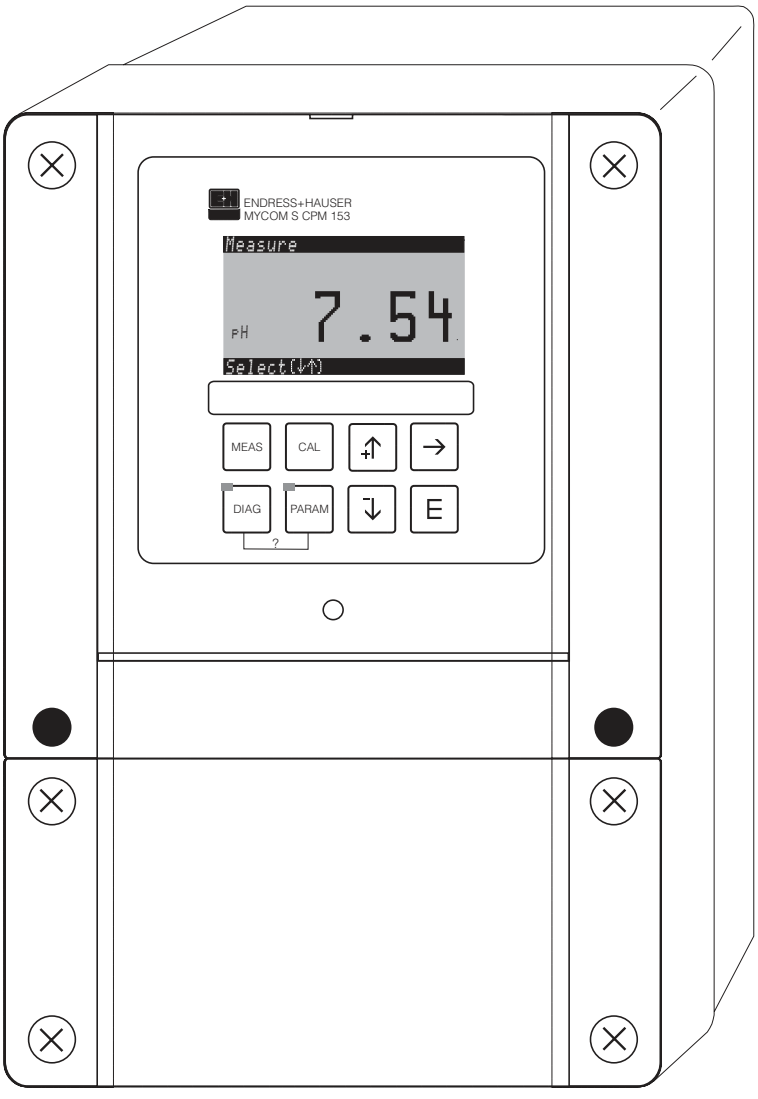
BA 233C/07/en/12.02
51513612
Software version 1.20 or later

Mycom S
CPM 153
pH and Redox Transmitter

Operating Instructions



Quality made by
Endress+Hauser

ISO 9001

Endress+Hauser
The Power of Know How

First Start-up ..... page 25

Using the menu "Quick Setup" in the chapter "First Start-up" you can configure the transmitter with the most important parameters quickly and easily. Important basic functions like language, measuring parameter, temperature compensation and current outputs are configured with the help of the on-site display.
You carry out further configuration in the corresponding menus as required.

Brief operating instructions



"PARAM": Parameter entry menu

"PARAM" allows you to return to the previous "return field" from any point in the menu.



"DIAG": brings you to the instrument diagnosis menu.



Help page: Press "DIAG" and "PARAM" together



"MEAS": Operation

Press "MEAS" to exit any of the menus ("PARAM", "DIAG", "CAL") without having complete the settings / calibration.



"CAL": Calibration



"E": (Enter): Continue in menu / confirm your selection

LED: "green" = everything OK. "red" = error.



Arrow keys:
- Scroll through menu options and highlight a selection or
- increment/decrement numbers by one step with "+" / "-".
  Next digit: using the "right arrow" (editor type 1) or
- "Activate" with the "right arrow" and scroll through the selection with "+" / "-"
  (editor type 2).

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1 Safety instructions

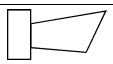
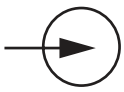
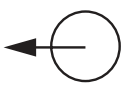
1.1 Safety symbols

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.
	**Double insulation** The equipment is protected with double insulation.
	**Alarm relay**
	**Input**
	**Output**

1.2 Designated use

The transmitter Mycom S CPM 153 is a measuring instrument for measurement pH value or redox potential. The transmitter is designed for measuring or control tasks in applications in the following industries:

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

The Ex version of the Mycom S CPM 153 allows operation even in hazardous areas (refer to "Approvals" in the product structure on page 7).

The manufacturer is not liable for damage caused by improper use or use other than that for which it is intended.

1.3 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 repairing of electrical instruments.

1.4 Operational safety

⚠ Warning!
If the device is used for any application other than those described in these Operating Instructions, it may lead to unsafe and improper functioning of the measuring system and is therefore not permitted.

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".

However, always pay attention to the following points:
- Measuring systems used in Ex areas have a separate document (XA 236C/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 (Ⓔx Europe, FM USA, Ⓒ 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 E+H sales centre.

1.4.1 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 the following design measures:

- cable screening
- interference suppression filter
- interference suppression capacitors

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

1.5 Return

If the transmitter has to be repaired, please return it *cleaned* to the E+H sales centre responsible. You can find the address on the last page of these instructions. For returns please use the original packaging.
With the instrument, please enclose a completed copy of the "Declaration of Contamination" form. You can find this at the end of these Operating Instructions.

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, logbooks, data logger. Plain text operation. 247x167x111 mm (HxWxD). Degree of 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	

	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 contact1, 2 passive current inputs (Ex and non-Ex)	
5	1 extra contact, 1 passive current input, 1 active resistance input (only 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	
CPM 153-		Complete order code

2.1.2 Nameplate

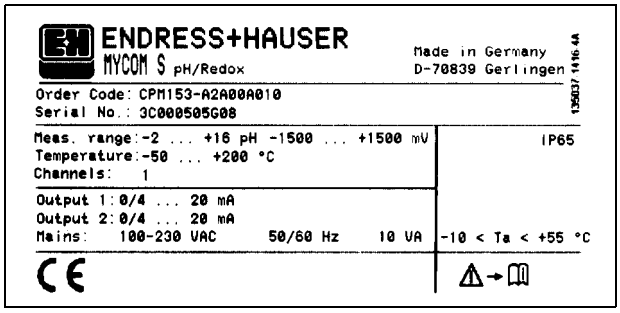


Fig. 1: Example for a nameplate of the transmitter Mycom S CPM 153.

2.2 Scope of delivery

Check the scope of delivery using your order and the delivery documents for:
- Completeness
- Instrument type and version acc. to the nameplate (see Chap. 2.1.2)
- Accessories (see Chap. 9)
- Operating Instructions BA 233C/07/en (for Ex-system also the XA 233C/07/a3)
- Instrument identification card

2.3 Certificates and approvals

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

3 Installation

3.1 Incoming acceptance, transport, storage

- Make sure the contents are undamaged! If any damage is found, inform your postal service, freight handler or forwarding agent. Keep any damaged goods until matters have been clarified.
  Check that the scope of delivery is complete.
- For storage and transport purposes, pack the instrument so that it is protected against impacts and humidity. 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 nearest Endress+Hauser sales centre (see the back page of these Operating Instructions).

3.2 Installation conditions

3.2.1 Installation dimensions

You can find the dimensions and length of the transmitter in the "Technical data" on page 110 ff.

3.3 Installation

3.3.1 Installation instructions

- The *standard* installation method for the CPM 153 transmitter is as a field instrument.
- The CPM 153 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 also require the weather protection cover CYY 101. This cover is compatible with all field instrument installations 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). Install the instrument in a shady location. Avoid direct sunlight.
- Mount the wall mounting housing so that the cable entries always point downwards.

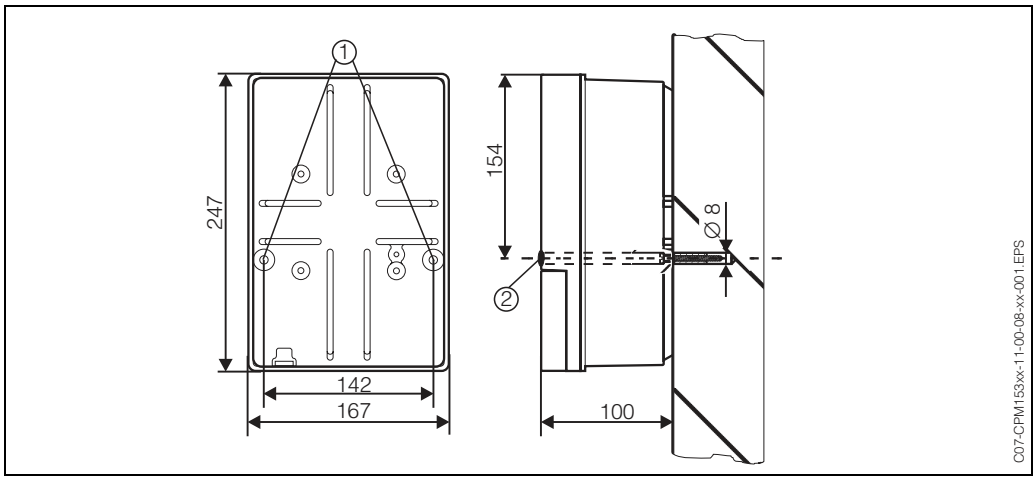


Fig. 2: Dimensions for wall mounting: Fixing screw: ø 6 mm
Wall plug: ø 8 mm
1: Fixing drill holes
2: Plastic cover cap

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 (M6): max. Ø 6.5 mm
   – Screw head: max. Ø 10.5 mm
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

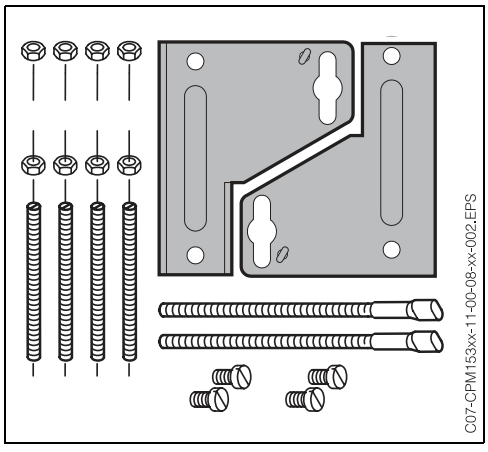


Fig. 3: Mounting kit Mycom S CPM 153

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
Installation depth: 134 mm
Pipe diameter: max. 70 mm

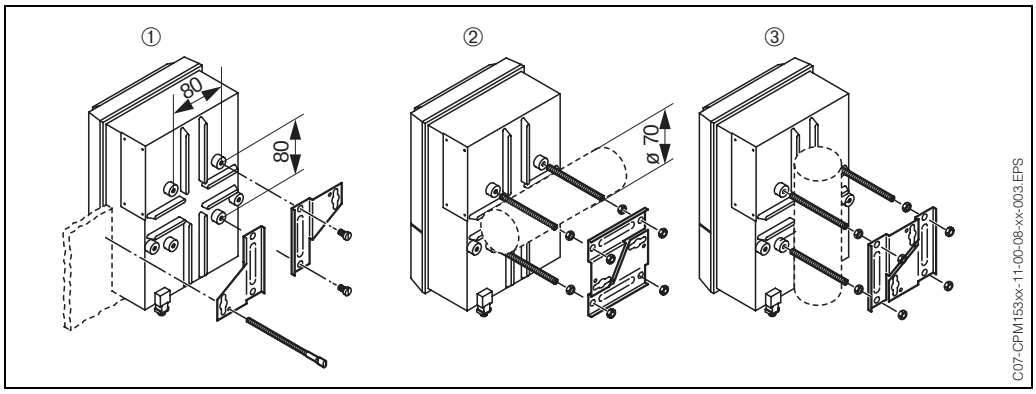


Fig. 4: Panel mounting ① and post mounting for CPM 153, horizontal ② and vertikal ③

Caution!
Danger of instrument damage.
For outdoor use, the CYY 101 weather protection cover is required (see Fig. 5 and "Accessories").

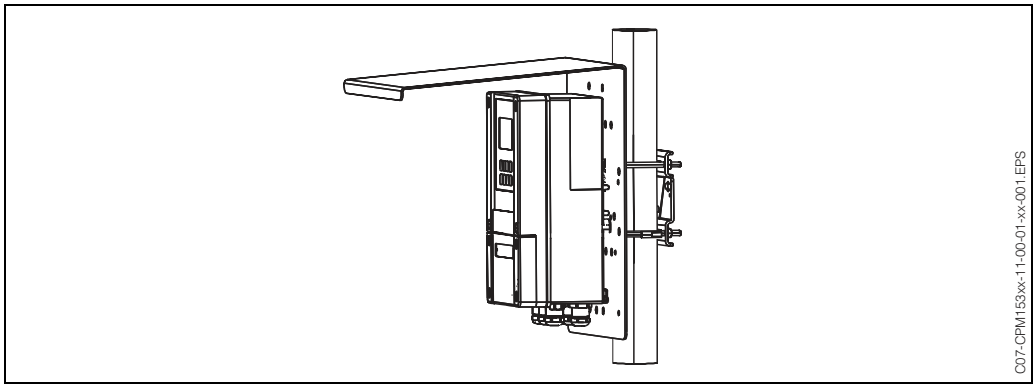


Fig. 5: Post mounting of the transmitter CPM 153 with weather protection cover CYY 101.

3.4 Checking the installation

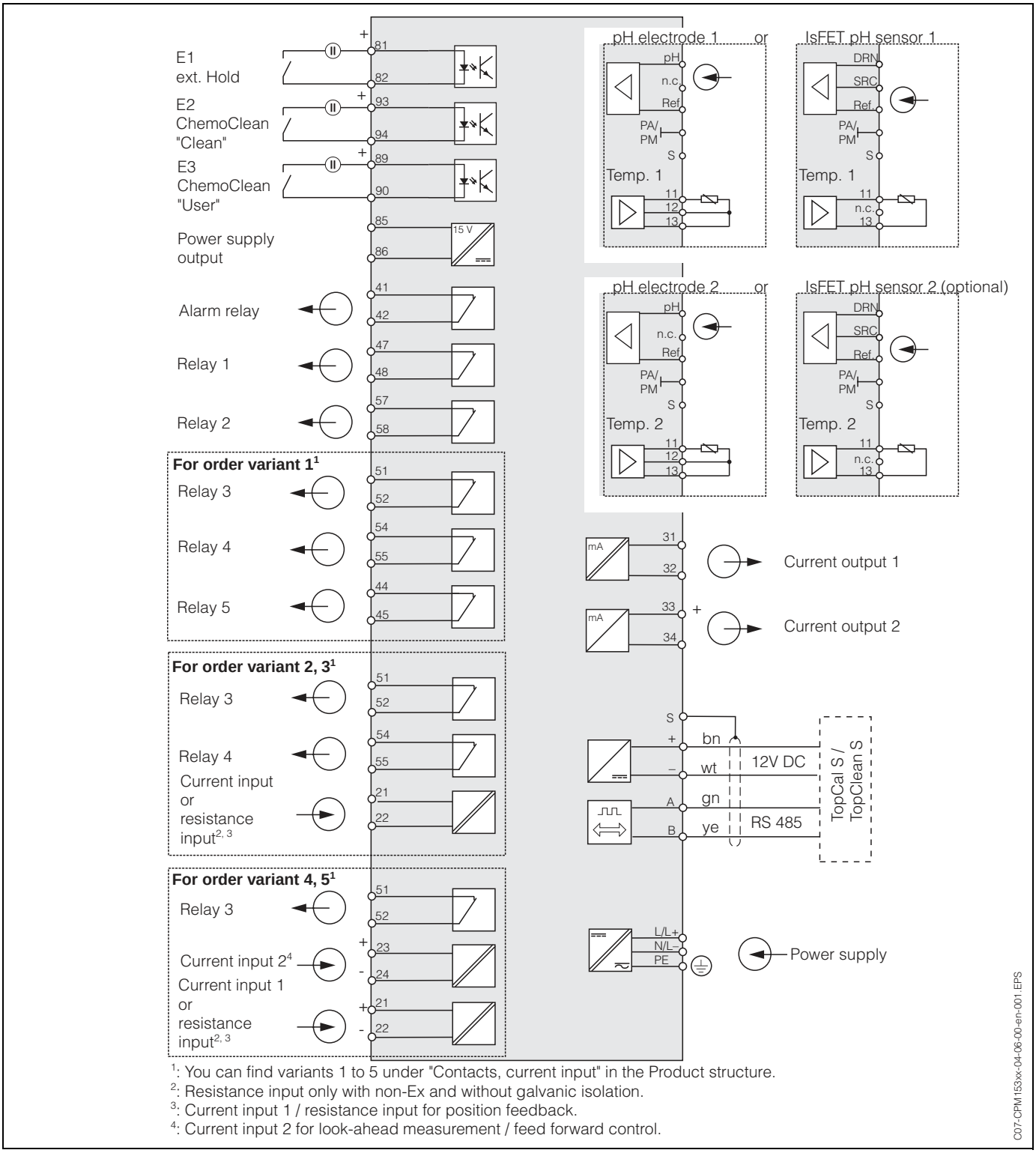
After installing the transmitter, carry out the following checks:

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 CYY 101 is required (see "Accessories").

4 Electrical connection

4.1 Quick wiring guide

4.1.1 Wiring diagram



[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. 6: Electrical connection for CPM 153

Warning!
A mains disconnecting device must be installed near the instrument and must be identified as the mains disconnection device for the Mycom S CPM 153 (see EN 61010-1).

Note!
Connect unused signal wires from input and output lines to the internal PE rail of the CPM 153.

4.1.2 Connection sticker

Connections in the connection compartment

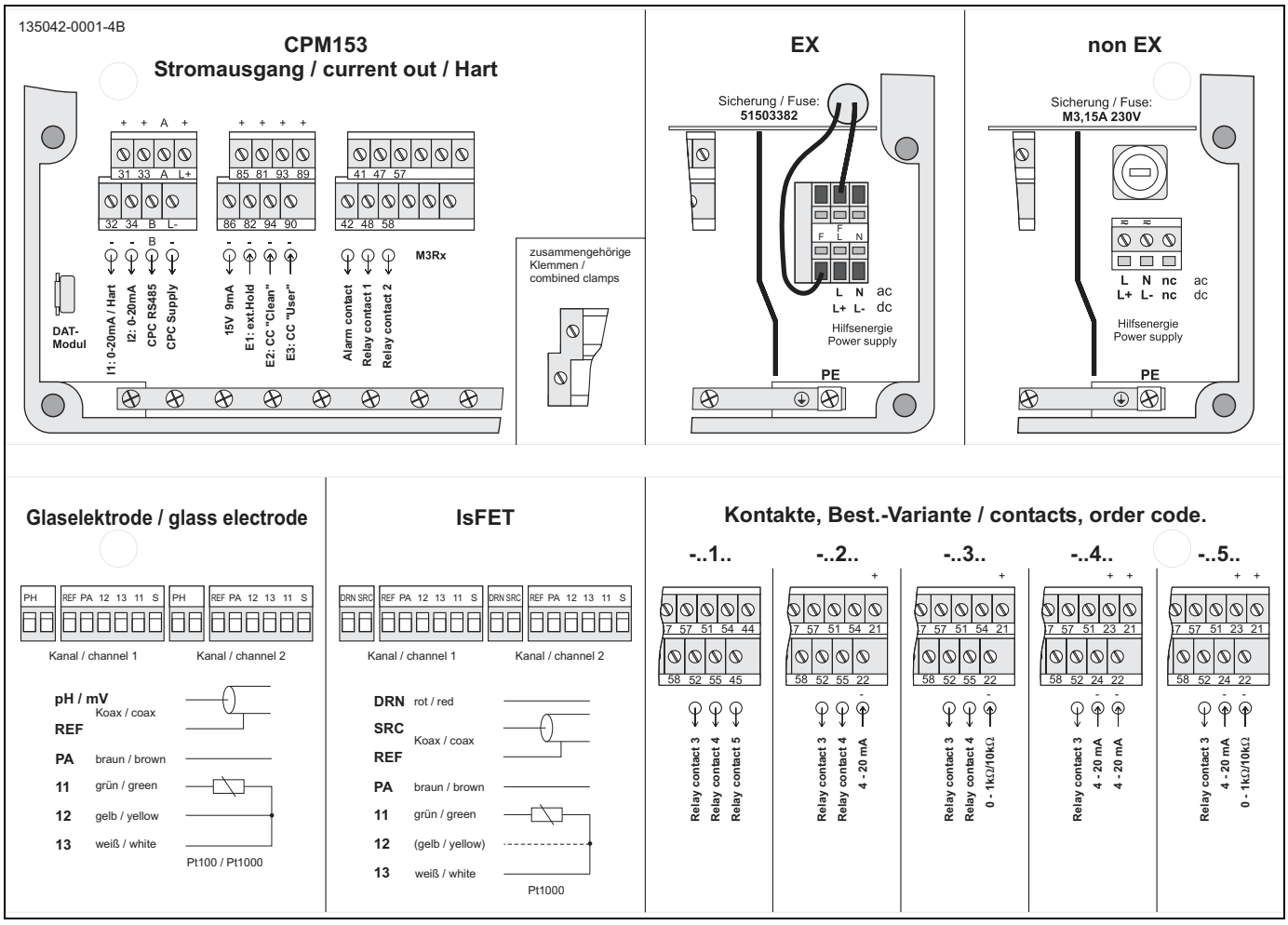


Fig. 7: Connection compartment sticker (you will find it in the connection compartment of the transmitter)
DRN = Drain
SCR = Source
REF = Reference

Connections in the front cover

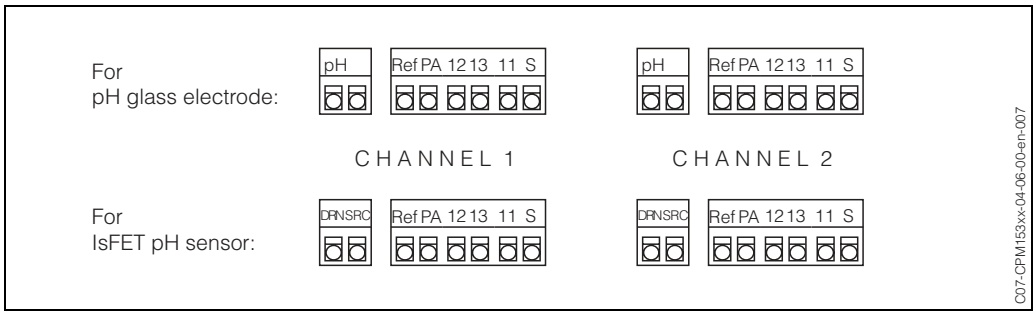


Fig. 8: Terminal assignment in the housing cover of the transmitter

Connections in the back cover

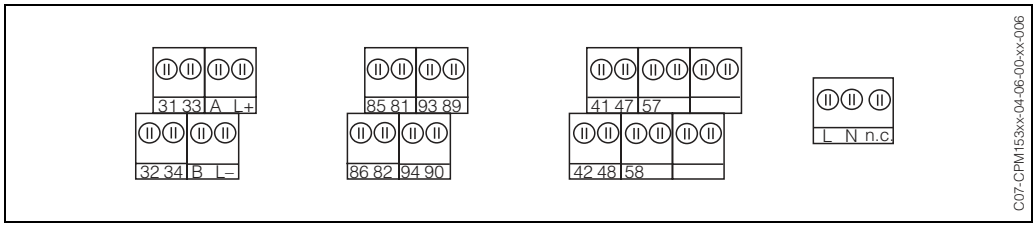


Fig. 9: Terminal assignment in the lower housing section of the transmitter

4.1.3 Contact assignment

In the basic version, the Mycom S CPM 153 possesses 1 alarm and 2 additional contacts. The instrument can be upgraded with the following **additional** equipment:
- 3 contacts
- 2 contacts and 1 current or resistance input (only for non-Ex)
- 1 contact, 1 current input and 1 current or resistance input (only for non-Ex)

The available contacts can be assigned via the software (see the "PARAM" menu → "Set up 1" → "Contacts" from page 36)

✎ Note!
- If you use NAMUR contacts (acc. to recommendations of process control engineering of the chemical and pharmaceutical industry), the contacts are set to the relays as follows:
  – Failure to "ALARM"
  – Maintenance required to "RELAY 1" and
  – Function check to "RELAY 2".

Selection by software	NAMUR on	NAMUR off
ALARM 41 42	Failure	Alarm
RELAY 1 47 48	Warning when maintenance required	freely selectable
RELAY 2 57 58	Function check	freely selectable

- You can assign up to three relays to the controller.

4.2 Sensor connection and measuring cable

4.2.1 Cable types

You require a screened special cable to connect pH and redox electrodes. You can use the following multicore and preterminated cable types:

- CPK 1 for electrodes without Pt 100
- CPK 6 for:
  – Sensopac with double reference electrode
  – 1 pH individual electrode, 1 reference electrode, 1 Pt 100
  – 2 pH combination electrodes with 1 Pt 100 or
    2 pH combination electrodes with 1 shared reference electrode
- CPK 9 for electrodes with TOP 68 plug-in heads (ESA / ESS) and Pt 100
- CPK 12 for IsFET pH sensors and pH/redox glass electrodes with TOP 68 plug-in heads (ESB) and Pt 100 / Pt 1000

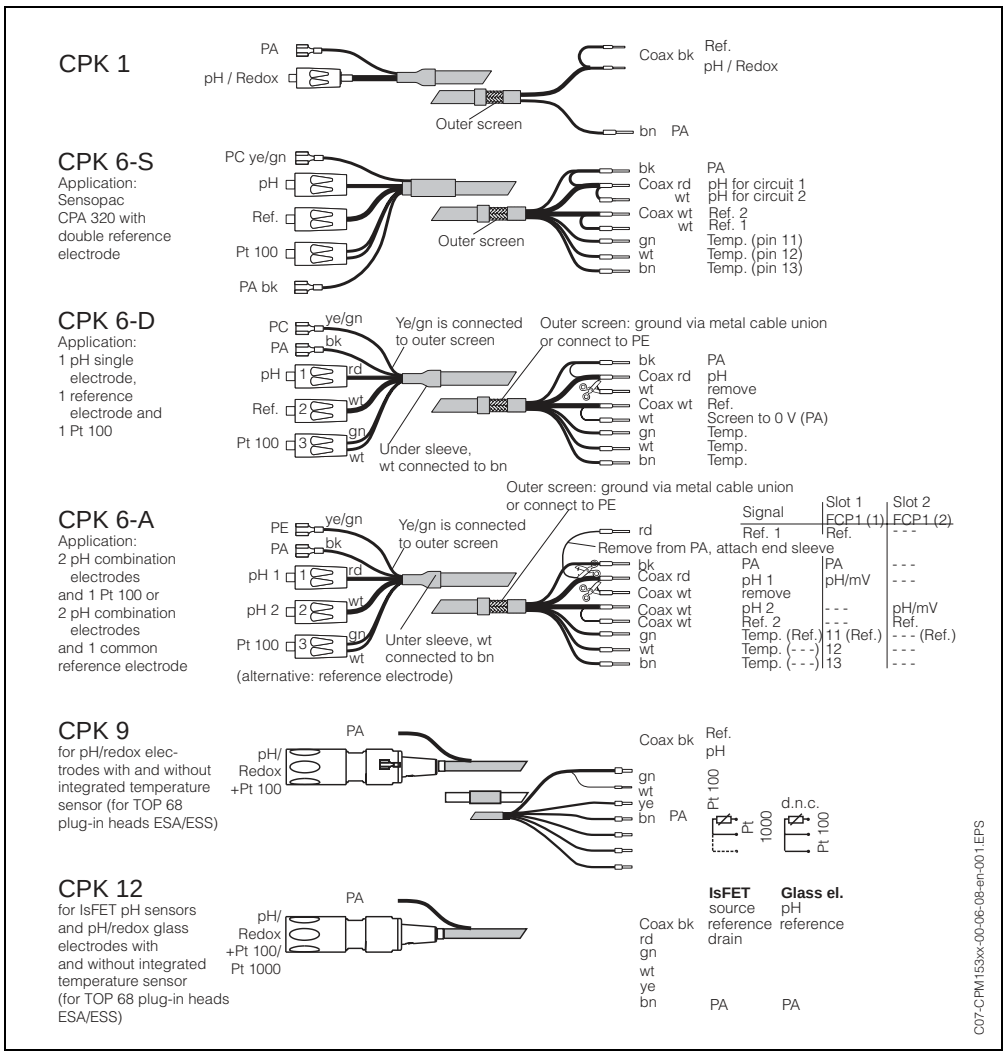


Fig. 10: Preterminated special measuring cables to connect pH and redox electrodes.

4.2.2 Changing the pH input from glass electrode to IsFET sensor

With this device you can run the electrode types glass electrode / redox electrode or IsFET sensors.
For adapt the electrical connection from glass electrodes to IsFET sensor CPS 401, please proceed as follows:

1. Open housing cover of the CPM 153.
2. Pull off both ends of the red line to the pH input (s. Fig. 29, p. 105; line to position 130).
3. Pin up the jumper on the back sides of the included terminals "DRN" and "SRC".
4. Remove the "pH" terminal out of the transmitter and replace it by the terminals "DRN" and "SRC".
5. Change the setting "electrode type" in the Quick Setup menu (p. 27) to "IsFET".

Note!
Please switch from IsFET sensor to glass electrode correspondingly.

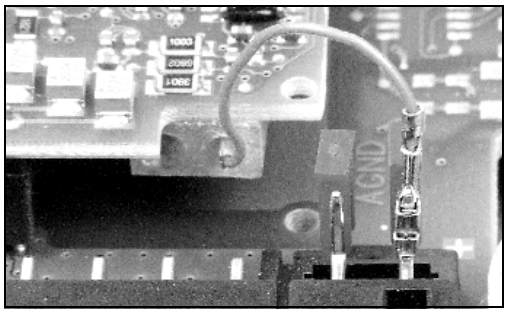


fig. 11: Cable (red) for connection of pH / Redox glass electrodes.

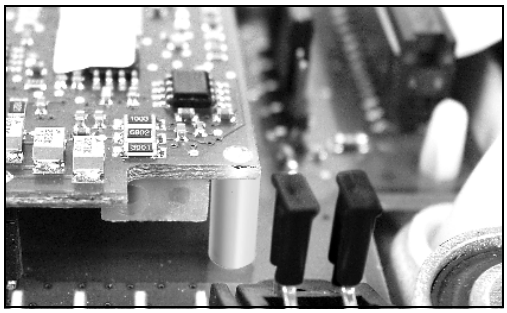


fig. 12: Jumper for connection of IsFET sensor TopHit H CPS 401

4.2.3 Outer screen connection

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

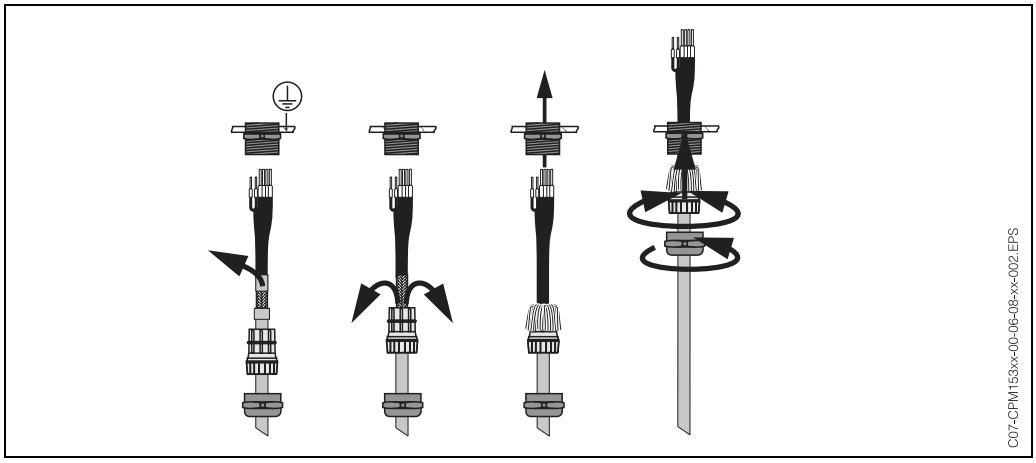


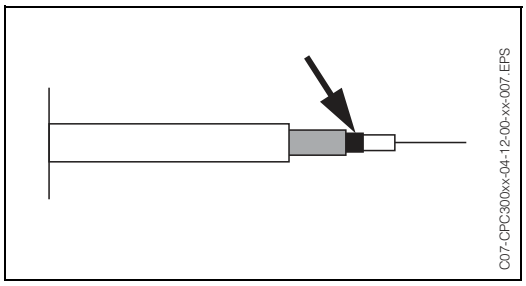
Fig. 13: Outer screen connection for CPK 1 to CPK 12 with metal cable gland. The screen contact is within the cable gland.

4.2.4 Cable extension

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

and the following types of non-terminated measuring cables:
- for CPK 1, CPK 9: Cable CYK 71
- for CPK 6: Cable DMK
- for CPK 12: Cable CYK 12

✎ Note!
With all cable types, the inner coaxial cable has a black, plastic, semi-conductor layer (arrow), which you must remove.



4.2.5 Symmetrical or unsymmetrical electrode connection

✎ Note!
The instrument is preset for symmetrical measurement (= with PML, potential matching line). For unsymmetrical measurement, the setting must be changed accordingly (s. page 32, Field A6, "Select connection type")..

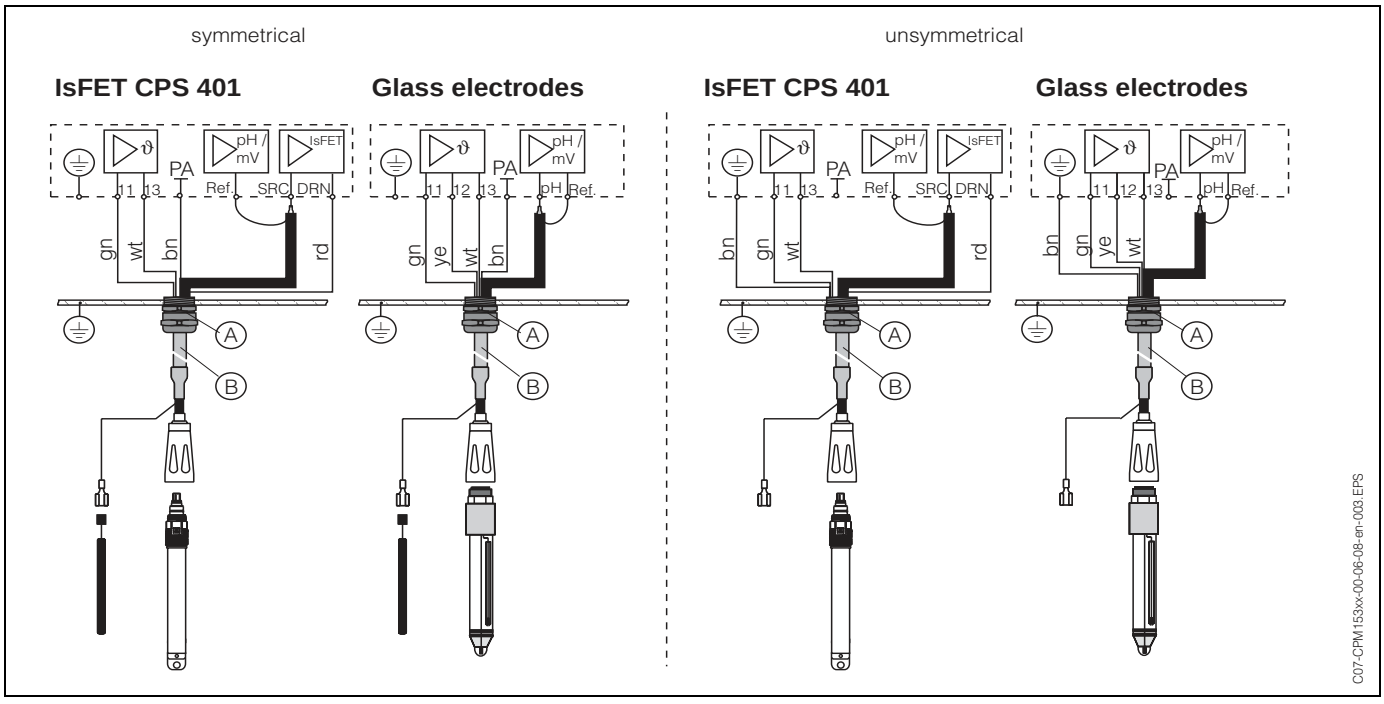


Fig. 14: Left: symmetrical electrode connection
Right: unsymmetrical electrode connection

Symmetrical (with PML)

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

Benefit of symmetrical connection

Measurement is easier under difficult ambient conditions (e.g. strongly flowing or high-impedance media or partially soiled diaphragm).

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.

Disadvantage of unsymmetrical connection

The measuring chain reference system has a heavier load, meaning that measuring errors in limiting operating conditions are possible (see symmetrically high-resistance instrument input). Monitoring of the reference electrode by the SC system (s. page 52) is not possible with unsymmetrical measurement.

Note!
Do not connect the PML, otherwise there can be shunt excitations.

4.3 Post connection check

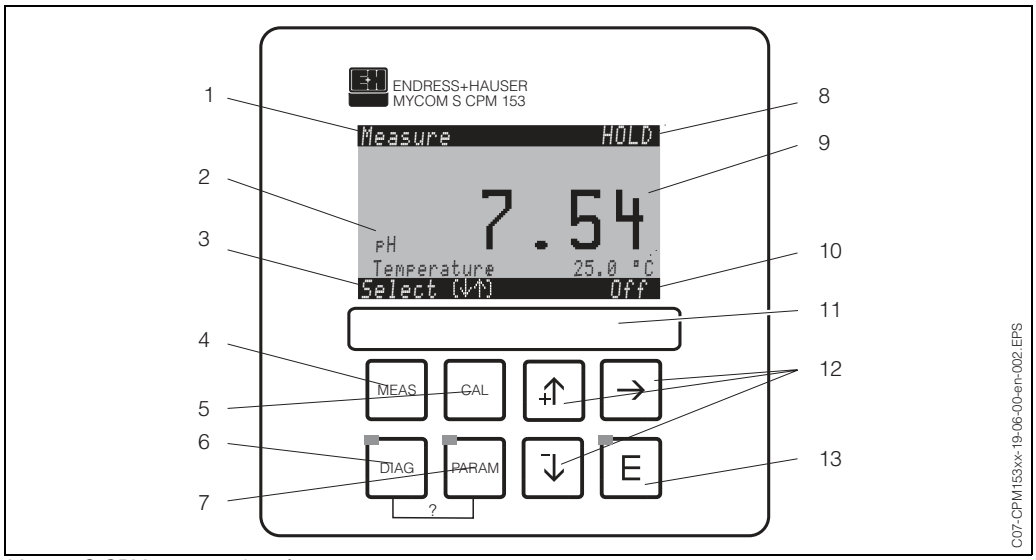
After wiring up the electrical connection of the measuring instrument, carry out the following checks:

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 E+H cable for electrode and sensor connection, see "Accessories".
Are the installed cables strain-relieved?	
Is the cable type route completely isolated?	Along the whole cable length, run the power supply and signal line cables separately 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 (PML): Is the PML connected to the measuring medium?	✎ Note! During calibration, insert the PML into the buffer solution.
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



Mycom S CPM 153 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
? = Press DIAG and PARAM simultaneously to open the help pages
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: ENTER key

5.1.2 Key assignment



"PARAM" brings you to the Configuration menu of the Mycom S CPM 153.

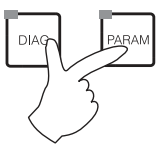
✎ Note!
"PARAM" allows you to return to the previous "return field" from any point in the menu. These are marked in bold in the menu overview (see Chap. 11.1).

LED: This is the send LED 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

"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

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

E

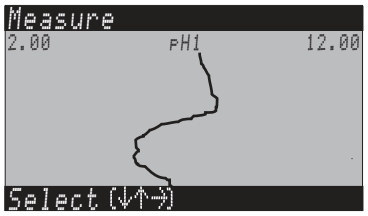
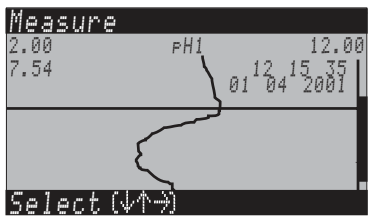
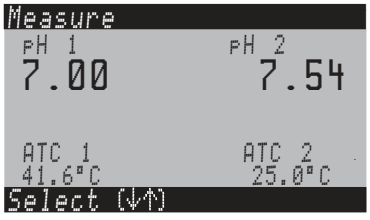
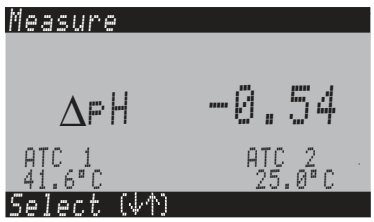
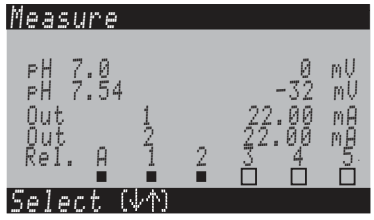
E (Enter) moves you one step forward in a menu or confirms a selection you made.

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)
  or
- Increment or decrement numbers by one step with "+" / "-".
  Move to the next digit with the "right arrow" (editor type 1) or
- "Activate" with the "right arrow" and scroll through the selection with "+" / "-" (editor type 2) (for information on editor types, see page 23).

5.1.3 Open measuring menus

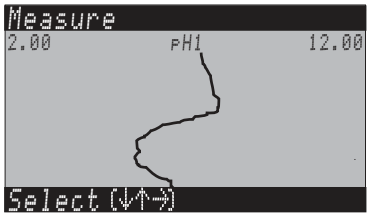
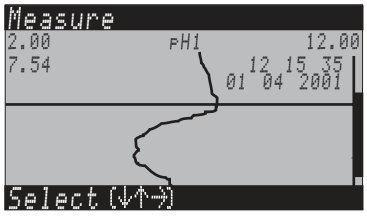
You can choose between the different measuring menus. Use the arrow keys to scroll between the different menus. Switch between the measured value characteristic and the data logger using the ENTER key E.

	↓ ↑		↓ ↑		
The current measured value of Circuit 1 is displayed.		If you have activated the data logger, you can see the current measured value characteristic here (record mode). If you have activated both data loggers, press the arrow key to switch to the view of the second measured value characteristic.		With an active data logger, you can open the recorded measured values by pressing the ENTER key (Scroll mode).	
	↓ ↑		↓ ↑		↓ ↑
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 logger

In the CPM 153, you have two data loggers available. With these data loggers you can
- Record a parameter with 500 sequential measuring points or
- two parameters each with 250 sequential measuring points.

To be able to use the function, activate the data logger in the "PARAM" menu → "Set up 2" → "Data Logger" (s. page 54). 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 the "PARAM" menu → "Set up 2" → "Data logger" you can open saved data by stating the date and time.

	
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. Access authorisation has the following levels:

Display level (accessible without a code):
The complete menu can be viewed. The configuration cannot be altered. No calibration is possible. On this level, only the controller parameters for new processes can be changed in the "DIAG" menu branch.

Maintenance code

Maintenance level (can be protected by the maintenance 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 levels are not protected.
You can ask for a universally valid maintenance code by contacting your service centre.

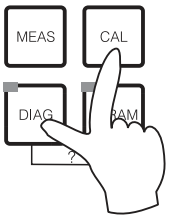
Specialist code

Specialist level (can be protected by the specialist code):
All menus can be accessed and changed.
Factory setting: Code = 0000, i.e. the levels are not protected.
You can ask for a universally valid specialist code by contacting your service centre.

To activate the codes (= functions locked) see the item "PARAM"→ "Set up 1" → "Access codes" (s. page 34). 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.

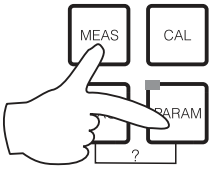
Locking the operation



This key combination locks the instrument from in-field configuration operations. To lock it, press "CAL" and "DIAG" simultaneously.

At the code prompt, the code appears as "9999". Only the settings in the "PARAM" menu can be seen.

Unlocking the operation



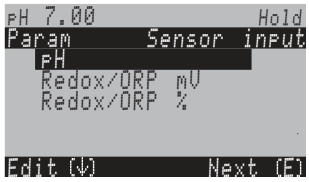
Press the "MEAS" and "PARAM" keys simultaneously to unlock the operation.

5.1.6 Description of the menu editor types

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

Editor type E1

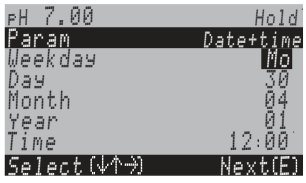
Editor type 1 (E1) *for functions, which can be directly selected from the display. The editing row shows "Edit".*



- 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.
- If you make your selection and confirm it by pressing E (*no flashing display*), you can exit the item by pressing E.

5.1.7 Factory setting

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 31), 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 K 1	off	off
Select temperature compensation circuit 2	–	ATC K2
Temperature measurement K 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	active with PARAM and CAL (inactive with DIAG)	active with PARAM and CAL (inactive with DIAG)
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 pluggd into the connection compartment of the transmitter. Using the DAT module you can
- *save* the complete settings, the logbooks and the data logger of the CPM 153 and
- *copy* the complete settings to other CPM 153 measuring transmitters with have identical hardware functionality.

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

6 Start-up

6.1 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 sure also the connection check is carried out (see Chap. 4.3).

6.2 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 Quick Setup 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 Quick Setup menu. If you do not, the instrument will not be operational. If you interrupt Quick Setup, it will start again the next time you start it up until **all** the menu options have been processed and completed.
- For parameter setting, you have to enter the specialist code (default setting 0000).

6.3 Special features for measurement with glass-free IsFET sensor

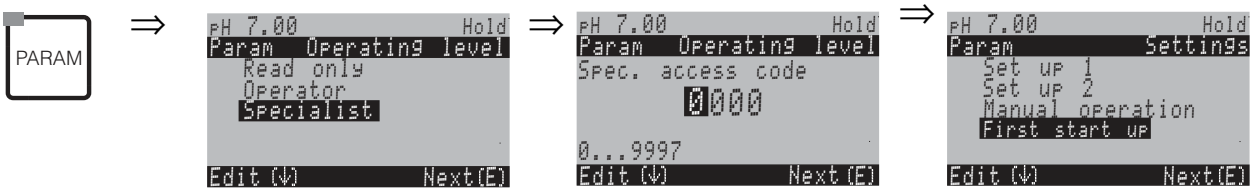
Switch-on behaviour
A closed control loop is created once the measuring system is switched on. During this time (approx. 5-8 minutes), the measured value adjusts to the real value. This settling behaviour occurs each time the liquid film between the pH-sensitive semiconductor and the reference lead is 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.

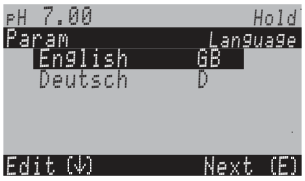
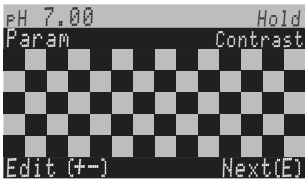
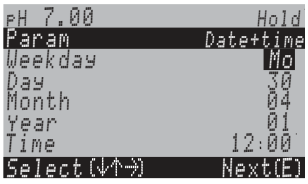
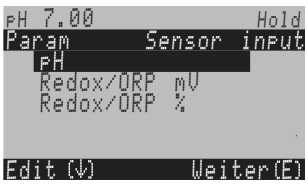
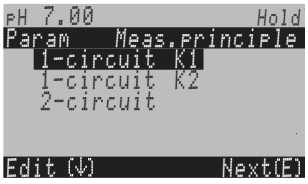
Sensitivity to light
Like all semiconductor elements, the IsFET chip is sensitive to light (measured value fluctuations). However only intense direct illumination impinges on the measuring value. For this reason, avoid direct exposure to sunlight during calibration. Normal ambient light does not affect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

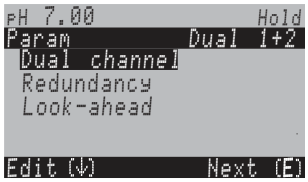
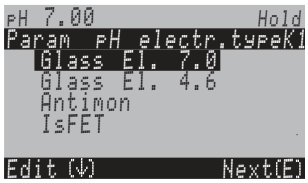
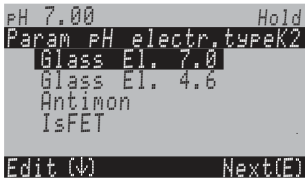
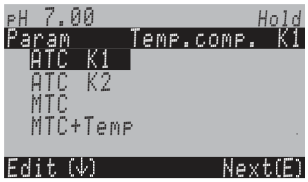
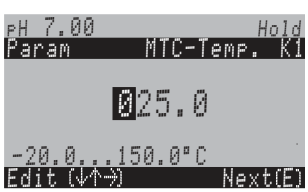
6.4 Quick Setup

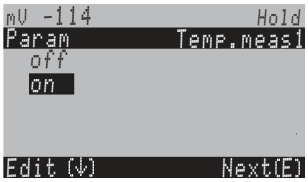
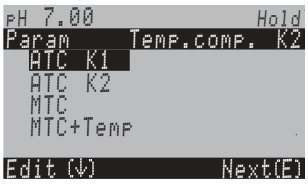
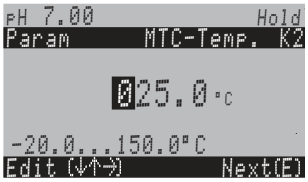
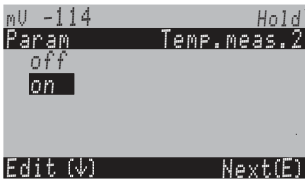
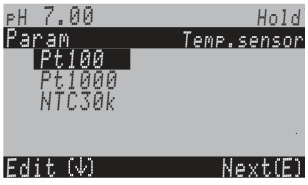
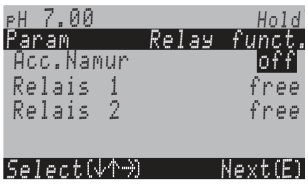
In this menu, configure the most important transmitter functions required for measurement.

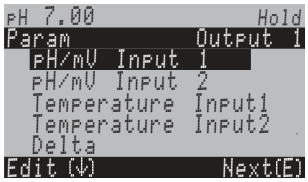
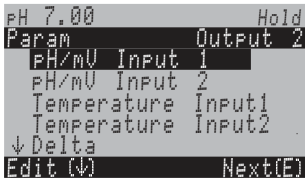
The Quick Setup ist started automatically when starting the instrument. You can open the Quick Setup at any time from the menu structure.
To enter the menu, proceed as follows:



CODE	DISPLAY	CHOICE (default = bold)	INFO
T1		**E** D	**Select language** Depending on ordered language version Language version variants: -A: E / D -B: E / F -C: E / I -D: E / ES -E: E / NL -F: E / J
T2			**Contrast setting as necessary** You can increase and reduce the contrast with the +/- keys.
T3		**Mo** **01** **04** **01** **12:00**	**Date and time entry** Enter the complete date and time here.
T4		**pH** Redox mV Redox %	**Operating mode selection** ✎ Note! • **If you change the operating mode, all user settings are automatically reset!** • Here the use of the DAT module can be helpful for saving your settings.
T5		**One circuit K1** One circuit K2 Two circuit	**Measuring principle selection** (one-circuit K2 and two circuits only with two-circuit instrument) *One-circuit K1 / K2* = measurement via sensor input 1 **or** 2 *Two-circuit* = measurement via **both** sensor inputs

CODE	DISPLAY	CHOICE (default = bold)	INFO
T6		**Dual channel** Redundancy Look-ahead	**Selection (only two circuit)** *Dual channel:* 2 electrodes work completely independently of each other. *Redundancy:* Detection of electrode wear. *Look-ahead:* Early reaction to flow and pH changes. For description, see note s. page 30.
T7		**Glass el. 7.0** Glass el. 4.6 Antimony IsFET	**Select electrode type 1** (only pH)´ ✎ 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. • Dependent on the ordered measuring input, "Glass el. 7.0" or "IsFET" is displayed as default value.
T8		**Glass el. 7.0** Glass el. 4,6 Antimony IsFET	**Select electrode type 2** (only with pH, two circuit)
T9		**solution ground** no solution ground	**Select connection type** *solution ground* = with potential matching connection (PML) *no solution ground* = without PML
T10		**°C** °F	**Select temperature display**
T11		**ATC K1** ATC K2 MTC MTC+Temp	**Select temperature compensation K1** ATC = automatic temperature compensation MTC = manual temp. comp. (with fixed temperature, entered in Field GAA2) MTC+Temp. = as MTC. On the display however, the value which appears is what the temperature sensor measures in the medium.
T12		025.0°C	**Temperature value K1** (only with pH and selection of MTC or MTC+Temp. in Field T11)

CODE	DISPLAY	CHOICE (default = bold)	INFO
T13		off **on**	**Temperature measurement K1** (only for redox)
T14		**ATC K1** ATC K2 MTC MTC+Temp	**Select temperature compensation K2** (only pH, two circuit)
T15		**025.0°C**	**Temperature value K2** (only for pH, two circuit and selection of MTC or MTC+Temp. in Field T14)
T16		off **on**	**Temperature measurement K2** (only for redox, two circuit)
T17		**Pt 100** Pt 1000 NTC 30k	**Select temperature sensor**
T18		NAMUR **off** Relay 1: **free** Relay 2: **free**	**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 14). Selection: Free / Controller / LC / CCW / CCC *Controller:* Controller control using relay *LC*: 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 72)

CODE	DISPLAY	CHOICE (default = bold)	INFO
T19		**pH/redox K1** pH/redox K2 Temperature K1 Temperature K2	**Select current output 1** (K2 only for two-circuit) Selection of the parameter, which shall be output on the current output.
T20		**pH/Redox K1** pH/Redox K2 Temperature K1 Temperature K2 Delta Continous controller	**Select current output 2** (K2 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 1 – circuit 2). *Continous controller*: Control of a controlling actuator via the current output (See also Controller menu page 56).
T22		**(0...9; A...Z)**	**Enter your customer specific instrument number.** 32-digit tag number. This is saved in the DAT module which is obtainable as an option.
T23		**restart** end	**Exit Quick Setup?** *restart* = Run through settings in Fields T1-T22 again *end* = Save the settings in Fields T1-T22 and exit Quick Setup.

Note!
The two-circuit instrument offers you the possiblity of connecting two electrodes which
- work completely independently of each other (**dual channel**) or
- **Redundancy** measurement is always advisable when it is necessary to detect electrode wear at an early stage.
- **Look-ahead**: Particularly in critical pipe neutralisations (inline), it is advisable to use a look-ahead 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.

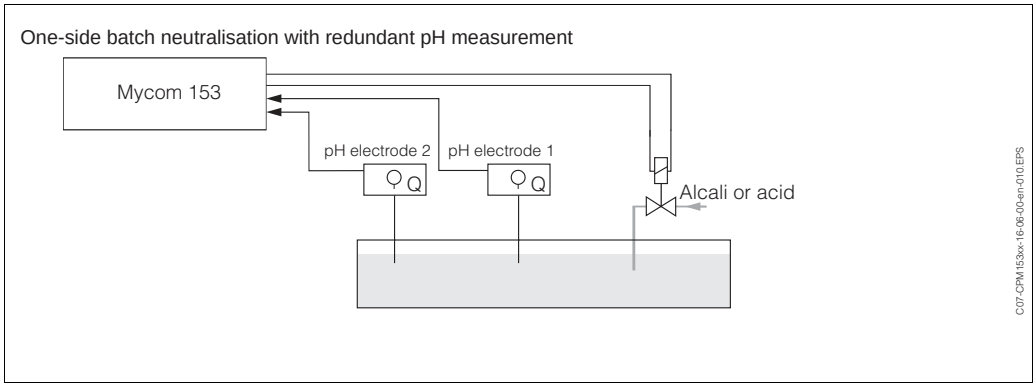


Fig. 15: Scheme of an one-side batch process with a redundancy pH measurement

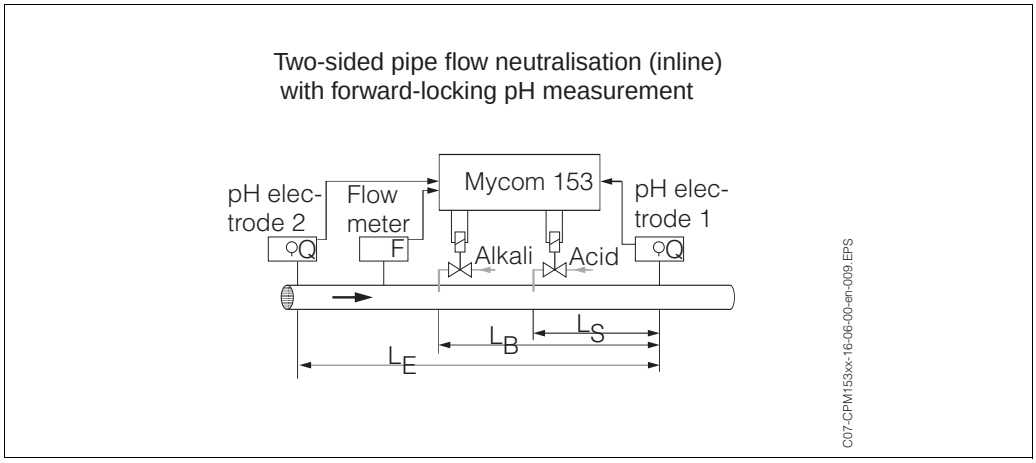


Fig. 16: Scheme of an two-sided inline process with a look-ahead pH measurement

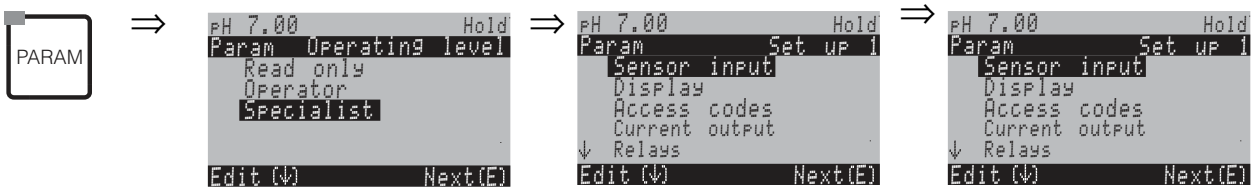
6.5 Description of functions

6.5.1 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 settings in the menu at the first commissioning in Quick Setup (s. page 25). You can change the selected values in this menu.

For the first entry to the parameter setting, you have to insert your specialist code (s. page 22, s. page 34). To enter the menu, proceed as follows:

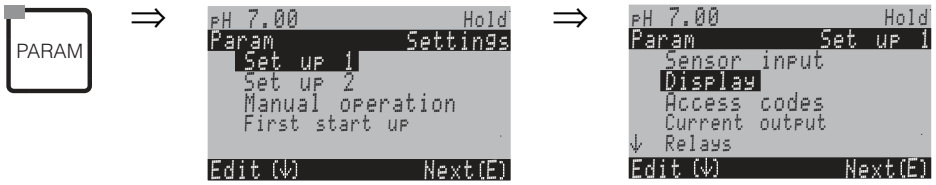


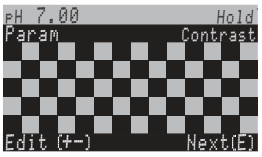
CODE	CHOICE (default = bold)	INFO
A1	**pH** Redox mV Redox %	**Operating mode selection** If the operating mode changes, the user settings are automatically reset.
A2	**One circuit K1** One circuit K2 Two circuit	**Measuring principle selection** (One circuit K2 and two circuit only with two circuit instrument) *One circuit K1 / K2* = measurement via sensor input 1 **or** 2 *Two circuit* = 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 "one-circuit". 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.

CODE	CHOICE (default = bold)	INFO
A3	**Dual channel** Redundancy Look-ahead	**Selection (only two circuit)** Electrodes measure with: *Dual channel*: completely independent of each other (you can set the "Delta Alarm" in the alarm menu, s. page 43). *Redundancy*: with two reference electrodes, to detect poisoning (only possible with electrodes of the same type, IsFET or glass). *Look-ahead*: for inline measurements with two electrodes. (*Look ahead* only available with two circuit transmitter and relay card with two current inputs). Select the controlling electrode in Field 174 on page 27 For further explanations, see page 27. ✎ 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)
A4	**Glass el. 7.0** Glass el. 4.6 IsFET Antimony 4.6	**Select electrode type 1** (only pH) ✎ 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. • Dependent on the ordered measuring input, "Glass el. 7.0" or "IsFET" is displayed as default value.
A5	**Glass el. 7.0** Glass el. 4.6 IsFET Antimony 4.6	**Select electrode type 2** (only with pH, two circuit)
A6	**symmetrical** unsymmetrical	**Select connection type** *symmetrical* = with potential matching (PML) *unsymmetrical* = without PML ✎ Note! For further information, see page 17.
A7	pH/Redox: **01s** Temperature: **01s** (01 ... 30s)	**Set measured value attenuation** The mean value over the set time is displayed.

6.5.2 Set up 1 – Display

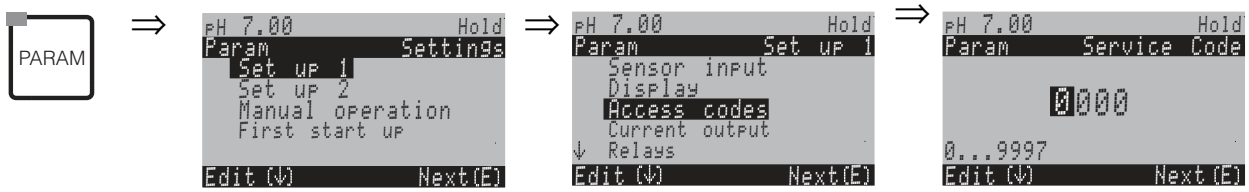
To enter the menu, proceed as follows:



CODE	CHOICE (default = bold)	INFO
B1	**E** D	**Select language** Depending on ordered language version. Language version variants: -A: E / D -B: E / F -C: E / I -D: E / ES -E: E / NL -F: E / J
B2		**Contrast setting as necessary** You can increase and reduce the contrast with the +/- keys.
B3	Weekday: **Su** Day: **01** Month: **04** Year: **01** Time: **08:00**	**Date and time entry** The complete date and time is required here.
B4	pH **00.00** pH 00.0	**Select of no. of decimal places** (only for pH measuring type)
B5	**°C** °F	**Select temperature unit** °C: Degree Celsius °F: Degree Fahrenheit
B6	**00000000** (0 ... 9; A ... Z)	**Enter your customer specific instrument number.** 32-digit tag number. This is saved in the DAT module. This is obtainable as an option.

6.5.3 Set up 1 – Access codes

To enter the menu, proceed as follows:

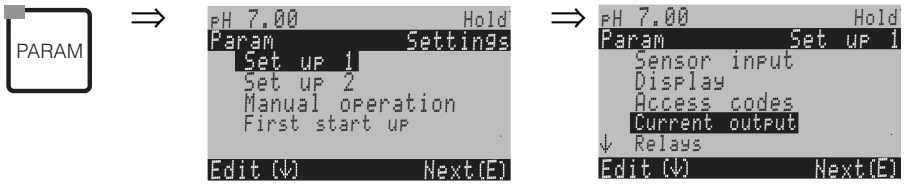


CODE	CHOICE **(default = bold)**	INFO (E1, 2 = editor types, s. page 23)
D1	**0000** (0 ... 9997)	**Enter maintenance code** In the range 0000 ... 9997, the code can be freely selected. 0000 = no Security Locking.
D2	0000 (0 ... 9997)	**Enter specialist code** In the range 0000 ... 9997, the code can be freely selected. 0000 = no Security Locking.

Note!
Danger of misuse. Make sure that the codes you enter and the universal code (s. page 34) are protected against misuse by unauthorised persons. Note down the codes and keep the in a place where unauthorised persons do not have access.

6.5.4 Set up 1 – Current outputs

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



CODE	CHOICE (default = bold)	INFO
E1	**Current output 1** Current output 2	**Select a current output** for which the settings apply.
Current output 1 (or 2):		
EA1	**pH/redox K1** pH/redox K2 Temperature K1 Temperature K2 Delta Continous controller	**Select measured value** which should be output at the current output. Selection possibilities related to the instrument variant and the selected output (see selection table above). *Delta:* The difference between the two measuring circuits will be output at the current output (circuit 1 – circuit 2). *Continous controller (only at current output 2):* The controller actuating variable is output (see controller menu as well on page 56). ✎ Note! Danger of data loss. If you change the assignment for the current output from "continous controller" to a different function **after** you have configured the controllers, the **complete** controller settings (s. page 56) is reset to the default values.
EA2	Caution! The configuration is changed.	**Note in display (for changed setting):** Cancel by pressing "PARAM" Continue (= confirm change) by pressing "E"
EA3	0 ... 20mA **4 ... 20mA**	**Current range selection**
EA4	!!Caution!! Current output 0...20mA and error current = 2.4 mA is dangerous.	**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 H1. 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)
EA5	**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.

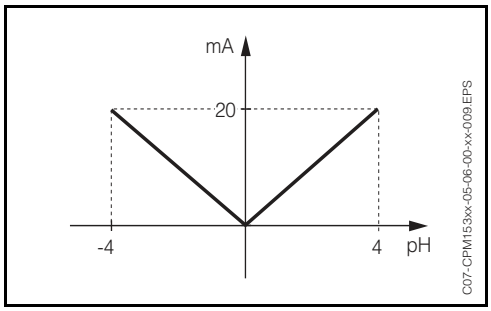
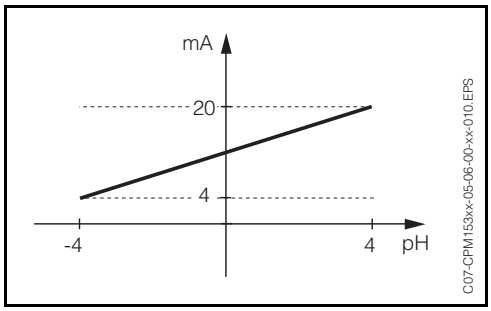
CODE	CHOICE (default = bold)	INFO
linear:		
EAA1	0/4 mA: **02.00 pH / 000.0°C / -0500 mV** 20 mA: **12.00 pH / 100.0°C / 0500 mV**	**Entry of the upper and lower measured value limits** The maximum measured value range is –2 ... +16 pH. The minimum distance from the upper to the lower measured value limit is 2 pH units. (Example.: 0/4 mA: pH 7 and 20 mA: pH 9)
EAA2	Linear characteristic active.	**Note in display:** The linear characteristic is activated after confirmation by pressing "E". Cancel by pressing "PARAM".
Table:		
EAB1	**02** (2 ... 10)	**Entry of the number of support points (value pairs)**
EAB2	pH/Redox/°C/: **000.0** mA: **04.00**	**Value pair entry** pH/Redox/°C - mA (number of required value pairs = number of support points desired in Field EAB1).
EAB3	**OK** Delete element(s)	**Selection:** Are the value pairs OK or do you want to delete elements?
EAB4	pH/Redox/°C/: **000.0** mA: **04.00**	**Delete:** Select the row to be deleted, delete with → and confirm by pressing "E".
EAB5	Valid table	**Note in display (no entry)** Table status If invalid, then back to EAB4.
EAB6	Table active	**Note in display:** The table is active after confirmation by pressing "E". Cancel by pressing "PARAM".

✎ Note!
The controller function "continous controller" can only be assigned to the 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 continous 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 continous 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 column 1).

– 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 column 2).

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
			

- Note on table entry: Enter the number of support points (value pairs) in Field EAB1. Enter the value pairs in Field EAB2. For example. (4 support points):

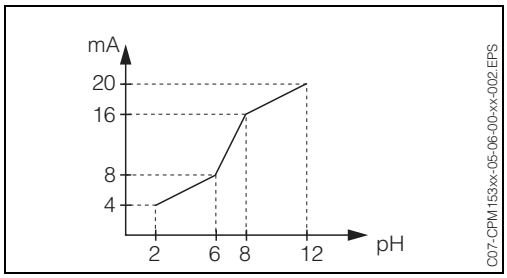


fig. 17: Example of characteristic enter using a table

6.5.5 Set up 1 – Relays

To enter the menu, proceed as follows:



CODE	SELECTION (default = bold)	INFO
F1	NAMUR: **off** Relay 1: **free** Relay 2: **free** Relay 3: **free** Relay 4: **free** Relay 5: **free**	**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 14). Selection: Free / Controller / LC / CCW / CCC *Controller:* Controller control using relay *LC*: 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 72) The limit value/controller relays are configured in the "PARAM" → "Set up 2" → "Controller confiuration". ✎ 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 56) is reset to the default values. • If you change the relay assignment for the controller, you must use the controller menu (s. page 56) 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 and ChemoClean functions, when the required relays 1 and 2 (s. page 14) are free.

CODE	SELECTION (default = bold)	INFO
F2	NC contact **NO contact**	**Selection acc. to NAMUR:** (only, if NAMUR is activated) Assignment of NAMUR contacts as NC contact (= normally closed contact, opens when relay active) or NO 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.
F3	NC contact **NO contact**	**Selection of controller contacts as NC contact or NO contact** (only, if controller is selected)
F4	NC contact **NO contact**	**Selection of limit values as NC contact or NO contact** (only, if limit values are selected)
F5	**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
F6	CHEMOCLEAN® is always an NO contact.	**Note in display** **(only, when the full ChemoClean function is selected in field F1, which means CCC and CCW)** With the ChemoClean function, the valves of injector CYR 10 are effected with a NO contact.

6.5.6 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).

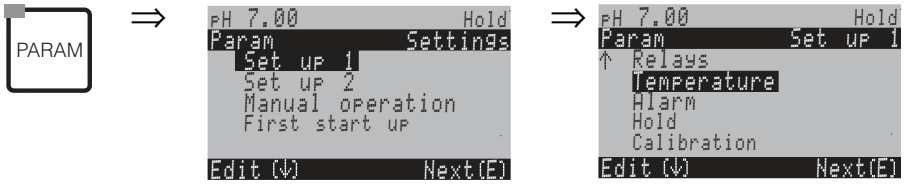
Temperature compensation
ATC: Automatic temperature compensation: The medium temperature is measured with a temperature sensor. This temperature is used via the temperature input in the Mycom S CPM 153 to adjust the electrode slope to the medium temperature.

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. On the display however, the value which appears is what 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 CPM 153 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 which to take measurements (e.g. process temperature and ambient temperature in the laboratory).
- Enter these recorded value pairs in the table (Field GBB3). As a reference temperature (Field GBC1) 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
G1	**Temperature** Medium compensation	**Selection for temperature compensation** Temperature = automatic (ATC) or manual (MTC) temperature compensation. Medium compensation (only for pH) = compensation of the medium using customer-specific tables (see below).
Temperature:		
GA1	**Measuring circuit 1** Measuring circuit 2	**Select measuring circuit** you wish to configure.
Measuring circuit 1 (or 2, optional):		
GAA1	**ATC K1** ATC K2 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 Field GAA2) MTC+Temp. = as MTC. On the display however, the value which appears is what the temperature sensor measures in the medium.
GAA2	**025.0°C** (0 ... 100.0 °C)	**MTC temperature** (only pH, MTC) Temperature entry for manual compensation
GAA3	**Off** On	**Select temperature measurement** (only redox) The reference temperature can be adapted according to customer specifics in Field GBC1.
GAA4	**Pt 100** Pt 1000 NTC 30k	**Select temperature sensor**
GAA5	**Temperature actual value** (–20.0 ... 150.0°C)	**Enter actual value temperature for temperature calibration** The value current measured by the temperature sensor can be changed/adapted. The temperature difference is stored internally as an offset value.
GAA6	**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
Medium compensation (only for pH):		
GB1	**Select table** Create tables Reference temperature	Selection Enter / activate customer-specific temperature compensation tables. *Select table* = select for activation
Select table:		
GBA1	Medium 1 Medium 2 Medium 3 **off**	**Select medium for measuring circuit 1** Select a medium for measuring circuit 1. *off* = no medium compensation
GBA2	Medium 1 Medium 2 Medium 3 **off**	**Select medium for measuring circuit 2** (only two circuit instruments) Select a medium for measuring circuit 2. *off* = no medium compensation
Create tables:		
GBB1	**Medium 1** Medium 2 Medium 3	**Select medium** Medium compensation curves can be entered as a table for three different media.
GBB2	**02** (2 ... 10)	**Entry of the number of support points (value pairs)** Value pair: pH/redox and temperature
GBB3	°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 desired in Field GBB2).
GBB4	**OK** Delete element(s)	**Selection:** Are the value pairs OK or do you want to delete elements?
GBB5	°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".
GBB6	Valid table	**Note in display:** The table is active after confirmation by pressing "E". Cancel by pressing "PARAM".
Reference temperature:		
GBC1	For laboratory measurement: **25.0°C** (0 ... 100°C)	**Enter reference temperature** to which the medium temperature shall be compensated. Enter the temperature at the pH r eference value of the process is defined (e.g. the ambient temperature in the laboratory).

6.5.7 Set up 1 – Alarm

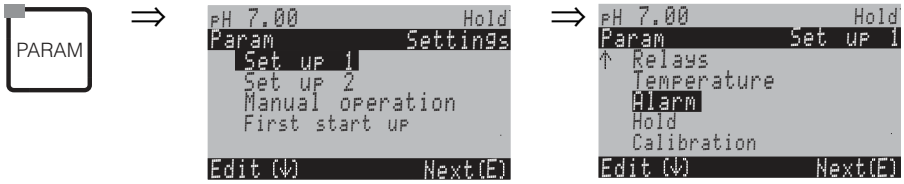
The CPM 153 continuously monitors the most important functions. If an error occurs, an error message (list of all error messages s. page 93) is set, which can trigger one of the following actions:

- The fault signalling contact is made active
- Current output 1 outputs the set error current (2.4 or 22 mA)
  Current output 2 outputs the set error current, if it has not been configured for the controller function.
- ChemoClean cleaning is started

In the list of error messages on page 93 you can see how the error numbers are assigned according to the factory settings. However, 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.

Note!
Please refer to for the complete list of possible error messages page 93.

To enter the menu, proceed as follows:



CODE	CHOICE (default = bold)	INFO
H1	Min (2.4 mA) **Max (22 mA)** Off	**Select error current** Set the error current at which an error message is active.
H2	!!Caution!! Current output 0...20 mA and error current = 2.4 mA is dangerous.	**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 H1. 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)
H3	**0000s** (0 ... 2000s)	**Alarm delay entry** Delay between error occurrence and alarm trigger.
H4	Function **off** Mainte- **1.00** pH nance: **3.00** pH Failure	**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.

CODE	CHOICE (default = bold)	INFO
H5	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 message triggers cleaning.
H6	Function: off Time input: 0000s (2...9999s)	**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.

6.5.8 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 on page 13, 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 field I5).

To enter the menu, proceed as follows:



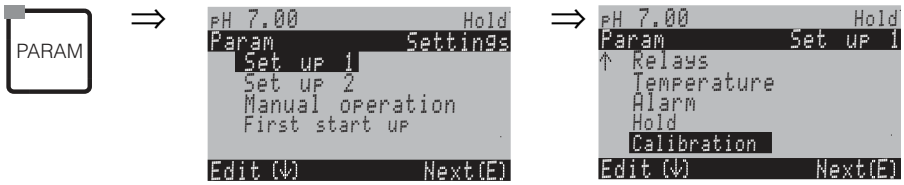
CODE	CHOICE (default = bold)	INFO
I1	CAL **on** DIAG **on** PARAM **on**	**Selection: automatic hold active when:** CAL = Calibration DIAG = Service/Diagnosis PARAM = Parameter entry menu
I2	**last** set Min (0/4 mA) Max (22 mA)	**Selection of current for hold** Last = the current value is "frozen" Set = The value set in Field I3 (below) is output in a hold. Min / Max = the minimum or maximum current value is output.
I3	**000%** (0 ... 100%)	**Enter Hold current** (only for Set) Number settable from 0% = 0/4 mA to 100% = 20 mA

CODE	CHOICE (default = bold)	INFO
I4	**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 in the display "Hold" blinks.
I5	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.

6.5.9 Set up 1 – Calibration

Operating mode pH

To enter the menu, proceed as follows:



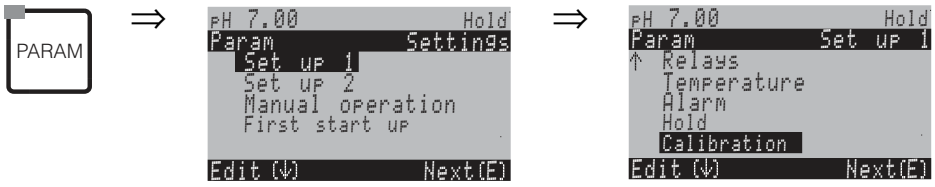
CODE	CHOICE (default = bold)	INFO
J1	**Offset** Manual calibration Special buffer table Cal. settings Calibration timer Autocal. TopCal	**Calibration menu selection** *Offset*: Entry of a fixed value by which the mV value is displaced. *Manual calibration:* Initial settings for the functions of the CAL key. *Special buffer table:* Edit tables for special buffer. *Cal. settings:* General calibration settings *Calibration timer:* Clock for calibration *Autocal. TopCal*: Initial settings for the TopCal S calibration.
	Offset:	
JG1	Curr. PV 1/2: **07.00** pH Offset 1/2: **00.00** pH	**Enter Offset value for pH value** *Curr. PV*: current measuring value (primary value) with Offset *Offset*: 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.

CODE	CHOICE (default = bold)	INFO
Manual calibration:		
JA1	**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. *Buffer manual*: During calibration, enter the buffer value. *Fixed buffer*: If the same buffer values are always used, you can select this function. *Auto. buffer recognition*: The transmitter TopCal S automatically recognises the used buffer values. ✎ Note! The automatic buffer recognition only functions if glass electrodes are connected to both measuring circuits. In case you are using an IsFET sensor, please calibrate with a different calibration function.
JA2	DIN 19267 Ingold **E+H** NBS / DIN 19266 Special buffer	**Select buffer type** (only fixed buffer, auto. buffer recognition) *Special buffer* = The special buffer tables for definition using Fields JB1 to JB6 are used. ✎ Note! You can find the buffer tables for the buffers offered in the Appendix (s. page 131).
JA3	Buffer 2.0 **Buffer 1** Buffer 4.01 Buffer 6.98 Buffer 9.18 Buffer 10.90	**Enter pH value for buffer 1 of the two-point calibration** (only fixed buffer)
JA4	Buffer 4.01 **Buffer 2** Buffer 6.98 Buffer 9.18 Buffer 10.90	**Enter pH value for buffer 2 of the two-point calibration** (only fixed buffer)
Special buffer table:		
JB1	**2** (2 ... 3)	**Enter the number of buffers** In a table, you can save up to 3 buffers not saved in the instrument. ✎ Note! Fields JB2 to JB6 must be run through individually for each buffer.
JB2	**1** (1 ... 2)	**Edit table** Entry using a table is possible for unsaved buffers. Select one of the tables for editing (up to three possible).
JB3	**10** (2 ... 10)	**Entry of the number of support points (value pairs)** Value pair: pH and temperature

CODE	CHOICE (default = bold)	INFO
JB4	°C: pH: **000.0** **04.00** 005.0 04.05	**Value pair entry** Enter temperature and pH/Redox (number of required value pairs = number of support points desired in field JB3).
JB5	**OK** Delete element(s)	**Selection:** Are the value pairs OK or do you want to delete any of them?
JB6	°C: pH: **000.0** **04.00** 005.0 04.05	**Delete:** Select the row to be deleted, delete it with → and confirm this with "E".
JB7	Valid table	**Note in display:** The table is active after confirmation by pressing "E". Cancel by pressing "PARAM".
Cal. settings:		
JC1	**MTC** ATC 1 ATC 2	**Select the temperature compensation for the calibration** ATC = automatic temp. comp. MTC = manual temp. comp. ✎ Note! The setting is only active during calibration. In measurement mode, the setting selected in GAA1 is valid.
JC2	**5.00 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 in field H5).
JC3	**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 in field H5).
JC6	**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.

CODE	CHOICE (default = bold)		INFO
JC7	Function1/2: Uis 1/2:	**off** on 00.00pH (0...16pH)	**Isothermic compensation** Activate the isotherm compensation and insert 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.
JC8	threshold length	**02 mV** 010s	**Stability** During calibration the mV values may maximally vary for the given threshold within the defined time range (length). During calibration, the mV value may change during the given period ("duration") at maximum by the stated amount ("threshold"), so that the calibration is considered as stable. Therefore you can adjust accuracy and timing individually to your process.
Calibration timer:			
JD1	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 a calibration must take place. *Time*: Display of the remaining time to an error message (count down).

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



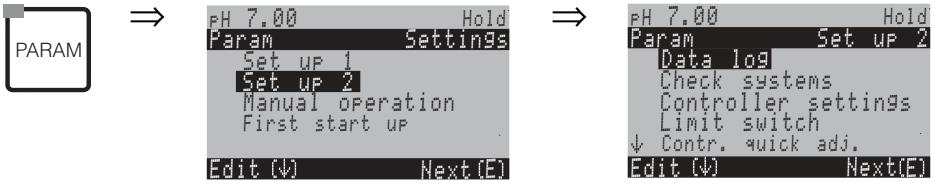
CODE	CHOICE (default = bold)	INFO
J1	**Offset** Manual calibration Cal. settings Calibration timer Calibration TopCal	**Calibration menu selection** *Offset*: Entry of a fixed value by which the mV value is displaced. *Manual calibration:* Initial settings for the function of the CAL key. *Cal. settings:* general calibration settings *Calibration timer:* Clock for calibration *Autocal TopCal*: Initial settings for the TopCal S calibration.
	Offset:	
JG1	Curr. PV 1/2: 0650 mV Offset 1/2 **0000 mV**	**Enter Offset value for redox value** *Curr. PV*: current measuring 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:	
JA1	**For redox abs.** **Data entry abs.** Calibration abs.	**Calibration parameter** *Data entry abs.*: Enter the electrode offset in mV. *Calibration abs.*: The electrode offset is calculated from the difference between the current measured value and the known buffer value.
	For: Redox %: **Data entry abs.** Data entry rel. Calibration abs. Calibration rel.	*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.*: The electrode offset is calculated from the difference between the current measured value and the known buffer value. *Calibration rel.*: Use of a non-toxic and unchanged sample and buffer.
	Cal. settings:	
JC3	**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.
JC6	**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.

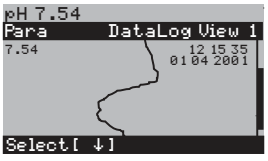
CODE	CHOICE (default = bold)	INFO
JC8	threshold **02 mV** length 010s	**Stability** During calibration the mV values may maximally vary for the given threshold within the defined time range (length). During calibration, the mV value may change during the given period ("duration") at maximum by the stated amount ("threshold"), so that the calibration is considered as stable. Therefore you can adjust accuracy and timing individually to your process.
Calibration timer:		
JD1	Cal timer: **on** Warning: **0001h** _____ Time: 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*: Display of the remaining time to an error message.

6.5.10 Set up 2 – Data Log

The data logger 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.

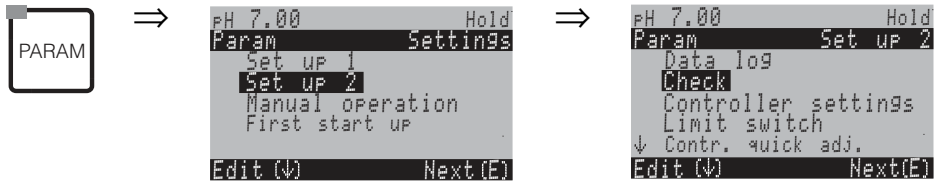
To enter the menu, proceed as follows:



CODE	CHOICE (default = bold)	INFO
K1	**Measuring interval** Data logger1 Data logger2 DataLog View 1 DataLog View 2	**Data logger settings** Using the data logger you can record • one parameter with 500 sequential measuring points or • two parameters each with 500 sequential measuring points.
	Measuring interval:	
KA1	**00005s** (2 ... 36000 s)	**Enter measuring interval** Enter the time interval after which the next measured value is recorded in the data logger.
	Data logger 1 (or 2):	
KB1 / KC1	Meas-ured value: pH/redox K1 Function: on	Selection Set the measured variable for recording (pH/redox , temp.) and the activate using the "on" function. ✎ Note! The data logger starts recording the measured value when you return to operation.
KB2 / KC2	Min: 12.00pH/-500mV Max: 12.00pH/500mV (-2...16pH/ -1500...1500mV)	**Set recording range** Values outside the defined range are not recorded.
	DataLog View 1 (or 2)	
KD1		**View of recorded data**

6.5.11 Set up 2 – Check

To enter the menu, proceed as follows:



CODE	CHOICE (default = bold)	INFO
L1	SCS K1: **off** SCS Ref. K1: **light** SCS K2: **off** SCS Ref. K2: **medium**	**Select SCS (= Sensor Check System) mode for measuring circuits 1 (K1) and 2 (K2) for the two-circuit instrument:** *SCS*: Recognition of glass breakage (off; *Ref.* =Reference electr.; Glass=electrode; G+R= Electr.+Reference electr.) *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.
L2	PCS K1: **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.

6.5.12 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 Quick Setup, page 25 or on the appropriate menu page. If you have not yet made the settings, please do this **before** configuring the controller.
- Number of relays available to the controller (Field T18, page 28, or Field F1, page 38) and/or
- Current output **2** must be defined as an continous controller if you want to control the actuator via a 20 mA interface (Field T20, page 29, or Field EA1, page 35).

✎ Note!
- *Danger of data loss.* If you assign the relays which are used by the controller with another function (Field F1, page 38), the **complete** controller configuration is reset to the default values.
- If you change the relay assignment for the controller in the Contacts menu (Field F1, page 38), 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, then we would recommend that you change the controller settings before removing the second card, so that all the relays used by the controller are located on card 1. Otherwise, you cannot use the controller function during the time in which the additional card is not plugged into the device, as the controller needs to access the relays on the second card.

Definition of terms

Actuators: Valves, gate valves, pumps and similar

Acid/alkali: The terms "acid" and "alkali" used **in the menu** are used here relating to the direction of action.
Acid = Dosing medium, which lowers the pH value.
Alkali = 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 an alkali (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 directions. This concerns, for example, a neutralisation process in which a dosing medium is used (acid *or* alkali).

With a *two-sided* process, control can generally working two-directions (use of acid *and* alkali). 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 are different in their relationship to the medium current:
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 set value has a constant value.

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

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.

Look-ahead pH measurement
To be able to resolve the general problems of a purely inline process, the CPM 153 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 CPM 153 has four different methods for controlling the actuators (see above).

1. PWM (Pulse-width modulation, "pulse-length controller")

With PLM, one side (i.e. acid *or* alkali) of the internal, continous 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}; s. Fig. 18) is. You can set the period length freely between 1 and 999.9 seconds. The minimum switch-on period is 0.4 seconds. Pulse-length-modulated outputs are intended to control solenoid valves, for example.
A two-sided process requires two PLM relays or one PLM and a three-point step controller (see below). One PLM relay on its own can only output
- a actuating variable of -100% ... 0% *or*
- of 0% .... +100%.

To avoid pulses which are too short, enter a minimum switch-on period. Pulses which are too short are not given to the relay/or the actuators. This benefits the actuator.

2. PFM (PFM; "pulse-frequency controller")

As with PWM, PFM is output as a rhythmic signal by the relay.
The greater the calculated manipulated 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 (s. Fig. 18). Pulse-frequency-modulated outputs are intended to control magnetic dosing pumps, for example.
Here too, two PFM relays are required for a two-sided process.

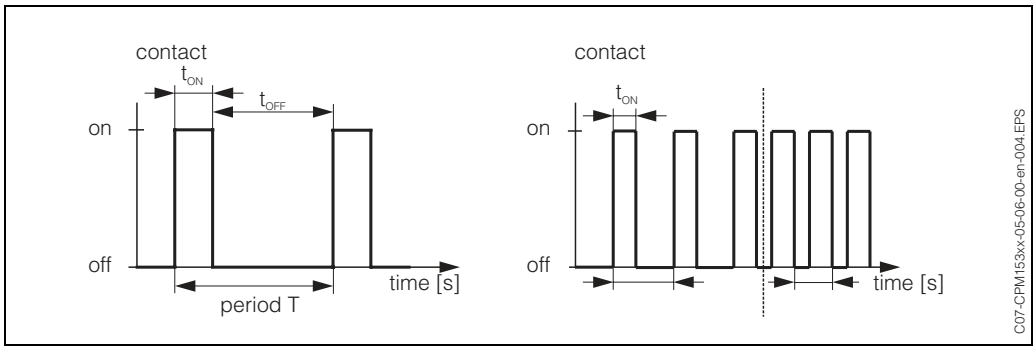


Fig. 18: left: pulse-width modulation (PWM)
Right: pulse-frequency modulation (PFM)

3. Three PS ("three-point step controller")
With the Mycom S, this type of control is only possible for *one* process side (acid *or* alkali). With two-sided processes, either PWM or PFM must be used for the other process side.

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. So that the Mycom S can set a actuating variable of, for example, 40% (valve 40% open), it requires the input of the time that the "+relay" is picked up to completely open a completely closed valve (= "*motor run time*").

✎ Note!
If using a driven valve, gate valve or similar, you must determine the motor run time, *before* beginning with the menu settings.

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. A actuating variable of 0% leads to a current of 10 mA (at 0 ... 20 mA) or 12 mA (at 4 .. 20 mA) (see Fig. 19).

✎ Note!
With a two-sided process, it should be noted that the actuator uses this method (also known as "split range".

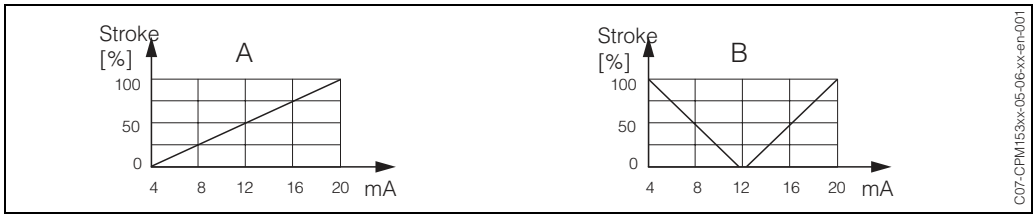


Fig. 19: A: Stroke diagram for a control valve
B: Stroke diagram for two contrarotating control valves ("split range")

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	Ordering variants CPM 153-
1-sided control	looking-ahead · 2-circuit · flow	1 PWM	2	1	1	–	x3x2xxxxx
		1 PFM	2	1	1	–	x3x2xxxxx
		1 three-PS 1 PWM/PFM, with signal	2	2	2	–	x3x4xxxxx
		1 three-PS 1 PWM/PFM, without signal	2	2	1	–	x3x2xxxxx
		analogue	2	–	1	1	x3x2xxxxx
	not looking-ahead	1 PWM	1	1	–	–	x1x0xxxxx
		1 PFM	1	1	–	–	x1x0xxxxx
		1 three-PS 1 PWM/PFM, with signal	1	2	1	–	x1x2xxxxx
		1 three-PS 1 PWM/PFM, without signal	1	2	–	–	x1x0xxxxx
		analogue	1	–	–	1	x1x0xxxxx

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Selection aid for online processes

Process	Path	Dosing actuators	Required hardware equipment for control: Circuits	Relay	Current inputs	Current outputs	Ordering variants CPM 153-
2-sided control	looking-ahead · 2-circuit · flow	2 PWM	2	2	1	–	x3x2xxxxx
		2 PFM	2	2	1	–	x3x2xxxxx
		1 three-PS 1 PWM/PFM, with signal	2	3	2	–	x3x4xxxxx
		1 three-PS 1 PWM/PFM, without signal	2	3	1	–	x3x2xxxxx
		current output split range	2	–	1	1	x3x2xxxxx
	not looking-ahead	2 PWM	1	2	–	–	x1x0xxxxx
		2 PFM	1	2	–	–	x1x0xxxxx
		1 three-PS 1 PWM/PFM, with signal	1	3	1	–	x1x2xxxxx
		1 three-PS 1 PWM/PFM, without signal	1	3	–	–	x1x0xxxxx
		current output	1	–	–	1	x1x0xxxxx

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Selection aid for batch processes

Process	Dosing actuators	Required hardware equipment for control: Circuits	Relay	Current inputs	Current outputs	Ordering variants CPM 153-
1-sided control	1 PWM	1	1	–	–	x1x0xxxxx
	1 PFM	1	1	–	–	x1x0xxxxx
	1 three-PS 1 PWM/PFM, with signal	1	2	1	–	x1x2xxxxx
	1 three-PS 1 PWM/PFM, without signal	1	2	–	–	x1x0xxxxx
	current output	1	–	–	1	x1x0xxxxx
2-sided control	2 PWM	1	2	–	–	x1x0xxxxx
	2 PFM	1	2	–	–	x1x0xxxxx
	1 three-PS 1 PWM/PFM, with signal	1	–	–	1	x1x0xxxxx
	1 three-PS 1 PWM/PFM, without signal	1	3	1	–	x1x2xxxxx
	current output	1	3	–	–	x1x0xxxxx

C07-CPM153xx-16-12-00-en-003.EPS

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

The controller in the CPM 153:
The CPM 153 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. 20. This is implemented in the CPM 153).
- The gain factor $K_P(X)$ is the purely proportional gain.

The following diagram shows the schematic structure of the CPM 153 controller. Because of the simplicity of the diagram, the Laplace transform of subfunctions is given.

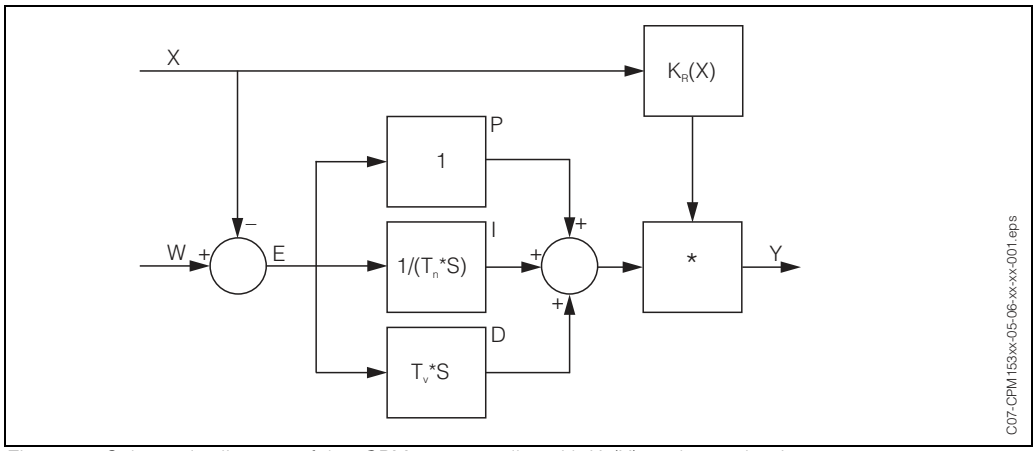


Fig. 20: Schematic diagram of the CPM 153controller with $K_R(X)$ as the total gain

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 alkali 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 alkali (y axis: pH value, x axis: volume units added to a strong alkali).

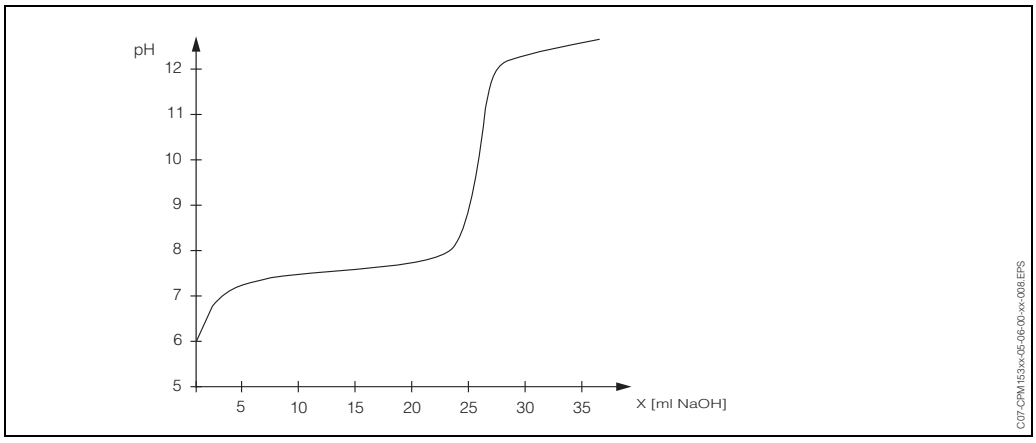


Fig. 21: Schematic titration curve of a weak acid with a strong alkali.

For difficult neutralisations, the CPM 153 controller gives you the option of partial compensating for the non-linearity by entering an inverse characteristic Y(X).

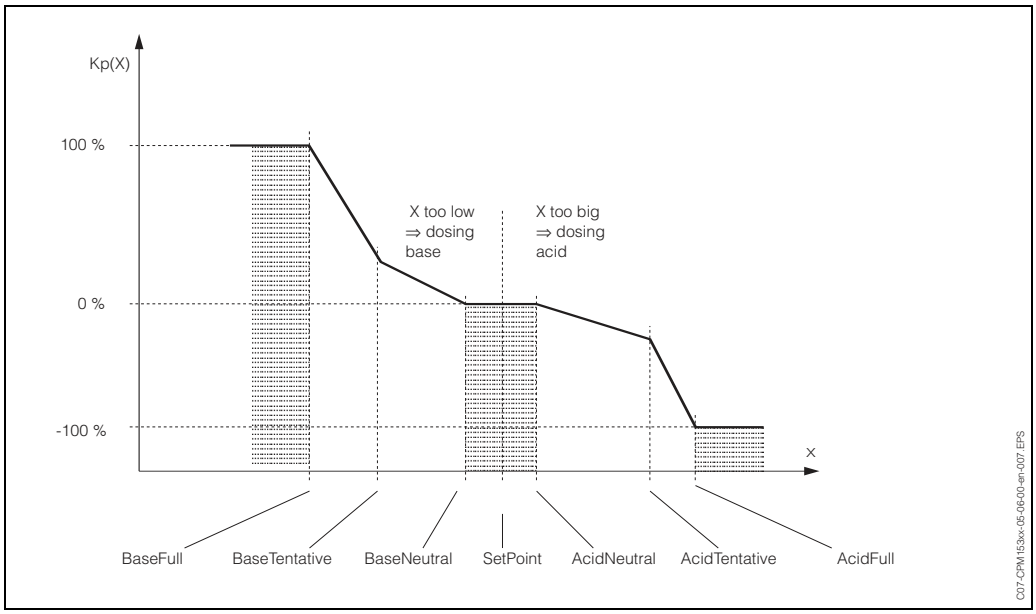


Fig. 22: Diagram to describe the most important corner points for control

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, then
- the dosing does not take place for the Batch process type,
- also not for the Inline process type and without an I component (Tn=0).
- If the controller is configured as a PI or PID controller for the Inline type, the controller decides itself if dosing will be carried out or not. This is dependent on the pH value history.

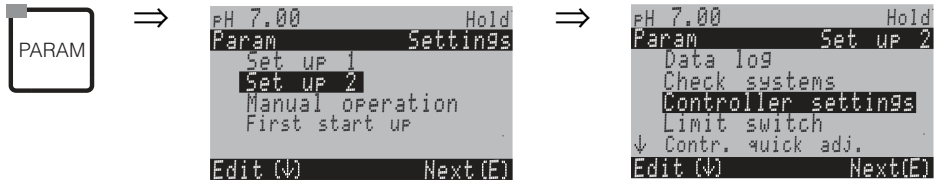
Points of the characteristic:
For *constant control gain* ("linear characteristic"), you require:
Set point W,
Neutral zone
– Two-sided: "Start of the neutral zone" and "End of neutral zone"
– One-sided: only one of the two points
For *range-dependent modulation gain* ("segmented curve"), you require 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 CPM 153 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 CPM 153
Sequence:
1. Actuators
2. Sensor technology
3. Feedback (e.g. look-ahead pH measurement, position feedback with three-point step controller, if available)
4. Curve:

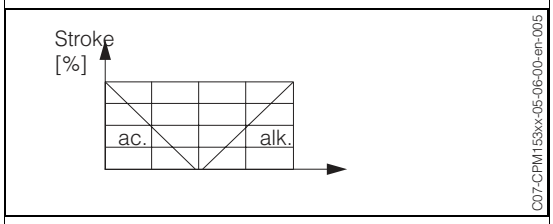
In the user settings (see below) you switch directly to an active measuring menu and can check the settings made and change them if necessary.

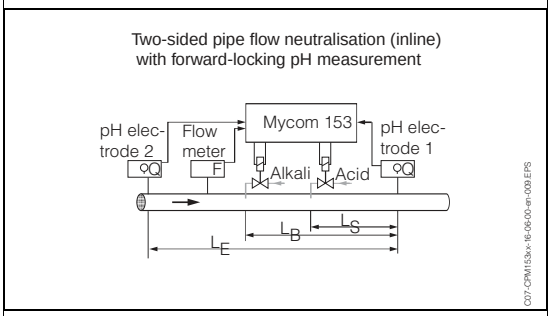
To enter the menu, proceed as follows:

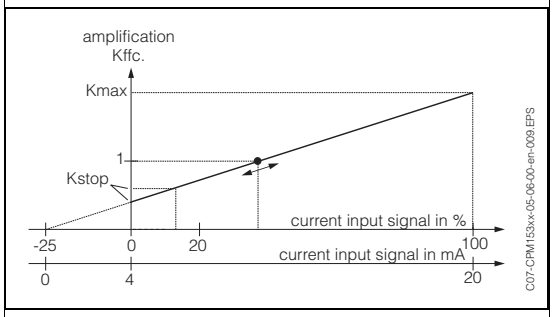


CODE	CHOICE (default = bold)	INFO
M1	**off** on	**Selection of Controller settings** ✎ Note! You must activate the controller settings **after** you have configured the controller in this menu branch.
M2	**Batch one-sided** Inline one-sided Batch two-sided Inline two-sided	**Select the process type,** which describes your process. *One-sided:* control using either acid *or* alkali *Two-sided:* control using either acid *and* alkali. You can only select this function if you have defined two controllers (in the "Contacts" menu and/or via the current output).
M3	Actuators Sensors Feedback **Curve**	**Select external hardware** For correct operation, you must completely configure these four submenus. *Actuators*: here, you can select and configure the methods which the controller uses to output the set values. *Sensors:* here you configure the look-ahead pH measurement or switch channels (only with two-circuit). *Feedback:* here you configure the position feedback of an actuator drive (only with the selection of three PS and position feedback = on; see Fields 162, 165 / 170, 165) *Curve:* here, you enter the controller parameters (neutral zone, set point, etc.). With this selection, you can also reach the "active measuring menu" (see Field 196).
	Actuators: With selection "one-sided" in field M1:	
	MA1 — Acid Alkali	**Dosing** Select the medium to be dosed to the process.
	MA2 — Pulse length Pulse-frequency 3-point step controller Current output	**Select control type**

CODE	CHOICE (default = bold)	INFO
MA3	+Relay **n.c.** –Relay **n.c.** Motor run time Position feedback off	**Relay selection** (for three-point step controller) *+Relay*: Open the valve further (= increase dosing) *–Relay*: Close the valve further (= reduce dosing) (The first free relay is always offered as the default.) Selection: n.c. (= not connected). After this, those relays which are released in the Contacts menu are always offered as the default. *Motor run time*: The time the motor drive requires to move the valve from completely closed to completely open. The CPM 153 requires this to be able to calculate the required pick-up time of the relay for any required position change. *Position feedback*: Without position feedback, the current valve position is calculated using the entered motor run time and the relay activity. With switched-on position feedback, the CPM 153 expects feedback from the actuator drive about the current valve position via a current or resistance input. ✎ Note! If you cannot select a relay here, use the "Contacts" menu to make relays available for the controller function.
MA4	Relay: **n.c.** max. pulse frequency 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)
MA5	Relay: **n.c.** Period: **000.0 s** t_E min: **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).
MA6	0 ... 20 mA 4 ... 20 mA	**Current output** Selection of the current range, which should be output at the current output.
MA7	0/4 mA 20 mA	**Current output** Assign the current value which corresponds to 100 % dosing medium provision.
Actuators: With selection "two-sided" in field M1:		
MB1	Dosing via: 2 outputs 1 output	**Control:** (This is only 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.

CODE	CHOICE (default = bold)	INFO
1 Output:		
MBA1	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.
MBA2	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/alkali dosing (see below, Fig. 23) in the "split range" method.  *Fig. 23: Two-sided control over one current output*
2 outputs:		
MBB1	Acid: I length Alkali: I length	**Dosing** Dosing can be carried be carried out using: PWM (= pulse length proportional), PFM (= pulse frequency proportional) or 1x Three-PS (= three-point step controller)
MBB2	+Relay **n.c.** –Relay **n.c.** Motor run time Position feedback off	**Acid dosing: Relay selection** (for three-point step controller) *Description see above*
MBB3	Relay: **n.c.** max. pulse frequency 1/min.	**Acid dosing: Relay selection** (for pulse frequency) *Description see above*
MBB4	Relay: **n.c.** Period: **000.0 s** t_E min: **000.0 s**	**Acid dosing: Relay selection** (for pulse length) *Description see above*
MBB5	+Relay **n.c.** –Relay **n.c.** Motor run time Position feedback off	**Alkali dosing: Relay selection** (for three-point step controller) *Description see above*
MBB6	Relay: **n.c.** max. pulse frequency 1/min.	**Alkali dosing: Relay selection** (for pulse frequency) *Description see above*

CODE	CHOICE (default = bold)	INFO
MBB7	Relay: **n.c.** Period: **000.0 s** t_E min: **000.0 s**	**Alkali dosing: Relay selection** (for pulse length) *Description see above*
Sensor technology:		
MC1	Look-ahead measurement: pH circuit 1 = controller pH circuit 2 = look-ahead	**Note in display:** (only look-ahead) In Quick Setup one process with look-ahead pH measurement was selected. ✎ Note! Control with look-ahead measurement is only possible in conjunction with a flowmeter and a two-circuit transmitter.
MC2	Control with: pH value circuit 1 pH value circuit 2	**Electrical assignment:** (only redundancy) Selection of with which measured value, control is effective.
MC3	L_B: 0.5 m L_S: 0.5 m L_E: 1.5 m	**System arrangement** 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 alkali dosing point L_E: Distance from the controlling electrode to the look-ahead electrode Remark on Fig. 24: Electrode 1 is the controlling electrode, electrode 2 is the look-ahead electrode.  *Fig. 24: Schematic diagram of two-sided control with look-ahead pH measurement*
MC4	Unit: m Unit: s 4 mA value: ___ 20 mA value: ___	**Flow velocity flowmeter** *Unit*: Entry of the length and time unit for flow velocity (e.g. m/s). *4 mA value*: Enter minimum flow velocity value. *20 mA value*: Enter maximum flow velocity value.

CODE	CHOICE (default = bold)		INFO
MC5	Function **on** Limit value **050.0** Kffc=1: **050.0** Kmax: 1.7 Kstop: 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 Kstör. *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 Kstör is displayed for a current input signal of 100 %. *Kstop*: here, the value of Kstör is displayed for current input signal which is equal to the limit value.  *Fig. 25: Multiplying feedforward control*
Feedback: The following selection is dependent on whether you have a resistance or a current input.			
With resistance input			
MD1	0 ... 1 kΩ 0 ... 10 kΩ		**Select range** for resistance.
MD2	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 it using the arrow keys, please check the "Actuators" menu to see if the relays have been assigned to valve control.
MD3	curr. resistance: ____ kΩ		**Assign a value for y = 100 %** Drive the valve to y = 100 %. Proceeding as in the previous field.
For current input 1:			
MD4	y_R = 0 ... 100 %	mA: 0 ... 20 20 ... 0 4 ... 20 20 ... 4	**Select current range** and assign the percentage range.

CODE		CHOICE (default = bold)	INFO
	MD5	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 the "E" key. ✎ Note! If you cannot change it using the arrow keys, please check the "Actuators" menu to see if the relays have been assigned to valve control.
	MD6	curr. mA value: ____ mA	**Assign a value for y = 100%** Drive the valve to y = 100%. Proceeding as in the previous field.
	Curve:		
	ME1	Constant curve Segmented curve	**Curve type selection** *Constant curve:* corresponds to a constant control gain. *Segmented curve:* corresponds to a range-dependent constant control gain.
	ME2	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 curve (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 alkali dosing): modulation gain for alkali dosing K_R *2* (only with acid dosing): modulation gain for acid dosing
	ME3	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 curve** *Setpoint*: the value which should be set. *St.ntr. zone (Start neutral zone)* End ntr. zone (*End neutral zone)* *O.pnt 1 and 2 (optimization point):* entry with x and y coordinates Ctrl.pnt. *1 (control point): The dosing is 100% alkali for measuring values < control point.* Ctrl.pnt. *2 (control point): The dosing is 100% acid for measuring values > control point.*
	ME4	Rapid process Standard process Slow process **User settings**	**Select process character** If you have no experience in setting parameters, these defaults *rapid /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 relevant for your process. Enter all the characteristic values yourself with the *user settings*.
	ME5	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 alkali dosing, Index 2 only for acid dosing) K_R *1*: modulation gain for alkali dosing K_R *2*: modulation gain for acid dosing *Tn*: integral action time *Tv*: derivative action time

CODE	CHOICE (default = bold)		INFO
ME6	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*: Pressing "E" to leave the controller simulation.
ME7	Function Set: act.: y:	auto 07.00pH 07.00pH 000	**Active Measuring menu** *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, optimization 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 alkali.

Note!

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

1. Set the values for the controller parameters (Field ME5)
2. Deflect process.
   Field ME7: 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 ME5. 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 ME6. There, you can continue or exit the simulation.

- Only exit the controller simulation in Field ME6 with "Simulation off". Otherwise, the simulation will continue to run in the background.

6.5.13 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 44).
These functions can be used both for pH/redox and temperature measurement.

To illustrate the contact states of any relay or fault signalling contact, refer to Fig. 26 for the
contact states:

Switch-on point > switch-off point (with increasing measured values):
– the relay contact closes at after the switch-on point t_1 is exceeded and the pickup delay ($t_2 t_1$) expires.
– Then the alarm threshold t_3 is reached and the error delay (t_4 - t_3) also expires, the fault signalling contact switches.
– With returning measured values, the fault signalling contact reopens when the alarm threshold is undershot at t_5. The appropriate error message is deleted.
– The relay contact opens again after the switch-off point is reached at t_6 and the drop-out delay has elapsed (t_7 - t_6).

✎ 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.
- You can make identical settings for a minimum function similar to the maximum function.

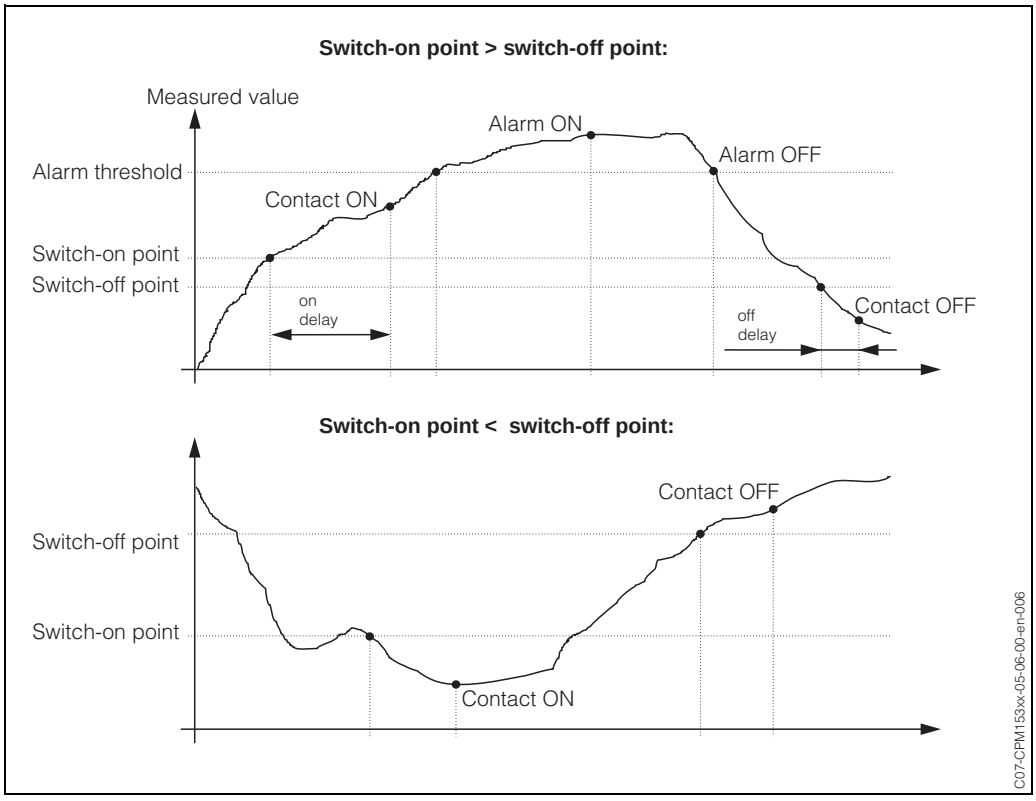
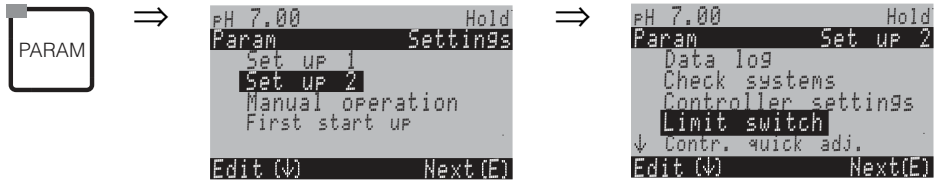


Fig. 26: Diagram of the relationship between switch-on and switch-off points and on and off delay

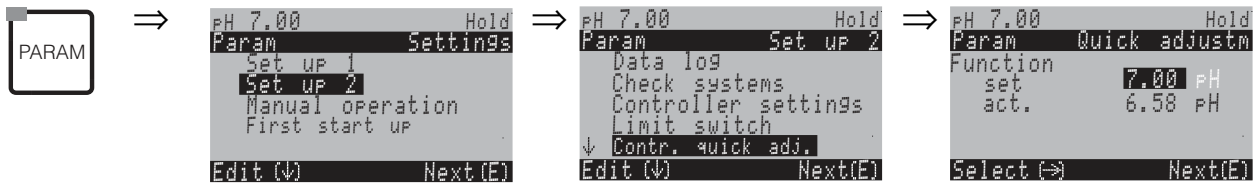
To enter the menu, proceed as follows:



CODE	CHOICE (default = bold)		INFO
P1	**Limit switch 1** Limit switch 2 Limit switch 3 Limit switch 4 Limit switch 5		**Selection** of the limit switch which you wish to configure. There are five limit switches available.
Limit switch 1 / 2 / 3 / 4 / 5:			
PA1 / PB1 / PC1 / PD1 / PE1	Function Assignment On point: Off point:	**off** **pH/Redox** **pH 16.00 (1500 mV/ 100%/150°C)** **pH 16.00 (1500 mV/ 100%/150°C)**	**Limit switch configuration:** *Function*: activation of function as limit switch *Assignment*: Selection of the measured value which shall 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)
PA2 / PB2 / PC2 / PD2 / PE2	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.

6.5.14 Set up 2 - Controller quick adjustment

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



6.5.15 Set up 2 – ChemoClean

hemoClean® is an automatic cleaning system for pH/redox electrodes. The injector (e.g. CYR 10) conveys water and cleaner over two contacts to the electrode.

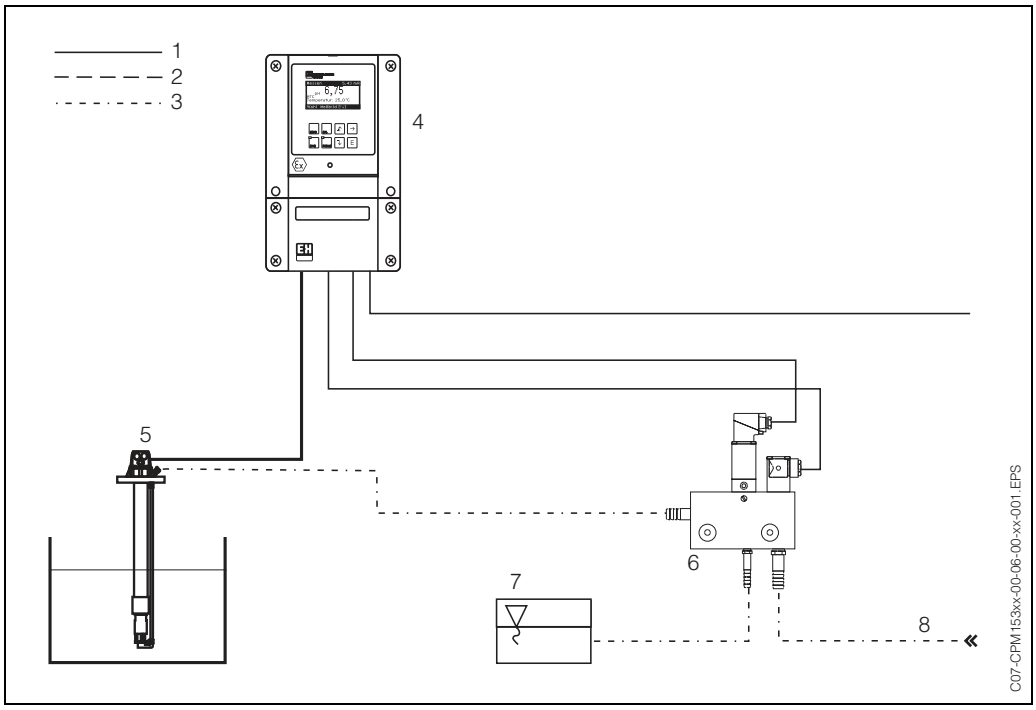


Fig. 27: 1: Electric line
2: Compressed air
3: Water/cleaning fluid
4: CPM 153 transmitter
5: Immersion assembly
6: Injector CYR 10
7: Cleaning fluid
8: Motive water

Operation:

1. In the menu "Basic settings" → "Contacts" (Field F1, s. page 36), the function ChemoClean® must be switched on and the appropriate contacts connected to the injector (see connection examples on page 128 ff.).
2. The cleaning processes are configured in the menu "PARAM" → "Set up 2" → "ChemoClean". Here, the automatic or event-controlled cleaning can be adapted to the process conditions.
   One or more of the following controls are possible:
   – Weekly programme (see below, Fields OA1 to OAA5): 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 Field O1, "Select Control Levels": Ext. control "on")
   – Cleaning trigger: Cleaning is carried out when an SCS alarm occurs (see also Field LM1 under "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 "E" 2 x ("Start cleaning")

Weekly 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 via the binary inputs directly.
- "User": User-defined cleaning programmes (create in programme editor; from Field NAD1).

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.

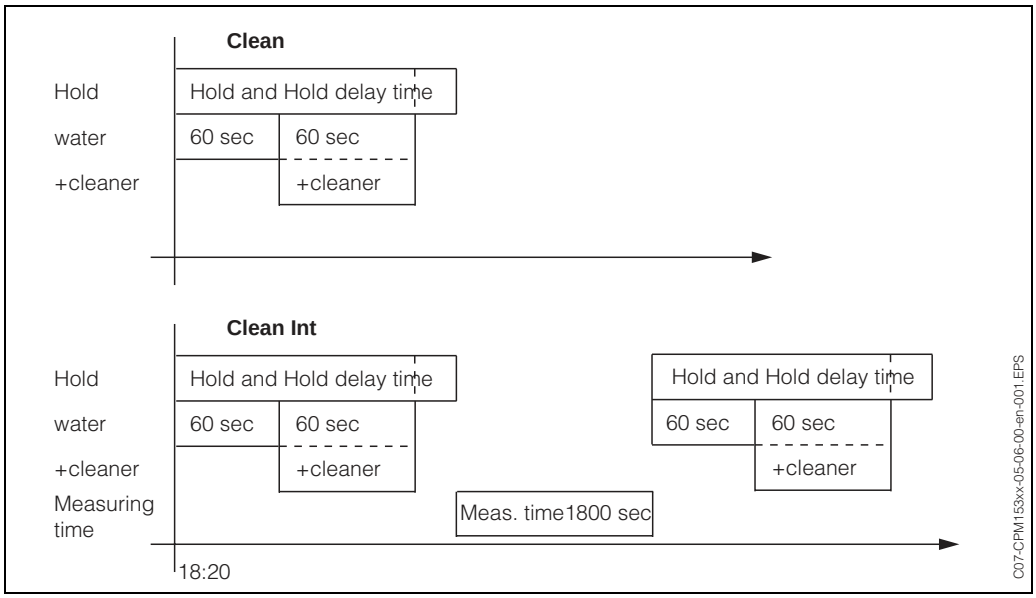


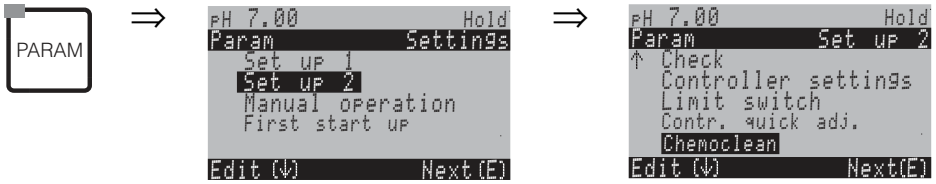
Fig. 28: Graphic representation of the above example

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

Field OAA1		Field OAA2 (with "Clean")		Field OAA2 (with "Clean Int")	
Clean		01 Water	**60 s**	01 Water	**60 s**
11:00	11:02	02 +Cleaner	**60s**	02 +Cleaner	**60s**
Clean		03 Water	**0 s**	03 Water	**0 s**
18:00	18:02	04 Rep. Clean	**0x**	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:



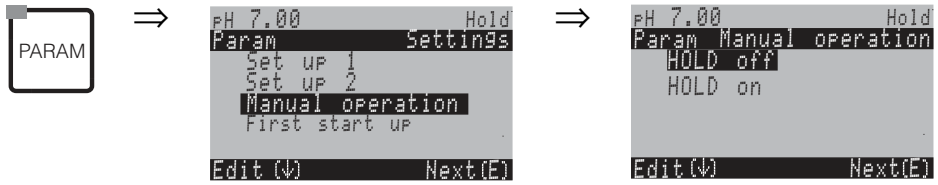
CODE	CHOICE (default = bold)		INFO
O1	Weekly progr. Clean trigger Ext. Control	**off** **off** **off**	**Select control levels** Select the function which will trigger ChemoClean cleaning.
O2	Weekly progr. Clean trigger Ext. Control	**off** **off** **off**	**Note in display:** Displays the current system status
O3	**Weekly programme** User prg.		**Select the configuration menu** *Weekly programme*: Select only with "weekly programme on" *User programme*: Here you create customer-specific programmes using the programme editor (see programme editor, p. 72).
Weekly programme:			
OA1	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.
OA2	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 field OA1 is copied to the day selected in the following field.
Edit day:			
OAA1	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. 72)
OAA2	01 Water 02 +Cleaner 03 Water 04 Rep. cleaning	0s 30s 30s 0x	**Select programme blocks** The times for individual programme steps can be individually adjusted here. Select a block for editing by pressing "E". *+Cleaner:* Cleaner will be delievered additional to water. *Rep. cleaning*: Number of repeats 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".

CODE	CHOICE (default = bold)	INFO
OAA3	**0010s** (0 ... 9999s)	**Water / cleaner:** Enter the time during which the valve remains open to allow the conveyance of water or cleaner.
OAA4	Repeat x number of times **00** (0 ... 10)	**Repeat cleaning** How often should the previous step (cleaner or water) be repeated?
Copy day:		
OAB1	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)***		
NAD1	**User prog. 1**	**Select user programme** With ChemoClean there is *one* user programme available.
NAD2	**Edit** Insert template Enable Disable Rename	**Select edit function** *Insert template*: An installed programme (e.g. *Clean*) can be inserted into the user programme. ✎ Note! • After a programme is disabled, it can be re-enabled at any time. • Leave this item by pressing "PARAM".
Edit:		
NADA1	01 02	**Select rows** The row with the selected position number can be edited with "E". ✎ Note! Leave this selection by pressing "PARAM".
NADA2	**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!)
Change/insert:		
NADA3	**Water** +Cleaner Wait Back to ...	**Select function** *Back to*: You can create a programme circuit with this function. Possible selection: Water, +Cleaner, wait, back to

CODE	CHOICE (default = bold)	INFO
Move to:		
NADA4	(Displays blocks as list) 01 Water 02 +Cleaner 03 Wait	**Select rows** You move the function selected in Field NADA1to the highlighted position. ✎ Note! The highlighted position will be overwritten.
Insert template:		
NADB1	User prog. = ? **no prog.** Clean _____	**Select the template** you want to copy to the user programme.
Enable programme:		
NADC1	Programme is enabled	**Note in display (no entry):** The created or edited programme is enabled.
NADC2	**User prog.** (0 ... 9; A ... Z)	**Change name** 9-character name for your user programme, freely selectable.
Disable programme		
NADD1	Do you want to disable the programme?	**Query** Pressing "E" (= Continue) disables the programme. Pressing "PARAM" (= Cancel) takes you back without disabling the programme.
NADD2	The programme was disabled.	**Note in display (no entry)**
Rename programme:		
NADE1	**Userprog.** (0 ... 9; A ... Z)	**Change name** 9-character name for your user programme, freely selectable.

6.5.16 Manual operation

To enter the menu, proceed as follows:



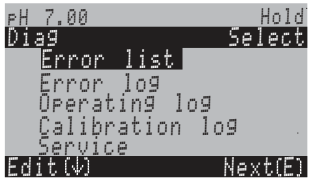
CODE	CHOICE (Default = bold)	INFO
R1	ChemoClean Hold	**Select manual operation** ✎ Note! • Leave the manual operation menu by pressing "PARAM", "DIAG" or "MEAS". • The settings are only active in this menu. Nothing is saved when you leave.
R2	!!!Caution!! You are now leaving manual operation.	**If you leave the manual operation:** Note in display Confirm with "Enter": Leave the manual operation. Abortion with "PARAM": Remaining in manual operation mode.
ChemoClean:		
RB1	Weekly progr. off Clean trigger off Ext. Control off	**Note in display (no entry):** System status
RB2	**Abort** Start	**ChemoClean cleaning** Start / Abort. Here, each external programme start is suppressed. ✎ Note! Leave this item by pressing "PARAM".
HOLD:		
RC1	**HOLD off** HOLD on	**Manual operation** Activate / deactivate Hold The "HOLD" function freezes the current outputs as soon 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 45).

6.5.17 Diagnosis

To enter the menu, proceed as follows:



⇒



⇒

CODE	CHOICE (Default = bold)	INFO
U	**Error list** Error log Operation log Calibration log Service	*Error list*: Displays the current active errors. (Complete error list with description s. page 93) *Error log*: Lists the last 30 signalled errors with date and time. *Operation log (service code necessary)*: Lists the last 30 registered operating steps with date and time. *Calibration log*: Lists the last 30 calibrations undertaken with date and time. ✎ Note! • Use the arrow keys to scroll through the lists. • Leave the lists by pressing "E".
Service:		
Y	**Factory settings** Simulations Check systems Reset DAT handling Instrument version Factory function	**Select service diagnosis** *Factory settings*: Different data groups can be reset to the factory settings. *Simulations*: The transmitter behaviour can be simulated after entering of different parameters. *Check systems*: The instrument functions (display, keys, etc.) can be tested individually. *Reset*: Device reset (no data loss!) *DAT handling*: Copy data into/out of the DAT module. *Instrument version*: Device-internal data e.g. serial number can be queried. *Factory function*: reset counter, write access
Factory settings:		
YA1	**Cancel** Settling data Calibration data All data 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 "Enter" deletes all the settings you made in this area! Pressing *Cancel* leaves this field without changing the values. Calibration data: All the saved data for calibrations such as zero point, slope, and offset. Setting data: the remaining data to be set. All data: calibration data + setting data Service data: all data + logbooks + reset counters. Service data / logbooks: these functions are only for authorised service personnel. The service code is required.

CODE	CHOICE (Default = bold)	INFO
Service data / logbooks:		
YAA1	**0000**	**Service code entry required** ✎ Note! For service access code, see Field D1, p. 34.
YAA2		**Note in display:** Incorrect service code entry (back to the last field)
Simulations:		
YB1	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)
YB2	Simulation: **off** Measured pH 07.00 value 1: 025.00°C Temperature: pH 00.00 Measured 000.00°C value 2: Temperature:	**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.
YB3	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.
Check systems		
YC1	Display Keypad RAM EEPROM Flash	**Select check** *Display*: All the fields are queries alternately. Defective cells become visible. *Keypad*: All the keys must be pressed one after the other. If the system is functioning perfectly, the appropriate 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".

CODE	CHOICE (Default = bold)	INFO
DAT handling:		
YD1	**Save to DAT** Read from DAT Erase DAT	**DAT selection** *Save to DAT*: You can save the both the configuration and the logbooks of your transmitter to the DAT module. *Read from DAT*: Copy the configuration saved on the DAT module into the EEPROM of the transmitter. *Delete DAT*: Delete all data on the DAT module. ✎ Note! • After the "Read from DAT" copying procedure, a reset is triggered automatically, and the device is configured with the copied values. (See below for reset). • If there is no DAT module inserted, a message appears on the display.
Save to DAT:		
YD2	!!Caution!! All the 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.
Read from DAT:		
YD3	in process	**Data were written to the DAT module**
Erase DAT:		
YD4	!!Caution!! All the 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.
Reset:		
YE		**Reset** You can restart the Mycom S with this function (similar to the "warm start" on your computer). You can use this function if the Mycom S does not react as expected. ✎ Note! This reset does not change saved data.
Instrument version:		
YF1	SW Version: 1.2 HW Version: 1 Serial No.: 12345678 Card ID: 1AB	**Controller data** Open controller data and the hardware version.
YF2	SW Version: 1.2 HW Version: 1 Serial No.: 12345678 Card ID: 1AB	**Basic module data**
YF3	SW Version: 1.2 HW Version: 1 Serial No.: 12345678 Card ID: 1AB	**Transmitter 1 data** Open transmitter data (1).

CODE	CHOICE (Default = bold)	INFO
YF4	SW Version: 1.2 HW Version: 1 Serial No.: 12345678 Card ID: 1AB	**Transmitter 2 data** Open transmitter data (2).
YF5	SW Version: 1.2 HW Version: 1 Serial No.: 12345678 Card ID: 1AB	**DC-DC converter** (only for two-circuit)) Module for power supply of transmitter 2
YF6	SW Version: 1.2 HW Version: 1 Serial No.: 12345678 Card ID: 1AB	**Relay data**
YF7	12345678901234	**Enter serial number** 14 digit number consisting of 0 ... 9 and A ... Z
YF8	CPM153-A2B00A010	**Order Code** 15 digit number consisting of 0 ... 9 and A ... Z
ChemoClean:		
YG1	Weekly progr. off Clean trigger off Ext. Control off	**Note in display (no entry):** System status
YG2	With E running programme is aborted.	**Note in display (no entry):** To be able to carry out the diagnosis, you must abort the programme currently running by pressing the "Enter" key.
YG3	Ext. Inputs Hardware	**Selection ChemoClean check**
Ext. Inputs:		
YGA1	Start Userprog AutoStop on Wait-Trigger on Measuring on Service on	**Info field:** status of external digital inputs
Hardware:		
YGB1	Water Cleaner Water and cleaner	**Selection hardware** Select a function which shall be tested.
YGB2	Weekly progr. off Clean trigger off Ext. Control off	**Note in display (no entry):** System status
Factory functions:		
YH1	**0**	**Reset counter** (only triggered by watchdog) Can be reset via Set Default → service data.
YH2	**1**	**Write access** Number of write accesses to the EEPROM is reported here.

6.5.18 Calibration

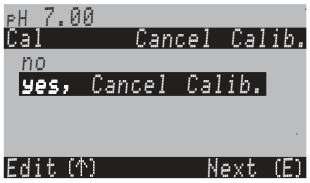
✎ Note!
The defaults for the on-site calibration are set in the menu
"PARAM" → "Set up 1" → "Calibration" (s. page 80 for pH / page 82 for redox).

The calibration can be protected with the maintenance and the specialist codes. No calibration can be carried out at the display level (compare with page 34).

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 90, pH and page 91, redox)
- For measurements with PML (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.

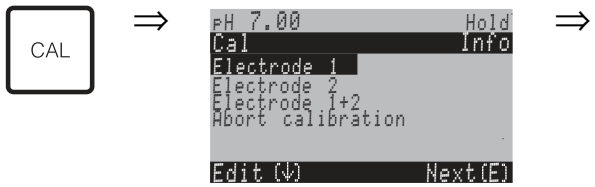


- If you confirm this with "yes, cancel cal.", you return to the measurement mode.
- If you select "no", calibration is continued.

The following section describes the calibration procedures for:

pH calibration	→	"Manual data entry" (s. page 80)
	→	"Manual calibration with buffer" (s. page 80)
	→	"Calibration with fixed buffer" (s. page 80)
	→	"Calibration with automatic buffer recognition" (s. page 80)
Redox absolute calibration	→	"Absolute data entry" (s. page 82)
	→	"Absolute calibration" (s. page 83)
Redox relative calibration	→	"Absolute data entry" (s. page 84)
	→	"Relative data entry" (s. page 86)
	→	"Absolute calibration" (s. page 85)
	→	"Relative calibration" (s. page 87)
	→	"50 % turnover point" (s. page 88)

To enter the menu, proceed as follows:



pH calibration

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

CODE	CHOICE (default = bold)	INFO
C1	**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.
CA	Calibration with data entry	**Note in display** Display of the type of on-site calibration selected in the calibration settings.
CAA1	**025.0 °C** (–20.0 ... +150.0 °C)	**Entry of temperature,** at which zero point and slope have been determined.
CAA2 / CAA3	**07.00** (pH –2.00 ... +16.00) IsFET: **act.value** (–500 ... +500mV)	**Entry of the electrode zero point 1 / 2** Confirm by pressing E
CAA4 / CAA5	**59.16 mV/pH** (5.00 ... 99.00 mV/pH)	**Entry of the electrode slope 1 / 2** Confirm by pressing E"
CAA6	**Accept** Reject Recalibrate	**End of calibration** *Accept*: Pressing E accepts the new calibration data. *Reject*: The data is not accepted and the device has not been recalibrated. *Recalibrate*: The data is rejected and the device is recalibrated.
CAA7	Electrode in medium?	**Note in display:** If the electrode is back in the medium, so that measurement can take place?

pH calibration

"Calibration with manual buffer" / "Calibration with fixed buffer" / "Calibration with automatic buffer recognition"
Buffer manual: The buffer pH value is entered manually. The display then shows the current measured value.
Fixed buffer: 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!
The automatic buffer recognition is only possible with glass electrodes.

CODE	CHOICE (default = bold)	INFO
C1	**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.
CA	Calibration with manual buffer (with fixed buffer / automatic buffer recognition)	**Note in display** Display of the type of on-site calibration selected in the calibration settings.
CAB1	**025.0 °C** (–20.0 ... +150.0 °C)	**Enter temperature,** (only if "Calibrate with MTC" is selected) Confirm by pressing E
CAB2	**025.0 °C** (–20.0 ... +150.0 °C)	**Enter buffer temperature** (only if "Calibrate with MTC" is selected) Confirm by pressing E
CAB3 / CAB7	Immerse: pH electrode in buffer 1	**Handling instructions** Immerse the electrode in buffer 1 / 2. Confirm by pressing E
CAB4 / CAB8	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
CAB5 / CAB9	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
CAB6 / CAB10	Invalid calibration value	**Note in display:** If an error is present (e.g. incorrect buffer used), this message is displayed.
CAB11 / CAB13	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.
CAB12 / CAB14	Electrode status K1 good	**Note in display:** Electrode status circuit 1 / 2: There are three status messages for the electrode status: "good", "OK.", "bad". If the status is displayed "bad", electrode replacement is recommended to ensure the quality of the pH measurement.
CAB15	**Accept** Reject Recalibrate	**End of calibration** *Accept*: Pressing E accepts the new calibration data. *Reject*: The data is not accepted and the device has not been recalibrated. *Recalibrate*: The data is rejected and the device is recalibrated.
CAB16	Electrode in medium?	**Note in display:** If the electrode is 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.

CODE	CHOICE (default = bold)	INFO
C1	**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.
CB	Calibration with abs. data entry	**Note in display** Display of the type of on-site calibration selected in the calibration settings.
CBA1 / CBA2	**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.
CBA3	Offset too high / too low	**Note in display:** Error message if the entered offset leaves the maximum range.
CBA4	**Accept** Reject Recalibrate	**End of calibration** *Accept*: Pressing E accepts the new calibration data. *Reject*: The data is not accepted and the device has not been recalibrated. *Recalibrate*: The data is rejected and the device is recalibrated.
CBA5	Electrode in medium?	**Note in display:** If the electrode is 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.

CODE	CHOICE (default = bold)	INFO
C1	**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.
CB	Calibration with abs. calibration	**Note in display** Display of the type of on-site calibration selected in the calibration settings.
CBB1	Immerse: Electrode in buffer	**Handling instructions** Immerse the electrode in the buffer. Confirm by pressing E
CBB2	**0225 mV** (–1500 ... +1500 mV)	**Enter buffer** During calibration, enter the buffer mV value.
CBB3	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
CBB4	Invalid calibration value	**Note in display:** Error message if the entered offset is too large.
CBB5 / CBB6	Offset 0005 Good mV	**Note in display:** Info on electrode 1. Data on the offset and calibration quality.
CBB7	**Accept** Reject Recalibrate	**End of calibration** *Accept*: Pressing E accepts the new calibration data. *Reject*: The data is not accepted and the device has not been recalibrated. *Recalibrate*: The data is rejected and the device is recalibrated.
CBB8	Electrode in medium?	**Note in display:** If the electrode is 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.

CODE	CHOICE (default = bold)	INFO
C1	**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.
CC	Calibration with abs. data entry	**Note in display** Display of the type of on-site calibration selected in the calibration settings.
CCA1 / CCA2	**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.
CCA3	Offset too high / too low	**Note in display:** Error message if the entered offset leaves the maximum range.
CCA4	**Accept** Reject Recalibrate	**End of calibration** *Accept*: Pressing E accepts the new calibration data. *Reject*: The data is not accepted and the device has not been recalibrated. *Recalibrate*: The data is rejected and the device is recalibrated.
CCA5	Electrode in medium?	**Note in display:** If the electrode is 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.

CODE	CHOICE (default = bold)	INFO
C1	**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.
CC	Calibration with abs. calibration	**Note in display** Display of the type of on-site calibration selected in the calibration settings.
CCB1	Immerse: Electrode in buffer	**Handling instructions** Immerse the electrode in the buffer. Confirm by pressing E
CCB2	**0225 mV** (–1500 ... +1500 mV)	**Enter buffer** During calibration, enter the buffer mV value.
CCB3	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
CCB4	Invalid calibration value	**Note in display:** Error message if the entered offset is too large.
CCB5 / CCB6	Offset 0005 Good mV	**Note in display:** Info on electrode 1 / 2 Data on the offset and calibration quality.
CCB7	**Accept** Reject Recalibrate	**End of calibration** *Accept*: Pressing E accepts the new calibration data. *Reject*: The data is not accepted and the device has not been recalibrated. *Recalibrate*: The data is rejected and the device is recalibrated.
CCB8	Electrode in medium?	**Note in display:** If the electrode is back in the medium, so that measurement can take place?

Calibration redox relative

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

CODE	CHOICE (default = bold)	INFO
C1	**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.
CC	Calibration with rel. data entry	**Note in display** Display of the type of on-site calibration selected in the calibration settings.
CCC1 / CCC2	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.
CCC3	Offset too high / too low	**Note in display:** Error message if the entered offset leaves the maximum range.
CCC4	**Accept** Reject Recalibrate	**End of calibration** *Accept*: Pressing E accepts the new calibration data. *Reject*: The data is not accepted and the device has not been recalibrated. *Recalibrate*: The data is rejected and the device is recalibrated.
CCC5	Electrode in medium?	**Note in display:** If the electrode is 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.

CODE	CHOICE (default = bold)	INFO
C1	**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.
CC	Calibration with abs. calibration	**Note in display** Display of the type of on-site calibration selected in the calibration settings.
CCD1 / CCD4	Immerse: Electrode in buffer 1	**Handling instructions** Immerse the electrode in buffer 1 / 2 (detoxified sample, see above). Confirm by pressing E
CCD2 / CCD5	**20 %** (0 ... 30 %)	**Enter buffer** Enter the relative redox value of buffer 1 / 2 (detoxified sample) in percent.
CCD3 / CCD6	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
CCD7	Invalid calibration value	**Note in display:** Error message if the entered offset is too large.
CCD8	**Accept** Reject Recalibrate	**End of calibration** *Accept*: Pressing E accepts the new calibration data. *Reject*: The data is not accepted and the device has not been recalibrated. *Recalibrate*: The data is rejected and the device is recalibrated.
CCD9	Electrode in medium?	**Note in display:** If the electrode is back in the medium, so that measurement can take place?

Calibration redox relative

"50 % turnover point"
The 50 % turnover point must be known (e.g. through titration of the toxic solution). It is used as the buffer of a sample at this turnover point.

CODE	CHOICE (default = bold)	INFO
C1	**Electrode 1** Electrode 2 shared Abort calibration	**Selection for calibration** (only two-circuit) lect electrode 1 *or* 2, and then run through calibration for each individual electrode.
CC	Calibration with 50 % turnover point	**Note in display** Display of the type of on-site calibration selected in the calibration settings.
CCE1	Immerse: Electrode in buffer	**Handling instructions** Immerse the electrode in buffer (sample at 50 % turnover point, see above). Confirm by pressing E
CCE2	**20 %** (0 ... 30 %)	**Enter buffer** Enter the relative redox value of buffer 1 (detoxified sample) in percent.
CCE3	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
CCE4 / CCE5	50 % voltage -500 mV 20 % 0395 mV 80 % -0500 mV	**Note in display:** Info on electrode 1 / 2 Data on the voltage sequence on the calibration curve.
CCE6	Invalid calibration value	**Note in display:** Error message if the entered offset is too large.
CCE7	**Accept** Reject Recalibrate	**End of calibration** *Accept*: Pressing E accepts the new calibration data. *Reject*: The data is not accepted and the device has not been recalibrated. *Recalibrate*: The data is rejected and the device is recalibrated.
CCE8	Electrode in medium?	**Note in display:** If the electrode is back in the medium, so that measurement can take place?

7 Maintenance

CPM 153 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 83).



Warning!
Danger to persons. 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 in-field instruments:
  Retighten the terminals in the instrument. Also check 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 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.

Preliminary pH calibration work

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 (CPS 401), 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 thinned 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!

- Only clean redox electrodes 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 system for 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.
- Not permitted: horizontal installation or installation with the plug-in head pointing downwards.

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 still unsymmetrical operating mode ("without PML") selected. See functional description, Field A6 on p. 32.
- 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).

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

- Carefully use mechanical means to clean metal pins or surfaces which have deposits on them, e.g. with 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.

Execution of calibration
The different types of calibration and their execution are described from page 82.

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. 93 : Error number list → List of all occurring error numbers.
Chap. 8.1.2, p. 99: Process-specific error → e.g. temperature value is incorrect.
Chap. 8.1.3, p. 101: 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 is required under voltage, this may only be carried out by an electrician, but 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 Field H5 (Alarm menu) on page 44.
- 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 EEP-ROM		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		–	–
E 008	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	
E 009	Failure	SCS message sensor 2		yes		no		no	
E 010	Failure	Temperature sensor 1 defective	Check temperature sensor and connections.	yes		no		no	
E 011	Failure	Temperature sensor 2 defective	Check temperature sensor and connections.	yes		no		no	
E019	Failure	Delta limit exceeded	Difference between channel 1 and 2 measured values too high. Process to inconsistant or sensor defective. Replace sensor if necessary.	yes		no		–	–

Error no.	NAMUR class	Error message	Possible causes / measures	Alarm contact		Error current		Automatic cleaning start	
				Fact	User	Fact	User	Fact	User
E027	Failure	Compressed air failure	Pressure below permitted minimum	yes		no		no	
E 030	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		–	–
E 031	Failure	SCS fault reference electrode 2		yes		no		–	–
E 032	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		–	–
E 033	Failure	Outside set zero point for sensor 1		yes		no		–	–
E 034	Failure	Outside set offset range for sensor 1		yes		no		–	–
E 035	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		–	–
E 036	Failure	Outside set zero point for sensor 2		yes		no		–	–
E 037	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 to inconsistant 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	PAL 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	PAL 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 inconsistant.	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
E027	Failure	Compressed air failure	Pressure below permitted minimum	yes		no		no	
E 030	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		–	–
E 031	Failure	SCS fault reference electrode 2		yes		no		–	–
E 032	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		–	–
E 033	Failure	Outside set zero point for sensor 1		yes		no		–	–
E 034	Failure	Outside set offset range for sensor 1		yes		no		–	–
E 035	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		–	–
E 036	Failure	Outside set zero point for sensor 2		yes		no		–	–
E 037	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 to inconsistant 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	PAL 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	PAL 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 inconsistant.	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	
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	
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.	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	
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		–	

Error no.	NAMUR class	Error message	Possible causes / measures	Alarm contact		Error current		Automatic cleaning start	
				Fact	User	Fact	User	Fact	User
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		–	

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 keyboard (Keys "CAL" + "DIAG" simultaneously = 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 (only file in one direction)
	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
Keine Kalibrierung möglich, weil Sensor-Anpasszeit zu lang.	Bei IsFET-Sensor: Feuchtigkeitsfilm der Messfläche abgerissen durch Abtrocknen oder Ausblasen mit Druckluft.	Feuchtigkeitsfil sicherstellen oder Puffer-Verweildauer > 6 Min. sicherstellen. IsFET-Sensor nicht mit Druckluft reinigen.	
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 (CPY 4-x)
	Problem with diaphragma 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. 4.1.1
	Measuring cable defective	Check cable	Ohmmeter
	Incorrect sensor type selected	Set sensor type on instrument (Field 141)	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 CPS 11-xASxx or Ceraliquid CPS 41
	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. 4.1.1
	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. 6.5	
	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	Shorted 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

Error	Possible cause	Remedial action	Equipment needed, spare parts
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 see Chap. 8.3
	Incorrect version		Resistance input only permissable with non-Ex.
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	
Data cannot be saved	No DAT memory module available		DAT available as accessory, see Chap. 9

8.1.3 Instrument-specific error

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 not change in display and/or instrument cannot be operated	Instrument or module in instrument not correctly installed	Check module connections	see installation diagram page 105
	Operating system in impermissible state	Switch instrument off and on	poss. EMC problem: if problem persists, have installation checked by E+H 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, performed using installation diagram page 105
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 circuit 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" / internal data

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 43).
If you have configured the controller for functioning with a current output, no error current is output on this current output should an error occur.

8.2.2 Response of contacts to errors

You can select the assignment of which instrument error messages trigger an alarm individually for each error message (see table on page 93, editing errors on page 44). In "NAMUR" mode, failure messages (E 001 – E 029) 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

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

8.2.3 Response of contacts to power failure

In the "Basic Settings" menu → "Contacts", you can define the contacts as NC contacts or NO contacts (s. page 36). 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 non-Ex	Module M3K	51507084
30	Power supply 100 ... 230 VAC non-Ex	Module M3G, power unit + 3 relay	51507087
30	Power supply 24 VAC/DC non-Ex	Module M3G, power unit + 3 relay	51507089
40	DC/DC convertor for measuring circuit 2	Module M3DC / Ex and non-Ex	51507091
50	Controller module pH, 2 x current output	Module M3CH-S2 / Non-Ex	51509506
50	Controller module pH, 2 x current + HART	Module M3CH-H2 / Non-Ex	51509507
50	Controller module pH, PROFIBUS-PA	Module M3CH-PA / Ex and non-Ex	51507094
50	Controller module pH, PROFIBUS-DP	Module M3CH-DP/ Non-Ex	51507095
60	pH input module	Module MKP2 / Ex and non-Ex	51507096
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 / Ex and 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 / Ex and non-Ex	51509513
80	Terminal set for pH input	Six-pin terminal + two-pin terminal	51507100
90	Jumper set	Five sets of all three jumper types	51507102
100	Partition plate for connection compartment	Five 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

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 103.

8.4.1 Device view

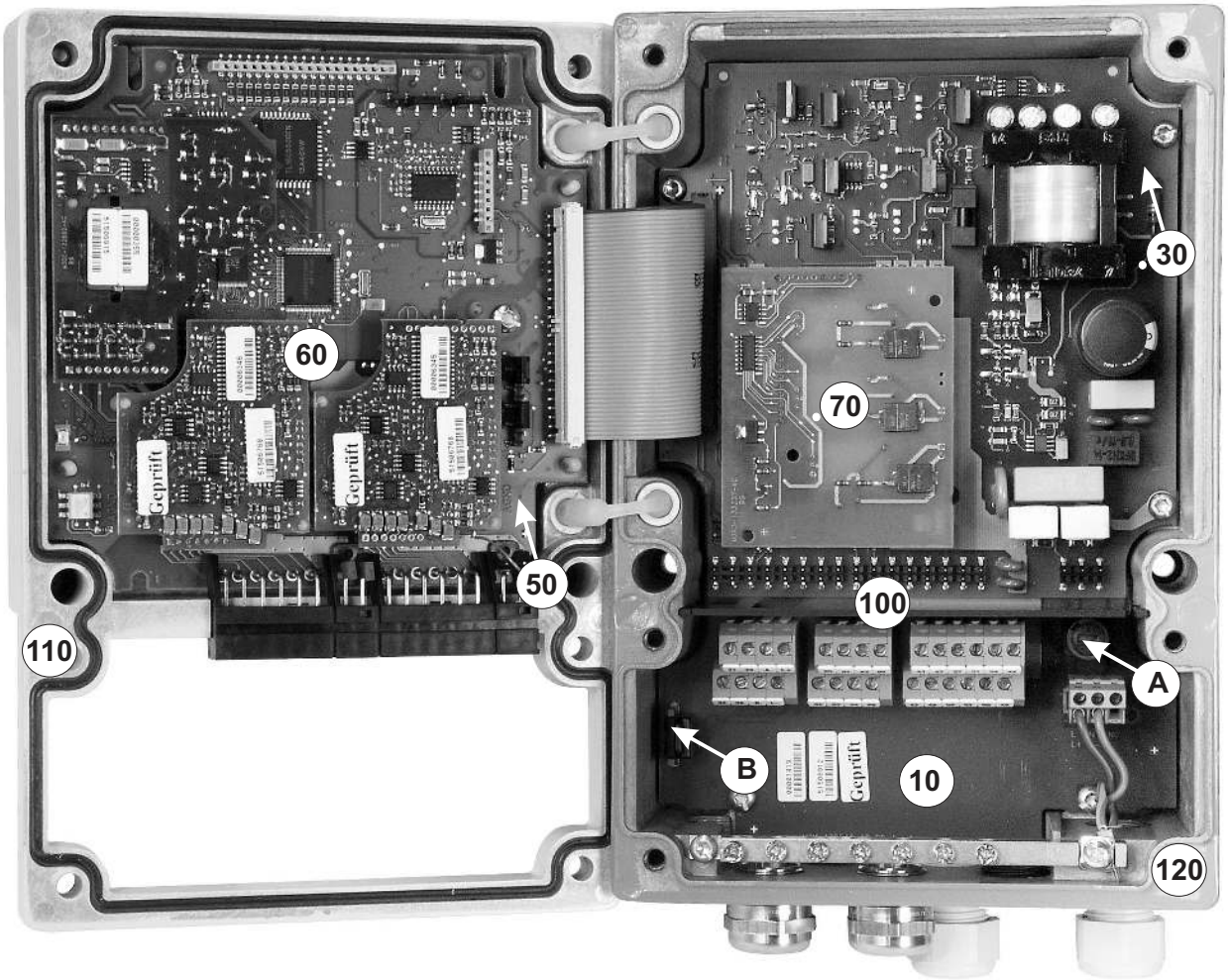


fig. 29: Interior view of the transmitter Mycom S
Remarks:
A: The figure shows the non-Ex fuse.
B: Slot for DAT memory module
10: Terminal module
30: Supply module
50: Controller module
60: pH input module
70: Relay module
80: Terminal set pH input
100: Partition plate (not shown in figure)
110: Housing 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!

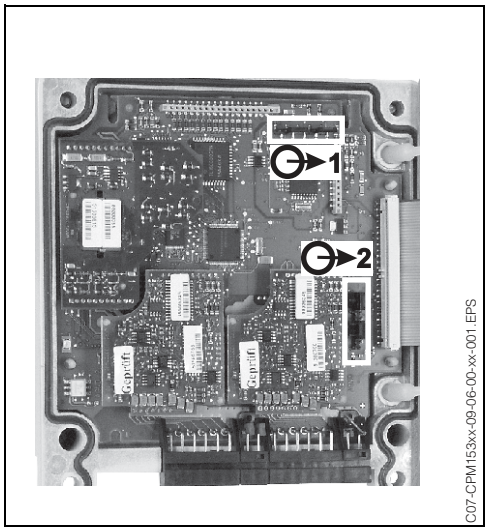


Fig. 30: Coding for active current outputs (Inner view of the housing's upper side)

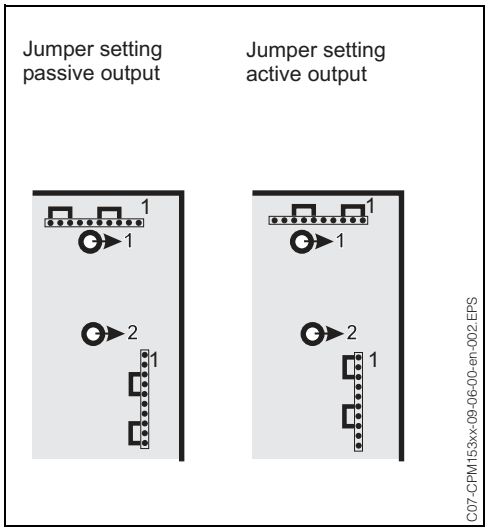


Fig. 31: Coding for passive or active current outputs

8.5 Replacing the device fuses

8.5.1 For non-Ex devices



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

- Position of the fuse holder: "A" in Fig. 29.
- Use only a 5 x 20 mm fine-wire fuse with 3.15 mA, 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 CPM 153 is a transmitter which contains electronic components and PCBs and therefore must be disposed of as electronic refuse. Please keep to the local regulations.

9 Accessories

Offline configuration

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 loggers of the CPM 153 and
- *copy* the complete settings to other CPM 153 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 CPA 140	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 • Channel
FlowFit P CPA 240	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 CPA 471 / 472 / 473 / 474 / 475	Retractable assembly for manual or pneumatic operation. Cleaning and calibrating the electrode is possible in process. CPA 475: 3A approval, EHEDG. Technical Information: CPA 471: TI 217C/07/en, Order No.: 51502596 CPA 472: TI 223C/07/en, Order No.: 51502645 CPA 473: TI 344C/07/en, Order No.: 51510923 CPA 474: TI 345C/07/en, Order No.: 51510925 CPA 475: 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 W CPS 11/12/13	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, Order No.: 50054649	• General process engineering • Industrial wastewater • Detoxification (cyanide, chrome) • Neutralisation
CeraLiquid P CPS 41/42/43	Electrodes with ceramic diaphragms and KCl liquid electrolyte, use with counterpressure, explosion-proof up to 8 bar Technical Information: TI 079C/07/en, Order No.: 50059346	• General process engineering • Ultra-pure water • Boiler feed water • Detoxification (cyanide)
CeraGel P CPS 71/72	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, Order No.: 51505837	• General process engineering • Food processing • Water treatment
TopHit H CPS 401	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, Order No.: 51506685	• General process engineering • Food, pharmaceutical applications • Water treatment • Biotechnology

Rinse connection adapter

Rinse connection adapter CPR 40 for the transport of cleaning agents for use with retractable assemblies.
Technical Information TI 342C/07/en, Order No. 51510059

Spray cleaning system

CYR 10 / CYR 20 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 cable

- *CPK 1*: Version with pilot wire and additional outer screen, sheathed in PVC, dia. 7.2 mm. Extension with cable CYK 71 possible, see table "Measuring cable as yard goods".
- *CPK 9*: For pH/redox electrodes with integrated temperature sensor and TOP68 plug-in head (version ESA, ESS). Extension with cable CYK 71 possible, see table "Measuring cable as yard goods".
- *CPK 12*: For IsFET pH sensors and pH/redox electrodes with integrated temperature sensor and TOP68 plug-in head. Extension with cable CYK 12 possible, see table "Measuring cable as yard goods".
- *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

Measuring cable as yard goods

Cable	Description	Order number
CYK 71	Measuring cable, consisting of a coaxial cable and 4 pilot wires	50085333
	Measuring cable for Ex applications	50085673
DMK	Connecting measuring cable, consisting of 3 coaxial cables	50003864
	DMK blue for Ex applications	50003866
CYK 12	Measuring cable, coax and 5 pilot wires, black	51506598
	Measuring cable for Ex applications, blue	51506616

Buffer solutions

Type	Characteristic value / contents	Applications
CPY 2	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)
CPY 3	+225 mV pH 7.0, contents: 100 ml; Order No.: CPY 3-0 +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

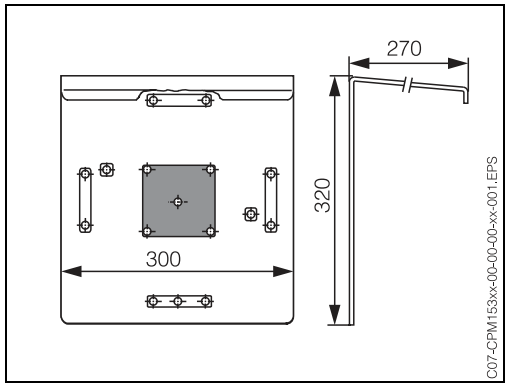
Flat gasket for sealing the front panel mounting of the CPM 153. Order No.: 50064975

Weather protection cover CYY 101

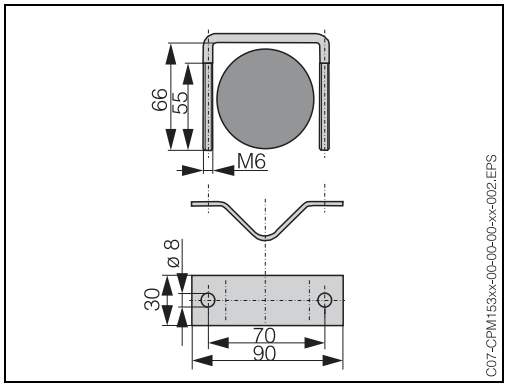
For installing the transmitter outdoors.

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



Weather protection cover CYY 101



Round post fixture for CYY 101

Technical Information TI 092C/07/en, Order No. 50061228

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
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: 1.8 ... 18 pH Redox: 300 ... 3000 mV Temperature: 17 ... 170°C
	active current output (only non-Ex): Load	max. 600 Ω
	passive current output: Input voltage range	6 ... 30 V

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

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
Controller	Function (selectable):		Pulse-length controller (PWM) Pulse-frequency controller (PFM) Three-point step controller (3-PS) 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

	With the maximum settable frequency in PFM	120 min^{-1}
	With the maximum settable period length in PWM	1 ... 999.9 s
	With PWM minimum switch-on period	0.4 s
Relay contacts	The NC/NO 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 CPM 153-xxxx**0**xxxx	100 ... 230 V AC +10/–15%
	Frequency	47 ... 64 Hz
	Power supply for CPM 153-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	3 x 2.5 mm^2

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	

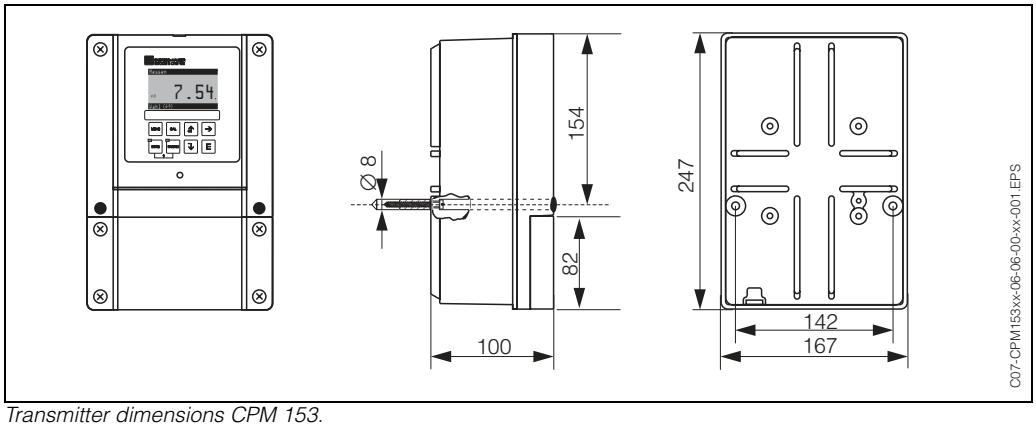
[1]: acc. to IEC 746-1, under nominal operating conditions

10.4 Ambient conditions

Ambient temperature	–10 ... +55°C
Ambient temperature limit	–20 ... +60°C
Storage and transport temperature	–30 ... +80°C
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)

10.5 Mechanical data

Design / dimensions



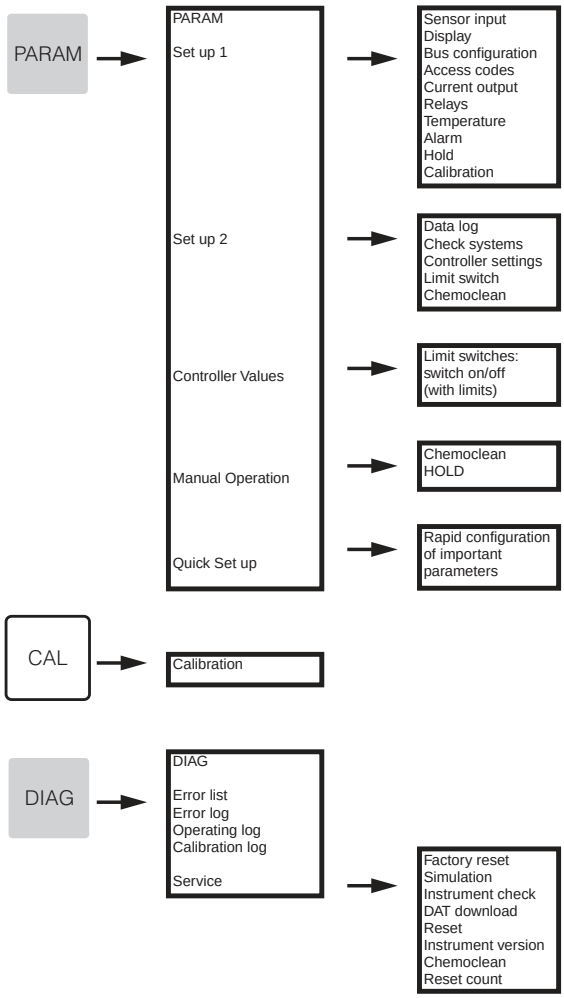
Transmitter dimensions CPM 153.

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

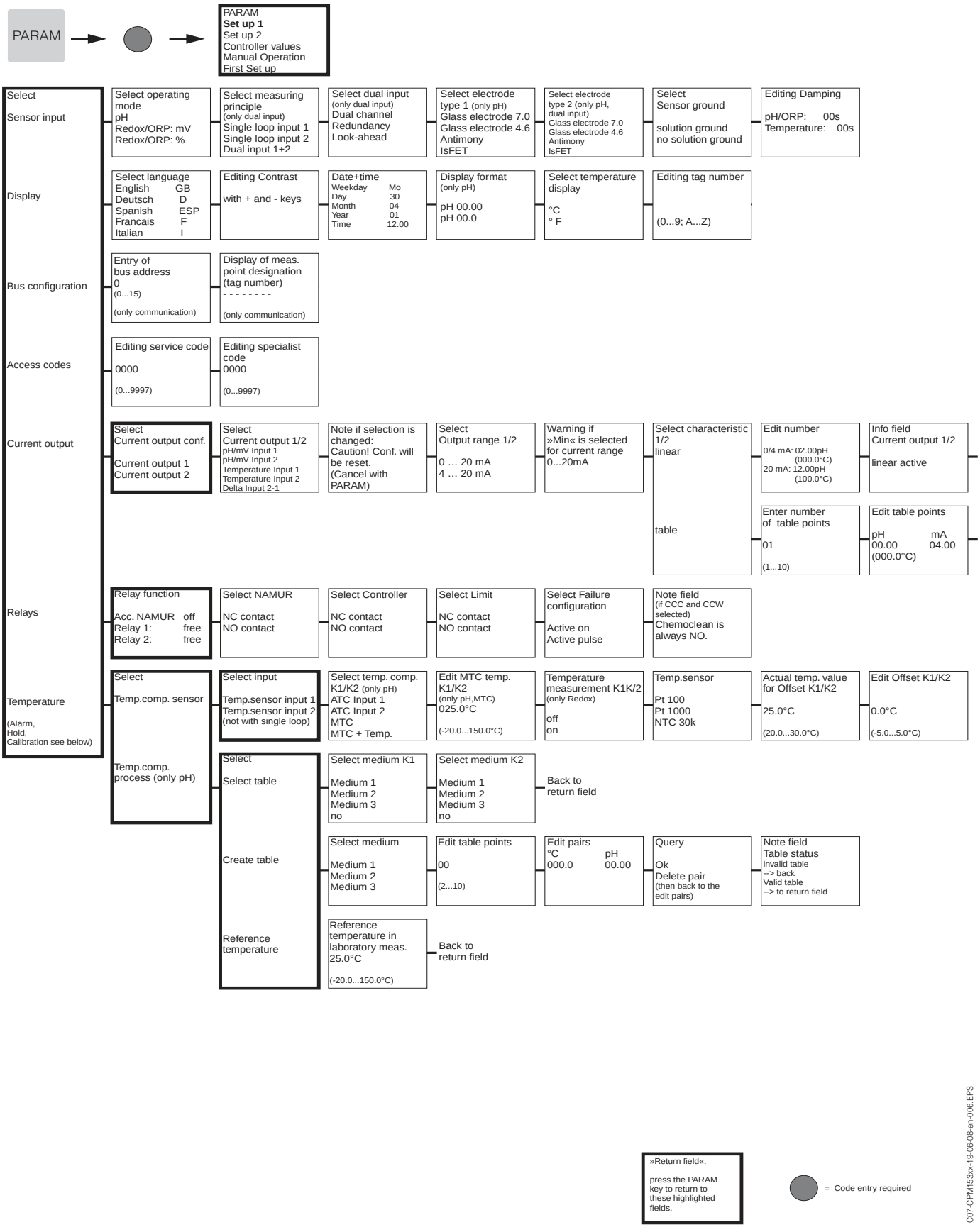
11 Appendix

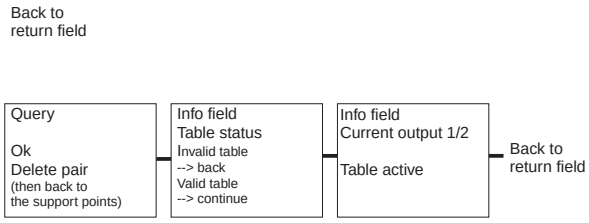
11.1 Operating matrix

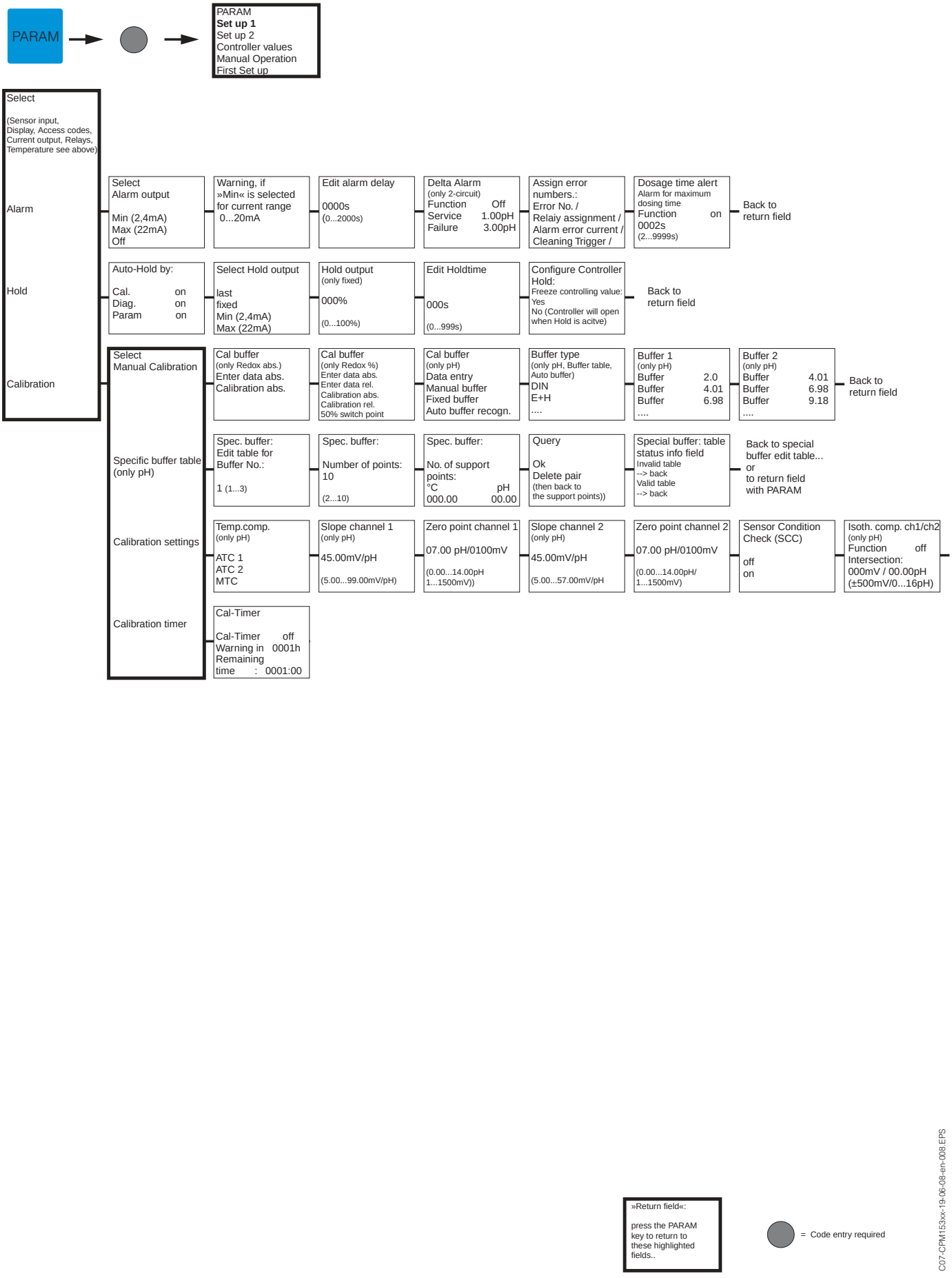
The basic structure of the operating menu is shown below.

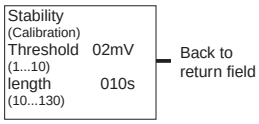


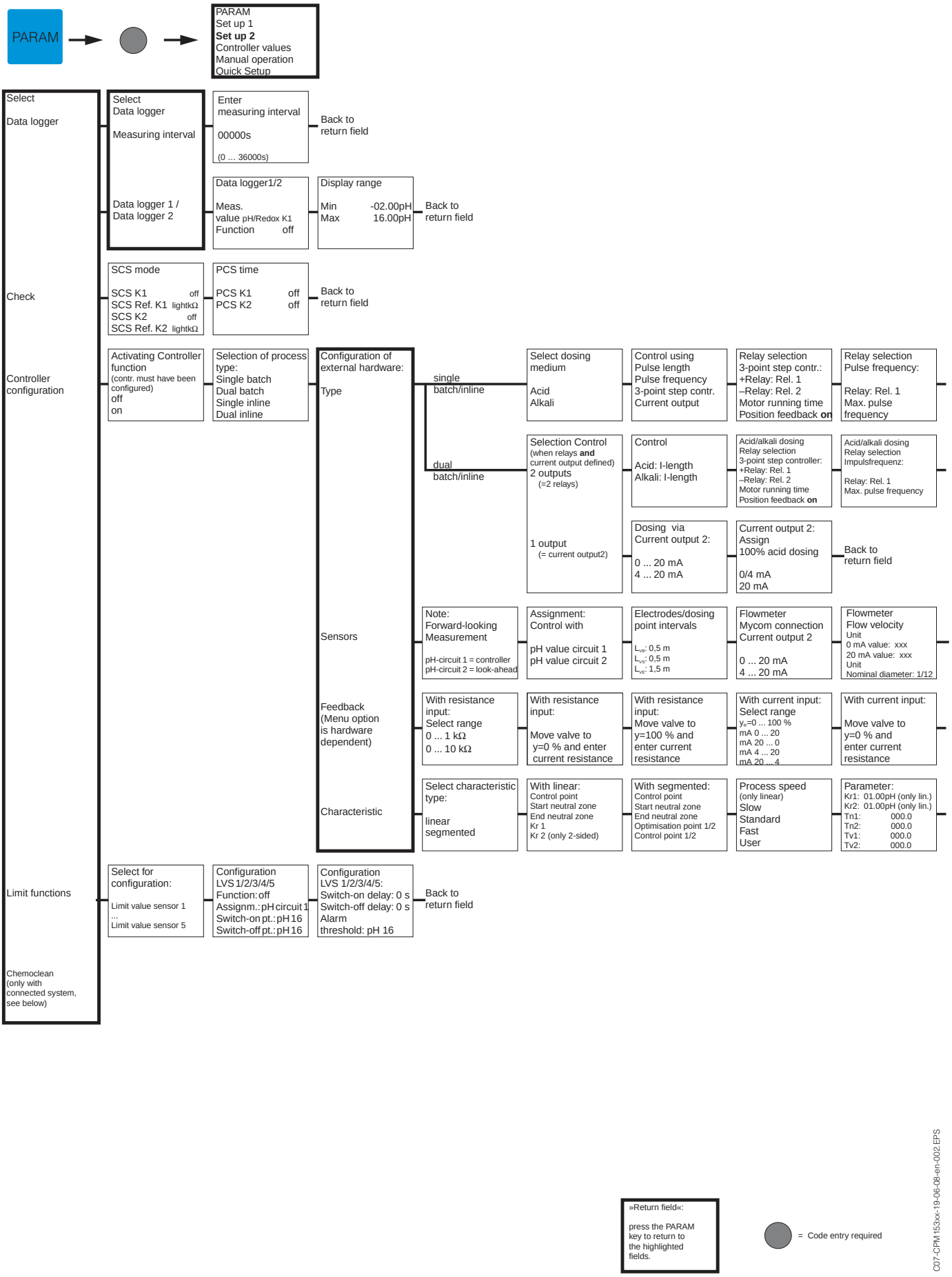
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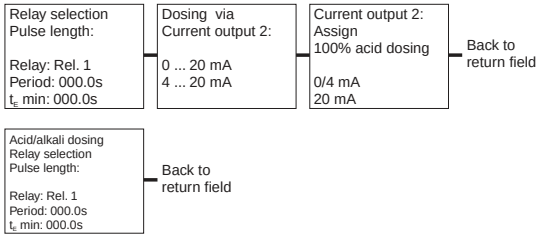

PARAM
PARAM
Set up 1
Set up 2
Controller values
Manual Operation
First Set up
Select
Sensor input
Select operating mode
pH
Redox/ORP: mV
Redox/ORP: %
Select measuring principle
(only dual input)
Single loop input 1
Single loop input 2
Dual input 1+2
Select dual input
(only dual input)
Dual channel
Redundancy
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

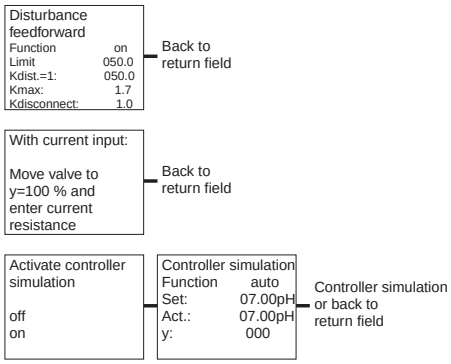

Back to
return field
Query
Ok
Delete pair
(then back to
the support points)
Info field
Table status
Invalid table
--> back
Valid table
--> continue
Info field
Current output 1/2
Table active
Back to
return field

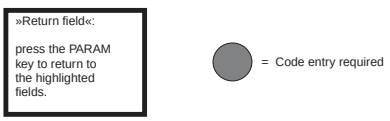

PARAM
PARAM
Set up 1
Set up 2
Controller values
Manual Operation
First Set up
Select
(Sensor input, Display, Access codes, Current output, Relays, Temperature see above)
Alarm
Select Alarm output
Min (2,4mA)
Max (22mA)
Off
Warning, if »Min« is selected for current range
0...20mA
Edit alarm delay
0000s
(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 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


Stability
(Calibration)
Threshold 02mV
(1...10)
length 010s
(10...130)
Back to
return field

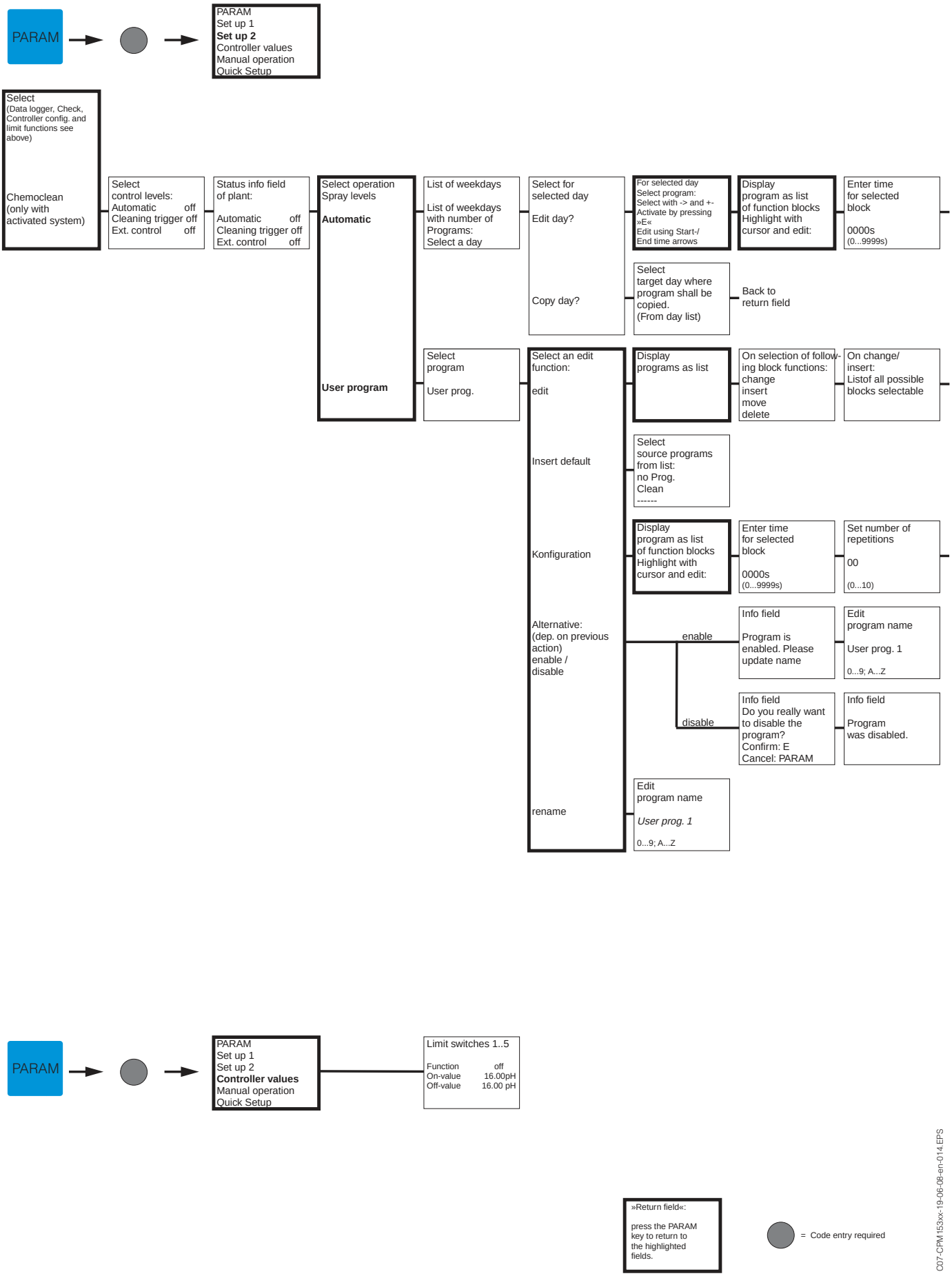

PARAM
PARAM
Set up 1
Set up 2
Controller values
Manual operation
Quick Setup
Select
Data logger
Limit functions
Chemoclean
(only with
connected system,
see below)
Check
Controller
configuration
Select
Data logger
Measuring interval
Data logger 1 /
Data logger 2
Enter
measuring interval
00000s
(0 ... 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
(contr. must have been
configured)
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 output 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
»Return field«:
press the PARAM
key to return to
the highlighted
fields.
= Code entry required
C07-CPM153xx-19-06-08-en-002.EPS



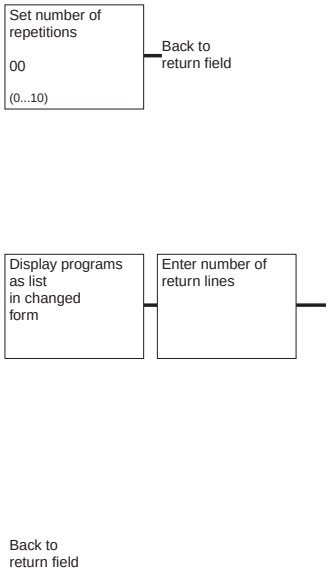


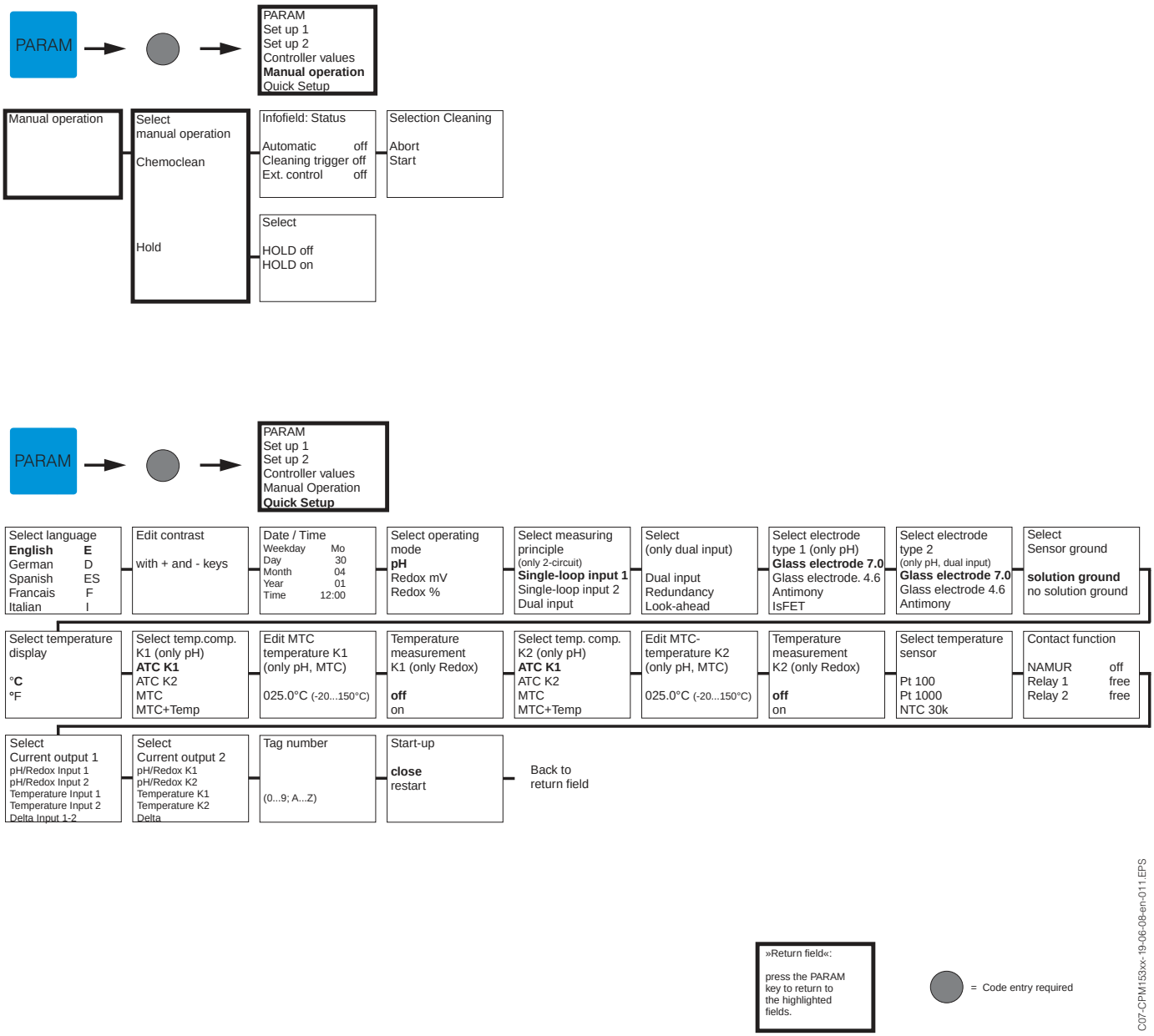


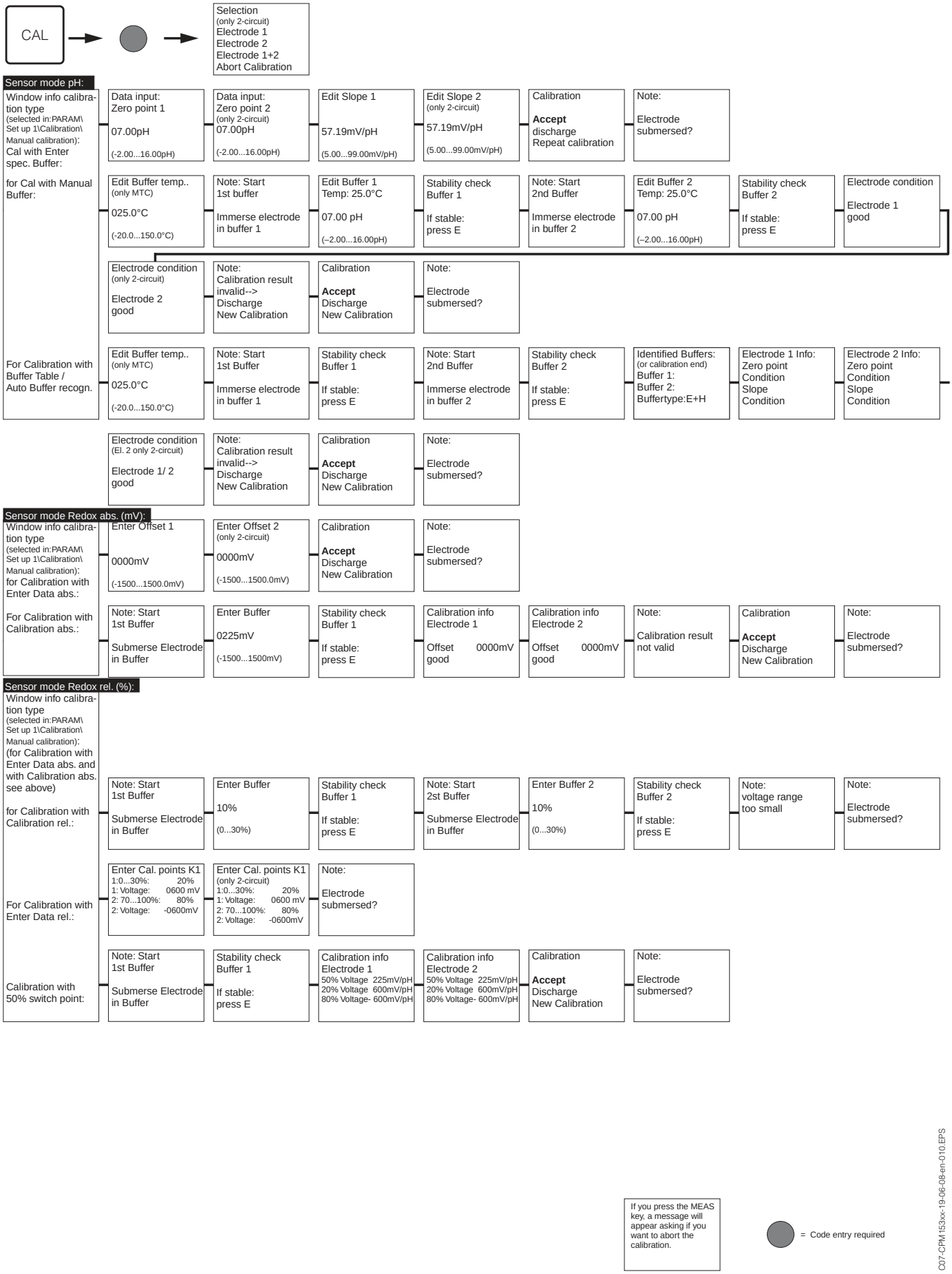
C07-CPM153xx-19-06-08-en-003.EPS

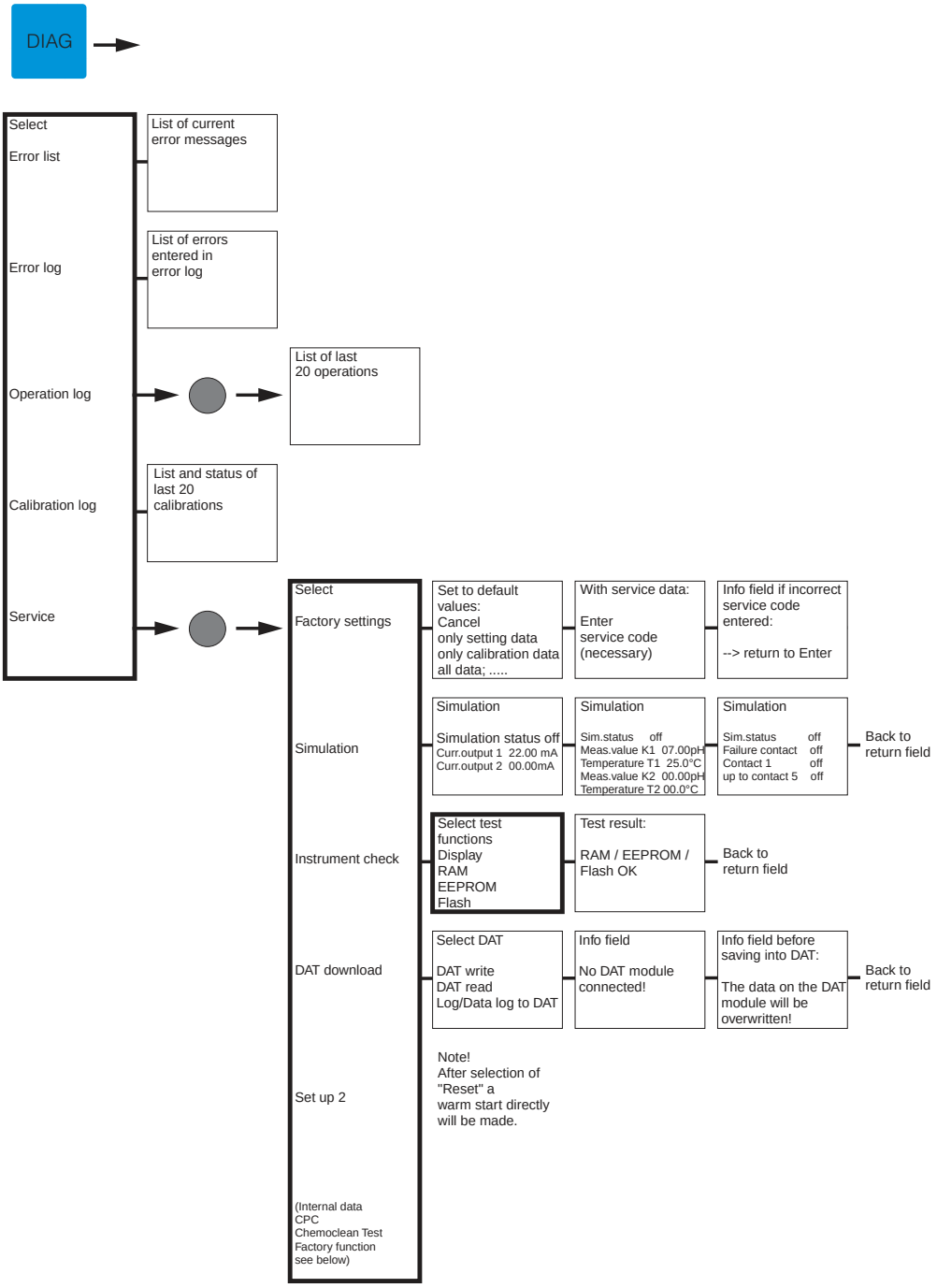

PARAM
PARAM
Set up 1
Set up 2
Controller values
Manual operation
Quick Setup
Select
(Data logger, Check, Controller config. and limit functions see above)
Chemoclean (only with activated system)
Select control levels:
Automatic off
Cleaning trigger off
Ext. control off
Status info field of plant:
Automatic 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 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
Display program as list of function blocks
Highlight with cursor and edit:
Enter time for selected block
0000s
(0...9999s)
Select target day where program shall be copied.
(From day list)
Back to return field
Select program
User prog.
Select an edit function:
edit
Insert default
Konfiguration
Alternative:
(dep. on previous action)
enable / disable
rename
Display programs as list
On selection of following block functions:
change
insert
move
delete
On change/ insert:
Listof all possible blocks selectable
Select source programs from list:
no Prog.
Clean

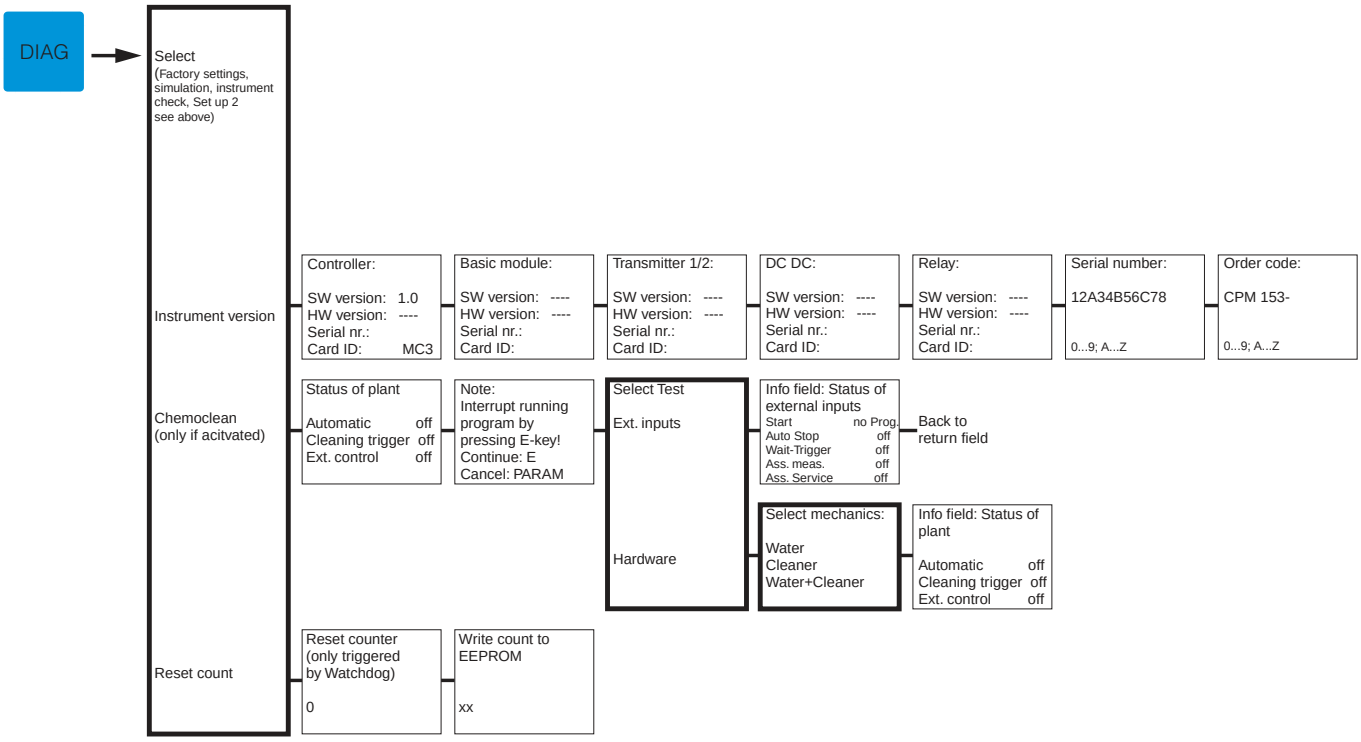
Display program as list of function blocks
Highlight with cursor and edit:
Enter time for selected block
0000s
(0...9999s)
Set number of repetitions
00
(0...10)
enable
disable
Info field
Program is enabled. Please update name
Edit program name
User prog. 1
0...9; A...Z
Info field
Do you really want to 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



»Return field«:

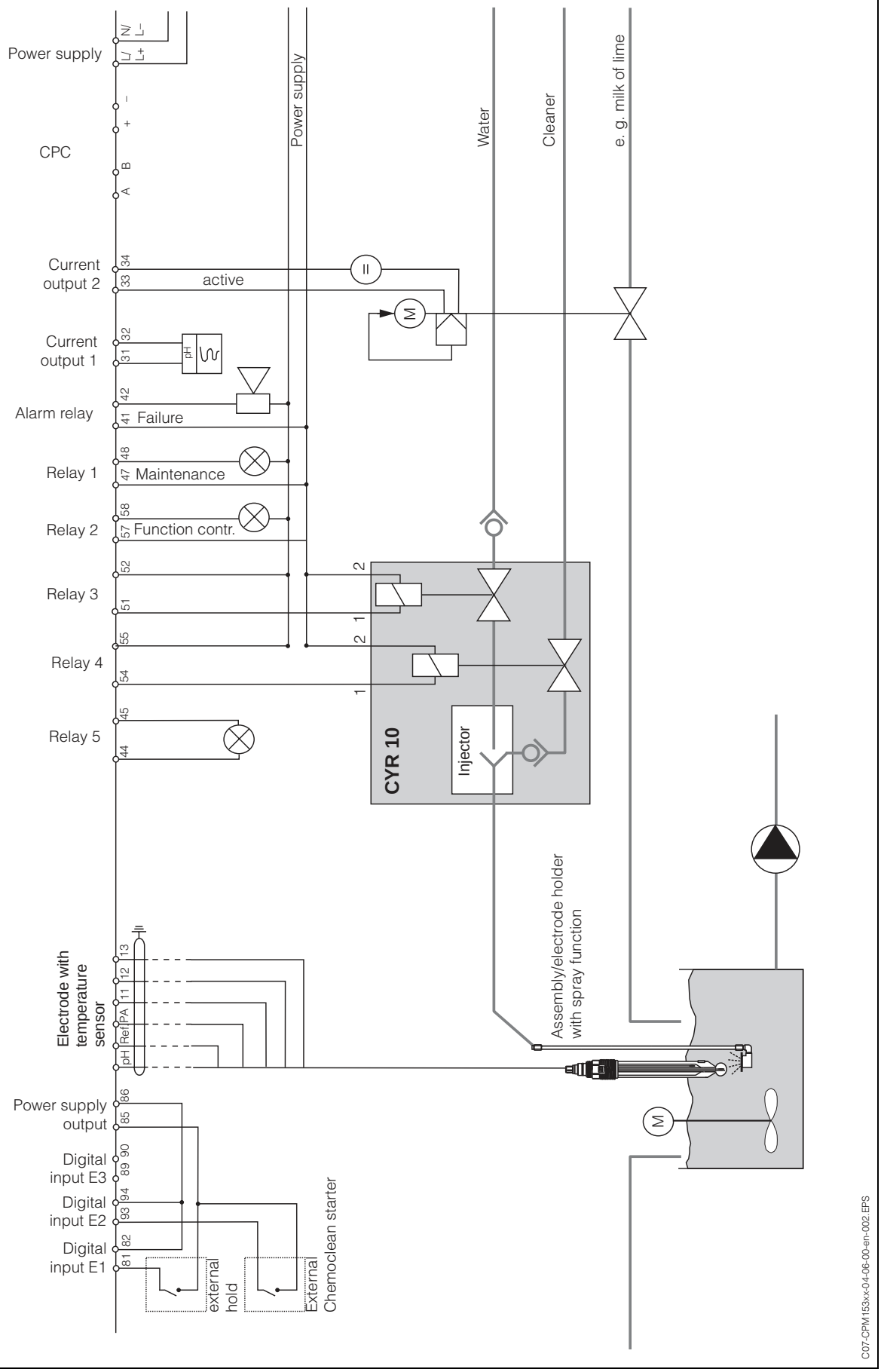
press the PARAM key to return to the highlighted fields.

= Code entry required

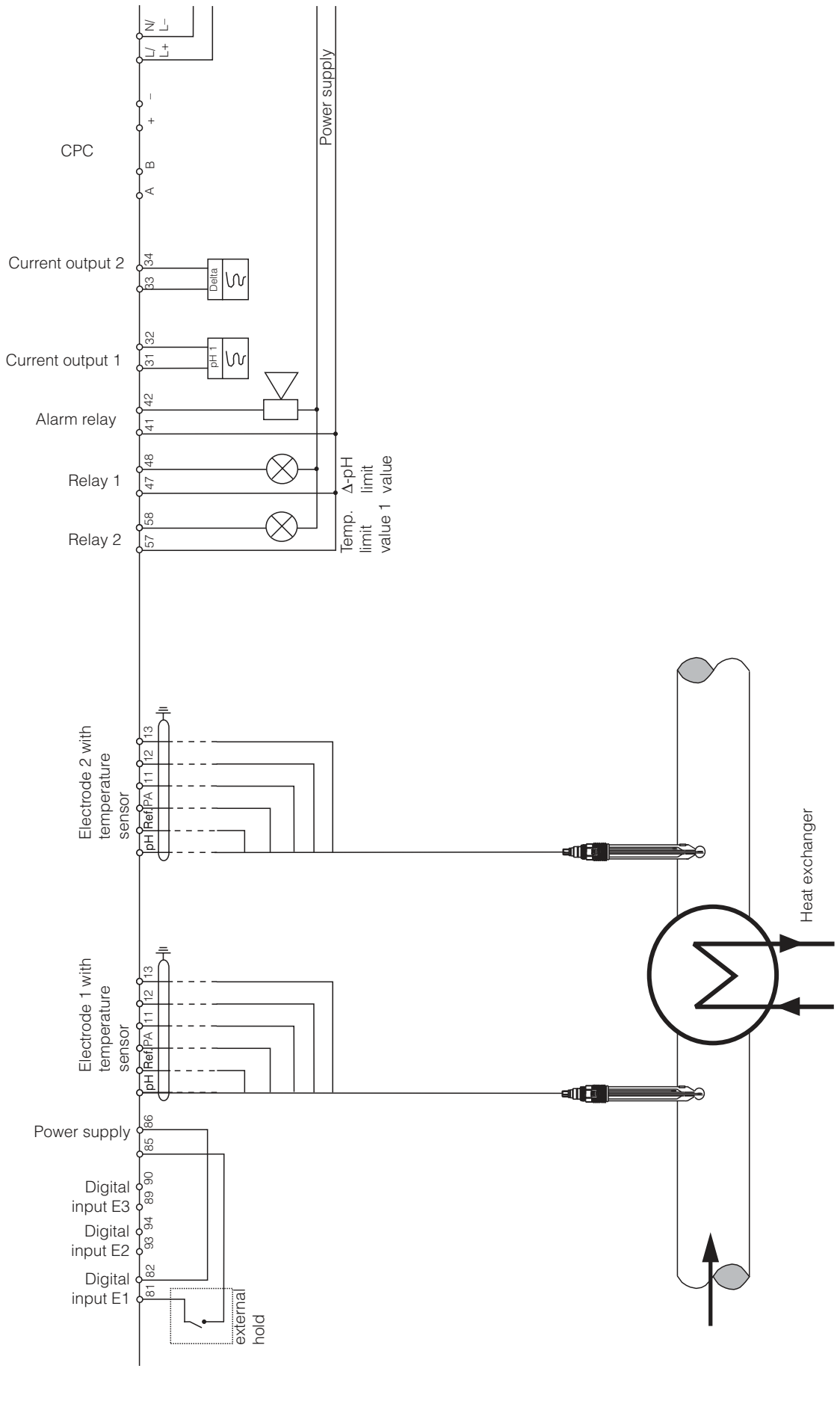
C07-CPM153xx-19-06-08-en-013.EPS

11.2 Wiring examples

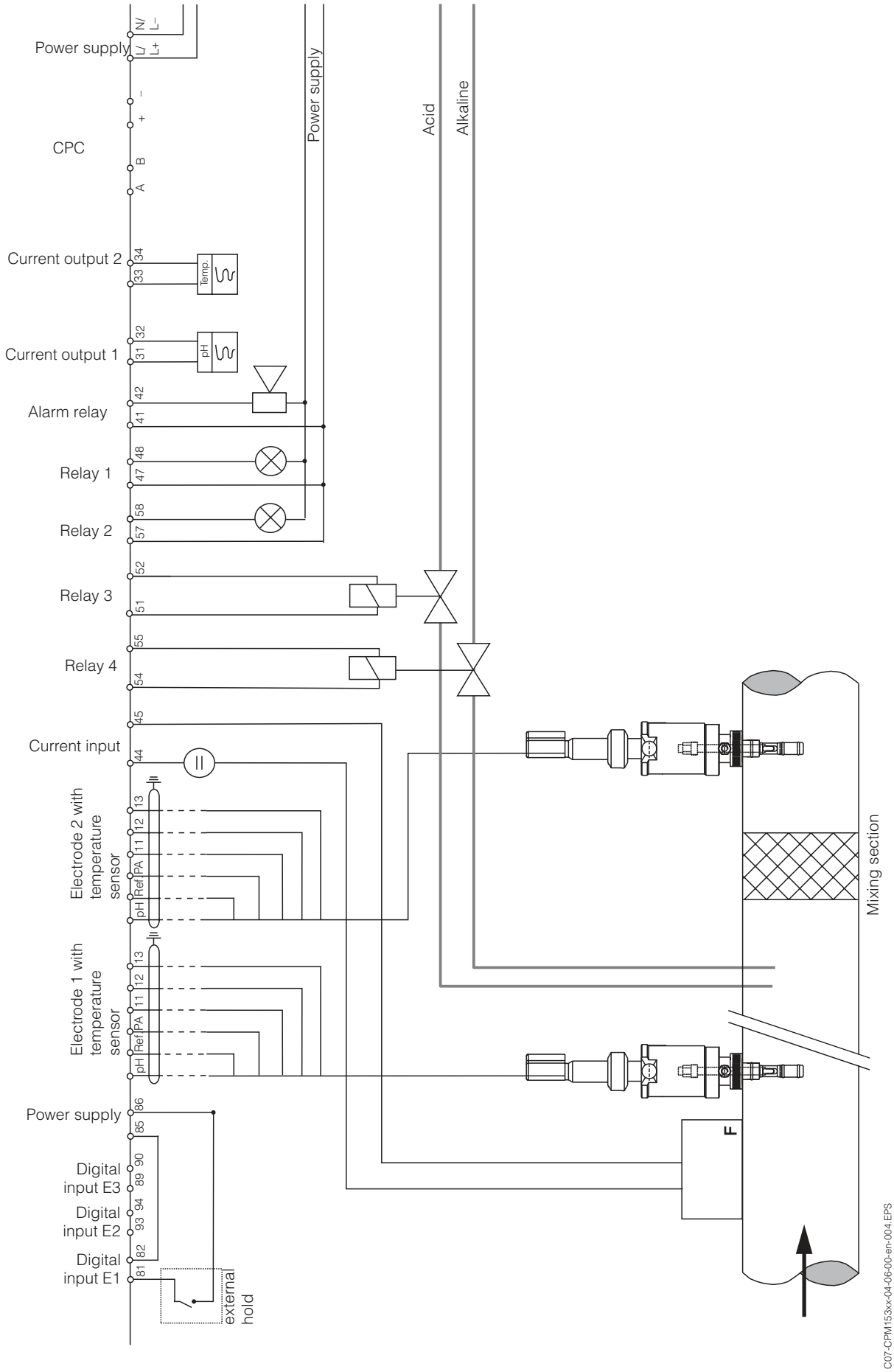
Non-Ex: One-circuit instrument, NAMUR contact assignment, Chemoclean with CYR 10 injector and assembly with spray head, one-sided neutralisation, temperature limit value, pH current output



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



Non-Ex: Two-circuit device, two-sided neutralisation controller with fault parameter, two current outputs (temp., pH)



11.3 Buffer tables

The following buffer tables are stored in the Mycom S CPM 153.

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

Ingold

°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	0,00	0,05	0,10	0,15	0,20	0,25	0,30	0,35	0,40	0,45	0,50	0,55	0,60	0,65	0,70	0,75	0,80	0,85	0,90	0,95
	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

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Declaration of contamination

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

type of instrument / sensor: _____ serial number: _____

medium / concentration: _____ temperature: _____ pressure: _____

cleaned with: _____ conductivity: _____ viscosity: _____

Warning hints for medium used:



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

Please mark the appropriate warning hints.

Reason for return:

_____

_____

Company data:

company: _____ contact person: _____

_____ _____

_____ department: _____

address: _____ phone number: _____

_____ Fax/E-Mail: _____

_____ your order no.: _____

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

_____ _____

(Date) (company stamp and legally binding signature)

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