 Checking cables and connections

Please check cables and connections using the following checklist. As there are many different combination possibilities, these instructions are kept to a general level and must be applied to the current installation.

- Check the electrode plug-in head for sealing and humidity.
- Check the sensor cable and particularly the outer insulation for breaks.
- Sensor cables which have become damp on the inside must be replaced.
  Only drying is not sufficient!
- If you are using a junction box: The inside of the box must be clean and dry. Moist dehydrating bags must be replaced.*
- Retighten the terminals in the junction box.*
- For field instruments:
  Retighten the terminals in the instrument. Also check that the interior and the PCBs are clean, dry and free of corrosion (if not: check the seals and screw unions for leaks and breaks). *, **
- For panel-mounted units:
  Retighten the terminals on the instrument, check the BNC connector. *, **
- Cable screens must be connected exactly as shown in the wiring diagram. If the screen is connected incorrectly or not at all, the fail-safety of the instrument could be impaired.

*: The frequency of these checks is dependent on environmental influences. In a normal climate and non-aggressive environment, an annual check is sufficient.
**: This work may only be carried out on a voltage-free instrument, as some of the terminals carry mains voltage.

7.1.3 Sensor cleaning

1. Remove dirt and deposits:
The selection of cleaning agent depends on the type of fouling. The most frequent fouling and the associated cleaning agents are listed in the table below:

Type of contamination	Cleaning agent
☝ Caution! Danger of sensor destruction. No acetone may be used to clean an ISFET pH sensor, otherwise the material may be damaged.	
Greases and oils	Substances containing tensides (alkaline) or water-soluble organic solvents (e.g. alcohol)
⚠ Warning! Danger of caustic burns! Protect your hands, eyes and clothing when you use the following detergents.	
Calciferous deposits, metal hydroxide deposits, heavy biological deposits	3% HCl or with Chemoclean: HCl (10%) in injector diluted to approx. 3%
Sulphide deposits	Mixture of hydrochloric acid (3%) and thiocarbamide (commercially available)
Protein deposits	Mixture of hydrochloric acid (0.1 molar) and pepsin (commercially available)
Fibres, suspended substances	Water under pressure, poss. with surface-active agents
Light biological deposits	Water under pressure

✎ Note!
- Clean redox electrodes only mechanically. Chemical cleaning applies a potential to the electrode that takes several hours to decay. This potential causes measuring errors.
- Do **not** clean ISFET sensors with compressed air.

2. Removing diaphragm blockages:
Blocked reference systems or reference electrode diaphragms can be mechanically cleaned (does not apply to ISFET pH sensor, teflon diaphragms or open ring electrodes):

- Use a small key file.
- Only file in one direction.

3. Check for air bubbles in the glass electrode:
Air bubbles indicate incorrect installation. Therefore check the installation position:

- Permitted: 15° to 165° to the horizontal.
- Exception: ISFET sensors may be installed horizontally or upside down.

4. Check for reference system reduction:
The inner metal lead of the reference system (Ag/AgCl) of a combination electrode or a separate reference electrode is usually light-brown and matt. A silver-coloured reference system is reduced and therefore defective. The cause is a current flowing through the reference element.
Possible causes:

- Incorrect operating mode of the measuring instrument (PM pin connected, but unsymmetrical operating mode ("no solution ground") selected). See functional description, field "Select type of connection" on p. 38.
- Shunt in measuring cable (e. g. through humidity) between reference line and grounded screen or PM line.
- Measuring instrument defective (shunt in reference input or entire input amplifier downstream of PE).

Preparatory redox calibration work
A soiled or coated redox electrode can be cleaned mechanically:

- Use mechanical means to carefully clean metal pins or surfaces which have deposits on them, e.g. fine abrasive sheets or a glass fibre brush.
- Do not clean redox measuring surfaces chemically. After chemical cleaning, e.g. with acid, a redox electrode requires a long period before it reaches a stable operating point again.

7.1.4 Maintenance of digital sensors

To maintain digital sensors with Memosens technology, proceed as follows:

1. If an error occurs or the sensor must be replaced according to the maintenance schedule, take a new or pre-calibrated sensor from the laboratory. In the laboratory, sensors are calibrated under optimum ambient conditions which guarantees a higher calibration quality.
2. Remove the soiled sensor and install the new sensor.
3. The sensor-specific data are automatically transmitted to the transmitter. A relase code is not required.
4. Measurement continues.
5. Take the used sensor back to the laboratory. There, you can regenerate it for reuse without measuring point down time.
   – Clean the sensor. Use the cleaning agents indicated above.
   – Inspect the sensor for damages.
   – If the sensor is not permanently damaged, calibrate it for reuse.

8 Troubleshooting

Troubleshooting relates not only to measures which
- can be carried out without opening the instrument but also to
- instrument defects which require the replacement of components.

8.1 Troubleshooting instructions

In this chapter, you will find diagnosis information and information on eliminating errors which occur:

chap. 8.1.1, p. 102: Error number list ➠ list of all occurring error numbers
chap. 8.1.2, p. 107: Process-specific errors ➠ e.g. temperature value is incorrect.
chap. 8.1.3, p. 109: Device-specific error ➠ e.g. display is dark.

Before starting the repair work, please note the following safety instructions:

Warning!
Danger to life.
- De-energise the instrument before you open it. Check that there is no voltage and secure the switch(es) against switch-on.
- If work under voltage is required, it may only be carried out by an electrician. A second person must be present for safety reasons.
- Switch contacts may be powered by separate circuits. Also de-energise these circuits before you work on the terminals.

Caution!
Danger to components through electrostatic discharge (ESD).
- Electronic components are sensitive to electrostatic discharge. Take protective measures, e.g. remove the charge from your person by touching the PE or wear a permanent grounding in the form of a wrist strap.
  Highly dangerous: Plastic floors at low air humidity and clothing made of synthetic materials.
- For your own safety, always use genuine spare parts. Only genuine spare parts ensure the correct function, precision and reliability after repairs.

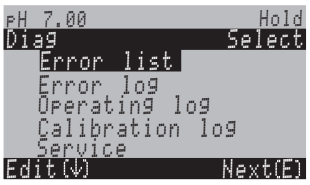
8.1.1 Error number list: Trouble-shooting and configuration

In the following error list, you can find a description of all the error numbers occurring.
For each error number, you can see whether the error triggers
- an alarm,
- an error current or
- cleaning

in the factory setting (=Fact.).

To enter the error list, proceed as follows:

⇒



✎ Note!
- Please process the errors as shown in the "Alarm" menu on page 48.
- The second column shows the assignment acc. to NAMUR work sheet NA64 (failure, maintenance, function control).

Error no.	NAMUR class	Error message	Possible causes / measures	Alarm contact		Error current		Automatic cleaning start	
				Fact	User	Fact	User	Fact	User
E001	Failure	Memory defective	Switch instrument off and on. If necessary corrective maintenance at factory.	yes		no		–	–
E002	Failure	Data error in EEPROM		yes		no		–	–
E 003	Failure	Invalid configuration	Repeat download.						
E004	Failure	Invalid hardware code	The new software cannot recognise the module.						
E006	Failure	Transmitter 1 defective	Test with new transmitter.	yes		no		–	–
E007	Failure	Transmitter 2 defective		yes		no		–	–
E008	Failure	SCS message sensor 1	Impedance of pH glass membrane too low: Check pH sensor; replace it, if necessary. For ISFET sensor: leak current > 400 nA. Replace sensor.	yes		no		no	
E009	Failure	SCS message sensor 2		yes		no		no	
E010	Failure	Temperature sensor 1 defective	Check temperature sensor and connections. ISFET: Check if you selected the corrected temperature sensor in the software s. page 46.	yes		no		no	
E011	Failure	Temperature sensor 2 defective	Check temperature sensor and connections. ISFET: Check if you selected the corrected temperature sensor in the software s. page 46.	yes		no		no	
E019	Failure	Delta limit exceeded	Difference between channel 1 and 2 measured values too high. Process too inconsistent or sensor defective. Replace sensor if necessary.	yes		no		–	–
E027	Failure	Compressed air failure	Pressure is below permitted minimum.	yes		no		no	

Error no.	NAMUR class	Error message	Possible causes / measures	Alarm contact		Error current		Automatic cleaning start	
				Fact	User	Fact	User	Fact	User
E028	Failure	Sensor 2 self test error	Error detected during sensor self test. Check sensor. If necessary, replace it.	yes		no		–	
E029	Failure	Sensor 1 self test error		yes		no		–	
E030	Failure	SCS fault reference electrode 1	Reference impedance too high: Check reference element and, if necessary replace reference or combination electrode. For ISFET sensor: Leak current > 400 nA. Replace sensor.	yes		no		–	–
E031	Failure	SCS fault reference electrode 2		yes		no		–	–
E032	Failure	Outside set slope range for sensor 1	Sensor aged or defective; reference aged, defective or diaphragm blocked; buffer solutions too old or contaminated; PML not in the buffer solutions.	yes		no		–	–
E033	Failure	Outside set zero point for sensor 1		yes		no		–	–
E034	Failure	Outside set offset range for sensor 1		yes		no		–	–
E035	Failure	Outside set slope range for sensor 2	Sensor aged or defective; reference aged, defective or diaphragm blocked; buffer solutions too old or contaminated; PML not in the buffer solutions.	yes		no		–	–
E036	Failure	Outside set zero point for sensor 2		yes		no		–	–
E037	Failure	Outside set offset range for sensor 2		yes		no		–	–
E038	Maintenance	Delta limit exceeded	Difference between channel 1 and 2 measured values too high. Process too inconsistent or sensor defective. Replace sensor if necessary.	yes		no		–	–
E040	Maintenance	SCC / electrode status of sensor 1 bad	Check sensor, replace if necessary; maybe clean (glass membrane blocked or run dry; diaphragm blocked).	yes		no		–	
E041	Maintenance	SCC / electrode status of sensor 2 bad		yes		no		–	
E043	Maintenance	Buffer difference channel 1 too small	Wrong buffer used; buffer entry incorrect; buffer self-recognition defective.	yes		no		–	
E044	Maintenance	Meas. value channel 1 unstable	PML missing; sensor too old; sensor sometimes dry; cable or plug defective.	yes		no		–	
E045	Failure	Calibration aborted	Repeat calibration and renew buffer solution. Replace electrode if necessary.	yes		no		–	
E048	Maintenance	Buffer difference channel 2 too small	Wrong buffer used; buffer entry incorrect; buffer self-recognition defective.	yes		no		–	
E049	Maintenance	Meas. value channel 2 unstable	PML missing; sensor too old; sensor sometimes dry; cable or plug defective.	yes		no		–	
E054	Maintenance	Dosage time alarm	Dosage time exceeded at total dosage. Dosage interrupted, dosing agent empty or process too inconsistent.	yes		no		no	

Error no.	NAMUR class	Error message	Possible causes / measures	Alarm contact		Error current		Automatic cleaning start	
				Fact	User	Fact	User	Fact	User
E055	Failure	Display range of main parameter 1 undershot	Measuring line broken; sensor in air or air cushion in assembly; potential matching missing in symmetrical measurement; static charging in media with lowest conductivity.	yes		no		no	
E056	Failure	Display range of main parameter 2 undershot		yes		no		no	
E057	Failure	Display range of main parameter 1 exceeded		yes		no		no	
E058	Failure	Display range of main parameter 2 exceeded		yes		no		no	
E059	Failure	Temperature range 1 undershot	Temperature sensor defective; sensor line interrupted or short-circuited; wrong sensor type selected.	yes		no		no	
E060	Failure	Temperature range 2 undershot		yes		no		no	
E061	Failure	Temperature range 1 exceeded		yes		no		no	
E062	Failure	Temperature range 2 exceeded		yes		no		no	
E063	Maintenance	Current limit 0/4 mA output 1	Measured value outside specified current range: Check measured value for plausibility. If necessary, adjust current output assignment 0/4 mA and/or 20 mA.	yes		no		no	
E064	Maintenance	Current limit 20 mA output 1		yes		no		no	
E065	Maintenance	Current limit 0/4 mA output 2		yes		no		no	
E066	Maintenance	Current limit 20 mA output 2		yes		no		no	
E067	Maintenance	Reference value exceeded controller LS 1	Dosing devices defective; chemical supply empty; measured value incorrect -> check for plausibility and function; incorrect control direction set; incorrect contact assigned; incorrect control function assigned.	yes		no		no	
E068	Maintenance	Reference value exceeded controller LS 2		yes		no		no	
E069	Maintenance	Reference value exceeded controller LS 3		yes		no		no	
E070	Maintenance	Reference value exceeded controller LS 4		yes		no		no	
E071	Maintenance	Reference value exceeded controller LS 5		yes		no		no	

Error no.	NAMUR class	Error message	Possible causes / measures	Alarm contact		Error current		Automatic cleaning start	
				Fact	User	Fact	User	Fact	User
E073	Failure	Temperature 1, table value undershot	Check temperature value for plausibility; if necessary, adjust or extend table.	yes		no		no	
E074	Failure	Temperature 2, table value undershot		yes		no		no	
E075	Failure	Temperature 1, table value exceeded		yes		no		no	
E076	Failure	Temperature 2, table value exceeded		yes		no		no	
E080	Maintenance	Range for current output 1 too small	Increase measuring range span for current output assignment.	no		no		no	
E081	Maintenance	Range for current output 2 too small		no		no		no	
E094	Failure	Incompatible sensor version 1	Digital sensor and transmitter are not compatible. Possibly, Ex version of sensor is used with non-Ex version of transmitter or vice versa	no		no		no	
E095	Failure	Incompatible sensor version 2		no		no		no	
E100	Function check	Current simulation active	Check if functions were consciously selected.	no		no		no	
E101	Function check	Service function active		no		no		no	
E106	Function check	Download active	Wait for download to end.	no		no		no	
E116	Failure	Download error	Repeat download.	no		no		no	
E117	Failure	DAT memory module data error	Check with other DAT memory module; when writing to DAT: repeat write process.	yes		no		no	
E126	Failure	Sensor power fail 2	Sensor communication present but sensor has too little current. Check whether Memosens connection is correctly inserted and locked.	no		no		no	
E127	Failure	Sensor power fail 1		no		no		no	
E146	Failure	No digital sensor with Memosens technology 2	Digital sensor is not correctly plugged in or connected. The transmitter goes into hold. Hold is removed after the sensor has been correctly plugged in or wired and transmits measured values.	no		no		no	
E147	Failure	No digital sensor with Memosens technology 1		no		no		no	
E152	Maintenance	PCS Channel 1 alarm	pH sensor defective or totally soiled; measured water flow in bypass interrupted; air cushion in assembly; measuring line interrupted, dosing component defective, chemicals empty.	no		no		no	
E153	Maintenance	PCS Channel 2 alarm		no		no		no	
E 156	Function check	Calibration timer run out	Time for calibration!	no		no		no	

Error no.	NAMUR class	Error message	Possible causes / measures	Alarm contact		Error current		Automatic cleaning start	
				Fact	User	Fact	User	Fact	User
E164	Failure	Dynamic range of pH convertor 1 exceeded	Check cable / sensor.	yes		no		–	
E165	Failure	Dynamic range of pH convertor 2 exceeded		yes		no		–	
E166	Failure	Dynamic range of reference convertor 1 exceeded		yes		no		–	
E167	Failure	Dynamic range of reference convertor 2 exceeded		yes		no		–	
E168	Maintenance	SCS message ISFET sensor 1	Leak current > 200 nA. Early warning. Work can be continued until error E008/E009 occurs.	no		no		–	
E169	Maintenance	SCS message ISFET sensor 2		no		no		–	
E171	Maintenance	Current input 1 undershot	Check process variables at transmitter. Change range assignment if required.	no		no		–	
E172	Maintenance	Current input 1 exceeded		no		no		–	
E173	Maintenance	Current input 2 undershot		no		no		–	
E174	Maintenance	Current input 2 exceeded		no		no		–	
E175	Maintenance	SCS glass warning 1	Check digital sensor for glass breakage or hair-line cracks; Check medium temperature. Measurement can continue until the error occurs.	no		no		–	
E176	Maintenance	SCS glass warning 2		no		no		–	
E177	Maintenance	SCS reference electrode warning 1	Check digital sensor for contamination and damage; clean electrode; measuring can continue until the error occurs.	no		no		–	
E178	Maintenance	SCS reference electrode warning 2		no		no		–	
E179	Failure	Data error sensor 2	Digital sensor does not deliver measured values. Sensor not correctly plugged in or wired; or sensor defective ➔ replace sensor.	no		no		no	
E180	Failure	Data error sensor 1		no		no		no	

8.1.2 Process-specific errors

Error	Possible cause	Remedial action	Equipment needed, spare parts
Instrument unconfigurable, Display for code prompt is 9999	Instrument hardware is locked via key-board (Keys "CAL" + "DIAG" simultane-ously = security locking)	Press "MEAS" and "PARAM" simultaneously to unlock.	
Measuring chain zero point not settable	Reference system poisoned	Test with new electrode.	pH/mV electrode
	Membrane blocked	Clean or grind diaphragm.	HCl 3%, file (ceramic diaphragm only, file in one direction only)
	Measuring line broken	pH input on instrument short-circuit ⇒ Display pH7.	pH input on instrument short-circuit ⇒ Display pH7
	Unsymmetrical sensor voltage too high	HCl 3%, file (only file in one direction).	Clean membranes or test with different electrode.
	Potential matching (PA/PM) Mycom ⇔ Incorrect medium	unsymm.: no PM or PM on PE. symm.: PM connection needed.	Connection see chap. 4.
No automatic calibration possible, as sensor settling time is too long	ISFET sensors only: liquid film between semiconductor and reference lead is interrupted due to drying or cleaning with compressed air.	Make sure that the liquid film is established or that the buffer remains in the rinse chamber for more than 6 min. Do not use compressed air to clean the ISFET sensor.	
No or slow display change	Electrode soiled	Clean electrode.	see chap. 7.1.3
	Electrode aged	Replace electrode.	New electrode
	Electrode defective (reference lead)	Replace electrode.	New electrode
	Inner buffer missing	Check KCl supply (0.8 bar above medium pressure).	KCl (CPY4-x)
	Problem with diaphragm or missing electrolyte		
Measuring chain slope not adjustable/slope too small	Connection not at high impedance (humidity, dirt)	Test cable, connector and junction boxes.	pH simulator, see also chap. 7.1.2.
	Instrument input defective	Directly test instrument.	pH simulator
	Electrode aged	Replace electrode.	pH electrode
Measuring chain slope not adjustable	Hairline crack in glass membrane	Replace electrode.	pH electrode
	Connection not at high impedance (humidity, dirt)	Test cable, connector and junction boxes.	pH simulator, see also Chap. 7.3.2.
	Semi-conductor layer in measuring cable not removed	Check inner coaxial cable, remove black layer.	
Permanent, incorrect measured value	Electrode not immersed or protective cap not removed	Check installation position, remove protective cap.	
	Air cushion in assembly	Check assembly and installation position.	
	Earth fault at or in the instrument	Test measurement in insulated vessel, possibly with buffer solution.	Plastic vessel, buffer solutions behaviour, when instrument is connected to process?
	Hairline crack in the glass membrane	Replace electrode.	pH electrode
	Instrument in impermissible operating state (no response on pressing key)	Switch instrument off and on.	EMC problem: If repeated, check grounding and wire routing.
Incorrect temperature reading	Incorrect sensor connection	Check connections using wiring diagram.	Wiring diagram see chap. 4.6.
	Measuring cable defective	Check cable.	Ohmmeter
	Incorrect sensor type selected	Set temperature sensor type on instrument (s. page 46).	Check temperature sensor with ohmmeter.
	Sensor defective	Check sensor.	

Error	Possible cause	Remedial action	Equipment needed, spare parts
pH value in process incorrect	No / incorrect temperature compensation	ATC: Activate function. MTC: Set process temperature.	
	Conductivity of medium too low	Select pH electrode with salt supply or liquid KCl.	e. g. Orbisint CPS11-xASxx, Ceraliquid CPS41 or Purisys CPF201
	Flow rate too high	Reduce flow rate or measure in a bypass.	
	Potential in medium	Poss. earth with / at PM pin (connect PM to PE).	Problem mainly occurs in plastic lines.
	Device unsymmetrical and PAL connected	Possibly earth with / at PA pin (connect PA to PE).	
	Electrode covered in dirt or deposits	Clean electrode (see Chap. 8.8.1).	Highly polluted media: Use spray cleaning.
Measured values fluctuate	Interference in measuring cable	Connect cable screens as per terminal diagram.	Wiring diagram see chap. 4.6.
	Interference in signal output line	Check line installation, possibly route line separately.	
	Interference potential in medium	Symmetrical measurement (with PML)	
	No potential matching (PA/PM) with symmetrical measurement	Connect PM pin in assembly to instrument terminal PA/PM.	Poss. ground medium by connecting PM to PE.
Div. controller, timer or clean functions cannot be activated	Relay module not available for relay 3 - 5	Install 3 relay module M3R-3	For order number and installation see chap. 8.4.
Controller / limit contact does not work	Controller switched off	Activate controller see chap. 6.6.	
	Controller in “Manual / Off” mode	Select "Auto" or "Manual on" mode.	Keypad / PARAM / manual operation / contacts
	Pick-up delay setting too long	Switch off or shorten pick-up delay period.	
	"Hold" function active "Auto hold" during calibration "Hold" input activated Manual "hold" active using keypad "Hold" active during configuration	Determine cause of hold and eliminate if not desired.	"Hold" is indicated in display when active.
Controller / limit contact work continuously	Contact in "Manual/on" mode	Set controller to "Manual/off" or "Auto".	
	Dropout delay setting too long	Shorten dropout delay period.	
	Control circuit interrupted	Check measured variable, current output or relay contacts, actuators, chemical supply.	
No pH/mV current output signal	Line open or short-circuited	Disconnect both (!) lines and measure directly on instrument.	mA meter 0–20 mA DC
	Output defective see Chap. 8.2.4	Replace controller module.	
Fixed current output signal	Current simulation active	Switch off simulation.	See DIAG / Service / Simulation.
	Processor system out of sync	Switch instrument off and on.	EMC problem: If repeated, check installation.
	"Hold" is active.	"Hold" status see display.	
Current output signal incorrect or different than expected	Incorrect current assignment	Check current assignment: Check whether you selected 0–20 mA or 4–20 mA.	
	Incorrect signal assignment	Any current output can be assigned to any measured value (pH1 or 2, Temp. 1 or 2, Delta pH).	Check under "PARAM" / current output.
	Total load in current circuit too high (>500 ohms)	Disconnect output and measure current directly on instrument.	mA meter for 0–20 mA DC
Feed forward control does not work	Additional module M3R-x missing	Additional module M3R-2 with 1 or M3R-1 with 2 current inputs	See spare parts list in chap. 8.3.
	Incorrect version		Resistance input only permissible with non-Ex.

Error	Possible cause	Remedial action	Equipment needed, spare parts
"Predictive" operating mode not available	No or wrong additional module	Additional module with 2 inputs required.	See spare parts list in chap. 8.3.
Feedback input does not work	Additional module M3R-x missing		See spare parts list in chap. 8.3. Resistance input only permissible with non-Ex.
Feedback incorrect	Feedback potentiometer outside range	Smallest permissible potentiometer 1 kohm, largest permissible potentiometer 10 kohms	
	Feedback range not set or not set correctly	Set lower and upper range value in "PARAM" menu.	
Feedback fluctuates	Cable version without screen used	Replace by screened cable version.	
	Cable screen not connected to the transmitter	Connect cable screen to PE rail.	
	Feedback cable is parallel to power lines (inductive coupling).	Connect both ends of the cable screen to PE.	
Data cannot be saved	No DAT memory module available		DAT available as accessory, see chap. 9.

8.1.3 Instrument-specific errors

Error	Possible cause	Tests and / or remedial action	Equipment, spare parts, personnel
Display dark, no LEDs active	No mains voltage	Check whether mains voltage is applied.	Electrician / e.g. multimeter
	Incorrect supply voltage or too low	Compare actual mains voltage with nameplate rating.	
	Connection defective	Terminal not picked-up; insulation clamped.	
	Instrument fuse defective (non-Ex)	Replace fuse after comparing mains voltage and nameplate rating.	Electrician / suitable fuse; see diagrams in Chap. 8.7
	Instrument fuse defective (Ex instrument)	Replace fuse.	Use Ex fuse; electrician required.
	Power unit defective	Replace power unit, pay attention to variant.	On-site diagnosis: all 6 red LEDs on the M3G module must be lit.
	Central module defective (if all 6 LEDs on the power unit M3G are lit)	Replace central module, pay attention to variant.	On-site diagnosis by E+H Service (test module required).
	Ribbon cable loose or defective	Check ribbon cable.	Cable soldered onto the site of the M3G module.
Display dark, but LED active	Central module defective (Module: M3Cx-x)	Replace central module M3Cx-x.	On-site diagnosis by E+H Service (test module required).
Display functioning, but no change in display and/or instrument cannot be operated	Instrument or module in instrument not correctly installed	Check module connections.	See installation diagram page 113.
	Operating system in impermissible state	Switch instrument off and on.	Poss. EMC problem: if problem persists, have installation checked by responsible service.
Instrument gets hot	Incorrect mains voltage or too high	Compare mains voltage and nameplate rating.	
	Power unit defective	Replace mainboard.	All 6 red LEDs on the M3G module must be lit.

Error	Possible cause	Tests and / or remedial action	Equipment, spare parts, personnel
Incorrect measured pH / mV value and / or measured temperature value	Transmitter module defective (module: MKP2), please carry out tests and measures first as described in chap. 8.1.2.	Test measuring inputs: Connect pH, Ref and PM directly on the instrument with wire jumpers: Display must be pH 7. Resistance 100 Ω of terminals 11 to 12+ 13. Display must be 0°C.	If test negative: Replace module MKP2 using installation diagram page 113. Caution! Display shows approx. pH 7. Exact value depends on the zero point deviation of the last calibration.
Current output, Current value incorrect	Calibration incorrect Load too high Shunt / short-circuit to frame in current circuit Incorrect operating mode	Test with integrated current simulation, connect mA meter directly to current output. Check, whether 0–20 mA or 4–20 mA is selected.	If simulation value incorrect: new module M3Cx-x required. If simulation value correct: Check current loop for load and shunts.
No current output signal	Current output stage defective (Module: M3CH-x) Instrument with PROFIBUS® interface	Test with integrated current simulation, connect mA meter directly to current output. PROFIBUS® instruments do not have a current output.	If test negative: Replace module M3CH-x. (Check variants, see spare parts list in chap. 8.3.) For information, see "DIAG" / instrument version.

8.2 Response of outputs to errors

8.2.1 Current output behaviour

If an error occurs in the system, an error current is output at the current output. You can adjust the value of this error current in the Alarm menu (see page 48).
If you have configured the controller for functioning with a current output, no error current is output on this current output.

8.2.2 Response of contacts to errors

You can set each individual error message to trigger or not to trigger an alarm (see table on page 102, editing errors on page 48). In "NAMUR" mode, failure messages always trigger an alarm.

Behaviour with standard setting

Instrument status	Alarm relay	Limit value / Controller
Normal operation	picked-up (Fail-safe behaviour)	Appropriate configuration and operating status
Alarm	Dropped out	
Voltage-free	Dropped out	Dropped out

Behaviour with NAMUR setting (contacts configured as active open contacts)

Instrument status	Alarm relay	Maintenance relay	Function check	Limit value/Controller
Normal operation	Picked-up (Fail-safe behaviour)	Picked-up	Picked-up	Appropriate configuration and operating status
Failure	Dropped out	Picked-up	Picked-up	Appropriate configuration and operating status
Maintenance required	Picked up	Dropped out	Picked-up	Appropriate configuration and operating status
Function check	Picked up	Picked-up	Dropped out	Appropriate configuration and operating status
Voltage-free	Dropped out	Dropped out	Dropped out	Dropped out

8.2.3 Response of contacts to power failure

In the "Setup 1" menu ➔ "Relays", you can define the contacts as "Active open" contacts or "Active closed" contacts (s. page 44). In the case of a power failure, the contacts will act according to the setting you make.

8.3 Spare parts

For your own safety, always use genuine spare parts. Only genuine spare parts ensure the correct function, precision and reliability after repair.

You receive all the spare parts in the form of a service kit with clear labelling, optimised packaging incl. ESD protection for modules and a manual.

Spare parts list

Pos. No.	Kit name	Contents / Use	Order code
10	Terminal module Standard + HART	Module M3K / non-Ex	51507084
10	Terminal module PROFIBUS	Module M3K / non-Ex	51510998
30	Power supply 100 ... 230 VAC non-Ex	Module M3G, power unit + 3 relays	51507087
30	Power supply 24 VAC/DC non-Ex	Module M3G, power unit + 3 relays	51507089
40	DC/DC converter for measuring circuit 2	Module M3DC / Ex and non-Ex	51507091
50	Controller module pH, 2 x current output	Module M3CH-S2 / Non-Ex	51510994
50	Controller module pH, 2 x current + HART	Module M3CH-H2 / Non-Ex	51510993
50	Controller module pH, PROFIBUS-PA	Module M3CH-PA / non-Ex	51510995
60	pH input module glass + ISFET	Module MKP2 / Ex and non-Ex	51507096
60	pH input module Memosens	Module MKD1 / Ex and non-Ex	51514966
70	Relay module 3 additional relays	Module M3R-3 / Ex and non-Ex	51507097
70	Relay module 2 Rel. + 1 current input	Module M3R-2 / Ex and non-Ex	51507098
70	Relay module 2 Rel. + 1 resistance input	Module M3R-2 / non-Ex	51509510
70	Relay module 1 Rel.+ 2 current inputs	Module M3R-1 / Ex and non-Ex	51507099
70	Relay module 1 Rel. + 1 current input + 1 resistance input	Module M3R-1 / non-Ex	51509513
80	Terminal set for pH input glass, 2 pairs	Six-pin terminal + two-pin terminal, 2 pieces each	51507100
80	Terminal set for pH input ISFET, 2 pairs	Six-pin terminal + two-pin terminal, 2 pieces each	51507858
90	Jumper set	5 sets of all three jumper types	51507102
100	Partition plate for connection compartment	5 partition plates	51507103
110	Front cover non-Ex	Upper section with keypad sheet, connection compartment cover, hinge, nameplate	51507104
120	Back cover non-Ex	For one and two-circuit instruments, cpl.	51507106
130	PROFIBUS M12 plug with cables	for installation in Pg installation place	51510930

✎ Note!
For spare part modules for exclusive use in Ex devices, see XA 233C/07/a3.

8.4 Installation and removal of parts

Please observe the danger instructions in chap. 8.3.
The position designations relate to the spare parts list on page 112.

8.4.1 Device view

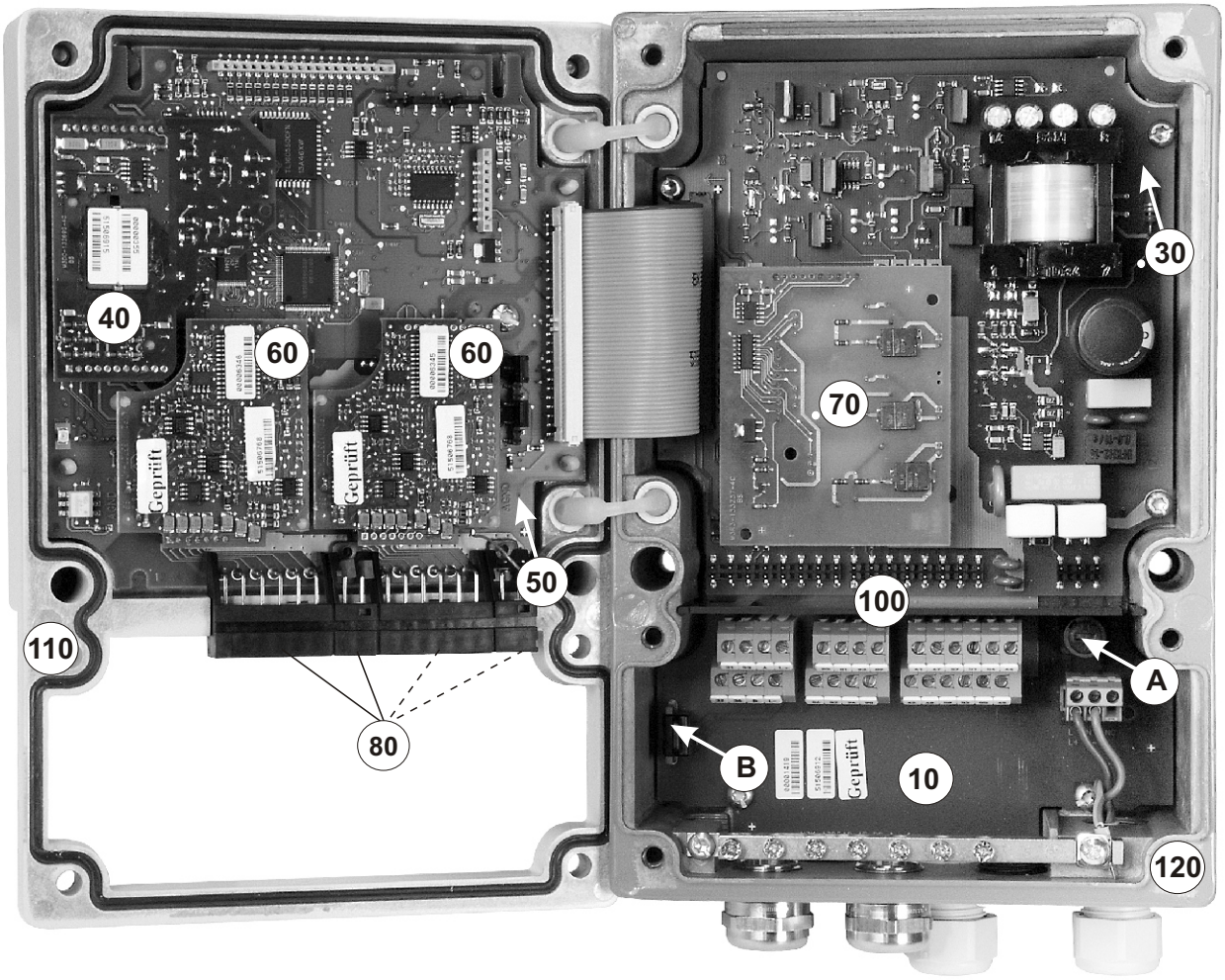


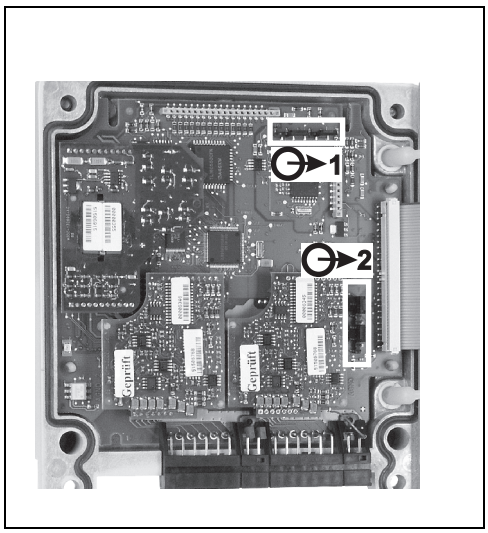
fig. 37: Interior view of the transmitter Mycom S
Remarks:
A: The figure shows the non-Ex fuse.
B: Slot for DAT memory module
10: Terminal module
30: Supply module
40: DC/DC converter
50: Controller module
60: pH input module
70: Relay module / current or resistance input
80: Terminal set pH input
100: Partition plate (not shown in figure)
110: Housing cover
120: Housing bottom

8.4.2 Codings

Current outputs active or passive:
For instrument versions CPM153-xxA/Bxx (2 current outputs) and CPM153-xxC/Dxx (2 current outputs with HART) the current outputs can be operated as active or passive. Jumpers on the controller module M3CH allow recoding.

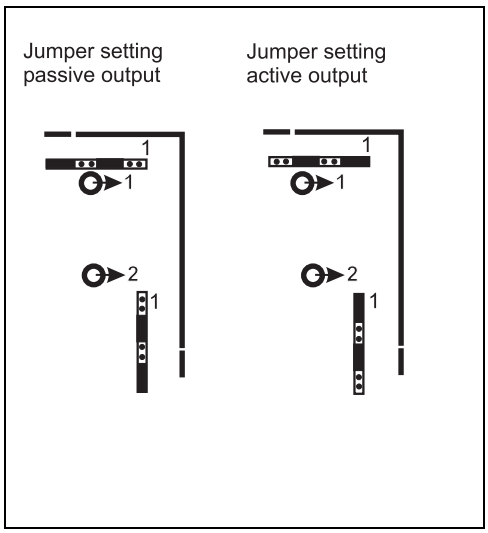
For **non**-Ex instruments, these modules may be recoded to active outputs.

Warning!
Ex instruments must **not** be recoded. Doing so will cause loss of intrinsic safety!



C07-CPM153xx-09-06-00-xx-001.eps

fig. 38: Coding for active current outputs (Inner view of the housing's upper part)



C07-CPM153xx-09-06-00-en-002.eps

fig. 39: Coding for passive or active current outputs

8.5 Replacing the device fuses

For non-Ex devices

Warning!
Danger of injury
Before replacing the fuse, make sure the device is voltage-free.

- Position of the fuse holder: "A" in fig. 37.
- Use only a 5 x 20 mm fine-wire fuse with 3.15 A, semi time-lag fuse. All other fuses are not permitted.

Caution!
If the fuse should fail again, have the device checked.

8.6 Disposal

The Mycom S CPM153 contains electronic components and PCBs and therefore must be disposed of as electronic refuse. Please keep to the local regulations.

9 Accessories

Offline configuration with Parawin

The Parawin tool provides you with a graphic PC operating program for configuring your measuring point at the PC using a simple and self-explanatory menu structure. Write the configuration to the DAT module using the RS232 interface on the PC. The module can then be plugged into the transmitter. You can switch the language via software. The offline configuration system consists of a DAT module, the software and a DAT interface (RS 232).
Required operating sytem: Windows NT/95/98/2000.
Order No.: 51507133 (only Mycom S)
Order No.: 51507563 (Topcal S, Topclean S / Mycom S)

DAT module

The DAT module is a memory device (EEPROM) which can be easily plugged into the connection compartment of the transmitter. Using the DAT module, you can
- save complete settings, logbooks and the data logs of the CPM153
- copy the complete settings to other CPM153 measuring transmitters which have identical hardware functionality.

This considerably reduces the effort to install or service several measuring points.
Order No.: 51507175

Assemblies

Type	Properties	Applications
Dipfit P CPA140	The immersion assembly with flange and bayonet system allows rapid electrode installation and removal, integration of Chemoclean® electrode cleaning possible without conversion. Technical Information: TI 178C/07/en, Order No.: 50088968	■ Open and closed containers and tanks ■ Channels
Flowfit P CPA240	Flow assembly for up to three electrodes, using a siphon-like construction, electrodes are kept wet even if the flow is interrupted. Technical Information: TI 178C/07/en, Order No.: 50088970	■ Pipelines
Cleanfit CPA471/472/ 473/474 /475	Retractable assembly for manual or pneumatic operation. Cleaning and calibrating the electrode is possible in process. CPA475: 3A approval, EHEDG. Technical Information: CPA471: TI 217C/07/en, Order No.: 51502596 CPA472: TI 223C/07/en, Order No.: 51502645 CPA473: TI 344C/07/en, Order No.: 51510923 CPA474: TI 345C/07/en, Order No.: 51510925 CPA475: TI 240C/07/en, Order No.: 51505599	■ General process engineering (471, 472, 473, 474) ■ Food, pharmaceutical applications (475) ■ Biotechnology (475)

pH/redox electrodes

Type	Properties	Applications
Orbisint CPS11/11D/ 12/13	Universally applicable, very easy to clean and insensitive to soiling due to PTFE diaphragm, pressures up to 6 bar, conductivity > 50 µS/cm Technical Information TI 028C/07/en, 50054649 and TI 367C07/en, 51513586	■ General process engineering ■ Industrial wastewater ■ Detoxification (cyanide, chrome) ■ Neutralisation
Ceraliquid CPS41/42/43	Electrodes with ceramic diaphragms and KCl liquid electrolyte, use with counterpressure, explosion-proof up to 8 bar Technical Information TI 079C/07/en, 50059346	■ General process engineering ■ Ultra-pure water ■ Boiler feed water ■ Detoxification (cyanide)
Ceragel CPS71/71D/ 72	Gel electrode with double-chamber reference system. Long-term stability, short response time, very long toxic path, resistant to alternating temperature and pressure cycles Technical Information TI 245C/07/en, 51505837 and TI 374C/07/en, 51513591	■ General process engineering ■ Food processing ■ Water treatment
Orbipore CPS91	Electrodes with double-chamber reference system and open aperture Technical Information TI 375C/07/en, 51513127	■ Chemical processes ■ Heavily soiled media
Tophit CPS471	Rupture-proof pH sensor based on ISFET technology. Short response time, very high resistance to alternating temperature cycles, sterilisable, almost no acid or alkaline errors Technical Information TI 283C/07/en, 51506685	■ General process engineering ■ Food, pharmaceutical applications ■ Water treatment ■ Biotechnology
Tophit CPS441	Sterilisable ISFET sensor for media with low conductivity, with liquid KCL electrolyte Technical Information TI 352C/07/en, 51506565	■ General process engineering ■ Ultra-pure water ■ Boiler feed water
Tophit CPS491	ISFET sensor with open aperture Technical Information TI 377C/07/en, 51513174	■ Chemical processes ■ Heavily soiled media

Rinse connection adapter

Rinse connection adapter CPR40 for the transport of cleaning agents for use with retractable assemblies.
Technical Information TI 342C/07/en, Order No. 51510059

Spray cleaning system

CYR10 / CYR20 Chemoclean Spray Cleaning System for the transport of cleaning agents or acids for use with retractable assemblies.
Technical Information TI 046C/07/en, Order No. 50014223

Service adapter Optoscope

The service adapter aids communication between Endress+Hauser transmitters and the PC using the service interface. You can use it to load new firmware and to save/write customer data (using a PC with the Windows 95/98 or Windows NT operating system).

Terminated pH measuring cables

- CPK1: For pH/redox electrodes without temperature sensor, with GSA plug-in head. Extension with cable CYK71 possible, see table "Measuring cables sold by the metre".
- CPK9: For pH/redox electrodes with integrated temperature sensor and TOP68 plug-in head (versions ESA, ESS). Extension with cable CYK71 possible, see table "Measuring cables sold by the metre".
- CPK12: For ISFET pH sensors and pH/redox electrodes with integrated temperature sensor and TOP68 plug-in head. Extension with cable CYK12 possible, see table "Measuring cables sold by the metre".
- CYK10: Memosens data cable for digital pH sensors with Memosens technology. Extension with cable CYK81 possible, see table "Measuring cables sold by the metre".
- Junction box VBM: Junction box for extending measuring cable connection between electrode and transmitter. Two screw unions for e.g. combination electrode.
  Material: aluminium casting, ingress protection IP 65. Order No.50003987
- Junction box VBA: Junction box for extending measuring cable connection between electrode and transmitter. Four screw unions for e.g. separate reference electrode.
  Material: aluminium casting, ingress protection IP 65. Order No.50003987
- Junction box RM: Junction box for extending measuring cable connection between digital sensor with Memosens technology and transmitter, 2 cable glands Pg 13.5, ingress protection IP 65. Order no.: 51500832

Measuring cables sold by the metre

Cable	Description	Order number
CYK71	Measuring cable, consisting of a coaxial cable, 4 pilot wires and outer screen	50085333
	Measuring cable for Ex applications	50085673
DMK	Measuring cable, consisting of 3 coaxial cables, 3 pilot wires and outer screen	50003864
	DMK blue for Ex applications	50003866
CYK12	Measuring cable, consisting of a coaxial cable, 5 pilot wires and outer screen, black	51506598
	Measuring cable for Ex applications, blue	51506616
CYK81	Non-terminated measuring cable for extension of sensor cables (e.g. Memosens), 2 x 2 wires, twisted pair with screen and PVC sheath	51502543

Buffer solutions

Type	Characteristic value / contents	Applications
CPY2	pH 4.0, red, contents: 100 ml; Order No.: CPY2-0 pH 7.0, green, contents: 100 ml; Order No.: CPY2-2 pH 4.0 20x20 ml (for single use), Order No.: CPY2-D pH 7.0 20x20 ml (for single use), Order No.: CPY2-E	pH calibration (reference temperature 25°C)
CPY3	+225 mV pH 7.0, contents: 100 ml; Order No.: CPY3-0 +475 mV, pH 0.0, contents: 100 ml; Order No.: CPY3-1	Redox calibration (measured at 25°C with PtAg or AgCl measuring chain)

Flat gasket

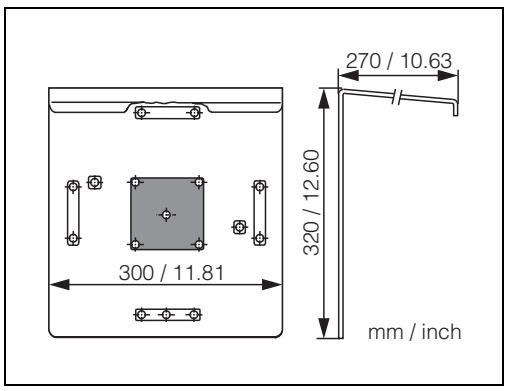
Flat gasket for sealing the front panel mounting of the CPM153.
Order No.: 50064975

Weather protection cover CYY101

Required for outdoor installation of the transmitter.
Material: stainless steel 1.4031. Order No.: CYY101-A

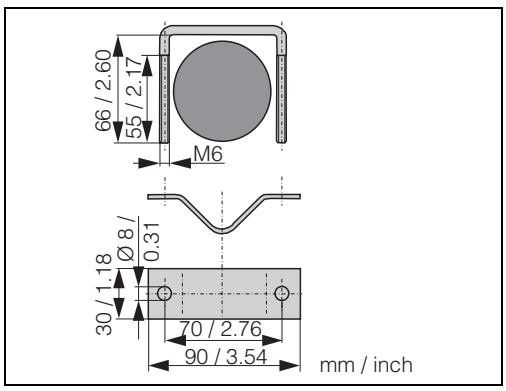
Round post fixture for weather protection cover

To fix the weather protection cover to vertical or horizontal posts with diameters of up to 60 mm.
Order No.: 50062121



C07-CPM153xx-00-00-00-xx-001.eps

fig. 40: Weather protection cover CYY101



C07-CPM153xx-00-00-00-xx-002.eps

fig. 41: Round post fixture for CYY101

10 Technical data

10.1 Input

Measured variables	pH, redox, temperature	
pH (glass / ISFET)	Measuring range	–2.00 ... +16.00
	Measured value resolution	pH 0.01
	Zero point offset range	pH –2 ... +16
	Range of automatic temperature compensation	–50 ... +150°C
	Reference temperature	25°C (settable with medium temperature compensation)
	Slope adjustment	5 ... 99 mV / pH
	Input resistance under nominal operating conditions	$> 1 \cdot 10^{12}\ \Omega$
	Input current under nominal operating conditions	$< 1.6 \cdot 10^{-12}$ A
Redox	Measuring range	–1500 ... +1500 mV –300 ... +300%
	Measured value resolution	0.1 mV
	Zero point offset range	+200 ... –200 mV
	Assignment with % display	adjustable, Δ for 100% = Δ 150 ... Δ 2000 mV
	Electrode offset	±120 mV
	Input resistance under nominal operating conditions	$> 1 \cdot 10^{12}\ \Omega$
	Input current under nominal operating conditions	$< 1.6 \cdot 10^{-12}$ A
Temperature	Temperature sensor	Pt 100 (three-wire circuit) Pt 1000 NTC 30k
	Measuring range (can also be displayed in °F)	–50 ... +150°C (NTC: –20 ... 100°C)
	Measured value resolution	0.1 K
	Temperature offset	± 5 K
Current inputs 1 / 2 (passive, optional)	Signal range	4 ... 20 mA
	Measured error[1]	max. 1% of measuring range
	Input voltage range	6 ... 30 V

Resistance input (active, optional, only with non-Ex)	Resistance ranges (software switchable)	0 ... 1 kΩ 0 ... 10 kΩ
	Measured error[1]	max. 1% of measuring range
Digital inputs	Input voltage	10 ... 50 V
	Internal resistance	R_i = 5 kΩ

[1]: acc. to IEC 746-1, under nominal operating conditions

10.2 Output parameters

Output signal	pH, redox, temperature	
Current outputs	Current range	0 / 4 ... 20 mA
	Error current	2.4 mA or 22 mA
	Measured error[1]	max. 0.2% of current range maximum
	Output distribution, settable	pH: Δ 0 ... Δ 18 pH Redox absolute: Δ 300 ... Δ 3000 mV Redox relative: Δ 0 ... Δ 600 % Temperature: Δ 17 ... Δ 200 °C / Δ 63 ... Δ 360 °F
	Active current output (only non-Ex): Load	max. 600 Ω
	Passive current output: Input voltage range	6 ... 30 V
Auxiliary voltage output (for digital inputs E1-E3)	Voltage	15 V DC
	Output current	max. 50 mA
Interface to CPG 30 / 300	Power supply: Output voltage	11.5 ... 18 V
	Output current	max. 60 mA
	Communication	RS 485
Limit value and alarm functions	Setpoint adjustments	pH –2.00 ... 16.00
	Hysteresis for switch contacts	pH: 0.1 ... 18 Redox absolute: 10 ... 100 mV Redox relative: 1 ... 3000%
	Error delay	0 ... 6000 s

[1]: acc. to IEC 746-1, under nominal operating conditions

Controller	Controlling signal output (selectable):	Pulse-length controller (PWM) Pulse-frequency controller (PFM) Three-point step controller (3-point step) Analogue (via current output)
	Controller behaviour	P / PI / PID
	Control gain K_R	0.01 … 20.00
	Integral action time T_n	0.0 … 999.9 min
	Derivative action time T_v	0.0 … 999.9 min
	Maximum settable frequency with PFM	120 min^{-1}
	Maximum settable period length with PWM	1 ... 999.9 s
	Minimum switch-on period with PWM	0.4 s
Relay contacts	The "Active open"/"Active closed" contact type can be set by software.	
	Switching voltage	max. 250 V AC / 125 V DC
	Switching current	max. 3 A
	Switching power	max. 750 VA
	Lifespan	≥ 5 million switching cycles
Galvanic isolation	At the same potential are: ■ Current output 1 and power supply ■ Current output 2, CPC and resistance input. The remaining circuits are galvanically isolated from each other.	
Electrical connection data	Power supply for CPM153-xxxx**0**xxxx	100 ... 230 V AC +10/–15%
	Frequency	47 ... 64 Hz
	Power supply for CPM153-xxxx**8**xxxx	24 V AC/DC +20/–15%
	Power consumption	max. 10 VA
	Separation voltage between galvanically isolated circuits	276 V_{rms}
	Terminals, max. cable cross-sectional area	2.5 mm²

10.3 Accuracy

Measured value resolution	pH: Redox: Temperature:	0.01 1 mV / 1% 0.1 K
Measurement deviation[1] display	pH: Redox: Temperature:	max. 0.2% of measuring range max. 1 mV max. 0.5 K
Measurement deviation[1]	max. 0.2% of current range maximum	
Repeatability[1]	max. 0.1% of measuring range	

[1]: acc. to IEC 746-1, under nominal operating conditions

10.4 Ambient conditions

Ambient temperature	-10 ... +55 °C / 14 ... 131 °F
Ambient temperature limit	–20 ... +60°C / -4 ... +140 °F
Storage and transport temperature	–30 ... +80°C / -22 ... +176 °F
Relative humidity	10 ... 95%, non-condensing
Ingress protection	IP 65
Electromagnetic compatibility	Interference emission to EN 61326: 1997 / A1:1998; Class B resource (Housing sector) Interference immunity to EN 61326: 1997 / A1:1998; Appendix A (Industrial sector)
Safety requirements	Complies with general safety requirements according to EN 61010. Complies with NAMUR recommendations NE 21.

10.5 Mechanical data

Design / dimensions

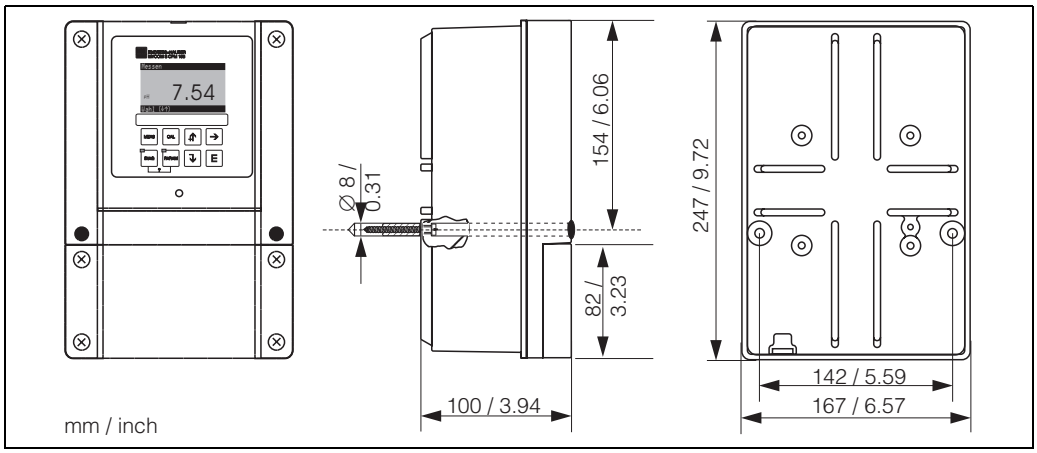


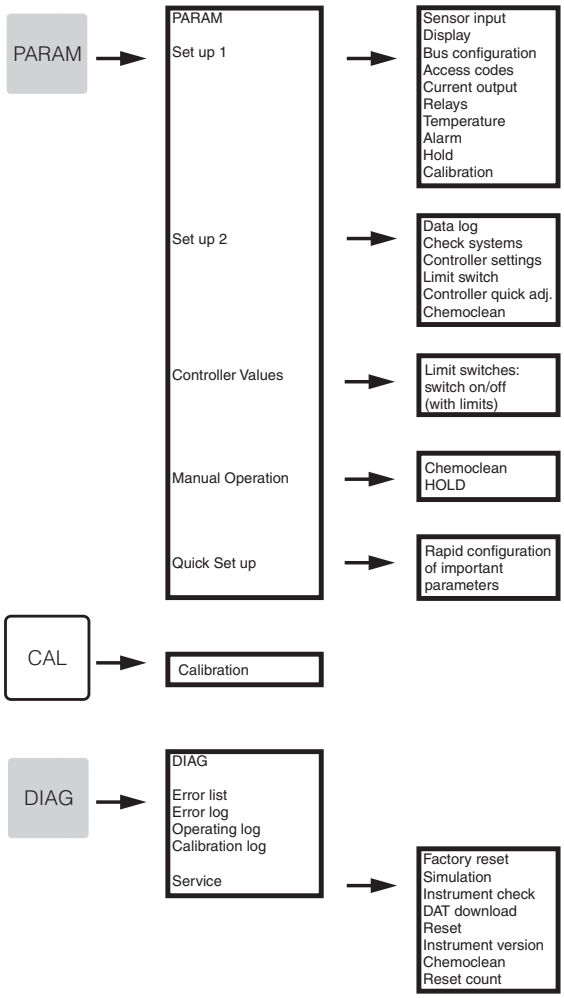
fig. 42: Transmitter dimensions

Weight	max. 6 kg / 13.2 lb.	
Material	Housing	GD-AlSi 12 (Mg content 0.05%), plastic-coated
	Front	Polyester, UV-resistant

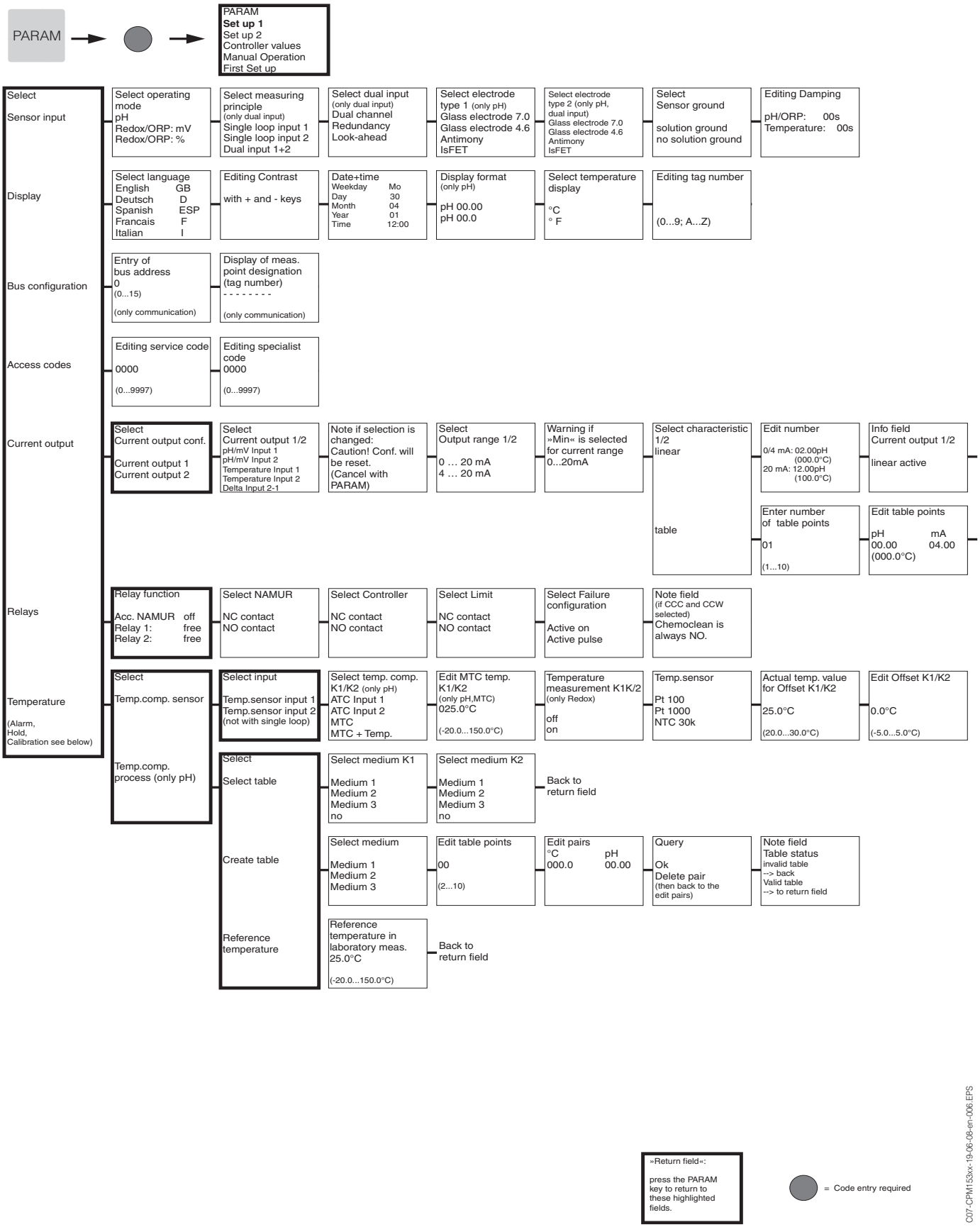
11 Appendix

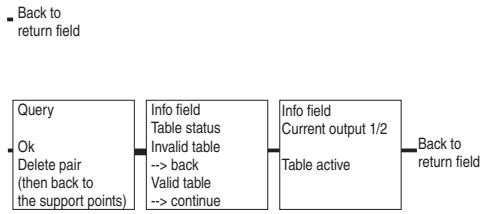
11.1 Operating matrix

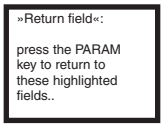
The basic structure of the operating menu is shown below.



C07-CPM153xx-19-06-08-en-005.EPS

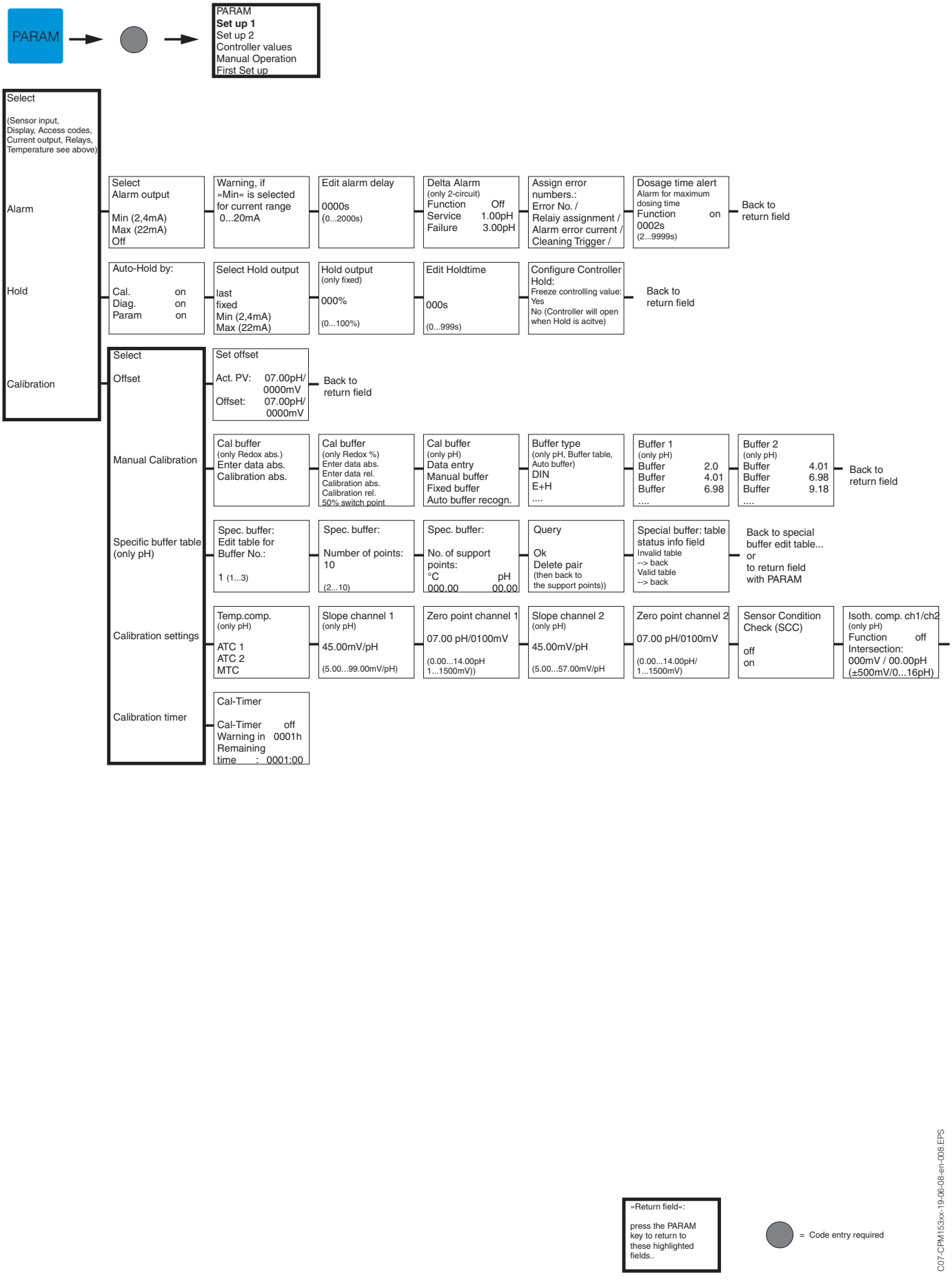

PARAM
PARAM
Set up 1
Set up 2
Controller values
Manual Operation
First Set up
Select
Sensor input
Select operating mode
pH
Redox/ORP: mV
Redox/ORP: %
Select measuring principle
(only dual input)
Single loop input 1
Single loop input 2
Dual input 1+2
Select dual input
(only dual input)
Dual channel
Redundancy
Look-ahead
Select electrode type 1 (only pH)
Glass electrode 7.0
Glass electrode 4.6
Antimony
IsFET
Select electrode type 2 (only pH, dual input)
Glass electrode 7.0
Glass electrode 4.6
Antimony
IsFET
Select
Sensor ground
solution ground
no solution ground
Editing Damping
pH/ORP: 00s
Temperature: 00s
Display
Select language
English GB
Deutsch D
Spanish ESP
Francais F
Italian I
Editing Contrast
with + and - keys
Date+time
Weekday Mo
Day 30
Month 04
Year 01
Time 12:00
Display format
(only pH)
pH 00.00
pH 00.0
Select temperature display
°C
° F
Editing tag number
(0...9; A...Z)
Bus configuration
Entry of bus address
0
(0...15)
(only communication)
Display of meas. point designation (tag number)
- - - - - - - -
(only communication)
Access codes
Editing service code
0000
(0...9997)
Editing specialist code
0000
(0...9997)
Current output
Select
Current output conf.
Current output 1
Current output 2
Select
Current output 1/2
pH/mV Input 1
pH/mV Input 2
Temperature Input 1
Temperature Input 2
Delta Input 2-1
Note if selection is changed:
Caution! Conf. will be reset.
(Cancel with PARAM)
Select
Output range 1/2
0 … 20 mA
4 … 20 mA
Warning if »Min« is selected for current range
0...20mA
Select characteristic 1/2
linear
table
Edit number
0/4 mA: 02.00pH (000.0°C)
20 mA: 12.00pH (100.0°C)
Enter number of table points
01
(1...10)
Info field
Current output 1/2
linear active
Edit table points
pH mA
00.00 04.00
(000.0°C)
Relays
Relay function
Acc. NAMUR off
Relay 1: free
Relay 2: free
Select NAMUR
NC contact
NO contact
Select Controller
NC contact
NO contact
Select Limit
NC contact
NO contact
Select Failure configuration
Active on
Active pulse
Note field
(if CCC and CCW selected)
Chemoclean is always NO.
Temperature
(Alarm, Hold, Calibration see below)
Select
Temp.comp. sensor
Temp.comp. process (only pH)
Select input
Temp.sensor input 1
Temp.sensor input 2
(not with single loop)
Select temp. comp. K1/K2 (only pH)
ATC Input 1
ATC Input 2
MTC
MTC + Temp.
Edit MTC temp. K1/K2
(only pH,MTC)
025.0°C
(-20.0...150.0°C)
Temperature measurement K1K/2
(only Redox)
off
on
Temp.sensor
Pt 100
Pt 1000
NTC 30k
Actual temp. value for Offset K1/K2
25.0°C
(20.0...30.0°C)
Edit Offset K1/K2
0.0°C
(-5.0...5.0°C)
Select
Select table
Select medium K1
Medium 1
Medium 2
Medium 3
no
Select medium K2
Medium 1
Medium 2
Medium 3
no
Back to return field
Create table
Select medium
Medium 1
Medium 2
Medium 3
Edit table points
00
(2...10)
Edit pairs
°C pH
000.0 00.00
Query
Ok
Delete pair
(then back to the edit pairs)
Note field
Table status
invalid table
--> back
Valid table
--> to return field
Reference temperature
Reference temperature in laboratory meas.
25.0°C
(-20.0...150.0°C)
Back to return field
»Return field«:
press the PARAM key to return to these highlighted fields.
= Code entry required
C07-CPM153xx-19-06-08-en-006.EPS

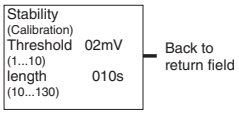


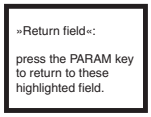


= Code entry required

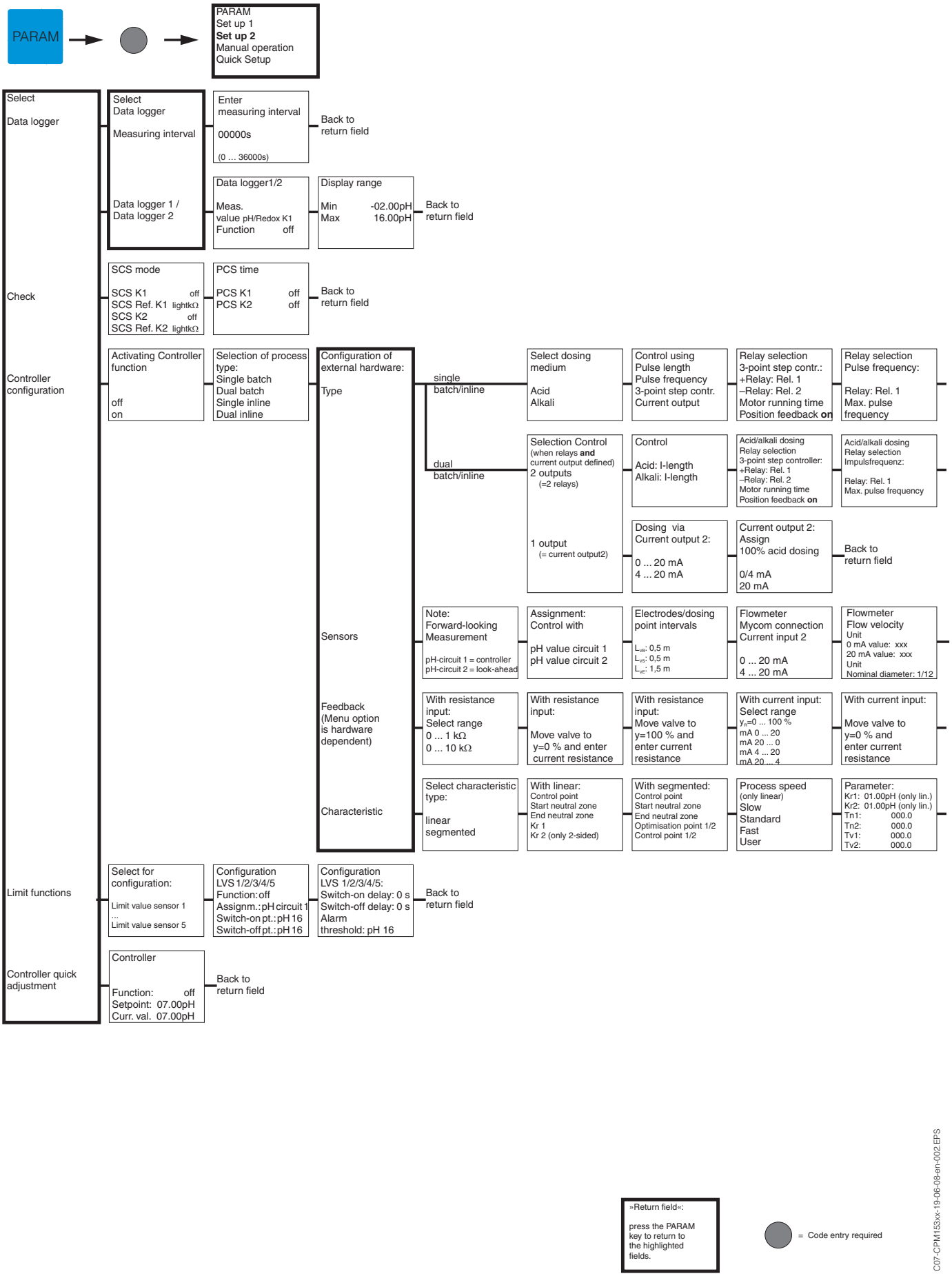
C07-CPM153xx-19-06-08-en-007.eps

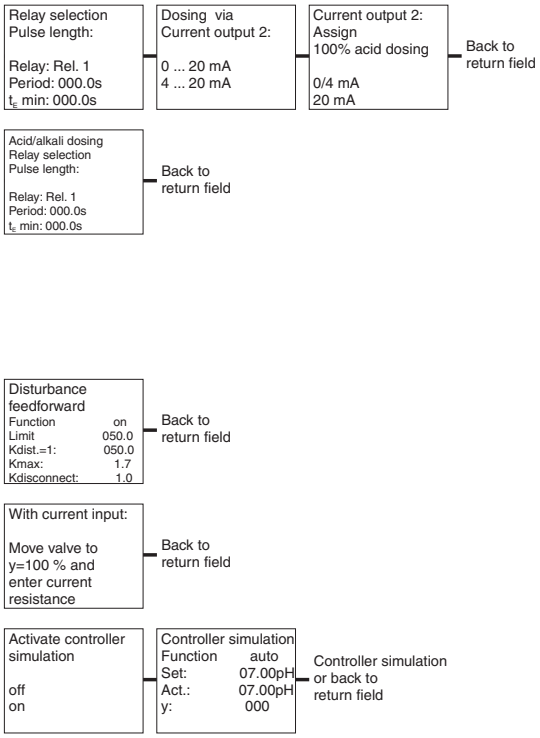

PARAM
PARAM
Set up 1
Set up 2
Controller values
Manual Operation
First Set up
Select
(Sensor input, Display, Access codes, Current output, Relays, Temperature see above)
Alarm
Select Alarm output
Min (2,4mA)
Max (22mA)
Off
Warning, if »Min« is selected for current range
0...20mA
Edit alarm delay
0000s
(0...2000s)
Delta Alarm
(only 2-circuit)
Function Off
Service 1.00pH
Failure 3.00pH
Assign error numbers.:
Error No. /
Relaiy assignment /
Alarm error current /
Cleaning Trigger /
Dosage time alert
Alarm for maximum dosing time
Function on
0002s
(2...9999s)
Back to return field
Hold
Auto-Hold by:
Cal. on
Diag. on
Param on
Select Hold output
last
fixed
Min (2,4mA)
Max (22mA)
Hold output
(only fixed)
000%
(0...100%)
Edit Holdtime
000s
(0...999s)
Configure Controller Hold:
Freeze controlling value:
Yes
No (Controller will open when Hold is acitve)
Back to return field
Calibration
Select
Offset
Set offset
Act. PV: 07.00pH/ 0000mV
Offset: 07.00pH/ 0000mV
Back to return field
Manual Calibration
Cal buffer
(only Redox abs.)
Enter data abs.
Calibration abs.
Cal buffer
(only Redox %)
Enter data abs.
Enter data rel.
Calibration abs.
Calibration rel.
50% switch point
Cal buffer
(only pH)
Data entry
Manual buffer
Fixed buffer
Auto buffer recogn.
Buffer type
(only pH, Buffer table, Auto buffer)
DIN
E+H
....
Buffer 1
(only pH)
Buffer 2.0
Buffer 4.01
Buffer 6.98
....
Buffer 2
(only pH)
Buffer 4.01
Buffer 6.98
Buffer 9.18
....
Back to return field
Specific buffer table (only pH)
Spec. buffer:
Edit table for
Buffer No.:
1 (1...3)
Spec. buffer:
Number of points:
10
(2...10)
Spec. buffer:
No. of support points:
°C pH
000.00 00.00
Query
Ok
Delete pair
(then back to the support points))
Special buffer: table status info field
Invalid table
--> back
Valid table
--> back
Back to special buffer edit table... or to return field with PARAM
Calibration settings
Temp.comp.
(only pH)
ATC 1
ATC 2
MTC
Slope channel 1
(only pH)
45.00mV/pH
(5.00...99.00mV/pH)
Zero point channel 1
07.00 pH/0100mV
(0.00...14.00pH 1...1500mV))
Slope channel 2
(only pH)
45.00mV/pH
(5.00...57.00mV/pH
Zero point channel 2
07.00 pH/0100mV
(0.00...14.00pH/ 1...1500mV)
Sensor Condition Check (SCC)
off
on
Isoth. comp. ch1/ch2
(only pH)
Function off
Intersection:
000mV / 00.00pH
(±500mV/0...16pH)
Calibration timer
Cal-Timer
Cal-Timer off
Warning in 0001h
Remaining time : 0001:00
»Return field«:
press the PARAM key to return to these highlighted fields..
= Code entry required
C07-CPM153xx-19-06-08-en-008.EPS





C07-CPM153xx-19-06-08-en-009.EPS


PARAM
PARAM
Set up 1
Set up 2
Manual operation
Quick Setup
Select
Data logger
Check
Controller configuration
Limit functions
Controller quick adjustment
Select
Data logger
Measuring interval
Data logger 1 /
Data logger 2
Enter
measuring interval
00000s
(0 … 36000s)
Back to
return field
Data logger1/2
Meas.
value pH/Redox K1
Function off
Display range
Min -02.00pH
Max 16.00pH
Back to
return field
SCS mode
SCS K1 off
SCS Ref. K1 lightkΩ
SCS K2 off
SCS Ref. K2 lightkΩ
PCS time
PCS K1 off
PCS K2 off
Back to
return field
Activating Controller function
off
on
Selection of process type:
Single batch
Dual batch
Single inline
Dual inline
Configuration of external hardware:
Type
single batch/inline
dual batch/inline
Select dosing medium
Acid
Alkali
Control using
Pulse length
Pulse frequency
3-point step contr.
Current output
Relay selection
3-point step contr.:
+Relay: Rel. 1
–Relay: Rel. 2
Motor running time
Position feedback on
Relay selection
Pulse frequency:
Relay: Rel. 1
Max. pulse frequency
Selection Control
(when relays and current output defined)
2 outputs
(=2 relays)
1 output
(= current output2)
Control
Acid: I-length
Alkali: I-length
Acid/alkali dosing
Relay selection
3-point step controller:
+Relay: Rel. 1
–Relay: Rel. 2
Motor running time
Position feedback on
Acid/alkali dosing
Relay selection
Impulsfrequenz:
Relay: Rel. 1
Max. pulse frequency
Dosing via
Current output 2:
0 ... 20 mA
4 ... 20 mA
Current output 2:
Assign
100% acid dosing
0/4 mA
20 mA
Back to
return field
Sensors
Note:
Forward-looking Measurement
pH-circuit 1 = controller
pH-circuit 2 = look-ahead
Assignment:
Control with
pH value circuit 1
pH value circuit 2
Electrodes/dosing point intervals
Flowmeter
Mycom connection
Current input 2
0 ... 20 mA
4 ... 20 mA
Flowmeter
Flow velocity
Unit
0 mA value: xxx
20 mA value: xxx
Unit
Nominal diameter: 1/12
Feedback
(Menu option is hardware dependent)
With resistance input:
Select range
0 ... 1 kΩ
0 ... 10 kΩ
With resistance input:
Move valve to y=0 % and enter current resistance
With resistance input:
Move valve to y=100 % and enter current resistance
With current input:
Select range
mA 0 ... 20
mA 20 ... 0
mA 4 ... 20
mA 20 ... 4
With current input:
Move valve to y=0 % and enter current resistance
Characteristic
Select characteristic type:
linear
segmented
With linear:
Control point
Start neutral zone
End neutral zone
Kr 1
Kr 2 (only 2-sided)
With segmented:
Control point
Start neutral zone
End neutral zone
Optimisation point 1/2
Control point 1/2
Process speed
(only linear)
Slow
Standard
Fast
User
Parameter:
Kr1: 01.00pH (only lin.)
Kr2: 01.00pH (only lin.)
Tn1: 000.0
Tn2: 000.0
Tv1: 000.0
Tv2: 000.0
Select for configuration:
Limit value sensor 1
...
Limit value sensor 5
Configuration
LVS 1/2/3/4/5
Function: off
Assignm.: pH circuit 1
Switch-on pt.: pH 16
Switch-off pt.: pH 16
Configuration
LVS 1/2/3/4/5:
Switch-on delay: 0 s
Switch-off delay: 0 s
Alarm
threshold: pH 16
Back to
return field
Controller
Function: off
Setpoint: 07.00pH
Curr. val. 07.00pH
Back to
return field
»Return field«:
press the PARAM key to return to the highlighted fields.
= Code entry required
C07-CPM153xx-19-06-08-en-002.EPS

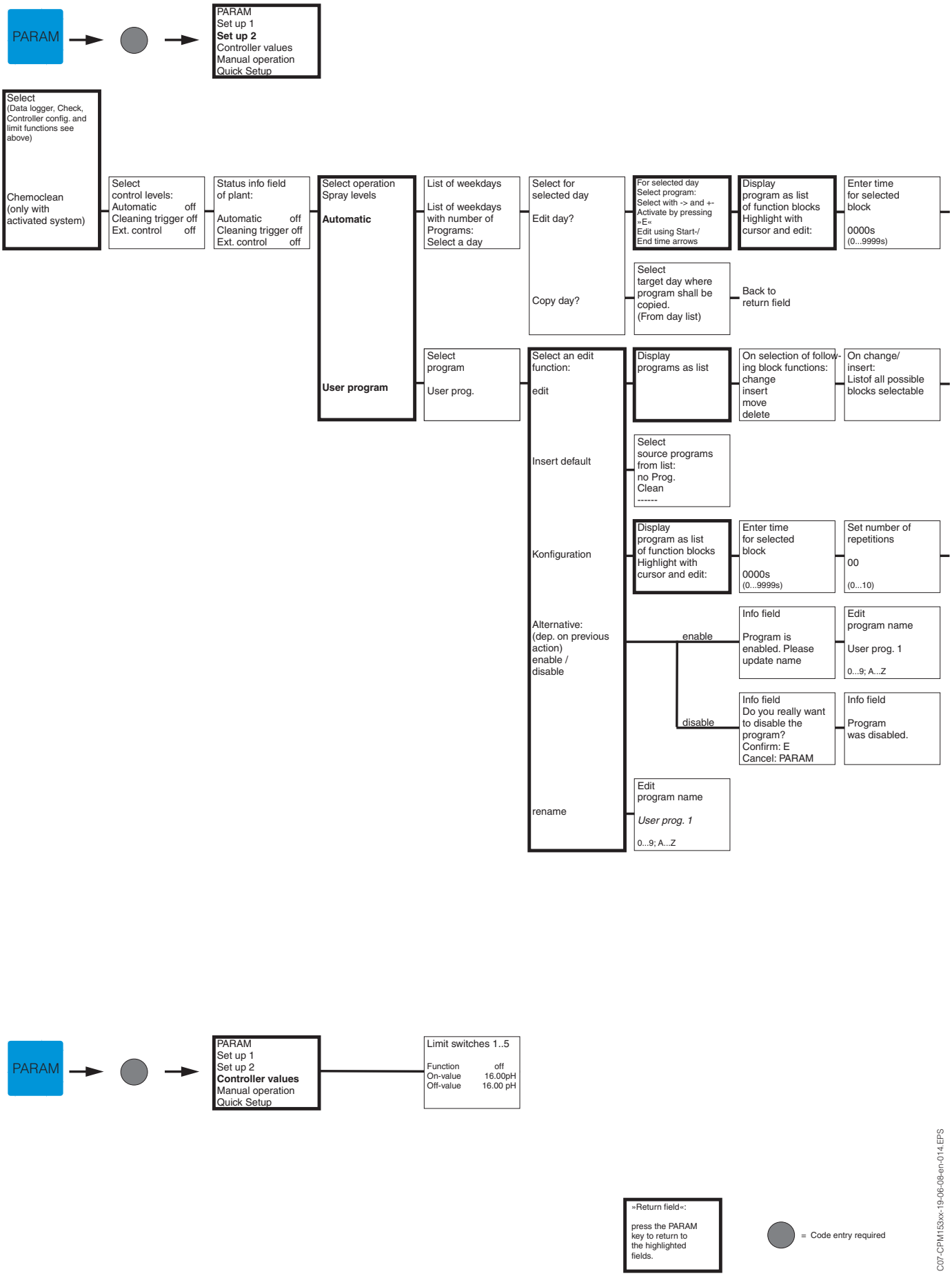


»Return field«:

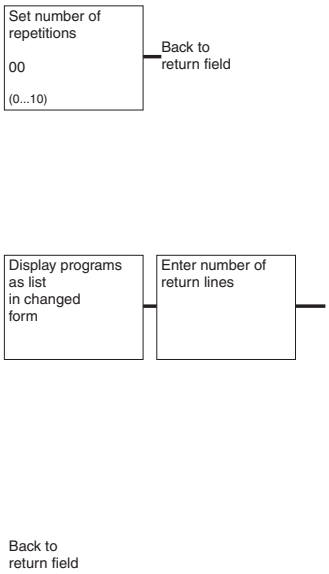
press the PARAM key to return to the highlighted fields.

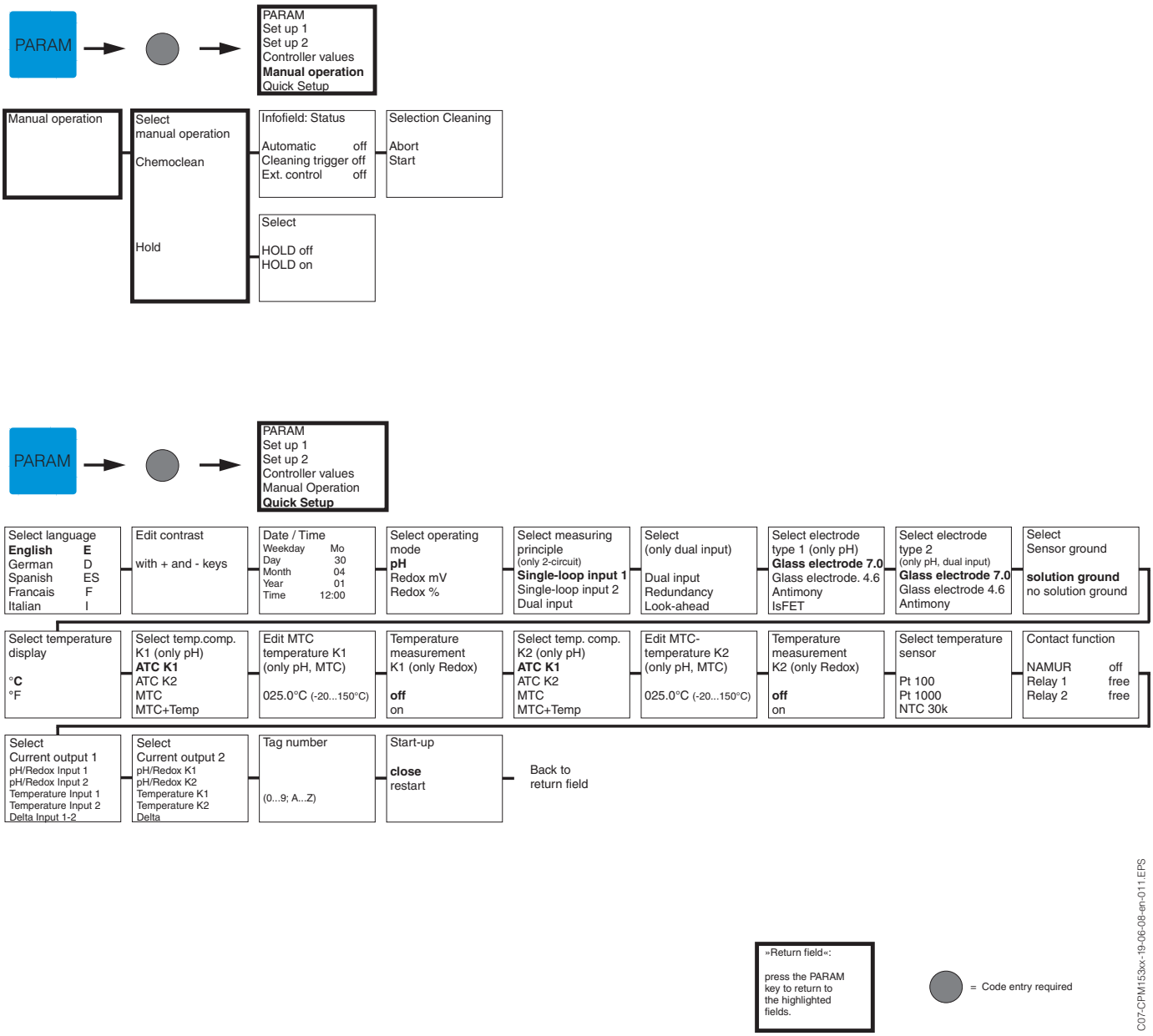
= Code entry required

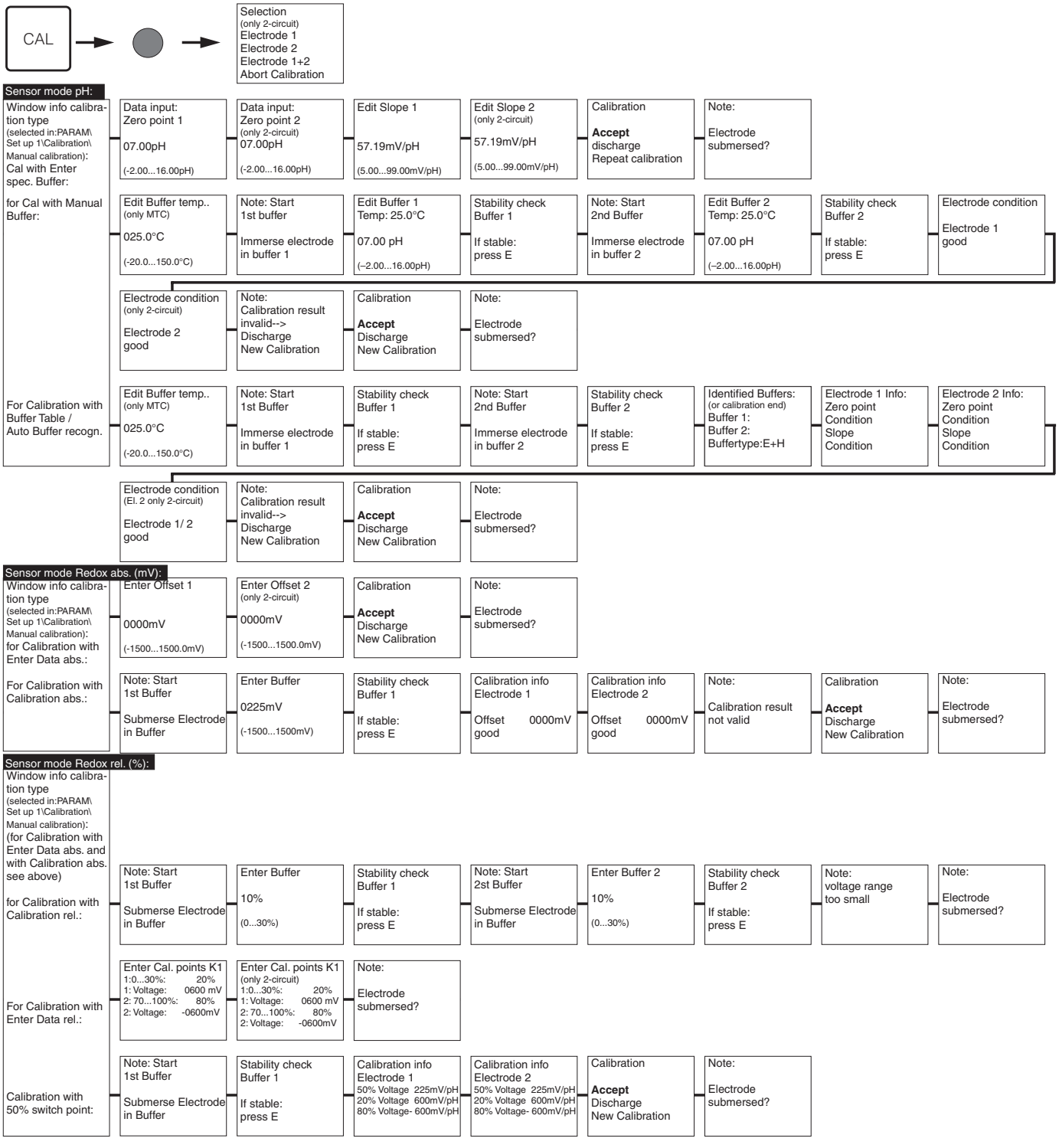
C07-CPM153xx-19-06-08-en-003.EPS

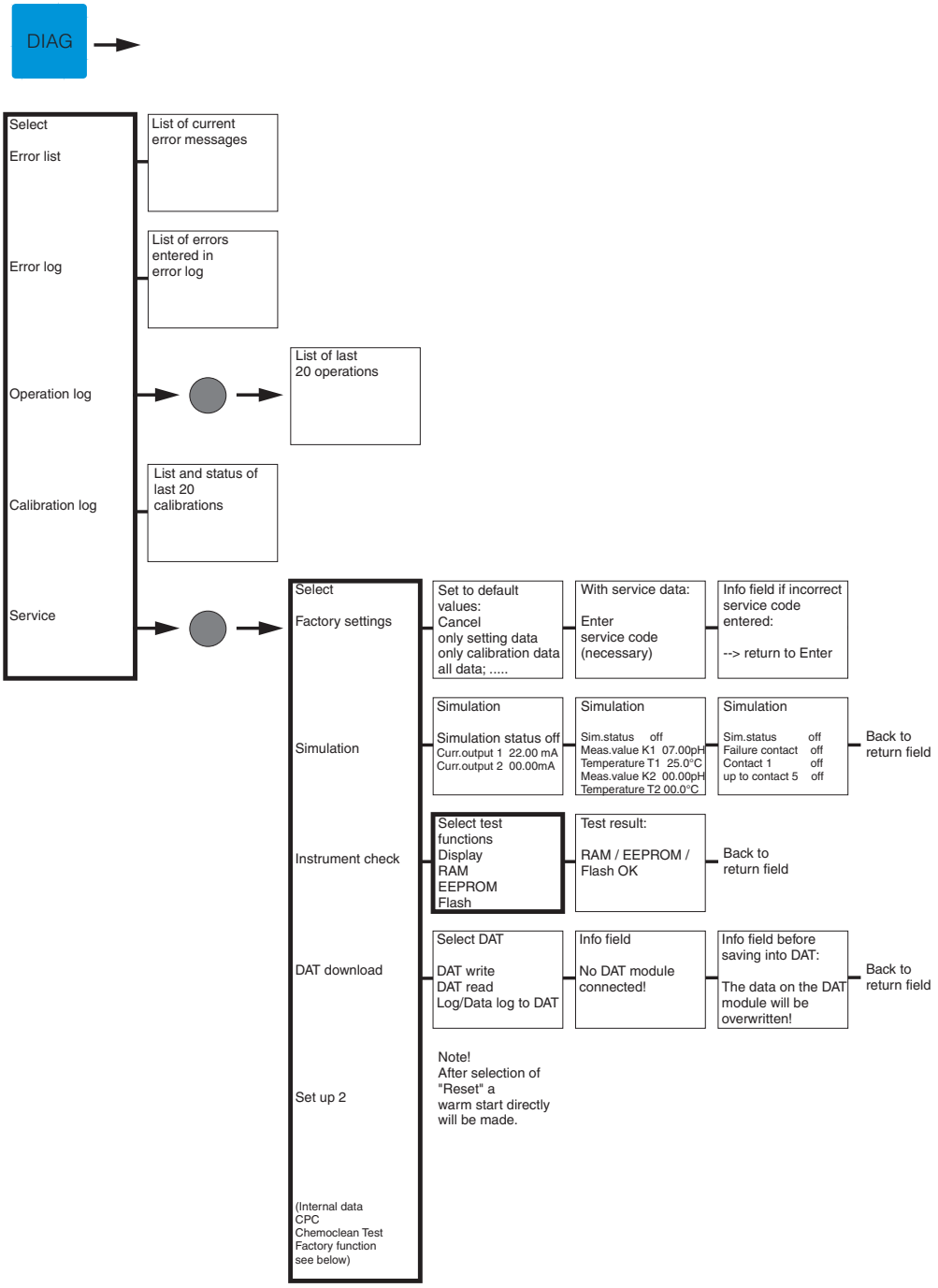

PARAM
PARAM
Set up 1
Set up 2
Controller values
Manual operation
Quick Setup
Select
(Data logger, Check, Controller config. and limit functions see above)
Chemoclean
(only with activated system)
Select
control levels:
Automatic off
Cleaning trigger off
Ext. control off
Status info field
of plant:
Automatic off
Cleaning trigger off
Ext. control off
Select operation
Spray levels
Automatic
User program
List of weekdays
List of weekdays
with number of
Programs:
Select a day
Select program
User prog.
Select for
selected day
Edit day?
Copy day?
For selected day
Select program:
Select with -> and +-
Activate by pressing
»E«
Edit using Start-/
End time arrows
Select
target day where
program shall be
copied.
(From day list)
Back to
return field
Display
program as list
of function blocks
Highlight with
cursor and edit:
Enter time
for selected
block
0000s
(0...9999s)
Select an edit
function:
edit
Insert default
Konfiguration
Alternative:
(dep. on previous
action)
enable /
disable
rename
Display
programs as list
Select
source programs
from list:
no Prog.
Clean

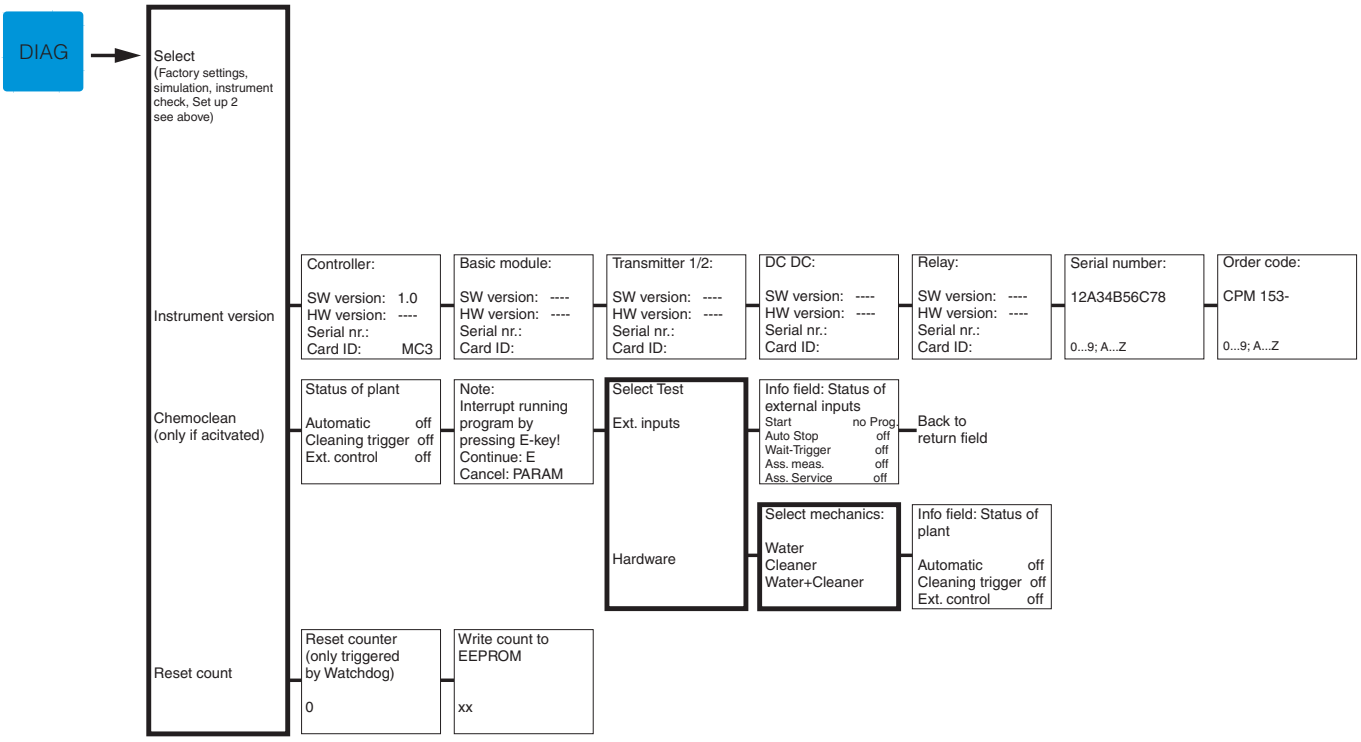
Display
program as list
of function blocks
Highlight with
cursor and edit:
On selection of follow-
ing block functions:
change
insert
move
delete
On change/
insert:
Listof all possible
blocks selectable
Enter time
for selected
block
0000s
(0...9999s)
Set number of
repetitions
00
(0...10)
enable
disable
Info field
Program is
enabled. Please
update name
Edit
program name
User prog. 1
0...9; A...Z
Info field
Do you really want
to disable the
program?
Confirm: E
Cancel: PARAM
Info field
Program
was disabled.
Edit
program name
User prog. 1
0...9; A...Z
PARAM
PARAM
Set up 1
Set up 2
Controller values
Manual operation
Quick Setup
Limit switches 1..5
Function off
On-value 16.00pH
Off-value 16.00 pH
»Return field«:
press the PARAM
key to return to
the highlighted
fields.
= Code entry required
C07-CPM153xx-19-06-08-en-014.EPS


Set number of repetitions
00
(0...10)
Back to return field
Display programs as list in changed form
Enter number of return lines
Back to return field
»Return field«:
press the PARAM key to return to the highlighted fields.
= Code entry required
C07-CPM153xx-19-06-08-en-015.EPS


PARAM
PARAM
Set up 1
Set up 2
Controller values
Manual operation
Quick Setup
Manual operation
Select
manual operation
Chemoclean
Hold
Infofield: Status
Automatic off
Cleaning trigger off
Ext. control off
Selection Cleaning
Abort
Start
Select
HOLD off
HOLD on
PARAM
PARAM
Set up 1
Set up 2
Controller values
Manual Operation
Quick Setup
Select language
English E
German D
Spanish ES
Francais F
Italian I
Edit contrast
with + and - keys
Date / Time
Weekday Mo
Day 30
Month 04
Year 01
Time 12:00
Select operating mode
pH
Redox mV
Redox %
Select measuring principle
(only 2-circuit)
Single-loop input 1
Single-loop input 2
Dual input
Select
(only dual input)
Dual input
Redundancy
Look-ahead
Select electrode type 1 (only pH)
Glass electrode 7.0
Glass electrode. 4.6
Antimony
IsFET
Select electrode type 2
(only pH, dual input)
Glass electrode 7.0
Glass electrode 4.6
Antimony
Select
Sensor ground
solution ground
no solution ground
Select temperature display
°C
°F
Select temp.comp. K1 (only pH)
ATC K1
ATC K2
MTC
MTC+Temp
Edit MTC temperature K1 (only pH, MTC)
025.0°C (-20...150°C)
Temperature measurement K1 (only Redox)
off
on
Select temp. comp. K2 (only pH)
ATC K1
ATC K2
MTC
MTC+Temp
Edit MTC-temperature K2 (only pH, MTC)
025.0°C (-20...150°C)
Temperature measurement K2 (only Redox)
off
on
Select temperature sensor
Pt 100
Pt 1000
NTC 30k
Contact function
NAMUR off
Relay 1 free
Relay 2 free
Select
Current output 1
pH/Redox Input 1
pH/Redox Input 2
Temperature Input 1
Temperature Input 2
Delta Input 1-2
Select
Current output 2
pH/Redox K1
pH/Redox K2
Temperature K1
Temperature K2
Delta
Tag number
(0...9; A...Z)
Start-up
close
restart
Back to return field
»Return field«:
press the PARAM key to return to the highlighted fields.
= Code entry required
C07-CPM153xx-19-06-08-en-011.EPS


CAL
Selection
(only 2-circuit)
Electrode 1
Electrode 2
Electrode 1+2
Abort Calibration
Sensor mode pH:
Window info calibration type (selected in:PARAM\ Set up 1\Calibration\ Manual calibration):
Cal with Enter spec. Buffer:
Data input: Zero point 1
07.00pH
(-2.00...16.00pH)
Data input: Zero point 2
(only 2-circuit)
07.00pH
(-2.00...16.00pH)
Edit Slope 1
57.19mV/pH
(5.00...99.00mV/pH)
Edit Slope 2
(only 2-circuit)
57.19mV/pH
(5.00...99.00mV/pH)
Calibration
Accept
discharge
Repeat calibration
Note:
Electrode submersed?
for Cal with Manual Buffer:
Edit Buffer temp..
(only MTC)
025.0°C
(-20.0...150.0°C)
Note: Start 1st buffer
Immerse electrode in buffer 1
Edit Buffer 1 Temp: 25.0°C
07.00 pH
(–2.00...16.00pH)
Stability check Buffer 1
If stable: press E
Note: Start 2nd Buffer
Immerse electrode in buffer 2
Edit Buffer 2 Temp: 25.0°C
07.00 pH
(–2.00...16.00pH)
Stability check Buffer 2
If stable: press E
Electrode condition
Electrode 1 good
Electrode condition
(only 2-circuit)
Electrode 2 good
Note: Calibration result invalid--> Discharge New Calibration
Calibration
Accept
Discharge
New Calibration
Note:
Electrode submersed?
For Calibration with Buffer Table / Auto Buffer recogn.
Edit Buffer temp..
(only MTC)
025.0°C
(-20.0...150.0°C)
Note: Start 1st Buffer
Immerse electrode in buffer 1
Stability check Buffer 1
If stable: press E
Note: Start 2nd Buffer
Immerse electrode in buffer 2
Stability check Buffer 2
If stable: press E
Identified Buffers:
(or calibration end)
Buffer 1:
Buffer 2:
Buffertype:E+H
Electrode 1 Info:
Zero point
Condition
Slope
Condition
Electrode 2 Info:
Zero point
Condition
Slope
Condition
Electrode condition
(El. 2 only 2-circuit)
Electrode 1/ 2 good
Note: Calibration result invalid--> Discharge New Calibration
Calibration
Accept
Discharge
New Calibration
Note:
Electrode submersed?
Sensor mode Redox abs. (mV):
Window info calibration type (selected in:PARAM\ Set up 1\Calibration\ Manual calibration):
for Calibration with Enter Data abs.:
Enter Offset 1
0000mV
(-1500...1500.0mV)
Enter Offset 2
(only 2-circuit)
0000mV
(-1500...1500.0mV)
Calibration
Accept
Discharge
New Calibration
Note:
Electrode submersed?
For Calibration with Calibration abs.:
Note: Start 1st Buffer
Submerse Electrode in Buffer
Enter Buffer
0225mV
(-1500...1500mV)
Stability check Buffer 1
If stable: press E
Calibration info Electrode 1
Offset 0000mV
good
Calibration info Electrode 2
Offset 0000mV
good
Note:
Calibration result not valid
Calibration
Accept
Discharge
New Calibration
Note:
Electrode submersed?
Sensor mode Redox rel. (%):
Window info calibration type (selected in:PARAM\ Set up 1\Calibration\ Manual calibration):
(for Calibration with Enter Data abs. and with Calibration abs. see above)
for Calibration with Calibration rel.:
Note: Start 1st Buffer
Submerse Electrode in Buffer
Enter Buffer
10%
(0...30%)
Stability check Buffer 1
If stable: press E
Note: Start 2st Buffer
Submerse Electrode in Buffer
Enter Buffer 2
10%
(0...30%)
Stability check Buffer 2
If stable: press E
Note:
voltage range too small
Note:
Electrode submersed?
For Calibration with Enter Data rel.:
Enter Cal. points K1
1:0...30%: 20%
1: Voltage: 0600 mV
2: 70...100%: 80%
2: Voltage: -0600mV
Enter Cal. points K1
(only 2-circuit)
1:0...30%: 20%
1: Voltage: 0600 mV
2: 70...100%: 80%
2: Voltage: -0600mV
Note:
Electrode submersed?
Calibration with 50% switch point:
Note: Start 1st Buffer
Submerse Electrode in Buffer
Stability check Buffer 1
If stable: press E
Calibration info Electrode 1
50% Voltage 225mV/pH
20% Voltage 600mV/pH
80% Voltage- 600mV/pH
Calibration info Electrode 2
50% Voltage 225mV/pH
20% Voltage 600mV/pH
80% Voltage- 600mV/pH
Calibration
Accept
Discharge
New Calibration
Note:
Electrode submersed?
If you press the MEAS key, a message will appear asking if you want to abort the calibration.
= Code entry required
C07-CPM153xx-19-06-08-en-010.EPS


DIAG
Select
Error list
List of current error messages
Error log
List of errors entered in error log
Operation log
List of last 20 operations
Calibration log
List and status of last 20 calibrations
Service
Select
Factory settings
Set to default values:
Cancel
only setting data
only calibration data
all data; .....
With service data:
Enter service code (necessary)
Info field if incorrect service code entered:
--> return to Enter
Simulation
Simulation
Simulation status off
Curr.output 1 22.00 mA
Curr.output 2 00.00mA
Simulation
Sim.status off
Meas.value K1 07.00pH
Temperature T1 25.0°C
Meas.value K2 00.00pH
Temperature T2 00.0°C
Simulation
Sim.status off
Failure contact off
Contact 1 off
up to contact 5 off
Back to return field
Instrument check
Select test functions
Display
RAM
EEPROM
Flash
Test result:
RAM / EEPROM / Flash OK
Back to return field
DAT download
Select DAT
DAT write
DAT read
Log/Data log to DAT
Info field
No DAT module connected!
Info field before saving into DAT:
The data on the DAT module will be overwritten!
Back to return field
Set up 2
Note!
After selection of "Reset" a warm start directly will be made.
(Internal data
CPC
Chemoclean Test
Factory function
see below)
»Return field«:
press the PARAM key to return to the highlighted fields.
= Code entry required
C07-CPM153xx-19-06-08-en-012.EPS


DIAG
Select
(Factory settings, simulation, instrument check, Set up 2 see above)
Instrument version
Controller:
SW version: 1.0
HW version: ----
Serial nr.:
Card ID: MC3
Basic module:
SW version: ----
HW version: ----
Serial nr.:
Card ID:
Transmitter 1/2:
SW version: ----
HW version: ----
Serial nr.:
Card ID:
DC DC:
SW version: ----
HW version: ----
Serial nr.:
Card ID:
Relay:
SW version: ----
HW version: ----
Serial nr.:
Card ID:
Serial number:
12A34B56C78
0...9; A...Z
Order code:
CPM 153-
0...9; A...Z
Chemoclean (only if acitvated)
Status of plant
Automatic off
Cleaning trigger off
Ext. control off
Note:
Interrupt running program by pressing E-key!
Continue: E
Cancel: PARAM
Select Test
Ext. inputs
Hardware
Info field: Status of external inputs
Start no Prog.
Auto Stop off
Wait-Trigger off
Ass. meas. off
Ass. Service off
Back to return field
Select mechanics:
Water
Cleaner
Water+Cleaner
Info field: Status of plant
Automatic off
Cleaning trigger off
Ext. control off
Reset count
Reset counter (only triggered by Watchdog)
0
Write count to EEPROM
xx
»Return field«:
press the PARAM key to return to the highlighted fields.
= Code entry required
C07-CPM153xx-19-06-08-en-013.EPS

11.2 Wiring examples

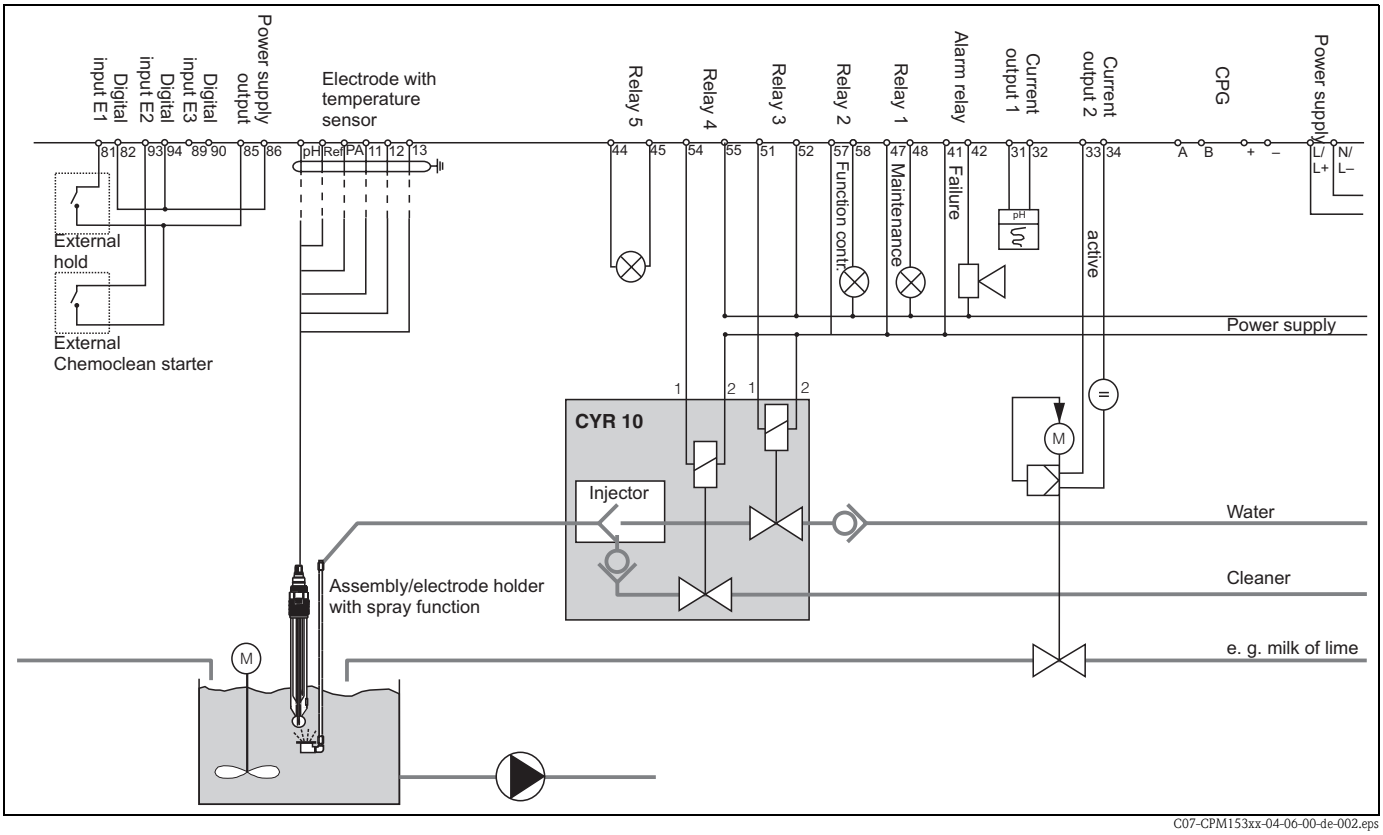


fig. 43: Non-Ex: One-circuit device, NAMUR, Chemoclean with injector CYR10 and assembly with spray head, one-sided neutralisation, temperature limit value, pH current output

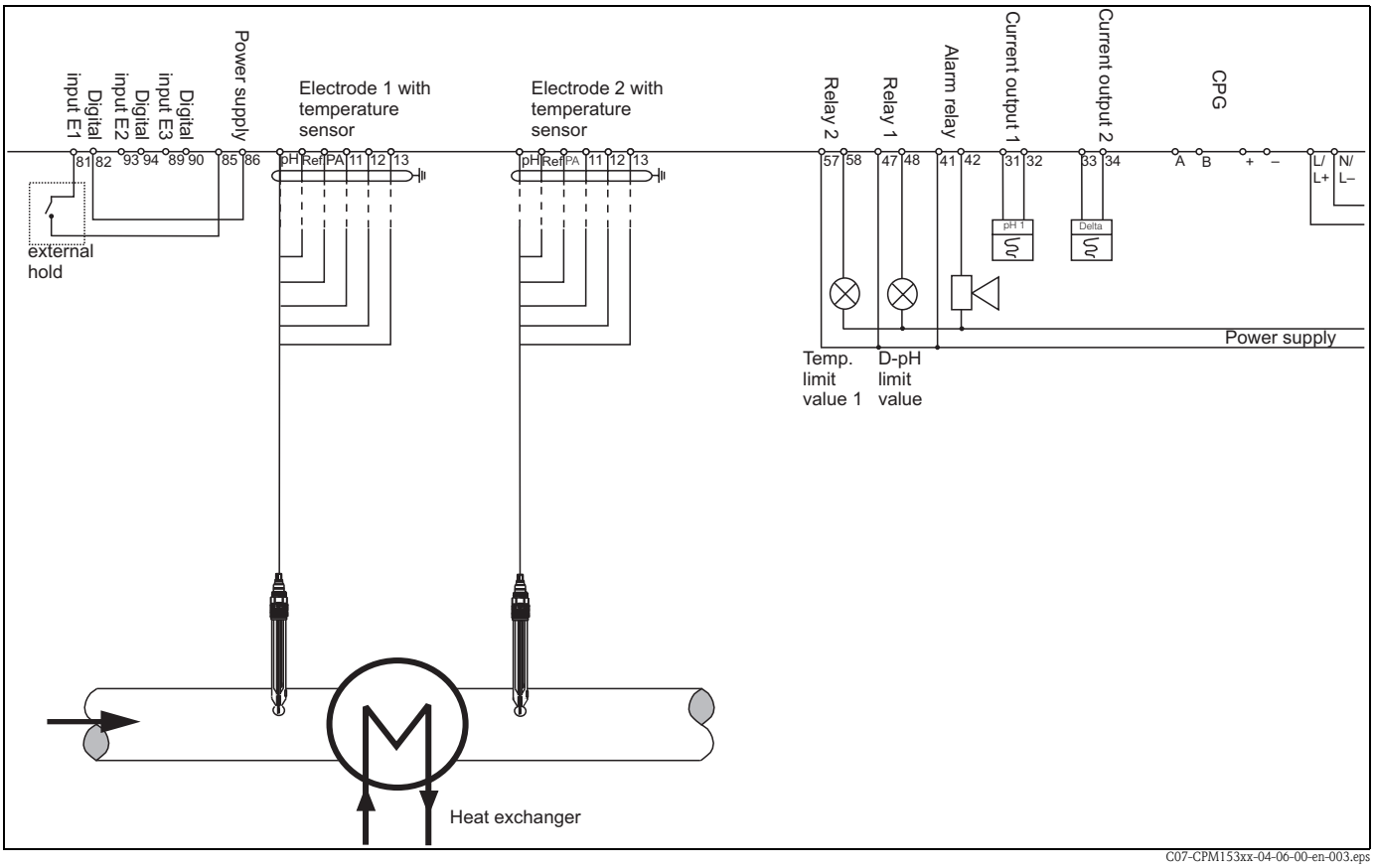


fig. 44: Non-Ex: Two-circuit difference measurement, pH and delta pH on current outputs, limit values for delta pH, temperature circuit 1

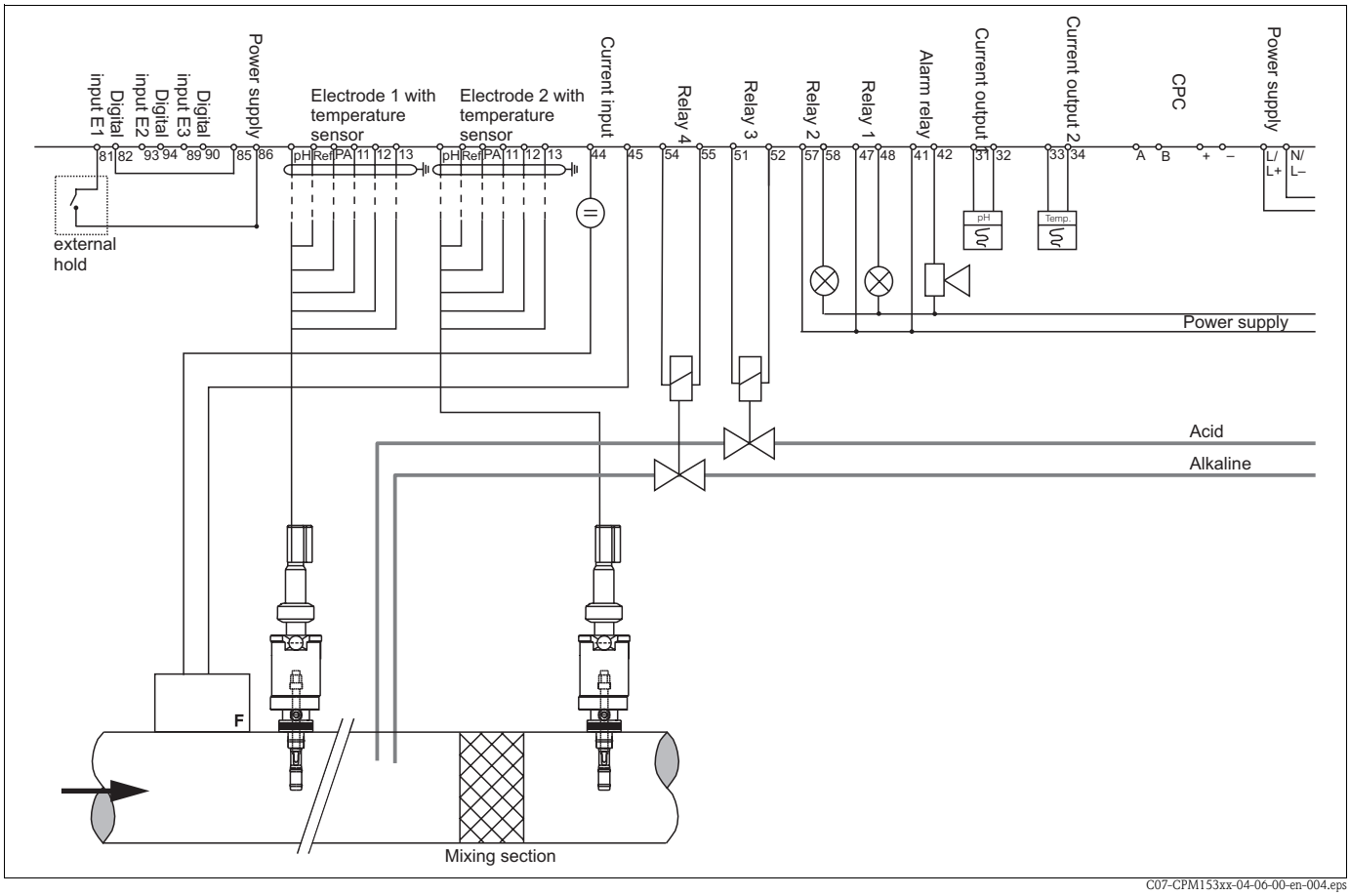


fig. 45: Non-Ex: Two-circuit device, two-sided in-line neutralisation controller, predictive, two current outputs (temperature, pH)

11.3 Buffer tables

The following buffer tables are stored in the Mycom S CPM153.

DIN 19267

°C	0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95
pH	1,08	1,08	1,09	1,09	1,09	1,09	1,10	1,10	1,10	1,10	1,11	1,11	1,11	1,11	1,11	1,11	1,12	1,12	1,13	1,13
	4,67	4,67	4,66	4,66	4,65	4,65	4,65	4,65	4,66	4,67	4,68	4,69	4,70	4,71	4,72	4,73	4,75	4,77	4,79	4,82
	6,89	6,87	6,84	6,82	6,80	6,79	6,78	6,77	6,76	6,76	6,76	6,76	6,76	6,76	6,76	6,77	6,78	6,79	6,80	6,81
	9,48	9,43	9,37	9,32	9,27	9,23	9,18	9,13	9,09	9,04	9,00	8,96	8,92	8,90	8,88	8,86	8,85	8,83	8,82	8,81
	13,95	13,63	13,37	13,16	12,96	12,75	12,61	12,45	12,29	12,09	11,98	11,79	11,69	11,56	11,43	11,31	11,19	11,09	10,99	10,89

Mettler

°C	0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95
pH	2,03	2,02	2,01	2,00	2,00	2,00	1,99	1,99	1,98	1,98	1,98	1,98	1,98	1,99	1,99	2,00	2,00	2,00	2,00	2,00
	4,01	4,01	4,00	4,00	4,00	4,01	4,01	4,02	4,03	4,04	4,06	4,08	4,10	4,13	4,16	4,19	4,22	4,26	4,30	4,35
	7,12	7,09	7,06	7,04	7,02	7,00	6,99	6,98	6,97	6,97	6,97	6,98	6,98	6,99	7,00	7,02	7,04	7,06	7,09	7,12
	9,52	9,45	9,38	9,32	9,26	9,21	9,16	9,11	9,06	9,03	8,99	8,96	8,93	8,90	8,88	8,85	8,83	8,81	8,79	8,77

E+H

°C	0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95
pH	2,01	2,01	2,01	2,00	2,00	2,00	2,00	2,00	2,00	2,00	2,00	2,00	2,00	2,00	2,01	2,01	2,01	2,01	2,01	2,01
	4,05	4,04	4,02	4,01	4,00	4,01	4,01	4,01	4,01	4,01	4,00	4,00	4,00	4,00	4,00	4,00	4,00	4,00	4,00	4,00
	7,13	7,07	7,05	7,02	7,00	6,98	6,98	6,96	6,95	6,95	6,95	6,95	6,96	6,96	6,96	6,96	6,97	6,98	7,00	7,02
	9,46	9,40	9,33	9,28	9,22	9,18	9,14	9,10	9,07	9,04	9,01	8,99	8,96	8,95	8,93	8,91	8,89	8,87	8,85	8,83
	11,45	11,32	11,20	11,10	11,00	10,90	10,81	10,72	10,64	10,56	10,48	10,35	10,23	10,21	10,19	10,12	10,06	10,00	9,93	9,86

NBS/DIN 19266

°C	0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95
pH	1,67	1,67	1,67	1,67	1,68	1,68	1,69	1,69	1,70	1,70	1,71	1,72	1,73	1,74	1,74	1,76	1,77	1,79	1,80	1,81
	4,01	4,01	4,00	4,00	4,00	4,01	4,01	4,02	4,03	4,04	4,06	4,08	4,10	4,11	4,12	4,14	4,16	4,18	4,20	4,23
	6,98	6,95	6,92	6,90	6,88	6,86	6,85	6,84	6,84	6,83	6,83	6,84	6,84	6,85	6,85	6,86	6,86	6,87	6,88	6,89
	9,46	9,39	9,33	9,27	9,22	9,18	9,14	9,10	9,07	9,04	9,01	8,99	8,96	8,94	8,93	8,91	8,89	8,87	8,85	8,83

Merck + Riedel

°C	0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95
pH	2,01	2,01	2,01	2,00	2,00	2,00	2,00	2,00	2,00	2,00	2,00	2,00	2,00	2,00	2,01	2,01	2,01	2,01	2,01	2,01
	4,05	4,04	4,02	4,01	4,00	4,01	4,01	4,01	4,01	4,01	4,00	4,00	4,00	4,00	4,00	4,00	4,00	4,00	4,00	4,00
	7,13	7,07	7,05	7,02	7,00	6,98	6,98	6,96	6,95	6,95	6,95	6,95	6,96	6,96	6,96	6,96	6,97	6,98	7,00	7,02
	9,24	9,16	9,11	9,05	9,00	8,95	8,91	8,88	8,85	8,82	8,79	8,76	8,73	8,72	8,70	8,68	8,66	8,65	8,64	8,64
	12,58	12,41	12,26	12,10	12,00	11,88	11,72	11,67	11,54	11,44	11,33	11,19	11,04	10,97	10,90	10,80	10,70	10,59	10,48	10.37

Index

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Declaration of contamination

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

Type of device / sensor:		Serial no.:			
Medium / concentration:		Temperature:		Pressure:	
Cleaned with:		Conductivity:		Viscosity:	

Warning hints for medium used (mark the appropriate hints)

☐	☐	☐	☐	☐	☐	☐	☐
radioactive	explosive	caustic	poisonous	harmful to health	biologically hazardous	inflammable	safe

Reason for return

Company data

Company:		Contact person:	
		Department:	
Address:		Phone:	
		Fax / e-mail:	
		Your order no.:	

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

(Place, date)

(Company stamp and legally binding signature)

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